Griffin, Toni <toni_griffin@fws.gov>

RE: NPS/FWS NER Briefing

1 message

Will Meeks <Will_Meeks@fws.gov> Thu, Apr 9, 2015 at 11:42 AM
To: Keenan Adams <keenan_adams@fws.gov>, Steve Kallin <steve_kallin@fws.gov>, Mike Blenden <mike_blenden@fws.gov>, Toni Griffin <toni_griffin@fws.gov>
Cc: Jeffrey Warren <jeffrey_warren@fws.gov>

Thanks Keenan. The only thing I'll add is if the previous agenda (not lead ammo/bear spray – that's an internal NWR discussion that's yet to be finalized) had a high profile thing that Steve wants on the agenda, we can add it. As we prepare the final agenda, let's take a moment to consider if we've missed anything. Thanks.

Will Meeks

U.S. Fish and Wildlife Service, Region 6

ARD-NWRS and PFW

303-236-4303 (w)

720-541-0310 (c)

From: Adams, Keenan [mailto:keenan_adams@fws.gov]
Sent: Thursday, April 09, 2015 11:15 AM
To: Steve Kallin; Mike Blenden; Toni Griffin
Cc: Jeffrey Warren; Will Meeks
Subject: NPS/FWS NER Briefing

All,

We received more direction for Noreen and Will's joint briefing with the NPS. The "Day light" is in reference to the Adaptive Management Plan and the NPS litigation. **Not** about lead ammunition and bear spray.

I talked with Jeff (Steve, please feel free to chime in) regarding the Adaptive Mgmt Plan and the key points are:

-The team set aside last two weeks of April to finalize the models and provide a "rough draft." The team consist of 2 State, 2 FS, 2 NPS, and NWRS Staff.

-The core team will meet in late May early June to finalize the draft.

-Draft will then go to the RO for an internal review (*need to decide how we allow respecting partners can internally comment)

-There is general consensus among the core group. As of now, all entities are "on-board." The NPS and NWR has been mostly "hand-in-hand."

-The NPS's lead biologist retired in February and he was contracted by the NWR to assist with the plan development.

-The NPS has mentioned the current grizzly bear litigation in the discussions, but the issue has not been elevated or has redirected any of the management plan.

-The elk culling inside the Park is important for the NWR to meet the objective

-The Spring-gulch subdivision (State of WY jurisdiction) has a high population that will impact the NWR to meet the objective

Steve,

Do you have any further information about the NPS litigation and the potential impacts for how the NPS views this management plan?

Regards,

--

Keenan Adams

Chief, Division of Biological Resources

National Wildlife Refuge System

Mountain-Prairie Region

Lakewood, CO

303-236-8102 (Office)

Make everything as simple as possible, but not simpler. ~Albert Einstein

Activities and Accomplishments to Achieve BEMP Goals

Summary for CCP – 12/19/2012

Habitat Goals:

- In 2007 a 100 acres of agricultural fields were reseeded to increase production of nutritious, palatable natural standing winter forage.

- From 2007 through 2012, approximately 1,000 acres of grassland were treated annually with a harrow in the Spring to promote grass production.

- In 2010 installed new $5.2 million irrigation system to significantly expand and improve irrigation capacity to increase winter forage. Water use was reduced and irrigated acres increased from approximately 900 acres to 3,300 acres annually.

Population Goals:

- Initiated a new South Unit Elk hunt in 2007 to encourage elk dispersal and increase harvest to reduce population.
- Initiated an annual public Bison Hunting Season in 2007 to reduce the population. The season length was increased several times to maximize harvest. A 145 day season was offered in 2012-13, from August 15 and ends January 6. Annual harvest is strongly linked to weather conditions and has varied from a high of 266 to a low of 139.
- -Developed the first Memorandum of Agreement with the Shoshone-Bannock Tribes to conduct a ceremonial bison event on the NER in 2008. An average of five bison have been annually harvested through this agreement.
- Bison population has been reduced from approximately 1,250 in 2007 to approximately 900 in 2012.
- Developed an on-line Refuge Hunting Permit Application System to encourage broader participation in the Refuge Elk Hunting Program.
- Provided recommendations and participated in annual elk season and harvest objective setting process with WGFD and Grand Teton National Park 2007-2012.

Information/Outreach Goals:

- Developed a Sleigh Ride Tour Interpretive Manual in 2007 for the Sleigh Ride Concessionaire, to cover key messages of the Bison and Elk Management Plan and National Wildlife Refuge System. Annually 20,000 to 25,000 people participate in this tour.

- Initiated a three day interpretive training program in 2007 for Sleigh Ride Tour concessionaire staff to ensure accurate delivery of key BEMP messages. This training is now conducted annually.
- Since 2007, presented programs to key community and conservation organizations which include explanations of management activities and strategies to achieve goals outlined in the BEMP. Organizations and individuals include but are not limited to: Jackson Hole Rotary; The Nature Conservancy; Jackson Hole Historical Society Annual Banquet; Grand Teton Association Board of Directors; Wyoming Outfitters and Guides Association Annual Meeting; Yellowstone Business Partnership; Teton County Commissioners; Town, County, State and Federal Elected Officials.
- Since 2007, implemented new visitor programs to highlight NER management activities and the above topics. Programs include: Roving Naturalist; Feature Creature, Wildlife Caravans and teacher seminars on NER management.
- Conducted school programs designed to build a foundational understanding about NER management and basic bison/elk ecology for hundreds of area second and fourth graders

Supplemental Feeding Program

- Developed criteria to coordinate the start and stop of the supplemental feeding program with the Wyoming Game and Fish Dept. This criteria has been used without incident since the 2008 feeding season.

Disease Prevention

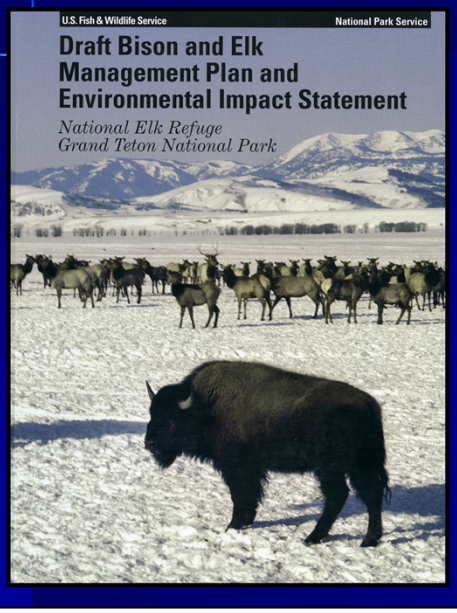
- Annually coordinated elk brucellosis vaccination on the NER with the WGFD each winter beginning in 2007.
- Denied WGFD request to administer brucellosis vaccination program for bison on NER during the winter of 2007-2008. Request was to vaccinate approximately 700 bison using syringe darts. The effective retrieval of used syringes from bison using this untested approach was in question. Large numbers of "unretrieved" syringes littering the NER would pose a safety hazard to refuge employees, hunters and other wildlife. The WGFD decided the delivery system needed further refinement and did not make a similar subsequent request.
- The NER provided funds from 2007 through 2012 to the WGFD to hire a technician(s) to collect CWD (Chronic Wasting Disease) samples on the Refuge and vicinity from hunter harvested elk during the hunting season. Most years, testing has been at the level of 95% confidence of detecting CWD at 1% prevalence.

- In 2008, as a standard operating procedure, permanent Refuge staff carry a firearm in the tractor during supplemental feeding. They are instructed to immediately shoot any elk that exhibit suspect CWD symptoms. All elk collected are then tested for CWD. Staff have received training in identifying CWD symptoms and have passed a firearms proficiency test.
- In 2009 a long-term, bison/elk herd health monitoring project was initiated on the Refuge with the Wildlife Health Office in Bozeman, MT (Tom Roffe). The purpose of this project is to identify the presence and prevalence of all diseases in these herds. Also, it attempts to determine if management actions cause environmental conditions which exacerbate the presence or prevalence of diseases. All elk collected for this project are tested for CWD. In 2011, approximately 50 elk were collected and tested for a variety of diseases.
- In 2008 the NER initiated the establishment of a CWD Working Group, comprised of land and wildlife management agencies that have influence on the Jackson Elk Herd. Members include: Grand Teton and Yellowstone National Parks, Bridger-Teton National Forest, Wyoming Game and Fish, and the National Elk Refuge. The purpose of this group is to share information and when possible, leverage efforts to detect the presence of CWD and reduce the risk of CWD environmental contamination. This Working Group meets on an "as-needed" basis.
- One of the outcomes from the CWD Working Group is a consensus concerning the importance of increased CWD surveillance. The GTNP, WGFD and NER will all pursue funding for additional CWD technicians to increase samples from hunter harvested elk. The coordination of this effort and potential sharing of CWD technicians between agencies was the topic for the CWD Working Group meeting in March, 2009.
- The WGFD has provided free, CWD testing service to NER and GTNP hunters. It is anticipated that increased public awareness combined with the ability for hunters to test their harvested elk, will increase the CWD sample size for the NER and GTNP.

Planning

- The development of a BEMP Adaptive Management Plan was initiated in November 2012. This effort was initially delayed pending the outcome of litigation.

NER Objectives:

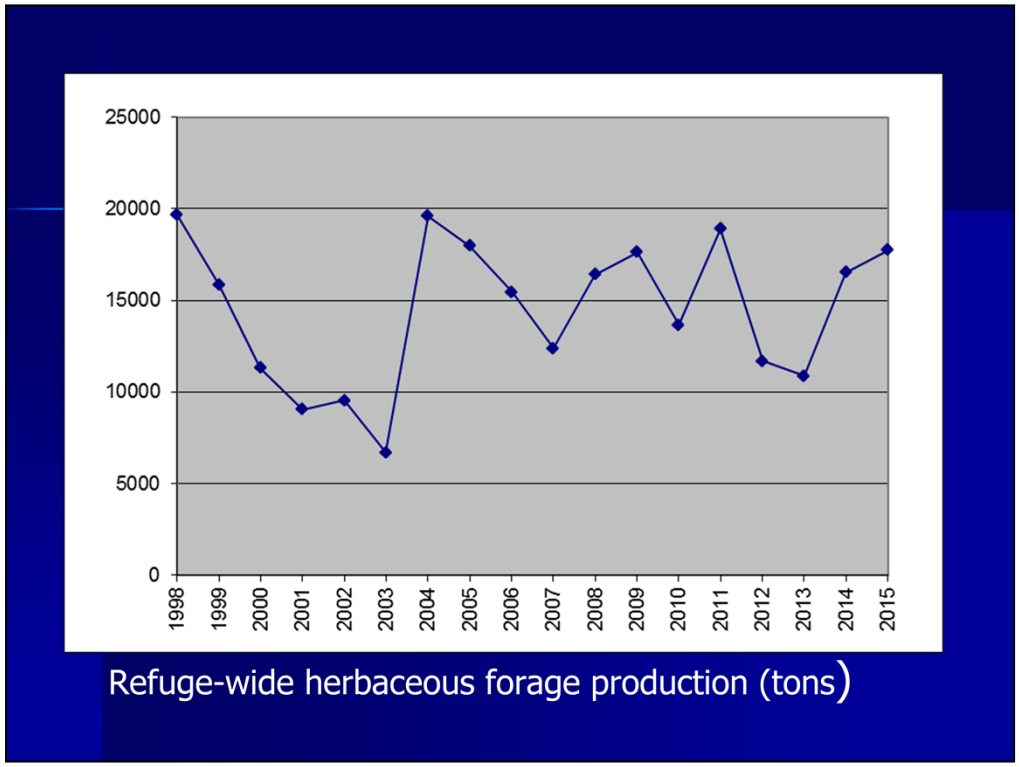


- Elk wintering on NER reduced to 5,000
- Bison wintering on NER reduced to 500
- Reduction in number of years that elk are fed and length of feed seasons: via meeting elk and bison objectives and increased forage production using irrigation

The refuge is managed according to the objectives of the 2007 Bison and Elk Management plan which are: SEE SCREEN

Therefore we are very interested in the variables that influence if/when/ and how long we feed. These variables are

1) The amount of forage produced during the previous growing season.
2) Forage consumption by elk and bison, which is influenced by the number of elk and bison and the amount of time that they are on the refuge,
3) Snow conditions, and lastly
4) The criteria used to determine when feeding is necessary and when it should stop. For example these criteria could be less conservative if there was a greater tolerance for winter elk mortality or elk/human conflicts.

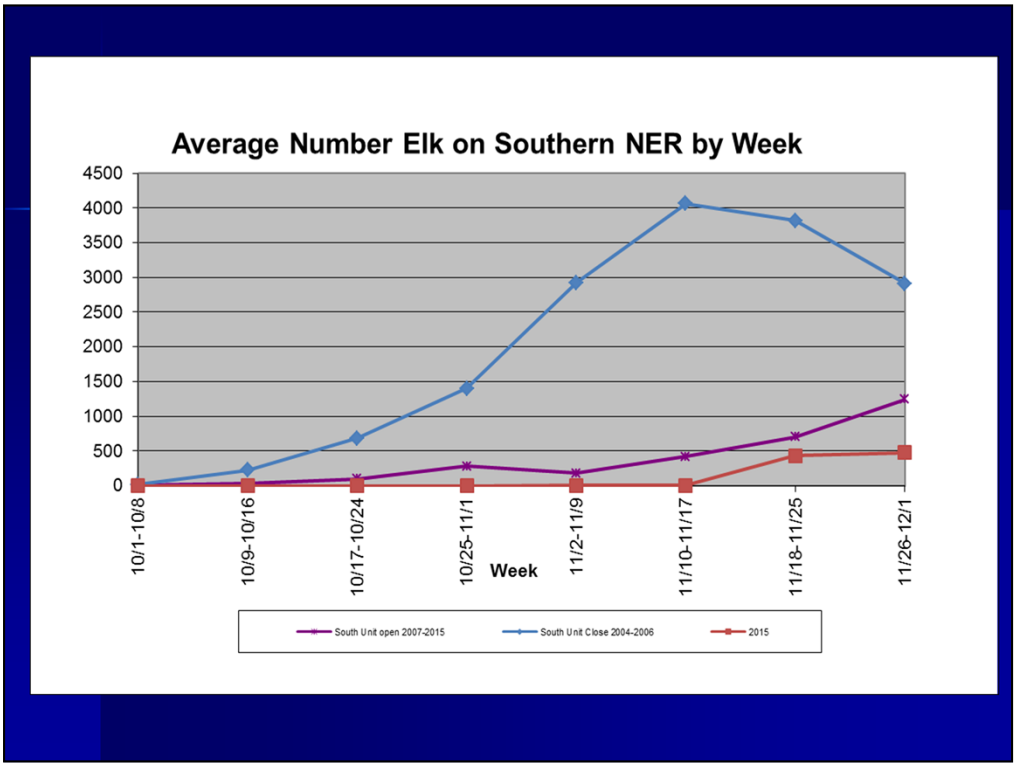


The amount of forage produced is important because it influences when supplemental feeding is necessary. In general more forage results in a shorter feed season.

This chart shows estimated refuge-wide herbaceous forage production in tons by year from 1998-2015. As you can see annual forage production varies widely by year (as low as 6,000 tons in 2003 and as high as 20,000 tons in 1998 and 2004). And this is primarily a function of May through August precipitation.

Estimated 2015 refuge-wide herbaceous forage production was 17,746 tons (22% above the long term average). Relatively high forage production on NER was attributed to above average total precipitation during the growing season (May through August) plus irrigation effects. Although 2015 forage production was 22% above average it was not a record high due to below average precipitation in June.

We estimate that irrigation of 3,238 acres bolstered forage production in 2015 by 1,953 tons over what would have grown in the absence of irrigation (a 9% increase in refuge wide forage production and a 12% increase in the high elk and bison use area on the south end of NER.

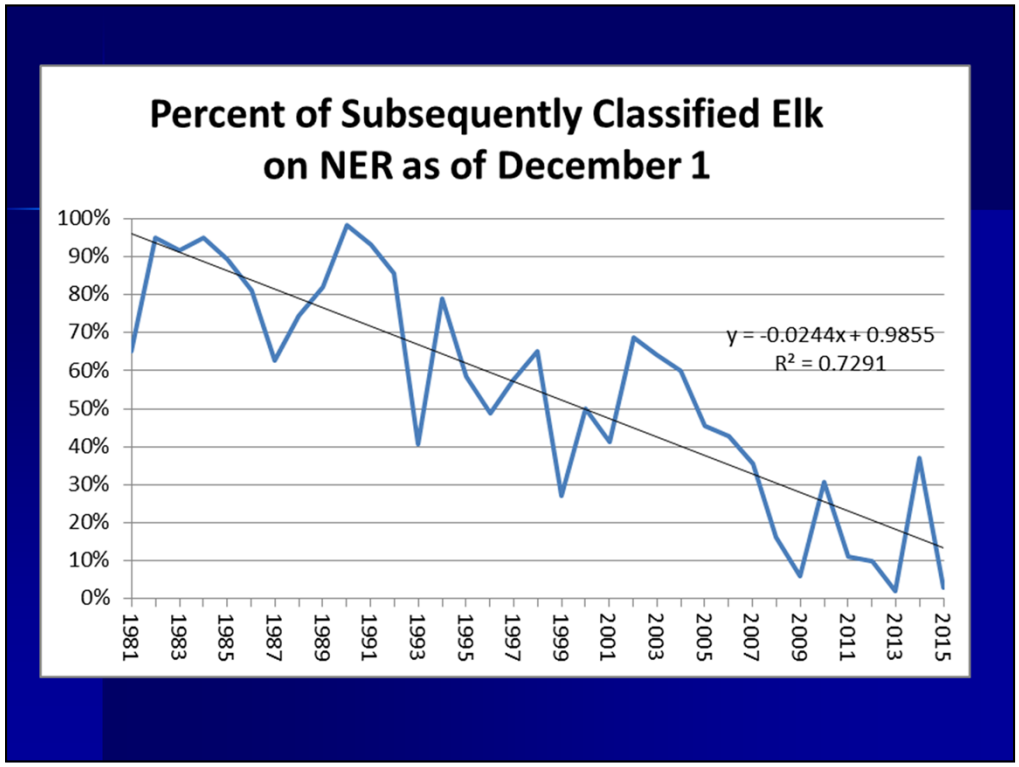


The number of elk and bison on the south end of the refuge during the fall influences the rate of forage consumption and therefore also influences when we begin supplemental feeding. Fewer elk and bison and late elk and bison arrival allow us to begin feeding later.

Historically the extreme south end of the refuge had been a safe zone during the fall hunting season, which encouraged elk to concentrate in this part of the refuge. The average number of elk on the south end of NER would increase to a peak of around 4,000 elk by Mid November, then decline slightly when HA 80 closed (see blue time series line)

Since 2007 there has been a south unit elk hunt on NER, and human disturbance associated with this hunt has moved large numbers of elk to other open hunt areas and likely reduced the amount of forage consumed by elk, reserving it for when it was more critically needed later in the winter (see purple line)

2015 (shown in red) continued this trend with almost no elk observed on southern NER until mid-November.

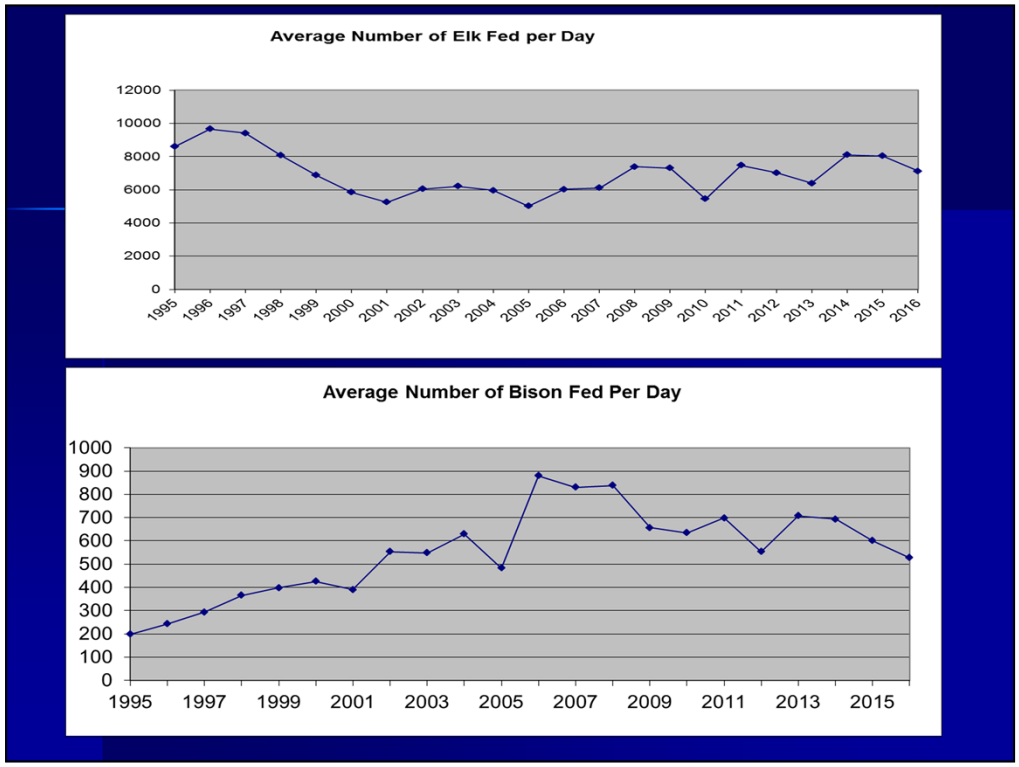


There is some evidence that the percentage of elk present on the refuge in late fall that subsequently are classified on the refuge during a mid-winter count has declined over time. For example thirty years ago the percentage of elk on December 1 fluctuated between 65 and 95%. In recent years the percent of elk has fluctuated between 2 and 35 percent.

The trend appears to pre-date the opening of the refuge's south unit hunt in 2007, although that probably magnified the effect.

The effect seems to be from a combination of later elk migrations to the refuge over time and elk quickly leaving the refuge once they arrive due to hunting pressure.

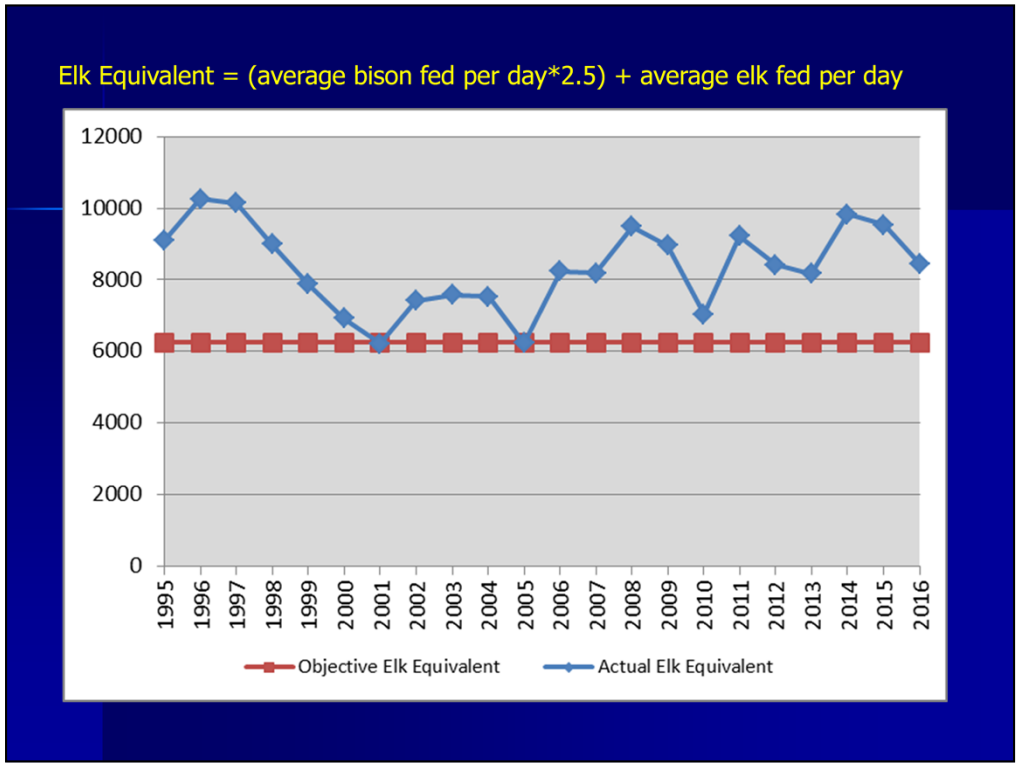
Either way this trend is beneficial if we are interested minimizing the time that elk are concentrated on NER for disease reasons, and for reducing the length of our feed seasons.



The top figure shows the average number of elk fed per day by year since 1995 (we have been in the 6,000-8000 range in recent years.

The bottom figure shows the average number of bison fed per day by year since 1995. We have been in the 525-700 range in recent years.

Key point is that we are still above the 5000 elk and 500 bison objectives established in the Bison and Elk Management Plan. We are on the right track to reach bison objectives, but there are no signs that we will ever reach the elk objective using current strategies.



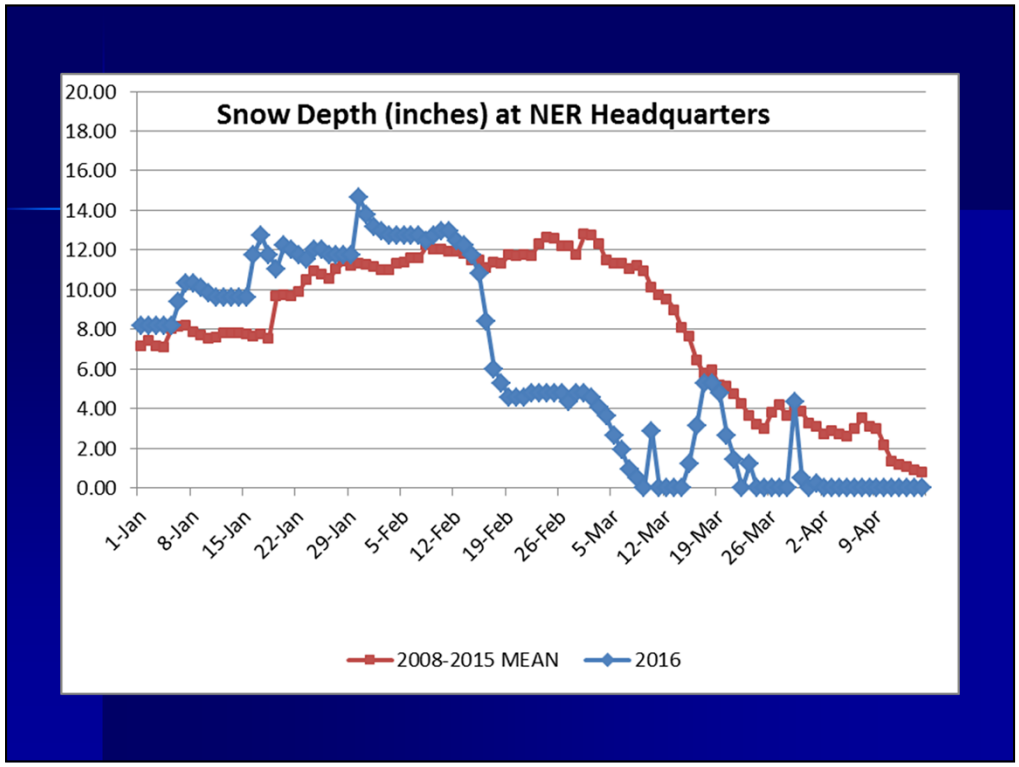
In terms of reducing our reliance on supplemental feeding, it is the combined forage consumption of elk and bison that matters.

A simplifed way to express this would be to assume that each bison is equivalent to 2.5 elk in terms of forage consumption, and combine the average number of elk and bison fed per day into elk equivalents.

Using this method our objective elk equivalents based on 5,000 elk and 500 bison is 6,250

We have not been at this level since the very mild winter of 2005,

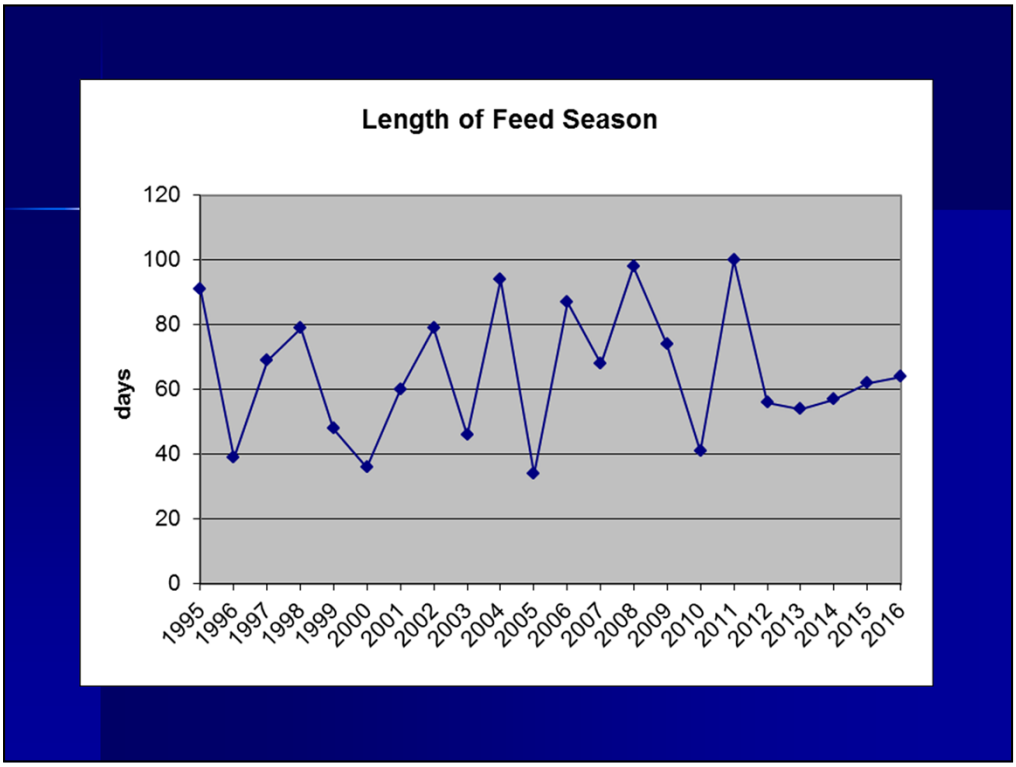
The key point is that it will be very difficult to reduce our reliance on supplemental feeding until we reach elk and bison population objectives. Although we seem to be making gradual progress with the bison objective, clearly there has been no progress in meeting the elk objective since 2007.



Snow conditions are one of the most important variables that influence when we start and end feeding, and obviously the variable over which we have the least control.

This chart shows snow depth in inches for at the NER headquarters from January 1 through April 15th for 2016 in blue compared to the 2008-2016 average in red.

Refuge snowpack depth was above average, but powdery for most of January which enabled us to delay the start of feeding until 30 January, slightly later than the long-term average start date. Although there was a significant melt in mid-january with the south end of the refuge completely snow free by the first week in march, there was still significant snow on the north end of NER and adjancent areas, and the last day of supplemental feeding was April 2, close to the long term average end date.



This chart shows the length of NER feed seasons since 1995.

This year the net effect of above average forage production, low NER elk numbers during the fall, and above average snowpack depth in January was a feed season 64 days long, very close to the long term average.

Since the implementation of the BEMP in 2007 we have made progress in increasing forage production on NER, and reducing the bison population, but on average we have been moving in the wrong direction in terms of the number of elk wintering on NER.

Reducing reliance on supplemental feeding will require, 1)continurnig to discourage elk and bison use of NER during the fall, (probably using late hunting seasons); 2) changing the feeding initiation and cessation criteria, 3)meeting elk and bison population objectives, or 4)some combination of all of these things.

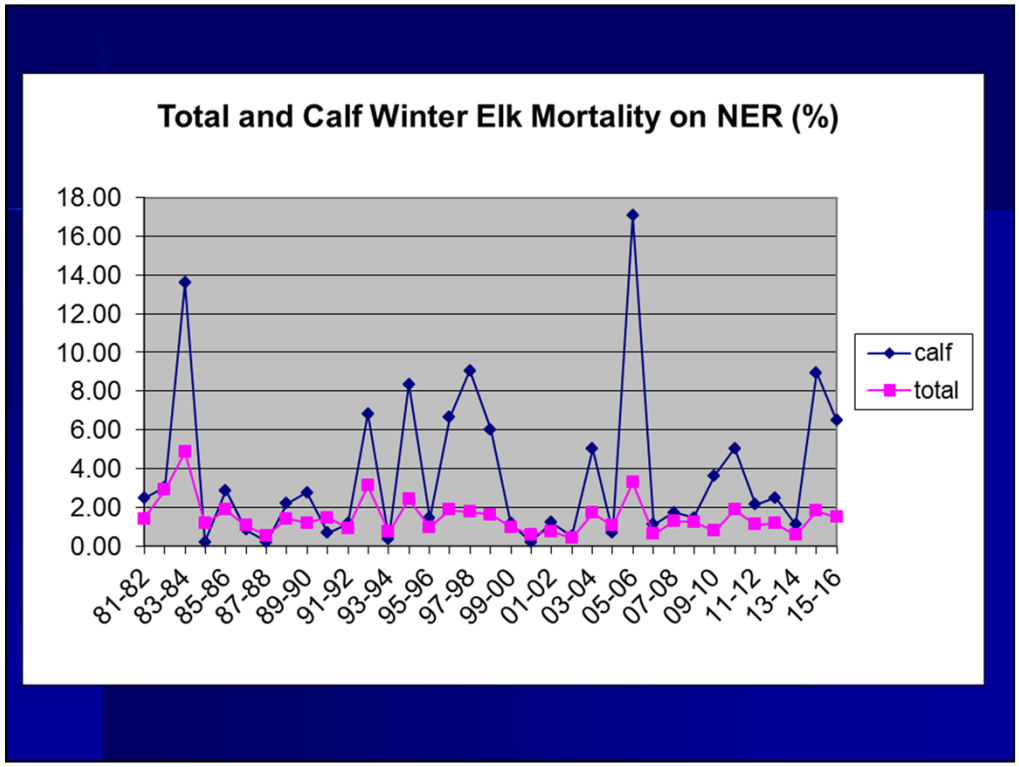


Lastly, given the uproar in the newspaper and on social media from CC for the Elk and their associates about elk starvation on NER I would be remiss if I did not present some information on the topic.

Their most serious allegation is that we are deliberately starving the elk to meet our 5,000 elk management objective.

The kindest thing that I can say about that is that it is a load of crap.

In short if NER were deliberately starving elk to meet our population objectives, then I would say that we are doing a very poor job of it.



This year we documented 108 total mortalities (1.5% of classified total) and 51 calf mortalities (6.5% of classified calves). These levels of mortality are remarkably low for a wintering elk population. For example Singer et al documented 355 average winter elk calf mortality in Yellowstone's northern range.

In 2016 on NER total mortality was near the long term average of 1.5% and calf mortality was slightly higher than the long term average of 3.6% probably due to foot rot and wolf predation. But still remarkably low.

From:	Will Meeks
To:	Matt Hogan
Subject:	RE: Dorsey Talking Points
Date:	Monday, May 06, 2013 2:58:04 PM
Attachments:	CircuitCourtFeedgroundRuling8-3-11.pdf GYC Advocate Fall 2012 Parting Thoughts Lloyd Dorsey.pdf JHNG Court Decision 8-10-2011.pdf NERCourtDecision3-26-10.pdf BisonElkMgmtPlanOutreachStrategyMemo 5-7-12.doc

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Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
NWRS and PFW
303-236-4303 (w)

From: Matt Hogan [mailto:Matt_Hogan@fws.gov]
Sent: Monday, May 06, 2013 1:22 PM
To: Will Meeks
Subject: RE: Dorsey Talking Points

Thanks Will. See question in the attached. Also, Steve references several attachments which were not included.

From: Will Meeks [mailto:Will_Meeks@fws.gov]
Sent: Monday, May 06, 2013 12:42 PM
To: Matt Hogan
Subject: Dorsey Talking Points

Matt,

Can't recall if I sent these last week . . . if not, here they are . . . if I did, disregard.

Steve Kallin put these together with concurrence from Santavy and Rundle.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
NWRS and PFW
303-236-4303 (w)

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued May 12, 2011 Decided August 3, 2011

No. 10-5144

DEFENDERS OF WILDLIFE, ET AL.,
APPELLANTS

v.

KENNETH LEE SALAZAR, IN HIS OFFICIAL CAPACITY AS SECRETARY OF THE INTERIOR, ET AL.,
APPELLEES

Appeal from the United States District Court
for the District of Columbia
(No. 1:08-cv-00945)

Timothy J. Preso argued the cause for appellants. With him on the briefs were *Douglas L. Honnold* and *Sean M. Helle. Sierra B. Weaver* entered an appearance.

Mark R. Haag, Attorney, U.S. Department of Justice, argued the cause for federal appellees. With him on the brief was *Robert H. Oakley*, Attorney.

James Kaste, Senior Assistant Attorney General, Office of the Attorney General for the State of Wyoming, was on the brief for intervenor State of Wyoming in support of federal

appellees. *R. Craig Lawrence*, Assistant U.S. Attorney, entered an appearance.

Before: ROGERS, TATEL, and GRIFFITH, *Circuit Judges*.

Opinion for the Court filed by *Circuit Judge* GRIFFITH.

GRIFFITH, *Circuit Judge*: As required by the National Wildlife Refuge System Improvement Act, the U.S. Fish and Wildlife Service and the National Park Service devised a plan to manage the elk and bison populations in the National Elk Refuge and Grand Teton National Park. Part of this plan includes ending the longstanding agency practice of feeding these animals during the winter. The Defenders of Wildlife challenge the plan because it fails to include a time certain for ending the practice. The district court rejected the challenge, and, for the reasons set forth below, we affirm its judgment.

I

The National Wildlife Refuge System includes over 550 refuges and 150 million acres of protected land. The Department of the Interior, acting through the U.S. Fish and Wildlife Service, manages these properties pursuant to the National Wildlife Refuge Administration Act, Pub. L. No. 89-669, 80 Stat. 926 (1966), as amended by the National Wildlife Refuge System Improvement Act ("Improvement Act"), Pub L. No. 105-57, 111 Stat. 1252 (1997) (codified at 16 U.S.C. §§ 668dd-668ee).

The National Elk Refuge is part of that system. Located just north of Jackson, Wyoming, and adjacent to Grand Teton National Park, the Refuge was established in 1912 when Congress designated 2000 acres in Jackson Hole as a "winter game (elk) reserve." Act of Aug. 10, 1912, Pub. L. No. 62-261, 37 Stat. 293 (codified as amended at 16 U.S.C. § 673). The Refuge is now a 24,700-acre expanse that the Secretary

holds "for the grazing of, and as a refuge for, American elk and other big game animals." 16 U.S.C. § 673a. Its landscape consists of meadows, marshes, streams, ponds, and open fields across a valley floor that includes sagebrush and rock outcroppings, all set against the majestic backdrop of the Teton and Gros Ventre mountain ranges. Lucky wayfarers may spot wolves, grizzly bears, trumpeter swans, and any number of the area's magnificent ungulates, including bison, bighorn sheep, pronghorn, mule deer, and, of course, elk. The National Elk Refuge's eponymous herd comprises one of the largest concentrations of elk in North America. It goes without saying that these elk are of considerable ecological, economic, and cultural value.

Around the turn of the last century, a series of severe winters in Wyoming strained the elk populations and spurred the good people of Jackson to save the elk by feeding them. When Congress created the Refuge in 1912, the federal government continued this practice, which the parties refer to as supplemental feeding. For roughly seventy days each winter, approximately 7000 elk and 1000 bison are drawn daily to the federal trough.

In recent years, it has become apparent that this practice, though born of benevolence, causes significant problems. According to the Department of the Interior, supplemental feeding leads to a seasonal concentration of elk and bison that is "an unnatural situation that has contributed to . . . an increased risk of potentially major outbreaks of exotic diseases . . . [and] damage to and loss of habitat." Final Bison and Elk Management Plan and Environmental Impact Statement for the National Elk Refuge / Grand Teton National Park / John D. Rockefeller, Jr., Memorial Parkway 9 (Feb. 1, 2007) [hereinafter February 2007 Management Plan and EIS]. This risk poses an existential threat to the elk and bison and puts the very purpose of the Refuge at jeopardy. *See id.*

(noting that the risk of diseases posed by increased concentrations of the animals has "the greatest potential to hinder . . . [the] purposes . . . [of] the National Elk Refuge").

One major problem is brucellosis—also known as "Bangs disease, undulant fever, and contagious abortion," *id.* at 564—which causes an infected female to abort her first calf, leaving behind contaminated fetal tissue on the ground capable of transmitting the disease to other animals, *id.* at 129. Brucellosis rates within normal Wyoming elk herds are approximately two percent, but rates among elk that frequent the Refuge feeding lines have averaged around seventeen percent in recent years. *Id.* at 130. Another major problem, chronic wasting disease (CWD), is the elk version of mad cow disease: Like its bovine counterpart, CWD assaults the central nervous system, causing brain lesions, behavioral changes, a loss of body condition, and ultimately death. CWD is caused by abnormal, non-living proteins known as prions that persist in the soil where infected animals graze, even after intensive efforts to remove them. *Id.* at 136-40. Statistical sampling suggests that in open, elk-hunt areas in Wyoming, the prevalence of CWD in elk averages around four percent. *Id.* at 137. But in confined areas—like those created by the feed lines—the prevalence can exceed ninety percent. *Id.* CWD is not yet prevalent in the Refuge, but if that changes, "environmental contamination will become a major concern due to the disease's ability to persist in the environment for a long period of time." *Id.*

All agree that supplemental feeding increases the risk of such diseases. Without supplemental feeding, the elk would gather in smaller groups, meaning that one sick elk would infect only the handful of others around it. But because the feeding lines bring so many together, the disease of one can quickly become that of many, if not all.

Spurred by a district court order requiring reassessment of the winter feeding operation, *see Fund for Animals v. Clark*, 27 F. Supp. 2d 8, 12-15 (D.D.C. 1998), the Fish and Wildlife Service teamed with the National Park Service,[*] also part of the Department of the Interior, to prepare a management plan for the elk and bison populations. The agencies analyzed six alternatives for managing the herds over the next fifteen years. These plans ran the gamut from maintaining the status quo to ending the practice of supplemental feeding within five years.

In April 2007, the agencies settled on an approach that would, over time, create conditions that would allow the elk and bison to survive the winter without supplemental feeding and, in the meantime, manage the risk of contagion until the practice ended. In essence, their plan seeks to restore natural forage that will allow the animals to sustain themselves during wintertime without the help of supplemental feeding. Bison and Elk Management Plan: National Elk Refuge and Grand Teton National Park 129-34 (Apr. 2007) [hereinafter April 2007 Management Plan]. For example, it provides for substantial reductions in the numbers of elk and bison, primarily through short-term increases in hunting, so that their populations will be closer to levels that would have existed had there never been a practice of supplemental feeding. *Id.* at 134-37. The plan also seeks to reduce disease transmission by rotating feed sites, spreading feed in long lines, separating elk and bison from neighboring livestock, providing increased CWD monitoring, and allowing Wyoming to vaccinate the herds. *Id.* at 138-39. Ultimately, over a fifteen-year period, "[a]s habitat and population objectives are achieved, [the agencies will aim to] decrease reliance on intensive

[*] Because the plan in this case also addresses management of elk and bison populations in nearby Grand Teton National Park, the National Park Service, which manages the park, joined in the effort.

supplemental winter feeding, including complete transition to free-standing forage if and when several established criteria are met, including support from the Wyoming Game and Fish Department and the public." *Id.* at 137.

Before adopting this approach, the agencies considered and rejected the petitioners' preferred alternative, which would have committed the Secretary to ending supplemental feeding within five years. As described in their brief, the agencies recognized that this alternative "would provide some advantages in terms of habitat benefits, a lower prevalence of brucellosis over the long term, and a lower risk for the spread of chronic wasting disease." Appellees' Br. 19 (citing Record of Decision, Final Bison and Elk Management Plan and Environmental Impact Statement: National Elk Refuge and Grand Teton National Park 10 (Apr. 2007) [hereinafter Record of Decision]). But they also found that "[this alternative] would likely result in an increase in elk mortality from starvation, predation, and disease related to poor body condition, particularly in severe winters." *Id.* (citing Record of Decision 10). This in turn would lead to a "long-term decrease in elk hunting and viewing opportunities in the Refuge, with attendant impacts on the area economy, and could cause elk herd numbers to fall below [the Wyoming Game and Fish Department's] statewide objective in some years." *Id.* at 19-20 (citing Record of Decision 10).

The agencies concluded that their preferred plan "[is more] consistent with regional herd management objectives, better balances divergent stakeholder interests, builds upon success on the ground, and enables managers to adapt to new information and changing conditions," all while preparing the animals for the eventual cessation of supplemental feeding and providing most of the benefits offered by the petitioners' preferred alternative. *Id.* at 20 (citing Record of Decision 14). On the issue of when to end supplemental feeding, the

agencies stressed that although they are committed to abandoning the practice, they would "not preclude the use of supplemental feeding or other management tools as [they] work to resolve the bison and elk management issues . . . . [N]or [would they] make predictions about how fast [they could] implement the phased approach for improving forage, reducing the [elk and bison populations], and reducing the need for supplemental feed . . . . When the biological, social, and political conditions enable [them] to consider a phase-out of feeding, [the plan's] adaptive framework provides [the agencies] with that flexibility." Record of Decision 13. In essence, the agencies determined that a deadline for ceasing supplemental feeding would be unduly restrictive in light of the many variables and concerns that need to be accounted for in managing the Refuge.

The Defenders of Wildlife, the Jackson Hole Conservation Alliance, the National Wildlife Refuge Association, the Greater Yellowstone Coalition, and the Wyoming Outdoor Council (collectively, the Defenders) filed suit in the district court, challenging the Secretary's plan under the Administrative Procedure Act. They argue the plan's failure to commit to a deadline for ending supplemental feeding was arbitrary and capricious given the Secretary's duty under the Improvement Act to "provide for the conservation of . . . wildlife" and "ensure that the biological integrity, diversity, and environmental health of the [wildlife refuge system] are maintained." 16 U.S.C. § 668dd(a)(4)(A)-(B). The district court granted summary judgment for the agencies, reasoning that the plan accounted for and managed the dangers of supplemental feeding and also created a program for phasing out the practice over a fifteen-year period. *Defenders of Wildlife v. Salazar*, 698 F. Supp. 2d 141, 147-48 (D.D.C. 2010). The Defenders of Wildlife filed a timely appeal, and we take jurisdiction pursuant to 28 U.S.C. § 1291.

We review the district court's grant of summary judgment de novo. *Castlewood Prods., LLC v. Norton*, 365 F.3d 1076, 1082 (D.C. Cir. 2004). Under the Administrative Procedure Act, we set aside agency action that is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). Our review focuses on whether the agency examined the relevant data, articulated a satisfactory explanation for its action, based its decision on the relevant factors, and committed no clear error of judgment. *Bluewater Network v. EPA*, 370 F.3d 1, 11 (D.C. Cir. 2004).

II

The parties agree that supplemental feeding poses serious risks for the elk and bison in the Refuge. The only question this case presents is whether it was arbitrary and capricious for the Secretary to transition away from supplemental feeding without committing himself to ending the practice on a particular date.

The Defenders argue it was, inasmuch as the very purpose of the National Wildlife Refuge System, as set out in the Improvement Act, "is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." 16 U.S.C. § 668dd(a)(2). To that end, the Defenders point out, the Act mandates that the Secretary manage refuges to "provide for the *conservation* of fish, wildlife, and plants, and their habitats within the System" and to "ensure that the *biological integrity, diversity, and environmental health* of the System are maintained for the benefit of present and future generations of Americans." *Id.* § 668dd(a)(4)(A), (B) (emphases added). The Act also instructs the Secretary to

"sustain and, where appropriate, restore and enhance, healthy populations of fish, wildlife, and plants utilizing . . . methods and procedures associated with modern scientific resource programs." *Id.* § 668ee(4). The Defenders argue that the Secretary's plan is unlawful because it does not fix a definite time for ending supplemental feeding, even though the agencies have acknowledged that the dangers posed by this practice imperil explicit statutory objectives. *See* February 2007 Management Plan and EIS 9. Underlying this statutory argument is some common sense: the whole point of a National Elk *Refuge* is to provide a sanctuary in which populations of healthy, reproducing elk can be sustained. *See* 16 U.S.C. § 673a (creating a "refuge" for the elk). The Refuge can hardly provide such a sanctuary if, every winter, elk and bison are drawn by the siren song of human-provided food to what becomes, through the act of gathering, a miasmic zone of life-threatening diseases.

The Defenders acknowledge that the Improvement Act also requires the Secretary to consider other factors such as the importance of recreation on refuge lands and cooperation with state officials in pursuing the objectives of the Act. *See id.* § 668dd(4)(I), (M). They argue, however, that such considerations may be pursued only when "compatible" or "consistent with" the conservation mission of the System and the purposes of each refuge. *See id.* § 668dd(a)(3)(B), (e)(3). Reading the several provisions of the Act that emphasize the importance of wildlife conservation together with the general purpose of the National Wildlife Refuge System, the Defenders contend that the agencies' top priority in managing the Refuge must be conservation, and other considerations must not hinder that objective.

For their part, the Secretary and Wyoming (intervening as a defendant-appellee in this case) argue that the Improvement Act confers upon the Secretary broad managerial discretion in

how to pursue the Act's objectives. They concede that conservation is the overarching objective, but argue that it cannot be the sole consideration. After all, the Act lists fourteen factors that the Secretary "shall" consider in administering the System, including, among others, "ensur[ing] effective coordination, interaction, and cooperation" with adjoining landowners and State fish and wildlife agencies in pursuit of the objectives of the Act. *Id.* § 668dd(a)(4)(E).

Given the discretion afforded him, the Secretary argues that the agencies reasonably determined that the plan is consistent with the objectives of the Act and the purposes of the Refuge. The plan addresses the risk of diseases by (1) increasing natural forage and decreasing the herd sizes, which will work in tandem to create conditions under which supplemental feeding can be stopped without unduly increasing the risk of starvation, (2) monitoring and managing the diseases that accompany gathering at the feed lines, and (3) progressively reducing reliance on supplemental feeding when certain criteria have been met.

There is no doubt that unmitigated continuation of supplemental feeding would undermine the conservation purpose of the National Wildlife Refuge System. But we cannot conclude that the agencies acted unlawfully by adopting a plan that contained no deadline for ending the practice, and that is the only issue before us. The record amply demonstrates that the agencies collected the relevant data, identified the dangers posed by supplemental feeding, and adopted a plan to mitigate those dangers. That they also determined that the many objectives of the Act, including conservation, could best be met without implementation of a fixed deadline for stopping supplemental feeding was not arbitrary or capricious.

The district court was right that the plan "might well have been unreasonable had the agencies categorically refused to phase out the winter feeding program in spite of all the evidence in the record about the dangers of supplemental feeding." *Defenders of Wildlife*, 698 F. Supp. 2d at 148. But they did no such thing. Instead, they selected an approach that is geared toward ending the practice over time while maintaining the flexibility needed to respond to facts on the ground. The Defenders are understandably concerned that this flexibility could be used to continue the practice indefinitely. But the agencies must proceed in a manner that is consistent with the science and accounts for the risks posed by supplemental feeding. There is nothing the agencies have said or done that causes us to doubt that they will. It is highly significant and indeed dispositive to us, as it was to the district court, that the agencies are committed to ending supplemental feeding. We do not know precisely how they will proceed, and that makes it impossible, at this stage, to declare that their plan is arbitrary and capricious simply because it does not specify a particular date by which the practice will cease. Should the agencies act unreasonably in establishing criteria for the transition or in otherwise carrying out the plan, that will be a different issue for another panel.

III

The Defenders also argue that the plan unlawfully gives the Wyoming Fish and Game Department a veto over whether supplemental feeding will end. They point to language in the plan stating that the agencies will seek to "decrease reliance on intensive supplemental winter feeding, including complete transition to free-standing forage *if and when several established criteria are met, including support from the Wyoming Game and Fish Department* and the public." April 2007 Management Plan 137 (emphasis added).

Regardless of how we might have read this language in the first instance, the Secretary has assured us in his briefs and at oral argument that the language confers no veto. *See* Appellees' Br. 34 (characterizing the disputed provision as "aspirational" rather than a grant of any power to Wyoming); Wyoming's Br. 28 n.6 (also agreeing that Wyoming does not have a veto); *cf. Wyoming v. United States*, 279 F.3d 1214, 1234 (10th Cir. 2002) ("[F]ederal management and regulation of federal wildlife refuges preempts state management and regulation of such refuges . . . where state management and regulation stand as an obstacle to the accomplishment of the full purposes and objectives of the Federal Government."). We take the Secretary at his word that Wyoming has no veto over the Secretary's duty to end a practice that is concededly at odds with the long-term health of the elk and bison in the Refuge.

IV

For the foregoing reasons, the district court's judgment is

Affirmed.

Parting Thoughts

It's time to do what is right for the Elk Refuge

Among the many reasons we choose to live in Jackson Hole, surely ranking near the top is our affection for wildlife and all that these wild animals of Greater Yellowstone represent.

Bears, wolves, bison, moose, pronghorn, eagles — we watch them, we admire them, we adapt to them, we understand their value to our incomparable way of life and the overall health of one of the last great ecosystems on the planet.

And so we fight for them, too. We'll help visitors to behave properly around grizzly bears, we'll challenge our own state's flawed plan regarding wolves, and we'll advocate against industry sprawl so pronghorn have pathways for their historic annual journeys from Grand Teton National Park to the Little Colorado Desert.

So it is beyond mystifying that we continue to invite ill health at best and catastrophe at worst for perhaps our most cherished of all wildlife: The Jackson Hole elk herd.

The winter feeding of elk began with the best intentions a century ago. As with manual typewriters, transistor radios and rotary telephones, it's time to banish this obsolete, unnatural and unhealthy annual rite to the dustbin of history.

Never mind that the National Elk Refuge is a petri dish for disease where the "wild" elk are baited in such bloated densities that they wallow in their own feces, urine and muck. Never mind that the highly infectious and always-fatal chronic wasting disease lurks just a couple divides away, its impacts so potentially devastating that images of elk toughing out harsh winters naturally will pale by comparison. Never mind that failing to phase out the annual elk soup kitchen before the arrival of CWD would be the height of recklessness, given the Jackson Hole elk's local economic value and their seasonal mingling with other Yellowstone herds.

And never mind that the Elk Refuge's solution to elk densities and disease — a $5.2 million irrigation boondoggle that last year provided a paltry 5 percent of the refuge's forage — is a costly waste of taxpayer money that runs counter to Wyoming's fiscal conservatism and itchiness over big government programs.

There is a higher calling for phasing out the alfalfa-pellet buffet lines at the Elk Refuge — and 22 other state-run feedgrounds that exist because western Wyoming seems to think its elk herds are somehow different than those elk that winter naturally in Montana, Idaho, Colorado, Utah, Nevada and, ahem, northern, southern, eastern and central Wyoming.

Feeding elk no longer aligns with the mission of a wildlife refuge. A federal court said as much in a decision last year that clarified the need for a phase-out of the feeding program to manage for healthy wildlife.

Even if you're skeptical about CWD hanging over the elk herd like the Sword of Damocles, if you cherish wildlife like most of us in Jackson Hole then surely gazing across the vast manicured lawn that is today's refuge raises suspicions that something is askew. Now look at those same lands and imagine a smaller but healthier free-ranging herd of elk along with moose, wolves, beaver, songbirds, and cutthroat trout thriving amid wild plant communities associated with an intact ecosystem.

Isn't that a truer reflection of what we value about Jackson Hole, the geographic heart of the 20-million-acre Greater Yellowstone Ecosystem?

Sure, there are concerns, though none insurmountable. A careful phaseout will ensure that tough Rocky Mountain elk will thrive on protected winter ranges, fencing will separate the 700 or so cattle in the valley from free-ranging elk, and visitors on sleighs will marvel at the Serengeti-like landscape that rises from the current refuge monoculture.

We can do better by our most cherished wildlife, and you can join the Greater Yellowstone Coalition in finding out how. GYC is convening community conversations about a healthier future without elk food lines.

To learn more about the Elk Refuge go to http://www.greateryellowstone.org/elkrefuge.

— Lloyd Dorsey, Wyoming Representative, Jackson

Refuge to end feeding 'as conditions allow'

Disease worries on feedgrounds overblown, says former Game and Fish commissioner.

By Cory Hatch

An official committed to the phase-out of supplemental feeding on the National Elk Refuge "as conditions allow" Tuesday, saying that elk and bison reduction hunts and a new irrigation system will help with the effort.

At the same time, a former Wyoming Game and Fish commissioner from Teton County said disease concerns on feedgrounds are overblown and the end of supplemental feeding would be bad for wildlife.

The contrasting opinions were aired after an appeals court in Washington, D.C., ruled Monday against conservation groups who sought a deadline for the end of supplemental feeding on the National Elk Refuge. Despite their ruling, the panel of three judges said risk from supplemental feeding, including disease and habitat damage, poses "an existential threat to the elk and bison and puts the very purpose of the refuge at jeopardy."

Refuge manager Steve Kallin said he is pleased with the decision.

"If the agencies had refused to ever consider ending feeding, that would be a different matter," Kallin said. "That is not the case. The [2007 Bison and Elk Management Plan] strives to achieve a healthy balance between the herd sizes and the available winter forage before we would end winter feeding."

U.S. Fish and Wildlife Service officials are worried chronic wasting disease will come to the refuge. Researchers say the always fatal, poorly understood disease might spread faster on feedgrounds than it has in the rest of Wyoming. If that's the case, the infectious agent — called a prion— could contaminate the refuge for years.

"We recognize there are disease risks over time," Kallin said. "We'd like to phase out winter feeding, but only as the conditions allow."

Hunts that reduce the numbers of elk and bison on the refuge are part of the solution to changing those conditions, Kallin said. A new irrigation system that increases the irrigated acreage from 900 to 4,300 acres will also help wean elk and bison off supplemental feed.

When feeding ends, Kallin said, there would likely be a contingency plan to allow feeding during severe winters.

Former Wyoming Game and Fish Commissioner Clark Allan said the disease concerns on feedgrounds have been exaggerated.

"All the worst-case scenarios for disease don't come anywhere near the loss for elk ... we would see if we stopped feeding," he said.

Allan, who is also a member of the group Sportsmen for Fish and Wildlife, said that populations of predators would suffer if feeding ended.

"People worry about habitat for wildlife; they worry about the moths and whitebark pine cones for the grizzlies," Allan said. "I think we need to orient ourselves toward sustaining this elk herd to sustain the grizzlies and wolves."

Allan admitted that the prospects for indefinite feeding of elk look grim.

"It doesn't look good," he said. "I'd sure like these judges to let the wildlife managers make those decisions. They should be leaving [the decision about whether to feed] up to the Game and Fish [Department]."

Conservation groups were disappointed with the judge's decision to not require a time line for the end of feeding, but said they were gratified by strong language against the practice.

"They did make it quite clear that an indefinite continuation of feeding is not legitimate under the laws governing the Fish and Wildlife Service," said Tim Preso, a staff attorney for Earthjustice. "They also made it clear that the service can't drag its feet.

"This ruling pretty clearly says you're going to have to [end feeding] if you're going to comply with the law," Preso said.

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

DEFENDERS OF WILDLIFE, *et al.*,	)	
	)	
Plaintiffs,	)	
	)	
v.	)	**Civil Case No. 08-0945 (RJL)**
	)	
KENNETH L. SALAZAR, in his official capacity as Secretary of the Interior, *et al.*,[1]	)	
	)	
Defendants,	)	
	)	
and	)	
	)	
STATE OF WYOMING,	)	
	)	
Defendant-Intervenor.	)	

MEMORANDUM OPINION
(March 26, 2010) [#24, 26, and 27]

Before the Court are dueling Motions for Summary Judgment arising from a dispute over the management of the National Elk Refuge in Jackson Hole, Wyoming. Defenders of Wildlife and their fellow plaintiffs challenge the comprehensive Bison and Elk Management Plan adopted jointly by the United States Fish and Wildlife Service ("FWS") and the National Park Service ("Park Service") (collectively, "the agencies"). The plaintiffs ask that the plan be set aside because it permits the indefinite feeding of elk on the Refuge despite

[1] Former Secretary of the Interior, Dirk Kempthorne, and former Director of the United States Fish and Wildlife Service, H. Dale Hall, were originally named as defendants in this case. Pursuant to Federal Rule of Civil Procedure 25(d), if a public officer named as a party to an action in his official capacity ceases to hold office, the court will automatically substitute that officer's successor. Accordingly, the Court substitutes Kenneth L. Salazar for Kempthorne and Sam D. Hamilton for Hall.

what they regard as overwhelming evidence that continued artificial feeding will lead to the catastrophic spread of disease and will disrupt the biological integrity of the Refuge, in violation of the National Wildlife Refuge System Improvement Act ("the Improvement Act"). The plaintiffs also contend that the plan and the accompanying environmental impact statement ("EIS") violate the National Environmental Policy Act ("NEPA") because they are insufficiently detailed to allow a reasonably complete discussion of mitigation. The defendants include the federal officials charged with administering the Refuge and the intervenor State of Wyoming. Together they contend that the plan constitutes a valid exercise of discretion and that it and the EIS are sufficiently detailed to satisfy the requirements of NEPA. Based on a review of the record and pleadings, the plaintiffs' Motion for Summary Judgment is DENIED, and the defendants' respective Cross Motions for Summary Judgment are GRANTED.

BACKGROUND

About a decade ago, the FWS and the Park Service initiated a process to develop a comprehensive plan for the management of bison and elk on the National Elk Refuge ("the Refuge") and other federal land. (*See* Final Bison and Elk Management Plan and Environmental Impact Statement (AR FR017a) ("FEIS Vol. 1") at 3).[2] The agencies considered a wide range of issues in formulating the plan, one of which was the wintertime practice of feeding the bison and elk. (*Id.* at 20-22). Supplemental feeding of elk began about a century ago as a means to reduce elk mortality during the winter and to minimize

[2] The Park Service joined the planning process because, in addition to the Refuge, the plan also addresses the management of bison and elk in the Grand Teton National Park. (*See* FEIS Vol. 1 at 3).

the likelihood of elk feeding on hay meant for livestock. (*Id.* at 6). More recently, bison also began eating the supplemental elk feed provided on the Refuge. (*Id.* at 7). Over the years, this practice has had the salutary effect of reducing elk winter mortality, sustaining a larger elk population than would have otherwise survived on the region's winter range, and reducing elk contact with haystacks and pastures for livestock. (*Id.* at 10).

Notwithstanding these benefits, the winter feeding program is not without potential costs. For instance, artificial feeding attracts more bison and elk than the Refuge can support, thus damaging the native habitat. (*Id.* at 9). The large concentration of elk and bison along the feedlines also contributes to the spread of disease. (*Id.* at 9-10; Smith Report (AR S007) at 3-4, 15-19). Of particular concern is the threat of Chronic Wasting Disease ("CWD"), the equivalent of "mad cow disease." (FEIS Vol. 1 at 136). Although CWD has not yet been detected on the Refuge, experts believe that it will eventually infect the elk and bison population. (*Id.* at 137; FEIS Vol. 2 at 200). The disease is generally fatal, and because it is difficult to eradicate, it could lead to population decline and possibly to the extinction of bison and elk on the Refuge. (FEIS Vol. 1 at 274, 514; Peterson CWD Report (AR S008) at 3). CWD is not the only disease that could spread as a result of artificial feeding practices; there are a host of other debilitating diseases as well. (*See, e.g.*, FEIS Vol. 1 at 129-33; *id.* at 133 (footrot); *id.* at 134-35 (bovine tuberculosis); *id.* at 133-34 (scabies); *id.* at 135 (bovine paratuberculosis)).

During the planning process, the agencies developed six alternatives to address the effects of the winter feeding program. The agencies' preferred alternative—Alternative 4—aims over a fifteen-year period to "decrease reliance on intensive supplemental winter

feeding, including complete transition to free-standing forage if and when several established criteria are met, including support from the Wyoming Game and Fish Department and the public." (FEIS Vol. 1 at 67). This alternative is predicated on the view that the agencies must improve the natural habitat supporting the bison and elk before they can discontinue supplemental feeding. Lest there be any doubt that the agencies intend to eliminate the feeding program, they rejected Alternative 5, which proposed the indefinite continuation of the program. (*Id.* at 50). In contrast to the conditions-based approach preferred by the agencies, Alternative 6, which the plaintiffs prefer, sets a time-sensitive goal of phasing out the winter feeding program within five years. (*Id.* at 52, 68).

To implement Alternative 4, the agencies developed and approved the Bison and Elk Management Plan now under review. The plan establishes four goals: (1) conserving the native habitat, (2) promoting sustainable populations of bison and elk, (3) helping the Wyoming Game and Fish Department ("WGFD") maintain its herd objectives, and (4) preventing the spread of disease. (Final Bison and Elk Management Plan (AF FR018a) ("FBEMP") at 129-39). To achieve these goals, the plan provides for the adaptive management of the bison and elk herds and their habitat with an "emphasis on improving winter, summer, and transitional range on refuge and park lands, while at the same time ensuring that the biotic integrity and environmental health of the resources will be sustained over the long term." (*Id.* at 125). More specifically, the plan directs the agencies to initiate habitat conservation projects for the improvement of forage and to work with adjacent landowners and the WGFD to minimize bison and elk feeding on private land. (*Id.*). Under the plan, the agencies will also coordinate with the WGFD to maintain an elk herd

population of approximately 11,000—almost half of which will be expected to winter on the Refuge—and to sustain a genetically viable bison herd of about 500. (*Id.* at 126). As these measures are implemented, the agencies will gradually transition away from supplemental feeding based on yet-to-be-determined triggers derived from some or all of the following factors: (1) the "level of forage production and availability" on the Refuge; (2) the "desired herd sizes and sex and age ratios"; (3) the "effective mitigation of bison and elk co-mingling with livestock on private lands"; (4) the "winter distribution patterns of elk and bison"; (5) the "prevalence of brucellosis, chronic wasting disease, and other wildlife diseases"; and (6) "public support." (*Id.* at 125-26). In short, the plan is designed "for progressively transitioning from intensive supplemental winter feeding to greater reliance on free-standing forage." (*Id.*).

DISCUSSION

I. Standard of Review

The plaintiffs seek to set aside the agencies' comprehensive Bison and Elk Management Plan and the accompanying Final Environmental Impact Statement on grounds that the agencies violated the Improvement Act and NEPA. The plaintiffs bring their challenge under the Administrative Procedure Act ("APA"), which requires this Court to set aside agency action found to be "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). "The scope of review under the 'arbitrary and capricious' standard is narrow and a court is not to substitute its judgment for that of the agency." *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983). To satisfy that standard, an agency need only "examine the

relevant data and articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made." *Id.* (internal quotation marks omitted). Because this case involves judicial review of final agency action, the normal summary judgment standard under Federal Rule of Civil Procedure 56(c) does not apply. *N.C. Fisheries Ass'n, Inc. v. Gutierrez*, 518 F. Supp. 2d 62, 79 (D.D.C. 2007).

II. Improvement Act Claim

The crux of the plaintiffs' claim is that the Bison and Elk Management Plan does not commit to a date-certain termination of the winter feeding program. Instead of phasing out the program in five years, as the plaintiffs think is necessary, the agencies have decided to phase out the program over time as certain conditions are met. Because this conditions-based approach leaves open the possibility that supplemental feeding will continue indefinitely, the plaintiffs contend that the plan adopted by the agencies is contrary to the Improvement Act or is—at a minimum—arbitrary, capricious, or an abuse of discretion. I disagree.

The Improvement Act established the National Wildlife Refuge System, the mission of which "is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." 16 U.S.C. § 668dd(a)(2). To carry out this mission, the Act directs the Secretary of the Interior to perform a wide range of duties. For instance, the Secretary must "provide for the conservation of fish, wildlife, and plants, and their habitats within the System." *Id.* § 668dd(a)(4)(A). Under the Act, "conservation" means "to sustain and,

where appropriate, restore and enhance, healthy populations of fish, wildlife, and plants utilizing . . . methods and procedures associated with modern scientific resource programs." *Id.* § 668ee(4). The Secretary must also "ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans." *Id.* § 668dd(a)(4)(B). In addition to these conservation duties, the Secretary must, among many others things, "ensure effective coordination, interaction, and cooperation with owners of land adjoining refuges," *id.* § 668dd(a)(4)(E); "ensure that opportunities are provided within the System for compatible wildlife-dependent recreational uses," *id.* § 668dd(a)(4)(I); and "ensure timely and effective cooperation and collaboration with Federal agencies and State fish and wildlife agencies," *id.* § 668dd(a)(4)(M).

The plaintiffs contend that the Bison and Elk Management Plan defeats the overarching mission of the Refuge and violates specific mandates of the Improvement Act concerning conservation. In particular, they claim that the plan fails to provide for the conservation of bison and elk, as well as their habitats, *see id.* § 668dd(a)(4)(A), and to ensure that the biological integrity, diversity, and environmental health of the Refuge are maintained, *see id.* § 668dd(a)(4)(B). Central to this claim is the presumably indefinite continuation of the winter feeding program, the adverse effects of which the plaintiffs take great care to detail. They explain how the unnaturally large density of bison and elk caused by supplemental feeding damages the surrounding habitat and facilitates the transmission of debilitating and deadly diseases that could lead to the decline, if not extinction, of bison and elk on the Refuge. Because the plan does not mitigate these adverse effects by requiring the elimination of the feeding program within at least five years, the plaintiffs contend that the

plan fails its clear statutory obligations to sustain a healthy population of bison and elk, to conserve the Refuge's habitat, and to ensure the biological integrity, diversity, and environmental health of the Refuge. Furthermore, the plaintiffs contend that the Improvement Act's conservation mandates "trump" whatever other duties the agencies have under the statute. (Pl. Reply [#30] at 8). Therefore, because the plan elevates the agencies' duties to coordinate with private landowners, to ensure recreational opportunities, and to work with the WGFD all at the expense of its conservation duties, the plaintiffs assert that the plan is contrary to the Improvement Act and must be set aside. Not so.

As an initial matter, at least one thing is clear: The Improvement Act does not mandate that any *particular* plan be adopted. The statute gives broad direction, not precise instruction. *Wyoming v. United States*, 279 F.3d 1214, 1239-40 (10th Cir. 2002) (noting the "broad language and general directives" of the Improvement Act). It requires, for instance, that agencies "provide for the conservation" of wildlife, "ensure . . . the biological integrity, diversity, and environmental health" of the Refuge, and "plan and direct the continued growth of the [Refuge] System in a manner that is best designed to accomplish the mission of the System." 16 U.S.C. § 668dd(a)(4)(A)-(C). How the agencies carry out these sweeping directives is a matter of considerable, though not unlimited, discretion. The statute says nothing about whether supplemental feeding should be phased out based on an established timeline or based on specific conditions. Indeed, it says nothing at all about supplemental feeding. The question before the Court, therefore, is not whether the Bison and Elk Management Plan violates any specific statutory provision (it does not), but whether the plan is arbitrary, capricious, or an abuse of discretion. It is not.

In making that determination, this Court, of course, does not stand in the agencies' shoes. Rather, its task is limited to determining whether the agencies have, at a minimum, articulated a "satisfactory explanation" that establishes a "rational connection between the facts found and the choice made." *Motor Vehicle Mfrs. Ass'n*, 463 U.S. at 43 (internal quotation marks omitted). In particular, I must consider whether the agencies' explanation "was based on a consideration of the relevant factors and whether there has been a clear error of judgment." *Id.* (internal quotation marks omitted). Simply stated, the Court has no legal authority to disturb the agencies' plan so long as it takes account of all the relevant factors set forth in the Improvement Act (and no others) and is reasonable based on the facts.

Having examined the administrative record and considered the rationale for the agencies' chosen course of action, I cannot say that the Bison and Elk Management Plan either fails to account for relevant factors or is unreasonable for phasing out the winter feeding program over a fifteen-year time horizon as conditions for doing so are met. Indeed, the plaintiffs themselves acknowledge that an immediate cessation of supplemental feeding would have "significant adverse environmental consequences." (Pl. Mot. for Summ. J. [#24-2] at 37). Instead, their chief complaint is that the adopted plan does not commit to certain elimination of the feeding program within an established timeline. The agencies' decision, however, is a reasonable one in light of the provisions and purposes of the Improvement Act. As the plaintiffs concede, supplemental feeding is necessary, for now, to maintain natural population levels during the winter. According to the agencies' environmental impact statement, "the wintering of unnaturally high densities of elk on the

refuge helps sustain a more natural population level at the larger landscape level by mitigating the loss of winter range." (FEIS Vol. 1 at 13). Because the pace at which the feeding program can be phased out depends upon the pace at which winter forage on the Refuge can be improved, the "[p]remature termination of feeding, while elk and bison numbers exceed winter habitat capacity, could result in unacceptable winter losses." (Smith Report (AR S007) at 9). For this reason, the agencies' decision to discontinue the program based on conditions on the ground, as opposed to a fixed timeline, makes considerable sense.[3]

That the agencies seek to avoid losses of bison and elk caused by the lack of winter habitat is hardly contrary to the conservationist provisions of the Improvement Act or the overarching purposes of the Refuge. After all, the point of a "refuge" is to shelter wildlife displaced by human development. *See* 16 U.S.C. § 673a (providing that Refuge land is to be used "for the grazing of, and as a refuge for, American elk and other big game animals").

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[3] The plaintiffs' argument that the plan gives the WGFD an effective veto over any decision to terminate the winter feeding program is overblown. To be sure, the plan provides that a "complete transition to free-standing forage" will occur "when several established criteria are met, *including support from the Wyoming Game and Fish Department and the public*." (FBEMP at 137 (emphasis added)). But this requirement to gain the support of the WGFD and the public is consistent with, if not required by, the Improvement Act itself, which directs the agencies "to increase support for the [Refuge] and participation from conservation partners and the public," 16 U.S.C. § 668dd(a)(4)(C), and to "ensure effective coordination, interaction, and cooperation with . . . the fish and wildlife agency" of the state in which the Refuge is located, *id.* § 668dd(a)(4)(E). Of course, if the WGFD and the public refuse to support termination of the feeding program even once the conditions are ripe for doing so, then nothing would prohibit the agencies from discontinuing the program without WGFD or public support. *See Wyoming*, 279 F.3d at 1234 ("[F]ederal management and regulation of federal wildlife refuges preempts state management and regulation of such refuges . . . where state management and regulation stand as an obstacle to the accomplishment of the full purposes and objectives of the Federal Government.").

And while the threat of disease is real and must be addressed, it makes little sense to avert population decline caused by disease only to bring about population decline caused by starvation. Thus, the agencies did not err by defining "healthy populations," which the Improvement Act does not specifically define, as including "a stable and continuing population (i.e., the population returns to an initial equilibrium after being disturbed) and a minimized likelihood of irreversible long-term effects." (FEIS Vol. 1 at 12). This interpretation of the Improvement Act, which the agencies administer, is entitled to deference. *See Chevron, U.S.A., Inc. v. Natural Res. Def. Council, Inc.*, 467 U.S. 837, 844 (1984) (stating that the Supreme Court has "long recognized that considerable weight should be accorded to an executive department's construction of a statutory scheme it is entrusted to administer").

Of course, the Bison and Elk Management Plan might well have been unreasonable had the agencies categorically refused to phase out the winter feeding program in spite of all the evidence in the record about the dangers of supplemental feeding. But the agencies did not do that. Far from mandating a continuation of the feeding program in perpetuity, the agencies have adopted a plan that takes measures to improve the Refuge so that the bison and elk that winter there can survive without supplemental feeding. The rate at which the program should be discontinued is necessarily a fact-dependent determination. Thus, by making the termination of winter feeding contingent, not on an arbitrary timeline, but on the Refuge's ability to support the bison and elk herd, the plan strikes a reasonable balance between maintaining population levels and mitigating disease, both of which are necessary to achieve the overarching conservationist purpose of the Refuge as a natural shelter for

displaced bison and elk. It matters not whether this Court believes it to be the right balance. The Court's sole task is to determine whether the agencies have articulated a satisfactory explanation for the balance they have struck given the factual record. They have!

III. NEPA Claim

The plaintiffs also seek to set aside the Bison and Elk Management Plan on the ground that the environmental impact statement, which accompanies the plan, violates NEPA. Under that statute, agencies proposing a major federal action must include a "detailed statement" of, among other things, "the environmental impact of the proposed action" and "any adverse environmental effects which cannot be avoided should the proposal be implemented." 42 U.S.C. § 4332(2)(C)(i), (ii). To satisfy the latter requirement, the EIS must contain "a reasonably complete discussion of possible mitigation measures." *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 351-52 (1989). The plaintiffs do not contend that the EIS lacks a detailed statement of the environmental impacts; instead, they contend that the adaptive management plan, which they regard as a "plan to make a plan," (Pl. Mot. for Summ. J. [#24-2] at 21), is insufficiently detailed to allow for a reasonably complete discussion of mitigation measures. I disagree.

This Court has rejected that kind of argument once before and will do so again in this case. In *Theodore Roosevelt Conservation Partnership v. Salazar*, I disagreed with TRCP's argument—nearly identical to the one here—that an "adaptive-management-mitigation plan [was] 'so amorphous and ill-defined' that the agency was unable to determine the environmental consequences of the project and thus unable to take the requisite 'hard look' at the project's effect on the environment." 605 F. Supp. 2d 263, 279 (D.D.C. 2009) (Leon,

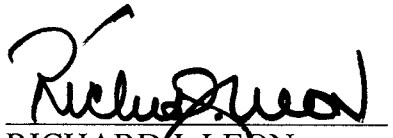
J.). In rejecting that argument, I noted that the agency's plan incorporated numerous specific mitigation techniques. *Id.* I also rejected TRCP's characterization of the plan as "equivalent to a decision to 'act now and deal with environmental consequences later,'" and I emphasized that "NEPA does not prevent agencies from adopting mitigation techniques and acknowledging they may be adjusted later depending on their effectiveness." *Id.* at 280.

Even though the agencies have yet to fill in every detail (which is to be expected of an adaptive management plan), the Bison and Elk Management Plan and EIS incorporate enough mitigation measures to provide a reasonably complete discussion of mitigation. For instance, the plan aims to mitigate the adverse effects of supplemental feeding by dispersing the feeding areas, (*see* FBEMP at 139); changing feed sites daily, (*id.*); spreading feed along meandering lines, (*id.*); delaying the onset of feeding each year, (FEIS Vol. 1 at 67); reducing the average daily ration of feed per elk or bison, (*id.*); decreasing the number of days each year of supplemental feeding, (*id.*); increasing harvest levels, (*id.*); vaccinating the bison and elk for brucellosis, (FEIS Vol. 1 at 73; FBEMP at 139); and increasing surveillance for CWD, (FEIS Vol. 1 at 40, 73; FBEMP at 126-27, 139). Again, the Court's role is a limited one—"to determine whether the EIS was compiled with objective good faith and whether the resulting statement would permit a decisionmaker to fully consider and balance the environmental factors." *Sierra Club v. Adams*, 578 F.2d 389, 393 (D.C. Cir. 1978) (internal quotation marks omitted). Having reviewed the administrative record, which includes a thorough two-volume EIS, I am confident that the agencies' preferred alternative and the plan based upon it are sufficiently detailed to provide a reasonably complete discussion of mitigation. In short, I conclude that the agencies have satisfied their

obligations under NEPA and that they have adequately addressed the possible environmental impacts and mitigation measures relating to their Bison and Elk Management Plan.

CONCLUSION

This case is an excellent example of how policy disputes too often end up in federal courts. Although the plaintiffs prefer a plan that would phase out the winter feeding program within five years, other stakeholders, including other environmental groups, prefer plans that would phase out the program over longer periods.[4] Fearing that premature termination of the program would adversely affect population levels, the agencies ultimately rejected the rigid five-year deadline that the plaintiffs advocate and opted instead for a plan that would phase out supplemental feeding as conditions for doing so were achieved. Unhappy with that result, the plaintiffs—quite predictably—turned to the courts. Unfortunately for the plaintiffs, this Court will not insinuate itself into the business of managing a wildlife refuge—a task that is well beyond its competence. Content that the agencies have articulated a satisfactory explanation for their chosen course of action and have adequately addressed mitigation for purposes of NEPA, I DENY the plaintiffs' Motion for Summary Judgment and GRANT the defendants' respective Cross Motions for Summary Judgment.



RICHARD J. LEON
United States District Judge

[4] The National Wildlife Federation, for instance, supported the agencies' preferred alternative, stating that "it is in the best interest of wildlife to discontinue winter feeding, however, a strategic, methodical approach to reducing feeding is preferable than eliminating feeding too quickly." (FEIS Vol. 2 at 150).

United States Department of the Interior

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May 11, 2012

MEMORANDUM

To: Refuge Supervisor, Region 6

From: Project Leader, National Elk Refuge, Jackson, WY

Subject: Bison and Elk Management Plan Outreach Strategy

The purpose of this memo is to outline the public outreach strategy the National Elk Refuge (NER) will use to implement the Bison and Elk Management Plan (BEMP).

Management of bison and elk on the NER is complex, controversial and contentious. The Bison and Elk Management Plan was completed in 2007 after a 9-year long, public Environmental Impact Statement (EIS) process which garnered 11,000 public comments. Over the course of a year, these migratory bison and elk herds cross various land ownership boundaries and as a result, involve three federal land management agencies, the State of Wyoming and numerous private land owners.

Despite efforts to build consensus between various stakeholders during the EIS process, none was reached on major aspects of the BEMP. Less than one year after the approval of the BEMP, the U.S. Fish and Wildlife Service was sued over the BEMP, first in Federal District, then in Federal Circuit Court. Indications are that additional lawsuits may be filed.

Concerning Plan implementation, the BEMP emphasizes a phased approach to reduce reliance on winter supplemental feeding and ultimately, when objectives are achieved and conditions allow, a complete transition to free-standing forage. See key BEMP excerpts below; **bold** added for emphasis:

> ADAPTIVE MANAGEMENT FRAMEWORK
> **The Preferred Alternative clearly states that the Fish and Wildlife Service intends to progressively reduce the use of supplemental feeding on the National Elk Refuge, and specific objectives and strategies were outlined to address habitat conservation and wildlife management in order to achieve a greater reliance on free-standing forage.** Many

of the commenters on the *Final Plan/EIS* wanted a definitive answer about eliminating the use of supplemental feeding, and many agencies and stakeholder groups, as well as the public, have divergent opinions about phasing out supplemental feeding. **The plan does not identify whether or not feeding will be phased out within 15 years; instead, it focuses on achieving the desired conditions that have been identified through an adaptive, progressive, and collaborative approach** that incorporates different objectives and tools (strategies) for managing these populations. No management tool will be precluded in the effort to resolve current bison and elk management issues, **nor will any predictions be made about how fast the first phase of this plan can be implemented. When the biological, social, and political conditions enable the Fish and Wildlife Service to consider a phaseout of feeding, this adaptive framework will provide flexibility**; success will not be possible without the continued cooperation and coordination with other federal/state agencies, including the Wyoming Game and Fish Department. (p. 32)

GOAL 2: SUSTAINABLE POPULATIONS

Implement a phased approach to reducing the number of animals on feed while achieving the state's population objectives. The first phase objective will be to reduce the number of elk on feed on the National Elk Refuge to approximately 5,000 and achieve a target population of approximately 500 bison (see recommendation to the Wyoming Game and Fish Department below). **The second phase objective will be to adaptively manage** bison and elk populations to achieve desired conditions, with animals relying predominantly on available native habitat (on refuge, park, and forest lands) and cultivated forage (on the refuge). (p. 135)

GOAL 3: NUMBERS OF ELK AND BISON

As habitat and population objectives are achieved, decrease reliance on intensive supplemental winter feeding, including complete transition to free-standing forage if and when several established criteria are met, including support from the Wyoming Game and Fish Department and the public.

Rationale: **Implementing a phased transition from intensive supplemental winter feeding to greater reliance on free-standing forage** will help maintain lower elk numbers on the refuge as a result of behavioral changes (fewer elk would know about supplemental feeding on the refuge and more should remain on native winter range). Reduced concentrations of wintering animals on supplemental feed would also be expected to reduce the transmission of wildlife diseases. (P.137)

Extensive public outreach was used to involve the public and implement the following "first phase" management actions: establishment of a public bison hunting season; the expansion of elk hunting to the southern part of the Refuge; implementation of a Tribal Ceremonial Bison Hunt; and the public process of completing an Environmental Assessment for the Irrigation Expansion Project. These outreach efforts included news releases, radio programs, NER website info and public meetings. These efforts were timely and informed the public about upcoming, observable management actions, and described how they could become involved in the process. The general theme of the outreach efforts stressed a "first phase" BEMP message, that these actions would help reduce reliance on the winter supplemental feeding program.

Additional key "first phase" management actions are in the process of development and include increasing elk harvest adjacent to the Refuge in Hunt Areas #78 and #80, and preventing bison/elk co-mingling with domestic cattle on area ranches. Area #78 elk harvest and the prevention of co-mingling of domestic livestock with wildlife involve private lands in close proximity to the Refuge. These efforts are dependent on the development of trusting and mutually respectful relationships between the Refuge and private landowners.

First phase efforts are designed to attain herd population and habitat goals which will result in closer balance between herd sizes and winter forage. Achieving "first phase" objectives will still likely take years to accomplish.

Focusing public outreach at this time on the long-term goal of phasing out supplemental feeding would rekindle and enflame the contentious debate concerning the pros and cons of a supplemental feeding program. This would create an unnecessary distraction and an impediment to developing the necessary relationships with area ranchers and private landowners to achieve these "first phase" objectives.

The long-term success of changing this NER herd management strategy is dependent upon support from the public and other land management agencies. Winter supplemental feeding has been successfully implemented to prevent winter elk starvation for over 100 years. Many in the public are extremely skeptical that free-standing forage can replace supplemental feeding and still maintain elk herd size objectives.

I believe there is wisdom in adopting a phased approach to transitioning away from winter supplemental feeding to free-standing forage. The demonstrated success of supporting winter bison and elk herds with free-standing forage will be essential in obtaining public support for this change in management strategy. In the case of managing the beloved and high profile Jackson Elk Herd, on-the-ground success, not goal statements or management slogans will be necessary to persuade the public to support the transition to free-standing forage.

Focusing on the "second phase" message of complete transition to natural standing forage while BEMP implementation is in the "first phase" would be counterproductive. Advertising the goal to stop feeding will unnecessarily revive the supplemental feeding controversy which will likely become an impediment to building relationships with area ranchers. This could certainly impede the ability to obtain long-term easements necessary to eliminate the co-mingling conflict.

The Area #78 summer elk herd segment is the fastest growing segment in the Jackson Elk Herd. However, the hunting of elk in many parts of Elk Hunt Area #78 (Spring Gulch) to control this population is also a very controversial topic. A number of the Spring Gulch subdivisions have protective conveniences which prohibit hunting and many believe no hunting should be allowed in this area. From a safety standpoint, the density of housing prevents the use of high powered rifles as a practical approach to harvesting elk in this area. However, archery hunting is a tool which could be used to increase harvest and cause disturbance in order to move the elk out of Area #78 to areas where they are more vulnerable to harvest. Peer pressure from Area #78 residents discourages hunting in this critical area.

WGFD has initiated contacts to expand hunting in Area #78 west of the Refuge and is making inroads toward allowing hunting in his area. Resurrecting the supplemental feeding controversy could also complicate the WGFD's efforts to encourage Area #78 landowners to allow hunting on their property.

I believe the most effective public outreach strategy is to use a message consistent with the corresponding implementation phase. We are currently implementing phase one of the BEMP, so I believe the appropriate overall message is that the NER is working to "reduce reliance on supplemental feeding." When conditions on the refuge provide an opportunity to move to phase two, then a phase two message can be initiated. At this time, I believe it would be counterproductive to use a phase two message such as, "complete transition to free-standing forage", during phase one implementation.

We are planning to continue to use a phase one message during implementation of the phase one BEMP strategy. Please contact me if you need additional information or clarification.

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United States Department of the Interior

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Steven W. Kallin
Refuge Manager

April 23, 2013

INFORMATION MEMORANDUM FOR THE REGIONAL DIRECTOR

FROM: Will Meeks, ARD, NWRS, Region 6, U.S. Fish and Wildlife Service

PHONE: (303) 236-4303

SUBJECT: National Elk Refuge – Execution of the Bison and Elk Management Plan

I. SUMMARY: The EIS for the Bison and Elk Management Plan (Plan) for the National Elk Refuge and Grand Teton National Park (GTNP) was signed in 2007. Significant progress has been made with construction of an irrigation system to increase natural forage production, and implementation of the bison hunt. We are making progress toward the target population of 500 bison, but no progress has been made in reducing the wintering elk population at NER. The U.S. has prevailed in a lawsuit filed by the Greater Yellowstone Coalition (GYC) and other NGOs in District and Circuit Courts. GYC wants the Service to announce a date certain to stop supplemental winter feeding. The Service is continuing to implement the Plan, with the next steps being to prepare the Adaptive Management Plan.

II. DISCUSSION: Our management of NER with supplemental feeding is not sustainable in the long-run. We are concentrating too many animals on the refuge, and there is significant risk of a major disease (CWD) catastrophe. Cessation of supplemental feeding, resulting in a significant elk mortality event through starvation, is not politically or socially viable. *For Service Eyes Only: The WGFD goal of 11,000 elk in the Jackson herd, and the plan's goal of 5,000 elk wintering on NER are too high to sustain without supplemental feeding*. The current plan for responding to detection of CWD at NER is inadequate. The recent killing of a grizzly bear at GTNP, by an elk hunter, is bringing pressure on NPS to stop hunting on the park. Continued cow elk hunting on the park is essential for meeting Plan objectives. The Refuge Manager has initiated discussions with area ranchers. The Adaptive Management Plan should include affirmative steps by wildlife agencies to gain acceptance of elk on private ranch land in Jackson Hole. The CCP for NER is in progress, and will incorporate the Plan.

III. POSITION OF MAJOR CONSTITUENTS

- **WGFD wants to prevent co-mingling of elk and cattle, continues to operate 22 elk feedgrounds in NW WY, and has shown no interest in seriously discussing cessation of supplemental feeding or reducing their target population for the Jackson elk herd.**
- **GYC, and other NGO's want the Service to set a date certain for cessation of feeding. The plaintiffs interpret the appellate court decision as a victory with implied direction for the Service to set a date for cessation.**

- **NPS is signatory to the Plan/EIS, but is under considerable pressure to reduce/eliminate, rather than increase elk hunting opportunities.**
- **Outfitters and many businesses in Jackson rely on elk-related recreation and will resist efforts to reduce elk numbers.**
- **We anticipate that a decision by the Service to stop feeding suddenly would result in legislative action by the WY delegation to mandate feeding by law.**

IV. KEY MESSAGES

- **CWD is likely to "arrive" at NER at any time. Continuing to feed in the presence of CWD may create a "biological superfund site", and elk population sink.**
- **Cessation of supplemental feeding without first significantly reducing the elk herd will result in mass starvation of calves.**
- **We need active cooperation from WFGD to develop the Adaptive Management Plan, per the Plan/EIS, and state involvement/assistance to address co-mingling and private land access for elk.**
- **We need to support continued elk hunting on GTNP.**

PREPARED BY: Dean Rundle, Refuge Supervisor
DATE: April 23, 2013

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued May 12, 2011 Decided August 3, 2011

No. 10-5144

DEFENDERS OF WILDLIFE, ET AL.,
APPELLANTS

v.

KENNETH LEE SALAZAR, IN HIS OFFICIAL CAPACITY AS SECRETARY OF THE INTERIOR, ET AL.,
APPELLEES

Appeal from the United States District Court
for the District of Columbia
(No. 1:08-cv-00945)

Timothy J. Preso argued the cause for appellants. With him on the briefs were *Douglas L. Honnold* and *Sean M. Helle. Sierra B. Weaver* entered an appearance.

Mark R. Haag, Attorney, U.S. Department of Justice, argued the cause for federal appellees. With him on the brief was *Robert H. Oakley*, Attorney.

James Kaste, Senior Assistant Attorney General, Office of the Attorney General for the State of Wyoming, was on the brief for intervenor State of Wyoming in support of federal

appellees. *R. Craig Lawrence*, Assistant U.S. Attorney, entered an appearance.

Before: ROGERS, TATEL, and GRIFFITH, *Circuit Judges*.

Opinion for the Court filed by *Circuit Judge* GRIFFITH.

GRIFFITH, *Circuit Judge*: As required by the National Wildlife Refuge System Improvement Act, the U.S. Fish and Wildlife Service and the National Park Service devised a plan to manage the elk and bison populations in the National Elk Refuge and Grand Teton National Park. Part of this plan includes ending the longstanding agency practice of feeding these animals during the winter. The Defenders of Wildlife challenge the plan because it fails to include a time certain for ending the practice. The district court rejected the challenge, and, for the reasons set forth below, we affirm its judgment.

I

The National Wildlife Refuge System includes over 550 refuges and 150 million acres of protected land. The Department of the Interior, acting through the U.S. Fish and Wildlife Service, manages these properties pursuant to the National Wildlife Refuge Administration Act, Pub. L. No. 89-669, 80 Stat. 926 (1966), as amended by the National Wildlife Refuge System Improvement Act ("Improvement Act"), Pub L. No. 105-57, 111 Stat. 1252 (1997) (codified at 16 U.S.C. §§ 668dd-668ee).

The National Elk Refuge is part of that system. Located just north of Jackson, Wyoming, and adjacent to Grand Teton National Park, the Refuge was established in 1912 when Congress designated 2000 acres in Jackson Hole as a "winter game (elk) reserve." Act of Aug. 10, 1912, Pub. L. No. 62-261, 37 Stat. 293 (codified as amended at 16 U.S.C. § 673). The Refuge is now a 24,700-acre expanse that the Secretary

holds "for the grazing of, and as a refuge for, American elk and other big game animals." 16 U.S.C. § 673a. Its landscape consists of meadows, marshes, streams, ponds, and open fields across a valley floor that includes sagebrush and rock outcroppings, all set against the majestic backdrop of the Teton and Gros Ventre mountain ranges. Lucky wayfarers may spot wolves, grizzly bears, trumpeter swans, and any number of the area's magnificent ungulates, including bison, bighorn sheep, pronghorn, mule deer, and, of course, elk. The National Elk Refuge's eponymous herd comprises one of the largest concentrations of elk in North America. It goes without saying that these elk are of considerable ecological, economic, and cultural value.

Around the turn of the last century, a series of severe winters in Wyoming strained the elk populations and spurred the good people of Jackson to save the elk by feeding them. When Congress created the Refuge in 1912, the federal government continued this practice, which the parties refer to as supplemental feeding. For roughly seventy days each winter, approximately 7000 elk and 1000 bison are drawn daily to the federal trough.

In recent years, it has become apparent that this practice, though born of benevolence, causes significant problems. According to the Department of the Interior, supplemental feeding leads to a seasonal concentration of elk and bison that is "an unnatural situation that has contributed to . . . an increased risk of potentially major outbreaks of exotic diseases . . . [and] damage to and loss of habitat." Final Bison and Elk Management Plan and Environmental Impact Statement for the National Elk Refuge / Grand Teton National Park / John D. Rockefeller, Jr., Memorial Parkway 9 (Feb. 1, 2007) [hereinafter February 2007 Management Plan and EIS]. This risk poses an existential threat to the elk and bison and puts the very purpose of the Refuge at jeopardy. *See id.*

(noting that the risk of diseases posed by increased concentrations of the animals has "the greatest potential to hinder . . . [the] purposes . . . [of] the National Elk Refuge").

One major problem is brucellosis—also known as "Bangs disease, undulant fever, and contagious abortion," *id.* at 564—which causes an infected female to abort her first calf, leaving behind contaminated fetal tissue on the ground capable of transmitting the disease to other animals, *id.* at 129. Brucellosis rates within normal Wyoming elk herds are approximately two percent, but rates among elk that frequent the Refuge feeding lines have averaged around seventeen percent in recent years. *Id.* at 130. Another major problem, chronic wasting disease (CWD), is the elk version of mad cow disease: Like its bovine counterpart, CWD assaults the central nervous system, causing brain lesions, behavioral changes, a loss of body condition, and ultimately death. CWD is caused by abnormal, non-living proteins known as prions that persist in the soil where infected animals graze, even after intensive efforts to remove them. *Id.* at 136-40. Statistical sampling suggests that in open, elk-hunt areas in Wyoming, the prevalence of CWD in elk averages around four percent. *Id.* at 137. But in confined areas—like those created by the feed lines—the prevalence can exceed ninety percent. *Id.* CWD is not yet prevalent in the Refuge, but if that changes, "environmental contamination will become a major concern due to the disease's ability to persist in the environment for a long period of time." *Id.*

All agree that supplemental feeding increases the risk of such diseases. Without supplemental feeding, the elk would gather in smaller groups, meaning that one sick elk would infect only the handful of others around it. But because the feeding lines bring so many together, the disease of one can quickly become that of many, if not all.

Spurred by a district court order requiring reassessment of the winter feeding operation, *see Fund for Animals v. Clark*, 27 F. Supp. 2d 8, 12-15 (D.D.C. 1998), the Fish and Wildlife Service teamed with the National Park Service,[*] also part of the Department of the Interior, to prepare a management plan for the elk and bison populations. The agencies analyzed six alternatives for managing the herds over the next fifteen years. These plans ran the gamut from maintaining the status quo to ending the practice of supplemental feeding within five years.

In April 2007, the agencies settled on an approach that would, over time, create conditions that would allow the elk and bison to survive the winter without supplemental feeding and, in the meantime, manage the risk of contagion until the practice ended. In essence, their plan seeks to restore natural forage that will allow the animals to sustain themselves during wintertime without the help of supplemental feeding. Bison and Elk Management Plan: National Elk Refuge and Grand Teton National Park 129-34 (Apr. 2007) [hereinafter April 2007 Management Plan]. For example, it provides for substantial reductions in the numbers of elk and bison, primarily through short-term increases in hunting, so that their populations will be closer to levels that would have existed had there never been a practice of supplemental feeding. *Id.* at 134-37. The plan also seeks to reduce disease transmission by rotating feed sites, spreading feed in long lines, separating elk and bison from neighboring livestock, providing increased CWD monitoring, and allowing Wyoming to vaccinate the herds. *Id.* at 138-39. Ultimately, over a fifteen-year period, "[a]s habitat and population objectives are achieved, [the agencies will aim to] decrease reliance on intensive

[*] Because the plan in this case also addresses management of elk and bison populations in nearby Grand Teton National Park, the National Park Service, which manages the park, joined in the effort.

supplemental winter feeding, including complete transition to free-standing forage if and when several established criteria are met, including support from the Wyoming Game and Fish Department and the public." *Id.* at 137.

Before adopting this approach, the agencies considered and rejected the petitioners' preferred alternative, which would have committed the Secretary to ending supplemental feeding within five years. As described in their brief, the agencies recognized that this alternative "would provide some advantages in terms of habitat benefits, a lower prevalence of brucellosis over the long term, and a lower risk for the spread of chronic wasting disease." Appellees' Br. 19 (citing Record of Decision, Final Bison and Elk Management Plan and Environmental Impact Statement: National Elk Refuge and Grand Teton National Park 10 (Apr. 2007) [hereinafter Record of Decision]). But they also found that "[this alternative] would likely result in an increase in elk mortality from starvation, predation, and disease related to poor body condition, particularly in severe winters." *Id.* (citing Record of Decision 10). This in turn would lead to a "long-term decrease in elk hunting and viewing opportunities in the Refuge, with attendant impacts on the area economy, and could cause elk herd numbers to fall below [the Wyoming Game and Fish Department's] statewide objective in some years." *Id.* at 19-20 (citing Record of Decision 10).

The agencies concluded that their preferred plan "[is more] consistent with regional herd management objectives, better balances divergent stakeholder interests, builds upon success on the ground, and enables managers to adapt to new information and changing conditions," all while preparing the animals for the eventual cessation of supplemental feeding and providing most of the benefits offered by the petitioners' preferred alternative. *Id.* at 20 (citing Record of Decision 14). On the issue of when to end supplemental feeding, the

agencies stressed that although they are committed to abandoning the practice, they would "not preclude the use of supplemental feeding or other management tools as [they] work to resolve the bison and elk management issues . . . . [N]or [would they] make predictions about how fast [they could] implement the phased approach for improving forage, reducing the [elk and bison populations], and reducing the need for supplemental feed . . . . When the biological, social, and political conditions enable [them] to consider a phase-out of feeding, [the plan's] adaptive framework provides [the agencies] with that flexibility." Record of Decision 13. In essence, the agencies determined that a deadline for ceasing supplemental feeding would be unduly restrictive in light of the many variables and concerns that need to be accounted for in managing the Refuge.

The Defenders of Wildlife, the Jackson Hole Conservation Alliance, the National Wildlife Refuge Association, the Greater Yellowstone Coalition, and the Wyoming Outdoor Council (collectively, the Defenders) filed suit in the district court, challenging the Secretary's plan under the Administrative Procedure Act. They argue the plan's failure to commit to a deadline for ending supplemental feeding was arbitrary and capricious given the Secretary's duty under the Improvement Act to "provide for the conservation of . . . wildlife" and "ensure that the biological integrity, diversity, and environmental health of the [wildlife refuge system] are maintained." 16 U.S.C. § 668dd(a)(4)(A)-(B). The district court granted summary judgment for the agencies, reasoning that the plan accounted for and managed the dangers of supplemental feeding and also created a program for phasing out the practice over a fifteen-year period. *Defenders of Wildlife v. Salazar*, 698 F. Supp. 2d 141, 147-48 (D.D.C. 2010). The Defenders of Wildlife filed a timely appeal, and we take jurisdiction pursuant to 28 U.S.C. § 1291.

We review the district court's grant of summary judgment de novo. *Castlewood Prods., LLC v. Norton*, 365 F.3d 1076, 1082 (D.C. Cir. 2004). Under the Administrative Procedure Act, we set aside agency action that is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). Our review focuses on whether the agency examined the relevant data, articulated a satisfactory explanation for its action, based its decision on the relevant factors, and committed no clear error of judgment. *Bluewater Network v. EPA*, 370 F.3d 1, 11 (D.C. Cir. 2004).

II

The parties agree that supplemental feeding poses serious risks for the elk and bison in the Refuge. The only question this case presents is whether it was arbitrary and capricious for the Secretary to transition away from supplemental feeding without committing himself to ending the practice on a particular date.

The Defenders argue it was, inasmuch as the very purpose of the National Wildlife Refuge System, as set out in the Improvement Act, "is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." 16 U.S.C. § 668dd(a)(2). To that end, the Defenders point out, the Act mandates that the Secretary manage refuges to "provide for the *conservation* of fish, wildlife, and plants, and their habitats within the System" and to "ensure that the *biological integrity, diversity, and environmental health* of the System are maintained for the benefit of present and future generations of Americans." *Id.* § 668dd(a)(4)(A), (B) (emphases added). The Act also instructs the Secretary to

"sustain and, where appropriate, restore and enhance, healthy populations of fish, wildlife, and plants utilizing . . . methods and procedures associated with modern scientific resource programs." *Id.* § 668ee(4). The Defenders argue that the Secretary's plan is unlawful because it does not fix a definite time for ending supplemental feeding, even though the agencies have acknowledged that the dangers posed by this practice imperil explicit statutory objectives. *See* February 2007 Management Plan and EIS 9. Underlying this statutory argument is some common sense: the whole point of a National Elk *Refuge* is to provide a sanctuary in which populations of healthy, reproducing elk can be sustained. *See* 16 U.S.C. § 673a (creating a "refuge" for the elk). The Refuge can hardly provide such a sanctuary if, every winter, elk and bison are drawn by the siren song of human-provided food to what becomes, through the act of gathering, a miasmic zone of life-threatening diseases.

The Defenders acknowledge that the Improvement Act also requires the Secretary to consider other factors such as the importance of recreation on refuge lands and cooperation with state officials in pursuing the objectives of the Act. *See id.* § 668dd(4)(I), (M). They argue, however, that such considerations may be pursued only when "compatible" or "consistent with" the conservation mission of the System and the purposes of each refuge. *See id.* § 668dd(a)(3)(B), (e)(3). Reading the several provisions of the Act that emphasize the importance of wildlife conservation together with the general purpose of the National Wildlife Refuge System, the Defenders contend that the agencies' top priority in managing the Refuge must be conservation, and other considerations must not hinder that objective.

For their part, the Secretary and Wyoming (intervening as a defendant-appellee in this case) argue that the Improvement Act confers upon the Secretary broad managerial discretion in

how to pursue the Act's objectives. They concede that conservation is the overarching objective, but argue that it cannot be the sole consideration. After all, the Act lists fourteen factors that the Secretary "shall" consider in administering the System, including, among others, "ensur[ing] effective coordination, interaction, and cooperation" with adjoining landowners and State fish and wildlife agencies in pursuit of the objectives of the Act. *Id.* § 668dd(a)(4)(E).

Given the discretion afforded him, the Secretary argues that the agencies reasonably determined that the plan is consistent with the objectives of the Act and the purposes of the Refuge. The plan addresses the risk of diseases by (1) increasing natural forage and decreasing the herd sizes, which will work in tandem to create conditions under which supplemental feeding can be stopped without unduly increasing the risk of starvation, (2) monitoring and managing the diseases that accompany gathering at the feed lines, and (3) progressively reducing reliance on supplemental feeding when certain criteria have been met.

There is no doubt that unmitigated continuation of supplemental feeding would undermine the conservation purpose of the National Wildlife Refuge System. But we cannot conclude that the agencies acted unlawfully by adopting a plan that contained no deadline for ending the practice, and that is the only issue before us. The record amply demonstrates that the agencies collected the relevant data, identified the dangers posed by supplemental feeding, and adopted a plan to mitigate those dangers. That they also determined that the many objectives of the Act, including conservation, could best be met without implementation of a fixed deadline for stopping supplemental feeding was not arbitrary or capricious.

The district court was right that the plan "might well have been unreasonable had the agencies categorically refused to phase out the winter feeding program in spite of all the evidence in the record about the dangers of supplemental feeding." *Defenders of Wildlife*, 698 F. Supp. 2d at 148. But they did no such thing. Instead, they selected an approach that is geared toward ending the practice over time while maintaining the flexibility needed to respond to facts on the ground. The Defenders are understandably concerned that this flexibility could be used to continue the practice indefinitely. But the agencies must proceed in a manner that is consistent with the science and accounts for the risks posed by supplemental feeding. There is nothing the agencies have said or done that causes us to doubt that they will. It is highly significant and indeed dispositive to us, as it was to the district court, that the agencies are committed to ending supplemental feeding. We do not know precisely how they will proceed, and that makes it impossible, at this stage, to declare that their plan is arbitrary and capricious simply because it does not specify a particular date by which the practice will cease. Should the agencies act unreasonably in establishing criteria for the transition or in otherwise carrying out the plan, that will be a different issue for another panel.

III

The Defenders also argue that the plan unlawfully gives the Wyoming Fish and Game Department a veto over whether supplemental feeding will end. They point to language in the plan stating that the agencies will seek to "decrease reliance on intensive supplemental winter feeding, including complete transition to free-standing forage *if and when several established criteria are met, including support from the Wyoming Game and Fish Department* and the public." April 2007 Management Plan 137 (emphasis added).

Regardless of how we might have read this language in the first instance, the Secretary has assured us in his briefs and at oral argument that the language confers no veto. *See* Appellees' Br. 34 (characterizing the disputed provision as "aspirational" rather than a grant of any power to Wyoming); Wyoming's Br. 28 n.6 (also agreeing that Wyoming does not have a veto); *cf. Wyoming v. United States*, 279 F.3d 1214, 1234 (10th Cir. 2002) ("[F]ederal management and regulation of federal wildlife refuges preempts state management and regulation of such refuges . . . where state management and regulation stand as an obstacle to the accomplishment of the full purposes and objectives of the Federal Government."). We take the Secretary at his word that Wyoming has no veto over the Secretary's duty to end a practice that is concededly at odds with the long-term health of the elk and bison in the Refuge.

IV

For the foregoing reasons, the district court's judgment is

Affirmed.

Cole, Eric <eric_cole@fws.gov>

Bison count on native winter range

1 message

Alyson Courtemanch <alyson.courtemanch@wyo.gov> Fri, Feb 12, 2016 at 4:52 PM
To: "Sarah_Dewey@nps.gov" <Sarah_Dewey@nps.gov>, "eric_Cole@fws.gov" <Eric_Cole@fws.gov>

Attached is a map of where we observed bison from the helicopter off feed. All of those up north were observed on 2/6/16 (4 days before the NER bison count). The ones on the north end of the NER were observed on 2/9/16 (1 day before the NER count).

We also observed two groups on 2/6 that I did not include in our final tally because I'm fairly confident they moved onto feed by the time of our ground count (8 bison on Kelly Hayfields and 13 bison on the north end of the NER). We did not see them when we flew the north end of the NER on 2/9.

Total: 48 bison
Cows: 3
Calves: 2
Yearling bulls: 1
Mature bulls: 42

I'd like your input on whether you think any of the groups on the attached map moved to the NER before our ground count. I think probably not, but I know that Sarah observed some movement.

If we choose to include all of those on the map, our total count (Feed + NWR) would be:

Total: 666 bison
Cows (including yearlings): 273
Calves: 139
Yearling bulls: 42
Mature bulls: 212

Calf:cow ratio 51:00
Mature bull:cow ratio 78:100 (this would be a substantial increase from last year's 35:100, probably due to cuts in bull tags).

Let me know if you think we need to make any adjustments to the native winter range numbers due to movement. I'm planning to share these numbers with the newspaper on Monday morning, so if you have any changes, please let me know.

Thanks!
Aly

--
Aly Courtemanch, Wildlife Biologist
Wyoming Game & Fish Department
420 North Cache
P.O. Box 67
Jackson, WY 83001
office: (307) 733-2383 x227
cell: (307) 730-2806

E-Mail to and from me, in connection with the transaction
of public business, is subject to the Wyoming Public Records
Act and may be disclosed to third parties.



Native Winter Range Bison 2016.jpg
5118K

Cole, Eric <eric_cole@fws.gov>

Briefing this p.m.

1 message

Blenden, Mike <mike_blenden@fws.gov> Tue, Mar 29, 2016 at 9:26 AM
To: Steve Kallin <steve_kallin@fws.gov>, Eric Cole <eric_cole@fws.gov>

Steve and Eric,

Here is the call information for briefing with Matt Hogan:

When Tue Mar 29, 2016 2pm – 2:30pm (MDT)
Where nonresponsive passcode nonresponsive
Who Will Meeks, matt_hogan@fws.gov*

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306
303-710-7934 cell

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

Blenden, Mike <mike_blenden@fws.gov>

Citizens Concerned for the Elk; WGFD Step Down Plan Meeting

2 messages

Steve Kallin <steve_kallin@fws.gov> Thu, Apr 7, 2016 at 9:31 AM
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>

Mike:

Attached is a “Guest Shot” published in yesterday’s Jackson Hole News and Guide written by Joanna Johnson, President of Concerned Citizens for the Elk. The gist of the letter:

-Feds don’t have the constitutional right to manage elk on the NER.

-Long term average of 7,500 elk on the NER, now we want to reduce the herd to 5,000 via starvation.

-Quotes Matthew Fry from the Governor’s Office who allegedly said the BEMP may not be as feasible as it was in 2007.

Also, I just received word from the WGFD that their Wildlife Administration plans to discuss the Step Down Plan/Jackson meeting, during the first week of May.

Call if you have any questions,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

JH News & Guide_ Don't Let the feds reduce elk numbers 4-6-2016.pdf
12K

Blenden, Mike <mike_blenden@fws.gov> Thu, Apr 7, 2016 at 9:39 AM
To: Steve Kallin <steve_kallin@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>

Thanks Steve.
[Quoted text hidden]
--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306
303-710-7934 cell

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

Blenden, Mike <mike_blenden@fws.gov>

Draft Elk Herd Objective comment letter

8 messages

Steve Kallin <steve_kallin@fws.gov> Wed, May 18, 2016 at 5:08 PM
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>

Mike:

Several weeks ago I sent you a first draft of a Jackson Elk Herd Objective comment letter. I recently received a copy of the WGFD proposed objective language and have made several relatively minor changes to that initial draft; see attached. My hope is to have this letter reviewed and submitted by the Regional Office to the WGFD by May 25, 2016, the deadline for submitting comments.

I will give you a brief call tomorrow to discuss a few details.

Thanks,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

Draft Comment Letter to Wyoming Game and Fish Commission 5-18-2016.docx
17K

Blenden, Mike <mike_blenden@fws.gov> Mon, May 23, 2016 at 2:35 PM
To: Steve Kallin <steve_kallin@fws.gov>

Steve,

Did you tell me this letter can be e-mailed to the state?

Mike
[Quoted text hidden]
--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306
303-710-7934 cell

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

Steve Kallin <steve_kallin@fws.gov> Mon, May 23, 2016 at 2:39 PM
To: Mike Blenden <mike_blenden@fws.gov>

Yes. It can be sent to Brad Hovinga at brad.hovinga@wyo.gov.

Thanks again for the support,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

From: Blenden, Mike [mailto:mike_blenden@fws.gov]
Sent: Monday, May 23, 2016 2:35 PM
To: Steve Kallin
Subject: Re: Draft Elk Herd Objective comment letter

[Quoted text hidden]

Blenden, Mike <mike_blenden@fws.gov> Tue, May 24, 2016 at 10:41 AM
To: Steve Kallin <steve_kallin@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>

Steve,

I apologize in advance for turning this in to a fire drill. My fault. I've discussed the letter with Maureen and I agree with her that this needs to be reduced to a shorter statement of what we recommend and a simple statement of why, without any judgmental statements. For example, don't bother quoting the state vet, just say something simple like "...consistent with the state veterinarian's recent presentation..." Hopefully, this can all be said in little more than one page.

Here's the fire drill. She is in until 3:30 today and I get on a plane in 1 hour. Can you reduce this down and get it back to Maureen ASAP?

Again, thanks for hopping on this and let me know if you have questions.

Mike

On Wed, May 18, 2016 at 5:08 PM, Steve Kallin <steve_kallin@fws.gov> wrote:
[Quoted text hidden]

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306
303-710-7934 cell

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

Wyoming Fish and Game Jackson Elk Herd Ojbective wo surname.docx
97K

Blenden, Mike <mike_blenden@fws.gov> Tue, May 24, 2016 at 10:45 AM
To: Maureen Gallagher <maureen_gallagher@fws.gov>

Mo,

This is what I sent Steve.

When we are ready to send, it goes to: brad.hovinga@wyo.gov

---------- Forwarded message ---------
From: **Blenden, Mike** <mike_blenden@fws.gov>
Date: Tue, May 24, 2016 at 10:41 AM
Subject: Re: Draft Elk Herd Objective comment letter
[Quoted text hidden]
[Quoted text hidden]

Wyoming Fish and Game Jackson Elk Herd Ojbective wo surname.docx
97K

Gallagher, Maureen <maureen_gallagher@fws.gov> Tue, May 24, 2016 at 11:29 AM
To: "Blenden, Mike" <mike_blenden@fws.gov>

Mike,
I will sign - cleared that with Will. I think we need to be very succinct. We have a ROD for the BEMP and that needs to be our sole stance. We stick by that and have no leeway unless that process is reopened.

Maureen Gallagher

Deputy Assistant Regional Director
Refuges and Partners for Fish and Wildlife
Mountain Prairie Region
134 Union Blvd
Lakewood, CO
303/236/4304
303/236/4792 fax

[Quoted text hidden]

Mike Blenden <mike_blenden@fws.gov> Tue, May 24, 2016 at 12:38 PM
To: "Gallagher, Maureen" <maureen_gallagher@fws.gov>

Cool. Makes sense. More later.

Sent from my iPhone
[Quoted text hidden]

Steve Kallin <steve_kallin@fws.gov> Tue, May 24, 2016 at 3:43 PM
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>

Mike:

I have been meeting with groups since 7:00 AM this morning and just completed my 4th speaking engagement. I just arrived at the Refuge and it is after 3:30 PM, so obviously I cannot make changes in time for the 3:30 PM deadline. I have another meeting this evening but could make changes later tonight if this comment letter can still be submitted by the deadline which is tomorrow.

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

From: Blenden, Mike [mailto:mike_blenden@fws.gov]
Sent: Tuesday, May 24, 2016 10:41 AM
To: Steve Kallin
Cc: Cris Dippel; Eric Cole
Subject: Re: Draft Elk Herd Objective comment letter

Steve,

[Quoted text hidden]
[Quoted text hidden]

Blenden, Mike <mike_blenden@fws.gov>

DRAFT letter to the Wyoming Game and Fish Commission

1 message

Steve Kallin <steve_kallin@fws.gov> Thu, May 5, 2016 at 3:30 PM
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>

Mike:

Attached is a first draft of the letter to the Wyoming Game and Fish Commission as we discussed earlier today.

It will likely need to be updated after we see the actual proposal being submitted by the WGFD to the WGF Commission.

Take care,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

Draft Comment Letter to Wyoming Game and Fish Commission 5-5-2016.docx
16K

Blenden, Mike <mike_blenden@fws.gov>

Elk Feeding Letter to WY Congressional Delegation

3 messages

Steve Kallin <steve_kallin@fws.gov> Fri, Jan 29, 2016 at 12:30 PM
To: Mike Blenden <mike_blenden@fws.gov>

Hi Mike:

Just a heads up. The attached letter was/is being sent to the Wyoming Congressional Delegation. The basic message: the elk are starving; replace the staff.

For your information, I have talked to all of the Field Reps for the three congressional members since Tuesday. We have a good relationship with these Field Reps. I meet with them 2-4 times a year, often while taking them on a tour of the NER. They are knowledgeable about NER operations and local pressures/politics.

Take care,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

NER Starving the Elk - Lutz _ 1-29-2016.pdf
34K

Steve Kallin <steve_kallin@fws.gov> Wed, Feb 3, 2016 at 4:49 AM
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Will Meeks <will_meeks@fws.gov>, Maureen Gallagher <maureen_gallagher@fws.gov>, Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>, Lori Iverson <lori_iverson@fws.gov>

Mike:

Just a heads-up, this letter was published in the Jackson Hole News and Guide today.

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Friday, January 29, 2016 12:31 PM
To: Mike Blenden

Subject: Elk Feeding Letter to WY Congressional Delegation

[Quoted text hidden]

NER Starving the Elk - Lutz _ 1-29-2016.pdf
34K

Will Meeks <will_meeks@fws.gov> Wed, Feb 3, 2016 at 7:46 AM
To: Steve Kallin <steve_kallin@fws.gov>, Mike Blenden <mike_blenden@fws.gov>

Can you prepare a HQ report submission.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303(w)
720-541-0319 (c)

Begin forwarded message:

From: Noreen Walsh <noreen_walsh@fws.gov>
Date: February 3, 2016 at 7:44:33 AM MST
To: Will Meeks <will_meeks@fws.gov>, Matt Hogan <matt_hogan@fws.gov>, Anna Munoz <anna_munoz@fws.gov>
Subject: RE: Elk Feeding Letter to WY Congressional Delegation

Thanks Will. Will Refuges put an update in the HQ report this week please?

Noreen Walsh

Regional Director

Mountain-Prairie Region

U. S. Fish and Wildlife Service

303 236 7920

From: Will Meeks [mailto:will_meeks@fws.gov]
Sent: Wednesday, February 03, 2016 5:12 AM
To: Noreen Walsh; Matt Hogan; Anna Munoz
Subject: Fwd: Elk Feeding Letter to WY Congressional Delegation

See attached.

Will Meeks

U.S. Fish and Wildlife Service

Mountain-Prairie Region

Assistant Regional Director

National Wildlife Refuge System

303-236-4303(w)

720-541-0319 (c)

Begin forwarded message:

> **From:** Steve Kallin <steve_kallin@fws.gov>
> **Date:** February 3, 2016 at 4:49:39 AM MST
> **To:** Mike Blenden <mike_blenden@fws.gov>
> **Cc:** Will Meeks <will_meeks@fws.gov>, Maureen Gallagher <maureen_gallagher@fws.gov>, Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>, Lori Iverson <lori_iverson@fws.gov>
> **Subject: FW: Elk Feeding Letter to WY Congressional Delegation**

[Quoted text hidden]

Blenden, Mike <mike_blenden@fws.gov>

FW: Step-Down Plan Meeting

5 messages

Steve Kallin <steve_kallin@fws.gov> Mon, Feb 8, 2016 at 1:50 PM
To: Mike Blenden <mike_blenden@fws.gov>

Mike:

Let's discuss this as a possible date. Looks like the WGFD does not have an interest in a feed ground tour. So if traveling from the RO to the NER for a March 11 date is an issue for your or Will, perhaps another date with a meeting in Cheyenne would be possible.

Call to discuss at your earliest convenience,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

From: Brad Hovinga [mailto:brad.hovinga@wyo.gov]
Sent: Friday, February 05, 2016 9:06 AM
To: Steve Kallin
Subject: Step-Down Plan Meeting

Steve,

It appears that Friday March 11th would work for some of our administration. The two deputy chiefs of the Wildlife Division can likely attend, as well as possibly the Director. Early afternoon would probably work best. A feedground tour will not be necessary as most of our administration has spent a considerable amount of time on the Refuge.

Please let me know if this works.

Thanks,
Brad

E-Mail to and from me, in connection with the transaction
of public business, is subject to the Wyoming Public Records
Act and may be disclosed to third parties.

Steve Kallin <steve_kallin@fws.gov> Tue, Feb 9, 2016 at 4:01 PM
To: Brad Hovinga <brad.hovinga@wyo.gov>
Cc: Will Meeks <will_meeks@fws.gov>, Mike Blenden <mike_blenden@fws.gov>

Hi Brad:

Sounds good! We have it on the calendar.

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

From: Brad Hovinga [mailto:brad.hovinga@wyo.gov]
Sent: Tuesday, February 09, 2016 3:53 PM
To: Steve Kallin
Subject: Re: Step-Down Plan Meeting

Great! Let's plan on 1:00 pm.

Thanks,

Brad

On Tue, Feb 9, 2016 at 3:50 PM, Steve Kallin <steve_kallin@fws.gov> wrote:

Hi Brad:

The afternoon of March 11 should work. Let me invite you to meet here at the Refuge. If that works, does 1:00 PM or 2:00 PM work better.

Thanks,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

From: Brad Hovinga [mailto:brad.hovinga@wyo.gov]
Sent: Friday, February 05, 2016 9:06 AM
To: Steve Kallin
Subject: Step-Down Plan Meeting

Steve,

It appears that Friday March 11th would work for some of our administration. The two deputy chiefs of the Wildlife Division can likely attend, as well as possibly the Director. Early afternoon would probably work best. A feedground tour will not be necessary as most of our administration has spent a considerable amount of time on the Refuge.

Please let me know if this works.

Thanks,
Brad

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of public business, is subject to the Wyoming Public Records
Act and may be disclosed to third parties.

--

Brad Hovinga

Wyoming Game and Fish Department

Regional Wildlife Supervisor

Jackson Region

Jackson, WY

(307) 733-2321

E-Mail to and from me, in connection with the transaction of public business, is subject to the Wyoming Public Records Act and may be disclosed to third parties.

Mike Blenden <mike_blenden@fws.gov> Wed, Feb 17, 2016 at 9:39 AM
To: Will_Meeks@fws.gov

Looks like 1:00 p.m. On March 11.

Sent from my iPad

Begin forwarded message:

> **From:** Steve Kallin <steve_kallin@fws.gov>
> **Date:** February 9, 2016 at 4:01:59 PM MST
> **To:** Brad Hovinga <brad.hovinga@wyo.gov>
> **Cc:** Will Meeks <will_meeks@fws.gov>, Mike Blenden <mike_blenden@fws.gov>
> **Subject: RE: Step-Down Plan Meeting**

[Quoted text hidden]

Will Meeks <will_meeks@fws.gov> Wed, Feb 17, 2016 at 4:41 PM
To: Steve Kallin <steve_kallin@fws.gov>
Cc: Mike Blenden <mike_blenden@fws.gov>

Steve,

Mike and I made our flight reservations today for this. Thanks.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303(w)
720-541-0310 (c)
[Quoted text hidden]

Steve Kallin <steve_kallin@fws.gov> Thu, Feb 18, 2016 at 7:25 AM
To: Will Meeks <will_meeks@fws.gov>
Cc: Mike Blenden <mike_blenden@fws.gov>

Excellent!

I will be drafting an agenda for your review within the next week.

Take care,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

From: Will Meeks [mailto:will_meeks@fws.gov]
Sent: Wednesday, February 17, 2016 4:41 PM
To: Steve Kallin
Cc: Mike Blenden

[Quoted text hidden]

[Quoted text hidden]

Cole, Eric <eric_cole@fws.gov>

Jackson elk data

1 message

Hobbs,Tom <Tom.Hobbs@colostate.edu> Tue, Feb 2, 2016 at 4:03 PM
To: Ryan Monello <Ryan_Monello@nps.gov>, "Doug.Brimeyer@wyo.gov" <Doug.Brimeyer@wyo.gov>, "Cole, Eric" <eric_cole@fws.gov>

Hi Ryan, Doug, Eric—

I now have a model coded that implements the math I sent earlier. It is giving reasonable results and can recover parameters used to simulate “fake” data. The next step is to incorporate the full Jackson dataset, harvest, census, classifications by hunt unit. It is pretty clear this is necessary because the harvest numbers I have are clearly not well aligned with the counts and classifications. Could I get the full data set in the near future?

I will be on a backcountry ski tour in SE Yellowstone until next Wednesday.

Best,

Tom

N. Thompson Hobbs
Natural Resource Ecology Laboratory, Department
of Ecosystem Science and Sustainability, and
Graduate Degree Program in Ecology
Colorado State University
Fort Collins, CO 80524
970-491-5738
ww.nrel.colostate.edu/hobbs-home.html

For group mailings:
Use of this mail list is intended exclusively for
internal communication at Colorado State University.
Any unauthorized use is prohibited.

Blenden, Mike <mike_blenden@fws.gov>

Meeting with WY Game and Fish

2 messages

Blenden, Mike <mike_blenden@fws.gov> Tue, Feb 9, 2016 at 10:11 AM
To: Will Meeks <will_meeks@fws.gov>
Cc: Steve Kallin <steve_kallin@fws.gov>

Will,

Steve has been trying to schedule a meeting with Scott Talbot at Noreen's request regarding the Step Down Plan. Next opportunity appears to be March 11. During that afternoon two of his deputies and possibly Scott will be in Jackson. They aren't interested in a tour of the feedgrounds but would be able to meet that afternoon. Are you interested in meeting with them, Steve and me that afternoon, and possibly a morning feeding ground tour? Would require skipping out early on LE in service.

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306
303-710-7934 cell

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

Will Meeks <will_meeks@fws.gov> Tue, Feb 9, 2016 at 10:18 AM
To: "Blenden, Mike" <mike_blenden@fws.gov>
Cc: Steve Kallin <steve_kallin@fws.gov>

Get it on the calendar

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303 (w)
720-541-0310 (c)
[Quoted text hidden]

Blenden, Mike <mike_blenden@fws.gov>

NER

3 messages

Will Meeks <Will_Meeks@fws.gov> Tue, Jul 21, 2015 at 8:54 AM
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Keenan Adams <keenan_adams@fws.gov>, Maureen Gallagher <maureen_gallagher@fws.gov>

Mike,

I need to push you for a recommendation on a path forward re: the Adaptive Management Plan at the Elk Refuge.

As you know, I am not going to Matt/Noreen and telling them we've slipped a year. Please get me something by the end of the week.

Thanks.

Will Meeks

U.S. Fish and Wildlife Service, Region 6

Acting ARD External Affairs (through September 2015)

303-236-4510 (w)

720-541-0310 (c)

Blenden, Mike <mike_blenden@fws.gov> Tue, Jul 21, 2015 at 9:15 AM
To: Will Meeks <Will_Meeks@fws.gov>
Cc: Keenan Adams <keenan_adams@fws.gov>, Maureen Gallagher <maureen_gallagher@fws.gov>

Will do.

[Quoted text hidden]

--

Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

Blenden, Mike <mike_blenden@fws.gov> Tue, Jul 21, 2015 at 11:48 AM
To: Steve Kallin <steve_kallin@fws.gov>

Let's talk. I need to give Will something other than what I've given so far.

[Quoted text hidden]

--

Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

Cole, Eric <eric_cole@fws.gov>

Re: bison data

1 message

Dewey, Sarah <sarah_dewey@nps.gov> Wed, Feb 10, 2016 at 3:09 PM
To: "Cole, Eric" <eric_cole@fws.gov>

Good to know our count matches up with what you guys have seen. Last Friday I saw about 20 bison heading south from Snake River Hill. I suspect that group has made it to the refuge by now, but there are still a few in the Snake River bottom near TriX/Cunningham Cabin/Moosehead. I'll try to get a total count so we can compare that with numbers from the WGF helo flight last Saturday to get the most accurate herd wide tally.

Also, I left a phone charger in the track vehicle. If you could grab that at some point that would be great.

Sarah

On Wed, Feb 10, 2016 at 2:43 PM, Cole, Eric <eric_cole@fws.gov> wrote:

> Great, thanks. Your observations seem consistent with our estimates, which is always nice.
>
> **Eric Cole**
> Refuge Biologist
> U.S. Fish & Wildlife Service, National Elk Refuge
> Jackson, WY
> 307.201.5432
>
> *"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle*
>
> On Wed, Feb 10, 2016 at 2:40 PM, Dewey, Sarah <sarah_dewey@nps.gov> wrote:
>
> > Hi Eric,
> >
> > We ended up counting twice since bison kept coming into feed out of the fog. Numbers were not too different, but I'm reporting the 2nd count as we ended up with a few more bison. Fernando also let us know about some bison that were further up Long Hollow feeding with the elk and those are also included in the total. We also drove up Flat Creek a ways, but did not find any additional bison.
> >
> > | Bulls | Cows | YBulls | YCows | Calves | Unkn | Total |
> > |---|---|---|---|---|---|---|
> > | 170 | 234 | 41 | 36 | 137 | 0 | 618 |
> > | 0.28 | 0.38 | 0.07 | 0.06 | 0.22 | 0.00 | Herd Percentages |
> > | 0.73 | | | | 0.59 | | Ratio using only adult animals |
> > | 0.78 | | | | 0.51 | | Ratio combining adults and yearlings |
> >
> > On Wed, Feb 10, 2016 at 2:21 PM, Cole, Eric <eric_cole@fws.gov> wrote:
> >
> > > Hi Sarah,
> > >
> > > I will be putting together a biological update soon and would like to include the bison classification count data. Did the classification count work out or was there too much fog?
> > >
> > > **Eric Cole**
> > > Refuge Biologist
> > > U.S. Fish & Wildlife Service, National Elk Refuge
> > > Jackson, WY
> > > 307.201.5432

> > *"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle*
>
> --
> Sarah Dewey, Wildlife Biologist
> Grand Teton National Park
> Science and Resource Management
> P.O. Box 170
> Moose, WY 83012
> (307) 739-3488

--
Sarah Dewey, Wildlife Biologist
Grand Teton National Park
Science and Resource Management
P.O. Box 170
Moose, WY 83012
(307) 739-3488

Cole, Eric <eric_cole@fws.gov>

Re: Elk Feeding

1 message

Brunner, Nikki (Enzi) <Nikki_Brunner@enzi.senate.gov> Thu, Jan 28, 2016 at 9:46 AM
To: Steve Kallin <steve_kallin@fws.gov>
Cc: Mike Blenden <mike_blenden@fws.gov>, Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>, Lori Iverson <lori_iverson@fws.gov>

Hello,

I just spoke with Earl and he does not wish to reach out directly. He feels that the refuge staff is ignorant and is choosing to write a letter to Senator Enzi with his concerns. As soon as I receive, I will share with all of so that we can respond accurately from our office.

Thanks so much for all of the hard work you have done to educate the public on this issue!

Nikki Brunner
Field Representative
U.S. Senator Mike Enzi
PO Box 12470
1110 Maple Way, Suite G
Jackson, WY 83002
(307) 739.9507 (office)
(307) 739.9520 (fax)

> On Jan 28, 2016, at 7:46 AM, Steve Kallin <steve_kallin@fws.gov> wrote:
>
> Hi Nikki:
>
> Thank you for your email. No, Earl Lutes has not called me. Please feel
> free to give him my phone number.
>
> There is a local group that is trying to create the impression the elk are
> starving. They just put an ad in the JH News and Guide yesterday and have
> a website, savetheelk.org.
>
> The elk are NOT starving. When you return we can go take a look at them.
> I would encourage anyone that is concerned to take a sleighride, and go
> out and get a close look at the elk.
>
> It appears we will begin the supplemental feeding by the start of next
> week, perhaps sooner depending on the upcoming storm . The AVERAGE start
> date to begin the supplemental feeding program is January 28.
>
> Thank you for the contact,
>
> Steve Kallin
> Project Leader
> National Elk Refuge
> PO Box 510
> 675 East Broadway
> Jackson, WY 83001
> Phone: (307) 201-5409
> Fax: (307) 733-9729
> steve_kallin@fws.gov
>
> -----Original Message-----
> From: Brunner, Nikki (Enzi) [mailto:Nikki_Brunner@enzi.senate.gov]
> Sent: Thursday, January 28, 2016 5:29 AM

> To: Steve Kallin
> Subject: Elk Feeding
>
> Good Morning, Steve!
>
> As you know, I'm in DC right now - but I wanted to let you know that I
> received a call from an Earl Lutes (or Loots ???) yesterday about the elk
> feeding. He is stating that biologists have recognized that the refuge is
> starving the elk and "you guys" just won't do anything about it.
> (I knew the calls would be coming soon) ;) Anyhow, with the time
> difference and our busy meeting agenda, I haven't returned his call yet.
> My intention is to provide him with your contact info, but I'm just
> curious as to if he has already approached you or not?
>
> Thanks Steve! I hope you have a great day!
>
> Nikki Brunner
> Field Representative
> U.S. Senator Mike Enzi
> PO Box 12470
> 1110 Maple Way, Suite G
> Jackson, WY 83002
> (307) 739.9507 (office)
> (307) 739.9520 (fax)

Cole, Eric <eric_cole@fws.gov>

Re: WY CWD plan comments

1 message

Gibbs, Samantha <samantha_gibbs@fws.gov> Mon, Mar 21, 2016 at 9:11 AM
To: Lee Jones <lee_c_jones@fws.gov>
Cc: Steve Kallin <steve_kallin@fws.gov>, Eric Cole <eric_cole@fws.gov>

Hi Lee,

In response to your comment "If WGFD were looking for a reason to close feedgrounds before detection, they would have already done so..."

I believe we still need to note in our comments for the record that the Service's preference would be prevention rather than waiting for a disease introduction to close the feed grounds, but acknowledging that we have ourselves been unable to do that.

Thanks,
Sam

On Mon, Mar 21, 2016 at 11:04 AM, Lee Jones <lee_c_jones@fws.gov> wrote:

> Hi Sam,
> Thanks for the suggestion, but that change would alter the meaning. We are suggesting closure of the feedgrounds following detection, since the current plan does not indicate that feedground management would change even after CWD detection. If WGFD were looking for a reason to close feedgrounds before detection, they would have already done so in the face of encroaching CWD and continued or worsening brucellosis and necrobacillosis. Let me know if you need additional clarification or have any questions. Thanks,
>
> _____
> Lee C. Jones
> USFWS-Wildlife Health Office
> 10 E. Babcock, Rm 105
> Bozeman, MT 59715
> Office: 406-587-2169
> Cell: 406-600-8405
> Fax: 406-587-9098
> lee_c_jones@fws.gov
>
> On Mar 21, 2016, at 6:33 AM, Gibbs, Samantha <samantha_gibbs@fws.gov> wrote:
>
> > Thanks Lee,
> >
> > The only change I would suggest is under the last bullet - replace "following" with "before":
> > • *We suggest that closure of feedgrounds **before** detection of CWD in these herd units should be a high priority. An overwhelming body of research indicates that feeding wildlife results in increased transmission of disease, and the imminent threat of CWD provides the perfect opportunity to shift from a management paradigm of large, artificially supplemented elk herds to naturally managed, healthy elk herds that are sustainable over the long term.*
> >
> > Kind regards,
> > Sam
> >
> > On Fri, Mar 18, 2016 at 12:55 PM, Jones, Lee <lee_c_jones@fws.gov> wrote:
> >
> > > I made some changes based on the WGFD revisions, and replaced our original comment about plant prion uptake with a new comment encouraging increased funding to surveillance over monitoring. I also considered a comment about the wolf statements that seem to be conflicting, but opted not to since WGFD was brave enough to emphasize and expand the section on the potential value of predation.

Please look over, and let me know if you feel we need a call to discuss. Otherwise, when I receive all of your comments I'll send to Will and Mark today to provide them with a 2-week timeframe to tackle. Thanks! Lee

Lee C. Jones
USFWS-Wildlife Health office
10 E. Babcock, Rm 105
Bozeman, MT 59715
Office: 406.587.2169
Cell: 406.600.8405
Fax: 406.587.9098
lee_c_jones@fws.gov

--
Samantha E. J. Gibbs, DVM PhD
Wildlife Veterinarian
Wildlife Health office
Natural Resource Program Center
National Wildlife Refuge System
U.S. Fish and Wildlife Service
571-216-5776
samantha_gibbs@fws.gov
For DOI personnel - please see https://sites.google.com/a/fws.gov/fws-wildlife-health/

--
Samantha E. J. Gibbs, DVM PhD
Wildlife Veterinarian
Wildlife Health office
Natural Resource Program Center
National Wildlife Refuge System
U.S. Fish and Wildlife Service
571-216-5776
samantha_gibbs@fws.gov
For DOI personnel - please see https://sites.google.com/a/fws.gov/fws-wildlife-health/

Blenden, Mike <mike_blenden@fws.gov>

WGFD Elk Herd Objective Meeting

1 message

Steve Kallin <steve_kallin@fws.gov> Wed, Apr 27, 2016 at 9:44 AM
To: Mike Blenden <mike_blenden@fws.gov>

Mike:

Please see the attached article in today's Jackson Hole News and Guide. We should talk soon, call at your earliest convenience.

Take care,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

WGFD Elk Herd Objective Meeting 4-25-2016.pdf
176K

Blenden, Mike <mike_blenden@fws.gov>

WGFD Jackson Elk Herd Population Objectives

2 messages

Steve Kallin <steve_kallin@fws.gov> Mon, May 2, 2016 at 3:34 PM
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Brad Hovinga <brad.hovinga@wyo.gov>, Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>

Hi Mike:

I met this morning with Brad Hovenga, Jackson WGFD Regional Wildlife Supervisor. Two updates.

First, the meeting by the WGFD Wildlife Administrators to discuss the BEMP Step Down Plan has been scheduled for May 19. I again offered to provide written information or meet with them in person if they believed it would be helpful.

Second, we discussed the WGFD proposal to drop winter sub-herd objectives for the Jackson Elk Herd. I believe the WGFD has legitimate management reasons for wanting to drop these objectives. I expressed the concern that to the public, or to future WGFD/FWS staff, it may appear the WGFD has purposely decided not to support the BEMP objective of 5,000 elk for the NER supplemental feeding program. They responded that was not their intent and committed to continue to work with us to meet the goals and objectives of the BEMP. I asked if a specific statement emphasizing continued WGFD support of the BEMP goals and objectives could be added to their proposal and incorporated into the Wyoming Game and Fish Commission's action. They agreed to include this language in a draft proposal, have it reviewed by the WGFD Administration, and if approved, provide us a draft for our review prior to the WGF Commissioner's Meeting. We also agreed to support this approach by submitting a letter of support to the WGF Commission from the FWS and NPS.

Call if you have any questions,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

Blenden, Mike <mike_blenden@fws.gov> Tue, May 3, 2016 at 11:33 AM
To: Steve Kallin <steve_kallin@fws.gov>
Cc: Brad Hovinga <brad.hovinga@wyo.gov>, Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>

Thanks Steve.
[Quoted text hidden]
--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306
303-710-7934 cell

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

Blenden, Mike <mike_blenden@fws.gov>

Wyoming comment letter

6 messages

Blenden, Mike <mike_blenden@fws.gov> Wed, May 25, 2016 at 8:37 AM
To: Kandi Baaske <kandi_baaske@fws.gov>
Cc: Maureen Gallagher <maureen_gallagher@fws.gov>, Steve Kallin <steve_kallin@fws.gov>

HI Kandi,

Attached is my final version of a comment letter to the state of Wyoming on Jackson Elk her objectives. Would you please print out for Maureen's signature and email to: brad.hovinga@wyo.gov after it is signed?

Thanks for the help all,

Mike

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306
303-710-7934 cell

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

Wyoming Fish and Game Jackson Elk Herd Ojbective MB final.docx
96K

Baaske, Kandi <kandi_baaske@fws.gov> Wed, May 25, 2016 at 8:41 AM
To: "Blenden, Mike" <mike_blenden@fws.gov>

Will do.

Kandi Baaske
HR/Payroll Liaison

NWRS Region 6 RO
134 Union Blvd. Ste. 300
Lakewood, CO 80228
(303) 236-4385 phone
(303) 236-4792 fax

[Quoted text hidden]

Steve Kallin <steve_kallin@fws.gov> Wed, May 25, 2016 at 8:52 AM
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Kandi Baaske <kandi_baaske@fws.gov>

Mike:

Thanks for adding the fourth bullet. However, the word “object” should read “objective” and “11,00” should be “11,000.”

Again, thank you for your help.

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

From: Blenden, Mike [mailto:mike_blenden@fws.gov]

Sent: Wednesday, May 25, 2016 8:37 AM
To: Kandi Baaske
Cc: Maureen Gallagher; Steve Kallin
Subject: Wyoming comment letter

[Quoted text hidden]

Baaske, Kandi <kandi_baaske@fws.gov> Wed, May 25, 2016 at 9:03 AM
To: Steve Kallin <steve_kallin@fws.gov>
Cc: Mike Blenden <mike_blenden@fws.gov>

Try this one.

Kandi Baaske
HR/Payroll Liaison
NWRS Region 6 RO
134 Union Blvd. Ste. 300
Lakewood, CO 80228
(303) 236-4385 phone
(303) 236-4792 fax

[Quoted text hidden]

Wyoming Fish and Game Jackson Elk Herd Ojbective MB final.docx
96K

Gallagher, Maureen <maureen_gallagher@fws.gov> Wed, May 25, 2016 at 10:08 AM
To: Kandi Baaske <kandi_baaske@fws.gov>
Cc: Mike Blenden <mike_blenden@fws.gov>, Steve Kallin <steve_kallin@fws.gov>

Kandi,
I made additional edits to this letter. Please print so that I can sign.
thx

Maureen Gallagher
Deputy Assistant Regional Director
Refuges and Partners for Fish and Wildlife
Mountain Prairie Region
134 Union Blvd
Lakewood, CO
303/236/4304
303/236/4792 fax

[Quoted text hidden]

2 attachments

Wyoming Fish and Game Jackson Elk Herd Ojbective MB final.docx
96K

Wyoming Fish and Game Jackson Elk Herd Ojbective MB final.docx
99K

Mike Blenden <mike_blenden@fws.gov> Wed, May 25, 2016 at 10:14 AM
To: "Gallagher, Maureen" <maureen_gallagher@fws.gov>
Cc: Kandi Baaske <kandi_baaske@fws.gov>, Steve Kallin <steve_kallin@fws.gov>

Thank you all.

Sent from my iPhone
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<Wyoming Fish and Game Jackson Elk Herd Ojbective MB final.docx>

Draft Letter to the Wyoming Game and Fish Commission concerning the Jackson Elk Herd Objective Proposal. 5/5/2016.

The USFWS supports the WGFD's proposal to retain the Jackson Elk Herd objective at 11,000 elk, and change population monitoring to a three-year running average while continuing to support the goals and objectives in the Bison and Elk Management Plan (BEMP), April 2007.

Through the BEMP, the Grand Teton National Park and the National Elk Refuge has, and will continue to support the WGFD Jackson Elk Herd objective of 11,000. The USFWS does not support increasing the herd objective above 11,000 elk.

For the purpose of reducing the risk of disease transmission, the BEMP also identifies the objective of ". . . transitioning from intensive supplemental winter feeding of bison and elk to greater reliance on natural forage on the refuge. " One strategy to achieving this outcome is "to reduce the number of elk on feed on the NER to approximately 5,000 . . ."

On September 7, 2007, the Wyoming Game and Fish Commission "set the Jackson Elk Population Objective at an overall 11,000 elk." Within that objective, the Commission also set winter distribution goals for the Gros Ventre feedgrounds, winter range and the National Elk Refuge. This action adopted 5,000 elk wintering on the National Elk Refuge.

The WGFD was an important cooperator in the development of the BEMP and has been a key partner in its implementation. Elk and bison management coordination through partnership with the WGFD has and will remain vital in the ongoing effort to successfully manage these wildlife populations.

The USFWS is not opposed to the WGFD's proposal to discontinue the use of winter subherd objectives. However, we are concerned that ending this practice may unintentionally convey the message to the public that the WGFD no longer supports the goals and objectives of the BEMP, especially the winter objective of 5,000 elk. We are also concerned that it could result in reduced WGFD support for BEMP objectives in the future after changes in WGFD personnel occurs through normal attrition.

For these reasons, we strongly urge the WGF Commission to clearly state in this action that the WGFD will continue to support and work in partnership to achieve the goals of the BEMP, including the winter goal of 5,000 elk on feed on the National Elk Refuge.

Public confidence in and support for the BEMP is vital to its successful implementation. Sustained support of the BEMP by the WGFD will continue to reinforce and enhance the public support for this collaborative approach in managing these highly visible wildlife populations.

An overarching strategy of the BEMP is to reduce the concentration of elk on the NER by reducing reliance on supplemental feeding to encourage the dispersal of elk to native winter range. The

approach of reducing elk concentrations on the NER follows a widely recognized principal in disease prevention and mitigation and will reduce the potential of disease transmission. This strategy is also consistent with a presentation on Chronic Wasting Disease (CWD) by WGFD State Veterinarian Mary Wood to the WGFD Commission on March 22, 2016 when she stated, ". . . artificially congregating animals in high density over a feed source will facilitate disease transmission. That's pretty much a stated fact; we know that will occur." In the same presentation, she also stated, "If we want to really look at proactive management, the single most proactive thing we can do for feed grounds in the face of CWD is to find ways to reduce reliance on feed before CWD ever hits." This is exactly what the NER/GTNP is attempting to do through implementation of the BEMP, especially In light of the westward expansion of CWD in Wyoming. Public recognition of continued WGFD support for the BEMP will be essential to its implementation, which is why the USFWS encourages the WGF Commission to make a clear statement of support in the Population Objective action to reiterate continued WGFD support for the BEMP.

The proposed WGFD approach of changing from using a model to estimate the total Jackson Elk Herd population to an actual survey count will increase the number of elk in the herd. This method will underestimate the number of elk not on feedgrounds, because some elk will not be observed. Several studies indicate that between 20-30% of the elk off of feedgrounds will be missed during flight surveys. The USFWS encourages and will support WGFD efforts to develop a "sight compensation adjustment" for surveying elk off feedgrounds to improve future survey accuracy.

Sincerely,

Name

Draft Letter to the Wyoming Game and Fish Commission concerning the Jackson Elk Herd Objective Proposal. 5/5/2016.

The U.S. Fish and Wildlife Service (FWS) appreciates the opportunity to provide comments during on the Jackson Elk Herd objective setting process. We support the WGFD's proposal to retain the Jackson Elk Herd objective at 11,000 elk, and change population monitoring to a three-year running average while continuing to support the goals and objectives in the Bison and Elk Management Plan (BEMP), April 2007.

Through the BEMP, the Grand Teton National Park and the National Elk Refuge has, and will continue to support the WGFD Jackson Elk Herd objective of 11,000. The USFWS does not support increasing the herd objective above 11,000 elk.

For the purpose of reducing the risk of disease transmission, the BEMP also identifies the objective of ". . . transitioning from intensive supplemental winter feeding of bison and elk to greater reliance on natural forage on the refuge. " One strategy to achieving this outcome is "to reduce the number of elk on feed on the NER to approximately 5,000 . . ."

On September 7, 2007, the Wyoming Game and Fish Commission "set the Jackson Elk Population Objective at an overall 11,000 elk." Within that objective, the Commission also set winter distribution goals for the Gros Ventre feedgrounds, native winter range and the National Elk Refuge. This action adopted 5,000 elk wintering on the National Elk Refuge.

The WGFD was an important cooperator in the development of the BEMP and has been a key partner in its implementation. Elk and bison management coordination through partnership with the WGFD has and will remain vital in the ongoing effort to successfully manage these wildlife populations.

The USFWS is not opposed to the WGFD's proposal to discontinue the use of winter subherd objectives. However, we are concerned that ending this practice may unintentionally convey the message to the public that the WGFD no longer supports the goals and objectives of the BEMP, especially the winter objective of 5,000 elk on the National Elk Refuge. We are also concerned that it could result in reduced WGFD support for BEMP objectives in the future after changes in WGFD personnel occurs through normal attrition.

For these reasons, we strongly urge the WGF Commission to clearly state in this action that the WGFD will continue to support and work in partnership to achieve the goals of the BEMP, including the winter goal of 5,000 elk on feed on the National Elk Refuge. We support the Jackson Elk Herd objective as proposed by the WGFD:

> *Manage for a mid-winter trend count of 11,000 elk, which will be estimated using ground classifications on feedgrounds and aerial surveys on native winter ranges. Mid-*

winter trend counts will be analyzed using a 3-year running average. The population will be managed for ±20% of the objective (range of 8,800 to 13,200). In addition, the WGFD will continue working with the NER and GTNP to achieve the goals outlined in the BEMP (2007).

Public confidence in and support for the BEMP is vital to its successful implementation. Sustained support of the BEMP by the WGFD will continue to reinforce and enhance the public support for this collaborative approach in managing these highly visible wildlife populations.

An overarching strategy of the BEMP is to reduce the concentration of elk on the NER by reducing reliance on supplemental feeding to encourage elk use of native winter range. The approach of reducing elk concentrations on the NER follows a widely recognized principal in disease prevention and mitigation and will reduce the potential of disease transmission. This strategy is also consistent with a presentation on Chronic Wasting Disease (CWD) by WGFD State Veterinarian Mary Wood to the WGFD Commission on March 22, 2016 when she stated, ". . . artificially congregating animals in high density over a feed source will facilitate disease transmission. That's pretty much a stated fact; we know that will occur." In the same presentation, she also stated, "If we want to really look at proactive management, the single most proactive thing we can do for feed grounds in the face of CWD is to find ways to reduce reliance on feed before CWD ever hits." This is exactly what the NER/GTNP is attempting to do through implementation of the BEMP, especially In light of the westward expansion of CWD in Wyoming. Public recognition of continued WGFD support for the BEMP will be essential to its implementation, which is why the USFWS encourages the WGF Commission to adopt the Jackson Elk Herd Objective as proposed by the WGFD which reiterates continued WGFD support for the BEMP.

The proposed WGFD approach of changing from a population model to estimate the total Jackson Elk Herd to methods using raw count data will effectively increase the population objective for the herd. Using unadjusted data will underestimate the number of elk not on feedgrounds to some unknown degree. The USFWS encourages and will support WGFD efforts to develop a "sightability index" for surveying elk off feedgrounds to improve future survey accuracy.

Thank you for this opportunity to provide comments for the Jackson Elk Herd objective setting process.

Sincerely,

Name

Elk and Bison Density Estimates Under Different Scenarios											
SPECIES	NUMBER	ACREAGE	PERACRE	PERSQMILE	PERSQKM	SCENARIO					
elk	7500	24000	0.3125	200	77.22	Average number of NER elk over entire refuge area					
elk	7500	5000	1.5	960	370.656	Average number of elk per 5,000 acre total feedground area					
elk	7500	13365	0.561167	359.147	138.6667	Average number of elk per 13365 acre core elk winter use area					
elk	7500	110	68.18182	43636.36	16848	Average number of elk per typical daily feedground area					
elk	5000	24000	0.208333	133.3333	51.48	Average number of NER elk over entire refuge area					
elk	5000	5000	1	640	247.104	Average number of elk per 5,000 acre total feedground area					
elk	5000	13365	0.374111	239.4314	92.44444	Average number of elk per 13365 acre core elk winter use area					
elk	5000	110	45.45455	29090.91	11232	Average number of elk per typical daily feedground area					
bison	700	24000	0.029167	18.66667	7.2072	Average number of bison over entire refuge area					
bison	700	5000	0.14	89.6	34.59456	Average number of bison per 5,000 acre total feedground area					
bison	700	7500	0.093333	59.73333	23.06304	Average number of bison per 7500 acre core bison winter use area					
bison	700	15	46.66667	29866.67	11531.52	Average number of bison per 15 acre typical daily feedground area					

A summary of the number of elk and bison counted on each feedground.

SEE SHEET 2 FOR PROJECTED FEED USE

WINTER	DATE	HQELK	NOWLINE	FLATSELK	CHAMBERSE	MCBRIDEELK	TOTALELK	FLATSBISO	CHAMBERSBI	MCBRIDEBISON	TOTALBIS	TONSFED
2006-2007	1/13/2007	0	1000	3800	300	0	5100	48	1000	0	1048	18
2006-2007	1/14/2007	0	2000	2500	500	0	5000	33	1000	0	1033	15.3
2006-2007	1/15/2007	0	3800	800	450	0	5050	0	1000	0	1000	19
2006-2007	1/16/2007	1900	2000	1300	500	0	5700	100	1000	0	1100	22
2006-2007	1/17/2007	2400	1100	1600	775	0	5875	20	800	0	820	23.8
2006-2007	1/18/2007	2500	1200	1800	500	0	6000	100	900	0	1000	26
2006-2007	1/19/2007	2500	1200	1850	500	0	6050	150	500	0	650	27
2006-2007	1/20/2007	2500	1400	2600	550	0	7050	5	65	0	70	24.8
2006-2007	1/21/2007	1800	1400	2500	300	0	6000	250	800	0	1050	37.8
2006-2007	1/22/2007	1800	1400	2800	200	0	6200	7	900	0	907	36.8
2006-2007	1/23/2007	1700	1400	3000	20	0	6120	220	800	0	1020	36.4
2006-2007	1/24/2007	1800	1400	3000	50	0	6250	40	750	0	790	36.3
2006-2007	1/25/2007	1800	1400	2100	750	0	6050	100	760	0	860	35.3
2006-2007	1/26/2007	1800	1400	2200	750	0	6150	100	800	0	900	36
2006-2007	1/27/2007	1800	1400	2600	1100	0	6900	30	900	0	930	38.5
2006-2007	1/28/2007	1300	1500	2900	800	0	6500	60	900	0	960	38.5
2006-2007	1/29/2007	900	2100	2800	350	0	6150	60	850	0	910	34.5
2006-2007	1/30/2007	1790	1601	2800	420	0	6611	43	800	0	843	40.5
2006-2007	1/31/2007	1650	1600	2300	800	0	6350	45	800	0	845	36
2006-2007	2/1/2007	700	2900	2005	150	0	5755	300	700	0	1000	38.6
2006-2007	2/2/2007	1800	1600	2900	250	0	6550	200	700	0	900	35.6
2006-2007	2/3/2007	1800	1700	3000	400	0	6900	100	700	0	800	40.8
2006-2007	2/4/2007	2000	1400	2300	1000	0	6700	41	850	0	891	41
2006-2007	2/5/2007	2000	900	3000	600	0	6500	26	800	0	826	36.8
2006-2007	2/6/2007	2000	750	3500	250	0	6500	60	750	0	810	36.5
2006-2007	2/7/2007	1900	1500	3600	250	0	7250	105	700	0	805	40.5
2006-2007	2/8/2007	500	2000	4300	250	0	7050	200	750	0	950	41.5
2006-2007	2/9/2007	2000	375	4100	200	0	6675	150	700	0	850	41.8
2006-2007	2/10/2007	2000	4200	518	200	0	6918	65	700	0	765	37.8
2006-2007	2/11/2007	1900	1700	2400	200	0	6200	50	750	0	800	39.8
2006-2007	2/12/2007	2600	1600	2800	200	0	7200	50	900	0	950	40.8
2006-2007	2/13/2007	1900	1400	3200	200	0	6700	250	700	0	950	37.8
2006-2007	2/14/2007	2100	1500	3200	400	0	7200	53	918	0	971	42.5
2006-2007	2/15/2007	2200	1800	2500	0	400	6900	5	0	400	405	34.5
2006-2007	2/16/2007	2719	1137	3290	0	133	7279	55	0	900	955	42.9
2006-2007	2/17/2007	0	1025	3400	0	60	4485	120	0	800	920	29.8
2006-2007	2/18/2007	1800	550	3900	0	400	6650	30	0	900	930	37.8
2006-2007	2/19/2007	2000	650	5000	0	400	8050	16	0	900	916	43.5
2006-2007	2/20/2007	2700	1200	2300	0	210	6410	20	0	900	920	35.4
2006-2007	2/21/2007	4500	1200	1200	0	200	7100	25	0	900	925	38
2006-2007	2/22/2007	0	2200	600	3700	230	6730	25	0	900	925	39.75
2006-2007	2/23/2007	0	3200	0	4000	300	7500	0	0	850	850	42.2
2006-2007	2/24/2007	0	2100	0	3200	340	5640	0	0	850	850	34
2006-2007	2/25/2007	0	900	2150	3800	350	7200	2	0	800	802	40.5
2006-2007	2/26/2007	0	2000	1700	2200	300	6200	7	16	900	923	38.8
2006-2007	2/27/2007	0	2200	2100	3200	350	7850	6	0	900	906	42.8
2006-2007	2/28/2007	0	1700	1700	2000	350	5750	8	0	950	958	39
2006-2007	3/1/2007	0	200	3900	3300	350	7750	16	0	850	866	46
2006-2007	3/2/2007	0	400	3700	2600	350	7050	16	9	850	875	38.3
2006-2007	3/3/2007	0	850	3900	3100	350	8200	35	7	900	942	39
2006-2007	3/4/2007	0	237	3700	3300	300	7537	20	20	900	940	43.8
2006-2007	3/5/2007	0	300	4000	2800	300	7400	16	0	850	866	39
2006-2007	3/6/2007	0	300	4300	2700	250	7550	16	0	900	916	48
2006-2007	3/7/2007	0	400	4200	2800	250	7650	15	30	900	945	43
2006-2007	3/8/2007	0	400	4100	3100	250	7850	30	30	900	960	45.5
2006-2007	3/9/2007	0	200	5000	1700	250	7150	11	0	900	911	42.8
2006-2007	3/10/2007	0	300	5000	2000	200	7500	20	12	900	932	43.8
2006-2007	3/11/2007	0	200	4000	2500	200	6900	5	0	600	605	35.3
2006-2007	3/12/2007	0	400	3900	2000	300	6600	8	33	500	541	28.8
2006-2007	3/13/2007	0	400	2200	2900	350	5850	13	0	800	813	25
2006-2007	3/14/2007	0	1800	1400	2350	0	5550	13	21	300	334	24.5
2006-2007	3/15/2007	0	2200	1700	1500	0	5400	12	0	0	12	16
2006-2007	3/16/2007	0	2500	125	350	0	2975	0	9	0	9	9.5
2006-2007	3/17/2007	0	1850	99	0	0	1949	0	0	0	0	6.8
2006-2007	3/18/2007	0	500	200	0	0	700	0	0	0	0	1.3
2006-2007	3/19/2007	0	500	21	0	0	521	14	0	0	14	1.2
2006-2007	3/20/2007	0	800	0	0	0	800	0	0	0	0	2.5
2006-2007	3/21/2007	0	500	0	0	0	500	0	0	0	0	1
						MEAN ELK/DAY	6122.5				TOTAL=	2254.35
											MEAN=	33.15221

used less feed than expected this year, Estimate we had 3,850 on hand, used 2,254 so have around 1,600 tons left

Following 2007 pellet deliveries, at start of 2008 feed season we estimate that we have 4,138 tons on hand.

WINTER	DATE	HQELK	NOWLINE	FLATSELK	CHAMBERSE	MCBRIDEELK	TOTALELK	FLATSBISO	CHAMBERSBI	MCBRIDEBISON	TOTALBIS	TONSFED
2007-2008	1/5/2008	0	0	0	0	0	0	0	0	650	650	3
2007-2008	1/6/2008	0	0	0	0	0	0	0	0	700	700	4
2007-2008	1/7/2008	0	0	0	0	0	0	0	0	800	800	5
2007-2008	1/8/2008	0	0	0	0	0	0	0	0	700	700	4

2007-2008	1/9/2008	0	0	0	0	0	0	0	0	850	850	3
2007-2008	1/10/2008	0	0	0	0	0	0	0	0	800	800	3
2007-2008	1/11/2008	0	0	0	0	0	0	0	0	800	800	3
2007-2008	1/12/2008	0	0	0	0	0	0	0	0	800	800	3
2007-2008	1/13/2008	0	0	0	0	0	0	0	0	800	800	6
2007-2008	1/14/2008	2200	1500	0	0	500	4200	0	0	700	700	12
2007-2008	1/15/2008	2200	2000	0	0	700	4900	0	0	800	800	15.4
2007-2008	1/16/2008	2500	1600	500	0	1100	5700	0	0	860	860	19
2007-2008	1/17/2008	2700	1500	1500	0	750	6450	0	0	700	700	23.5
2007-2008	1/18/2008	2700	1100	1400	0	800	6000	7	0	800	807	26.5
2007-2008	1/19/2008	2600	1200	1300	0	850	5950	7	0	800	807	32.9
2007-2008	1/20/2008	2400	850	1500	0	1125	5875	22	0	860	882	33
2007-2008	1/21/2008	2400	1000	1500	0	1200	6100	22	0	870	892	37.5
2007-2008	1/22/2008	2450	850	1600	0	1200	6100	22	0	860	882	40.8
2007-2008	1/23/2008	1200	1400	3250	0	1200	7050	20	0	860	880	42.5
2007-2008	1/24/2008	1600	900	3400	0	1200	7100	20	0	900	920	38
2007-2008	1/25/2008	2000	850	3300	0	850	7000	8	0	850	858	48
2007-2008	1/26/2008	1600	950	3200	0	1250	7000	120	0	750	870	43.5
2007-2008	1/27/2008	1825	675	3200	0	1300	7000	230	0	800	1030	46.5
2007-2008	1/28/2008	1900	700	3200	0	1300	7100	230	0	800	1030	49
2007-2008	1/29/2008	1900	950	3200	0	1200	7250	230	0	800	1030	48.5
2007-2008	1/30/2008	1600	1100	3300	0	1225	7225	200	0	675	875	45
2007-2008	1/31/2008	1800	900	3200	0	1200	7100	200	0	700	900	45
2007-2008	2/1/2008	1700	1200	3250	0	1300	7450	190	0	750	940	50
2007-2008	2/2/2008	1800	900	3300	0	1300	7300	165	0	650	815	46.4
2007-2008	2/3/2008	900	2300	3200	0	1300	7700	167	0	725	892	51.5
2007-2008	2/4/2008	950	2900	2800	0	1550	8200	30	0	850	880	54
2007-2008	2/5/2008	1000	2900	1950	0	1600	7450	12	0	875	887	50.5
2007-2008	2/6/2008	850	2500	2100	0	1700	7150	40	0	860	900	50.5
2007-2008	2/7/2008	900	2800	2700	0	1700	8100	40	0	850	890	48
2007-2008	2/8/2008	1060	2771	3311	0	805	7947	100		800	900	56
2007-2008	2/9/2008	1050	2800	3150	0	850	7850	56	0	750	806	50
2007-2008	2/10/2008	1050	3550	3200	0	825	8625	120	0	800	920	51.5
2007-2008	2/11/2008	775	900	5700	0	850	8225	129	0	780	909	52.5
2007-2008	2/12/2008	750	1700	4800	0	725	7975	50		875	925	51.1
2007-2008	2/13/2008	900	1900	4500	0	750	8050	91	0	850	941	53.5
2007-2008	2/14/2008	0	2400	4500	0	850	7750	90	0	830	920	50.5
2007-2008	2/15/2008	0	1900	4800	0	850	7550	15	0	875	890	46.5
2007-2008	2/16/2008	0	2000	4900	0	850	7750	120	0	800	920	50
2007-2008	2/17/2008	0	2850	4600	0	875	8325	125	0	820	945	55
2007-2008	2/18/2008	0	2850	4600	0	875	8325	150	0	820	970	53.5
2007-2008	2/19/2008	0	2950	4600	0	800	8350	162	0	800	962	54.5
2007-2008	2/20/2008	0	3000	4500	0	750	8250	200	0	750	950	51.5
2007-2008	2/21/2008	0	3000	4400	0	800	8200	80	0	850	930	51.5
2007-2008	2/22/2008	0	3000	4450	0	850	8300	135	0	800	935	49.5
2007-2008	2/23/2008	0	3300	4200	0	850	8350	110	0	810	920	54.5
2007-2008	2/24/2008	0	3600	4500	0	850	8950	214	0	800	1014	57
2007-2008	2/25/2008	0	3100	3800	0	1000	7900	40	0	900	940	48
2007-2008	2/26/2008	0	3150	3900	0	1100	8150	34	0	900	934	50
2007-2008	2/27/2008	0	3368	4100	0	1100	8568	40	0	500	540	44
2007-2008	2/28/2008	0	3200	4000	0	1000	8200	475	0	450	925	49.5
2007-2008	2/29/2008	0	3200	4000	0	1000	8200	225	0	650	875	51
2007-2008	3/1/2008	0	3300	3900	0	1050	8250	125	0	675	800	48
2007-2008	3/2/2008	0	3300	2900	0	1700	7900	220	0	680	900	53.5
2007-2008	3/3/2008	0	3550	3600	0	1800	8950	220	0	675	895	58
2007-2008	3/4/2008	0	3550	3600	0	1480	8630	200	0	690	890	53.5
2007-2008	3/5/2008	0	3300	3800	0	900	8000	200	0	775	975	53
2007-2008	3/6/2008	0	3600	3600	0	900	8100	150	0	800	950	50
2007-2008	3/7/2008	0	3600	3700	0	900	8200	35	0	900	935	50.5
2007-2008	3/8/2008	0	3600	3900	0	500	8000	30	0	900	930	50.8
2007-2008	3/9/2008	0	3650	3800	0	530	7980	10	0	910	920	47.3
2007-2008	3/10/2008	0	2350	5000	0	680	8030	10	0	910	920	52
2007-2008	3/11/2008	0	1575	6200	0	500	8275	0	0	900	900	48
2007-2008	3/12/2008	0	1650	6100	0	575	8325	7	0	900	907	52
2007-2008	3/13/2008	0	1200	6200	0	550	7950	7	0	900	907	48.5
2007-2008	3/14/2008	0	1300	6200	0	600	8100	18	0	900	918	52
2007-2008	3/15/2008	0	1300	6200	0	600	8100	6	0	900	906	49.5
2007-2008	3/16/2008	0	1600	6000	0	600	8200	9	0	895	904	45.5
2007-2008	3/17/2008	0	1600	6000	0	600	8200	10	0	900	910	46
2007-2008	3/18/2008	0	4250	6000	0	675	10925	10	0	900	910	58.8
2007-2008	3/19/2008	0	1350	6000	0	675	8025	140	0	825	965	46.3
2007-2008	3/20/2008	0	1700	6000	0	500	8200	150	0	900	1050	42.5
2007-2008	3/21/2008	0	1700	5700	0	600	8000	175	0	700	875	48.5
2007-2008	3/22/2008	0	2400	5300	0	500	8200	160	0	760	920	49.5
2007-2008	3/23/2008	0	1450	5900	0	575	7925	120	0	760	880	46
2007-2008	3/24/2008	0	1500	6000	0	480	7980	195	0	680	875	43.8
2007-2008	3/25/2008	0	2250	5000	0	750	8000	400	0	450	850	41
2007-2008	3/26/2008	350	2500	4500	0	775	8125	0	0	250	250	34
2007-2008	3/27/2008	400	3900	2800	0	600	7700	500	0	350	850	34.1
2007-2008	3/28/2008	500	3200	3300	0	550	7550	225	0	500	725	37.3

2007-2008	3/29/2008	500	2300	4500	0	750	8050	250	0	400	650	35.2
2007-2008	3/30/2008	0	3350	3500	0	550	7400	700	0	350	1050	29
2007-2008	3/31/2008	0	1450	5000	0	550	7000	700	0	175	875	27.5
2007-2008	4/1/2008	0	4550	3200	0	550	8300	700	0	250	950	34.8
2007-2008	4/2/2008	0	3600	3800	0	475	7875	500	0	550	1050	33.5
2007-2008	4/3/2008	550	1600	4100	0	600	6850	700	0	100	800	31.9
2007-2008	4/4/2008	300	1700	4500	0	0	6500	0	800	0	800	27
2007-2008	4/5/2008	450	2600	4500	0	100	7650	120	800	0	920	34
2007-2008	4/6/2008	625	3350	5000	0	0	8975	0	800	0	800	30
2007-2008	4/7/2008	500	2600	4500	0	500	8100	15	0	900	915	34.5
2007-2008	4/8/2008	550	100	6000	0	200	6850	0	575	200	775	29
2007-2008	4/9/2008	325	0	7500	0	250	8075	0	0	200	200	27.3
2007-2008	4/10/2008	400	0	7100	200	0	7700	150	750	0	900	24.2
2007-2008	4/11/2008	400	0	0	200	6500	7100	0	800	50	850	30
2007-2008	4/12/2008	400	0	400	0	6500	7300	850	0	10	860	28.3
2007-2008	4/13/2008	400	0	1400	0	4000	5800	850	0	0	850	17.6
2007-2008	4/14/2008	450	0	1400	0	5100	6950	850	0	80	930	24
2007-2008	4/15/2008	0	0	5300	0	700	6000	550	0	300	850	15.4
2007-2008	4/16/2008	0	0	730	0	4000	4730	700	0	50	750	14.5
2007-2008	4/17/2008	0	0	2000	0	4500	6500	0		200	200	16.3
2007-2008	4/18/2008	0	0	4550	0	1200	5750	5	0	250	255	11
2007-2008	4/19/2008	0	0	6500	0	0	6500	0	0	0	0	9
2007-2008	4/20/2008	0	0	6500	0	0	6500	200	0	0	200	13.5
							7556.2755	Mean elk/day during regular feed season				4080 Total
												4046 Total
WINTER	DATE	HQELK	NOWLINE	FLATSELK	CHAMBERSE	MCBRIDEELK	TOTALELK	FLATSBISO	CHAMBERSBI	MCBRIDEBISON	TOTALBIS	TONSFED
2008-2009	1/27/2009	1800	1050	1550	0	1050	5450	0	0	700	700	18.8
2008-2009	1/28/2009	2300	600	2500	0	600	6000	30	0	800	830	21
2008-2009	1/29/2009	2000	1150	2600	0	725	6475	22	0	800	822	24.5
2008-2009	1/30/2009	2500	1750	2800	0	850	7900	45	0	850	895	27.8
2008-2009	1/31/2009	2600	1600	2800	0	800	7800	45	0	600	645	35
2008-2009	2/1/2009	2500	1500	1900	0	1250	7150	80	0	700	780	36
2008-2009	2/2/2009	2500	1200	2800	0	825	7325	37	0	700	737	35.5
2008-2009	2/3/2009	2400	1200	2750	0	750	7100	21	0	800	821	38.5
2008-2009	2/4/2009	2500	1200	2700	0	950	7350	16	0	800	816	40.5
2008-2009	2/5/2009	2500	1700	2950	0	875	8025	19	0	800	819	37.7
2008-2009	2/6/2009	3450	2000	2900	0	900	9250	18	0	800	818	44
2008-2009	2/7/2009	2600	1500	2900	0	900	7900	20	0	700	720	42.5
2008-2009	2/8/2009	2600	1500	1650	0	935	6685	0	0	775	775	38.5
2008-2009	2/9/2009	2600	1500	2400	0	925	7425	20	0	735	755	42.5
2008-2009	2/10/2009	550	3550	2400	0	935	7435	16	0	755	771	43.7
2008-2009	2/11/2009	650	1750	4300	0	900	7600	15	0	735	750	41.5
2008-2009	2/12/2009	500	1800	3150	0	900	6350	16	0	750	766	35
2008-2009	2/13/2009	550	1800	3550	0	800	6700	19	0	700	719	37.5
2008-2009	2/14/2009	750	1600	3250	0	900	6500	20	0	800	820	41
2008-2009	2/15/2009	800	1600	3350	0	700	6450	17	0	600	617	37.8
2008-2009	2/16/2009	850	2000	3350	0	700	6900	18	0	700	718	43.3
2008-2009	2/17/2009	950	2300	3350	0	750	7350	18	0	800	818	43.7
2008-2009	2/18/2009	850	2300	3500	0	500	7150	10	0	450	460	43.5
2008-2009	2/19/2009	800	2000	3500	0	750	7050	15	0	675	690	40.3
2008-2009	2/20/2009	700	2200	3800	0	700	7400	15	0	700	715	38.5
2008-2009	2/21/2009	700	2000	3800	0	825	7325	9	0	850	859	41.3
2008-2009	2/22/2009	800	2450	3000	0	700	6950	9	0	625	634	38.6
2008-2009	2/23/2009	850	2800	3250	0	830	7730	9	0	750	759	45.9
2008-2009	2/24/2009	950	2600	3200	0	750	7500	9	0	750	759	42.6
2008-2009	2/25/2009	950	2300	3700	0	525	7475	9	0	800	809	47.3
2008-2009	2/26/2009	1422	1838	3400	0	800	7460	9	0	800	809	53
2008-2009	2/27/2009	1250	1350	3400	0	800	6800	10	0	800	810	39.6
2008-2009	2/28/2009	1500	2600	2900	0	650	7650	10	0	600	610	44
2008-2009	3/1/2009	1300	2600	2300	0	600	6800	10	0	650	660	39.1
2008-2009	3/2/2009	1200	2200	3000	0	750	7150	9	0	600	609	44
2008-2009	3/3/2009	1200	2500	2550	0	650	6900	12	0	700	712	37.5
2008-2009	3/4/2009	1150	2800	2800	0	650	7400	12	0	700	712	45.3
2008-2009	3/5/2009	1400	2550	3000	0	650	7600	12	0	700	712	41.5
2008-2009	3/6/2009	1350	2600	2800	0	650	7400	24	0	700	724	44.5
2008-2009	3/7/2009	900	2300	3000	0	760	6960	25	0	720	745	40.2
2008-2009	3/8/2009	1150	2600	3000	0	725	7475	250	0	630	880	40
2008-2009	3/9/2009	1000	2800	2400	0	600	6800	307	0	400	707	36.5
2008-2009	3/10/2009	1050	2800	2900	0	600	7350	280	0	400	680	40
2008-2009	3/11/2009	850	2000	2700	0	550	6100	220	0	425	645	36
2008-2009	3/12/2009	1500	3400	2700	0	600	8200	200	0	400	600	38
2008-2009	3/13/2009	900	3500	2900	0	300	7600	260	0	400	660	37
2008-2009	3/14/2009	400	3200	3100	0	550	7250	220	0	375	595	37.5
2008-2009	3/15/2009	600	3300	2500	0	450	6850	110	0	600	710	36.6
2008-2009	3/16/2009	950	2000	3350	0	500	6800	200	0	550	750	38
2008-2009	3/17/2009	1100	2600	3350	0	450	7500	177	0	450	627	39
2008-2009	3/18/2009	1350	1500	4300	0	350	7500	190	0	450	640	31.5
2008-2009	3/19/2009	1350	190	5300	0	150	6990	120	0	500	620	34.5

2008-2009	3/20/2009	1350	215	5100	0	300	6965	15	0	650	665	34.5
2008-2009	3/21/2009	1000	250	5200	0	375	6825	12	0	525	537	31.5
2008-2009	3/22/2009	1200	600	4300	0	425	6525	21	0	650	671	33.7
2008-2009	3/23/2009	1200	1200	4650	0	250	7300	16	0	800	816	33
2008-2009	3/24/2009	1200	500	5350	0	250	7300	15	0	550	565	24.5
2008-2009	3/25/2009	1600	1500	4200	0	350	7650	10	0	650	660	26.3
2008-2009	3/26/2009	1800	2200	3400	0	250	7650	16	0	700	716	21.1
2008-2009	3/27/2009	1200	700	3950	0	350	6200	10	0	500	510	25.2
2008-2009	3/28/2009	900	2000	4000	0	425	7325	10	0	675	685	29.3
2008-2009	3/29/2009	1800	2400	3500	0	450	8150	0	0	750	750	32
2008-2009	3/30/2009	2100	1900	3850	0	500	8350	13	0	750	763	37
2008-2009	3/31/2009	2300	1800	3800	0	500	8400	26	0	650	676	35
2008-2009	4/1/2009	2050	2050	4000	0	500	8600	12	0	700	712	41
2008-2009	4/2/2009	1600	2000	3400	0	400	7400	15	0	450	465	35.3
2008-2009	4/3/2009	2000	1900	3900	0	300	8100	412	0	220	632	36.5
2008-2009	4/4/2009	81	2000	4000	0	320	6401	6	0	590	596	31.6
2008-2009	4/5/2009	57	1800	4600	0	390	6847	0	0	130	130	25.5
2008-2009	4/6/2009	52	2000	4950	0	300	7302	30	0	250	280	23.2
2008-2009	4/7/2009	0	2000	5350	0	0	7350	5	0	0	5	18.5
2008-2009	4/8/2009	0	1800	4600	0	0	6400	4	0	0	4	18.5
2008-2009	4/9/2009	0	2350	5300	0	0	7650	250	0	0	250	24
2008-2009	4/10/2009	0	0	6000	0	0	6000	0	0	0	0	15.5
						Ave=	**7228.7162**				**660.8378**	**Total Tons**
WINTER	DATE	HQELK	NOWLINE	FLATSELK	CHAMBERSE	MCBRIDEELK	TOTALELK	FLATSBISO	CHAMBERSBI	MCBRIDEBISON	TOTALBIS	TONSFED
2009-2010	2/12/2010	300	140	2800	0	1200	4440	250	0	300	550	9.4
2009-2010	2/13/2010	335	158	2300	0	250	3043	150	0	500	650	10.8
2009-2010	2/14/2010	350	160	2600	0	675	3785	0	0	550	550	12.7
2009-2010	2/15/2010	350	175	3500	0	800	4825	0	0	850	850	19.3
2009-2010	2/16/2010	350	190	3600	0	900	5040	0	0	758	758	25.5
2009-2010	2/17/2010	360	200	3900	0	800	5260	0	0	800	800	28.4
2009-2010	2/18/2010	385	86	4000	0	850	5321	0	0	750	750	27
2009-2010	2/19/2010	400	99	4000	0	850	5349	0	0	780	780	28.5
2009-2010	2/20/2010	450	91	3900	0	850	5291	0	0	775	775	29.2
2009-2010	2/21/2010	450	94	4000	0	850	5394	0	0	760	760	30.5
2009-2010	2/22/2010	475	95	4100	0	840	5510	0	0	750	750	29.7
2009-2010	2/23/2010	420	100	4000	0	650	5170	0	0	700	700	30.4
2009-2010	2/24/2010	400	1000	2700	0	700	4800	0	0	750	750	28.6
2009-2010	2/25/2010	420	1300	3000	0	800	5520	2	0	690	692	27.7
2009-2010	2/26/2010	420	1300	3600	0	700	6020	0	0	650	650	34
2009-2010	2/27/2010	0	1800	3200	0	550	5550	2	0	760	762	30
2009-2010	2/28/2010	0	1800	3500	0	300	5600	2	0	650	652	28.8
2009-2010	3/1/2010	0	1800	3500	0	275	5575	5	0	500	505	25.3
2009-2010	3/2/2010	0	550	3900	0	300	4750	5	0	750	755	28.8
2009-2010	3/3/2010	0	625	4500	0	250	5375	5	0	725	730	28.5
2009-2010	3/4/2010	0	780	4600	0	300	5680	45	0	650	695	30.8
2009-2010	3/5/2010	0	375	3800	0	350	4525	12	0	750	762	27.1
2009-2010	3/6/2010	0	850	4500	0	250	5600	12	0	600	612	28
2009-2010	3/7/2010	0	850	4500	0	250	5600	8	0	600	608	27.6
2009-2010	3/8/2010	0	750	4500	0	250	5500	8	0	500	508	26.5
2009-2010	3/9/2010	0	850	4400	0	400	5650	0	0	700	700	30.8
2009-2010	3/10/2010	0	850	4400	0	400	5650	0	0	700	700	31
2009-2010	3/11/2010	0	1000	4000	0	400	5400	0	0	700	700	31
2009-2010	3/12/2010	0	1800	3800	0	250	5850	0	0	500	500	27
2009-2010	3/13/2010	0	2500	3800	0	350	6650	0	0	650	650	31
2009-2010	3/14/2010	0	1700	3800	0	500	6000	0	0	700	700	29.5
2009-2010	3/15/2010	0	1950	3600	0	500	6050	0	0	400	400	28.5
2009-2010	3/16/2010	0	1500	3900	0	250	5650	0	0	200	200	25.8
2009-2010	3/17/2010	0	1500	3600	0	300	5400	0	0	500	500	25.3
2009-2010	3/18/2010	0	1800	3700	0	400	5900	0	0	500	500	28.5
2009-2010	3/19/2010	0	2100	3800	0	300	6200	0	0	500	500	26
2009-2010	3/20/2010	0	2100	3800	0	200	6100	0	0	600	600	24.6
2009-2010	3/21/2010	0	2400	3000	0	300	5700	0	0	250	250	19.5
2009-2010	3/22/2010	0	4500	1200	0	400	6100	18	0	700	718	24.7
2009-2010	3/23/2010	0	3700	1950	0	450	6100	15	0	600	615	19.7
2009-2010	3/24/2010	0	3700	2100	0	600	6400	0	0	500	500	10.9
						ave=	**5447**				**636**	**Total Tons**
												Should be
												Patti's calc
												Amount of
												Total Feed
												My estimat
												Feed shed

WINTER	DATE	HQELK	NOWLINELK	FLATSELK	MCBRIDEEL	TOTALELK	FLATSBIS	MCBRIDEBI	TOTALBISO	LBSFEDELK	LBSFEDBISO	SHED3	SHED4	SHED11	TONSFED	COMMENT	
2010-2011	1/5/2011	0	0	0	0	0	0	700	700	0	11000	0	0	11000	5.5	Bison were	1
2010-2011	1/6/2011	450	4000	1600	380	6430	4	500	504	14960	4040	0	14000	5000	9.5	low ration t	1
2010-2011	1/7/2011	500	2400	2700	300	5900	3	500	503	21470	5030	0	20500	6000	13.3	low ration t	1
2010-2011	1/8/2011	400	2300	3650	350	6700	0	500	500	30300	4500	0	28800	6000	17.4	low ration t	1
2010-2011	1/9/2011	500	2700	3800	450	7450	5	550	555	31450	8050	0	29500	10000	19.8	low ration t	1
2010-2011	1/10/2011	550	2650	3500	450	7150	4	550	554	37700	8100	0	35800	10000	22.9	low ration t	1
2010-2011	1/11/2011	600	2200	4000	650	7450	5	600	605	45900	5600	0	42000	9500	25.8	low ration t	1
2010-2011	1/12/2011	550	1700	4400	650	7300	4	700	704	60450	7050	0	54500	13000	33.8		1
2010-2011	1/13/2011	600	2800	3000	650	7050	3	700	703	57950	10550	0	53000	15500	34.3		1
2010-2011	1/14/2011	600	3100	3100	650	7450	3	750	753	61955	16045	0	56000	22000	39.0		1
2010-2011	1/15/2011	700	2100	4100	650	7550	3	750	753	62455	14045	0	56500	20000	38.3		1
2010-2011	1/16/2011	625	2400	4300	600	7925	4	700	704	64900	11100	0	60000	16000	38.0		1
2010-2011	1/17/2011	625	2200	4100	500	7425	4	700	704	61955	11045	0	58000	15000	36.5		1
2010-2011	1/18/2011	800	1550	5000	400	7750	0	700	700	63500	11000	0	60000	14500	37.3		1
2010-2011	1/19/2011	800	1400	3800	450	6450	20	650	670	54700	10300	0	51000	14000	32.5	elk and bis	1
2010-2011	1/20/2011	550	1900	4300	450	7200	5	750	755	60020	15080	0	56000	19100	37.6		1
2010-2011	1/21/2011	600	2100	4400	500	7600	190	500	690	63100	13400	0	62500	14000	38.3		1
2010-2011	1/22/2011	600	2200	4200	550	7550	200	550	750	66600	14400	0	65000	16000	40.5		1
2010-2011	1/23/2011	700	2500	4200	550	7950	75	600	675	67500	12200	0	64200	15500	39.9		1
2010-2011	1/24/2011	800	2550	4200	600	8150	25	700	725	69200	14300	0	64500	19000	41.8		1
2010-2011	1/25/2011	400	2550	4200	600	7750	25	700	725	68300	15350	0	64150	19500	41.8		1
2010-2011	1/26/2011	600	2500	4100	650	7850	63	650	713	69800	14200	0	64000	20000	42.0		1
2010-2011	1/27/2011	600	1800	4300	500	7200	180	560	740	63000	13500	0	60500	16000	38.3		1
2010-2011	1/28/2011	600	2600	3700	700	7600	190	550	740	74000	15000	0	72000	17000	44.5		1
2010-2011	1/29/2011	600	2600	3800	700	7700	170	500	670	70000	13000	0	66000	17000	41.5		1
2010-2011	1/30/2011	420	3200	4000	750	8370	35	500	535	74000	10500	0	67500	17000	42.3		1
2010-2011	1/31/2011	450	2500	4000	750	7700	60	650	710	70000	13600	0	64600	19000	41.8		1
2010-2011	2/1/2011	350	2300	4600	900	8150	100	650	750	71000	14000	0	64000	21000	42.5		1
2010-2011	2/2/2011	350	3700	2700	700	7450	170	570	740	71000	14800	0	67800	18000	42.9		1
2010-2011	2/3/2011	250	1800	3500	500	6050	170	550	720	65500	15000	0	64500	16000	40.3		1
2010-2011	2/4/2011	210	2400	3800	720	7130	160	650	810	68500	17000	0	65000	20500	42.8		1
2010-2011	2/5/2011	225	2050	4300	600	7175	160	620	780	69500	15000	0	66000	18500	42.3		1
2010-2011	2/6/2011	200	1900	4200	700	7000	100	650	750	66500	14500	0	61000	20000	40.5		1
2010-2011	2/7/2011	225	2000	4200	700	7125	120	500	620	69500	12800	0	63800	18500	41.2		1
2010-2011	2/8/2011	225	2000	4200	650	7075	110	650	760	69000	14650	0	63650	20000	41.8		1
2010-2011	2/9/2011	268	2800	4000	600	7668	200	550	750	76000	15000	0	73000	18000	45.5	practice fo	1
2010-2011	2/10/2011	301	2615	4272	558	7746	180	650	830	80700	15000	0	74500	21200	47.9	Elk classifi	1
2010-2011	2/11/2011	300	2700	4300	600	7900	175	650	883	68500	26500	0	68500	26500	47.5	Bison class	1
2010-2011	2/12/2011	300	2600	4300	600	7800	140	640	780	73500	13500	0	71000	16000	43.5		1
2010-2011	2/13/2011	300	2650	4200	650	7800	50	750	800	73000	15750	0	67250	21500	44.4		1
2010-2011	2/14/2011	325	2600	4200	450	7575	200	700	900	71200	17000	0	71000	17200	44.1		1
2010-2011	2/15/2011	310	2800	4200	400	7710	180	400	580	72000	10700	0	71700	11000	41.4		1
2010-2011	2/16/2011	375	2700	4100	400	7575	650	100	750	65500	12000	0	74000	3500	38.8		1
2010-2011	2/17/2011	350	2700	4200	400	7650	650	85	735	74500	14000	0	81500	7000	44.3		1
2010-2011	2/18/2011	320	2800	4300	350	7770	40	350	390	69500	8000	0	29000	48500	38.8		1
2010-2011	2/19/2011	300	2850	4100	1000	8250	0	650	650	76500	15000	0	26500	65000	45.8		1
2010-2011	2/20/2011	320	2800	4100	450	7670	50	650	700	71250	16750	0	29000	59000	44.0		1
2010-2011	2/21/2011	310	2850	4000	300	7460	150	650	800	68000	15250	0	27000	56250	41.6		1
2010-2011	2/22/2011	300	2806	4000	250	7356	200	600	800	71000	15000	0	28000	58000	43.0		1
2010-2011	2/23/2011	300	2810	4100	370	7580	100	800	900	73500	18500	0	26000	66000	46.0		1
2010-2011	2/24/2011	400	2600	4400	250	7650	200	700	900	65500	18000	0	27500	56000	41.8		1
2010-2011	2/25/2011	350	2600	4700	275	7925	275	650	925	72000	19000	0	29000	62000	45.5		1
2010-2011	2/26/2011	310	2600	4500	300	7710	280	650	930	72000	19000	0	27000	64000	45.5		1
2010-2011	2/27/2011	347	2800	4300	400	7847	250	800	1050	71500	19500	0	28000	63000	45.5		1
2010-2011	2/28/2011	46	4100	3250	400	7796	0	830	830	70650	17000	0	34400	53250	43.8		1
2010-2011	3/1/2011	1300	1750	5100	1000	9150	0	350	350	80000	7000	0	28000	59000	43.5		1
2010-2011	3/2/2011	1100	1800	5000	600	8500	350	550	900	74000	18000	0	24000	68000	46.0		1
2010-2011	3/3/2011	1300	1900	4400	320	7920	400	90	490	79000	10000	0	34000	55000	44.5		1
2010-2011	3/4/2011	1300	1900	4400	300	7900	600	180	780	66500	16000	0	27000	55500	41.3		1
2010-2011	3/5/2011	0	3300	4200	140	7640	650	100	750	65500	15000	0	28000	52500	40.3		1
2010-2011	3/6/2011	251	5000	1500	0	6751	800	0	800	60000	16220	0	24000	52220	38.1		1

2010-2011	3/7/2011	99	2100	4500	800	7499	250	250	500	64000	10000	0	21000	53000	37.0		1	
2010-2011	3/8/2011	0	2600	4700	800	8100	250	600	850	69000	16000	0	25000	60000	42.5		1	
2010-2011	3/9/2011	400	2400	4400	300	7500	350	450	800	67500	16500	0	20000	64000	42.0		1	
2010-2011	3/10/2011	900	900	5600	500	7900	350	550	900	72500	19000	0	16500	75000	45.8		1	
2010-2011	3/11/2011	900	900	5700	450	7950	350	500	850	87000	17000	0	25000	79000	52.0		1	
2010-2011	3/12/2011	210	1400	5900	400	7910	200	450	650	72000	14000	0	14000	72000	43.0		1	
2010-2011	3/13/2011	400	750	5200	900	7250	175	550	725	59750	12750	0	10500	62000	36.3		1	
2010-2011	3/14/2011	325	650	5200	650	6825	150	600	750	58000	14000	0	9000	63000	36.0		1	
2010-2011	3/15/2011	550	1650	4900	400	7500	150	500	650	66600	11250	0	19500	58350	38.9		1	
2010-2011	3/16/2011	600	1625	4800	550	7575	100	500	600	68500	9500	0	20000	58000	39.0		1	
2010-2011	3/17/2011	800	1800	4800	350	7750	200	500	700	69500	14000	0	21500	62000	41.8		1	
2010-2011	3/18/2011	600	700	4700	350	6350	9	800	809	55300	16200	0	9500	62000	35.8		1	
2010-2011	3/19/2011	400	1550	5500	700	8150	6	800	806	68850	16150	0	17000	68000	42.5		1	
2010-2011	3/20/2011	600	1100	5000	400	7100	10	800	810	60500	16150	0	14000	62650	38.3		1	
2010-2011	3/21/2011	400	650	5400	400	6850	5	700	705	56300	14100	0	8000	62400	35.2		1	
2010-2011	3/22/2011	575	1000	5200	400	7175	50	15	65	59450	1050	0	13000	47500	30.3		1	
2010-2011	3/23/2011	575	1200	5500	600	7875	450	250	700	66500	14000	0	12500	68000	40.3		1	
2010-2011	3/24/2011	600	1300	5300	450	7650	12	760	772	66800	17200	0	16000	68000	42.0		1	
2010-2011	3/25/2011	700	1100	5400	500	7700	3	700	703	66540	14060	0	15000	65600	40.3		1	
2010-2011	3/26/2011	425	1050	5500	250	7225	3	720	723	60950	14050	0	12000	63000	37.5		1	
2010-2011	3/27/2011	1800	1200	4100	380	7480	30	740	770	57750	15450	0	23000	50200	36.6		1	
2010-2011	3/28/2011	625	2400	4000	400	7425	5	750	755	60600	15085	0	25000	50685	37.8		1	
2010-2011	3/29/2011	600	2300	4000	400	7300	30	700	730	56600	14450	0	21000	50050	35.5		1	
2010-2011	3/30/2011	600	1600	4200	450	6850	350	450	800	61050	15000	5500	13500	57050	38.0		1	
2010-2011	3/31/2011	900	2000	3800	450	7150	100	560	660	60000	13500	17000	8500	48000	36.8		1	
2010-2011	4/1/2011	900	2400	3100	280	6680	100	550	650	55000	15000	26000	0	44000	35.0		1	
2010-2011	4/2/2011	725	188	5200	320	6433	0	630	630	51500	10500	8000	0	54000	31.0		1	
2010-2011	4/3/2011	700	0	5300	380	6380	0	660	660	45000	13000	5000	0	53000	29.0		1	
2010-2011	4/4/2011	600	350	5200	350	6500	8	680	688	50880	14120	8000	0	57000	32.5		1	
2010-2011	4/5/2011	600	625	5500	200	6925	15	1	16	51200	300	10000	0	41500	25.8		1	
2010-2011	4/6/2011	1275	200	5000	400	6875	12	700	712	54800	14200	12000	0	57000	34.5		1	
2010-2011	4/7/2011	1100	200	5100	550	6950	9	750	759	51800	10200	12000	0	50000	31.0		1	
2010-2011	4/8/2011	1200	200	4900	1200	7500	0	680	680	54300	14000	11800	0	56500	34.2		1	
2010-2011	4/9/2011	1100	2200	3500	640	7440	20	720	740	56500	14500	22000	0	49000	35.5		1	
2010-2011	4/10/2011	1200	2300	3400	380	7280	12	640	652	62000	13240	28000	0	47240	37.6		1	
2010-2011	4/11/2011	1150	1500	5000	150	7800	30	750	780	59200	15600	20000	0	54800	37.4		1	
2010-2011	4/12/2011	1100	750	4500	400	6750	10	750	760	47000	15200	10000	0	52200	31.1		1	
2010-2011	4/13/2011	1100	650	5800	250	7800	5	100	105	49900	2100	10000	0	42000	26.0		1	
2010-2011	4/14/2011	1800	1400	5700	450	9350	6	350	356	47400	6100	16000	0	37500	26.8		1	
2010-2011	4/15/2011	2000	1200	4000	800	8000	6	600	606	32900	8600	14000	0	27500	20.8		1	
	MEAN	598	2022	4346	502	7468	130	568	698	62779	13262	2330	34110	38980	37.7		MEAN	
	SUM	59772	202169	434572	50243	746756	12961	56781	69800	6277885	1339510	235300	3445150	3936945	3809		SUM	
	MAX	2000	5000	5900	1200	9350	800	830	1050	87000	26500	28000	81500	79000	52		MAX	
	MIN	0	0	1500	0	5900	0	0	16	14960	300	0	0	3500	6		MIN	
	STDEV	377	915	792	198	567	167	195	163	12036	4116	5871	25382	21928	8		STDEV	
		HQELK	NOWLINELK	FLATSELK	MCBRIDEEL	TOTALELK	FLATSBIS(	MCBRIDEBI	TOTALBISO	LBSFEDELK	LBSFEDBISO	SHED3	SHED4	SHED11	TONSFED			
Based on 2011 estimated feed use, 2010 estimates of feed on hand, and graphing actual amount of feed remaining in sheds after 2011 feed season,																		
Estimated amount of feed on hand prior to any 2011 feed deliveries:1720 tons in shed 3, 675 tons in shed 4, and 100 tons in shed 11(McBride)																		
Approximately 2,500 tons on hand prior to 2011 pellet delivery. Largest quantity of oldest feed is 2009 feed at east end of Shed 3. Small quantities of 2009 feed																		
are in Shed 4 and Shed 11. Highest priority for 2011 pellet delivery is shed 11(Mcbride), followed by west end of shed 4.																		
POST 2011 DELIVERIES ESTIMATED FEED ON HAND: 1720 tons shed 3; 1975 tons shed 4, 1891 tons Mcbride shed 11= **5,586 tons total on hand prior to 2012 feed season**																		
		HQELK	NOWLINELK	FLATSELK	MCBRIDEEL	TOTALELK	FLATSBIS(	MCBRIDEBI	TOTALBISO	LBSFEDELK	LBSFEDBISO	SHED3	SHED4	SHED11	TONSFED	COMMENT		

Total Elk Feedground Estimates by Date

Day of Year		2007	2008	2009	2010	2011	2012	2013
1	1-Jan							
2	2-Jan							
3	3-Jan							
4	4-Jan							
5	5-Jan							
6	6-Jan					6430		
7	7-Jan					5900		
8	8-Jan					6700		
9	9-Jan					7450		
10	10-Jan					7150		
11	11-Jan					7450		
12	12-Jan					7300		
13	13-Jan	5100				7050		
14	14-Jan	5000	4200			7450		
15	15-Jan	5050	4900			7550		
16	16-Jan	5700	5700			7925		
17	17-Jan	5875	6450			7425		
18	18-Jan	6000	6000			7750		
19	19-Jan	6050	5950			6450		
20	20-Jan	7050	5875			7200		
21	21-Jan	6000	6100			7600		
22	22-Jan	6200	6100			7550		
23	23-Jan	6120	7050			7950		
24	24-Jan	6250	7100			8150		
25	25-Jan	6050	7000			7750		
26	26-Jan	6150	7000			7850		
27	27-Jan	6900	7000	5450		7200		
28	28-Jan	6500	7100	6000		7600		
29	29-Jan	6150	7250	6475		7700		
30	30-Jan	6611	7225	7900		8370		
31	31-Jan	6350	7100	7800		7700		5000
32	1-Feb	5755	7450	7150		8150		5500
33	2-Feb	6550	7300	7325		7450	5660	5425
34	3-Feb	6900	7700	7100		6050	5400	6300
35	4-Feb	6700	8200	7350		7130	5650	6450
36	5-Feb	6500	7450	8025		7175	5725	5950
37	6-Feb	6500	7150	9250		7000	6575	5600
38	7-Feb	7250	8100	7900		7125	6575	5750
39	8-Feb	7050	7947	6685		7075	5925	5425
40	9-Feb	6675	7850	7425		7668	6225	5350
41	10-Feb	6918	8625	7435		7746	6240	6150
42	11-Feb	6200	8225	7600		7900	6320	5900
43	12-Feb	7200	7975	6350	4440	7800	6075	6209
44	13-Feb	6700	8050	6700	3043	7800	7360	6085
45	14-Feb	7200	7750	6500	3785	7575	7810	6085
46	15-Feb	6900	7550	6450	4825	7710	7815	6490
47	16-Feb	7279	7750	6900	5040	7575	7370	6470
48	17-Feb	4485	8325	7350	5260	7650	7435	6550
49	18-Feb	6650	8325	7150	5321	7770	7435	6450
50	19-Feb	8050	8350	7050	5349	8250	7335	6375
51	20-Feb	6410	8250	7400	5291	7670	7310	5900
52	21-Feb	7100	8200	7325	5394	7460	7450	6300

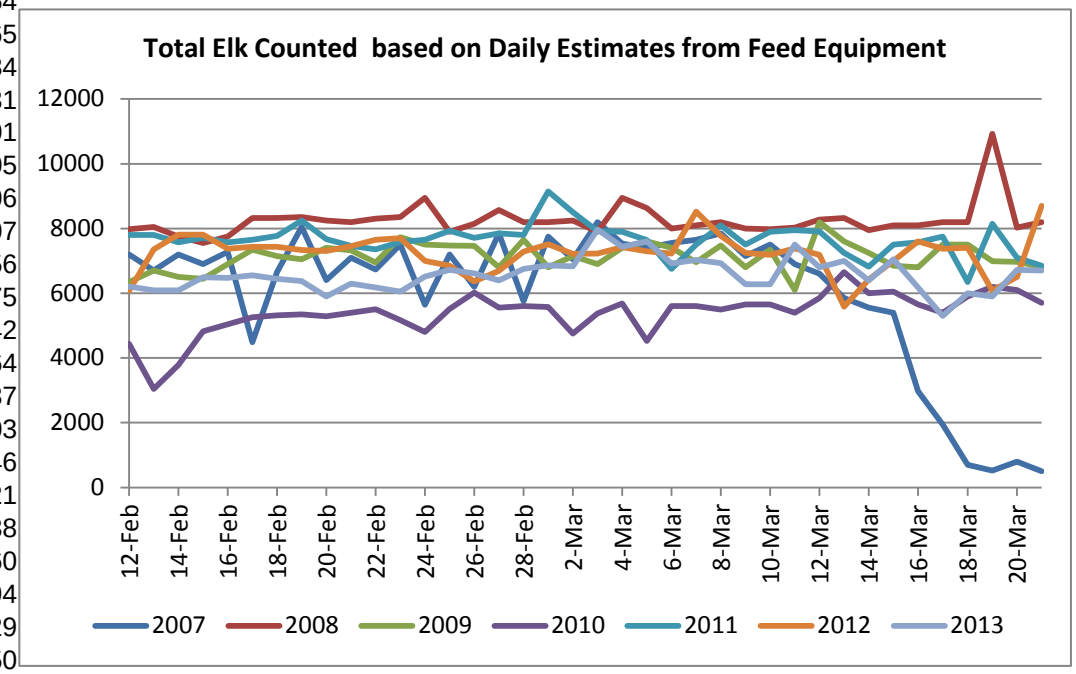
53	22-Feb	6730	8300	6950	5510	7356	7650	6175
54	23-Feb	7500	8350	7730	5170	7580	7700	6050
55	24-Feb	5640	8950	7500	4800	7650	7000	6513
56	25-Feb	7200	7900	7475	5520	7925	6850	6721
57	26-Feb	6200	8150	7460	6020	7710	6365	6615
58	27-Feb	7850	8568	6800	5550	7847	6690	6400
59	28-Feb	5750	8200	7650	5600	7796	7290	6750
60	1-Mar	7750	8200	6800	5575	9150	7510	6860
61	2-Mar	7050	8250	7150	4750	8500	7220	6828
62	3-Mar	8200	7900	6900	5375	7920	7225	7971
63	4-Mar	7537	8950	7400	5680	7900	7425	7432
64	5-Mar	7400	8630	7600	4525	7640	7296	7600
65	6-Mar	7550	8000	7400	5600	6751	7230	6920
66	7-Mar	7650	8100	6960	5600	7499	8520	7030
67	8-Mar	7850	8200	7475	5500	8100	7770	6925
68	9-Mar	7150	8000	6800	5650	7500	7250	6275
69	10-Mar	7500	7980	7350	5650	7900	7190	6279
70	11-Mar	6900	8030	6100	5400	7950	7387	7500
71	12-Mar	6600	8275	8200	5850	7910	7185	6800
72	13-Mar	5850	8325	7600	6650	7250	5580	7000
73	14-Mar	5550	7950	7250	6000	6825	6425	6400
74	15-Mar	5400	8100	6850	6050	7500	7000	7050
75	16-Mar	2975	8100	6800	5650	7575	7600	6175
76	17-Mar	1949	8200	7500	5400	7750	7375	5300
77	18-Mar	700	8200	7500	5900	6350	7400	6000
78	19-Mar	521	10925	6990	6200	8150	6075	5900
79	20-Mar	800	8025	6965	6100	7100	6500	6720
80	21-Mar	500	8200	6825	5700	6850	8700	6700
81	22-Mar		8000	6525	6100	7175	7600	6925
82	23-Mar		8200	7300	6100	7875	7630	7200
83	24-Mar		7925	7300	6400	7650	7505	7100
84	25-Mar		7980	7650		7700	7525	5600
85	26-Mar		8000	7650		7225	6987	
86	27-Mar		8125	6200		7480	6900	
87	28-Mar		7700	7325		7425	6150	
88	29-Mar		7550	8150		7300	7950	
89	30-Mar		8050	8350		6850		
90	31-Mar		7400	8400		7150		
91	1-Apr		7000	8600		6680		
92	2-Apr		8300	7400		6433		
93	3-Apr		7875	8100		6380		
94	4-Apr		6850	6401		6500		
95	5-Apr		6500	6847		6925		
96	6-Apr		7650	7302		6875		
97	7-Apr		8975	7350		6950		
98	8-Apr		8100	6400		7500		
99	9-Apr		6850	7650		7440		
100	10-Apr		8075	6000		7280		
101	11-Apr		7700			7800		
102	12-Apr		7100			6750		
103	13-Apr		7300			7800		
104	14-Apr		5800			9350		
105	15-Apr		6950			8000		
			6000					
			4730					

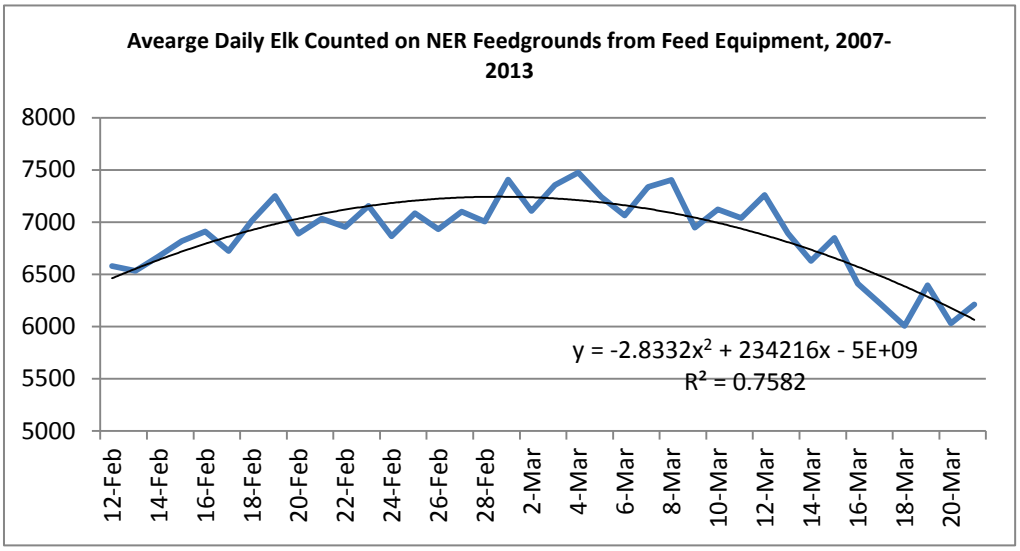
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See sheet 2 for variable descriptions and site location descriptions

See sheet 3 for detailed site descriptions

DATE	DayofYear	INDEXSITE	DESCRIPTION	FORAGE	DEPTH(in)	SWE	DENSITY	COMMENTS
12/19/2006	-13	1	Dike Carex	2000	0	nm	nm	Ground ice 1inch thick throughout site
12/19/2006	-13	4	Headquarters Sub Poa	2000	1	nm	nm	Forage utilization higher in poa patches than
12/19/2006	-13	3	Peterson Carex	3000	0	nm	nm	Patchy ground ice
12/19/2006	-13	2	Peterson Sub Poa	1500	0	nm	nm	Patchy high intensity bison utilization
1/3/2007	3	1	Dike Carex	2000	1	nm	nm	Ground ice 1inch thick throughout site
1/3/2007	3	4	Headquarters Sub Poa	750	2	nm	nm	Snow soft
1/3/2007	3	3	Peterson Carex	1500	2	nm	nm	Snow soft
1/3/2007	3	2	Peterson Sub Poa	750	2	nm	nm	Recent heavy elk use
1/8/2007	8	3	Peterson Carex	1000	4	nm	nm	Snow soft
1/8/2007	8	2	Peterson Sub Poa	300	3	nm	nm	Snow soft
1/10/2007	10	1	Dike Carex	750	0	nm	nm	Ground ice 1inch thick throughout site
12/14/2007	-18	4	Headquarters Sub Poa	1500	2	nm	nm	snow soft, does not limit access to forage
12/14/2007	-18	2	Peterson Sub Poa	1250	1	nm	nm	snow soft, does not limit access to forage
12/14/2007	-18	3	Peterson Carex	2500	1	nm	nm	snow soft, does not limit access to forage
12/14/2007	-18	1	Dike Carex	2250	1	nm	nm	snow soft, does not limit access to forage
1/3/2008	3	1	Dike Carex	1250	3	nm	nm	no ground ice, snow soft, does not limit acces
1/7/2008	7	4	Headquarters Sub Poa	750	9	nm	nm	snow soft, does not limit access to forage
1/7/2008	7	1	Dike Carex	750	7	nm	nm	no ground ice, snow soft, does not limit acces
1/5/2009	5	4	Headquarters Sub Poa	150	8	nm	nm	3-4 inch crust capable of supporting person.
1/5/2009	5	5	8.28.2 Russian Wildrye	470	7	nm	nm	1-2 inch crust but evidence of elk foraging sin
1/6/2009	6	6	2.36.1 Meadow Brome	816	10	nm	nm	Pre treatment measurements prior to discing
1/7/2009	7	6	2.36.1 Meadow Brome	375	6	nm	nm	1 day post treatment in disced area, No crust
1/7/2009	7	6	2.36.1 Meadow Brome	530	7	nm	nm	1 day post treatment in undisced control area
1/7/2009	7	1	Dike Carex	540	5	nm	nm	Wet, heavy dense snow with some ground ice
1/7/2009	7	7	6.34.1 Intermediate whe	1200	19	nm	nm	Heavily drifted, 3" new snow on top of 2 inch s
1/7/2009	7	3	Peterson Carex	630	12	nm	nm	3 inches dense new snow on top of 1-2" crust
1/12/2009	12	4	Headquarters Sub Poa	140	6	nm	nm	Extensive elk foraging since 1/5/08 during wa
1/12/2009	12	6	2.36.1 Meadow Brome	400	7	nm	nm	Undisced control area. No evidence of recent
1/12/2009	12	8	Russian wildrye Chambe	650	9	nm	nm	No evidence of recent elk foraging. Deep crus
1/15/2009	15	9	2.5.1 Sub Poa	400	6	nm	nm	Patchy thick surface crust and ground ice limi
1/20/2009	20	10	Nowlin Creek Bench	280	6	nm	nm	Dense, crusted snow. Closer to creek no snov
1/20/2009	20	1	Dike Carex	260	3	nm	nm	Patchy dense snow and ice with some bare g

1/20/2009	20	8	Russian wildrye Chambe	440	8	nm	nm	Recent moderate bison utilization. 2 inch crus
1/5/2010	5	11	McBride smooth brome	2060	3	nm	nm	No crusting or ground ice, very little if any utili
1/5/2010	5	5	8.28.2 Russian Wildrye	355	3	nm	nm	No crusting or ground ice, heavy utilization by
1/5/2010	5	3	Peterson Carex	2280	2	nm	nm	Patchy snow, considerable green forage rema
1/5/2010	5	1	Dike Carex	1260	1	nm	nm	Significant ground ice caused by sheet flow, b
1/12/2010	12	4	Headquarters Sub Poa	1320	3	nm	nm	Some elk foraging, some basal green remaini
1/12/2010	12	12	2.31.2 elymus/smooth b	1060	5	nm	nm	Sugar snow not barrier to foraging
1/12/2010	12	6	2.36.1 Meadow Brome	485	3	nm	nm	Heavy elk utilization; small amount of green b
1/12/2010	12	7	6.34.1 Intermediate whe	2010	4	nm	nm	Sugar snow not barrier to foraging; light elk us
1/22/2010	22	11	McBride smooth brome	935	8	nm	nm	Minor ground ice, snow not barrier to forage a
1/25/2010	25	9	2.5.1 Sub Poa	670	10	nm	nm	Snow denser than it has been but still not a ba
1/25/2010	25	13	Hatchery bench	960	11	nm	nm	
1/25/2010	25	3	Peterson Carex	1480	6	nm	nm	Dense heavy snow but still not a barrier to for
1/25/2010	25	14	Chambers center pivot n	1015	6	nm	nm	Recent elk use (today), some ground ice decr
2/2/2010	33	15	northeast of newest elk j	505	9	nm	nm	Snow generally powdery, but many areas with
2/2/2010	33	3	Peterson Carex	1305	6	nm	nm	Some elk foraging, but more intense ~200 m
2/2/2010	33	7	6.34.1 Intermediate whe	1390	5	nm	nm	Some elk and bison foraging, dense snow at
2/2/2010	33	16	Southwest of 2 post cros	1230	6	nm	nm	Elk and bison foraging. Most remainng forage
12/17/2010	-15	4	Headquarters Sub Poa	1230	2	nm	nm	Some residual green veg present. Patchy snc
12/17/2010	-15	12	2.31.2 elymus/smooth b	500	2	nm	nm	Extensive ground ice and heavy elk foraging a
12/17/2010	-15	1	Dike Carex	1810	1	nm	nm	Frozen subirrigation water and ground ice thro
12/17/2010	-15	3	Peterson Carex	1480	3	nm	nm	Snow patchy, but dense where it ocurrs. Som
12/21/2010	-11	14	Chambers center pivot n	410	5	nm	nm	Recent snow light but ~2" of ground crust/ice.
12/21/2010	-11	11	McBride smooth brome	760	10	nm	nm	8" of soft snow covering 2" of dense ground c
12/21/2010	-11	7	6.34.1 Intermediate whe	500	9	nm	nm	7" of soft snow covering 2" of dense ground c
1/3/2011	3	9	2.5.1 Sub Poa	320	12	nm	nm	Thick wind crust and heavy subsurface crust
1/3/2011	3	1	Dike Carex	290	6	nm	nm	Heavy elk and bison foraging and subsurface
1/3/2011	3	11	McBride smooth brome	420	8	nm	nm	Some ground ice and 3" subsurface crust limi
1/9/2012	9	4	Headquarters Sub Poa	650	1	nm	nm	Ground ice with patchy dense snow. Some re
1/9/2012	9	6	2.36.1 Meadow Brome	200	1	nm	nm	Ground ice. Intense elk use of this area, but c
1/9/2012	9	14	Chambers center pivot n	610	1	nm	nm	Patchy ground ice. High elk use of meadow b
1/9/2012	9	7	6.34.1 Intermediate whe	1030	6	nm	nm	hard surface crust, but still acessible. Some g
1/23/2012	23	7	6.34.1 Intermediate whe	740	11	nm	nm	Recent elk and bison use, dense snow, some
1/23/2012	23	17	FP 27 poverty crested w	625	6	nm	nm	Significant ground ice, but forage accessible.
1/23/2012	23	14	Chambers center pivot n	270	4	nm	nm	Heavy utilization. Basically foraged out. Major
1/23/2012	23	1	Dike Carex	230	3	nm	nm	Sample area in ice flow. Similar conditions ex
1/26/2012	26	3	Peterson Carex	810	8	nm	nm	Patchy ground ice, but still accessible with rec

1/26/2012	26	9	2.5.1 Sub Poa	360	11	nm	nm	Several crust layers, plus gorund ice. Unlikel
1/30/2012	30	4	Headquarters Sub Poa	190	7	nm	nm	Ground ice 2" added to average measured sn
1/30/2012	30	3	Peterson Carex	660	8	nm	nm	Patchy ground ice, elk have recently foraged i
1/30/2012	30	17	FP 27 poverty crested w	465	6	nm	nm	Some residual green; patchy ground ice, elk h
1/7/2013	7	7	6.34.1 Intermediate whe	950	6	nm	nm	powder to ground with some green vegetation
1/7/2013	7	14	Chambers center pivot n	430	5	nm	nm	powder to ground but apparent heavy foragin
1/7/2013	7	6	2.36.1 Meadow Brome	480	5	nm	nm	heavy elk foraging with extensive forage crate
1/15/2013	15	9	2.5.1 Sub Poa	490	7	nm	nm	moderate elk foraging with craters. Some gre
1/15/2013	15	13	Hatchery bench	640	9	nm	nm	moderate elk foraging with craters. Snow den
1/15/2013	15	18	north of last town wellho	440	9	nm	nm	heavy elk foraging with craters. Some green g
1/17/2013	17	1	Dike Carex	850	10	nm	nm	surprisingly little foraging activity, snow mostly
1/17/2013	17	3	Peterson Carex	990	9	nm	nm	surprisingly little foraging activity, snow mostly
1/17/2013	17	7	6.34.1 Intermediate whe	430	7	nm	nm	major recent foraging by elk and some by bis
1/22/2013	22	1	Dike Carex	700	8	nm	nm	only slight increasein foraging activity since 1/
1/22/2013	22	3	Peterson Carex	820	8	nm	nm	powder in unforaged area. Trail and forage ar
1/25/2013	25	3	Peterson Carex	940	8	nm	nm	melting has exposed patches of forage, but s
1/25/2013	25	1	Dike Carex	820	8	nm	nm	wet heavy snow due to warming temperature.
1/28/2013	28	3	Peterson Carex	650	9	nm	nm	generally 2=4 inches of powder of crust but pa
1/28/2013	28	4	Headquarters Sub Poa	180	9	nm	nm	5" powder over crusty snow. Extensive forage
1/28/2013	28	1	Dike Carex	750	7	nm	nm	Snow denser than it has been but still not a m
12/30/2013	-2	4	Headquarters Sub Poa	900	3	nm	nm	Limited ground ice and some foraging activity
12/30/2013	-2	5	8.28.2 Russian Wildrye	630	3	nm	nm	powder snow to ground. Some elk foraging p
12/30/2013	-2	7	6.34.1 Intermediate whe	1660	4	nm	nm	Significant elk foraging already
1/10/2014	10	1	Dike Carex	890	2	nm	nm	Minor ground ice, snow not barrier to forage a
1/10/2014	10	17	FP 27 poverty crested w	580	4	nm	nm	Only minor elk use to date, some wind crustin
1/10/2014	10	3	Peterson Carex	1850	2	nm	nm	Significant green sedge and grass remaining.
1/15/2014	15	18	north of last town wellho	270	5	nm	nm	considerable crusting and ground ice/ Some v
1/15/2014	15	1	Dike Carex	830	1	nm	nm	patchy snow. Snow patches are high density
1/17/2014	17	13	Hatchery bench	720	3	nm	nm	snow dense but not deep. Some forage still a
1/17/2014	17	7	6.34.1 Intermediate whe	1110	3	nm	nm	Significant ground ice from forage craters, bu
1/23/2014	23	4	Headquarters Sub Poa	800	5	nm	nm	previous foraging has created patchy areas o
1/23/2014	23	14	Chambers center pivot n	280	2	nm	nm	below threshold levels due to heavy elk foragi
1/23/2014	23	1	Dike Carex	510	1	nm	nm	snow patchy but where present is very dense
1/28/2014	28	9	2.5.1 Sub Poa	440	4	nm	nm	some past foraging activity causing pathcy ar
1/28/2014	28	7	6.34.1 Intermediate whe	370	3	nm	nm	major recent foraging by elk and some by bis
1/28/2014	28	3	Peterson Carex	930	1	nm	nm	significant recent elk foraging activity. Snow v
1/28/2014	28	1	Dike Carex	390	1	nm	nm	only patchy snow and ground ice. Heavy fora

1/28/2014	28	6	2.36.1 Meadow Brome	130	1	nm	nm	dense crust and ground ice. Heavily foraged b
1/31/2014	31	4	Headquarters Sub Poa	550	6	nm	nm	minor surface crust, many old foraging craters
1/31/2014	31	3	Peterson Carex	680	4	nm	nm	powdery snow does not hinder access to fora
1/31/2014	31	5	8.28.2 Russian Wildrye	390	4	nm	nm	Significant recent bison foraging. Considerabl
12/22/2014	-10	18	north of last town wellho	520	3	nm	nm	Some residual green grass, but intensive elk f
12/22/2014	-10	3	Peterson Carex	2280	1	nm	nm	Ground is not frozen and patches of stading w
12/22/2014	-10	7	6.34.1 Intermediate whe	1600	4	nm	nm	Signifcant green grass remaining. Some crus
1/6/2015	6	1	Dike Carex	600	4	nm	nm	Some green vegetation remaining. Heavy rec
1/6/2015	6	3	Peterson Carex	1210	6	nm	nm	Some green vegetation remaining. Snow wet
1/6/2015	6	14	Chambers center pivot r	370	5	nm	nm	Mostly alfalfa and crested whetgrass remainir
1/6/2015	6	17	FP 27 poverty crested w	480	3	nm	nm	Late season irrigated area. Some green rema
1/12/2015	12	4	Headquarters Sub Poa	420	7	nm	nm	Significant surface crust but accessible by elk
1/12/2015	12	9	2.5.1 Sub Poa	480	7	nm	nm	Warm and snow has softened enough to be e
1/12/2015	12	3	Peterson Carex	650	5	nm	nm	Noticible more elk foraging than 1/6/15; some
1/12/2015	12	7	6.34.1 Intermediate whe	340	7	nm	nm	Surface crust but accessible, Very high foragi
1/12/2015	12	5	8.28.2 Russian Wildrye	220	3	nm	nm	Surface crust and groud ice, but most forage
12/29/2015	-3	18	north of last town wellho	500	8	nm	nm	snow powdery to ground but significant past e
12/29/2015	-3	1	Dike Carex	1860	6	nm	nm	snow powdery but patchy ground ice. Some r
12/29/2015	-3	7	6.34.1 Intermediate whe	2020	7	nm	nm	considerable elk foraging but some residual g
12/29/2015	-3	17	FP 27 poverty crested w	800	8	nm	nm	snow powdery to ground, signifcant green bas
1/6/2016	6	4	Headquarters Sub Poa	1450	10	nm	nm	snow mainly powder to ground. Some patchy
1/6/2016	6	11	McBride smooth brome	620	8	nm	nm	snow mainly powder to ground. Some patchy
1/6/2016	6	14	Chambers center pivot r	440	6	nm	nm	Considearble old elk foraging activity. Minor re
1/6/2016	6	1	Dike Carex	870	9	nm	nm	powder to ground except where previosuly for
1/13/2016	13	3	Peterson Carex	2610	11	nm	nm	mainly powder to ground with minor foaging a
1/13/2016	13	17	FP 27 poverty crested w	460	8	nm	nm	powder to ground except where previosuly for
1/13/2016	13	16	Southwest of 2 post cros	1020	8	nm	nm	extensive previous foraging. Snow powdery in
1/13/2016	13	6	2.36.1 Meadow Brome	90	5	nm	nm	heavily foraged, snow dense and trampled
1/13/2016	13	1	Dike Carex	480	6	nm	nm	foraging has increased in area. Snow dense a
1/18/2016	18	13	Hatchery bench	890	15	nm	nm	no recent elk use. Snow deep due to recent c
1/18/2016	18	9	2.5.1 Sub Poa	490	11	nm	nm	bull elk in area. Some previous foraging. Sno
1/18/2016	18	7	6.34.1 Intermediate whe	560	9	nm	nm	extensive foraging and dense snow associate
1/18/2016	18	3	Peterson Carex	1450	9	nm	nm	snow dense but accessible to ground at most
1/18/2016	18	17	FP 27 poverty crested w	380	7	nm	nm	powder to ground except in old foraging crate
1/24/2016	24	4	Headquarters Sub Poa	540	7	nm	nm	heavily foraged, snow dense and trampled at
1/24/2016	24	3	Peterson Carex	1230	9	nm	nm	not much more foraging at site since last time
1/24/2016	24	7	6.34.1 Intermediate whe	400	7	nm	nm	heavily foraged by ek including some recent a

1/24/2016	24	17	FP 27 poverty crested w	490	8	nm	nm	not much more foraging at site since last time			
DATE		INDEXSITE	DESCRIPTION	FORAGE	DEPTH(in)	SWE	DENSITY	COMMENTS			

Elymus											
s to forage; recent moderate elk use											
s to forage; recent moderate elk use											
Forage largely inacessible. Elk abandoned site since 1/3/09											
ce it became cold, sugar snow beneath crust											
experiment. Limited evidence of recent elk foraging. 2 inch surface crust, sugar snow to ground											
but Snow very dense and forage only accesible because temp 40 F.											
2 inch surface crust, sugar below crust with limited ground ice											
e. Unlikely that forage would be availbale if temperatures were below freezing											
surface crust, sugar snow beneath crust. No evidence of elk or bison use under current snow conditions											
. Snow is dense under crust. Unlikely forage will be available at all when weather gets colder											
rm period and subsequent freezing has made most forage unavailable due to foraging crater ice											
elk foraging. 2 distinct 1 inch crust layers with sugar in between. Patchy ground ice.											
st, but sugar beneath. Forage still accessible											
ts access to forage, but some evidence of limited recent elk foraging under these conditions											
w, but most forage consumed											
round. With exception of baltic rush, most forage removed in bare spots											

t with sugar. Previous forage craters frozen in												
zation to date												
elk past 2 weeks												
aining												
ut this effect not widespread outside of this site												
ng, minor localized ground ice												
asal remaining; limited, patchy ground ice due to prior foraging												
se in recent days, no evidence of bison use												
ccess												
arrier, some drifting, still green forage available												
age access. Some ground ice. Surprisingly little evidence of elk foraging at this late date												
eases amount of available forage												
elk foraging craters. Ground ice and dense snow associated with foraging craters												
to west of this site. Some ground ice, but not limiting access to forage. Only limited green and high percentage of baltic rush remaining												
foraging locations, otherwise accessible												
is poor quality stemmy alfalfa and crested wheatgrass												
w crusty but accessible. Elk have foraged moderately in this area.												
and trampling												
ughout the area but little cosndierable forage including some green above ice with little foraging to date												
e green grass/sedge present.												
Heavy recent elk foraging in area with cratering												
rust and ice												
rust and ice												
n places. Old forage craters greatly increased snow density and decreased forage accessibility.												
melting has compacted snow and resulted in 2" thick ground ice.												
ting access to forage												
sidual green grass still available												
onsiderable more forage remaining in smooth brome dominated area 200 yards to south. Clearly meadow brome is a preferred elk forage												
rome. Nearby intermediate wheatgrass largely untouched												
green poa in understory												
ground ice. Still some residual green grass												
Some resifual green grass												
gorund ice												
ist on about 200 refuge acres. Not very representative												
ent elk foraging activity												

y that elk will return to this area										
ow depth total. Elk have abandoned area.										
n area										
ave foraged recently in this area										
left										
g prior to snow accumulation. Most likely by elk because there has been no bison activity in this area										
rs making snow dense										
en grass remaining. Minor wind crust. Snow dense in crater areas but mostly powder to ground in non foraged sites										
se in crater areas but mostly powder to ground in non foraged sites. Most remaining forage smooth brome										
rass remaining. Snow dense in crater areas but mostly powder to ground in non foraged sites										
y powder to ground with minor wind crusting at surface										
y powder with patchy ground ice. Still some green sedge beneath snow, mixed with baltic rush and other species										
on. Heavily craterd with snow density affecting access to remaining forage.										
17/13. cratered areas dense but otherwise powder to ground										
eas more dense. Slightly more elk activity since 1/17/13										
now is wet and dense. Some green remaining										
Some green forage remaining										
artialy accessible snow. Some green veg remaining										
craters and very dense in cratered areas										
ajor barrier, still green forage available										
but forage still accessible. Considerable green Poa remaining.										
rior to snow accumulation										
ccess										
g on surface, some green grass present										
Some ground ice but not enough to limit access to forage. Elk in vicinity										
vind packed surface snow. Some green remaining where limited forage is accessible										
or ice, but ample forage still available										
cessible and some green remaining. Considerable recent elk use of area.										
considerable forage still remaining. Minor green remaining (mostly poa). High recent elk and bison use										
ground ice. Mainly baltic rush remaining										
ng. Snow patchy and high density										
or ground ice. Minor green carex remaining, but mainly balic rush remaining										
eas of dense snow but remaining forage largely accessible										
on. Heavily cratered with snow density affecting access to remaining forage.										
ery limited and not affecting access to remaining forage. Minor green remaining, but cured sedge and baltic rush.										
ging by elk. Mainly sedge and baltic rush remaining										

y elk likely earlier in the season. Well below threshold availability.							
s with dense snow at ground level. Minor green, but mainly baltic rush remaining							
ge. Significant recent elk foraging activity in area. Minor green sedge remaining, but mainly baltic rush							
e ground ice associated with older foraging activity							
foraging has occured. Some ground ice associated with trampling							
vater. Significant green grasses and sefge remaining							
ting but generally not a barrier to foraging. Some elk foraging already							
ent elk use. Snow wet and heavy but accessible to ground in most areas							
and heavy but accessible to ground in most areas							
g. Meadow brome all consumed. Snow wet and heavy but accessible to ground in most areas							
ining, but heavy utilization prior to recent snow. Snow wet and heavy but accessible to ground							
, Significant ground ice and evidecen of previous elk foraging							
asily acessible. Evidence of signifcant foraging by elk earlier in season							
ground ice but snow generally not a hinderance, some green remaining							
ng activity since 12/22/14 resulting in dense snow/ice from foraging craters							
appears to have been consumed earlier in the season							
lk foraging.							
esidual green remaining							
reen and patches of undisturbed snow remaining							
sal grass remaining, only limited foraging to date.							
elk foraging in area. Some residual green remaining							
elk foraging in area. Some residual green remaining							
esidual green. Snow powder except in old craters							
aged. Some resdual green							
ctivity in the area and patchy, minor ground ice							
aged. Some resdual green							
non forage areas							
round old craters but 70% of subplots foraged/trampled							
drifting. Still accessible to gorund. Minro residual green remaining							
w dense but still accessible to gorund except where previously foraged							
d with forage craters. 90% of subplots previously foraged							
subplots. Ground ice at previously forages subplots							
rs. About 50% of subplots in old foraging craters. Some residual green							
80% of subplots. Minor residual green							
. Sugar snow to ground at most subplots with some residual green							
ctivity. 90% of subplots in old craters. Snow dense associated with past foraging.							

. About 60% of subplots in old foraging craters, otherwise suger snow to ground with some residual green											

FIELD	FIELD Description
DATE	Date index site was visited by Eric Cole and Doug Brimeyer
INDEXSITE	Index Site Number as indicated in c:\cole\gis data\feed initiation evaluation\20062007indexsites GIS shapefile map and associ
DESCRIPTION	Location description and primary plant community at site. Ie. Dike Carex sample site is located NW of Dike Road and is prima
FORAGE	Estimated lbs./acre(dry weight) of herbaceous forage available to elk based on ocular estimate. Beginning 2009 see C:\Biologi
DEPTH	Average snow depth at the site (inches). Mean at 10 subplots along transect at montoring site
SWE	Average Snow Water Equivalent at the site (inches); nm = not measured
DENSITY	Average Snow Density at the Site (percent); nm = not measured

ated hardcopy												
ily Carex spp.												
cal\Feeding\Feeding initiation methodology\2008-2009 Initiation Methods\Initiation_Cessation Protocol. Mean of 10 subplots along transect at monitor												

ng site.

SITE	SITE STATUS	NAD83X	NAD83Y	Bearing (true)	Dominant Plant Community	Description
1	Key	523593	4818608	300	Carex spp.	Sub irrigated Carex dominated NW of Dike R
2	Key	523197	4820588	180	Sub-Irrigated Poa	Sub irrigated Poa spp. south of Peterson field
3	Key	523047	4820596	180	Carex spp.	Sub irrigated Carex dominated SW of Peterso
4	Key	521091	4815347	360	Sub-Irrigated Poa	Sub-irrigated Poa with Foxtail and Elymus spp
5	Supplemental	525191	4819408	10	Russian wildrye Ag7	Coincides with forage production sampling sit
6	Key	522322	4818184	50	Meadow brome Ag2	Coincides with forage production sampling sit
7	Supplemental	526218	4822675	20	Intermediate wheatgrass	Coincides with forage production site 6.34.1
8	Supplemental	525540	4819618	180	Russian wildrye Ag7	Russian wildrye off Chambers road
9	Key	520884	4818980	150	Sub Poa Gr1	coincides with forage production sampling site
10	Key	522590	4818926	180	Sub Poa Gr1	Nowlin creek bench north of horse pasture
11	Supplemental	527183	4821807	350	Smooth brome Ag3	McBride smooth brome field north of middle l
12	Supplemental	522302	4818133	160	Smooth brome Ag4	Forage Production Site 2.31.2
13	Supplemental	521650	4820460	150	Smooth brome mixed sub poa	Hatchery bench. Mix of high spots with brome
14	Key	526969	4820082	300	Meadow brome Ag2	Chambers center pivot meadow brome
15	Key	520180	4817887	70	Sub-Irrigated Poa	northeast of newest elk jump, sub-irrigated po
16	Supplemental	525570	4818439	210	Smooth brome-alflafa-crested	Southwest of 2 post crossing into Vandeveer
17	Supplemental	525339	4819992	90	Crested wheatgrass	Corresponds to FP27
18	Key	520607	4814793	360	Meadow brome Ag2	north of last town wellhouse

Note site status subject to change annauly based on conditions. For example late season irrigation or fall rains on upland sites can produce high
changing site status from supplemental to key in some years

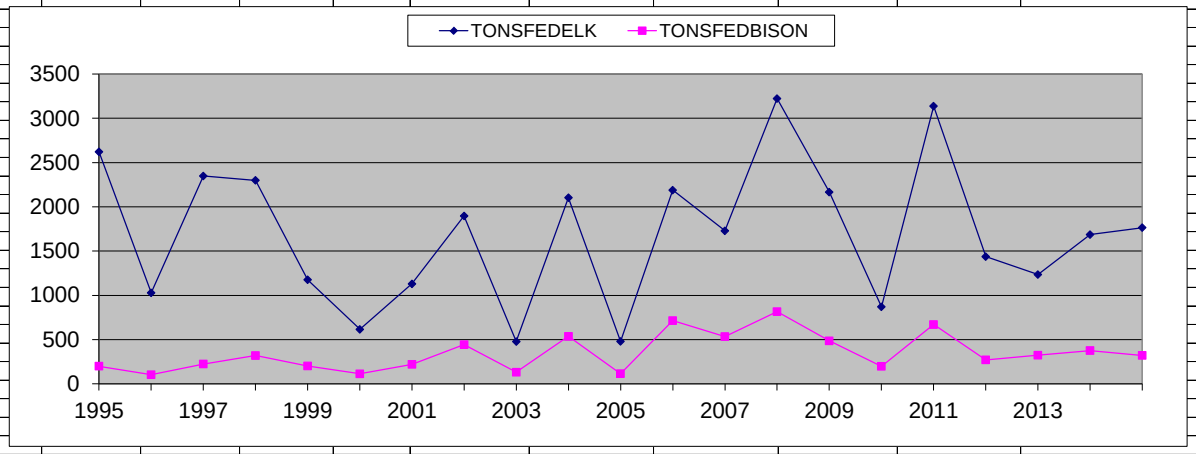
oad		
n Field, near exclosure		
. codominant, west of Shop Ponds		
e 8.28.2		
e 2.36.1		
e 2.5.1		
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and sub poa		
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tract		
n quality greenup,		

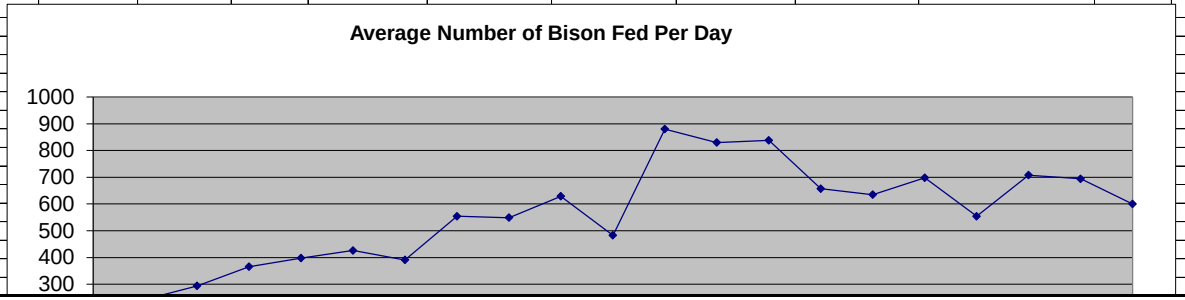
Mean available forage and snow depth across sites for given sample day. Feed season start day of year for that w

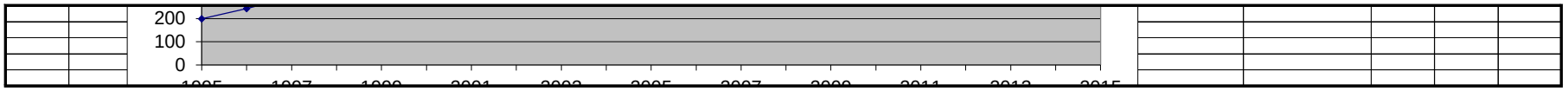
WINTER	DATE	YEARDAY	MEANFOR	DEPTH(inc	Feed Start Date	Feed Start Day of Year
2006-2007	12/19/2006	-13	2125	0.25	1/13/2007	13
2006-2007	1/3/2007	3	1250	1.75	1/13/2007	13
2006-2007	1/8/2007	8	650	3.5	1/13/2007	13
2006-2007	1/10/2007	10	750	0	1/13/2007	13
2007-2008	12/14/2007	-18	1875	1.25	1/14/2008	14
2007-2008	1/3/2008	3	1250	3	1/14/2008	14
2007-2008	1/7/2008	7	750	8	1/14/2008	14
2008-2009	1/5/2009	5	310	7.5	1/27/2009	27
2008-2009	1/6/2009	6	816	10	1/27/2009	27
2008-2009	1/7/2009	7	655	9.8	1/27/2009	27
2008-2009	1/12/2009	12	396.66	7.33	1/27/2009	27
2008-2009	1/15/2009	15	400	6	1/27/2009	27
2008-2009	1/20/2009	20	326.66	5.66	1/27/2009	27
2009-2010	1/5/2010	5	1488.75	2.25	2/12/2010	43
2009-2010	1/12/2010	12	1218.75	3.75	2/12/2010	43
2009-2010	1/22/2010	22	935	8	2/12/2010	43
2009-2010	1/25/2010	25	1031.25	8.25	2/12/2010	43
2009-2010	2/2/2010	33	1107.5	6.5	2/12/2010	43
2010-2011	12/17/2010	-15	1255	2	1/5/2011	5
2010-2011	12/21/2010	-11	556.66	8	1/5/2011	5
2010-2011	1/3/2011	3	343.33	8.66	1/5/2011	5
2011-2012	1/9/2012	9	622.5	2.25	2/2/2012	33
2011-2012	1/23/2012	23	466.25	6	2/2/2012	33
2011-2012	1/26/2012	26	585	9.5	2/2/2012	33
2011-2012	1/30/2012	30	438.33	7	2/2/2012	33
2012-2013	1/7/2013	7	620	5.33	1/31/2013	31
2012-2013	1/15/2013	15	523.33	8.33	1/31/2013	31
2012-2013	1/17/2013	17	756.66	8.66	1/31/2013	31
2012-2013	1/22/2013	22	760	8	1/31/2013	31
2012-2013	1/25/2013	25	880	8	1/31/2013	31
2012-2013	1/28/2013	28	526.66	8.33	1/31/2013	31
2013-2014	12/30/2013	-2	1063.33	3.33	2/4/2014	35
2013-2014	1/10/2014	10	1106.66	2.66	2/4/2014	35
2013-2014	1/15/2014	15	550	3	2/4/2014	35
2013-2014	1/17/2014	17	915	3	2/4/2014	35
2013-2014	1/23/2014	23	530	2.66	2/4/2014	35
2013-2014	1/28/2014	28	452	2	2/4/2014	35
2013-2014	1/31/2014	31	540	4.66	2/4/2014	35
2014-2015	12/22/2014	-10	1466.66	2.66	1/19/2015	19
2014-2015	1/6/2015	6	665	4.5	1/19/2015	19
2014-2015	1/12/2015	12	422	5.8	1/19/2015	19
2015-2016	12/29/2015	-3	1295	7.25		
2015-2016	1/6/2016	6	845	8.25		
2015-2016	1/13/2016	13	932	7.6		
2015-2016	1/18/2016	18	754	10.2		
2015-2016	1/24/2016	24	665	7.75		

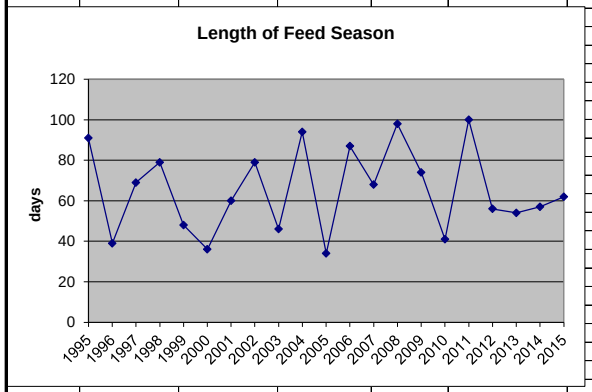
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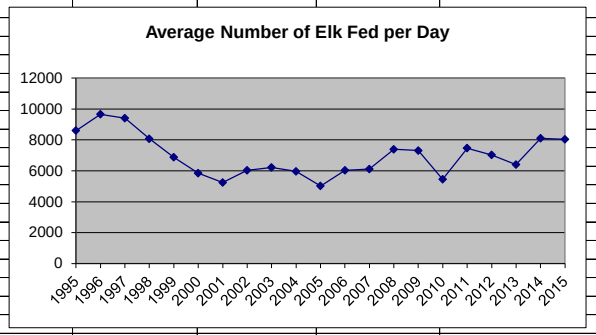
WINTER	START	STARTDAYOF	END	ENDDAYO	TONSFEDELK	TONSFEDBISON	TOTAL TONS FE	DAYSFEDELK	DAYSFEDBISON	AVE#ELKFEDPERDAY	AVE#BISO	AVElbsperelkperda	avelbsperbisonperday	YEAR	COMMENT
1994-1995	1/6/1995	6	4/6/1995	96	2622	199	2821	91	91	8604	199	6.7	22.0	1995	
1995-1996	2/27/1996	58	4/4/1996	95	1029	102	1131	39	39	9653	243	5.5	21.5	1996	
1996-1997	1/28/1997	28	4/6/1997	96	2348	224	2572	69	69	9403	294	7.2	22.1	1997	
1997-1998	1/16/1998	16	4/4/1998	94	2299	319	2618	79	79	8070	366	7.2	22.1	1998	
1998-1999	2/16/1999	47	4/4/1999	94	1175	202	1377	48	48	6875	398	7.1	21.2	1999	
1999-2000	2/25/2000	56	3/30/2000	90	616	113	729	36	36	5849	426	5.9	14.8	2000	
2000-2001	1/25/2001	25	3/24/2001	83	1129	221	1350	60	59	5242	391	7.2	19.2	2001	
2001-2002	1/10/2002	10	3/29/2002	88	1897	443	2340	79	77	6036	554	7.5	19.5	2002	
2002-2003	2/17/2003	48	4/3/2003	93	478	132	610	46	46	6213	549	5.5	17.2	2003	
2003-2004	12/30/2003	-1	4/1/2004	92	2104	537	2641	94	93	5963	629	8.2	20.1	2004	
2004-2005	2/28/2005	59	4/3/2005	93	480	114	594	34	31	5021	483	5.6	15.3	2005	
2005-2006	1/16/2006	16	4/12/2006	102	2189	714	2903	87	86	6027	880	8.4	18.9	2006	
2006-2007	1/13/2007	13	3/20/2007	80	1729	534	2263	68	64	6115	830	8.3	20.1	2007	
2007-2008	1/14/2008	14	4/20/2008	111	3223	815	4038	98	98	7390	838	8.7	19.6	2008	
2008-2009	1/27/2009	27	4/10/2009	100	2167	486	2653	74	74	7310	657	8.0	20.0	2009	
2009-2010	2/12/2010	43	3/24/2010	83	871	197	1067	41	41	5454	635	7.8	15.2	2010	
2010-2011	1/5/2011	5	4/15/2011	105	3139	670	3809	100	101	7468	698	8.4	19.0	2011	
2011-2012	2/2/2012	33	3/28/2012	88	1437	271	1708	56	56	7024	554	7.3	17.5	2012	Although bison class
2012-2013	1/31/2013	31	3/25/2013	84	1234	324	1558	54	54	6397	708	7.2	17.0	2013	
2013-2014	2/4/2014	35	4/1/2014	91	1686	376	2062	57	57	8100	694	7.3	19.0	2014	
2014-2015	1/19/2015	19	3/21/2015	80	1765	321	2086	62	62	8035	600	7.1	17.3	2015	
		28	MEAN	92	1696	348	2044	65	65	6964	554	7.2	19.0	95-2014 mean	

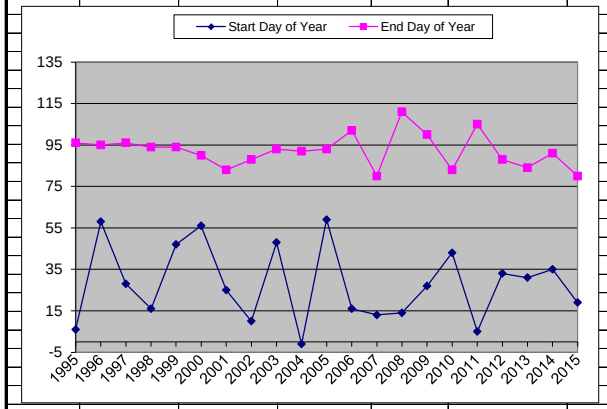


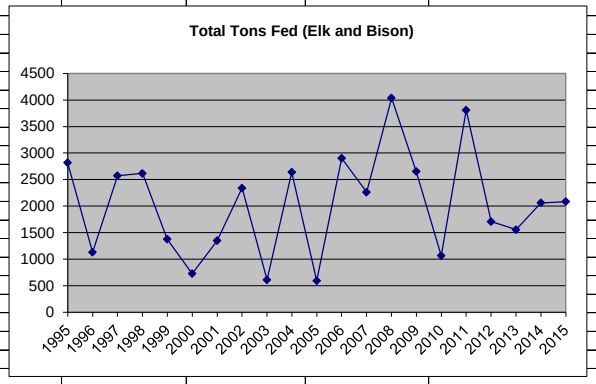



200
100
0


Length of Feed Season
days
120
100
80
60
40
20
0
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015


Average Number of Elk Fed per Day
12000
10000
8000
6000
4000
2000
0
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015


Start Day of Year
End Day of Year
135
115
95
75
55
35
15
-5
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015


Total Tons Fed (Elk and Bison)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

count was 760, daily bison attendance on feedgrounds was sporadic

United States Department of the Interior

NATIONAL PARK SERVICE

GRAND TETON NATIONAL PARK
P.O. DRAWER 170
MOOSE, WYOMING 83012

IN REPLY REFER TO:

7.A.1

MEMORANDUM

To: Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office

From: Mary Gibson Scott, Superintendent, Grand Teton National Park & John D. Rockefeller, Jr. Memorial Parkway

Subject: Re-initiation of formal consultation on Grand Teton National Park and National Elk Refuge Bison and Elk Management Plan/EIS (Formal Consultation No. ES-6-WY-07-F014)

In February 2007, Grand Teton National Park (GRTE) and the National Elk Refuge (NER) submitted to your office the *Bison and Elk Management Plan for the National Elk Refuge and Grand Teton National Park* (BEMP) and related materials necessary to initiate formal consultation regarding potential impacts to threatened and endangered species (formal consultation no. ES-6-WY-07-F014). The final biological opinion provided for an incidental take of one grizzly bear related to GRTE's legislatively permitted elk reduction program (ERP). On November 22, 2012, a group of hunters participating in the ERP shot and killed an adult male grizzly bear in the Snake River bottoms area of Hunt Area 75, within the park. This leaves the park with no additional grizzly bear take related to the ERP during the remaining nine years of the plan's intended 15-year life span. Accordingly, with this letter we are requesting to re-open formal consultation on the BEMP.

The BEMP acknowledged that grizzlies occurred in GRTE's Hunt Area 79 and that they were anticipated to occur in Hunt Area 75, particularly along the Snake River bottoms and on Blacktail Butte, where hunters "may experience a higher risk of grizzly conflict than in other portions of Area 75" (p. 190 final BEMP, cited from the FWS biological opinion). The Draft BEMP/EIS further stated:

- "The ecosystem's grizzly bears number an estimated 400-600, and their distribution has been increasing over the past two decades. They widely use the northern two-thirds of the park, but can occur throughout the park and surrounding areas" (p.153).

- Under ***Impacts Common to All Alternatives***... "*Hunting Risks to Grizzly Bears* – As the grizzly bear population continues to expand southward, the risk of conflicts between hunters and grizzlies would increase and could result in increased mortality for bears and hunters under Alternatives 1,3,4,5, and 6, which would continue....., when necessary, an elk reduction program in the park" (p. 345).

Similarly, the biological opinion acknowledged that "the long term risk [of hunting related grizzly mortality]…would be considerably higher in all areas where grizzly bear occur," and that "the service anticipates that the proposed action will exacerbate the short-term risk for hunting-related grizzly bear mortality with the park…"(final BEMP p.194-195).

Conditions associated with the ERP remain largely the same as they were in 2007 except that, as anticipated in the plan, grizzly bear distribution and numbers in the south end of the park appear to have increased. We have documented these changes based on research done by the Interagency Grizzly Bear Study Team, and on opportunistic observations. Since 2007, several grizzly bears have been observed seeking out gut piles left on the landscape during the elk reduction program, just as they have throughout the ecosystem for decades during hunting seasons. We believe that grizzly bears will continue this behavior and that the risk of hunter-grizzly bear contacts will continue to be relatively high as long as the ERP is necessary.

In 2013, Grand Teton staff, in collaboration with the Wyoming Game and Fish Department, proposed several new measures to help mitigate the potential for hunter-grizzly bear conflicts during the ERP. These include: 1) closing the Snake River bottoms between Ditch Creek and Dead Man's Bar; 2) beginning the hunt two weeks later; 3) limiting ammunition carried in the field to seven cartridges per day; and 4) limiting the number of shots hunters can take at a group of running elk to one (the latter two measures aim to reduce elk wounding loss).

Existing measures to help minimize human-bear encounters during the elk reduction program include: 1) requiring all hunters to carry bear spray; 2) maintaining a significant ranger presence and contacting a high percentage of program participants in the field; 3) not allowing artificial elk calls, which can draw bears to hunters; 4) providing a secure camping area for participants where carcasses can be safely stored out of reach of bears; 5) providing an abundance of bear safety educational materials to all permit holders, including warnings that hunters can expect to encounter bears while hunting in the park; and 6) significantly reducing numbers of hunters in the field (elk reduction program permits issued have declined from 1,150 in 2007 to 725 in 2012, and are proposed to further decrease to 650 in 2013; Table 2).

In addition, GRTE has developed and implemented several new grizzly bear conservation measures since 2007. First, we initiated a new "Be Bear Aware" campaign in 2007. This effort emphasized improving management of visitors in bear country through development, purchase, and placement of a variety of new information and education materials. Second, in 2007 we created the "Wildlife Brigade", a corps of paid and volunteer staff to respond to the rapidly escalating number of traffic jams caused by grizzly and black bear sightings along roads ('bear jams'); enforce food storage at campgrounds, picnic areas, and other developed areas; and continue refining the park's bear management program. This new program has been highly successful. In recent years the crew has consisted of one full-time bear management specialist, two paid seasonal rangers, and 10-12 seasonal volunteers and interns. They manage hundreds of bear jams annually, patrol park facilities and trails daily for food storage compliance, write courtesy food storage warnings for visitors, and educate thousands of visitors through direct contacts in the process. Third, we initiated a campaign in 2008 to purchase and install additional bear-resistant food storage boxes in collaboration with the Grand Teton National Park Foundation and park concessioners. To date, nearly 400 boxes have been installed in campsites and other developed areas. Fourth, in 2009, the park contracted the Wyoming Survey and Analysis Center at the University of Wyoming to evaluate effectiveness of our "Be Bear Aware" message. The results of this work provided valuable feedback on which park visitors were being reached and how the message affected their behaviors. Finally, in 2012, the park contracted a marketing specialist from Montana State University to study and evaluate "Be Bear Aware" messaging ecosystem-wide.

The ERP has occurred annually since 2007 and has been developed and administered under conditions set for in the park's establishing legislation (Public Law 81-787, 64 STAT 849). The need for the program is evaluated annually, and seasons are set in coordination with the Wyoming Game and Fish Department (Table 2).

Table 2. Grand Teton National Park elk reduction program permits and harvest, 2007-2013.

Year	Area 75 Permits	Area 79 Permits	Total Permits	Total Harvest	Comments
2007	500	650	1150	214	Some A79 permits also valid in A75
2008	550	600	1150	264	Some A79 permits also valid in A75
2009	325	575	900	361	Some A79 permits also valid in A75
2010	325	150	475	341	Some A79 permits also valid in A75
2011	675	75	750	278	Some A79 permits also valid in A75
2012	700	25	725	187	100% antlerless tags
2013[1]	650	0	650		A75 Type 4 permits valid in A79 Oct 19 – November 3, 2013

[1]Proposed

The final biological opinion (USFWS 2007) identified one broad "Reasonable and Prudent Measure," three specific "Terms and Conditions," and nine "Conservation Recommendations." The park has complied with each of these.

Summary

GRTE is requesting to re-initiate formal consultation on its 2007 BEMP/EIS, completed with the NER, because the level of ERP grizzly bear incidental take in the FWS's 2007 final biological opinion (USFWS 2012) was reached in 2012. The Yellowstone ecosystem grizzly bear population has appeared to remain relatively steady since 2007 (IGBST 2012), but its distribution has increased in the GRTE vicinity (Schwartz et al. 2006, Bjornlie et al. 2013), corroborating increased sightings of grizzly bears, including females with young, in the southern half of the park.

GRTE has complied with all requirements and recommendations set forth by the FWS in the biological opinion (USFWS 2007), and has been highly successful at minimizing human-grizzly bear conflicts through intensive programs for food and garbage storage, management of bear jams, public education, hunting-specific conflict reduction measures, and other conservation actions.

We believe continued implementation of the BEMP is likely to incur additional losses of grizzly bears from hunter-grizzly bear conflicts, which will adversely affect grizzly bears. However, we also believe the number of bears affected will be small and will not jeopardize the continued existence of the Yellowstone ecosystem grizzly bear population.

If you have questions or need additional information regarding this matter, please contact senior wildlife biologist Steve Cain at 307-739-3485.

Results of this work also provided valuable feedback to land and wildlife management agencies about current messaging systems and how to improve them in the future. Overall, GRTE's program has been highly successful at minimizing human-grizzly bear conflicts, with no management removals or relocations required since 2007 (Table 1).

Table 1. Grizzly bear conflicts in Grand Teton National Park 2007-2012.

Date	Type	Location	Action	Comments
6-13-2007	Human injury	Willow Flats	None	Mauling
7-14-2007	Mortality	Hwy 89/191/287 near Arizona Creek	None	Road kill male cub of year
6-26-08	Property damage	Grassy Lake Rd campsite #2	None	Bear ripped tent, no attractants
5-9-10	Property damage, food reward	Huckleberry Hot Springs	Area temporarily closed, bear box installed	Adult bear closely approached and obtained food in day pack
6-2-10	Mortality	Hwy 89/191/26 near Spread Creek	None	Road kill male 3 year old G133
6-21-10	Property damage	Grassy Lake Rd campsite #1	None	Bear ripped tarp off tent, no attractants
10-25-11	Food Reward	Hwy 89/191/26 near Moose	None	Family group (610 plus 3 COY) observed rummaging through trash bag along highway
10-30-11	Human injury	Snake River Bottom near Schwabacher Landing	Area temporarily closed	Mauling
5-27-12	Food Reward	Colter Bay Developed Area	None	Yearling grizzly bear allegedly fed from a car
6-21-2012	Mortality	Hwy 89/191/26 near Lost Creek Road	None	Road kill male yearling
11-22-2012	Mortality	Snake River Bottom near Schwabacher Landing	Area closed for remainder of Elk Reduction Program	Adult male grizzly killed in self-defense

Literature Cited

Bjiornlie, D. D., D. J. Thompson, M. A. Haroldson, C. C. Schwartz, K. A. Gunther, S. L. Cain, and D. B. Tyers. 2013. Methods to estimate distribution and range extent of grizzly bears in the Greater Yellowstone Ecosystem. *In Review.*

Haroldson, M.A., C.C. Schwartz, S. Cherry, and D.S. Moody. 2004. Possible effects of elk harvest on fall distribution of grizzly bears in the Greater Yellowstone Ecosystem. Journal of Wildlife Management 68(1):129-137.

Schwartz, C. C., Haroldson M. A., Gunther K. A., Moody D. 2006. Distribution of grizzly bears in the Greater Yellowstone Ecosystem in 2004. Ursus 17(1):63-66.

Interagency Grizzly Bear Study Team (IGBST). 2012. Unpublished data. USGS Northern Rocky Mountain Science Center, Interagency Grizzly Bear Study Team, Bozeman, Montana.

USFWS. 2007. Memorandum, from Wyoming Field Supervisor to National Elk Refuge Manager. Final Biological Opinion for the Bison and Elk Management Plan Grand Teton National Park Transprotation Plan (Formal Consultation No. ES-6-WY-07-F014). U.S. Fish and Wildlife Service, Cheyenne, Wyoming.

USFWS and USNPS. 2007. Bison and Elk Management Plan: National Elk Refuge and Grand Teton National Park. U.S. Fish and Wildlife Service and U.S. National Park Service. Lakewood, CO. 251pp.

cc: Manager, National Elk Refuge

SCain:SCM:LB:4/30/2013

Parting Thoughts

It's time to do what is right for the Elk Refuge

Among the many reasons we choose to live in Jackson Hole, surely ranking near the top is our affection for wildlife and all that these wild animals of Greater Yellowstone represent.

Bears, wolves, bison, moose, pronghorn, eagles — we watch them, we admire them, we adapt to them, we understand their value to our incomparable way of life and the overall health of one of the last great ecosystems on the planet.

And so we fight for them, too. We'll help visitors to behave properly around grizzly bears, we'll challenge our own state's flawed plan regarding wolves, and we'll advocate against industry sprawl so pronghorn have pathways for their historic annual journeys from Grand Teton National Park to the Little Colorado Desert.

So it is beyond mystifying that we continue to invite ill health at best and catastrophe at worst for perhaps our most cherished of all wildlife: The Jackson Hole elk herd.

The winter feeding of elk began with the best intentions a century ago. As with manual typewriters, transistor radios and rotary telephones, it's time to banish this obsolete, unnatural and unhealthy annual rite to the dustbin of history.

Never mind that the National Elk Refuge is a petri dish for disease where the "wild" elk are baited in such bloated densities that they wallow in their own feces, urine and muck. Never mind that the highly infectious and always-fatal chronic wasting disease lurks just a couple divides away, its impacts so potentially devastating that images of elk toughing out harsh winters naturally will pale by comparison. Never mind that failing to phase out the annual elk soup kitchen before the arrival of CWD would be the height of recklessness, given the Jackson Hole elk's local economic value and their seasonal mingling with other Yellowstone herds.

And never mind that the Elk Refuge's solution to elk densities and disease — a $5.2 million irrigation boondoggle that last year provided a paltry 5 percent of the refuge's forage — is a costly waste of taxpayer money that runs counter to Wyoming's fiscal conservatism and itchiness over big government programs.

There is a higher calling for phasing out the alfalfa-pellet buffet lines at the Elk Refuge — and 22 other state-run feedgrounds that exist because western Wyoming seems to think its elk herds are somehow different than those elk that winter naturally in Montana, Idaho, Colorado, Utah, Nevada and, ahem, northern, southern, eastern and central Wyoming.

Feeding elk no longer aligns with the mission of a wildlife refuge. A federal court said as much in a decision last year that clarified the need for a phase-out of the feeding program to manage for healthy wildlife.

Even if you're skeptical about CWD hanging over the elk herd like the Sword of Damocles, if you cherish wildlife like most of us in Jackson Hole then surely gazing across the vast manicured lawn that is today's refuge raises suspicions that something is askew. Now look at those same lands and imagine a smaller but healthier free-ranging herd of elk along with moose, wolves, beaver, songbirds, and cutthroat trout thriving amid wild plant communities associated with an intact ecosystem.

Isn't that a truer reflection of what we value about Jackson Hole, the geographic heart of the 20-million-acre Greater Yellowstone Ecosystem?

Sure, there are concerns, though none insurmountable. A careful phaseout will ensure that tough Rocky Mountain elk will thrive on protected winter ranges, fencing will separate the 700 or so cattle in the valley from free-ranging elk, and visitors on sleighs will marvel at the Serengeti-like landscape that rises from the current refuge monoculture.

We can do better by our most cherished wildlife, and you can join the Greater Yellowstone Coalition in finding out how. GYC is convening community conversations about a healthier future without elk food lines.

To learn more about the Elk Refuge go to http://www.greateryellowstone.org/elkrefuge.

— Lloyd Dorsey, Wyoming Representative, Jackson

O PI NI O N

Don't let the feds reduce elk numbers

The National Elk Refuge is famous. Many people come here to see the largest elk herd in the world. Yet it appears that the federal government desires to lower the numbers to an exhibition herd.

Wildlife was not enumerated in the U.S. Constitution (10th Amendment). Therefore, wildlife management is an exclusive state right. The Wyoming Game and Fish Department is the rightful manager. It should not allow herd reduction to happen, as there is a co-management agreement between it and the refuge concerning the wintering elk.

The National Elk Refuge was established by an act of Congress in 1912. Of the 75 years of records kept, an average of 7,500 elk have been fed there each year. Now the refuge wants to reduce that number to 5,000 elk via starvation. But starvation is not listed as an acceptable tool for lowering wildlife populations, anywhere.

The refuge claims the Bison and Elk 2007 Management Plan gives it the authority to implement the strategy associated with the plan in what is referred to as the "Step Down Plan," which proposes to reduce elk and bison dependence on supplemental winter feeding.

Matthew Fry, policy advisor to Gov. Matt Mead, states: "The plan was finalized in 2007 but was delayed by a series of litigation. Court decisions in 2010 and 2011 ruled in favor of the agency's final decision (the plan).

'The U.S. Fish and Wildlife Service (Service) has worked under the guidance of the plan since that time. However, they have not yet finalized their formal adaptive management plan for feeding."Unfortunately, the landscape and elk behaviors have changed since the plan's development, which occurred between 2000-2006. As a result, there are concerns from the state and the Wyoming Game and Fish Department that the plan is not as feasible as it would have been if it were implemented in 2007. Accordingly, we are working with the WGFD and the Service to address the real world functionality of the plan. "It is our understanding that the Service soon plans to initiate public outreach for the Adaptive Management Plan that would guide future feeding strategies. It is key that the public become involved in this process to better inform a final product. We will continue to work with the managing agencies to assist with the best outcomes for the elk wintering in Jackson Hole."

The National Elk Refuge management is proceeding as if a wintering number has been established and finalized. That has not happened yet. The population objective for the Northern Jackson Hole Elk Herd is 11,000. That number cannot be maintained if only 5,000 are fed on the refuge.

Wyoming's wildlife is a renewable natural resource that belongs to the state and contributes substantially to our economy. *Valley native Joanna Johnson is director of Concerned Citizens for the Elk Inc. SaveTheElk@wyoming.com. The opinions of columnists who appear these pages are their own and do not necessarily represent the views of the publisher.*

GUEST SHOT

Joanna Johnson

Refuge to end feeding 'as conditions allow'

Disease worries on feedgrounds overblown, says former Game and Fish commissioner.

By Cory Hatch

An official committed to the phase-out of supplemental feeding on the National Elk Refuge "as conditions allow" Tuesday, saying that elk and bison reduction hunts and a new irrigation system will help with the effort.

At the same time, a former Wyoming Game and Fish commissioner from Teton County said disease concerns on feedgrounds are overblown and the end of supplemental feeding would be bad for wildlife.

The contrasting opinions were aired after an appeals court in Washington, D.C., ruled Monday against conservation groups who sought a deadline for the end of supplemental feeding on the National Elk Refuge. Despite their ruling, the panel of three judges said risk from supplemental feeding, including disease and habitat damage, poses "an existential threat to the elk and bison and puts the very purpose of the refuge at jeopardy."

Refuge manager Steve Kallin said he is pleased with the decision.

"If the agencies had refused to ever consider ending feeding, that would be a different matter," Kallin said. "That is not the case. The [2007 Bison and Elk Management Plan] strives to achieve a healthy balance between the herd sizes and the available winter forage before we would end winter feeding."

U.S. Fish and Wildlife Service officials are worried chronic wasting disease will come to the refuge. Researchers say the always fatal, poorly understood disease might spread faster on feedgrounds than it has in the rest of Wyoming. If that's the case, the infectious agent — called a prion— could contaminate the refuge for years.

"We recognize there are disease risks over time," Kallin said. "We'd like to phase out winter feeding, but only as the conditions allow."

Hunts that reduce the numbers of elk and bison on the refuge are part of the solution to changing those conditions, Kallin said. A new irrigation system that increases the irrigated acreage from 900 to 4,300 acres will also help wean elk and bison off supplemental feed.

When feeding ends, Kallin said, there would likely be a contingency plan to allow feeding during severe winters.

Former Wyoming Game and Fish Commissioner Clark Allan said the disease concerns on feedgrounds have been exaggerated.

"All the worst-case scenarios for disease don't come anywhere near the loss for elk ... we would see if we stopped feeding," he said.

Allan, who is also a member of the group Sportsmen for Fish and Wildlife, said that populations of predators would suffer if feeding ended.

"People worry about habitat for wildlife; they worry about the moths and whitebark pine cones for the grizzlies," Allan said. "I think we need to orient ourselves toward sustaining this elk herd to sustain the grizzlies and wolves."

Allan admitted that the prospects for indefinite feeding of elk look grim.

"It doesn't look good," he said. "I'd sure like these judges to let the wildlife managers make those decisions. They should be leaving [the decision about whether to feed] up to the Game and Fish [Department]."

Conservation groups were disappointed with the judge's decision to not require a time line for the end of feeding, but said they were gratified by strong language against the practice.

"They did make it quite clear that an indefinite continuation of feeding is not legitimate under the laws governing the Fish and Wildlife Service," said Tim Preso, a staff attorney for Earthjustice. "They also made it clear that the service can't drag its feet.

"This ruling pretty clearly says you're going to have to [end feeding] if you're going to comply with the law," Preso said.

RESPONSE TO LLOYD DORSEY'S QUESTIONS IN HIS REQUEST FOR A TELEPHONE CONVERSATION WITH THE REGIONAL DIRECTOR (E-MAIL OF JULY 1, 2013)

"...attached is the list of Elk Refuge discussion topics from our (GYC & NPCA) May 9, 2013, meeting with Region 6 FWS Director Noreen Walsh and her staff. I'd like to have a phone conversation soon with Director Walsh about some of these items; particularly items 5, 7, 8, and 9 on the attached list."

5. Identify steps needed to end feeding, such as fencing or other mitigation measures to prevent comingling with livestock, and discuss potential sources of funding available.

The Bison and Elk Management Plan (BEMP, 2007) lists many management actions, all working toward achieving the Phase 1 goal of reducing reliance on supplemental feeding and ultimately the Phase 2 goal of eliminating the need for supplemental feeding. Some of the primary steps to reach these desired conditions are outlined below and are in various stages of implementation:

A. Reduce bison and elk herds to meet population objectives by improving harvest efficiencies of public hunting programs on the National Elk Refuge (NER) and the Elk Reduction Program on the Grand Teton National Park (GTNP). These efforts are funded with appropriated funds through the NER and GTNP annual operating budgets.

B. Increase forage production on the NER through expanded irrigation. A significant infrastructure upgrade to the NER irrigation system was completed in 2010 and funded primarily through Recovery and Reinvestment Act funding. Maintenance and operation of this system is funded by appropriated dollars through the NER annual operating budget.

C. Prevent new infestations of noxious weeds to maintain forage production. These funds have primarily come from appropriated funds through the NER and other Regional Refuge Programs. The Teton County Weed and Pest has been an integral partner in this effort.

D. Improve habitat on transitional and winter habitats within the GTNP. Appropriated funds have been primarily provided through the GTNP operating budget for this ongoing effort.

E. Work with area ranchers to prevent comingling with cattle through a variety of mitigation measures which may include:

   -Land use easements funded and held by private conservation organizations;

   -Land use easements held by the federal government are being considered at this time. Should this approach be used, the NER Land Acquisition Boundary would need to be expanded. If the FWS adopts this approach, it would be included in the NER Comprehensive Conservation Plan which is tentatively scheduled for public comment

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later this year. A possible source of funds for this type of program is the Land and Water Conservation Fund.

F. Elk/bison exclosure fencing is not panacea to resolve the supplemental feeding issue. In limited, specific situations, funded primarily through the USFWS Partners for Wildlife Program, fencing may be used to help ranchers prevent comingling with livestock. Money from appropriated funds could be leveraged by adding matching private funds from conservation organizations

7. GYC and NPCA request a copy of the "structured framework of adaptive management actions" required under the Service's April 2007 Bison and Elk Management Plan for the National Elk Refuge.

The BEMP was challenged in court 13 months after its completion. It was decided not to move forward with the Adaptive Management Plan (AMP) process until after the conclusion of this lawsuit. When the final opinion from the Federal Court of Appeals was rendered in August 2011, the NER had already initiated its Comprehensive Conservation Planning (CCP) process and did not have the resources to simultaneously develop the AMP. Although the CCP process is still ongoing, the NER staff commitment to this effort is beginning to subside, which allowed the AMP process to be initiated in June 2013.

8. GYC and NPCA request the new memoranda of understanding between the Service and the Wyoming Game and Fish Department pursuant to the April 2007 Bison and Elk Management Plan.

This process was placed on hold for the same reasons as stated in #7 above. Several versions of a new MOU were drafted, prior to the lawsuit however, that effort was placed on hold pending the outcome of court decisions and the completion of NER staff involvement in the CCP process. It is anticipated that work on this agreement will resume later this year.

9. Request a copy of the "step-down management plans" identified in the April 2007 Bison and Elk Management Plan. <u>See, e.g.</u>, BEMP at p.14 for CWD.

The decision to complete a CWD step-down plan, like the completion of the AMP, was put on hold pending the outcome of the above reverenced litigation. As you are aware, the BEMP calls for the NER to follow the State of Wyoming's CWD Plan. The NER contacted the Wyoming Game and Fish Department (WGFD) after the BEMP litigation was completed and learned they were planning to update the Wyoming CWD Plan pending the publication of research completed by Dr. Terry Creeger (WGFD). This research is in its second peer review, and when published, will trigger the update of the Wyoming CWD Plan. The NER will determine the need for a CWD step-down plan after reviewing the updated Wyoming CWD Plan.

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January 28, 2016

Senator John Barrasso
Senator Mike B. Enzi
Representative Cynthia Lummia

Dear Senator Barrasso, Senator Enzi and Representative Cynthia Lummis:

The Elk on the National Elk Refuge need your help. Elk Refuge Manager Steve Kallin is starving them to death. That is his way of lowering the population of the elk herd.

On January 6, 2016 Ken Griggs D.V.M. who has 56 years of observational experience with ruminates, evaluated the condition of the elk and stated that they need nutrition ASAP (evidently the dead grass the elk are digging through the snow for, lacks protein).

Refuge Manager Steve Kallin says the refuge was not created to feed the elk.

Refuge Biologist Eric Cole made the comment that the public needs to be more tolerant of winter elk mortality through starvation.

Do they think the refuge was created for the tax payer to watch them starve the elk while they put a paycheck in their pockets so they can fill their bellies.

Every year it is a fight to get these government employees to do their jobs. We the Concerned Citizens for the Elk want these people replaced with somebody more humane and competent.

Sincerely,

Earl L. Lutz
Concerned Citizens for the Elk

cc: Steve Kallin
Eric Cole

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

DEFENDERS OF WILDLIFE, *et al.*,	)	
	)	
Plaintiffs,	)	
	)	
v.	)	**Civil Case No. 08-0945 (RJL)**
	)	
KENNETH L. SALAZAR, in his official capacity as Secretary of the Interior, *et al.*,[1]	)	
	)	
Defendants,	)	
	)	
and	)	
	)	
STATE OF WYOMING,	)	
	)	
Defendant-Intervenor.	)	

MEMORANDUM OPINION
(March 26, 2010) [#24, 26, and 27]

Before the Court are dueling Motions for Summary Judgment arising from a dispute over the management of the National Elk Refuge in Jackson Hole, Wyoming. Defenders of Wildlife and their fellow plaintiffs challenge the comprehensive Bison and Elk Management Plan adopted jointly by the United States Fish and Wildlife Service ("FWS") and the National Park Service ("Park Service") (collectively, "the agencies"). The plaintiffs ask that the plan be set aside because it permits the indefinite feeding of elk on the Refuge despite

[1] Former Secretary of the Interior, Dirk Kempthorne, and former Director of the United States Fish and Wildlife Service, H. Dale Hall, were originally named as defendants in this case. Pursuant to Federal Rule of Civil Procedure 25(d), if a public officer named as a party to an action in his official capacity ceases to hold office, the court will automatically substitute that officer's successor. Accordingly, the Court substitutes Kenneth L. Salazar for Kempthorne and Sam D. Hamilton for Hall.

what they regard as overwhelming evidence that continued artificial feeding will lead to the catastrophic spread of disease and will disrupt the biological integrity of the Refuge, in violation of the National Wildlife Refuge System Improvement Act ("the Improvement Act"). The plaintiffs also contend that the plan and the accompanying environmental impact statement ("EIS") violate the National Environmental Policy Act ("NEPA") because they are insufficiently detailed to allow a reasonably complete discussion of mitigation. The defendants include the federal officials charged with administering the Refuge and the intervenor State of Wyoming. Together they contend that the plan constitutes a valid exercise of discretion and that it and the EIS are sufficiently detailed to satisfy the requirements of NEPA. Based on a review of the record and pleadings, the plaintiffs' Motion for Summary Judgment is DENIED, and the defendants' respective Cross Motions for Summary Judgment are GRANTED.

BACKGROUND

About a decade ago, the FWS and the Park Service initiated a process to develop a comprehensive plan for the management of bison and elk on the National Elk Refuge ("the Refuge") and other federal land. (*See* Final Bison and Elk Management Plan and Environmental Impact Statement (AR FR017a) ("FEIS Vol. 1") at 3).[2] The agencies considered a wide range of issues in formulating the plan, one of which was the wintertime practice of feeding the bison and elk. (*Id.* at 20-22). Supplemental feeding of elk began about a century ago as a means to reduce elk mortality during the winter and to minimize

[2] The Park Service joined the planning process because, in addition to the Refuge, the plan also addresses the management of bison and elk in the Grand Teton National Park. (*See* FEIS Vol. 1 at 3).

the likelihood of elk feeding on hay meant for livestock. (*Id.* at 6). More recently, bison also began eating the supplemental elk feed provided on the Refuge. (*Id.* at 7). Over the years, this practice has had the salutary effect of reducing elk winter mortality, sustaining a larger elk population than would have otherwise survived on the region's winter range, and reducing elk contact with haystacks and pastures for livestock. (*Id.* at 10).

Notwithstanding these benefits, the winter feeding program is not without potential costs. For instance, artificial feeding attracts more bison and elk than the Refuge can support, thus damaging the native habitat. (*Id.* at 9). The large concentration of elk and bison along the feedlines also contributes to the spread of disease. (*Id.* at 9-10; Smith Report (AR S007) at 3-4, 15-19). Of particular concern is the threat of Chronic Wasting Disease ("CWD"), the equivalent of "mad cow disease." (FEIS Vol. 1 at 136). Although CWD has not yet been detected on the Refuge, experts believe that it will eventually infect the elk and bison population. (*Id.* at 137; FEIS Vol. 2 at 200). The disease is generally fatal, and because it is difficult to eradicate, it could lead to population decline and possibly to the extinction of bison and elk on the Refuge. (FEIS Vol. 1 at 274, 514; Peterson CWD Report (AR S008) at 3). CWD is not the only disease that could spread as a result of artificial feeding practices; there are a host of other debilitating diseases as well. (*See, e.g.*, FEIS Vol. 1 at 129-33; *id.* at 133 (footrot); *id.* at 134-35 (bovine tuberculosis); *id.* at 133-34 (scabies); *id.* at 135 (bovine paratuberculosis)).

During the planning process, the agencies developed six alternatives to address the effects of the winter feeding program. The agencies' preferred alternative—Alternative 4—aims over a fifteen-year period to "decrease reliance on intensive supplemental winter

feeding, including complete transition to free-standing forage if and when several established criteria are met, including support from the Wyoming Game and Fish Department and the public." (FEIS Vol. 1 at 67). This alternative is predicated on the view that the agencies must improve the natural habitat supporting the bison and elk before they can discontinue supplemental feeding. Lest there be any doubt that the agencies intend to eliminate the feeding program, they rejected Alternative 5, which proposed the indefinite continuation of the program. (*Id.* at 50). In contrast to the conditions-based approach preferred by the agencies, Alternative 6, which the plaintiffs prefer, sets a time-sensitive goal of phasing out the winter feeding program within five years. (*Id.* at 52, 68).

To implement Alternative 4, the agencies developed and approved the Bison and Elk Management Plan now under review. The plan establishes four goals: (1) conserving the native habitat, (2) promoting sustainable populations of bison and elk, (3) helping the Wyoming Game and Fish Department ("WGFD") maintain its herd objectives, and (4) preventing the spread of disease. (Final Bison and Elk Management Plan (AF FR018a) ("FBEMP") at 129-39). To achieve these goals, the plan provides for the adaptive management of the bison and elk herds and their habitat with an "emphasis on improving winter, summer, and transitional range on refuge and park lands, while at the same time ensuring that the biotic integrity and environmental health of the resources will be sustained over the long term." (*Id.* at 125). More specifically, the plan directs the agencies to initiate habitat conservation projects for the improvement of forage and to work with adjacent landowners and the WGFD to minimize bison and elk feeding on private land. (*Id.*). Under the plan, the agencies will also coordinate with the WGFD to maintain an elk herd

population of approximately 11,000—almost half of which will be expected to winter on the Refuge—and to sustain a genetically viable bison herd of about 500. (*Id.* at 126). As these measures are implemented, the agencies will gradually transition away from supplemental feeding based on yet-to-be-determined triggers derived from some or all of the following factors: (1) the "level of forage production and availability" on the Refuge; (2) the "desired herd sizes and sex and age ratios"; (3) the "effective mitigation of bison and elk co-mingling with livestock on private lands"; (4) the "winter distribution patterns of elk and bison"; (5) the "prevalence of brucellosis, chronic wasting disease, and other wildlife diseases"; and (6) "public support." (*Id.* at 125-26). In short, the plan is designed "for progressively transitioning from intensive supplemental winter feeding to greater reliance on free-standing forage." (*Id.*).

DISCUSSION

I. Standard of Review

The plaintiffs seek to set aside the agencies' comprehensive Bison and Elk Management Plan and the accompanying Final Environmental Impact Statement on grounds that the agencies violated the Improvement Act and NEPA. The plaintiffs bring their challenge under the Administrative Procedure Act ("APA"), which requires this Court to set aside agency action found to be "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). "The scope of review under the 'arbitrary and capricious' standard is narrow and a court is not to substitute its judgment for that of the agency." *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983). To satisfy that standard, an agency need only "examine the

relevant data and articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made." *Id.* (internal quotation marks omitted). Because this case involves judicial review of final agency action, the normal summary judgment standard under Federal Rule of Civil Procedure 56(c) does not apply. *N.C. Fisheries Ass'n, Inc. v. Gutierrez*, 518 F. Supp. 2d 62, 79 (D.D.C. 2007).

II. Improvement Act Claim

The crux of the plaintiffs' claim is that the Bison and Elk Management Plan does not commit to a date-certain termination of the winter feeding program. Instead of phasing out the program in five years, as the plaintiffs think is necessary, the agencies have decided to phase out the program over time as certain conditions are met. Because this conditions-based approach leaves open the possibility that supplemental feeding will continue indefinitely, the plaintiffs contend that the plan adopted by the agencies is contrary to the Improvement Act or is—at a minimum—arbitrary, capricious, or an abuse of discretion. I disagree.

The Improvement Act established the National Wildlife Refuge System, the mission of which "is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." 16 U.S.C. § 668dd(a)(2). To carry out this mission, the Act directs the Secretary of the Interior to perform a wide range of duties. For instance, the Secretary must "provide for the conservation of fish, wildlife, and plants, and their habitats within the System." *Id.* § 668dd(a)(4)(A). Under the Act, "conservation" means "to sustain and,

where appropriate, restore and enhance, healthy populations of fish, wildlife, and plants utilizing . . . methods and procedures associated with modern scientific resource programs." *Id.* § 668ee(4). The Secretary must also "ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans." *Id.* § 668dd(a)(4)(B). In addition to these conservation duties, the Secretary must, among many others things, "ensure effective coordination, interaction, and cooperation with owners of land adjoining refuges," *id.* § 668dd(a)(4)(E); "ensure that opportunities are provided within the System for compatible wildlife-dependent recreational uses," *id.* § 668dd(a)(4)(I); and "ensure timely and effective cooperation and collaboration with Federal agencies and State fish and wildlife agencies," *id.* § 668dd(a)(4)(M).

The plaintiffs contend that the Bison and Elk Management Plan defeats the overarching mission of the Refuge and violates specific mandates of the Improvement Act concerning conservation. In particular, they claim that the plan fails to provide for the conservation of bison and elk, as well as their habitats, *see id.* § 668dd(a)(4)(A), and to ensure that the biological integrity, diversity, and environmental health of the Refuge are maintained, *see id.* § 668dd(a)(4)(B). Central to this claim is the presumably indefinite continuation of the winter feeding program, the adverse effects of which the plaintiffs take great care to detail. They explain how the unnaturally large density of bison and elk caused by supplemental feeding damages the surrounding habitat and facilitates the transmission of debilitating and deadly diseases that could lead to the decline, if not extinction, of bison and elk on the Refuge. Because the plan does not mitigate these adverse effects by requiring the elimination of the feeding program within at least five years, the plaintiffs contend that the

plan fails its clear statutory obligations to sustain a healthy population of bison and elk, to conserve the Refuge's habitat, and to ensure the biological integrity, diversity, and environmental health of the Refuge. Furthermore, the plaintiffs contend that the Improvement Act's conservation mandates "trump" whatever other duties the agencies have under the statute. (Pl. Reply [#30] at 8). Therefore, because the plan elevates the agencies' duties to coordinate with private landowners, to ensure recreational opportunities, and to work with the WGFD all at the expense of its conservation duties, the plaintiffs assert that the plan is contrary to the Improvement Act and must be set aside. Not so.

As an initial matter, at least one thing is clear: The Improvement Act does not mandate that any *particular* plan be adopted. The statute gives broad direction, not precise instruction. *Wyoming v. United States*, 279 F.3d 1214, 1239-40 (10th Cir. 2002) (noting the "broad language and general directives" of the Improvement Act). It requires, for instance, that agencies "provide for the conservation" of wildlife, "ensure . . . the biological integrity, diversity, and environmental health" of the Refuge, and "plan and direct the continued growth of the [Refuge] System in a manner that is best designed to accomplish the mission of the System." 16 U.S.C. § 668dd(a)(4)(A)-(C). How the agencies carry out these sweeping directives is a matter of considerable, though not unlimited, discretion. The statute says nothing about whether supplemental feeding should be phased out based on an established timeline or based on specific conditions. Indeed, it says nothing at all about supplemental feeding. The question before the Court, therefore, is not whether the Bison and Elk Management Plan violates any specific statutory provision (it does not), but whether the plan is arbitrary, capricious, or an abuse of discretion. It is not.

In making that determination, this Court, of course, does not stand in the agencies' shoes. Rather, its task is limited to determining whether the agencies have, at a minimum, articulated a "satisfactory explanation" that establishes a "rational connection between the facts found and the choice made." *Motor Vehicle Mfrs. Ass'n*, 463 U.S. at 43 (internal quotation marks omitted). In particular, I must consider whether the agencies' explanation "was based on a consideration of the relevant factors and whether there has been a clear error of judgment." *Id.* (internal quotation marks omitted). Simply stated, the Court has no legal authority to disturb the agencies' plan so long as it takes account of all the relevant factors set forth in the Improvement Act (and no others) and is reasonable based on the facts.

Having examined the administrative record and considered the rationale for the agencies' chosen course of action, I cannot say that the Bison and Elk Management Plan either fails to account for relevant factors or is unreasonable for phasing out the winter feeding program over a fifteen-year time horizon as conditions for doing so are met. Indeed, the plaintiffs themselves acknowledge that an immediate cessation of supplemental feeding would have "significant adverse environmental consequences." (Pl. Mot. for Summ. J. [#24-2] at 37). Instead, their chief complaint is that the adopted plan does not commit to certain elimination of the feeding program within an established timeline. The agencies' decision, however, is a reasonable one in light of the provisions and purposes of the Improvement Act. As the plaintiffs concede, supplemental feeding is necessary, for now, to maintain natural population levels during the winter. According to the agencies' environmental impact statement, "the wintering of unnaturally high densities of elk on the

refuge helps sustain a more natural population level at the larger landscape level by mitigating the loss of winter range." (FEIS Vol. 1 at 13). Because the pace at which the feeding program can be phased out depends upon the pace at which winter forage on the Refuge can be improved, the "[p]remature termination of feeding, while elk and bison numbers exceed winter habitat capacity, could result in unacceptable winter losses." (Smith Report (AR S007) at 9). For this reason, the agencies' decision to discontinue the program based on conditions on the ground, as opposed to a fixed timeline, makes considerable sense.[3]

That the agencies seek to avoid losses of bison and elk caused by the lack of winter habitat is hardly contrary to the conservationist provisions of the Improvement Act or the overarching purposes of the Refuge. After all, the point of a "refuge" is to shelter wildlife displaced by human development. *See* 16 U.S.C. § 673a (providing that Refuge land is to be used "for the grazing of, and as a refuge for, American elk and other big game animals").

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[3] The plaintiffs' argument that the plan gives the WGFD an effective veto over any decision to terminate the winter feeding program is overblown. To be sure, the plan provides that a "complete transition to free-standing forage" will occur "when several established criteria are met, *including support from the Wyoming Game and Fish Department and the public*." (FBEMP at 137 (emphasis added)). But this requirement to gain the support of the WGFD and the public is consistent with, if not required by, the Improvement Act itself, which directs the agencies "to increase support for the [Refuge] and participation from conservation partners and the public," 16 U.S.C. § 668dd(a)(4)(C), and to "ensure effective coordination, interaction, and cooperation with . . . the fish and wildlife agency" of the state in which the Refuge is located, *id.* § 668dd(a)(4)(E). Of course, if the WGFD and the public refuse to support termination of the feeding program even once the conditions are ripe for doing so, then nothing would prohibit the agencies from discontinuing the program without WGFD or public support. *See Wyoming*, 279 F.3d at 1234 ("[F]ederal management and regulation of federal wildlife refuges preempts state management and regulation of such refuges . . . where state management and regulation stand as an obstacle to the accomplishment of the full purposes and objectives of the Federal Government.").

And while the threat of disease is real and must be addressed, it makes little sense to avert population decline caused by disease only to bring about population decline caused by starvation. Thus, the agencies did not err by defining "healthy populations," which the Improvement Act does not specifically define, as including "a stable and continuing population (i.e., the population returns to an initial equilibrium after being disturbed) and a minimized likelihood of irreversible long-term effects." (FEIS Vol. 1 at 12). This interpretation of the Improvement Act, which the agencies administer, is entitled to deference. *See Chevron, U.S.A., Inc. v. Natural Res. Def. Council, Inc.*, 467 U.S. 837, 844 (1984) (stating that the Supreme Court has "long recognized that considerable weight should be accorded to an executive department's construction of a statutory scheme it is entrusted to administer").

Of course, the Bison and Elk Management Plan might well have been unreasonable had the agencies categorically refused to phase out the winter feeding program in spite of all the evidence in the record about the dangers of supplemental feeding. But the agencies did not do that. Far from mandating a continuation of the feeding program in perpetuity, the agencies have adopted a plan that takes measures to improve the Refuge so that the bison and elk that winter there can survive without supplemental feeding. The rate at which the program should be discontinued is necessarily a fact-dependent determination. Thus, by making the termination of winter feeding contingent, not on an arbitrary timeline, but on the Refuge's ability to support the bison and elk herd, the plan strikes a reasonable balance between maintaining population levels and mitigating disease, both of which are necessary to achieve the overarching conservationist purpose of the Refuge as a natural shelter for

displaced bison and elk. It matters not whether this Court believes it to be the right balance. The Court's sole task is to determine whether the agencies have articulated a satisfactory explanation for the balance they have struck given the factual record. They have!

III. NEPA Claim

The plaintiffs also seek to set aside the Bison and Elk Management Plan on the ground that the environmental impact statement, which accompanies the plan, violates NEPA. Under that statute, agencies proposing a major federal action must include a "detailed statement" of, among other things, "the environmental impact of the proposed action" and "any adverse environmental effects which cannot be avoided should the proposal be implemented." 42 U.S.C. § 4332(2)(C)(i), (ii). To satisfy the latter requirement, the EIS must contain "a reasonably complete discussion of possible mitigation measures." *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 351-52 (1989). The plaintiffs do not contend that the EIS lacks a detailed statement of the environmental impacts; instead, they contend that the adaptive management plan, which they regard as a "plan to make a plan," (Pl. Mot. for Summ. J. [#24-2] at 21), is insufficiently detailed to allow for a reasonably complete discussion of mitigation measures. I disagree.

This Court has rejected that kind of argument once before and will do so again in this case. In *Theodore Roosevelt Conservation Partnership v. Salazar*, I disagreed with TRCP's argument—nearly identical to the one here—that an "adaptive-management-mitigation plan [was] 'so amorphous and ill-defined' that the agency was unable to determine the environmental consequences of the project and thus unable to take the requisite 'hard look' at the project's effect on the environment." 605 F. Supp. 2d 263, 279 (D.D.C. 2009) (Leon,

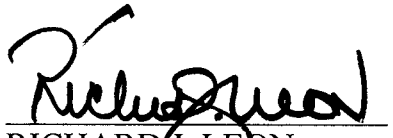
J.). In rejecting that argument, I noted that the agency's plan incorporated numerous specific mitigation techniques. *Id.* I also rejected TRCP's characterization of the plan as "equivalent to a decision to 'act now and deal with environmental consequences later,'" and I emphasized that "NEPA does not prevent agencies from adopting mitigation techniques and acknowledging they may be adjusted later depending on their effectiveness." *Id.* at 280.

Even though the agencies have yet to fill in every detail (which is to be expected of an adaptive management plan), the Bison and Elk Management Plan and EIS incorporate enough mitigation measures to provide a reasonably complete discussion of mitigation. For instance, the plan aims to mitigate the adverse effects of supplemental feeding by dispersing the feeding areas, (*see* FBEMP at 139); changing feed sites daily, (*id.*); spreading feed along meandering lines, (*id.*); delaying the onset of feeding each year, (FEIS Vol. 1 at 67); reducing the average daily ration of feed per elk or bison, (*id.*); decreasing the number of days each year of supplemental feeding, (*id.*); increasing harvest levels, (*id.*); vaccinating the bison and elk for brucellosis, (FEIS Vol. 1 at 73; FBEMP at 139); and increasing surveillance for CWD, (FEIS Vol. 1 at 40, 73; FBEMP at 126-27, 139). Again, the Court's role is a limited one—"to determine whether the EIS was compiled with objective good faith and whether the resulting statement would permit a decisionmaker to fully consider and balance the environmental factors." *Sierra Club v. Adams*, 578 F.2d 389, 393 (D.C. Cir. 1978) (internal quotation marks omitted). Having reviewed the administrative record, which includes a thorough two-volume EIS, I am confident that the agencies' preferred alternative and the plan based upon it are sufficiently detailed to provide a reasonably complete discussion of mitigation. In short, I conclude that the agencies have satisfied their

obligations under NEPA and that they have adequately addressed the possible environmental impacts and mitigation measures relating to their Bison and Elk Management Plan.

CONCLUSION

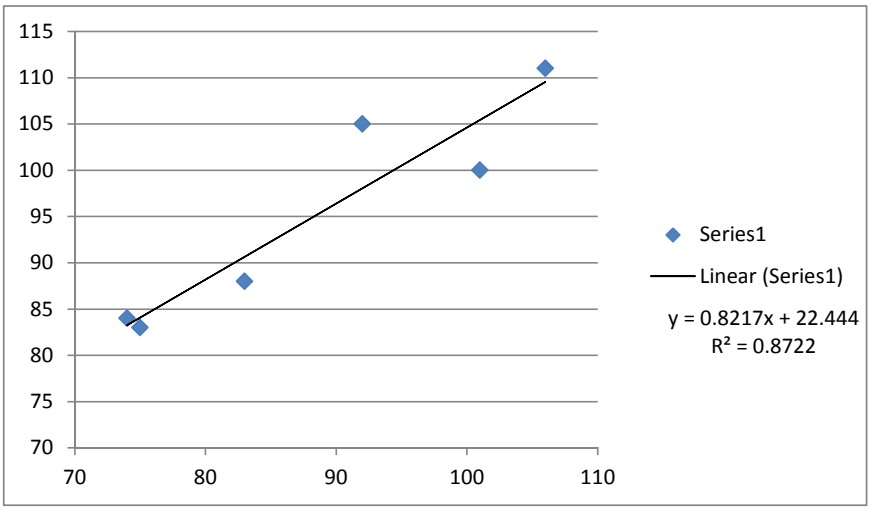
This case is an excellent example of how policy disputes too often end up in federal courts. Although the plaintiffs prefer a plan that would phase out the winter feeding program within five years, other stakeholders, including other environmental groups, prefer plans that would phase out the program over longer periods.[4] Fearing that premature termination of the program would adversely affect population levels, the agencies ultimately rejected the rigid five-year deadline that the plaintiffs advocate and opted instead for a plan that would phase out supplemental feeding as conditions for doing so were achieved. Unhappy with that result, the plaintiffs—quite predictably—turned to the courts. Unfortunately for the plaintiffs, this Court will not insinuate itself into the business of managing a wildlife refuge—a task that is well beyond its competence. Content that the agencies have articulated a satisfactory explanation for their chosen course of action and have adequately addressed mitigation for purposes of NEPA, I DENY the plaintiffs' Motion for Summary Judgment and GRANT the defendants' respective Cross Motions for Summary Judgment.



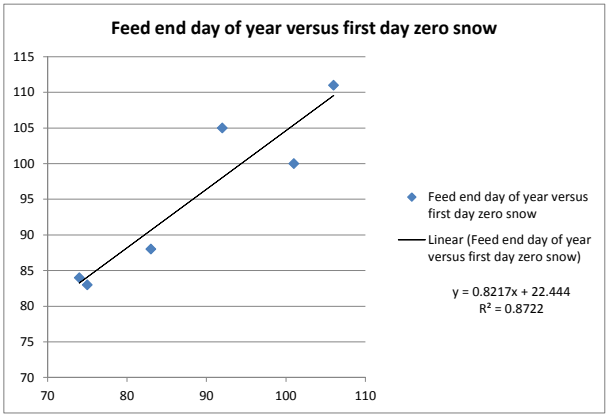
RICHARD J. LEON
United States District Judge

[4] The National Wildlife Federation, for instance, supported the agencies' preferred alternative, stating that "it is in the best interest of wildlife to discontinue winter feeding, however, a strategic, methodical approach to reducing feeding is preferable than eliminating feeding too quickly." (FEIS Vol. 2 at 150).

WINTER	DATE OF FIRST ZERO SNOW AT HEADQUARTERS SNOWSTAKE	ENDNOWDAY	FEEDEND	FEEDENDDAYOFYEAR
1994-1995			4/6/1995	96
1995-1996			4/4/1996	95
1996-1997			4/6/1997	96
1997-1998			4/4/1998	94
1998-1999			4/4/1999	94
1999-2000			3/30/2000	90
2000-2001			3/24/2001	83
2001-2002			3/29/2002	88
2002-2003			4/3/2003	93
2003-2004			4/1/2004	92
2004-2005			4/3/2005	93
2005-2006			4/12/2006	102
2006-2007			3/20/2007	80
2007-2008	4/15/2008	106	4/20/2008	111
2008-2009	4/11/2009	101	4/10/2009	100
2009-2010	3/16/2010	75	3/24/2010	83
2010-2011	4/2/2011	92	4/15/2011	105
2011-2012	3/23/2012	83	3/28/2012	88
2012-2013	3/15/2013	74	3/25/2013	84



Predicted Last Day of Feeding (day of year) based on previous relationship between first day of year that there was a zero snow measurement at the headquartrs snow stake and actual last day of feeding



Last Day Snow	Predicted Last Day of Feeding	
74	83.2498	comparable to 2013 last first zero snow day 3/15/13
86	93.1102	example if first day of zero snow is 3/27 then predicted last day of feeding is 4/3

From:	Paul Santavy
To:	will_meeks@fws.gov
Subject:	Fw: Grand Teton National Park Elk Reduction Program Consultation Request
Date:	Tuesday, May 07, 2013 10:04:54 PM
Attachments:	GTNP Elk Reduction Program Consultation Request 5-6-2013.pdf

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From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Tuesday, May 07, 2013 07:53 AM
To: Dean Rundle <dean_rundle@fws.gov>
Cc: Paul Santavy <paul_santavy@fws.gov>
Subject: Grand Teton National Park Elk Reduction Program Consultation Request

Dean:

The attached is somewhat related to the upcoming meeting with the RD and Lloyd Dorsey/Sharon Mader. The GTNP has used up the "one grizzly bear mortality" outlined in the 2007 Bison and Elk Management Plan. They are requesting a formal consultation with ES in Wyoming. The request has a good summary of the conflicts with grizzly bears on the GTNP. Dorsey and Mader will contend the GTNP Elk Reduction Program puts grizzly bears in jeopardy and is only necessary because of the supplemental feeding program on the NER. Stop the feeding and save the bears.

Call to discuss if you have any questions,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

United States Department of the Interior

NATIONAL PARK SERVICE

GRAND TETON NATIONAL PARK
P.O. DRAWER 170
MOOSE, WYOMING 83012

IN REPLY REFER TO:

7.A.1

MEMORANDUM

To: Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office

From: Mary Gibson Scott, Superintendent, Grand Teton National Park & John D. Rockefeller, Jr. Memorial Parkway

Subject: Re-initiation of formal consultation on Grand Teton National Park and National Elk Refuge Bison and Elk Management Plan/EIS (Formal Consultation No. ES-6-WY-07-F014)

In February 2007, Grand Teton National Park (GRTE) and the National Elk Refuge (NER) submitted to your office the *Bison and Elk Management Plan for the National Elk Refuge and Grand Teton National Park* (BEMP) and related materials necessary to initiate formal consultation regarding potential impacts to threatened and endangered species (formal consultation no. ES-6-WY-07-F014). The final biological opinion provided for an incidental take of one grizzly bear related to GRTE's legislatively permitted elk reduction program (ERP). On November 22, 2012, a group of hunters participating in the ERP shot and killed an adult male grizzly bear in the Snake River bottoms area of Hunt Area 75, within the park. This leaves the park with no additional grizzly bear take related to the ERP during the remaining nine years of the plan's intended 15-year life span. Accordingly, with this letter we are requesting to re-open formal consultation on the BEMP.

The BEMP acknowledged that grizzlies occurred in GRTE's Hunt Area 79 and that they were anticipated to occur in Hunt Area 75, particularly along the Snake River bottoms and on Blacktail Butte, where hunters "may experience a higher risk of grizzly conflict than in other portions of Area 75" (p. 190 final BEMP, cited from the FWS biological opinion). The Draft BEMP/EIS further stated:

- "The ecosystem's grizzly bears number an estimated 400-600, and their distribution has been increasing over the past two decades. They widely use the northern two-thirds of the park, but can occur throughout the park and surrounding areas" (p.153).

- Under ***Impacts Common to All Alternatives***... "*Hunting Risks to Grizzly Bears* – As the grizzly bear population continues to expand southward, the risk of conflicts between hunters and grizzlies would increase and could result in increased mortality for bears and hunters under Alternatives 1,3,4,5, and 6, which would continue....., when necessary, an elk reduction program in the park" (p. 345).

Similarly, the biological opinion acknowledged that "the long term risk [of hunting related grizzly mortality]…would be considerably higher in all areas where grizzly bear occur," and that "the service anticipates that the proposed action will exacerbate the short-term risk for hunting-related grizzly bear mortality with the park…"(final BEMP p.194-195).

Conditions associated with the ERP remain largely the same as they were in 2007 except that, as anticipated in the plan, grizzly bear distribution and numbers in the south end of the park appear to have increased. We have documented these changes based on research done by the Interagency Grizzly Bear Study Team, and on opportunistic observations. Since 2007, several grizzly bears have been observed seeking out gut piles left on the landscape during the elk reduction program, just as they have throughout the ecosystem for decades during hunting seasons. We believe that grizzly bears will continue this behavior and that the risk of hunter-grizzly bear contacts will continue to be relatively high as long as the ERP is necessary.

In 2013, Grand Teton staff, in collaboration with the Wyoming Game and Fish Department, proposed several new measures to help mitigate the potential for hunter-grizzly bear conflicts during the ERP. These include: 1) closing the Snake River bottoms between Ditch Creek and Dead Man's Bar; 2) beginning the hunt two weeks later; 3) limiting ammunition carried in the field to seven cartridges per day; and 4) limiting the number of shots hunters can take at a group of running elk to one (the latter two measures aim to reduce elk wounding loss).

Existing measures to help minimize human-bear encounters during the elk reduction program include: 1) requiring all hunters to carry bear spray; 2) maintaining a significant ranger presence and contacting a high percentage of program participants in the field; 3) not allowing artificial elk calls, which can draw bears to hunters; 4) providing a secure camping area for participants where carcasses can be safely stored out of reach of bears; 5) providing an abundance of bear safety educational materials to all permit holders, including warnings that hunters can expect to encounter bears while hunting in the park; and 6) significantly reducing numbers of hunters in the field (elk reduction program permits issued have declined from 1,150 in 2007 to 725 in 2012, and are proposed to further decrease to 650 in 2013; Table 2).

In addition, GRTE has developed and implemented several new grizzly bear conservation measures since 2007. First, we initiated a new "Be Bear Aware" campaign in 2007. This effort emphasized improving management of visitors in bear country through development, purchase, and placement of a variety of new information and education materials. Second, in 2007 we created the "Wildlife Brigade", a corps of paid and volunteer staff to respond to the rapidly escalating number of traffic jams caused by grizzly and black bear sightings along roads ('bear jams'); enforce food storage at campgrounds, picnic areas, and other developed areas; and continue refining the park's bear management program. This new program has been highly successful. In recent years the crew has consisted of one full-time bear management specialist, two paid seasonal rangers, and 10-12 seasonal volunteers and interns. They manage hundreds of bear jams annually, patrol park facilities and trails daily for food storage compliance, write courtesy food storage warnings for visitors, and educate thousands of visitors through direct contacts in the process. Third, we initiated a campaign in 2008 to purchase and install additional bear-resistant food storage boxes in collaboration with the Grand Teton National Park Foundation and park concessioners. To date, nearly 400 boxes have been installed in campsites and other developed areas. Fourth, in 2009, the park contracted the Wyoming Survey and Analysis Center at the University of Wyoming to evaluate effectiveness of our "Be Bear Aware" message. The results of this work provided valuable feedback on which park visitors were being reached and how the message affected their behaviors. Finally, in 2012, the park contracted a marketing specialist from Montana State University to study and evaluate "Be Bear Aware" messaging ecosystem-wide.

The ERP has occurred annually since 2007 and has been developed and administered under conditions set for in the park's establishing legislation (Public Law 81-787, 64 STAT 849). The need for the program is evaluated annually, and seasons are set in coordination with the Wyoming Game and Fish Department (Table 2).

Table 2. Grand Teton National Park elk reduction program permits and harvest, 2007-2013.

Year	Area 75 Permits	Area 79 Permits	Total Permits	Total Harvest	Comments
2007	500	650	1150	214	Some A79 permits also valid in A75
2008	550	600	1150	264	Some A79 permits also valid in A75
2009	325	575	900	361	Some A79 permits also valid in A75
2010	325	150	475	341	Some A79 permits also valid in A75
2011	675	75	750	278	Some A79 permits also valid in A75
2012	700	25	725	187	100% antlerless tags
2013[1]	650	0	650		A75 Type 4 permits valid in A79 Oct 19 – November 3, 2013

[1]Proposed

The final biological opinion (USFWS 2007) identified one broad "Reasonable and Prudent Measure," three specific "Terms and Conditions," and nine "Conservation Recommendations." The park has complied with each of these.

Summary

GRTE is requesting to re-initiate formal consultation on its 2007 BEMP/EIS, completed with the NER, because the level of ERP grizzly bear incidental take in the FWS's 2007 final biological opinion (USFWS 2012) was reached in 2012. The Yellowstone ecosystem grizzly bear population has appeared to remain relatively steady since 2007 (IGBST 2012), but its distribution has increased in the GRTE vicinity (Schwartz et al. 2006, Bjornlie et al. 2013), corroborating increased sightings of grizzly bears, including females with young, in the southern half of the park.

GRTE has complied with all requirements and recommendations set forth by the FWS in the biological opinion (USFWS 2007), and has been highly successful at minimizing human-grizzly bear conflicts through intensive programs for food and garbage storage, management of bear jams, public education, hunting-specific conflict reduction measures, and other conservation actions.

We believe continued implementation of the BEMP is likely to incur additional losses of grizzly bears from hunter-grizzly bear conflicts, which will adversely affect grizzly bears. However, we also believe the number of bears affected will be small and will not jeopardize the continued existence of the Yellowstone ecosystem grizzly bear population.

If you have questions or need additional information regarding this matter, please contact senior wildlife biologist Steve Cain at 307-739-3485.

Results of this work also provided valuable feedback to land and wildlife management agencies about current messaging systems and how to improve them in the future. Overall, GRTE's program has been highly successful at minimizing human-grizzly bear conflicts, with no management removals or relocations required since 2007 (Table 1).

Table 1. Grizzly bear conflicts in Grand Teton National Park 2007-2012.

Date	Type	Location	Action	Comments
6-13-2007	Human injury	Willow Flats	None	Mauling
7-14-2007	Mortality	Hwy 89/191/287 near Arizona Creek	None	Road kill male cub of year
6-26-08	Property damage	Grassy Lake Rd campsite #2	None	Bear ripped tent, no attractants
5-9-10	Property damage, food reward	Huckleberry Hot Springs	Area temporarily closed, bear box installed	Adult bear closely approached and obtained food in day pack
6-2-10	Mortality	Hwy 89/191/26 near Spread Creek	None	Road kill male 3 year old G133
6-21-10	Property damage	Grassy Lake Rd campsite #1	None	Bear ripped tarp off tent, no attractants
10-25-11	Food Reward	Hwy 89/191/26 near Moose	None	Family group (610 plus 3 COY) observed rummaging through trash bag along highway
10-30-11	Human injury	Snake River Bottom near Schwabacher Landing	Area temporarily closed	Mauling
5-27-12	Food Reward	Colter Bay Developed Area	None	Yearling grizzly bear allegedly fed from a car
6-21-2012	Mortality	Hwy 89/191/26 near Lost Creek Road	None	Road kill male yearling
11-22-2012	Mortality	Snake River Bottom near Schwabacher Landing	Area closed for remainder of Elk Reduction Program	Adult male grizzly killed in self-defense

Literature Cited

Bjiornlie, D. D., D. J. Thompson, M. A. Haroldson, C. C. Schwartz, K. A. Gunther, S. L. Cain, and D. B. Tyers. 2013. Methods to estimate distribution and range extent of grizzly bears in the Greater Yellowstone Ecosystem. *In Review.*

Haroldson, M.A., C.C. Schwartz, S. Cherry, and D.S. Moody. 2004. Possible effects of elk harvest on fall distribution of grizzly bears in the Greater Yellowstone Ecosystem. Journal of Wildlife Management 68(1):129-137.

Schwartz, C. C., Haroldson M. A., Gunther K. A., Moody D. 2006. Distribution of grizzly bears in the Greater Yellowstone Ecosystem in 2004. Ursus 17(1):63-66.

Interagency Grizzly Bear Study Team (IGBST). 2012. Unpublished data. USGS Northern Rocky Mountain Science Center, Interagency Grizzly Bear Study Team, Bozeman, Montana.

USFWS. 2007. Memorandum, from Wyoming Field Supervisor to National Elk Refuge Manager. Final Biological Opinion for the Bison and Elk Management Plan Grand Teton National Park Transprotation Plan (Formal Consultation No. ES-6-WY-07-F014). U.S. Fish and Wildlife Service, Cheyenne, Wyoming.

USFWS and USNPS. 2007. Bison and Elk Management Plan: National Elk Refuge and Grand Teton National Park. U.S. Fish and Wildlife Service and U.S. National Park Service. Lakewood, CO. 251pp.

cc: Manager, National Elk Refuge

SCain:SCM:LB:4/30/2013

From: Will Meeks
To: Paul Santavy
Subject: Re: Grand Teton National Park Elk Reduction Program Consultation Request
Date: Wednesday, May 08, 2013 6:13:48 AM

Got it from Dean. Thanks.

Will Meeks
U.S. Fish and Wildlife Service
R6 - Assistant Regional Director
NWRS and PFW
303-236-4303

On May 7, 2013, at 10:04 PM, Paul Santavy <paul_santavy@fws.gov> wrote:

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Tuesday, May 07, 2013 07:53 AM
To: Dean Rundle <dean_rundle@fws.gov>
Cc: Paul Santavy <paul_santavy@fws.gov>
Subject: Grand Teton National Park Elk Reduction Program Consultation Request

Dean:

The attached is somewhat related to the upcoming meeting with the RD and Lloyd Dorsey/Sharon Mader. The GTNP has used up the one grizzly bear mortality outlined in the 2007 Bison and Elk Management Plan. They are requesting a formal consultation with ES in Wyoming. The request has a good summary of the conflicts with grizzly bears on the GTNP. Dorsey and Mader will contend the GTNP Elk Reduction Program puts grizzly bears in jeopardy and is only necessary because of the supplemental feeding program on the NER. Stop the feeding and save the bears.

Call to discuss if you have any questions, ,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

<GTNP Elk Reduction Program Consultation Request 5-6-2013.pdf>

From: Nye, Brandon
To: Carl Millegan; Dean Rundle; Paul Santavy; Steve Kallin; Tina Dobrinsky; Will Meeks
Subject: DTS DCN 054532 NER Congressional
Date: Thursday, May 16, 2013 10:19:10 AM

This item has a due date of May 24, 2013 for the RD's signature. I forgot to include this in the email of the Congressional letter.

Brandon A Nye
Travel Specialist
Mountain-Prairie Region
National Wildlife Refuge System
134 Union Blvd, Suite 300
Lakewood, Colorado 80228
(303) 236-8131

From: Rundle, Dean
To: Will Meeks; Paul Santavy
Subject: NER Update
Date: Monday, June 10, 2013 2:40:29 PM

I talked to Steve Kallin and found out the following:

1. Re. the RD's meeting with Scott Talbot, Steve appreciates that WGF is actively engaged in the Adaptive Managerment Planning process. They are currently scheduling a second meeting of that group (FWS/NPS/WGF). The only thing he asks from WGF is to encourage a free hand for the local WGF folks he works with around Jackson to make recommended adjustments in harvest strategies to help achieve our population goals. For example Steve has been working hard to get the state to harvest more elk in Unit 80, and the local state folks have agreed to issue a few more permits - this did not raise significant concerns from the guides/outfitters when proposed. NER is working with WGF to collar additional elk in the Northern (Teton Wilderness) herd segment, hopefully to get additional migration data that might have the state more comfortable with additional harvest opportunity.

2. Steve ran into the local Rep. Lummis aide, Pat Alman, at a Snake River planning meeting last week. She apologized for not returning his call yet regarding the Pathways letter - and also apologized to Steve for not cc'ing him on the letter to the Director. Steve has left two messages with her, but she has not gotten back to him yet. Steve's perception is that the Pathway issue is not on the front burner w/Ms. Alman or Rep. Lummis.

Dean Rundle
Refuge Supervisor, MT/WY/UT
Region 6, Lakewood, CO
303-236-4306

From:	Will Meeks
To:	Noreen Walsh
Cc:	Matt Hogan; Paul Santavy
Subject:	NER/Dorsey questions
Date:	Tuesday, July 30, 2013 8:40:33 AM
Attachments:	Lloyd Dorsey.response.7.12.13.docx

Noreen,

As we just discussed here is a document with Lloyd's questions (in quotes at top of first page) and our responses to them. I think a phone call is the best approach and am happy to join you if you'd like.

If there is more information needed, please let me know.

Thanks.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
NWRS and PFW
303-236-4303 (work)
720-541-0310 (cell)

RESPONSE TO LLOYD DORSEY'S QUESTIONS IN HIS REQUEST FOR A TELEPHONE CONVERSATION WITH THE REGIONAL DIRECTOR (E-MAIL OF JULY 1, 2013)

"...attached is the list of Elk Refuge discussion topics from our (GYC & NPCA) May 9, 2013, meeting with Region 6 FWS Director Noreen Walsh and her staff. I'd like to have a phone conversation soon with Director Walsh about some of these items; particularly items 5, 7, 8, and 9 on the attached list."

5. Identify steps needed to end feeding, such as fencing or other mitigation measures to prevent comingling with livestock, and discuss potential sources of funding available.

The Bison and Elk Management Plan (BEMP, 2007) lists many management actions, all working toward achieving the Phase 1 goal of reducing reliance on supplemental feeding and ultimately the Phase 2 goal of eliminating the need for supplemental feeding. Some of the primary steps to reach these desired conditions are outlined below and are in various stages of implementation:

A. Reduce bison and elk herds to meet population objectives by improving harvest efficiencies of public hunting programs on the National Elk Refuge (NER) and the Elk Reduction Program on the Grand Teton National Park (GTNP). These efforts are funded with appropriated funds through the NER and GTNP annual operating budgets.

B. Increase forage production on the NER through expanded irrigation. A significant infrastructure upgrade to the NER irrigation system was completed in 2010 and funded primarily through Recovery and Reinvestment Act funding. Maintenance and operation of this system is funded by appropriated dollars through the NER annual operating budget.

C. Prevent new infestations of noxious weeds to maintain forage production. These funds have primarily come from appropriated funds through the NER and other Regional Refuge Programs. The Teton County Weed and Pest has been an integral partner in this effort.

D. Improve habitat on transitional and winter habitats within the GTNP. Appropriated funds have been primarily provided through the GTNP operating budget for this ongoing effort.

E. Work with area ranchers to prevent comingling with cattle through a variety of mitigation measures which may include:

   -Land use easements funded and held by private conservation organizations;

   -Land use easements held by the federal government are being considered at this time. Should this approach be used, the NER Land Acquisition Boundary would need to be expanded. If the FWS adopts this approach, it would be included in the NER Comprehensive Conservation Plan which is tentatively scheduled for public comment

DRAFT

later this year. A possible source of funds for this type of program is the Land and Water Conservation Fund.

F. Elk/bison exclosure fencing is not panacea to resolve the supplemental feeding issue. In limited, specific situations, funded primarily through the USFWS Partners for Wildlife Program, fencing may be used to help ranchers prevent comingling with livestock. Money from appropriated funds could be leveraged by adding matching private funds from conservation organizations

7. GYC and NPCA request a copy of the "structured framework of adaptive management actions" required under the Service's April 2007 Bison and Elk Management Plan for the National Elk Refuge.

The BEMP was challenged in court 13 months after its completion. It was decided not to move forward with the Adaptive Management Plan (AMP) process until after the conclusion of this lawsuit. When the final opinion from the Federal Court of Appeals was rendered in August 2011, the NER had already initiated its Comprehensive Conservation Planning (CCP) process and did not have the resources to simultaneously develop the AMP. Although the CCP process is still ongoing, the NER staff commitment to this effort is beginning to subside, which allowed the AMP process to be initiated in June 2013.

8. GYC and NPCA request the new memoranda of understanding between the Service and the Wyoming Game and Fish Department pursuant to the April 2007 Bison and Elk Management Plan.

This process was placed on hold for the same reasons as stated in #7 above. Several versions of a new MOU were drafted, prior to the lawsuit however, that effort was placed on hold pending the outcome of court decisions and the completion of NER staff involvement in the CCP process. It is anticipated that work on this agreement will resume later this year.

9. Request a copy of the "step-down management plans" identified in the April 2007 Bison and Elk Management Plan. <u>See, e.g.</u>, BEMP at p.14 for CWD.

The decision to complete a CWD step-down plan, like the completion of the AMP, was put on hold pending the outcome of the above reverenced litigation. As you are aware, the BEMP calls for the NER to follow the State of Wyoming's CWD Plan. The NER contacted the Wyoming Game and Fish Department (WGFD) after the BEMP litigation was completed and learned they were planning to update the Wyoming CWD Plan pending the publication of research completed by Dr. Terry Creeger (WGFD). This research is in its second peer review, and when published, will trigger the update of the Wyoming CWD Plan. The NER will determine the need for a CWD step-down plan after reviewing the updated Wyoming CWD Plan.

DRAFT

From: Will Meeks
To: Matt Hogan
Subject: FW: NER/Dorsey questions
Date: Tuesday, July 30, 2013 10:21:13 AM
Attachments: Lloyd Dorsey.response.7.12.13.docx

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
NWRS and PFW
303-236-4303 (work)
720-541-0310 (cell)

From: Will Meeks [mailto:Will_Meeks@fws.gov]
Sent: Tuesday, July 30, 2013 8:41 AM
To: Noreen Walsh
Cc: Matt Hogan (Matt_Hogan@fws.gov); Paul Santavy
Subject: NER/Dorsey questions

Noreen,

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DRAFT

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DRAFT

From:	Debbie Schreiner
To:	Noreen Walsh; Matt Hogan
Cc:	Will Meeks; Paul Santavy
Subject:	talk soon - Lloyd Dorsey
Date:	Friday, August 02, 2013 9:16:31 AM

FYI

From: Leith Edgar [mailto:leith_edgar@fws.gov]
Sent: Thursday, August 01, 2013 2:32 PM
To: Robert Segin; Lori Iverson
Cc: Marla Trollan; debbie_schreiner@fws.gov
Subject: FW: talk soon

Steve & Lori,

Lloyd Dorsey called the front office, which passed this over to me. I spoke to Lloyd moments ago. He is providing us with courtesy notification of an upcoming push by the GYC to end supplemental feeding at the NER (it's in the Service's decision authority, but has not been implemented). This campaign has been ongoing, but is going to be ramped up soon. Here's the campaign page: https://secure3.convio.net/gyc/site/Advocacy?pagename=homepage&page=UserAction&id=397&JServSessionIdr004=vdngq1oav3.app333a

As you can see, there is the potential for Noreen Walsh, Dean Rundle & Steve Kallin to receive emails on this topic from the public. Lloyd expressed an interest in this not affecting the work of the aforementioned & was wondering if we wouldn't prefer to have all email comments sent to a specific, dedicated email address that someone is checking regularly & that is of our choosing. He also mentioned the possibility of GYC collecting all the comments. GYC is planning to launch this campaign any day now, but was amenable to holding off until Monday for a decision from us on an email address & comment collection. Lloyd said he would be in touch if he needed a decision from us before Monday.

Please determine what's best for Noreen, Dean & Steve K. & provide an answer back to Lloyd directly before COB Monday. I will let you know if he contacts me between now & then. Please let me know if you have any questions.

Thanks,

Leith

Leith Edgar
Public Affairs Specialist for MT, ND, SD & UT
Mountain-Prairie Region
U.S. Fish and Wildlife Service
(303) 236-4588

From: Lloyd Dorsey [mailto:ldorsey@greateryellowstone.org]
Sent: Thursday, August 01, 2013 1:43 PM
To: Leith_Edgar@fws.gov
Subject: talk soon

Leith: thanks for calling me back. Our website is noted below, and you can click on Take Action, and see
what we've had available for folks to weigh in to the FWS about phasing out the feeding on the Elk Refuge.

I explained to Debbie Schreiner in Noreen's office that we plan on expanding that outreach to the public.
Debbie referred me to you. Talk soon,

Lloyd Dorsey

Wyoming Representative, Greater Yellowstone Coalition
Box 4857, Jackson, WY 83001
307-734-6004 307-690-1967-cell
ldorsey@greateryellowstone.org www.greateryellowstone.org

"People protecting the lands, waters and wildlife
of the Greater Yellowstone Ecosystem,
now and for future generations."

From: Noreen Walsh
To: Debbie Schreiner
Cc: Matt Hogan; Will Meeks; Paul Santavy; Leith Edgar
Subject: Re: talk soon - Lloyd Dorsey
Date: Friday, August 02, 2013 9:20:03 AM

A dedicated email address sounds like the way to go - thanks Leith

Sent from my iPhone

On Aug 2, 2013, at 9:16 AM, Debbie Schreiner <Debbie_Schreiner@fws.gov> wrote:

> FYI
>
>
> **From:** Leith Edgar [mailto:leith_edgar@fws.gov]
> **Sent:** Thursday, August 01, 2013 2:32 PM
> **To:** Robert Segin; Lori Iverson
> **Cc:** Marla Trollan; debbie_schreiner@fws.gov
> **Subject:** FW: talk soon
>
> Steve & Lori,
>
> Lloyd Dorsey called the front office, which passed this over to me. I spoke to Lloyd moments ago. He is providing us with courtesy notification of an upcoming push by the GYC to end supplemental feeding at the NER (it's in the Service's decision authority, but has not been implemented). This campaign has been ongoing, but is going to be ramped up soon. Here's the campaign page: https://secure3.convio.net/gyc/site/Advocacy?pagename=homepage&page=UserAction&id=397&JServSessionIdr004=vdngq1oav3.app333a
>
> As you can see, there is the potential for Noreen Walsh, Dean Rundle & Steve Kallin to receive emails on this topic from the public. Lloyd expressed an interest in this not affecting the work of the aforementioned & was wondering if we wouldn't prefer to have all email comments sent to a specific, dedicated email address that someone is checking regularly & that is of our choosing. He also mentioned the possibility of GYC collecting all the comments. GYC is planning to launch this campaign any day now, but was amenable to holding off until Monday for a decision from us on an email address & comment collection. Lloyd said he would be in touch if he needed a decision from us before Monday.
>
> Please determine what's best for Noreen, Dean & Steve K. & provide an answer back to Lloyd directly before COB Monday. I will let you know if he contacts me between now & then. Please let me know if you have any questions.
>
> Thanks,
>
> Leith

Leith Edgar
Public Affairs Specialist for MT, ND, SD & UT
Mountain-Prairie Region
U.S. Fish and Wildlife Service
(303) 236-4588

From: Lloyd Dorsey [mailto:ldorsey@greateryellowstone.org]
Sent: Thursday, August 01, 2013 1:43 PM
To: Leith_Edgar@fws.gov
Subject: talk soon

Leith: thanks for calling me back. Our website is noted below, and you can click on Take Action, and see
what we've had available for folks to weigh in to the FWS about phasing out the feeding on the Elk Refuge.

I explained to Debbie Schreiner in Noreen's office that we plan on expanding that outreach to the public.
Debbie referred me to you. Talk soon,

Lloyd Dorsey

Wyoming Representative, Greater Yellowstone Coalition
Box 4857, Jackson, WY 83001
307-734-6004 307-690-1967-cell
ldorsey@greateryellowstone.org
www.greateryellowstone.org

"People protecting the lands, waters and wildlife
of the Greater Yellowstone Ecosystem,
now and for future generations."

From: Will Meeks
To: Paul Santavy
Subject: Fwd: NER/Dorsey questions
Date: Friday, August 09, 2013 8:31:16 AM

Paul,

I know you weren't there, so you wouldn't know the questions, but Dean was. I can't for the life of me find those in my notes. Can you ask Dean, or Matt/Noreen?

I seem to recall that there was one about private landowners and fence.

Will Meeks
U.S. Fish and Wildlife Service
R6 - Assistant Regional Director
NWRS and PFW
303-236-4303

Begin forwarded message:

> **From:** Noreen Walsh <noreen_walsh@fws.gov>
> **Date:** August 8, 2013, 8:08:11 PM MDT
> **To:** Will Meeks <will_meeks@fws.gov>
> **Cc:** Matt Hogan <matt_hogan@fws.gov>, Paul Santavy <paul_santavy@fws.gov>
> **Subject: RE: NER/Dorsey questions**
>
> Thanks much Will. We will schedule this call soon and I would like you to join. How about the questions I posed to you at the close of our meeting with Lloyd? I would like to hear your answers to those as well.
>
> Noreen
>
> Noreen Walsh
> Regional Director
> Mountain-Prairie Region
> U. S. Fish and Wildlife Service
>
> 303 236 7920
>
> ***The Mountain-Prairie Region of the U. S. Fish and Wildlife Service:*** *We provide conservation stewardship of some of America's most scenic lands, to ensure healthy fish and wildlife for the enjoyment and benefit of all people.*
>
> ---
>
> **From:** Will Meeks [mailto:Will_Meeks@fws.gov]
> **Sent:** Tuesday, July 30, 2013 8:41 AM
> **To:** Noreen Walsh
> **Cc:** Matt Hogan; Paul Santavy

Subject: NER/Dorsey questions

Noreen,

As we just discussed here is a document with Lloyd's questions (in quotes at top of first page) and our responses to them. I think a phone call is the best approach and am happy to join you if you'd like.

If there is more information needed, please let me know.

Thanks.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
NWRS and PFW
303-236-4303 (work)
720-541-0310 (cell)

From: Santavy, Paul
To: Will Meeks
Subject: Re: NER/Dorsey questions
Date: Friday, August 09, 2013 8:34:01 AM

---

yup, will do

_____
PAUL SANTAVY, *CFP, AWB*
Deputy Assistant Regional Director
NWRS and PFW
Mountain-Prairie Region
U.S. Fish & Wildlife Service
Phone: 303-236-4304
Cell: 303-515-0809

On Fri, Aug 9, 2013 at 8:31 AM, Will Meeks <will_meeks@fws.gov> wrote:

> Paul,
>
> I know you weren't there, so you wouldn't know the questions, but Dean was. I can't for the life of me find those in my notes. Can you ask Dean, or Matt/Noreen?
>
> I seem to recall that there was one about private landowners and fence.
>
> Will Meeks
> U.S. Fish and Wildlife Service
> R6 - Assistant Regional Director
> NWRS and PFW
> 303-236-4303
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> > **Cc:** Matt Hogan <matt_hogan@fws.gov>, Paul Santavy <paul_santavy@fws.gov>
> > **Subject: RE: NER/Dorsey questions**
> >
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> >
> > Noreen
> >
> > Noreen Walsh

Regional Director

Mountain-Prairie Region

U. S. Fish and Wildlife Service

303 236 7920

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If there is more information needed, please let me know.

Thanks.

Will Meeks

U.S. Fish and Wildlife Service

Mountain-Prairie Region

Assistant Regional Director

NWRS and PFW

303-236-4303 (work)

720-541-0310 (cell)

From: Will Meeks
To: Noreen Walsh; Carl Millegan
Cc: Paul Santavy; Matt Hogan; Steve Kallin
Subject: RE: RD meeting with Lloyd Dorsey
Date: Friday, January 31, 2014 8:53:46 AM

My thoughts were that it would limited to an hour.

We met with Sharon Mader with Dorsey here, so that's no issue. Steve likely knows the other folks however and we should consider his insight. (Steve – can you provide some?)

If it's more of a meet and greet, I say it's OK. If Lloyd wants it to be a point/counterpoint (he alludes to 2-3 topics), then I say just him for this go-round.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
NWRS and PFW
303-236-4303 (work)
720-541-0310 (cell)

From: Noreen Walsh [mailto:noreen_walsh@fws.gov]
Sent: Friday, January 31, 2014 8:11 AM
To: Carl Millegan
Cc: Will Meeks; Paul Santavy; Matt Hogan; Steve Kallin
Subject: RE: RD meeting with Lloyd Dorsey

Dear all,
What's your advice? This doesn't seem unmanageable, but I am not planning to get into a public meeting type situation. Are we limiting this to an hour?
Noreen

Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service

303 236 7920

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From: Millegan, Carl [mailto:carl_millegan@fws.gov]
Sent: Thursday, January 30, 2014 9:05 AM
To: Noreen Walsh
Cc: Will Meeks; Paul Santavy; Matt Hogan; Steve Kallin
Subject: Fwd: RD meeting with Lloyd Dorsey

Noreen,

Please see the information from Steve Kallin regarding meeting with Lloyd and his question about expanding the conversation with you to included several other individuals. Are you comfortable with his request? If not please let us know, so we manage Lloyd's agenda.

If you have questions, please let Steve Kallin and I know.

Thanks,

c

---------- Forwarded message ----------
From: **Steve Kallin** <steve_kallin@fws.gov>
Date: Wed, Jan 29, 2014 at 12:00 PM
Subject: RD meeting with Lloyd Dorsey
To: Carl Millegan <carl_millegan@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>

Carl:

I just confirmed that Lloyd Dorsey is available on Thursday, February 13 to meet with Noreen at the NER from 10:00 AM to 11:00 AM.

He asked to expand this meeting and broaden the conversation to include the following organizations:

-Jackson Hole Conservation Alliance, Wildlands Director Siva Sundaresan
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Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

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Carl Millegan
Acting Refuge Supervisor MT/WY/UT
U.S.Fish and Wildlife Service
Mountain Prairie Region, 6
134 Union Blvd.
Lakewood, CO 80228
Ph: (303)236-4344 Fax: (303)236-4792
Cell: (303)720-3701
e-mail: carl_millegan@fws.gov

From: Millegan, Carl
To: Noreen Walsh
Cc: Will Meeks; Paul Santavy; Matt Hogan; Steve Kallin
Subject: Re: RD meeting with Lloyd Dorsey
Date: Friday, January 31, 2014 9:08:39 AM

Noreen,

I spoke to Steve and we think keeping the meeting to one hour is best. Steve is going to contact Lloyd and let him know that we want to keep the conversation productive between you and him, and we think having a group of folks there with potentially new topics will muddy the water or dilute the importance of what Lloyd really wants to visit with you about. Steve is going to work with Lloyd to provide his agenda for the discussion so you can be informed prior to sitting down with him. As soon as Steve gets his agenda, he will pass it on.

If you have any other questions, I will be glad to run them down.

Thanks,

c

On Fri, Jan 31, 2014 at 8:11 AM, Noreen Walsh <noreen_walsh@fws.gov> wrote:

> Dear all,
>
> What's your advice? This doesn't seem unmanageable, but I am not planning to get into a public meeting type situation. Are we limiting this to an hour?
>
> Noreen
>
> Noreen Walsh
>
> Regional Director
>
> Mountain-Prairie Region
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> U. S. Fish and Wildlife Service
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> 303 236 7920
>
> ***The Mountain-Prairie Region of the U. S. Fish and Wildlife Service:*** *We provide conservation stewardship of some of America's most scenic lands, to ensure healthy fish and wildlife for the enjoyment and benefit of all people.*

From: Millegan, Carl [mailto:carl_millegan@fws.gov]
Sent: Thursday, January 30, 2014 9:05 AM
To: Noreen Walsh
Cc: Will Meeks; Paul Santavy; Matt Hogan; Steve Kallin
Subject: Fwd: RD meeting with Lloyd Dorsey

Noreen,

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If you have questions, please let Steve Kallin and I know.

Thanks,

c

---------- Forwarded message ----------
From: **Steve Kallin** <steve_kallin@fws.gov>
Date: Wed, Jan 29, 2014 at 12:00 PM
Subject: RD meeting with Lloyd Dorsey
To: Carl Millegan <carl_millegan@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>

Carl:

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-National Park Conservation Association, Grand Teton Senior Program Manager Sharon Mader

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Lloyd would propose to discuss 2-3 topics during this period. If this isn't desirable, he would still be happy to come himself.

Because the meeting with Lloyd was requested by Noreen, I'm not sure exactly what she wants to accomplish during the meeting. So I am requesting guidance concerning the request to broaden the meeting.

Take care,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 733-9212, extension 2

Fax: (307) 733-9729

steve_kallin@fws.gov

--

Carl Millegan

Acting Refuge Supervisor MT/WY/UT

U.S.Fish and Wildlife Service

Mountain Prairie Region, 6

134 Union Blvd.

Lakewood, CO 80228

Ph: (303)236-4344 Fax: (303)236-4792

Cell: (303)720-3701

e-mail: carl_millegan@fws.gov

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Carl Millegan
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Lakewood, CO 80228
Ph: (303)236-4344 Fax: (303)236-4792
Cell: (303)720-3701
e-mail: carl_millegan@fws.gov

From:	Noreen Walsh
To:	Carl Millegan
Cc:	Will Meeks; Paul Santavy; Matt Hogan; Steve Kallin
Subject:	RE: RD meeting with Lloyd Dorsey
Date:	Friday, January 31, 2014 10:30:49 AM

That works – thank you all

Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service

303 236 7920

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From: Millegan, Carl [mailto:carl_millegan@fws.gov]
Sent: Friday, January 31, 2014 9:09 AM
To: Noreen Walsh
Cc: Will Meeks; Paul Santavy; Matt Hogan; Steve Kallin
Subject: Re: RD meeting with Lloyd Dorsey

Noreen,

I spoke to Steve and we think keeping the meeting to one hour is best. Steve is going to contact Lloyd and let him know that we want to keep the conversation productive between you and him, and we think having a group of folks there with potentially new topics will muddy the water or dilute the importance of what Lloyd really wants to visit with you about. Steve is going to work with Lloyd to provide his agenda for the discussion so you can be informed prior to sitting down with him. As soon as Steve gets his agenda, he will pass it on.

If you have any other questions, I will be glad to run them down.

Thanks,

c

On Fri, Jan 31, 2014 at 8:11 AM, Noreen Walsh <noreen_walsh@fws.gov> wrote:

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Noreen

Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service

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From: Millegan, Carl [mailto:carl_millegan@fws.gov]
Sent: Thursday, January 30, 2014 9:05 AM
To: Noreen Walsh
Cc: Will Meeks; Paul Santavy; Matt Hogan; Steve Kallin
Subject: Fwd: RD meeting with Lloyd Dorsey

Noreen,

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If you have questions, please let Steve Kallin and I know.

Thanks,

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From: **Steve Kallin** <steve_kallin@fws.gov>
Date: Wed, Jan 29, 2014 at 12:00 PM
Subject: RD meeting with Lloyd Dorsey
To: Carl Millegan <carl_millegan@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>

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Jackson, WY 83001
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Fax: (307) 733-9729
steve_kallin@fws.gov

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e-mail: carl_millegan@fws.gov

From:	Will Meeks
To:	Paul Santavy; Carl Millegan
Subject:	FW: RD meeting with Lloyd Dorsey
Date:	Monday, February 03, 2014 12:02:39 PM

FYI

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
NWRS and PFW
303-236-4303 (work)
720-541-0310 (cell)

From: Will Meeks [mailto:Will_Meeks@fws.gov]
Sent: Monday, February 03, 2014 12:02 PM
To: Noreen Walsh
Subject: RE: RD meeting with Lloyd Dorsey

Correct.

As you know, Paul Santavy will accompany you on the trip.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
NWRS and PFW
303-236-4303 (work)
720-541-0310 (cell)

From: Noreen Walsh [mailto:noreen_walsh@fws.gov]
Sent: Monday, February 03, 2014 12:01 PM
To: Will Meeks
Subject: FW: RD meeting with Lloyd Dorsey

Just circling back with you and your folks: I appreciated your advice to keep it to just Lloyd and I believe that is where we ended up, correct?

Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service

303 236 7920

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From: Debbie Schreiner [mailto:Debbie_Schreiner@fws.gov]
Sent: Monday, February 03, 2014 10:13 AM
To: Noreen Walsh
Subject: FW: RD meeting with Lloyd Dorsey

From: Millegan, Carl [mailto:carl_millegan@fws.gov]
Sent: Friday, January 31, 2014 3:33 PM
To: Debbie Schreiner
Subject: Fwd: RD meeting with Lloyd Dorsey

Debbie,

FYI, I wanted to let you know in case you needed to put it into Noreen's schedule.

Thanks,

c

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Ph: (303)236-4344 Fax: (303)236-4792
Cell: (303)720-3701
e-mail: carl_millegan@fws.gov

From: Will Meeks
To: Noreen Walsh
Subject: RE: RD meeting with Lloyd Dorsey
Date: Monday, February 03, 2014 12:02:25 PM

Correct.

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Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
NWRS and PFW
303-236-4303 (work)
720-541-0310 (cell)

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To: Will Meeks
Subject: FW: RD meeting with Lloyd Dorsey

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Mountain-Prairie Region
U. S. Fish and Wildlife Service

303 236 7920

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Sent: Monday, February 03, 2014 10:13 AM
To: Noreen Walsh
Subject: FW: RD meeting with Lloyd Dorsey

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To: Debbie Schreiner
Subject: Fwd: RD meeting with Lloyd Dorsey

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steve_kallin@fws.gov

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Carl Millegan
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Mountain Prairie Region, 6

134 Union Blvd.
Lakewood, CO 80228
Ph: (303)236-4344 Fax: (303)236-4792
Cell: (303)720-3701
e-mail: carl_millegan@fws.gov

From:	Cole, Eric
To:	Bryan Yetter; troffe@exchange.montana.edu; Aly Coutemanch; Amanda Soliday; Arnie Dood; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Cris Dippel; Daniel Huckel; Daniel Sharps; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Nathaniel Reed; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan Patla; Terry Roper; Tim Fuchs; Tim Pratt; Tom Ninnemann; Tom Reed; Ture Schoultz; Wayne King
Subject:	2/3/14 National Elk Refuge Biological Update
Date:	Monday, February 03, 2014 4:21:36 PM

2/3/14 National Elk Refuge Biological Update

Supplemental Feeding

As part of ongoing efforts to determine when supplemental feeding is necessary. I evaluated snow and forage conditions with Aly Courtemanch of WGFD on Friday January 31, and available forage at most index sites was near or below the threshold level of 300 lbs/acre. Although remaining forage was higher in wet meadow areas north of Nowlin Creek, large numbers of elk have been foraging in this area. We predicted that remaining forage reserves would last only a few more days and recommended that supplemental feeding begin on Tuesday, February 4. Refuge manger Steve Kallin and WGFD supervisor Tim Fuchs accepted this recommendation.

The timing of supplemental feeding is influenced by 3 factors
1)Amount of forage produced the previous growing season: Although irrigation increased forage production by 12%, precipitation was below average in each month of the growing season from May through August. As a result overall refuge forage production was 23% below average.

2)The number of elk and bison and the duration of time that they spend on NER: There were relatively low numbers of elk and bison on NER during the fall and early winter. The NER elk season ran through December 15, and as a result there were not significant elk congregations on NER until December 11. The NER bison season ran until January 12, and there were not significant sustained bison concentrations until the third week of January. With elk and bison spending little time on NER, less forage was consumed during the fall and early winter period.

3)Snow conditions: Refuge staff has consistently monitored daily snow-pack depths at NER headquarters since 2008, and 2014 daily snow depths were well below average until January 30, 2014, when snow depths increased to just below average. Low snow depths in December and January allowed elk and bison to easily access forage in most areas on the south end of the refuge.

In summary relatively low numbers of elk and bison and below average snow pack depths allowed us to delay supplemental feeding roughly a week later than the long term average despite below average forage production in the 2013 growing season.

Elk and Bison Numbers and Distribution

Field estimates suggested that there were approximately 6,000 elk and 600 bison using the south end of NER on 1/31/14. Photos were taken concurrent with field estimates which will allow much more precise counts, but these photo estimates have not been completed yet. Classification counts for elk and bison will also be conducted in mid-February in cooperation with WGFD and Grand Teton National Park staff, which will provide additional information on elk and bison numbers. Typically the number of elk and bison on feed increases as the season progresses.

Pronghorn

I counted approximately 50 pronghorn on 1/31/14. They were located in the Flat Creek Riparian area north of Poverty Flats. As mentioned in previous updates, they have failed to migrate out of Jackson Hole, and winter survival for pronghorn that fail to migrate is poor under even average snow conditions.

Wolves

Based on telemetry information from radio collars, the Pinnacle Peak Pack has been regularly active on and around the refuge since late December 2013. With the exception of an observation of 4 wolves on Miller Butte on 1/14/14. they have mainly been active at night.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.733.9212 ext. 7

From: Paul Santavy
To: Will Meeks; Carl Millegan
Subject: Fwd: NER news release: Supplemental Feeding to Begin This Week
Date: Monday, February 03, 2014 7:58:43 PM

Sent from my iPhone

Begin forwarded message:

> **From:** "Iverson, Lori" <lori_iverson@fws.gov>
> **Date:** February 3, 2014 at 2:49:32 PM MST
> **To:** undisclosed-recipients:;
> **Subject: NER news release: Supplemental Feeding to Begin This Week**
>
> **National Elk Refuge News Release**
> US Fish & Wildlife Service
> Department of the Interior
>
> National Elk Refuge
> PO Box 510
> Jackson, Wyoming 83001
>
> Lori Iverson / 307.733.9212
>
> ---
>
> FOR IMMEDIATE RELEASE
> February 3, 2014 14-05
>
> **Supplemental Feeding to Begin This Week**
>
> National Elk Refuge and Wyoming Game & Fish Department wildlife managers have determined that available forage on the Refuge has declined to levels where supplemental feeding of elk and bison is necessary. The winter feeding program is scheduled to begin on Tuesday, February 4. Approximately 6,000 elk and 600 bison are currently wintering on the Refuge.
>
> Wildlife managers announced last week that despite low forage production due to drought during the 2013 growing season, enough available grasses and other herbaceous vegetation could delay feeding beyond the nearly 20–year average start date. The Refuge's management strategy attempts to reduce the need for supplemental feeding in order to minimize the time bison and elk are concentrated on the feed lines, thus reducing the potential for disease transmission.
>
> Biologists returned to forage monitoring sites late last week to reassess conditions after the passing of winter storm that brought both snow and

cold temperatures to the area. Most of the evaluated sites were at or approaching an established threshold of 300 pounds of forage per acre. The wet meadows north of Nowlin Creek and west of the Poverty Flats management areas had the most available forage, but heavy elk use in these areas was resulting in declining amounts of natural food sources. The amount of remaining forage is one criteria used to decide when supplemental feeding may be necessary.

The February 4 feeding start date is one week later than the 1995–2013 average, and 11 days later than the 10–year average. The start date, ranging from December 31 to February 28, varies widely based on winter severity and available forage. A January 29 news release includes more detailed information on producing, measuring and sampling forage on the National Elk Refuge. Photos of Refuge forage production and sampling are available on the National Elk Refuge photo gallery.

- FWS -

Lori Iverson
Outreach & Visitor Services
U.S. Fish & Wildlife Service
National Elk Refuge
PO Box 510 / 675 East Broadway
Jackson, WY 83001
Phone: 307.733.9212, ext 6
Cell: 307.690.4375
Fax: 307.733.9729
lori_iverson@fws.gov
National Elk Refuge photo gallery
National Elk Refuge web page

"There are some things you best learn in calm, and some in storm." -- Willa Cather

From:	Will Meeks
To:	Noreen Walsh; Matt Hogan
Subject:	Fwd: NER news release: Supplemental Feeding to Begin This Week
Date:	Monday, February 03, 2014 8:09:33 PM

FYI

Will Meeks
U.S. Fish and Wildlife Service
R6 - Assistant Regional Director
NWRS and PFW
303-236-4303

Begin forwarded message:

From: Paul Santavy <paul_santavy@fws.gov>
Date: February 3, 2014, 7:58:40 PM MST
To: Will Meeks <will_meeks@fws.gov>, Carl Millegan <carl_millegan@fws.gov>
Subject: Fwd: NER news release: Supplemental Feeding to Begin This Week

Sent from my iPhone

Begin forwarded message:

From: "Iverson, Lori" <lori_iverson@fws.gov>
Date: February 3, 2014 at 2:49:32 PM MST
To: undisclosed-recipients:;
Subject: NER news release: Supplemental Feeding to Begin This Week

National Elk Refuge News Release
US Fish & Wildlife Service
Department of the Interior

National Elk Refuge
PO Box 510
Jackson, Wyoming 83001

Lori Iverson / 307.733.9212

FOR IMMEDIATE RELEASE
February 3, 2014 14-05

Supplemental Feeding to Begin This Week

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- FWS -

Lori Iverson
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National Elk Refuge
PO Box 510 / 675 East Broadway
Jackson, WY 83001
Phone: 307.733.9212, ext 6
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Fax: 307.733.9729
lori_iverson@fws.gov
National Elk Refuge photo gallery
National Elk Refuge web page

"There are some things you best learn in calm, and some in storm." -- Willa Cather

From:	Debbie Schreiner
To:	Carl Millegan
Cc:	Will Meeks; Paul Santavy
Subject:	RE: RD meeting with Lloyd Dorsey
Date:	Friday, February 07, 2014 8:55:47 AM

Noreen would like talking points for the meeting with Lloyd Dorsey. Please email them to me and Noreen by COB Monday, February 10. Thanks.

From: Millegan, Carl [mailto:carl_millegan@fws.gov]
Sent: Friday, January 31, 2014 3:33 PM
To: Debbie Schreiner
Subject: Fwd: RD meeting with Lloyd Dorsey

Debbie,

FYI, I wanted to let you know in case you needed to put it into Noreen's schedule.

Thanks,

c

---------- Forwarded message ----------
From: **Steve Kallin** <steve_kallin@fws.gov>
Date: Wed, Jan 29, 2014 at 12:00 PM
Subject: RD meeting with Lloyd Dorsey
To: Carl Millegan <carl_millegan@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>

Carl:

I just confirmed that Lloyd Dorsey is available on Thursday, February 13 to meet with Noreen at the NER from 10:00 AM to 11:00 AM.

He asked to expand this meeting and broaden the conversation to include the following organizations:

-Jackson Hole Conservation Alliance, Wildlands Director Siva Sundaresan
-National Park Conservation Association, Grand Teton Senior Program Manager Sharon Mader
-Sierra Club, Teton Group Chairman John Spahr and Bonnie Rice

Lloyd would propose to discuss 2-3 topics during this period. If this isn't desirable, he would still be happy to come himself.

Because the meeting with Lloyd was requested by Noreen, I'm not sure exactly what she wants to accomplish during the meeting. So I am requesting guidance concerning the request to broaden the meeting.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

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Carl Millegan
Acting Refuge Supervisor MT/WY/UT
U.S.Fish and Wildlife Service
Mountain Prairie Region, 6
134 Union Blvd.
Lakewood, CO 80228
Ph: (303)236-4344 Fax: (303)236-4792
Cell: (303)720-3701
e-mail: carl_millegan@fws.gov

From: Millegan, Carl
To: Debbie Schreiner
Cc: Will Meeks; Paul Santavy
Subject: Re: RD meeting with Lloyd Dorsey
Date: Friday, February 07, 2014 9:02:19 AM

Steve and I are working on them. We will have them soon.

Thanks,

c

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e-mail: carl_millegan@fws.gov

From:	Debbie Schreiner
To:	Carl Millegan
Cc:	Will Meeks; Paul Santavy
Subject:	RE: RD meeting with Lloyd Dorsey
Date:	Monday, February 10, 2014 10:27:48 AM

Noreen also wanted to know the agenda for Wednesday, February 12.

From: Millegan, Carl [mailto:carl_millegan@fws.gov]
Sent: Friday, February 07, 2014 9:02 AM
To: Debbie Schreiner
Cc: Will Meeks; Paul Santavy
Subject: Re: RD meeting with Lloyd Dorsey

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Thanks,

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e-mail: carl_millegan@fws.gov

From:	Millegan, Carl
To:	Debbie Schreiner; Noreen Walsh
Cc:	Will Meeks; Paul Santavy; Steve Kallin
Subject:	Re: RD meeting with Lloyd Dorsey
Date:	Monday, February 10, 2014 2:04:55 PM
Attachments:	GYC-NER letter 11-26-13_final.pdf National Elk Refuge Elk Feeding Program Tour Agenda February 11-13-2014.docx Talking Points Dorsey mtg 2-13-2014.docx

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Debbie and Noreen,

Please find attached three documents for Noreen's visit to National Elk Refuge this week.

A draft agenda for her time in Jackson, Wyoming.

A letter from the Greater Yellowstone Coalition RE: Elk Winter Feeding Program at National Elk Refuge.

Talking points for the meeting with Lloyd Dorsey.

Thanks and we look forward to seeing Noreen tomorrow evening. My cell phone number in case you need it (303)720-3701

c

On Mon, Feb 10, 2014 at 10:27 AM, Debbie Schreiner <Debbie_Schreiner@fws.gov> wrote:

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> **To:** Debbie Schreiner
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Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

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Jackson, WY 83001

Phone: (307) 733-9212, extension 2

Fax: (307) 733-9729

steve_kallin@fws.gov

--

Carl Millegan

Acting Refuge Supervisor MT/WY/UT

U.S.Fish and Wildlife Service

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e-mail: carl_millegan@fws.gov

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e-mail: carl_millegan@fws.gov

Greater Yellowstone Coalition
America's Voice for a Greater Yellowstone | LANDS • WATERS • WILDLIFE

November 26, 2013

Noreen Walsh, Region 6 Director
U.S. Fish and Wildlife Service
134 Union Blvd
Lakewood, CO 80228

Dear Director Walsh:

We respectfully submit the enclosed petition with signatures from more than 18,000 supporters of the Greater Yellowstone Coalition (GYC) supporting the USFWS in phasing out winter feeding on the National Elk Refuge. GYC has a long history of participation in the Bison and Elk Management Plan EIS process, helping educate the public to voice informed opinions, and seeking collaborative solutions to multifaceted challenges concerning the management of wildlife on and around the National Elk Refuge.

The public realizes the science is clear, that continued feeding on the Elk Refuge places world-class wildlife at risk of various diseases, with the spector of Chronic Wasting Disease (CWD) in the future. Such concentrations of elk drawn by the feeding program also harms habitat for other wildlife species. Experts within and outside the USFWS agree that the best solution is to phase out feeding and return this area to as natural a condition as possible.

GYC stands ready to assist the USFWS in phasing out winter feeding on the Elk Refuge. We have held community meetings about the impending significant changes in managing elk and bison in Jackson Hole without winter feeding. We have pledged to secure funding to help construct elk-proof fences to prevent comingling with nearby livestock during winter. We have submitted science-based comments and proposed pilot projects to the

Bridger-Teton Forest and the State of Wyoming to help phase out state-operated feedgrounds in the Gros Ventre Valley.

Our 40,000 members and supporters and the more than 18,000 individual signatures on the enclosed petition, support the USFWS in phasing out winter feeding of elk and bison on the National Elk Refuge. We believe we share a common goal in maintaining a healthy and vibrant elk population in western Wyoming. We look forward to working with Refuge Manager Steve Kallin to achieve this important goal.

With the highest regard,

Caroline Byrd, Executive Director
Greater Yellowstone Coalition
215 S. Wallace Ave
Bozeman, MT 59715
406-586-1593
cbyrd@greateryellowstone.org

Cc:

Jeff Rupert, Chief, Division of Natural Resources & Conservation Planning, National Wildlife Refuge System, USFWS

Steve Kallin, Manager, National Elk Refuge, USFWS

National Elk Refuge Elk Feeding Program Tour

Tuesday February 11, 2014

9:00PM Pick up RD Noreen Walsh at the Jackson Hole, WY Airport and take her to the Lexington Hotel.

Wednesday February 12, 2014

7:30AM – 11:30AM Elk Feeding Program Tour with Refuge Manager Steve Kallin

11:30AM – 1:00PM Follow-up Q&A/Working Lunch

1:00PM – 2:00PM Tour Refuge Visitor Center

2:00PM – 4:00PM Visit with Refuge Staff and Volunteers at Refuge Headquarters

4:00PM Through rest of evening – Dinner with Steve Kallin (Time and Place TBD)

Thursday February 13, 2014

8:00AM – 10:00AM General follow-up regarding Elk Feeding Program and Preparation for Meeting with Lloyd Dorsey.

10:00AM – 11:00AM Meeting with Lloyd Dorsey

11:00AM – 12:00AM Early Lunch and head to Airport

Flight back to Denver departs at 1:26PM.

Talking Points for 2/13/2014 meeting with Lloyd Dorsey at the National Elk Refuge

1. Discussion of the November 26, 2013 letter from GYC to Noreen Walsh with 18,000 + signatures. (letter attached)

-Thank you for letter summarizing GYC membership support instead of continual form emails.

-Appreciate GYC interest and commitment to healthy elk herds in WY and support for meeting goals outlined in the Bison and Elk Management Plan.

-Look forward to working with GYC to reach mutually beneficial goals. Consider involving NER in public educational outreach and events.

-NER will continue to implement actions to achieve goals as outlined in the BEMP. Currently working with agency partners to develop an Adaptive Management Plan (AMP) to garner consent and support for management actions to achieve BEMP goals.

2. Discussion of potential opportunities to reduce livestock/wildlife conflicts on private lands near the Elk Refuge.

-The NER is working to develop private conservation easements with the goal of eliminating the co-mingling conflict and allow elk to disperse away from the NER.

-Can GYC provide funds to support private conservation easements and/or letters of support for funding applications?

-How much funding can GYC provide for private fencing to prevent co-mingling?

3. Elk Refuge CCP timing.

-Draft CCP should be available for public comment by June 1, 2014 if not sooner.

-Would you like to be notified?

From:	Steve Kallin
To:	Tim Fuchs; Doug Brimeyer; Steve Cain; Sarah Dewey; Dale Deiter; Kerry Murphy; Jeffrey Warren; Cris Dippel; Eric Cole
Subject:	Rescheduled Bison & Elk AMP Meeting; Monday, February 24, 12:30-4:00 PM
Date:	Friday, February 14, 2014 9:17:17 AM

Hi All:

Sorry for the last minute cancellation yesterday. Hopefully the weather will cooperate more the next time we try to meet.

Our last Doodle Poll showed Monday, February 24 from 12:30 PM to 4:00 PM as open for nearly everyone. So, I would like to reschedule our cancelled meeting for that time. I understand that schedules change quickly, so please drop me a quick email at your earliest convenience and let me know if you are still able to attend at that time. Hopefully this time still works because the last Doodle Poll showed the month of March was almost entirely unavailable due to conflicts.

Thanks again, look forward to hearing from you.

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Will Meeks
To: Santavy, Paul
Subject: Re: Adaptive Management Plan Summary and Timeline
Date: Wednesday, February 19, 2014 12:07:03 PM

Exactly. I think we could have helped though by only giving her the info she asked for and needed.

Will Meeks
U.S. Fish and Wildlife Service
R6 - Assistant Regional Director
NWRS and PFW
303-236-4303 (w)
720-541-0310 (c)

On Feb 19, 2014, at 12:06 PM, "Santavy, Paul" <paul_santavy@fws.gov> wrote:

> I agree, but she did directly ask him for a copy, so I see why he gave it to her.
>
> Many different parts to this, I think the date that best represents what she is looking for (an Adaptive Management plan...) is the 6/1 date. The others are components.
>
> _____
> **PAUL SANTAVY**, *CFP, AWB*
> Deputy Assistant Regional Director
> NWRS and PFW
> Mountain-Prairie Region
> U.S. Fish & Wildlife Service
> Phone: 303-236-4304
> Cell: 303-515-0809
>
> On Wed, Feb 19, 2014 at 12:00 PM, Will Meeks <will_meeks@fws.gov> wrote:
>> I wish he hadn't sent this without coordinating with us first. I will look at the details but she will not accept a end of CY as a deadline. At least that's my hunch.
>>
>> Will Meeks
>> U.S. Fish and Wildlife Service
>> R6 - Assistant Regional Director
>> NWRS and PFW
>> 303-236-4303 (w)
>> 720-541-0310 (c)
>>
>> Begin forwarded message:
>>
>> **From:** Steve Kallin <steve_kallin@fws.gov>
>> **Date:** February 19, 2014 at 11:48:21 AM MST
>> **To:** Noreen Walsh <noreen_walsh@fws.gov>
>> **Cc:** Carl Millegan <carl_millegan@fws.gov>, Paul Santavy

<paul_santavy@fws.gov>, Will Meeks <will_meeks@fws.gov>, Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>, Jeffrey Warren <jeffrey_warren@fws.gov>
Subject: Adaptive Management Plan Summary and Timeline

Hi Noreen:

Attached is a one page overview of the Bison and Elk Adaptive Management Planning (AMP) effort per our conversation last week. This summary was written by Jeff Warren,(Area Wildlife Biologist, Red Rock Lakes NWR) who is doing a stellar job facilitating this effort. The "Projected Completion Dates" will be discussed in more detail with the AMP team at our next meeting on Feb. 24. I will give you an update on changes to those dates next week.

Thanks again for visiting. We enjoyed having you become acquainted with the NER,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 733-9212, extension 2

Fax: (307) 733-9729

steve_kallin@fws.gov

<NER_Summary_2_13_2014_DRAFT.docx>

From: Will Meeks
To: Paul Santavy
Subject: Fwd: Adaptive Management Plan Summary and Timeline
Date: Wednesday, February 19, 2014 12:00:12 PM

I wish he hadn't sent this without coordinating with us first. I will look at the details but she will not accept a end of CY as a deadline. At least that's my hunch.

Will Meeks
U.S. Fish and Wildlife Service
R6 - Assistant Regional Director
NWRS and PFW
303-236-4303 (w)
720-541-0310 (c)

Begin forwarded message:

> **From:** Steve Kallin <steve_kallin@fws.gov>
> **Date:** February 19, 2014 at 11:48:21 AM MST
> **To:** Noreen Walsh <noreen_walsh@fws.gov>
> **Cc:** Carl Millegan <carl_millegan@fws.gov>, Paul Santavy <paul_santavy@fws.gov>, Will Meeks <will_meeks@fws.gov>, Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>, Jeffrey Warren <jeffrey_warren@fws.gov>
> **Subject: Adaptive Management Plan Summary and Timeline**
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> Hi Noreen:
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> Steve Kallin
> Project Leader
> National Elk Refuge
> PO Box 510
> 675 East Broadway
> Jackson, WY 83001
> Phone: (307) 733-9212, extension 2
> Fax: (307) 733-9729
> steve_kallin@fws.gov
>
> <NER_Summary_2_13_2014_DRAFT.docx>

From: Santavy, Paul
To: Will Meeks
Subject: Re: Adaptive Management Plan Summary and Timeline
Date: Wednesday, February 19, 2014 12:06:16 PM

I agree, but she did directly ask him for a copy, so I see why he gave it to her.

Many different parts to this, I think the date that best represents what she is looking for (an Adaptive Management plan...) is the 6/1 date. The others are components.

_____
PAUL SANTAVY, *CFP, AWB*
Deputy Assistant Regional Director
NWRS and PFW
Mountain-Prairie Region
U.S. Fish & Wildlife Service
Phone: 303-236-4304
Cell: 303-515-0809

On Wed, Feb 19, 2014 at 12:00 PM, Will Meeks <will_meeks@fws.gov> wrote:

> I wish he hadn't sent this without coordinating with us first. I will look at the details but she will not accept a end of CY as a deadline. At least that's my hunch.
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> Will Meeks
> U.S. Fish and Wildlife Service
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> 303-236-4303 (w)
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> Begin forwarded message:
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> > **Date:** February 19, 2014 at 11:48:21 AM MST
> > **To:** Noreen Walsh <noreen_walsh@fws.gov>
> > **Cc:** Carl Millegan <carl_millegan@fws.gov>, Paul Santavy <paul_santavy@fws.gov>, Will Meeks <will_meeks@fws.gov>, Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>, Jeffrey Warren <jeffrey_warren@fws.gov>
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Thanks again for visiting. We enjoyed having you become acquainted with the NER,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 733-9212, extension 2

Fax: (307) 733-9729

steve_kallin@fws.gov

<NER_Summary_2_13_2014_DRAFT.docx>

From: Noreen Walsh
To: Steve Kallin
Cc: Carl Millegan; Paul Santavy; Will Meeks; Cris Dippel; Eric Cole; Jeffrey Warren
Subject: Re: Adaptive Management Plan Summary and Timeline
Date: Wednesday, February 19, 2014 12:29:11 PM

Thank you so much Steve, and Jeff! This is very helpful and I appreciate you sharing it so I can do my best to support you efforts. The visit was great and I appreciate you taking time out of your busy schedule to show me around. You all are doing phenomenal work in a challenging situation. I'm proud and appreciative of the whole team.

All my best,
Noreen

Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service

On Feb 19, 2014, at 11:48 AM, Steve Kallin <steve_kallin@fws.gov> wrote:

> Hi Noreen:
>
> Attached is a one page overview of the Bison and Elk Adaptive Management Planning (AMP) effort per our conversation last week. This summary was written by Jeff Warren, (Area Wildlife Biologist, Red Rock Lakes NWR) who is doing a stellar job facilitating this effort. The "Projected Completion Dates" will be discussed in more detail with the AMP team at our next meeting on Feb. 24. I will give you an update on changes to those dates next week.
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> Project Leader
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> Fax: (307) 733-9729
> steve_kallin@fws.gov
>
> <NER_Summary_2_13_2014_DRAFT.docx>

From:	Steve Kallin
To:	Dale Deiter; Kerry Murphy; Steve Cain; Sarah Dewey; Tim Fuchs; Doug Brimeyer; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Kallin
Subject:	DOODLE POLL - Bison & Elk AMP meeting
Date:	Tuesday, February 25, 2014 10:54:04 AM

The Doodle Poll link below is for our next AMP meeting in either late March or April. Please reply at your earliest convenience.

http://doodle.com/vdx4k44xu57iehit

Thanks again for your time and contributions toward this effort.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Doodle
To: Steve Kallin
Subject: Doodle: "Bison & Elk Adaptive Management Meeting; March/April" Update
Date: Thursday, February 27, 2014 11:56:47 AM

View this poll on your dashboard

Hi Steve Kallin,

"Jeff" just provided information to the poll "Bison & Elk Adaptive Management Meeting; March/April."

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Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "Bison & Elk Adaptive Management Meeting; March/April" Update
Date: Friday, February 28, 2014 3:46:24 PM

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Hi Steve Kallin,

"Doug Brimeyer" just provided information to the poll "Bison & Elk Adaptive Management Meeting; March/April."

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Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Steve Kallin
To:	Carl Millegan
Cc:	Paul Santavy; Mike Blenden; Cris Dippel; Eric Cole
Subject:	FW: article on Alakali Feedgrounds
Date:	Monday, March 03, 2014 9:14:26 AM
Attachments:	Alkali Feedground Scoping Comments 5-8-2012.doc Alakali Creek Feedground SEIS - DOI Comments.pdf

Carl:

Attached are scoping comments I provided the Bridger-Teton National Forest concerning the Alkali Feedground. Also attached are the final joint comments from the National Park Service and the U.S. Fish and Wildlife Service. I worked with Dave Carlson (Ecological Services, R-6) and Ryan Manello (National Park Service) for the consolidated comments from the Dept. of Interior.

Also, be aware that our elk and bison classification counts have shown that we have 8,300 elk and 786 bison on the NER! We have had a relatively mild winter until shortly after your visit when snowfall increased significantly, pushing more elk down onto the refuge. (http://www.jhnewsandguide.com/news/environmental/births-factor-in-surge-in-refuge-elk-numbers/article_7845100f-cf5a-5fe8-adf0-32a5b82913dc.html). We met with the WGFD last week to discuss season setting for the elk reduction program on the Grand Teton National Park, the NER and surrounding lands. At that time they were unable to quantify how many elk drifted down to the NER from the Gros Ventre River feedgrounds. An unofficial estimate by one WGFD employee was 900. They will be flying to complete the classification count in the Gros Ventre as soon as weather permits, and then be able to provide a survey-based estimate of the number of elk leaving the Gros Ventre for the NER.

The Alkali feedground is the closest to the NER of the three WGFD feedgrounds in the Gros Ventre. It is the last chance to stop elk from a down drainage movement to the NER. Unfortunately, it appears it was not completely effective this year. I'm afraid now that more Gros Ventre elk have discovered the NER feedgrounds, that we will be struggling with an even higher percentage of the North Jackson Elk Herd coming to the NER. Historically, about 65% of the North Jackson Elk Herd winters on the NER.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Noreen Walsh [mailto:noreen_walsh@fws.gov]
Sent: Monday, March 03, 2014 7:34 AM
To: Will Meeks; marla Trollan; Paul Santavy; Steve Kallin
Cc: Matt Hogan

Subject: article on Alakali Feedgrounds

I believe while visited with Steve recently, he indicated we had also recently commented on the BTNF DEIS and plans to renew the permit for this feedground (but correct me if I am wrong).

Let's be ready for media interest in our role and/or position on this topic, which will only get hotter as time goes by. Keep me posted. (and thanks for your note this weekend Steve.)

http://www.jhnewsandguide.com/opinion/columnists/the_new_west_todd_wilkinson/alkali-feedground-puts-b-t-in-hot-seat/article_4530c45c-2866-5017-9b0d-8ceac3845f24.html

thanks,
Noreen

Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service

303 236 7920

The Mountain-Prairie Region of the U. S. Fish and Wildlife Service: *We provide conservation stewardship of some of America's most scenic lands, to ensure healthy fish and wildlife for the enjoyment and benefit of all people.*

United States Department of the Interior

FISH AND WILDLIFE SERVICE
NATIONAL ELK REFUGE
675 E. Broadway
Jackson, WY 83001
(307) 733-9212 extension 2
FAX (307) 733-9729

May 10, 2012

Forest Supervisor
Bridger-Teton National Forest
P.O. Box 1888
Jackson, WY 83001

This letter provides comments concerning the Bridger-Teton National Forest proposed action to authorize the continued use of National Forest Lands, specifically the Alkali Creek site, by the Wyoming Game and Fish Commission (WGFC) for winter elk feeding and related management programs.

The migratory nature of the Jackson Elk Herd and their seasonal movements across a variety of federal, state and private land ownership boundaries has inexorably linked multiple land management agencies to the management of this herd. Experience has shown that use of the Alkali Creek site as a winter feedground for elk can have an impact on the elk management goals and objectives for the National Elk Refuge as outlined in the 2007 Bison and Elk Management Plan.

We strongly recommend that you broaden the "topics to be considered" in the Supplemental EIS for the Alkali Creek feedground proposal to include the following:

- Impacts of this action on the goals and objectives outlined in the 2007 Bison and Elk Management Plan for the National Elk Refuge and the Grand Teton National Park.

- The impacts of winter supplemental feeding or the cessation thereof, on down drainage elk migration from the Gros Ventre valley to the National Elk Refuge.

- The impacts of wolf activity and their effects on elk distribution within the Gros Ventre River Valley and resulting elk movement to the National Elk Refuge.

- The flexibility of a review every five years to evaluate changes in elk population size, habitat conditions and disease threats which may impact the management of the Jackson Elk Herd, and influence the continued authorization of the use of the Alkali Creek feedground for winter elk feeding. This review should include land management agencies which have Jackson Elk Herd management responsibilities such as: The

Bridger-Teton National Forest, the Wyoming Game and Fish Department, the Grand Teton National Park and the National Elk Refuge.

The National Elk Refuge stands ready to provide additional information concerning its elk management goals and objectives and the possible impacts of approving or denying use of the Alkali Creek feedground on the NER elk management program.

Sincerely,

Steven W. Kallin
Refuge Manager

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Denver Federal Center, Building 67, Room 118
Post Office Box 25007 (D-108)
Denver, Colorado 80225-0007

June 3, 2013

9043.1
ER 13/0239

Ms. Cheryl Probert
Acting Forest Supervisor
Bridger-Teton National Forest
340 N. Cache
Jackson, WY 83001

Dear Ms. Probert,

The Department of the Interior has reviewed the Supplemental Revised Final Environmental Impact Statement, Long Term Special Use Authorization for the Wyoming Game and Fish Commission to Use National Forest System Land for Winter Elk Management Activities at Alkali Creek Feedground. The National Park Service (NPS) and US Fish and Wildlife Service (USFWS) submit the following consolidated comments.

COMMENTS

The North Jackson Elk Herd, including those that winter in the Gros Ventre River drainage at the Alkali Creek Feedground, share summer and winter range areas with other herd segments in Grand Teton (GTNP) and Yellowstone National Parks and the USFWS' National Elk Refuge (NER). Past work has made it clear that management of elk in one portion of the herd can also affect other segments. Thus, the National Park Service and NER have a strong vested interest in adopting coordinated and consistent management strategies for this herd.

The GTNP and NER, in cooperation with the Wyoming Game and Fish Department (WGFD), completed a Bison and Elk Management Plan (BEMP) in 2007. The BEMP acknowledged that brucellosis transmission among elk is generally thought to be largely influenced by high concentrations of elk associated with winter feeding programs. Similarly, elk concentrated on feedgrounds is likely to facilitate the spread of chronic wasting disease (CWD) when it reaches this area. As such, an overarching strategy to achieve the goals of the BEMP is to reduce reliance on winter supplemental feeding of bison and elk, and to transition to complete reliance on natural standing forage at an undetermined time in the future. Reduced reliance on supplemental feeding is to be achieved by increasing natural standing forage on the GTNP and

the NER, reducing the bison herd to 500 animals, and reducing the number of elk receiving supplemental feed on the NER to 5,000.

We recommend the USFS, in conjunction with WGFD, consider some of these same goals for the Alkali Creek Feedground permit. For example, working with WGFD, the BEMP adopted a strategy to phase in a transition to reliance on native forage by installing new irrigation systems to improve forage production on the NER, and the NPS initiated habitat restoration to improve native plant communities that support elk and bison on transitional ranges. The BEMP also outlined a range of goals that are being implemented to address disease concerns, including, but not limited to, reducing elk and bison numbers and wintering densities, changing feeding sites daily, separating elk and bison, and feeding along meandering lines. The BEMP called for identifying criteria, in collaboration with WGFD, that would determine factors such as feeding initiation date, season length, daily ration, and winter conditions under which feeding would be necessary. We recommend the USFS adopt a similar approach for the Alkali Creek Feedground.

As in the BEMP, we also recommend the USFS work with WGFD to develop a structured framework to coordinate feeding efforts with other feedgrounds in the area. Without such actions, elk management on the Alkali Creek Feedground may negatively impact the management of elk on the NER and Yellowstone and Grand Teton National Parks. For example, GPS elk tracking data have demonstrated an exchange of elk between the Alkali Creek Feedground and the NER during winter months. In addition, experience has shown that if supplemental feeding is not synchronized between these two sites, elk can drift down valley from Alkali Creek to the NER. This can substantially increase the number of elk on the NER and could prevent population objectives outlined in the BEMP from being achieved.

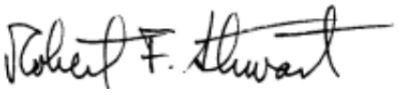
Due to population goals and disease concerns, we recommend USFS incorporate conditions in the permit that will 1) reduce long-term reliance on supplemental feed to support wintering elk and 2) incorporate a more coordinated response when CWD is found in the feedground. Elk exchange between these two feedgrounds can also play a role in spreading diseases from one site to another. Elk infected with chronic wasting disease (CWD) have the potential to contaminate a feedground in the long-term with prions, which could transmit the disease to elk using that site in the future. Should either the Alkali Creek Feedground or the NER become contaminated with CWD prions, transportation of this disease or other diseases could occur between feedgrounds and impact wintering elk at both sites. Coupled with reduced supplemental feeding, we also recommend USFS explore measures to reduce the need for elk feeding as a means to prevent commingling with livestock. Under the BEMP, for example, FWS and the NPS will be working with private and agency partners to minimize bison and elk conflicts with adjacent land owners (e.g. by providing human and/or financial resources to manage commingling and reduce crop depredation by elk and/or bison on private lands). Specifically, these measures could involve establishing goals to fence elk out of livestock feed areas and stock yards in cooperation with the WGFD and adjacent livestock producers.

Finally, we recommend that extension of the Alkali Creek Feedgrounds be coordinated with other agencies who share management responsibilities for the North Jackson Elk Herd. We recommend that the USFS conduct a review of elk management practices for Alkali Creek every five years with participation by the GTNP, Yellowstone National Park and the NER. This

review should attempt to identify changing conditions, threats and corresponding management alternatives that could be used to compliment and support efforts to achieve the goals outlined in the Bison and Elk Management Plan and maintain a healthy, viable North Jackson Elk Herd.

Please contact Ryan Monello, Wildlife Biologist in the NPS' Biological Resource Management Division at telephone (970) 267-2170, and Steve Kallin at USFWS' NER at telephone (307) 733-9212, extension 2, if you have questions concerning these comments.

Sincerely,



Robert F. Stewart
Regional Environmental Officer

cc: Pam Bode, Team Leader

From: Steve Kallin
To: Eric Cole
Cc: Cris Dippel; Lori Iverson; Daniel Sharps
Subject: RE: Predicting NER feeding end date: contingency plans for while I"m on leave
Date: Monday, March 03, 2014 10:52:12 AM

Eric:

Good info which we will consider during your absence.

Also, on a somewhat related note. We will need to continue elk counts into April to determine if the Bike Path will open on May 1 or earlier.

Thanks,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Cole, Eric [mailto:eric_cole@fws.gov]
Sent: Monday, March 03, 2014 10:23 AM
To: Steve Kallin; Cris Dippel; Aly Coutemanch; Doug Brimeyer; Tim Pratt
Subject: Predicting NER feeding end date: contingency plans for while I'm on leave

Given that I will be on leave and out of the area from March 23 through April 3, there is a high probability that feeding on the refuge might end during my absence.

Determining feeding cessation date on the refuge has been even more subjective than determining feeding initiation date, with the elk generally telling us when it is time to quit based on their behavior.

However there might be a more defensible way to determine when feeding cessation should occur. I have been making consistent daily snow depth measurements at NER headquarters for the past seven years, and it appears that the first day that zero snow is measured at this site is strongly correlated with feeding end date (The last day of feeding is approximately a week after the first day zero snow is detected at the headquarters monitoring site). Please see the attached spreadsheet, which documents this effect.

My recommendation is for my technician Tim Pratt to monitor daily snow depth at the headquarters site in my absence and inform you all and the refuge feeders when this occurs. At that time the feeders will begin scaling back feed rations over a week so that 1 week following the first day of zero snow measurement will be the last day of feeding. Elk will be fed approximately 2 pounds per animal on the last day of feeding.

Let me know what you think

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.733.9212 ext. 7

From: Doodle
To: Steve Kallin
Subject: Doodle: "Bison & Elk Adaptive Management Meeting; March/April" Update
Date: Tuesday, March 04, 2014 3:56:51 PM

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Hi Steve Kallin,

"Tim Fuchs" just provided information to the poll "Bison & Elk Adaptive Management Meeting; March/April."

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Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Steve Kallin
To:	Dale Deiter; Kerry Murphy; Steve Cain; Sarah Dewey; Tim Fuchs; Doug Brimeyer; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Kallin
Subject:	NEXT Bison & Elk AMP meeting on Monday, April 7 from 12:30 PM to 4:00 PM
Date:	Friday, March 07, 2014 1:09:18 PM

Hi All:

Thanks for responding to the Doodle Poll. The next AMP meeting will be scheduled for Monday, April 7 at 12:30 PM to 4:00 PM at the NER Headquarters. We will have an ample supply of "strong" coffee to ensure a lively and robust discussion for this afternoon meeting.

Thanks again for contributing your time and insights to this effort.

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

From:	Jeffrey Warren
To:	Steve Kallin
Subject:	RE: NEXT Bison & Elk AMP meeting on Monday, April 7 from 12:30 PM to 4:00 PM
Date:	Saturday, March 08, 2014 9:01:50 AM

Sounds good – do you know if there will be a room in the bunkhouse either the night before or after the meeting? Just in case there's a need for me to come in early or stay an extra day.

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Friday, March 07, 2014 1:09 PM
To: Dale Deiter; Kerry Murphy; Steve Cain; Sarah Dewey; Tim Fuchs; Doug Brimeyer; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Kallin
Subject: NEXT Bison & Elk AMP meeting on Monday, April 7 from 12:30 PM to 4:00 PM

Hi All:

Thanks for responding to the Doodle Poll. The next AMP meeting will be scheduled for Monday, April 7 at 12:30 PM to 4:00 PM at the NER Headquarters. We will have an ample supply of "strong" coffee to ensure a lively and robust discussion for this afternoon meeting.

Thanks again for contributing your time and insights to this effort.

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

From:	Cole, Eric
To:	Bryan Yetter; Tony Hough; Amanda Soliday; Chris Clapp; Cris Dippel; Daniel Sharps; Dave Dunlap; Fernando Escobedo; Steve Koob; Tim Pratt; Lori Iverson; Steve Kallin
Subject:	Feed Season End Date and other issues
Date:	Monday, March 17, 2014 11:21:51 AM

Given relatively warm temperatures and the pace of snow melt, I estimate that we have less than 2 weeks left in the feed season. Feeding end date is strongly correlated with snow pack depth at the refuge headquarters monitoring site. Typically on the first day that there is zero snow remaining at this site we begin scaling back feed rates, and at that point we have about 1 week left in the feed season. Current snow pack depth at the headquarters monitoring site is only 3".

I will be out of the area on leave from March 23 through April 3, and it is very likely that the gradual reduction in feeding rates and the last day of the feed season will occur in my absence. I have instructed Tim to monitor snow depths at the refuge headquarters while I am gone, and he will let you know when the first snow free day is. Beginning the first day following zero snow at HQ, feed rates will be reduced according to the following schedule:

Day 1= 7 lbs
Day 2= 7 lbs
Day 3= 6 lbs
Day 4= 5 lbs
Day 5= 4 lbs
Day 6= 3 lbs and completely feed out all trailers. Feed bins should be swept out prior to storage.

A few things to keep in mind as feed rates are reduced: Elk and bison distribution will become less and less predictable. It might not be possible to keep elk an bison groups where you want them, and if this is the case elk groups should be fed where they are. This might require more creative feeding and cooperation among feeders. For example the Flats Rig might need to come to Nowlin or vice verse to ensure elk are getting the appropriate ration. Do not waste time observing the herd (dump and run). As feed rates are reduced, only feed the bison that are likely to interfere with elk feeding operations. For example there is no need to wait 2 hours for all the bison to come over McBride ridge if the elk have already been adequately fed.

There is an error on the current feed schedule, and Cajun's last feed day will be March 28. Should feeding continue after that date is anyone available to cover the following feed dates?

Sat March 29 McBride
Wed April 2 Nowlin/HQ
Thu April 3 Nowlin/HQ
Fri Apr 4 Nowlin/HQ
Sat Apr 5 McBride
Wed Apr 9 Nowlin/HQ

Thanks,

Eric Cole
Refuge Biologist

U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.733.9212 ext. 7

From:	Jeffrey Warren
To:	Doug Brimeyer
Cc:	Steve Kallin; kmmurphy02@fs.fed.us; Sarah Dewey; Eric Cole; Scott Smith; Steven (Steve) Cain; Dale Deiter; Cris Dippel; Tim Fuchs
Subject:	RE: Bison population model
Date:	Friday, March 21, 2014 9:27:22 AM

Doug,

Thanks, this helps. I'll send an updated summary hopefully later today.

During a prior meeting I told a few of you that I would send along a recipe for venison/elk shanks – I finally remembered to scan it and have attached it for those interested.

Cheers,

Jeff

From: Doug Brimeyer [mailto:doug.brimeyer@wyo.gov]
Sent: Thursday, March 20, 2014 8:10 PM
To: Jeffrey Warren
Cc: Steve Kallin; kmmurphy02@fs.fed.us; Sarah Dewey; Eric Cole; Scott Smith; Steven (Steve) Cain; Dale Deiter; Cris Dippel; Tim Fuchs
Subject: Re: Bison population model

Jeff,
The ROD recognized Wyoming Game and Fish Commission primacy in setting a bison population objective, and recommended that a population objective of 500 bison would alleviate most concerns with maintaining adequate genetic variability into the future. The Wyoming Game and Fish Commission moved to adopt a post-season objective of 500 bison during their February 2008 meeting. If you need a reference we should be able to find this in the Commission meeting notes.

I attached some demographic data for you so you can get an idea on harvest levels, trend data and classifications.

On Mar 20, 2014 5:10 PM, "Jeffrey Warren" <jeffrey_warren@fws.gov> wrote:
Hello all,

I did a quick simulation of the Jackson Bison Herd to project its response to harvest. There are a few demographic rates (and SDs) that I could use information specific to the JBH, if available. Please take a look at the attached write-up and let me know if you have any data/thoughts/edits you'd like to share.

Cheers,

Jeff Warren
Wildlife Biologist
27650B South Valley Road
Lima, MT 59739

406 276-3536 ext. 304

“Without data, all you are is just another person with an opinion” – Unknown

“It’s tough to make predictions, especially about the future” – Yogi Berra

E-Mail to and from me, in connection with the transaction
of public business, is subject to the Wyoming Public Records
Act and may be disclosed to third parties.

From:	Murphy, Kerry M -FS
To:	Jeffrey Warren; Doug Brimeyer
Cc:	Steve Kallin; Sarah Dewey; Eric_Cole@fws.gov; Scott Smith; Steven (Steve) Cain; Deiter, Dale A -FS; Cris Dippel; Tim Fuchs
Subject:	RE: Bison population model
Date:	Friday, March 21, 2014 11:43:06 AM

Jeff: I looked at the model. Some tuning on the vital rates and other parameter estimates might be needed, but that is minor. Looks like the right tool.

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Friday, March 21, 2014 9:27 AM
To: Doug Brimeyer
Cc: Steve Kallin; Murphy, Kerry M -FS; Sarah Dewey; Eric_Cole@fws.gov; Scott Smith; Steven (Steve) Cain; Deiter, Dale A -FS; Cris Dippel; Tim Fuchs
Subject: RE: Bison population model

Doug,

Thanks, this helps. I'll send an updated summary hopefully later today.

During a prior meeting I told a few of you that I would send along a recipe for venison/elk shanks – I finally remembered to scan it and have attached it for those interested.

Cheers,

Jeff

From: Doug Brimeyer [mailto:doug.brimeyer@wyo.gov]
Sent: Thursday, March 20, 2014 8:10 PM
To: Jeffrey Warren
Cc: Steve Kallin; kmmurphy02@fs.fed.us; Sarah Dewey; Eric Cole; Scott Smith; Steven (Steve) Cain; Dale Deiter; Cris Dippel; Tim Fuchs
Subject: Re: Bison population model

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From:	Jeffrey Warren
To:	Tim Fuchs; Steve Kallin; Steven (Steve) Cain; Kerry Murphy
Subject:	Draft paragraph on WGFD objective setting process
Date:	Friday, March 21, 2014 11:49:28 AM

I wanted to make sure the draft paragraph below was acceptable for each of you; it will be included in the 'reference case' section of the AMP.

Big game population objectives in Wyoming are evaluated and updated at least every five years. Objectives represent the preferred number of animals during winter within a herd unit (e.g., the Jackson Elk Herd) and are determined based upon multiple factors, including 1) available habitat to support the defined population, 2) hunting access, and 3) tolerance for wildlife on private lands by landowners (Tassell et al. 1995). Public input on proposed population objectives is obtained during public hearings. After the hearings the proposed population objectives are sent to the Wyoming Game and Fish Commission (a governor-appointed policy-making board) for review and approval. The NER, GTNP, and BTNF have actively participated in WGFD big game population objective review and revision processes in the past for both the JEH and JBH. These federal agencies will continue to participate in objective setting for the JEH and JBH populations.

Thanks,

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406 276-3536 ext. 304

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"It's tough to make predictions, especially about the future" – Yogi Berra

From: Jeffrey Warren
To: Steve Kallin
Cc: Eric Cole; Cris Dippel
Subject: RE: Hazing bison from the Nowlin unit
Date: Friday, March 21, 2014 1:13:19 PM

Steve, Cris, and Eric,

In lieu of having a special action for Nowlin unit to haze bison, and then having a separate action to haze bison south of a line that largely (wholly?) includes the Nowlin unit, can we simply define a line across the south end of the refuge that any bison south of would be hazed north? If that sounds reasonable to you, could you please help me define that line in the following paragraph (bolded section I need help with).

Reduction, or elimination, of winter feeding will likely result in bison having a broader winter distribution in Jackson Hole. This could lead to more frequent use of the Nowlin unit by bison; the Nowlin unit is where commercial sleigh rides are conducted. Moreover, increased bison use of the southern portion of the NER beyond the Nowlin unit increases the potential for bison to enter the town of Jackson. For public safety and to minimize conflict in the Nowlin unit, bison will be hazed if found **south of the line from Nowlin gate east to the Twin Creek subdivision road, west along Nowlin Creek to Flat Creek, west along Flat Creek to highway 89.**

A separate action of agency-accompanied hunters will also be included as an action to haze bison to the north. Would that include the Miller Barn unit, or only the southern units that currently allow hunting?

I'm on the road next week and out the following week, but can make these changes prior to our meeting if you can get me comments/revisions by next Thursday.

Thanks,

Jeff

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Saturday, March 01, 2014 9:57 AM
To: Jeffrey Warren
Cc: Eric Cole; Cris Dippel
Subject: RE: Hazing bison from the Nowlin unit

Jeff:

I don't recommend a "buffer" between bison and a sleigh. Whenever bison cross the line you have described, they should be hazed. The "haze" line should extend directly west from the confluence of Nowlin Cr. and Flat Cr. to Highway 89.

Also, safety is the primary concern, not just for the sleigh ride program, but also for the Town of Jackson. We don't want bison in Jackson! This should be emphasized.

Agency-accompanied hunters could be a separate action used outside of the Nowlin Unit should the need arise, like at the "Bull Pen" up by Kelly.

Thanks Jeff,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Cole, Eric [mailto:eric_cole@fws.gov]
Sent: Friday, February 28, 2014 10:20 AM
To: Jeffrey Warren; Steve Kallin; Cris Dippel
Subject: Re: Hazing bison from the Nowlin unit

In my opinion Agency-accompanied hunters should be its own action independent of the Nowlin unit because it would likely be used elsewhere on the refuge.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.733.9212 ext. 7

On Thu, Feb 27, 2014 at 11:47 AM, Jeffrey Warren <jeffrey_warren@fws.gov> wrote:
I drafted a paragraph (pasted below) covering hazing bison from the Nowlin unit and the potential to use agency-accompanied hunters in the south units to haze bison. Could you please take a look at it and proved comments/edits, especially for my questions (in bold).

Thanks,

Jeff Warren
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27650B South Valley Road
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From: Jeffrey Warren
To: Steve Kallin
Cc: Eric Cole; Cris Dippel
Subject: RE: Hazing bison from the Nowlin unit
Date: Friday, March 21, 2014 1:29:29 PM

Here is a revised version to consider. Thanks.

Reduction, or elimination, of winter feeding will likely result in bison having a broader winter distribution in Jackson Hole. This could lead to more frequent use of the Nowlin unit by bison; the Nowlin unit is where commercial sleigh rides are conducted. Moreover, increased bison use of the southern portion of the NER beyond the Nowlin unit increases the potential for bison to enter the town of Jackson. For public safety and to minimize conflict in the Nowlin unit, bison will be hazed north if found **south of the line originating at the eastern boundary of the NER at Twin Creek Ranch Road, west along Twin Creek Ranch Road to Nowlin Creek, northwest along Nowlin Creek to Flat Creek, and southwest along Flat Creek to Highway 89.**

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Friday, March 21, 2014 1:13 PM
To: Steve Kallin
Cc: Eric Cole; Cris Dippel
Subject: RE: Hazing bison from the Nowlin unit

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From: Steve Kallin
To: Jeffrey Warren
Subject: RE: Draft paragraph on WGFD objective setting process
Date: Friday, March 21, 2014 3:24:22 PM

Jeff:

Can't say I remember working with the WGFD to evaluate and update the elk population objective since I have been at the NER. I would be interested to see how Eric would describe our involvement when he returns.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

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406 276-3536 ext. 304

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From: Iverson, Lori
To: Steve Kallin
Subject: Feeding Start / End spreadsheet
Date: Monday, March 31, 2014 11:03:11 AM
Attachments: Loris copy feeding summary 1995 to present.xls

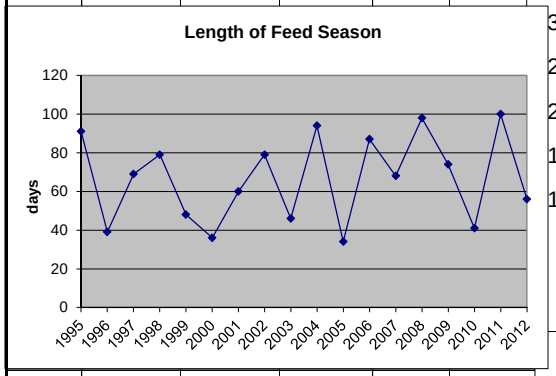
Lori Iverson
Outreach & Visitor Services
U.S. Fish & Wildlife Service
National Elk Refuge
PO Box 510 / 675 East Broadway
Jackson, WY 83001
Phone: 307.733.9212, ext 6
Cell: 307.690.4375
Fax: 307.733.9729
lori_iverson@fws.gov
National Elk Refuge photo gallery
National Elk Refuge web page
Twitter: @NatlElkRefuge

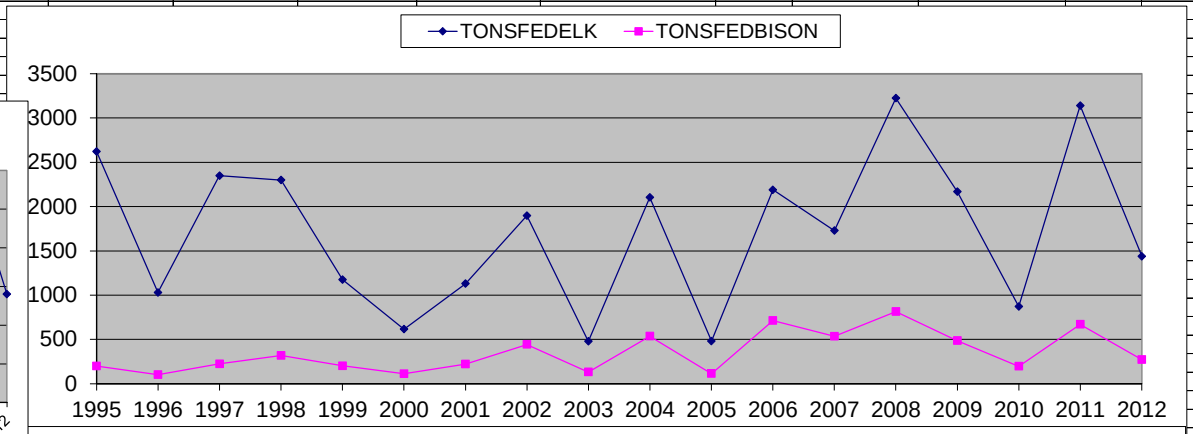
"In the end, we will conserve only what we love." -- Baba Dioum

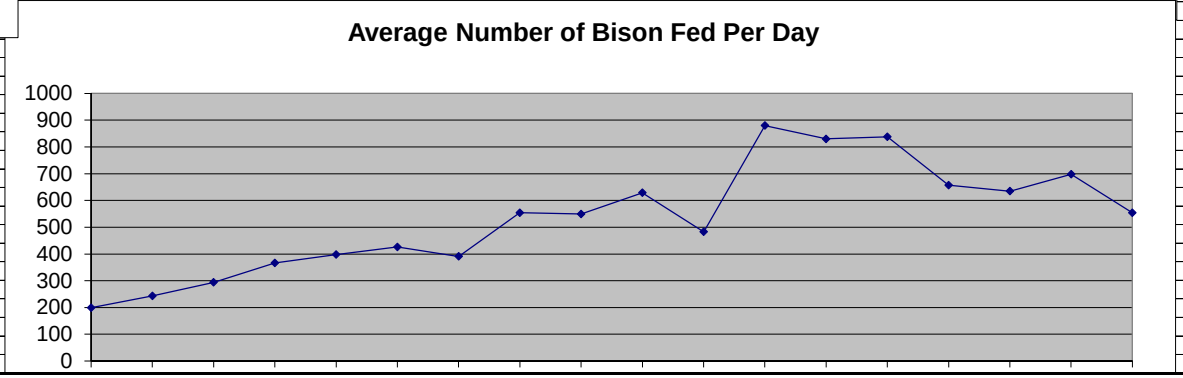
WINTER	START	STARTDAYOF	END	ENDDAYO	TONSFEDELK	TONSFEDBISON	TOTAL TONS FE	DAYSFEDELK	DAYSFEDBISON	AVE#ELKFEDPERDAY	AVE#BISO	AVElbsperelkperd	avelbsperbisonperday	YEAR	COMMENT
1994-1995	1/6/1995	6	4/6/1995	96	2622	199	2821	91	91	8604	199	6.7	22.0	1995	
1995-1996	2/27/1996	58	4/4/1996	95	1029	102	1131	39	39	9653	243	5.5	21.5	1996	
1996-1997	1/28/1997	28	4/6/1997	96	2348	224	2572	69	69	9403	294	7.2	22.1	1997	
1997-1998	1/16/1998	16	4/4/1998	94	2299	319	2618	79	79	8070	366	7.2	22.1	1998	
1998-1999	2/16/1999	47	4/4/1999	94	1175	202	1377	48	48	6875	398	7.1	21.2	1999	
1999-2000	2/25/2000	56	3/30/2000	90	616	113	729	36	36	5849	426	5.9	14.8	2000	
2000-2001	1/25/2001	25	3/24/2001	83	1129	221	1350	60	59	5242	391	7.2	19.2	2001	
2001-2002	1/10/2002	10	3/29/2002	88	1897	443	2340	79	77	6036	554	7.5	19.5	2002	
2002-2003	2/17/2003	48	4/3/2003	93	478	132	610	46	46	6213	549	5.5	17.2	2003	
2003-2004	12/30/2003	-1	4/1/2004	92	2104	537	2641	***94***	93	5963	629	8.2	20.1	2004	
2004-2005	2/28/2005	59	4/3/2005	93	480	114	594	***34***	31	5021	483	5.6	15.3	2005	
2005-2006	1/16/2006	16	4/12/2006	102	2189	714	2903	***87***	86	6027	880	8.4	18.9	2006	
2006-2007	1/13/2007	13	3/20/2007	80	1729	534	2263	***68***	64	6115	830	8.3	20.1	2007	
2007-2008	1/14/2008	14	4/20/2008	111	3223	815	4038	***98***	98	7390	838	8.7	19.6	2008	
2008-2009	1/27/2009	27	4/10/2009	100	2167	486	2653	***74***	74	7310	657	8.0	20.0	2009	
2009-2010	2/12/2010	43	3/24/2010	83	871	197	1067	***41***	41	5454	635	7.8	15.2	2010	
2010-2011	1/5/2011	5	4/15/2011	105	3139	670	3809	***100***	101	7468	698	8.4	19.0	2011	
2011-2012	2/2/2012	33	3/28/2012	88	1437	271	1708	***56***	56	7024	554	7.3	17.5	2012	Although bison class d
2012-2013	1/31/2013	31	3/26/2013	85				***55***						2013	
2013-2014	2/4/2014	35	4/1/2014	91				***57***							
		28	MEAN	***93***	1718	350	2068	66	66	6873	535	7.2	19.2	95-2012 mean	
		28	10-yr Averag	***94***				71							

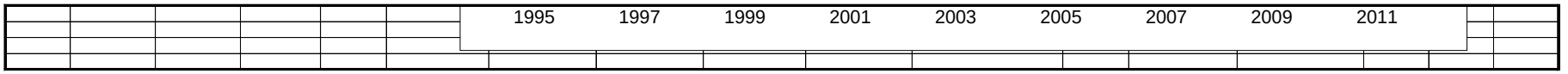
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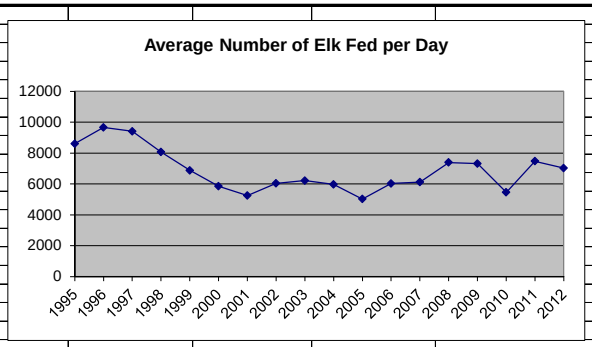
94 = April 4

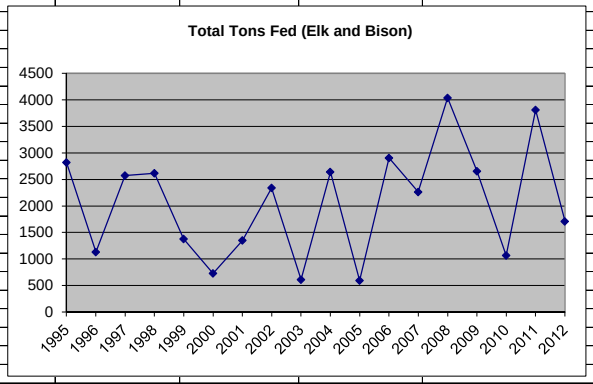


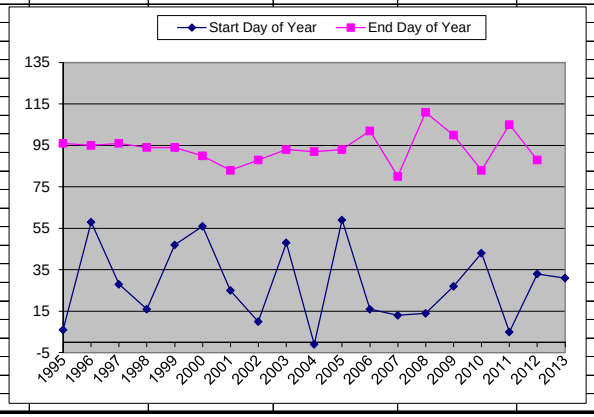





1995
1997
1999
2001
2003
2005
2007
2009
2011


Average Number of Elk Fed per Day
12000
10000
8000
6000
4000
2000
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012


Total Tons Fed (Elk and Bison)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012


Start Day of Year
End Day of Year
135
115
95
75
55
35
15
-5
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013

ount was 760, daily bison attendance on feedgrounds was sporadic					

From: Monello, Ryan
To: Steve Kallin
Subject: Re: FW: Chronic Wasting Disease Request for Proposals
Date: Monday, April 07, 2014 8:40:31 AM

Hi Steve -

Tom and I had a good meeting on Friday. We would like to submit a proposal with you for this funding source. In particular, we would like to create a stage-structured population model that will 1) provide the refuge with a base population model using state-of-the-art Bayesian techniques and forecasting for the elk population and 2) allow us to use your population-specific data and our existing data (e.g., survival rates of infected elk) to determine the potential impacts of CWD on the refuge. In some ways this may sound similar to past work (e.g., stage structured model using likelihood methods by Lubow and Smith 2004); however, the Bayesian approach will allow us to do things not possible in the frequentist (likelihood) approach, such as estimating the relationship between population growth or decline and prevalence of CWD. (In case anyone is interested in the details....the Bayesian approach allows estimates of uncertainty in derived quantities such as the dominant eigenvalue in a population projection matrix, which is not feasible in the frequentist framework).

I think we will need a couple of things from the refuge to make sure this is a worthwhile endeavor.

1 - A good understanding of your existing population data and methods. I don't need the data at this time, I just need to know what has been collected, what the methods have generally been, and for how long it has been collected (counts, age and sex classifications, density or population estimates, harvest, etc.). One question of particular interest - is there a way to get at observation error of this data (e.g., via repeated counts or classifications in a winter)?

2 - Existing/current population analyses. For example, I'm aware you have a sightability model and stage-structured model using likelihood methods (Lubow and Smith 2004). Do you have additional updates or models you are working with? We want to be sure we don't duplicate methods.

You don't have to necessarily answer this in an email, I would be happy just to talk to you or the refuge biologist to get an idea of what exists. I just wanted to give you a heads up so you can think about it for a bit.

Thanks!

Ryan

On Thu, Mar 13, 2014 at 12:10 PM, Steve Kallin <steve_kallin@fws.gov> wrote:

> Ryan:

Thought you may want to know about this source of funding for CWD work, which includes monitoring and research associated with National Wildlife Refuges. There is a nationwide total of $300,000 available and the application deadline is May 8, 2014. Lee Jones lead the Herd Health Monitoring Project here at the NER. She is also involved with this RFP process and will be attending the Elk Studies Group meeting on April 24. Thought it would be helpful for you to be aware of this opportunity in the event it fits some of the ideas you/we may have in working together here in Jackson Hole. Lee Jones would be happy to answer any questions you may have concerning this funding.

Also for your information, I have attached an update by the WGFD concerning our CWD monitoring efforts primarily in the Jackson Hole area.

Give a call if you have any questions. Thanks again for your willingness to present on April 24!

Take care,

Steve Kallin

Project Leader

National Elk Refuge

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Jackson, WY 83001

Phone: (307) 733-9212, extension 2

Fax: (307) 733-9729

steve_kallin@fws.gov

From: Jones, Lee [mailto:lee_c_jones@fws.gov]
Sent: Thursday, March 06, 2014 3:37 PM
To: FW6 RW Project Leaders
Cc: Wayne J. King; Barbara Boyle; Bernie Petersen; Carl Millegan
Subject: Chronic Wasting Disease Request for Proposals

Hello,

Please see below for the national Chronic Wasting Disease Request for Proposals (RFP) issued today by the Natural Resource Program Center (NRPC). Please note that the proposal **deadline is May 8, 2014**. This RFP covers CWD activities through January 31, 2015 including work conducted during the upcoming fall hunting season.

CWD funds will not be disbursed directly to state agencies, but Refuges may choose to re-distribute any portion of these funds to state agencies as partners.

CWD sample testing will be funded centrally from NRPC. While this cost does not need to be included in your proposal budget, please clearly identify the estimated number of samples to be tested.

Please don't hesitate to contact me with any questions. Thank you!

Lee C. Jones

Wildlife Biologist

USFWS-Wildlife Health Office

10 E. Babcock, Rm 105

Bozeman, MT 59715

Office: 406.587.2169

Cell: 406.600.8405

Fax: 406.587.9098

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--

Ryan Monello, PhD
Wildlife Biologist/Disease Ecologist
Wildlife Health Branch
Biological Resource Management Division

National Park Service
1201 Oak Ridge Dr., Suite 200
Fort Collins, CO 80525
Office: 970-267-2170
Cell: 970-568-2492
Fax: 970-225-3585

The NPS One Health Network: promoting and protecting the health of all species and the parks that we share.

From:	Steve Kallin
To:	Dale Deiter; Kerry Murphy; Tim Fuchs; Doug Brimeyer; Steve Cain; Sarah Dewey; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Kallin
Subject:	Adaptive Management Doodle Poll
Date:	Wednesday, April 09, 2014 6:50:19 AM

Hi All:

Below is a link to a Doodle Poll for our next Adaptive Management Plan meeting. At our last meeting everyone was in favor of moving the meetings back to the morning and most believed that Monday, May 5 would work. Check your calendars, complete the poll and we will confirm a date as soon as possible.

http://doodle.com/7qdsky43pxexfber

Thank you for the effort and time you are investing in this process. We've had excellent discussions as we plan for the management of a very complex situation.

Thanks again,

Steve Kallin
Project Leader
National Elk Refuge
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675 East Broadway
Jackson, WY 83001
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Fax: (307) 733-9729
steve_kallin@fws.gov

From:	Steve Kallin
To:	Dale Deiter; Kerry Murphy; Tim Fuchs; Doug Brimeyer; Steve Cain; Sarah Dewey; Cris Dippel; Eric Cole; Jeffrey Warren; Lee Jones; Ryan Monello
Subject:	Elk Disease Overview and CWD Research Discussion
Date:	Wednesday, April 09, 2014 7:33:27 AM

Hi All:

On Thursday, April 25 at 2:30 PM, you are invited to meet at the National Elk Refuge Headquarters for an update on Tyler Johnson's (Bridger-Teton National Forest) elk disease literature review and to discuss ideas for possible CWD research in the Jackson Hole Area. The CWD discussion will involve Ryan Monello, who will be presenting his latest CWD research from the Rocky Mountain National Park area earlier in the day at the Elk Studies Group meeting.

Hope you can make it,

Steve Kallin
Project Leader
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Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

From:	Steve Kallin
To:	Dale Deiter; Kerry Murphy; Tim Fuchs; Doug Brimeyer; Steve Cain; Sarah Dewey; Cris Dippel; Eric Cole; Jeffrey Warren; Lee Jones; Ryan Monello
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steve_kallin@fws.gov

From: Doodle
To: Steve Kallin
Subject: Doodle: "Bison and Elk Adaptive Management Plan Meeting" Update
Date: Wednesday, April 09, 2014 7:54:58 AM

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From: Doodle
To: Steve Kallin
Subject: Doodle: "Bison and Elk Adaptive Management Plan Meeting" Update
Date: Wednesday, April 09, 2014 9:18:38 AM

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From: Doodle
To: Steve Kallin
Subject: Doodle: "Bison and Elk Adaptive Management Plan Meeting" Update
Date: Wednesday, April 09, 2014 10:11:26 AM

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From: Doodle
To: Steve Kallin
Subject: Doodle: "Bison and Elk Adaptive Management Plan Meeting" Update
Date: Wednesday, April 09, 2014 12:42:39 PM

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From: Doodle
To: Steve Kallin
Subject: Doodle: "Bison and Elk Adaptive Management Plan Meeting" Update
Date: Wednesday, April 09, 2014 2:00:08 PM

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Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "Bison and Elk Adaptive Management Plan Meeting" Update
Date: Wednesday, April 09, 2014 3:10:29 PM

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Doodle AG, Werdstrasse 21, 8021 Zürich

From: Paul Santavy
To: Will Meeks; Bridget Fahey
Cc: Kathy Perez
Subject: Fwd: info
Date: Thursday, April 10, 2014 8:52:49 AM
Attachments: 20140307_NOI_ERP Grand Teton.pdf

FYI

-Paul

Begin forwarded message:

> **From:** Steve Kallin <steve_kallin@fws.gov>
> **To:** Paul Santavy <paul_santavy@fws.gov>
> **Subject: FW: info**
>
> Paul:
>
> See the attached "60-day Notice of Violations of the Endangered Species Act in Connection With Grand Teton National Park's 'Elk Reduction Program' and Annual Hunting of Elk in the Park." Not sure how involved the NER would be in this litigation. The BEMP and NER Supplemental Feeding programs are mentioned. Although I haven't had a chance to read this, I understand the concern is the incidental take of grizzly bears. Certainly the FWS and ES will be involved.
>
> Take care,
>
> Steve Kallin
> Project Leader
> National Elk Refuge
> PO Box 510
> 675 East Broadway
> Jackson, WY 83001
> Phone: (307) 733-9212, extension 2
> Fax: (307) 733-9729
> steve_kallin@fws.gov
>
> **From:** Cain, Steven (Steve) [mailto:steve_cain@nps.gov]
> **Sent:** Monday, April 07, 2014 10:07 AM
> **To:** Steve Kallin
> **Subject:** Fwd: info
>
> ---------- Forwarded message ----------
> From: **Belleman, Ann** <ann_belleman@fws.gov>
> Date: Fri, Apr 4, 2014 at 10:22 AM
> Subject: info
> To: "Steven (Steve) Cain" <steve_cain@nps.gov>
>
> Ann Belleman
> U.S. Fish and Wildlife Service
> Wyoming Ecological Svcs. Field Office
> 5353 Yellowstone Rd., Suite 308A
> Cheyenne, WY 82009

ann_belleman@fws.gov

307-421-5839 (work cell)
307-772-2374 (FWS-Cheyenne)
218-529-5171 (EPA-MN)

--
****
Steve Cain, senior wildlife biologist
Grand Teton National Park and John D. Rockefeller, Jr. Memorial Parkway
PO Drawer 170
Moose, WY 83012
(307)739-3485
****
"*If there are no dogs in heaven, then when I die I want to go where they went" Will Rogers*

DEPARTMENT OF THE INTERIOR
TASKING PROFILE

ACCN #:	ESO-00053947	Status:	Closed	Fiscal Year:	2014
Document Date:	**Received Date:**	**Due Date:**	**Action Office:**	**Signature Level:**	**Doc Source:**
02/28/2014	03/07/2014		FWS	AA	ATTY

To (Recipient): Jewell, Sally

From (Author): Glitzenstein, Eric R.

Attorney at Law/SMC Science Director
Meyer & Glitzenstein
Washington,, DC 20009

Subject Text: Notice of ESA violations in connection with Grand Teton NP Elk Reduction Program and annual hunting of Elk in the Park.

Req. Surnames:

Mail Carrier: **Mail Track #:**

Cross Ref:

Copies To: SIO-OES

Status Tracking:

Correspondence Specialist and Phone: SIO-OES Tim Feeney/202-208-6701

Closed Comments:

Signed:

Meyer Glitzenstein & Crystal
1601 Connecticut Avenue, N.W.
Suite 700
Washington, D.C. 20009-1063

Katherine A. Meyer
Eric R. Glitzenstein
Howard M. Crystal
William S. Eubanks II
Rosemary C. Greene (Admitted in MT & IL)
Michelle D. Sinnott (Admitted in VA)

Telephone (202) 588-5206
Fax (202) 588-5049
www.meyerglitz.com

February 28, 2014

Via Certified and Electronic Mail

Sally Jewel, Secretary
United States Department of the Interior
1849 C Street, N.W.
Washington, D.C. 20240
exsec@ios.doi.gov

Dan Ashe, Director
United States Fish & Wildlife Service
1849 C Street, N.W.
Washington, D.C. 20240
d_m_ashe@fws.gov

Jonathan Jarvis, Director
National Park Service
1849 C Street, N.W.
Washington, D.C. 20240
Jon_jarvis@nps.gov

RECEIVED
2014 MAR -7 PM 2:50
OFFICE OF THE EXECUTIVE SECRETARIAT
64610

Re: **60-Day Notice of Violations of the Endangered Species Act in Connection With Grand Teton National Park's "Elk Reduction Program" and Annual Hunting of Elk in the Park**

Dear Secretary Jewel, Director Ashe, and Director Jarvis:

On behalf of conservationist Timothy C. Mayo and wildlife photographer and advocate W. Kent Nelson, we hereby put you on formal notice, pursuant to section 11(g) of the Endangered Species Act, 16 U.S.C. § 1540(g) ("ESA"), that the National Park Service ("NPS") is in violation of the ESA in connection with the Grand Teton National Park's ("Grand Teton" or the "Park") so-called "Elk Reduction Program" ("ERP") pursuant to which NPS, in conjunction with the State of Wyoming, authorizes significant numbers of elk to be hunted within the Park each year. In particular, as set forth below, the Park Service and Fish and Wildlife Service ("FWS") are in violation of section 7 of the ESA, 16 U.S.C. § 1536, by recently increasing the permissible

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"take" of threatened grizzly bears caused by the ERP without providing any biological (or any other) rationale for the specific number of grizzly bears that may now be killed or otherwise taken in connection with the hunt, and without even reconciling the significant increase in authorized grizzly bear takes with the FWS's purported commitment to phase out the supplemental feeding of elk on the National Elk Refuge ("NER" or "Refuge") – which, in turn, is used to justify the hunting of elk in the Park.

STATUTORY AND REGULATORY FRAMEWORK

Congress enacted the ESA to ensure that "the ecosystems upon which endangered and threatened species depend [are] conserved, [and] to provide a program for the conservation of such endangered species and threatened species." 16 U.S.C. § 1531. The ESA reflects "an explicit congressional decision to afford first priority to the declared national policy of saving endangered species." *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 185 (1978).

Section 9 of the ESA prohibits any "person" from "taking" any member of an endangered species. 16 U.S.C. § 1538(a). The term "take" is defined broadly to include "harass, harm, pursue, hunt, wound, kill, trap, capture, or collect." *Id.* § 1532(19). The Service has further defined "harass" to include "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, including breeding, feeding, or sheltering." 50 C.F.R. § 17.3. In addition, "harm" is defined to include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering." *Id.*

Section 7 of the ESA directs all federal agencies, in consultation with the FWS, to use their existing authorities to conserve threatened or endangered species. 16 U.S.C. § 1536(a)(1); *see id.* § 1532(3) (defining "conservation"). Section 7 further requires all agencies to "insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species." *Id.* § 1536(a)(2). To carry out this obligation, an agency formally "consults" with the FWS when it undertakes an action that may affect listed species. 50 C.F.R. § 402.14. The consultation must be based on the "best scientific and commercial data available," *id.*, and culminates in a Biological Opinion, which must assess whether the action will jeopardize the continued existence of the species and, if not, set forth a "written statement" – known as an "incidental take statement" ("ITS") – that specifies the amount of "incidental taking" that is authorized, as well as "those reasonable and prudent measures," along with implementing "terms and conditions" that "the [Service] considers necessary or appropriate to minimize" the impact on the species. 16 U.S.C. § 1536(b)(4).

Reinitation of formal consultation "is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law" and, among other factors, "the amount or extent of taking specified in the incidental take statement" is exceeded, or "if new information reveals

effects of the action that may affect listed species . . . in a manner or to an extent not previously considered." 50 C.F.R. § 402.16.

FACTUAL BACKGROUND

In 2007, NPS and FWS engaged in formal consultation regarding the Bison and Elk Management Plan ("Plan") for the Park and the NER and, as part of the Plan, the ERP in the Park. The Plan, which is supposed to be in effect for fifteen years (i.e., until 2022), calls for phasing out the environmentally destructive practice of supplemental feeding of elk and bison on the Refuge, *see* 2007 Final Biological Opinion for the Bison and Elk Management Plan (Formal Consultation No. ES-6-WY-07-F014) ("BiOp") (Attachment A) at 171 ; *id.* at 19 ("supplemental feeding would be reduced from current levels and replaced by greater ungulate reliance on standing forage"); see *also Defenders of Wildlife v. Salazar*, 651 F.3d 112, 113 (D.C. Cir. 2011) ("[p]art of this plan includes ending the longstanding agency practice of feeding these animals during the winter"), as well as taking certain other management actions affecting elk and other wildlife in the Park and Refuge.

Of particular relevance here, under the Plan as analyzed in the 2007 BiOp, over the long term it was "estimated that the number of deputized [elk] hunters [in the Park] would decline from an average of 1,600 hunters per year to 773-957" hunters." BiOp at 4. Similarly, it was anticipated that the number of elk "harvested" in the Park over the "long term" would decrease from 480 to 232-287. *Id.* at 20.[1]

In analyzing the impacts of the Plan as a whole and the ERP in particular on the threatened Grizzly Bear, the BiOp explained that the Park represents a significant part of the Yellowstone Grizzly Bear Ecoystem recovery zone. BiOp at 8, 9. The BiOp also acknowledged that "[a]voiding human-caused bear mortality is a goal of the Grizzly Bear Recovery Plan and *is essential to maintaining a viable grizzly bear population.*" *Id.* at 6 (emphasis added). The BiOp further recognized that "[i]solation from human activities is extremely important for bear survival, due to the tendency of grizzly bears to rapidly habituate to human foods," but that "[h]uman-bear interactions have been increasing in the YGBE" and that the "greatest increase in recent years is self-defense in fall by big game hunters." *Id.* at 11; *id.* at 17 ("Hunting-related deaths resulting from human-grizzly conflict remain the most significant source of known grizzly bear mortality in the GYE . . . While the high level of hunting-related grizzly mortality has not been directly linked to hunter numbers in the [primary conservation area], it is nonetheless

[1] The BiOp also stated that the "elk hunting opportunities on the Refuge would decline from an average of 733 hunters per year to 420-487," while the number of elk hunters in the Bridger-Teton National Forest "and other areas outside the Refuge and Park would increase to an estimated 5,000-5,870 hunters per year, an increase of 29-35 percent." BiOp at 4. This is because, as a result of the Plan's commitment to return elk management to a more natural regime, "in the long-term it is expected that herd reductions in the Grant Teton segment will cause individuals to radiate into and be sustained in other herd segments [outside the Park and Refuge], allowing proportionately more elk to be" killed in those areas. BiOp at 21.

primarily the result of chance encounters between bears and hunters in the field, conflicts over ungulate carcasses and conflicts in hunter camps often as a result of game meat being kept in campsites."). The BiOp also recognized that "[w]inter-killed ungulates are an important food supply" for grizzlies, and that other traditional food sources – such as whitebark pine, army cutthroat worms, and cutthroat trout – are themselves threatened for various reasons. *Id.* at 11-12.

The BiOp concluded that "unlike on the Refuge, the variability of terrain and densely wooded areas in the Park contribute to an elevated risk of hunting-related conflicts occurring," although "[t]his increased risk would be minimal in the long term as a result of the proposed action, but would be higher in the short-term, especially within Area 79." BiOp at 24. In light of the Service's prediction that the "proposed action will exacerbate the short-term risk for hunting-related grizzly bear mortality within the Park," while resulting in a "minimal risk in the long term," the BiOp established a limit of "1 grizzly bear (adult or juvenile) over the 15-year implementation period of the Plan [that] could be incidentally taken as a result of the proposed action" in the Park. *Id.* at 25. The BiOp established a single "reasonable and prudent measure" as "necessary and appropriate to minimize impacts of incidental take on grizzly bears" – i.e., "[m]inimize the likelihood of hunting-related human/grizzly bear conflict associated with the Project through education of hunters" – and stated that it should be sufficient to ensure that the incidental take limit was not exceeded. *Id.* at 26. However, the BiOp also made clear that "[i]f, during the course of the action, this level of incidental take is reached, such incidental take represents new information requiring re-initiation of consultation and review of the reasonable and prudent measures provided." *Id.*

As explained in a 2013 NPS memorandum requesting reinitiation of formal consultation, "[o]n November 22, 2012, a group of 3 hunters participating in the ERP shot and killed an adult male grizzly bear in the Snake River bottoms area of Hunt Area 75, within [Grand Teton]. This leaves the park with no additional grizzly bear take related to the ERP during the remaining 9 years of the plan's intended 15 years year life span." *See* 4/29/13 Memorandum from Superintendent, Grant Teton National Park to Field Supervisor, U.S. FWS, Wyoming Field Office (Attachment B) at 1. Consequently, NPS "request[ed] to re-open formal consultation on the [Plan]." *Id.*

Although the 2007 BiOp was expressly premised on the assumption that the ERP component of the Plan would result in "***minimal*** risk" to grizzly bears "in the long term," BiOp at 25 (emphasis added), NPS's request for reinitiation of consultation asserted that the "risk of hunter-grizzly contacts *will continue to be* ***relatively high*** *as long as the ERP is necessary*." Attachment B at 2 (emphasis added). The reinitation request did not explain why a long-term risk that was deemed to be "minimal" in 2007 was being described as "relatively high" in 2012, nor did it explain over what period of time an ERP in the Park would be deemed necessary or the criteria that would be used to make that assessment. *See also id.* at 4 (asserting that the

"need for the program is evaluated annually" without explaining how that occurs or what standards are used).[2]

The request for reinitiation stated that in 2013, NPS, along with the Wyoming Game and Fish Department, "proposed several new measures" purportedly designed to "help mitigate the potential for hunter-grizzly bear conflicts during the ERP," including "1) closing the Snake River bottoms between Ditch Creek and Dead Man's Bar; 2) beginning the hunt 2 weeks later; 3) limiting ammunition carried in the field to 7 cartridges per day; and 4) limiting the number of shots hunters can take at a group of elk to one . . . ." Attachment B at 4. The request did not explain the rationale for these particular measures with respect to the mitigation of grizzly bear take, nor did it commit to continuing them for the remainder of the ERP or describe other measures that may have been considered but were rejected (such as closing more areas with documented grizzly bear presence to elk hunting). However, the request did state that NPS "believe[s] continued implementation of the BEMP is likely to incur additional losses of grizzly bears from hunter-grizzly bear conflicts, which will adversely affect grizzly bears," *id.* at 5, although the request made no effort to estimate the number of grizzly bear "takes" that will "likely" occur as a result of the Plan.

On September 13, 2013, the FWS issued a cursory "addendum" to the BiOp and a new ITS that the FWS stated "supersede the previous 2007 ITS, and this addendum and new ITS are valid for the remaining 9 years under the 2007 [BiOp], through the year 2022." 9/13/13 Memorandum from the Field Supervisor, U.S. FWS Wyoming Field Office, to Superintendent, Grand Teton (Attachment C) at 1. While asserting that "this memo/addendum . . . tiers off our 2007 biological opinion," *id.* at 2, the addendum also makes clear that the 2007 BiOp was premised on a seriously flawed assumption, i.e., that activities occurring in the Bridger-Teton National Forest were covered by the Plan and hence should also be addressed in the formal consultation and ITS for the Plan. *See id.* at 2 ("In response to the Park's reinitiation of formal consultation and after review of the 2007 biological opinion, the Service believes authorization of incidental take for the Forest was in error as the Forest was not covered by the final Plan EIS decision. Therefore, we are rescinding incidental take [authorization] of two grizzly bears on the Forest and the following biological opinion addendum covers only the Park and Refuge.") (emphasis in original).

The addendum does not analyze at all the legal and environmental implications of the FWS's elimination of one of the three federal agencies from the scope of the consultation analysis. Instead, the addendum repeats, virtually verbatim, the reinitation request – even when it totally contradicts factual findings and assumptions in the 2007 BiOp. Most notably,

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[2] Far from asserting that conditions had dramatically changed since 2007, the request for reinitiation stated that "[c]onditions associated with the ERP remain largely the same as they were in 2007 except, as anticipated in the plan, grizzly bear distribution and numbers in the south end of the park appear to have increased," Attachment B at 2, and that "several grizzly bears have been observed seeking out gut piles left on the landscape during the elk reduction program, just as they have throughout the ecosystem for decades during hunting seasons." Attachment B at 2.

the addendum reiterates NPS's assertion that there will be a "relatively high risk of hunter-grizzly contacts as long as the ERP is necessary," Attachment C at 2, without making any effort to reconcile that prediction with the BiOp's contrary finding that the long-term risk for grizzly bears in the Park would be "minimal." Likewise, the addendum asserts that the "Service *agrees* that continued implementation of the Plan is likely to incur additional losses of grizzly bears from hunter-grizzly bear conflicts, which will likely adversely affect grizzly bears," *id.* at 3 (emphasis added), but, again, makes no effort to explain – or even to acknowledge – the contradiction between that prediction and the assessment in the BiOp that the entire 15-year Plan would result in the "take" of only a single grizzly bear.

The addendum reiterates the "new measures" proposed by NPS "specifically for the 2013 season," but does not analyze their efficacy or biological rationale in any manner, nor does it even suggest that these measures will remain in effect for the life of the Plan. Addendum C at 3. To the contrary, the addendum merely says that these measures "may change" – without saying why, how, or based on which criteria – that "[s]pecific area openings or closures and associated timing have varied over time," and that two of the items proposed for 2013 (i.e., beginning the hunt two weeks later and limiting the number of shots hunters may take at a group of running elk) "will likely remain in the future as conditions of the [hunting] permit[s]." *Id.* at 2, 3. Assuming that the Service believes that all of the "new measures" are indeed important for limiting grizzly bear take, *see id.* at 4 ("the Service agrees with the new measures being implemented"), the addendum never explains why these measures (or some permutation of them) are not being made permanent reasonable and prudent measures/terms and conditions that must be followed by NPS for incidental take authorization under the rubric of the consultation.[3]

Finally, the addendum significantly increases the authorized level of take associated with the Plan, stating that the "***Service anticipates up to 4 additional grizzly bears in the Park and 2 grizzly bears on the refuge may be incidentally taken directly or indirectly as a result of the Plan during the remaining 9 years this biological opinion is valid***." Attachment C at 4 (emphasis added); *id.* ("The cumulative amount of take now equals 5 grizzly bears in the Park and 2 grizzly bears on the Refuge for the remaining 9-year duration of this biological opinion[.])." Although this increases the authorized take in the Park and on the Refuge *seven-fold* from that embodied in the 2007 BiOp, and does so for an agency action of *significantly smaller scope* than previously analyzed – since impacts on the Forest are no longer deemed to be part of the authorized federal action, Attachment C at 2 – the addendum sets forth no explanation whatsoever of how the Service derived these "take" figures from the available documentation.

---

[3] Instead, again without explanation, the addendum adds a single term and condition, which is merely an obligation by NPS to submit an "annual report" regarding the "previous year's level of incidental take" and a "brief narrative of any of [non-binding] Conservation Recommendations the Park and Refuge could not adhere to." Attachment C at 4.

DISCUSSION

NPS's request for reinitiation of consultation, the FWS's addendum to the BiOp and accompanying ITS, and NPS's reliance on that document to authorize activities in the Park that will adversely affect Grizzly bears violate the ESA and implementing regulations in a number of ways.

First, the ESA and its implementing regulations do not provide for an "addendum" that "tiers" off an earlier BiOp. As a general matter, although regulations implementing the National Environmental Policy Act expressly provide for "tiering" in appropriate circumstances – i.e., where a site-specific project is "included within" a broader program that has already undergone NEPA review, 40 C.F.R. § 15-2.20 – nothing in the ESA regulations authorizes such an approach. Rather, those regulations simply provide that when one or more of the reinitation criteria are triggered – as is indisputably the case here – "[r]einitiation of formal consultation is required." 50 C.F.R. § 402.16. In turn, "formal consultation," culminating in a *comprehensive biological opinion* – not a cursory "addendum" – entails consideration of a number of specific items, including, e.g., a review of the "current status of the listed species," 50 C.F.R. § 402.14(g)(2); a consideration of the effects of the action along with "cumulative effects," *id.* § 402.14(g)(3); and a "detailed discussion of the effects of the action on listed species." *Id.* § 402.14(h)2).

The Service's addendum does not remotely satisfy these requirements. For example, other than a general assertion of a "stable to slightly increasing grizzly bear population and expanding distribution" in the GYE, Attachment C at 4, there is no analysis whatsoever of the "current status" of the species and the threats facing it. Of particular relevance here, although the 2007 BiOp explained that various Grizzly Bear food sources are under threat, and that the species is heavily dependent on ungulate consumption, the addendum makes no mention of the Service's views concerning the *existing and projected* availability of various food sources and their importance to the species' long-term survival and recovery.

Likewise, the addendum contains no analysis whatsoever of cumulative effects, which is a particularly glaring omission in view of the statement in the addendum that the 2007 "authorization of incidental take for the Forest was in error as the Forest was not covered by the final Plan EIS decision." BiOp at 2. By "rescinding incidental take of two grizzly bears on the Forest" and confining the addendum to "only the Park and the Refuge," the addendum not only significantly modifies the entire agency action under review – further undermining any possible rationale for truncating the formal consultation process that would normally be required – but the FWS overlooked (or ignored) the fact that if Grizzly Bear impacts on the Forest are no longer deemed to be subject to analysis and regulation as part of the agency action under review, ***then they must at least be analyzed as cumulative effects***. But the addendum totally ignores such impacts along with all other cumulative effects, as defined in the ESA regulations. *See* 50 C.F.R. § 402.02.

Second, the addendum and revised ITS not only are not based on the "best scientific" data available, as required by section 7 of the ESA and implementing regulations, they

contradict without explanation statements and predictions made in the 2007 BiOp concerning the impacts of the action. To begin with, even apart from any inconsistency with prior statements, if there is some rationale for the particular take limits set forth in the addendum, they are not explained in the addendum itself. Numbers that appear to have been plucked out of thin air merely to allow the annual hunts to proceed unabated in the Park are based on *no* science, let alone the "best available" science. *See Bennett v. Spear*, 520 U.S. 154, 169 (1997) (the "obvious purpose" of the requirement that agencies rely on the best available science in implementing the ESA is "to ensure that that the ESA not be implemented haphazardly, on the basis of speculation or surmise").

Here, however, the new take limits are not only devoid of any scientific explanation, they make no sense in light of what the Service said when it issued the 2007 BiOp. When it issued the 2007 BiOp the Service stated that there was virtually no threat of grizzly bear take on the Refuge – and thus authorized *zero* incidental take in connection with implementation of the Plan on the Refuge – and that any "increased risk [in the Park] would be *minimal* in the long term as a result of the proposed action." BiOp at 24-25 (emphasis added). Indeed, the overall risk of take associated with the Plan *should* decline over time if NPS is truly committed to doing what it has claimed it will do, i.e., phase out the supplemental feeding program that has been used as the main justification for the ERP. *See Defenders of Wildlife*, 651 F.3d at 231 ("Part of this plan includes ending the longstanding practice of feeding these animals during the winter."). Instead, however, the FWS has significantly and arbitrarily increased the take prediction and authorization – from a single Grizzly Bear in the Park and Refuge for the *entire* fifteen-year Plan to *seven* Grizzly bears in the Park and Refuge for a Plan that is now due to last only eight more years and is supposed to *lessen* the need for hunting-related impacts over that time span – without even acknowledging the inconsistency with the Service's prior analysis, let alone explaining why a dramatically different result should now be reached.

Third, while vastly increasing the take authorization, the addendum does not [?] even address all of the forms of take that may be associated with the ERP. The Addendum acknowledges that "[s]ince 2007, several grizzly bears have been observed seeking out gut piles left on the landscape during the ERP on Park lands . . . ." Attachment C at 2. Although this constitutes a clear example of "harassment" as defined by the ESA regulations, *see* 50 C.F.R. § 17.3 (defining "harassment" to include any "intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly *disrupt normal behavioral patterns, including . . . feeding*") (emphasis added), the addendum does not address or account for this form of take in the ITS which is distinct from the hunter-related killing that may *result* from disrupting the bears' "normal behavioral patterns." Nor does the ITS address the adverse impact on Grizzly Bears of depriving them of an essential food source in the Park and the Refuge, i.e., elk taken by hunters – especially as other critical Grizzly food sources are subject to myriad threats – although that also qualifies as harassment, as well as take through adverse habitat modification. *Id.*

Fourth, although it is well-established that the Service's evaluation of whether a federal action will "jeopardize" a listed species "must adequately consider the proposed action's

impacts on the listed species' chances of recovery," National Wildlife Federation v. NMFS, 524 F.3d 917, 933 (9th Cir. 2008) (emphasis added), the Addendum here contains no analysis of the extent to which ongoing Grizzly Bear take associated with the Plan and the ERP in particular – and especially the depletion of an important Grizzly food source – will impair Grizzly Bear recovery. Rather, the Addendum simply asserts that "[g]iven the existing and new conservation measures, we believe that Plan and ERP will not affect the recovery of grizzly bears in the ecosystem," without explaining that conclusion or even specifying those specific "conservation measures" on which it is based.

Fifth, related to the foregoing point, while significantly increasing the take prediction and authorization, the addendum sets forth no explanation for why it is not also adding additional "reasonable and prudent measures"/"terms and conditions" in order to "minimize" the impact of the anticipated take on Grizzly Bears, as required by section 7(b)(4) of the ESA, 16 U.S.C. § 1536(b)(4). As noted, the only new obligation imposed on the NPS is to "submit an annual report" describing the "previous year's level of incidental take" and a "brief narrative on any of our Conservation Recommendations the Park and Refuge could not adhere to, and other relevant information." Attachment C at 4. There is no explanation in the addendum of what this additional "report" is intended to accomplish.

More important, there is no discussion of why the FWS is not even considering imposing additional *substantive* measures in view of the significant increase in Grizzly take that is being authorized. For example, while asserting that "[s]pecific area openings or closures and associated timing [in the Park] have varied over time," Attachment C at 3, the addendum provides no explanation for why the Service does not simply make it a condition of any additional authorized take that NPS *close* to elk hunting all of the areas in the Park where "hunter-grizzly bear conflicts, which will adversely affect grizzly bears," are now anticipated to occur. *Id.* Assuming that there is any justification for elk hunting in any national park or in Grant Teton in particular – which we strongly dispute – there is certainly no legal or practical need for such hunting in those parts of Grant Teton that are used as habitat of a federally threatened species. At the very least, the FWS has not complied with section 7(b)(4) of the ESA when the Service has failed, without explanation, to even consider such measures for further "minimiz[ing]" the seven-fold increase in Grizzly Bear take in the Park and the Refuge that the Service now anticipates and authorizes. By the same token, the Service has failed to "implement" its own recovery plan for the Grizzly Bear – as mandated by section 4(f) of the ESA, 16 U.S.C. § 1533(f) – which calls for avoiding sources of human-caused Grizzly mortality. *See supra* at 3.

Sixth, under these circumstances, NPS has also violated its obligation under section 7(a)(1) of the ESA, 16 U.S.C. § 1536(a)(1). In addition to the obligation to avoid jeopardizing species under section 7(a)(2), section 7(a)(1) of the Act imposes an obligation on all federal agencies, in consultation with the FWS, to "carry[] out programs for the conservation" of listed species. 16 U.S.C. § 1536(a)(1); *see also Pyramid Lake Paiute Tribe of Indians v. Dep't of the Navy*, 898 F.2d 1410, 1416-17 (9th Cir. 1990) (noting that federal agencies have 'affirmative obligations to conserve under [S]ection 7(a)(1)"). Plainly, NPS is not carrying out an effective

program for the "conservation" of Grizzly bears by continuing to allow for substantial elk hunting in any portions of Grand Teton where NPS itself believes that Grizzly bear conflicts with hunters are likely to occur in the future.

CONCLUSION

We would be happy to discuss with you or your representatives any of the issues raised in this letter. However, unless the agencies commit that they will not rely upon the legally flawed addendum and ITS and will promptly rectify the ESA violations set forth in this letter, we will have no choice but to consider pursuing other appropriate relief.

Sincerely,



Eric R. Glitzenstein
Rosemary Greene

cc:

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APPENDIX E: BIOLOGICAL OPINION

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

In Reply Refer To:
ES-61411/W.25/WY07FA0209
ES-6-WY-07-F014

Memorandum

To: Barry Reiswig, Refuge Manager, U.S. Fish and Wildlife Service, National Elk Refuge, Jackson, Wyoming

From: Brian T. Kelly, Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming

Subject: Final Biological Opinion for the Bison and Elk Management Plan (Formal Consultation No. ES-6-WY-07-F014)

This memorandum transmits the U.S. Fish and Wildlife Service's (Service) final biological opinion based on our review of the January 2007 Bison and Elk Management Plan (Plan or Project) and Final Environmental Impact Statement (FEIS) and the Project's effects on endangered, threatened, proposed and experimental non-essential species.

This final biological opinion addresses the effects of the Project on the threatened grizzly bear (*Ursus arctos horribilis*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act; 50 CFR § 402.14). Your February 07, 2007 letter requesting formal consultation, and including the Intra-Service Section 7 Biological Evaluation (BE) form, was received on February 7, 2007.

The National Elk Refuge (NER or Refuge) and Grand Teton National Park (GTNP or Park)/John D. Rockefeller, Jr., (JDR) Memorial Parkway are proposing to implement a bison and elk management plan that will address adaptive management of the Jackson bison and elk herds and their habitat on the Refuge and in the Park with an emphasis on improving range quality, and insuring long term sustainability of biotic integrity and environmental health. The Plan includes development and implementation of a dynamic framework for decreasing the need for supplemental feeding on the Refuge based on existing conditions, trends, new research findings, and other changing circumstances. The Park and NER will work in close cooperation with the Wyoming Game and Fish Department (WGFD) during both development and implementation of

Attachment A

this framework which will include population management through methods including implementation of special, organized elk and bison hunts, vegetation restoration, ongoing monitoring, and public education as integral components.

The Service concurs with the Refuge's assessment that the Project is likely to have "no affect/no adverse modification" for Canada lynx (*Lynx canadensis*), "may affect, not likely to adversely affect species/adversely modify critical habitat" for the gray wolf (*Canis lupus)* and bald eagle (*Haliaeetus leucocephalus*), and "no effect" for the yellow-billed cuckoo (*Coccyzus americanus*).

This final biological opinion is based on information provided in the FEIS, BE, telephone conversations with Laurie Shannon, Project Manager, of the Service's Mountain-Prairie Region Lakewood, Colorado office, Steve Cain, Senior Wildlife Biologist for GTNP, and other sources of information. A complete administrative record of this consultation is on file in the Cheyenne Field Office.

CONSULTATION HISTORY

Initial discussions regarding the Bison and Elk Management Plan/EIS began several years ago. A summary of pertinent sections of the draft EIS dealing with threatened and endangered species was received by the Service's Wyoming Field Office on July 14, 2004. A full copy of the Draft Bison and Elk Management Plan/EIS was received on July 20, 2005; however, consultation was delayed pending completion of a BE for the Project. The Final Bison and Elk Management Plan/EIS was received on February 2, 2007, and both the BE and the request for initiation of formal consultation were received on February 7, 2007. The consultation was assigned log number ES-6-WY-07-F014. Since January 2007, numerous telephone conversations regarding the Project have taken place between all involved parties.

BIOLOGICAL OPINION
Grizzly Bear and Gray Wolf

DESCRIPTION OF THE PROPOSED ACTION

The Final Bison and Elk Management Plan and EIS for the NER and GTNP addresses adaptive management of the Jackson bison and elk herds and their habitat on the Refuge and in the Park with an emphasis on improving range quality and insuring long term sustainability of biotic integrity and environmental health. It includes development and implementation of a dynamic framework for decreasing the need for supplemental feeding on the refuge based on existing conditions, trends, new research findings, and other changing circumstances. The Park and NER will work in close cooperation with the WGFD during both development and implementation of this framework which will include population management through methods including implementation of special, organized elk and bison hunts, vegetation restoration, ongoing monitoring, and public education as integral components.

Chronic Wasting Disease/Brucellosis

Efforts would be made to coordinate with the WGFD to increase surveillance in elk for chronic wasting disease (CWD), a fatal transmissible disease of white-tailed deer, mule deer, and elk. The objective of surveillance would be to provide a 95 percent confidence level of discovering infection at 1 percent prevalence in the Jackson elk herd. If infection was found, strategies from the state's *Chronic Wasting Disease Management Plan* (WGFD 2006) would be implemented to reduce transmission. These strategies include removing clinically consistent elk, removing 50 animals within 5 miles of the index case, and another 50 within 10 miles if an additional positive animal is found during collection of the first 50; enforcing carcass movement and disposal restrictions; decreasing duration of feeding and expanding the distribution of feeding to the extent possible; and potentially decreasing elk densities through hunting or other management strategies. Any difference from this general approach is detailed under the alternative strategies. Plans to follow the state's *Chronic Wasting Disease Management Plan* have been made in deference to the State and could change if the National Park Service and/or the Service adopted management requirements that differed from what is currently being done. Potential changes would be communicated to the State.

The NER and GTNP/ John D. Rockefeller, Jr., Memorial Parkway will work cooperatively with the state of Wyoming and others to reduce the prevalence of brucellosis in the elk and bison populations in order to protect the economic interests and viability of the livestock industry, and reduce the risk of adverse effects for other non-endemic diseases not currently present in the Jackson elk and bison populations.

Strategies for Hunting/Reduction Programs

The Service and the NPS would work cooperatively with the WGFD to achieve population objectives (including herd ratios and elk herd segment sizes), to develop hunting seasons, and to evaluate hunting or elk reduction areas. The WGFD would formally establish objectives and strategies after public review and approval by the Wyoming Game and Fish Commission.

In the long term, elk hunting opportunities on the Refuge would decline from an average of 733 hunters per year to 420–487. In the Park it is estimated that the number of deputized hunters would decline from an average of 1,600 hunters per year to 773–957. The number of elk hunters in the Bridger-Teton National Forest (B-TNF) and other areas outside the Refuge and Park would increase to an estimated 5,600–5,870 hunters per year, an increase of 29–35 percent. For the herd unit as a whole, the number of elk hunters could range from an estimated 6,793 to 7,314 per year, which is an increase of 2–10 percent compared to average baseline conditions.

In the short term an estimated 140–150 bison would be harvested each year to reduce bison numbers to a herd of approximately 500 animals. An average of about 50 bison would continue to be harvested in the national forest and the remaining 90–100 bison on the Refuge. This would allow an average of about 175–190 bison hunters in Jackson Hole each year.

In the long term the number of bison harvested each year would decline to about 70 bison. The number of bison harvested on the Refuge and the national forest could be equally split, or up to 50 bison could be harvested in the national forest. This would allow an average of about 90 bison hunters in Jackson Hole each year.

Adaptive Management of Habitat and Populations

Under the proposed action, the NER will provide secure, sustainable ungulate grazing habitat characterized primarily by native composition that is healthy, productive and sustained for the benefit of elk, bison and other native species. Actions included under the proposed plan would be implemented in concert with restoring and perpetuating natural ecosystem functions of native habitats used by bison and elk in GTNP and the JDR. The proposed action would contribute to maintaining sustainable population of elk and bison that are healthy, at a reduced risk of contracting non-endemic diseases, and able to adapt to changing environmental conditions.

Four goals outlined in the Plan and developed based upon the desired conditions and purposes of the NER and GTNP, the missions of the National Wildlife Refuge System and the National Park System, and other legal and policy directives include:

i. Habitat Conservation
ii. Maintaining Sustainable Populations
iii. Managing Numbers of Elk and Bison
iv. Disease Management

The aforementioned goals laid out under the proposed action would be accomplished through the following objectives:

- Initiate habitat restoration projects to improve native and cultivated forage and achieve desired conditions and goals.
- Protect woody vegetation on the refuge by rotating small exclosures until habitats have recovered. Prescribed fire could be used and logging allowed on the refuge inside exclosures.
- Initiate restoration of about 4,500 acres (1,821 ha) of previously cultivated areas in the Park to native plant communities.
- Work with private and agency partners to minimize bison/elk conflicts with adjacent landowners (e.g., by providing human and/or financial resources to manage co-mingling and reduce crop depredation by elk and bison on private lands).
- Initiate a public education effort to build understanding of natural elk and bison behavior, ecology, distribution, disease implications, and effects to other species.
- Identify criteria for beginning and ending feeding each year in consultation with the WGFD.
- In collaboration with the WGFD, develop a structured framework of adaptive management actions that include established criteria for progressively transitioning from intensive supplemental winter feeding to greater reliance on free-standing forage, based on some or all of the following considerations:
    1. level of forage production and availability on the NER
    2. desired herd sizes and sex and age ratios
    3. effective mitigation of bison and elk co-mingling with livestock on private lands
    4. winter distribution patterns of elk and bison
    5. prevalence of brucellosis, chronic wasting disease, and other wildlife diseases
    6. public support
- Work in collaboration with the WGFD to maintain the Jackson elk herd objective of 11,000 (after the initial phased approach, approximately 5,000 elk would be expected to winter on the refuge). As herd sizes and habitat objectives are achieved, further reduce feeding or elk numbers, based on established criteria and changing social, political, or biological conditions. Use hunting on the Refuge, and when necessary, the elk herd reduction program in the Park, to assist the State in managing herd sizes, sex and age ratios, and summer distributions.
- Recommend that the WGFD establish a genetically viable bison herd of approximately 500 animals, with as close to an even sex ratio as possible to maximize maintenance of genetic variation over time. Initiate a WGFD-administered bison hunt on the Refuge.
- Allow the WGFD to vaccinate elk and bison for brucellosis on the Refuge as long as logistically feasible.

Other Wildlife-dependent Recreation

- Over time wildlife viewing opportunities would be concentrated during some winters and would be more natural and sporadic during milder winters.
- Build public understanding and support for bison and elk management actions.

STATUS OF THE SPECIES

Grizzly Bear

Life History

Home range and dispersal. Much of the following information is summarized from the Grizzly Bear Recovery Plan (U.S. Fish and Wildlife Service 1993); additional information including species description can be obtained in that document. Grizzly bears require large areas to fulfill all their basic biological needs, as well as dense forest cover for hiding and security. In the Greater Yellowstone Ecosystem (GYE), defined as an area of relative ecological intactness covering some 19 million acres (7,689,027 ha), lodgepole pine (*Pinus contorta*) forests are a large and dynamic part of grizzly bear habitat. Grizzly bears generally do not use areas with human-caused habitat disturbances, and often, the lack of security cover and overstory cover are believed to be major causes of this (Gillian et al. 1994). Grizzly bear home range size averages 50 to 500 mi^2 (130 to 1,300 km^2). Within these home ranges the grizzly bear uses a diverse mixture of forests, moist meadows, grasslands, and riparian habitats to complete its life cycle. Grizzly bears generally prefer large, remote areas of habitat that are isolated from human development for feeding, denning, and reproduction (USFWS 1993). Long distance travel habits of some grizzly bears increase the risk of contact with highway crossings, hunters, recreationists, and a variety of other human congregations. Isolation from human activities is extremely important for bear survival, as grizzly bears habituate to human foods quickly. Food-conditioned bears often must be eliminated or removed from developed areas. Avoiding human-caused bear mortality is a goal of the Grizzly Bear Recovery Plan (USFWS 1993) and is essential to maintaining a viable grizzly bear population.

Diet. The grizzly bear is an opportunistic omnivore that uses a wide variety of plant and animal food sources. Grizzly bears in the Yellowstone Grizzly Bear Ecosystem (YGBE), a 9,500 sq. mi. (23,300 km^2) area consisting of Yellowstone National Park (YNP), GTNP, JDR Memorial Parkway, the Gallatin, Shoshone, Bridger-Teton, Targhee, Beaverhead, and Custer national forests, as well as state, private and Bureau of Land Management (BLM) lands, have the highest percentage of meat consumption in their diet of any inland grizzly bear population (Hilderbrand *et al.* 1999). Meat constitutes as much as 79 percent of the diet of male, and 45 percent of the diet of female grizzly bears in the YGBE (Jacoby et al. 1999). Ungulates, both adult and neonate, are an especially important food source for bears in the spring and fall (Zager and Beecham, 2006), and use of these carcasses in the YGBE is well documented (Podruzny and

Gunther 2001). Grizzly bears also eat small mammals such as pika and marmots; however, these mammals form a relatively minor portion of the bear's diet. Spawning cutthroat trout in streams surrounding Yellowstone Lake in YNP have been documented as an important food source for grizzly bears there (Mattson and Reinhart 1995). Army cutworm moths (*Euxoa auxiliaries*, ACMs) are also an important food source for bears in the YGBE (Mattson *et al.* 1991a). ACMs congregate in remote, high altitude alpine talus areas and feed on alpine flowers. These moths provide important dietary fat in the fall, when grizzly bears are preparing for hibernation, and are also positively correlated with bear reproductive success (Bjornlie and Haroldson 2001). During times of great moth abundance, grizzly bears may eat up to 40,000 moths per day totaling 20,000 kcal/day (USGS 2005). Surviving moths migrate back to lower elevations to deposit their eggs, leaving the alpine areas between August and October. ACM congregation sites are in remote areas, and therefore potentially reduce human-bear conflicts by isolating the bears. Grizzly bears will also eat ants (Mattson 2001) and earthworms (Mattson *et al.* 2002).

The grizzly bear also makes use of a variety of vegetative food sources. Whitebark pine (*Pinus albicaulis*) seeds are an important fall source of food for grizzly bears in the YGBE (Mattson and Reinhard 1997), and bears are known to consume whitebark pine seeds contained in red squirrel cone caches (Mattson and Reinhard 1997). In addition to supplying a food source high in fat, whitebark pine seed crops also serve grizzly bears by keeping them occupied at high elevations far from intense human use. Studies show that in years when high quality bear foods are low, there is an increase in human-bear conflicts (Gunther et al. 2004) as well as human-caused grizzly bear mortality (Mattson et al. 1992). Other vegetative food sources such as exotic clover species, yampa (*Perideridiea gairdneri*), biscuit root (*Lomatium cous*), and sweet cicily (*Osmorhiza chilensis*) are eaten almost exclusively in some years and seasons (Mattson et al. 1991). Other grizzly bear seasonal forage may include graminoids, horsetail, forbs, and fruits (whortleberry and huckleberry) and fungi (Mattson and Knight 1991).

Den site selection. Grizzly bears generally construct dens in areas far from human disturbance at an elevation of about 6,500 to 10,000 ft. (2,000 to 3,050 m). Grizzly bears in the GYE den from the end of September to the last week in April or early May, with entrance and emergence dates affected by the gender and reproductive status of the bears. Denning bears can be disturbed by winter sport activities such as snowmobiling as well as by human den encroachment, and late season hunting, and current studies are focused on minimizing disturbance by controlling access to important denning areas (Haroldson *et al.* 2002, Podruzny *et al.* 2002). If pregnant female bears are disturbed in their dens and this disturbance causes them to relocate to a new den prior to parturition, negative consequences can occur in the form of reduced cub fitness and survival (Linnell *et al.* 2000, Swenson *et al.* 1997).

Population Dynamic/Status and Distribution

Grizzly bear numbers have greatly declined during the past two centuries. It is believed that the grizzly bear population numbered over 50,000 individuals prior to the 18th century (USFWS 1993). More recently, the estimated total population of grizzly bears as of 1993 stood at 800 to

1,000 individuals (USFWS 1993). The exact size of the grizzly bear population in the YGBE is currently unknown, as the very nature of the grizzly bear and the rugged terrain it inhabits makes any census efforts extremely difficult. Eberhardt and Knight (1996) used several different estimates of population parameters to determine a minimum total population size of 245 grizzly bears, an estimated population size of 390 grizzly bears using marked females, and an estimated population size of 344 grizzly bears using distinct family groups. In 2003, the Interagency Conservation Strategy team identified the minimum population estimate for the grizzly bear population in the YGBE as of 2001 as 365 grizzly bears with a total population estimate of 531. Haroldson and Frey (2004) determined a minimum population estimate of 416 in both 2002 and 2003. The Interagency Grizzly Bear Study Team more recently estimated the population at 580 bears (USFWS 2005).

The grizzly bear was listed as a threatened species on July 28, 1975 (USFWS 1975). Historically, the grizzly bear ranged from the Great Plains to the Pacific Coast, and from the northern U.S. border with Canada to the southern border with Mexico. Currently in the contiguous United States, the grizzly population has been reduced to roughly two percent of its former range. It presently occupies portions of Canadian British Columbia and Alberta, and portions of Montana, Idaho, Wyoming, Washington, and Alaska in the United States. The grizzly bear population in the YGBE and surrounding area was proposed for delisting from the list of endangered and threatened species in November 2005 (USFWS 2005).

Conservation

In an effort to facilitate consistency in the management of grizzly bear habitat within and across ecosystems, the Interagency Grizzly Bear Guidelines were developed by the Interagency Grizzly Bear Committee (IGBC)(51 FR 42863; November 26, 1986) for use by land managers. The IGBC developed specific land management guidelines for use in each of the five ecosystems including the YGBE.

Recovery zones also have been established for the grizzly bear and include areas large enough and of sufficient habitat quality to support a recovered bear population. According to the Grizzly Bear Recovery Plan (USFWS 1993), a recovery zone is defined as that area in each grizzly bear ecosystem within which the population and habitat criteria for achievement of recovery will be measured. Areas outside of recovery zones may provide habitat that grizzly bears will use, but are not considered necessary for the survival and recovery of this species. The area outside the recovery zone but within the 10-mile buffer area is managed to consider and protect grizzlies and their habitat whenever possible, recognizing that population and mortality data within this zone are collected and pertinent to recovery criteria. Beyond the 10-mile buffer, grizzly bear mortalities or populations are not considered when determining whether recovery goals have been met, although protection is still accorded to the grizzly bear under the Act.

The Yellowstone Grizzly Bear Recovery Zone (Recovery Zone) covers approximately 5,438,000 acres (2,200,729 ha) of primarily NPS and National Forest Service (NFS) lands, roughly 89

percent of the currently known distribution of the grizzly bears in the YGBE. Yellowstone and Grand Teton National Parks make up 39.4 percent of the YGBE recovery zone. Private holdings and other ownership make up 2.1 percent of the recovery zone and the remaining 58.5 percent occurs on lands managed by the NFS (ICST 2003).

Areas within the Recovery Zone are stratified into Management Situation Zones 1, 2, or 3; each having a specific management direction according to the Interagency Grizzly Bear Guidelines (IGBC 1986).

> **Management Situation 1** (MS1): lands contain population centers of grizzlies, are key to the survival of the species, and are where management decisions will favor the needs of the bear even when other land use values compete.
>
> **Management Situation 2** (MS2): lands are those areas that lack distinct population centers and the need for this habitat for survival of the grizzly bear is more uncertain. The status of such lands is subject to review. Here, management will at least maintain those habitat conditions that resulted in the area being classified as MS2.
>
> **Management Situation 3** (MS3): designation is intended for lands where grizzly bears may occur infrequently. There is high probability that Federal activities here may affect the species survival and recovery. Management focus is on human-bear conflict minimization, rather than habitat maintenance and protection.

Recovery zones are divided into smaller areas called Bear Management Units (BMUs) for the purpose of habitat evaluation and monitoring. BMUs were designed to:

(1) assess the effects of existing and proposed activities on grizzly bear habitat without having the effects diluted by consideration of too large an area;

(2) address unique habitat characteristics and bear activity and use patterns;

(3) identify contiguous complexes of habitat which meet year-long needs of the grizzly bear; and,

(4) establish priorities for areas where land use management needs would require cumulative effects assessments.

The low survival of adult females was identified as the single most important factor in causing the decline in the Yellowstone population prior to the mid-1980s (Knight and Eberhardt 1985). The current Grizzly Bear Recovery Plan (USFWS 1993) outlines demographic goals to objectively measure and monitor the recovery of the Yellowstone grizzly bear population. That plan defines a recovered population as one that can sustain the existing level of known and

unknown human-caused mortality that exists in the ecosystem and is well-distributed throughout the recovery zone. Demographic recovery criteria outlined for the Yellowstone recovery zone include:

(1) observation of 15 females with cubs of the year annually (unduplicated sightings) over a 6-year running average;

(2) occupation of 16 of the 18 BMUs by females with young from a running 6-year sum of verified observations, and no 2 adjacent BMUs unoccupied with a study to be initiated in the Plateau and Henry's Lake BMUs to determine the capability of these units to support females with cubs;

(3) known, human-caused mortality not to exceed 4 percent of the current population estimate (based on most recent 3-year sum of females with young); with no more than 30 percent of this total mortality limit incurred by females; and,

(4) these mortality limits cannot be exceeded during any 2 consecutive years.

In addition, the existence of adequate regulatory mechanisms for population and habitat management through the development of a conservation strategy must be demonstrated.

In 1994, all population recovery parameters were achieved for the first time, and since 1997 these recovery criteria have not been exceeded in 2 consecutive years. In 2005, a revised method for calculating total population size and sustainable mortality levels for the YGBE was established (IGBST 2005). The revised method was appended to the Recovery Plan and included in the Conservation Strategy. By the end of 2005, the number of unduplicated females with cubs-of-the-year stood at 31 within the recovery zone and 10-mile perimeter (Haroldson 2006), resulting in a 6-year running average of 40 unduplicated females with cubs – more than double the recovery target of 15 females identified in the Recovery Plan (USFWS 1993). Sixteen of 18 BMUs had verified observations of female grizzly bears with young during 2003, 17 of 18 BMUs during 2004 (Podruzny 2005) and 18 of 18 BMUs in 2005 (Schwartz et al. 2006).

Threats

Isolation from human activities is extremely important for bear survival, due to the tendency of grizzly bears to rapidly habituate to human foods. Food-conditioned bears often must be eliminated or removed from developed areas. Avoiding human-caused bear mortality is a goal of the Recovery Plan and is essential to maintaining a viable grizzly bear population (USFWS 1993).

Primary threats to grizzly bears are associated with motorized and dispersed recreational use and forest management activities, including timber harvest. Recreation use includes hunting, fishing, camping, horseback riding, hiking, biking, off-road vehicle (ORV) use, and snowmobiling. Direct human-caused mortality is the most obvious threat to the grizzly bear. This kind of mortality can occur in several ways: (1) defense of human life or property, (2) management removals, (3) mistaken identification by big game hunters, or (4) malicious killing. Nuisance bears are removed to defend human life or property, usually because they have become dangerously bold as a result of food conditioning and habituation at campsites, lodges, resorts, and private residences or they become habituated predators of livestock (Knight and Judd 1983).

Human-grizzly bear interactions have been increasing in the YGBE due, in part, to increasing human use and development, increasing bear numbers, and bears and people both expanding their range of occupancy, increasing the chances of adverse encounters. The frequency of grizzly bear-human conflicts is inversely associated with the abundance of natural bear foods (Gunther *et al.* 2004). Most grizzly bear mortalities are directly related to grizzly bear-human conflicts. The Interagency Conservation Strategy Team (2000, pp. 1-2) reported known human-caused mortalities from 1992-98. Of 58 human-caused mortalities, 43 percent were hunting-related, 10 percent were poaching, 28 percent were food-conditioned bears, 7 percent were related to livestock and 12 percent were accidental deaths. The greatest increase in recent years is self-defense in fall by big game hunters. According to a study by Gunther *et al.* (2004a), three areas were identified as having 71 percent of the 136 conflicts in the GYE in 2003. These were (1) the headwaters region of the Green, Snake, and Wind Rivers, (2) the Crandall Creek/Sunlight Basin area, and (3) the north and south forks of the Shoshone River.

There are a number of naturally or semi-naturally occurring factors that also may influence Yellowstone grizzly bear population levels. Whitebark pine provides an important food source for grizzly bears. Blister rust, which has severe consequences on whitebark pine in the Northern Continental Divide Ecosystem, has been observed in the Yellowstone area. The Yellowstone cutthroat trout, which is an important food source for grizzly bears in the area, has been negatively influenced by introduced lake trout, which are less available to bears due to their deeper water habits (Reinhart *et al.* 2001). Winter-killed ungulates are an important food supply, but ungulate populations vary widely in numbers and are influenced by weather conditions. The reintroduction of wolves has increased competition for ungulate prey and winter-killed carrion. Recent fires may have impacts on available food and cover over the short term, particularly to individual bears with heavily burned home ranges. Fire, in general, over time stimulates many forage species and berries preferred by bears, provided alternate food supplies and cover is available to maintain bears through the immediate aftermath of the fire.

Army cutworm moths in some areas could be affected by agricultural pesticide use, and due to their reliance on this food resource, there has been concern that certain pesticides may bioaccumulate in bears. Recent investigation into this possibility indicates that, while pesticides are present in ACMs in trace quantities, they are most likely not sufficient to cause direct adverse effects on, or biomagnify in bears (Robinson et al. 2006). This study cautions, however, that

pesticide use is a relevant concern when addressing bear conservation issues. Due to their unique physiology including hyperphagia, brown fat accumulation and torpor, bears may assimilate and excrete certain chemicals in unique ways. Further research is recommended including sampling and analysis of blood, hair and fat samples in order to monitor this potential threat as available pesticides and their listed uses change.

Grizzly bears have also experienced displacement from available habitat (loss of habitat effectiveness due to human disturbance) due to increased human uses from (1) expanding road access in wilderness areas (Kasworm and Manley 1989), (2) ORV use and (3) recreation use. They have also experienced loss of existing available habitat due to (1) increased development on private land related primarily to residential housing, and (2) potential for increased development on public land related primarily to oil/gas and recreation development. The grizzly bear also faces a decrease in value of available habitat due to (1) a loss of biodiversity (especially early-succession related vegetative types), and (2) sub-optimal composition, structure, and juxtaposition of vegetation as a result of fire suppression, management strategies, and advancing succession. Finally the bear faces isolation due to fragmentation of available habitat due to (1) major development of private land, (2) construction of major highways that block or restrict movement, (3) inadequate provision for linkage on minor roads and highways, and (4) large blocks of clearcuts.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed State or Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation process.

The action area is defined at 50 CFR 402 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." While the proposed action directly affects the areas located within the NER, GTNP and JDR Memorial Parkway, it will indirectly affect other areas outside of the Refuge and within the B-TNF.

The action area/decision area defined in the EIS includes the NER, GTNP, and the JDR Memorial Parkway.

- The NER is a 24,700 acre (9,996 hectare) unit of the National Wildlife Refuge System administered by the Service. The GTNP is 309,995 acres (125,453 ha), and JDR Memorial Parkway is an additional 23,777 acres (9,622 ha), for a total of 333,772 (135,076 ha) acres administered by them NPS.

- The GTNP is 22.5 miles (36 kilometers) wide and 41 miles (66 km) long from north to south. Elevations range from 6,420 feet (1,957 m) on the valley floor to 13,766 ft. (4,196 m) (the summit of Grand Teton). The Park is bordered to the northwest, west, and southwest by Targhee National Forest. On the south the Park surrounds a wedge of private land and a small section of Bridger-Teton National Forest (B-TNF). The Teton Wilderness in the B-TNF borders the Park to the northeast.

- The JDR Memorial Parkway extends for 82 miles (132 km) from West Thumb in YNP to the north entrance of GTNP. The management area between the two parks includes 7.5 miles (12 km) of parkway and 23,778 acres (9,623 ha).

Ecologically, the NER, GTNP, JDR Memorial Parkway, and YNP are part of a larger area referred to as the GYE.

For the purposes of this biological opinion, we will also consider portions of surrounding lands in the B-TNF and other areas outside of the Refuge as part of the action area due to the projected long-term increase in the number of hunters as a result of the proposed action. The action area will be discussed in terms of Game Management Units (GMU) or Existing Elk Hunting Areas (Area). The following is a brief description of their general locations within the action area:

NER GMUs

Area 77. National Elk Refuge. Beginning where U.S. Highway 26 crosses the Gros Ventre River; easterly up said river to the B-TNF boundary; southerly along said boundary to Flat Creek; westerly along said creek approximately 3.5 miles to the second road crossing; southerly along said road .8 mile to a trail junction; westerly along a marked boundary to the NER fence; northerly along said fence to the Gros Ventre River.

GTNP GMUs

Area 72. Webb Canyon/Moose Creek. All of the drainages of Berry Creek, Owl Creek and Webb Canyon Creek and that area north of Berry Creek to the GTNP boundary.
Area 75. Snake River. Beginning at the junction of the Gros Ventre-Kelly Road and U.S. Highway 26-89-191; northerly along said highway to Ditch Creek; westerly along said creek to the Snake River proper; northerly along the easternmost bank of the main channel of the Snake river to the northernmost channel of Spread Creek; easterly along said creek to U.S. Highway 26-89-191; southwesterly along said highway to U.S.F.S. Road 30310 at the Cunningham Cabin; southerly along said road to the GTNP boundary; southerly along said boundary to the intersection with the Shadow Mountain-Kelly Road (U.S.F.S. Road 30340); southwesterly along said road to the junction of the Teton Science School road; northeasterly along said road one and one-quarter (1¼) miles to a marked boundary; easterly one (1) mile to the GTNP boundary; southerly along the GTNP boundary to the Gros Ventre-Kelly Road; southwesterly along said road to U.S. Highway 26-89-191.

Area 79. Teton Park. Beginning where the U.S. Forest Service access road (U.S.F.S. Road 30310) near Cunningham Cabin intersects U.S. Highway 26-89-191; northerly along said highway to the junction of U.S. Highway 89-287 at Moran; northwesterly along said highway to the Grand Teton National Park boundary easterly and southerly along said boundary to the U.S. Forest Service access road (U.S. F.S. Road 30310) near Cunningham Cabin; westerly along said road to U.S. Highway 26-89-191.

B-TNF GMUs

Area 70. Buffalo Fork. Beginning where U.S. Highway 26-287 intersects the GTNP boundary; northerly along said boundary to Pacific Creek; northeasterly up said creek to Gravel Creek; northerly up said creek to the Snake River Trail; northerly along said trail to the south boundary of YNP; easterly along said boundary to the Continental Divide; southerly and easterly along said divide to U.S. Highway 26-287 at Togwotee Pass; westerly along said highway to the east boundary of GTNP.

Area 71. Pacific Creek. Beginning where Pacific Creek crosses the GTNP boundary; northerly along said boundary to the Targhee National Forest boundary; northerly along said boundary to the southern boundary of YNP; easterly along said boundary to the Snake River Trail at Fox Park; southwesterly along said trail over Big Game Ridge to Gravel Creek; southerly along said creek to Pacific Creek; southerly down said creek to the GTNP boundary.

Area 74. Ditch Creek. Beginning where Ditch Creek crosses the GTNP boundary; northeasterly along said boundary to Brush Creek; southerly up said creek to the divide between Brush Creek and Ditch Creek; southerly along a posted boundary to Ditch Creek; southerly down said creek to the GTNP boundary.

Area 78. Wilson. Beginning at the junction of Wyoming Highway 22 and Wyoming Highway 390; northerly along Wyoming Highway 390 to the GTNP boundary; northerly and southerly along said boundary to U.S. Highway 26-89-191; southerly along said highway to its junction with Wyoming Highway 22; westerly along said highway to its junction with Wyoming Highway 390.

Area 80. Sheep Creek. All of the drainages of Flat Creek, Sheep Creek and Nowlin Creek east of the NER.

Area 81. Spread Creek. Beginning where the GTNP boundary crosses the Gros Ventre River; northerly along said boundary to Ditch Creek; up said creek to a posted boundary; straight north along the posted boundary to the divide between Brush Creek and Ditch Creek; northerly down Brush Creek to the GTNP boundary; northerly along said boundary to U.S. Highway 26-287; easterly along said highway to Togwotee Pass and the Continental Divide; southerly along said divide to the Moccasin Basin Road (U.S.F.S. Road 30750); southerly down said road to the North Fork of Fish Creek at Calf Creek; southerly down said creek to Fish Creek; southeasterly down said creek to the Gros Ventre River; westerly down said river to the GTNP Park boundary.

Area 82. Crystal Peak. Beginning where the Gros Ventre River crosses the NER boundary near the town of Kelly; easterly up said river to Kinky Creek; easterly up said creek to the Darwin Ranch Road (U.S.F.S. Road 620); easterly along said road to the divide between the Green River and Gros Ventre River; southwesterly along said divide to the divide between the Green River

and Hoback River at Hodges Peak; westerly along the divide between Flat Creek and the Gros Ventre River; northerly along said divide to the NER boundary; northerly along said boundary to the Gros Ventre River.

Area 84. Lower Hoback. Beginning where U.S. Highway 191 crosses Flat Creek at the north edge of the town of Jackson; due east to the NER boundary; easterly along said boundary to the B-TNF boundary and the ridge between Twin Creeks and Cache Creek; easterly along said ridge to Jackson Peak; southerly along the divide between Flat Creek and Cache Creek to Cache Peak; easterly along the divide between Flat Creek and Granite Creek to Pyramid Peak; southerly along the divide between the Gros Ventre River and the Hoback River to Steamboat Peak; southerly and westerly along the divide between Shoal Creek and Dell Creek; westerly along said divide to the Riling Draw Road; southerly along said road to the Dell Creek Road; westerly along said road to the Hoback River; westerly down said river to Cliff Creek; southerly up Cliff Creek to the divide between the Greys River and the Hoback River; northwesterly along said divide to the divide between the Greys River and Willow Creek; northerly along said divide to the divide between the Bailey Creek and Willow Creek (Greyback Ridge); northerly along said divide to Dry Wash Draw; westerly down said draw to Bailey Creek; northwesterly down said creek to the Snake River; northerly up said river to Wyoming Highway 22; easterly along said highway to U.S. Highway 191; easterly along said highway to Flat Creek at the north edge of the town of Jackson.

Past projects, their effects on grizzly bears, and the level of incidental take have also been considered in the environmental baseline. Previous formal consultation in the vicinity of the action area addressed transportation projects and grazing permits. The projects are: (1) the Grand Teton National Park Transportation Plan (WY003, February 9, 2007); (2) domestic livestock grazing in Grand Teton National Park (WY9351, May 2, 2006); (3) the Federal Highway Administration's Highway 287/26 Reconstruction project, a.k.a. Togwotee Pass Highway (WY5998, August 22, 2003); and (4) the Forest Services' issuance of commercial grazing permits on the Bridger-Teton National Forest (WY4715, December 3, 2002). These projects, their effects to the grizzly bears, and the level of incidental take have been considered in the environmental baseline for this biological opinion.

Status of the Species within the Action Area

Portions of the action area are within the Yellowstone Recovery Zone and Primary Conservation Area (PCA) for grizzly bears identified in the Conservation Strategy for the Grizzly Bears in the GYE (USFWS 2003). The PCA, or grizzly bear recovery zone as it was initially described (USFWS 1982), was delineated to define an area within which to focus grizzly bear recovery efforts after the species was listed in 1975. At the time the boundary was delineated, grizzly bears were uncommon in GTNP and surrounding areas. Currently, however, grizzly bears are established in large areas outside of the PCA in GTNP (Schwartz et al. 2002), and the line does not represent grizzly bear distribution in the GTNP area.

Grizzly bears are relatively common in the southern GYE, including the Gros Ventre Mountains southeast of GTNP, and are regularly observed in the Teton Mountain Range north of Paintbrush Canyon and the Badger Creek drainage. Grizzly bears have been observed on the valley floor south of Triangle X Ranch, at Jackson Lake, in Death Canyon, and south of GTNP in the vicinity of Teton Village and along the Snake River south of Jackson (Schwartz et al. 2002). In addition, a young male radio-collared grizzly bear used the Bradley-Taggart Lakes and White Grass areas for several weeks in 2005, providing empirical evidence for the continued southward movement of grizzly bears in the Teton Range.

There have been no grizzly bears sighted on the NER since 1994; however, bears occupy areas immediately north and east of the Refuge. As the GYE bear population continues to expand southward into presently unoccupied areas, and with continued habituation of bears to human presence and activity, the potential for the occurrence of bears on the Refuge will likely increase.

Management of grizzly bears and their habitat in the Park follows IGBC guidelines (1986) and the Park's Human-Bear Management Plan (NPS 1989). These guidelines were developed to provide effective direction for the conservation of grizzly bears and their habitat to Federal agencies responsible for managing land within the recovery zone. The objectives for managing grizzly bears in the Park under the 1989 NPS plan are to: (1) restore and maintain the natural integrity, distribution, and behavior of grizzly bears, (2) provide opportunities for visitors to understand, observe, and appreciate grizzly bears, and (3) provide for visitor safety by minimizing bear/human conflicts, by reducing human-generated food sources, and by regulating visitor distribution.

The Park has been highly successful in promoting grizzly bear recovery and reducing bear-human conflicts (e.g., property damages, incidents of bears obtaining human food, bear-inflicted human injuries) and human-caused bear mortalities in the Park. Recreational and administrative facilities, human activities, and human waste (garbage and sewage) in GTNP are managed in a manner that minimizes the potential for human-caused grizzly bear mortalities. Management actions also include implementation of backcountry food storage requirements. Bears that are typically wary of humans will often tolerate people at close distances when carcasses or other high quality foods are available.

Shifts in grizzly bear seasonal distribution within the GYE appear to be directly related to resource availability. Recent research indicates that bears in YNP are 2 times more likely to be found outside of the park during the early hunting season. This movement occurred regardless of the relative yearly production and abundance of whitebark pine seed production (Haroldson et al. 2004). Elk hunting seasons in the GYE begin as early as September 10 and run through December 3. This period coincides with late hyperphagia in GYE grizzly bears, as well as the time period (September-October) during which the majority of hunting-related grizzly bear mortalities have occurred (Haroldson et al. 2004)

Hunting-related deaths resulting from human-grizzly conflict remain the most significant source of known grizzly bear mortality in the GYE (Haroldson et al. 2004; USFWS 2003). In the PCA itself, analysis of the potential correlation between hunter numbers and levels of known and probable grizzly bear mortality from 1987 to 1997 indicated little relationship (USFWS 2003). This analysis did not consider the relationship between hunter numbers and grizzly bear mortality in areas outside of the PCA. While the high level of hunting-related grizzly mortality has not been directly linked to hunter numbers in the PCA, it is nonetheless primarily the result of chance encounters between bears and hunters in the field, conflicts over ungulate carcasses and conflicts in hunter camps often as a result of game meat being kept in campsites (USFWS 2003; Haroldson et al. 2004).

Status of Species Habitat within the Action Area

The following is a brief description of habitat and cover types within existing elk hunting areas/GMUs:

Within the NER, elk hunting area (77) is dominated by mixed shrub and sagebrush shrubland interspersed with grassland. Riparian woodland habitat consists primarily of narrowleaf cottonwood (*Populus angustifolia*) and willow (*Salix* spp.) stands. Aspen woodlands occur on many hillsides, often some distance from water sources. Small patches of conifer forest occur within the hunt area and consist of Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*) and junipers. Agricultural areas and cultivated fields occur throughout the hunt area. The relatively even and open nature of terrain within the hunt area provides excellent foraging habitat for ungulates, but largely precludes grizzly-bear use and occupancy.

Within the GTNP, elk hunting areas (72, 75, 79) have quite different topographical and vegetational characteristics. Area 72 ranges from valley floor to alpine, with coniferous woodlands of lodgepole pine as well as whitebark pine, Englemann spruce (*Picea engelmannii*), sub-alpine fir (*Abies bifolia*), and Douglas-fir. Area 75 is predominately covered in sagebrush, with rolling terrain punctuated by areas of steeper relief. Small patches of grassland are located along the eastern border, with cultivated fields to the south. Patches of coniferous woodlands are located south of Ditch Creek and in the Snake River bottom. The relative lack of tree cover across most of the hunt area makes it less suitable for grizzly bears, with the exception of areas within the Snake River bottom, Blacktail Butte, and other small forested patches. Area 79 is composed of highly variable terrain predominately covered in dense coniferous woodlands composed of lodgepole pine, whitebark pine, Douglas and subalpine fir, and spruce; but it also includes some large expanses of sagebrush grasslands and willow habitats. The extensive areas of tree cover throughout the hunt area provide a large amount of suitable habitat for both elk and grizzly bear.

Within the B-TNF, elk hunting areas (70, 71, 74, 78, 80, 81, 82, 84) are highly variable in terms of terrain and are predominately forested with dense stands of conifers dominated by lodgepole pine, as well as whitebark pine, Englemann spruce, sub-alpine fir, and Douglas-fir.

Willow and quaking aspen (*Populus tremuloides*) occur in valley bottoms in association with streams, and sagebrush shrubland and grassland habitat grow in the lower elevations. The varied topography, dense woodland cover and general lack of human development offer extensive suitable habitat for grizzly bear north the Gros Ventre River and provide important transitional, and migration habitat for elk.

Factors Affecting Species Environment within the Action Area

General Factors

Past and ongoing actions within the action area and within the grizzly bear Recovery Zone are likely to affect GYE grizzly bears moving through the action area whether their home range is within or adjacent to the action area. These actions include:

- livestock grazing (which would impact grizzly bears through management actions),
- private land development,
- firewood cutting,
- road use/management/improvements,
- timber harvest,
- recreation activities that lead to human-bear conflicts,
- vegetation management,
- wild and prescribed fire, and
- loss or decline of important food sources (e.g., whitebark pine seeds due to fire suppression).

EFFECTS OF THE ACTION

Under section 7(a)(2) of the Act, "effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, with the effects of other activities interrelated or interdependent with that action. Direct effects are immediate effects of the proposed action on the species or its habitat. Indirect effects are those caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). The effects of the action are added to the environmental baseline to determine the future baseline and to form the basis for the determination in this opinion. Should the Federal action result in a jeopardy situation and/or adverse modification conclusion, the Service may propose reasonable and prudent alternatives that the Federal agency can take to avoid violation of section 7(a)(2). The effects discussed below are the result of direct and indirect impacts of implementing the proposed project and are addressed according to the four management goals outlined in the Plan. They are broken down and discussed further according to key actions occurring under each goal.

Habitat conservation

Under the proposed action 800-2,000 acres/year (324-809 ha/yr) of cultivated land would continue to be flood irrigated, while up to 1,100 acres (445 ha) would be converted from flood to sprinkler irrigation. Restoration of native species to 4,500 acres (1,821 ha) of existing agriculture fields would occur in GTNP and exclosures would be used on the Refuge to allow recovery of willow, aspen and cottonwood stands. These actions would likely result in an overall minor decrease in total herbaceous forage available for elk and bison, but would improve the overall quality of available forage. While these actions may alter ungulate distributions and densities, and cause elk in the Jackson herd to alter their movements within and outside of the Refuge in response to the changes, it is unlikely that these factors would have any significant impact on the GYE grizzly bear population.

Sustainable populations/ Elk and bison numbers

Supplemental feeding

Under the proposed action, supplemental feeding would be reduced from current levels and replaced by greater ungulate reliance on standing forage. The reduction in food supplementation may lead to changes in ungulate distribution and mortality and would likely cause elk and bison to return to a more natural pattern of existence influenced to a greater degree by factors such as climate and availability of native forage. Supplemental feeding likely reduces the effects of density in the Jackson elk herd (Lubow and Smith 2004); therefore, density-dependent effects on seasonal juvenile survival and dispersal may become more apparent as supplemental feeding is reduced. These effects, however, along with any associated decrease in adult and juvenile elk survival rates, are likely to be negligible since the Jackson elk herd is maintained below carrying capacity (Lubow and Smith 2004). While minor increases in elk mortality as a result of reduced supplemental feeding may be beneficial to grizzly bears in the GYE due to increased availability of carcasses, the effect would not likely be significant.

Elk hunt

The Jackson elk herd comprises one of the largest concentrations of elk in North America, with an estimated 13,000 individuals whose seasonal distributions allow them to be considered as being divided into four herd segments (Grand Teton, Yellowstone, Teton Wilderness, and Gros Ventre). The elk migrate across several jurisdictional boundaries, including the NER, GTNP, JDR Memorial Parkway, YNP, B-TNF, BLM resource areas, and state and private lands. Because of its large size, wide distribution, effects on vegetation, and importance to the area's predators and scavengers, the Jackson elk herd contributes significantly to the ecology of the southern GYE.

Elk hunting has been an annual event on the NER since 1955 and is the primary management tool used to control the Jackson elk herd population both on the Refuge and throughout the

Jackson elk herd units. As part of the proposed action, there will be a short-term increase in hunter numbers on the Refuge from 733 to 1,000 and an increase from 220 to 300 elk harvested annually. In the long term, overall hunter numbers on the Refuge will likely decrease to 470-487, as will the number of elk harvested (126-146). Hunting on the Refuge currently occurs in Area 77; however, a small hunt area may potentially be added in the southern portion of the Refuge in order to force elk back into other hunt areas. Hunting will be strictly managed and the areas available to hunting frequently patrolled. Hunting permits issued for the Refuge are day-use only and do not allow hunters to camp overnight. Due to these aforementioned factors, and the fact that habitat on the Refuge is relatively open and generally lacks densely forested areas, it is unlikely that the risk of elk hunters killing grizzly bears will be greater in either the short or long term as a result of the proposed action.

Elk hunting as part of the Park's annual elk reduction, occurs on approximately 66,600 acres (26,952 ha) of the Park's backcountry, 29,100 acres (11,776.4 ha) of which is in the recovery zone. Under the proposed action, there will be a short-term increase in the number of hunters permitted and deputized to hunt in the Park from 1,600 currently, to 2,200, and an increase in the number of elk harvested from 480 to 650. In the long term, the overall number of hunters in the Park will decrease to 773-957 per year, and the number of elk harvested will decrease to 232-287. Unlike the Refuge, overnight camping is permitted in certain areas.

There are 3 elk hunting areas (Areas 72, 79, 75) located within the boundaries of the GTNP. The terrain of Area 75 is largely open and lacking densely forested areas. This open, shrubland characteristic and general absence of dense woodland cover would tend to reduce the risk of surprise encounters between elk hunters and grizzly bears in these areas that might potentially result in human-caused grizzly mortality. Exceptions include the Snake River bottom where thicker cover exists and grizzly bears are known to frequent, and Blacktail Butte where grizzly bears might be expected to occur (Steve Cain, National Park Service, person. comm. 2007). Hunters in this area may face a higher risk of grizzly conflict than in other portions of Area 75. Portions of Area 71 are located within the 23,778 acres (9,623 ha) of the JDR Memorial Parkway managed by the Park; however, hunting for elk and other wildlife is largely managed by the WGFD. Area 72 has been closed to hunting since 1967. It is the only area in the Park west of the Snake River where hunting was authorized in the Park's 1950 enabling legislation and, although the potential for it to be reopened exists, this is not expected to occur within the foreseeable future. Compared with Area 75, Area 79 contains large expanses of dense woodland that provide ideal grizzly bear cover. Portions of the hunting area are located within the Buffalo Spread Creek BMU and represent a region where human-bear conflicts have occurred in the past (Haroldson et al. 2004; Gunther et al. 2004). The short-term risk for future human-bear conflicts resulting in potential grizzly bear mortality as a result of the proposed action is considered high for this hunting area both south of Elk Ranch and north of Moran and highway 26/287. However, a later start date of the elk hunting season relative to surrounding areas, a 30 to 40 percent yearly hunter-ranger contact rate, restricted backcountry camping, required use of bear-deterrence spray and supplemental educational materials addressing hunter-grizzly conflict

provided to deputized hunters (Steve Cain, National Park Service, person. comm. 2007) may limit this potential risk. The long term risk is considered to be equivalent to current levels.

Most of the remainder of the Jackson elk herd unit is comprised of the Buffalo and Jackson ranger districts of B-TNF. Elevation ranges from about 6,300 ft. (1,920 m) to nearly 12,200 ft. (3,719 m) at the headwaters of the Yellowstone River. There is not expected to be a substantial short-term increase in the short term in either the number of elk hunters using the forest or the number of elk harvested unless hunts on the Refuge cause more elk to move into these areas. As a result of the proposed action, in the long-term it is expected that herd reductions in the Grand Teton segment will cause individuals to radiate into and be sustained in other herd segments, allowing proportionately more elk to be harvested. In the long-term, it is estimated that there will be a 29-35 percent increase in hunter numbers in the B-TNF (from 4,227 currently to 5,600-5,870) as a result of the proposed action. The number of elk harvested per year in the B-TNF is predicted to increase from 1,268 to between 1,680 and 1,761.

There are 6 hunting areas (Area 70, 71, 74, 80, 81, 82) located in the B-TNF and surrounding the Park. These areas are dotted with dense coniferous woodlands interspersed with more open woods, and sagebrush and mixed grasslands at lower elevations and in the valleys. The terrain is highly variable with elevations ranging from 6,396 to 9,676 ft. (1,950 to 2,950 m). Multiple human-bear conflicts have been recorded throughout these areas in the past including hunting-related grizzly bear mortalities (Haroldson et al. 2004; Gunther et al. 2004, USFWS 2003). Elk season start dates in these areas range from September 10 to September 26, which corresponds both with the period when bears are actively foraging and preparing for hibernation and with the time during which most known and probable hunting-related grizzly bear mortalities occur (Haroldson et al. 2004; Gunther et al. 2004). Traditional early fall elk hunts in these areas have created a reliable food source for hyperphagous bears which take advantage of ungulate remains left by hunters, and this brings them into close proximity to hunters themselves (Haroldson et al. 2004). As a result of these factors, the risk of human-bear conflict resulting in potential hunting-related grizzly bear mortality is considered high in Areas 70, 71, and 81. Hunting Areas 73, 78, 84, and 85 are considered to represent regions with low risk of human-bear conflict due to the relatively high level of human occupation and their location outside of the main fall migration routes of the Jackson herd.

Bison hunt

A bison hunt would occur under the proposed action in order to reduce the herd size on the Refuge, increase bison distribution, limit bison-elk conflict along feed lines and reduce the potential for disease transmission. A reduction in herd size would also contribute to enhancement of habitat through a decrease in the damage caused by excessive grazing and browsing of willow, aspen and cottonwood stands. Initially, the bison hunt would reduce herd size by 140-150 bison/year, of which, 90-100 would be removed on the Refuge and 50 would be removed from the B-TNF. This would involve an average of 175-190 bison hunters each year. In the long term, the Plan estimates that an average of 70 bison will be killed annually, with an

average of 90 hunters participating in the hunt. This nevertheless represents a substantial increase over recent numbers of bison being harvested and bison hunters on the Refuge. Despite the increase in the number of hunters on the NER, due to the aforementioned factors and conditions associated with hunts on Refuge, the risk of human-grizzly conflict resulting in hunting-caused grizzly bear mortality is considered to be low, both in the short and the long term. The risk of hunter-caused grizzly mortality associated with bison hunts in the B-TNF is considered to be higher than on the Refuge, especially in the northern portions of Area 81 east of Elk Ranch and between Buffalo Fork and Spread Creek.

Disease management

In order to maintain the health of elk and bison populations while continuing supplemental feeding at reduced levels, a variety of disease management techniques will be explored (e.g., vaccination, selective fertility control, age- and sex-specific harvest). Under the proposed action, WGFD personnel will be allowed to use brucellosis vaccine Strain 19 on elk and RB51 on calf and nonpregnant female bison along feedlines during feedline operations. Grizzly bears may consume elk or bison exposed to these brucellosis vaccines; however, research indicates that there are no significant adverse effects of the RB51 vaccine on nontarget species (Januszewski et al. 2001). No clinical trials have been conducted to determine if vaccine Strain 19 is safe for nontarget species; however, the vaccine has been used on WGFD feedgrounds for 17 years without any noticeable adverse clinical, histological or reproductive effects on nontarget species. Since vaccination activities will occur within the Refuge along feedlines, it is not expected that there would be a risk of disturbance to grizzly bear associated with the action.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Cumulative Effects within the Action Area

Several privately owned and State of Wyoming-owned in-holdings are present in GTNP; depending upon future human activities occurring on these properties, grizzly bears could be negatively affected. For many years, GTNP has attempted to secure these in-holdings with lifetime leases and out-right purchases and has been very successful in doing so. No large-scale developments or land-based projects have been proposed for these in-holdings.

There are plans to convey the Laurance S. Rockefeller (LSR) Preserve (approximately 1,100 acres [445 ha]) in southern GTNP to the Federal government in 2007. However, the LSR Preserve is presently a private in-holding in the Park. Although the future plans include removal

of most of the development that has been present on the ranch, the current owners will develop an interpretive facility and trail system prior to the conveyance of the property.

Cumulative Effects Adjacent to the Action Area and Grizzly Bear Recovery Zone

Cumulative effects of actions outside the action area and within the grizzly bear Recovery Zone are likely to affect resident grizzly bears moving through the action area whether their home range is within or adjacent to the action area. These actions include:

- livestock grazing (which would impact grizzly bears through management actions),
- private land development,
- firewood cutting,
- road use/management/improvement,
- timber harvest,
- recreation activities that lead to human-bear conflicts,
- vegetation management,
- wild and prescribed fire, and
- loss or decline of important food sources (e.g., whitebark pine seeds due to fire suppression),

The recent Teton County, Wyoming, approval of the Snake River Associates development plan for Teton Village on private land adjacent to the Park's southern boundary could have additional cumulative, long-term impacts on grizzly bears. This development will likely result in a higher number of visitors to the Park and an increase in associated dispersed recreational use. This may be particularly true in the southwest corner of the Park, where excellent bear habitat exists. Grizzly bears will likely colonize this area, even though it is several miles outside of the PCA.

These activities would cumulatively contribute to increased mortality risks, reduce availability of secure habitat, and diminish habitat effectiveness for grizzly bears. However, the total cumulative impact of the above-listed activities, as well as other unidentified actions occurring within the grizzly bear recovery zone, do not appear to be adversely affecting population recovery, as evidenced by the expanding grizzly bear population in the GYA (Eberhardt and Knight 1996; Schwartz et al. 2002; Pyare et al. 2004).

CONCLUSION

After reviewing the current status of the threatened grizzly bear, the environmental baseline for the species in the action area, the effects of the action and the cumulative effects, it is the Service's opinion that the Final Bison and Elk Management Plan, as proposed, is not likely to jeopardize the continued existence of the grizzly bear. No critical habitat has been designated for grizzly bears, therefore, none will be affected. Implementing regulations for section 7 (50 CFR

402) define "jeopardize the continued existence of" as to "engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." Our conclusion that the proposed action is not likely to jeopardize the continued existence of grizzly bears is based primarily on the information presented in the FEIS and BE prepared for the proposed Bison and Elk Management Plan, information in our files, and informal discussions between the Service, the Park and other personnel from other agencies and groups.

Grizzly bears in the GYE have increased in numbers and expanded in range during the past two decades (Schwartz et al. 2006). Female grizzly bears with young have been observed out side of the recovery zone, leading to the assumption that females are able to establish home ranges and find the resources needed to survive and reproduce in these areas.

The Service concludes that some adverse affects may occur to grizzly bears as a result of the proposed bison and elk management plan. The existing level of hunting on the Refuge has not presented a problem of grizzly-human conflict and, though the best available information suggests the GYE grizzly bear population is stable to increasing and is expanding its range to the south, the open nature of terrain on the Refuge and high levels of human activity and visibility will limit the risk of conflicts in both the short and long terms. As on the Refuge, existing hunting within the Park has not presented a substantial problem of hunting-caused grizzly bear mortality; however, unlike on the Refuge, the variability of terrain and densely wooded areas in the Park contribute to an elevated risk of hunting-related conflicts occurring. This increased risk would be minimal in the long term as a result of the proposed action, but would be higher in the short-term, especially within Area 79. Within the B-TNF, the short term risk of increased hunting-related grizzly bear mortality would be relatively unchanged as a result of the proposed plan under current conditions. The long-term risk, however, would be considerably higher in all areas where grizzly bear occur.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation when it actually kills or injures listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent act or omission which creates the likelihood of injury to listed species by annoying it such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to

and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary and must be implemented by the Park and Refuge so that they become binding conditions of any permit issued by the Park or Refuge, as appropriate, in order for the exemption from prohibited taking of the species concerned, as described in section 7(o)(2), to apply. The Park and Refuge have a continuing duty to regulate the activity covered by this incidental take statement. If the Park or Refuge (1) fails to assume and implement the terms and conditions or (2) fails to require permittees to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or other documents, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Park and Refuge must report the progress of the action and its impact on the species to the Service as specified in the Incidental Take Statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

Considering the history of hunting-related conflicts in the GYE, differing strategies for management of hunters by the Park and the B-TNF, and differences in landscape and habitat characteristics, the risk of hunting-related grizzly bear mortality and associated incidental take are addressed separately for the Park and the B-TNF. The Service anticipates that the proposed action will exacerbate the short-term risk for hunting-related grizzly bear mortality within the Park and the long-term risk for hunting-related grizzly bear mortality in the B-TNF and JDR Memorial Parkway as a result of the Plan.

The Service anticipates 1 grizzly bear (adult or juvenile) over the 15-year implementation period of the Plan could be incidentally taken as a result of the proposed action in GTNP and 2 grizzly bears (adult or juvenile) in a 15-year period could be incidentally taken as a result of the proposed action in the B-TNF. It is expected that all grizzly bears would be lethally taken through hunting-related conflicts. In the period 1987-2001, an average of 2 human-caused grizzly bear mortalities occurred per year in the B-TNF. During the same time period the average human-caused grizzly bear mortality was less than 1 per year in the Park (USFWS 2003). The incidental take of 2 grizzly bears in the B-TNF and 1 in GTNP as a result of the proposed action is considered to be in addition to this baseline level of mortality.

EFFECT OF THE TAKE

As analyzed in this biological opinion, the Service concludes that this level of anticipated incidental take is not likely to result in jeopardy to the species. Critical habitat has not been designated for the grizzly bear; therefore none would be affected.

REASONABLE AND PRUDENT MEASURES

The Service believes the following Reasonable and Prudent Measures (RPM) are necessary and appropriate to minimize impacts of incidental take of grizzly bears:

RPM 1 Minimize the likelihood of hunting-related human/grizzly bear conflict associated with the Project through education of hunters

TERMS AND CONDITIONS

The Service believes no more than 3 grizzly bears will be incidentally taken as a result of the proposed action. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is reached, such incidental take represents new information requiring re-initiation of consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

1. The Park and Refuge shall continue ongoing educational measures related to limiting the risk of hunter-grizzly conflict and hunting-caused grizzly bear mortality and shall adapt or modify these measures as changing circumstances and information warrant.

2. If incidental take of grizzly bears in the B-TNF above the baseline level reaches 1 grizzly bear, Service and Park representatives shall meet with representatives from the WGFD and B-TNF to discuss whether additional educational and/or preventative measures or other changes could be implemented within the action area to minimize additional take of grizzly bears within the B-TNF.

3. In the event that a grizzly bear is killed within the action area as a result of hunting-related conflict, the Park, Refuge or B-TNF shall notify the Service's Wyoming Field Office (307-772-2374) and the Service's Law Enforcement Office (307-261-6365) within 24 hours.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation Recommendations (CR) are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

CR1. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects, or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

CR2. The Refuge and Park should participate in ongoing interagency efforts to identify, map and manage linkage habitats essential to grizzly bear movement. Please contact the Service's grizzly bear recovery coordinator at (406) 243-4903 for information.

CR3. If grizzly bears are sighted on the NER during the implementation period of the project, all hunting activities on the NER should be reassessed in order to determine the potential risk of hunter-grizzly conflict.

CR4. The Park should encourage hunters to move their kills out from underneath thick tree cover or undergrowth into more open areas as quickly as possible in order to reduce the risk of surprise encounters with grizzly bears.

CR5. The Park should encourage hunters to retrieve and remove or hang their kills as quickly as possible after making a kill in order to reduce the risk of hunter-grizzly conflict over ungulate carcasses.

CR6. The Park should recommend that after making a kill or tagging a kill, any hunter that finds a grizzly bear is already on the carcass will forfeit that kill and/or tag.

CR7. The Park should place educational signs/information addressing the risks of hunter-grizzly conflict, including information on daily and seasonal periods that represent the highest risk for hunter-grizzly conflict and how to diffuse grizzly bear confrontations, in any parking area, maintained camp site and high use trail head where such signs/information are not already in place.

CR8. The Park should continue encouraging hunters to maintain at least 100m distance between any campsite and any carcass or meat that is hung in order to elevate it beyond the reach of scavenging grizzly bears.

CR9. As a non-action agency indirectly affected by the proposed project, the B-TNF should implement the abovementioned conservation measures whenever possible and appropriate.

REINITIATION REQUIREMENT

This concludes formal consultation on the action outlined in your February 7, 2007, request for formal consultation on the Final Bison and Elk Management Plan and Environmental Impact

Statement. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your assistance in the conservation of endangered, threatened, and proposed species. If you have any questions or comments on this final biological opinion or your responsibilities under the Act, please contact Tyler Fox of our staff at the letterhead address or by phone at (307) 772-2374, extension 237.

cc: B-TNF, Forest Supervisor, Jackson, WY (K. Hamilton)
FWS, Grizzly Bear Recovery Coordinator, Montana (C. Servheen)
FWS, Planning Team Leader, Lakewood, CO (L. Shannon)
GTNP, Superintendent, Jackson, WY (M. Gibson-Scott)
GTNP, Management Assistant, Moose, WY (G. Pollock)
GTNP, Senior Wildlife Biologist, Moose, WY (S. Cain)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (V. Stelter)
WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)

Literature Cited

Bjornlie, D. and M. Haroldson. 2001. Grizzly bear use of insect aggregation sites documented from aerial telemetry and observations. Pages 44-51 *in* C. C. Schwartz and M. A. Haroldson, Eds. Yellowstone grizzly bear investigations: Annual report of the Interagency Grizzly Bear Study Team, 2000. U.S. Geological Survey, Bozeman, Montana.

Eberhardt, L. L. and R. Knight. 1996. How many grizzlies in Yellowstone? Journal of Wildlife Management 60:416-421.

Gillian, C.M., F.M. Hammond, and C.M. Peterson. 1994. "Evaluation of an aversive conditioning technique used on female grizzly bears in the Yellowstone ecosystem." Pp. 503-512 in Proceeedings and papers of the Ninth International Conference on Bear Research and Management. Bears—Their Biology and Management (Claar, J.J. and P. Schullery, eds). Missoula, MT.

Gunther, K. A., M. A. Haroldson, K. Frey, S. L. Cain, J. Copeland, and C. C. Schwartz. 2004. Grizzly bear--human conflicts in the Greater Yellowstone Ecosystem, 1992-2000. Ursus 15(1):10-22.

Gunther, K.A, M.T. Bruscino, S.L. Cain, K. Frey, L. Hanauska-Brown, M. Haroldson and C.C. Schwartz. 2004a. Grizzly Bear-Human Conflicts in the Greater Yellowstone Ecosystem. Pages 53-56 *in* C. C. Schwartz and M. A. Haroldson, Eds. Yellowstone grizzly bear investigations: Annual report of the Interagency Grizzly Bear Study Team, 2003. U.S. Geological Survey, Bozeman, Montana.

Haroldson, M.A. 2006. Grizzly bear mortalities. Pages 16-22 *in* C.C. Schwartz, M.A. Haroldson, and K. West, editors. Yellowstone grizzly bear investigations: annual report of the Interagency Grizzly Bear Study Team, 2005. U.S. Geological Survey, Bozeman, Montana.

Haroldson, M. A. and K. Frey. 2004. Grizzly bear mortalities. Pages 22-25 in C. C. Schwartz and M. A. Haroldson, eds. Yellowstone grizzly bear investigations: annual reports of the Interagency Grizzly Bear Study Team, 2003. U.S. Geological Survey, Bozeman, MT.

Haroldson, M. A. Ternant, K. A. Gunther, and C. C. Schwartz. 2002. Grizzly bear denning chronology and movements in the Greater Yellowstone Ecosystem. Ursus 13:29-37.

Hilderbrand, G. V., S. G. Jenkins, C. C. Schwartz, T. A. Hanley, and C. T. Robbins. 1999. Effect of seasonal differences in dietary meat intake on changes in body mass and composition in wild and captive bears. Canadian Journal of Zoology 77:1623-1630.

Interagency Grizzly Bear Study Team (IGBST). 2005. Reassessing methods to estimate population size and sustainable mortality limits for the Yellowstone grizzly bear. Interagency Grizzly Bear Study Team, U.S. Geological Survey, Northern Rocky Mountain Science Center, Montana State University, Bozeman, Montana, U.S.A.

IGBST. 2000. Yellowstone Grizzly Bear Investigations, Report of the Interagency Study Team 2000. U.S. Geological Survey, Wyoming Game and Fish Department, U.S. Fish and Wildlife Service, Montana Fish, Wildlife and Parks Department, U.S.D.A. Forest Service, Idaho Fish and Game Department (Charles C. Schwartz and Mark A. Haroldson, Eds).

Interagency Conservation Strategy Team (ICST). 2003. Final Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Area. The Interagency Conservation Strategy Team. 174 pp.

Interagency Grizzly Bear Committee (IGBC). 1986. Interagency grizzly bear guidelines. U.S. Forest Service, Washington, D.C.

Jacoby, M. E., G. V. Hilderbrand, C. Servheen, C. C. Schwartz, S. M. Arthur, T. A. Hanley, C. C. Robbins, and R. Michner. 1999. Trophic relations of brown and black bears in several western North American ecosystems. Journal of Wildlife Management 63:921–929.

Januszewski, M.C., S.C. Olsen, R.G. McLean, L. Clark, and J.C. Rhyan. 2001. Experimental infection of nontarget species of rodents and birds with Brucella abortus strain RB51 vaccine. Journal of Wildlife Diseases 37(3):532-537.

Kasworm, W. F., and T. L. Manley. 1989. Road and trail influences on grizzly bears and black bears in northwest Montana. International Conference on Bear Research and Management 8:79-84.

Knight, R. R. and L. L. Eberhardt. 1985. Population dynamics of Yellowstone grizzly bears. Ecology 66(2):323-334.

Knight, R. R. and S. L. Judd. 1983. Grizzly bears that kill livestock. International Conference for Bear Research and Management 5:186-190.

Linnell, J. D. C., J. E. Swenson, R. Anderson, and B. Barnes. 2000. How vulnerable are denning bears to disturbance? Wildlife Society Bulletin 28(2):400-413.

Lubow, B.C., and B.L. Smith. 2004. Population dynamics of the Jackson elk herd. Journal of Wildlife Management. 68(4):810-829

Mattson, D. J. 2001. Myrmecophagy by Yellowstone grizzly bears. Canadian Journal of Zoology 79:779-793.

Mattson, D. J. and D. P. Reinhart. 1997. Excavation of red squirrel middens by grizzly bears in the whitebark pine zone. Journal of Applied Ecology 34:926-940.

Mattson, D. J. and D. P. Reinhart. 1995. Influences of cutthroat trout (*Onchorhynchus clarki*) on behavior and reproduction of Yellowstone grizzly bears (*Ursus arctos*), 1975-1989. Canadian Journal of Zoology 73:2072-2079.

Mattson, D. J. and R. R. Knight. 1991. Effects of access on human-caused mortality of Yellowstone grizzly bears. USDI National Park Service, Interagency Grizzly Bear Study Team Report 1991B.

Mattson, D. J., M. G. French, and S. P. French. 2002. Consumption of earthworms by Yellowstone grizzly bears. Ursus 13:105-110.

Mattson, D. J., B.M. Blanchard, and R.R. Knight. 1992. Yellowstone grizzly bear mortality, human habituation, and whitebark pine seed crops. Journal of Wildlife Management 56:432-442.

Mattson, D. J., B. M Blanchard, and R. R. Knight. 1991. Food habits of Yellowstone grizzly bears, 1977-1987. Canadian Journal Zoology 69:1619-1629.

Mattson, D. J., C. M. Gillin, S. A. Benson, and R. R. Knight. 1991a. Bear feeding activity at alpine insect aggregation sites in the Yellowstone ecosystem. Canadian Journal of Zoology 69:2430-2435.

Podruzny, S. 2005. Occupancy of Bear Management Units by Females with Young. Page 17 *in* C.C. Schwartz, M.A. Haroldson and S. Podruzny, editors. Yellowstone Grizzly Bear Investigations: Annual report of the Interagency Grizzly Bear Study Team, 2004. U.S. Geological Survey. Bozeman, Montana. 131 pp.

Podruzny, S. Cherry, C. C. Schwartz, and L. A. Landenburger. 2002. Grizzly Bear Denning and Potential Conflict Areas in the Greater Yellowstone Ecosystem. Ursus 13:19-28.

Podruzny, S. and K. Gunther. 2001. Spring Ungulate Availability and Use by Grizzly Bears in Yellowstone National Park. Pages 33-36 *in* C. C. Schwartz and M. A. Haroldson, editors. Yellowstone Grizzly Bear Investigations: Annual report of the Interagency Grizzly Bear Study Team, 2000. U.S. Geological Survey. Bozeman, MT.

Pyare, S., S. Cain, D. Moody, C. Schwartz, and J. Berger. 2004. Carnivore re-colonization: reality, possibility and a non-equilibrium century for grizzly bears in the Southern Yellowstone Ecosystem. Animal Conservation 7:1-7.

Reinhart, D. P., M. A. Haroldson, D. J. Mattson, and K. A. Gunther. 2001. Effects of exotic species on Yellowstone grizzly bears. Western North American Naturalist 61(3):227-288.

Robinson, H.L., C.C. Schwartz, J.D. Petty and P.F. Brussard. 2006. Assessment of pesticide residues in army cutworm moths (*Euxoa auxiliaries*) from the Greater Yellowstone Ecosystem and their potential consequences to foraging grizzly bears (*Ursos arctos horribilis*). Chemosphere 64:1704-1712

Schwartz, C.C., M.A. Haroldson, K. West, editors. 2006. Yellowstone grizzly bear investigations: annual report of the Interagency Grizzly Bear Study Team, 2005. U.S. Geological Survey, Bozeman, Montana. 90 pp.

Schwartz, C.C., M.A. Haroldson, K.A. Gunther, and D. Moody. 2002. Distribution of grizzly bears in the Greater Yellowstone Ecosystem 1990-2000. Ursus 13:203-212.

U.S. Fish and Wildlife Service (USFWS). 2005. Endangered and Threatened Wildlife and Plants; Designating the Greater Yellowstone Ecosystem Population of Grizzly Bears as a Distinct Population Segment; Removing the Yellowstone Distinct Population Segment of Grizzly Bears From the Federal List of Endangered and Threatened Wildlife; Proposed Rule. Federal Register 70 (221):69854-69884.

USFWS. 2003. Final conservation strategy for the grizzly bear in the Yellowstone ecosystem. U.S. Fish and Wildlife Service, Missoula, Montana 87 pp.

USFWS. 1993. Grizzly Bear Recovery Plan. Missoula, MT 181 pp.

USFWS. 1982. Grizzly bear recovery plan. Fish and Wildlife Reference Service. Denver, Colorado.

USFWS. 1975. Endangered and Threatened Wildlife: Amendment Listing the Grizzly Bear of the 48 Conterminous States as a Threatened Species. Federal Register 40(145):31734-31736.

U.S. Geological Survey (USGS). 2005. Website accessed January 2006. Katherine Kendall, Principal Investigator. http://nrmsc.usgs.gov/research/grizzlyb.htm

Zager, B., and J. Beecham. 2006. The role of American black bears and brown bears as predators on ungulates in North America. Ursus 17(2):95-108

April 29, 2013

Memorandum

To: Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming

From: Superintendent, Grand Teton National Park, Moose, Wyoming

Subject: Re-initiation of formal consultation on Grand Teton National Park and National Elk Refuge Bison and Elk Management Plan/EIS (Formal Consultation No. ES-6-WY-07-F014)

In February 2007, Grand Teton National Park (GRTE) and the National Elk Refuge (NER) submitted to your office the Bison and Elk Management Plan (BEMP) and related materials necessary to initiate formal consultation regarding potential impacts to threatened and endangered species (Formal Consultation No. ES-6-WY-07-F014). The final biological opinion for this consultation provided for an incidental take of 1 grizzly bear related to GRTE's elk reduction program (ERP). On November 22, 2012, a group of 3 hunters participating in the ERP shot and killed an adult male grizzly bear in the Snake River bottoms area of Hunt Area 75, within GRTE. This leaves the park with no additional grizzly bear take related to the ERP during the remaining 9 years of the plan's intended 15 year life span. Accordingly, with this letter we are requesting to re-open formal consultation on the BEMP.

The BEMP acknowledged that grizzlies occurred in GRTE's Hunt Area 79 and that they were anticipated to occur in Hunt Area 75, particularly along the Snake River bottoms and on Blacktail Butte, where hunters "may experience a higher risk of grizzly conflict than in other portions of Area 75" (p. 190 final BEMP, cited from the FWS biological opinion). The Draft BEMP/EIS further stated:

- "The ecosystem's grizzly bears number an estimated 400-600, and their distribution has been increasing over the past two decades. They widely use the northern two-thirds of the park, but can occur throughout the park and surrounding areas" (p.153).
- Under ***Impacts Common to All Alternatives***... "*Hunting Risks to Grizzly Bears* – As the grizzly bear population continues to expand southward, the risk of conflicts between hunters and grizzlies would increase and could result in increased mortality for bears and hunters under Alternatives 1,3,4,5, and 6, which would continue....., when necessary, an elk reduction program in the park" (p. 345).

Similarly, the biological opinion acknowledged that "the long term risk [of hunting related grizzly mortality]...would be considerably higher in all areas where grizzly bear occur," and that "the service anticipates that the proposed action will exacerbate the short-term risk for hunting-related grizzly bear mortality with the park..."(final BEMP p.194-195).

Conditions associated with the ERP remain largely the same as they were in 2007 except, as anticipated in the plan, grizzly bear distribution and numbers in the south end of the park appear to have increased. We have documented these changes based on opportunistic observations. Since 2007, several grizzly bears have been observed seeking out gut piles left on the landscape during the elk reduction program, just as they have throughout the ecosystem for decades during hunting seasons. We believe that grizzly bears will continue this behavior and that the risk of hunter-grizzly bear contacts will continue to be relatively high as long as the ERP is necessary.

In 2013, GRTE, in collaboration with the Wyoming Game and Fish Department, proposed several new measures to help mitigate the potential for hunter-grizzly bear conflicts during the ERP. These include: 1) closing the Snake River bottoms between Ditch Creek and Dead Man's Bar; 2) beginning the hunt 2 weeks later; 3) limiting ammunition carried in the field to 7 cartridges per day; and 4) limiting the number of shots hunters can take at a group of running elk to one (the latter two measures aim to reduce elk wounding loss).

Existing measures to help minimize human-bear encounters during the elk reduction program include: 1) requiring all hunters to carry bear spray; 2) maintaining a significant ranger presence and contacting a high percentage of program participants in the field; 3) not allowing artificial elk calls, which can draw bears to hunters; 4) providing a secure camping area for participants where carcasses can be safely stored out of reach of bears; 5) providing an abundance of bear safety educational materials to all permit holders, including warnings that hunters can expect to encounter bears while hunting in the park; and 6) significantly reducing numbers of hunters in the field (elk reduction program permits issued have declined from 1,150 in 2007 to 725 in 2012, and are proposed to further decrease to 650 in 2013; Table 2).

In addition, GRTE has developed and implemented several new grizzly bear conservation measures since 2007. First, we initiated a new "Be Bear Aware" campaign in 2007. This effort emphasized improving management of visitors in bear country through development, purchase, and placement of a variety of new information and education materials. Second, in 2007 we created the "Wildlife Brigade", a corps of paid and volunteer staff to respond to the rapidly escalating number of traffic jams caused by grizzly and black bear sightings along roads ('bear jams'); enforce food storage at campgrounds, picnic areas, and other developed areas; and continue refining the park's bear management program. This new program has been highly successful. In recent years the crew has consisted of one full-time bear management specialist, 2 paid seasonal rangers, and 10-12 seasonal volunteers and interns. They manage hundreds of bear jams annually, patrol park facilities and trails daily for food storage compliance, write courtesy food storage warnings for visitors, and educate thousands of visitors through direct contacts in the process. Third, we initiated a campaign in 2008 to purchase and install additional bear-resistant food storage boxes in collaboration with the Grand Teton National Park Foundation and park concessionaires. To date, nearly 400 boxes have been installed in camp sites and other developed areas. Fourth, in 2009, the park contracted the Wyoming Survey and Analysis Center at the University of Wyoming to evaluate effectiveness of our "Be Bear Aware" message. The results of this work provided valuable feedback on which park visitors were being reached and how the message affected their behaviors. Finally, in 2012 the park contracted a marketing specialist from Montana State University to study and evaluate "Be

Bear Aware" messaging ecosystem-wide. Results of this work also provided valuable feedback to land and wildlife management agencies about current messaging systems and how to improve them in the future. Overall, GRTE's program has been highly successful at minimizing human-grizzly bear conflicts, with no management removals or relocations required since 2007 (Table 1).

Table 1. Grizzly bear conflicts in Grand Teton National Park 2007-2012.

Date	Type	Location	Action	Comments
6-13-2007	Human injury	Willow Flats	None	Mauling
7-14-2007	Mortality	Hwy 89/191/287 near Arizona Creek	None	Road kill male cub of year
6-26-08	Property damage	Grassy Lake Rd campsite #2	None	Bear ripped tent, no attractants
5-9-10	Property damage, food reward	Huckleberry Hot Springs	Area temporarily closed, bear box installed	Adult bear closely approached and obtained food in day pack
6-2-10	Mortality	Hwy 89/191/26 near Spread Creek	None	Road kill male 3 year old G133
6-21-10	Property damage	Grassy Lake Rd campsite #1	None	Bear ripped tarp off tent, no attractants
10-25-11	Food Reward	Hwy 89/191/26 near Moose	None	Family group (610 plus 3 COY) observed rummaging through trash bag along highway
10-30-11	Human injury	Snake River Bottom near Schwabacher Landing	Area temporarily closed	Mauling
5-27-12	Food Reward	Colter Bay Developed Area	None	Yearling grizzly bear allegedly fed from a car
6-21-2012	Mortality	Hwy 89/191/26 near Lost Creek Road	None	Road kill male yearling
11-22-2012	Mortality	Snake River Bottom near Schwabacher Landing	Area closed for remainder of Elk Reduction Program	Adult male grizzly killed in self-defense

The ERP has occurred annually since 2007 and has been developed and administered as per conditions

set for in the park's establishing legislation (Public Law 81-787, 64 STAT 849). The need for the program is evaluated annually, and seasons are set in coordination with the Wyoming Game and Fish Department (Table 2).

Table 2. Grand Teton National Park elk reduction program permits and harvest, 2007-2013.

Year	Area 75 Permits	Area 79 Permits	Total Permits	Total Harvest	Comments
2007	500	650	1150	214	Some A79 permits also valid in A75
2008	550	600	1150	264	Some A79 permits also valid in A75
2009	325	575	900	361	Some A79 permits also valid in A75
2010	325	150	475	341	Some A79 permits also valid in A75
2011	675	75	750	278	Some A79 permits also valid in A75
2012	700	25	725	187	100% antlerless tags
2013[1]	650	0	650		A75 Type 4 permits valid in A79 Oct 19 – November 3, 2013

[1]Proposed

The Final Biological Opinion (USFWS 2007) identified 1 broad Reasonable and Prudent Measure, 3 specific Terms and Conditions, and 9 Conservation Recommendations. The park has complied with each of these.

Summary

GRTE is requesting to re-initiate formal consultation on its 2007 BEMP/EIS, completed with the NER, because the level of ERP grizzly bear incidental take (1) in the FWS's 2007 Final Biological Opinion (USFWS 2012) was reached in 2012. The Yellowstone ecosystem grizzly bear population has appeared to remain relatively steady since 2007 (IGBST 2012), but its distribution has increased in the GRTE vicinity (Schwartz et al. 2006, Bjornlie et al. 2013), corroborating increased sightings of grizzly bears, including females with young, in the southern half of the park.

GRTE has complied with all requirements and recommendations set forth by the FWS in the biological opinion (USFWS 2007), and has been highly successful at minimizing human-grizzly bear conflicts through intensive programs for food and garbage storage, management of bear jams, public education, hunting-specific conflict reduction measures, and other conservation actions.

We believe continued implementation of the BEMP is likely to incur additional losses of grizzly bears from hunter-grizzly bear conflicts, which will adversely affect grizzly bears. However, we also believe the number of bears affected will be small and will not jeopardize the continued existence of the Yellowstone ecosystem grizzly bear population.

If you have questions or need additional information regarding this matter, please contact senior wildlife biologist Steve Cain at 307-739-3485.

Literature Cited

Bjiornlie, D. D., D. J. Thompson, M. A. Haroldson, C. C. Schwartz, K. A. Gunther, S. L. Cain, and D. B. Tyers. 2013. Methods to estimate distribution and range extent of grizzly bears in the Greater Yellowstone Ecosystem. *In Review.*

Haroldson, M.A., C.C. Schwartz, S. Cherry, and D.S. Moody. 2004. Possible effects of elk harvest on fall distribution of grizzly bears in the Greater Yellowstone Ecosystem. Journal of Wildlife Management 68(1):129-137.

Schwartz, C. C., Haroldson M. A., Gunther K. A., Moody D. 2006. Distribution of grizzly bears in the Greater Yellowstone Ecosystem in 2004. Ursus 17(1):63-66.

Interagency Grizzly Bear Study Team (IGBST). 2012. Unpublished data. USGS Northern Rocky Mountain Science Center, Interagency Grizzly Bear Study Team, Bozeman, Montana.

USFWS. 2007. Memorandum, from Wyoming Field Supervisor to National Elk Refuge Manager. Final Biological Opinion for the Bison and Elk Management Plan Grand Teton National Park Transprotation Plan (Formal Consultation No. ES-6-WY-07-F014). U.S. Fish and Wildlife Service, Cheyenne, Wyoming.

USFWS and USNPS. 2007. Bison and Elk Management Plan: National Elk Refuge and Grand Teton National Park. U.S. Fish and Wildlife Service and U.S. National Park Service. Lakewood, CO. 251pp.

CC: Manager, National Elk Refuge.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

SEP 13 2013

In Reply Refer To:
06E13000/WY13F0094

Memorandum

To: Superintendent, National Park Service, Grand Teton National Park, Moose, Wyoming

Refuge Manager, U.S. Fish and Wildlife Service, National Elk Refuge, Jackson, Wyoming

From: Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming

Subject: Re-initiation of formal consultation on Grand Teton National Park and National Elk Refuge Bison and Elk Management Plan/EIS

This memorandum transmits the U.S. Fish and Wildlife Service's (Service) addendum to our biological opinion on the 2007 Bison and Elk Management Plan for the National Elk Refuge and Grand Teton National Park Environmental Impact Statement and a correction regarding the Bridger-Teton National Forest (Forest). Grand Teton National Park (Park) and the National Elk Refuge (Refuge) formally consulted with the Service on the Bison and Elk Management Plan (hereafter, Plan) in 2007, and the Service issued a subsequent biological opinion (our memorandum WY07F014). Our biological opinion included an Incidental Take Statement (ITS) for an anticipated level of incidental take of one grizzly bear (*Ursus arctos horribilis*) in the Park as a result of hunter-related mortality related to the legislatively permitted elk reduction program (ERP; part of the Plan).

Subsequent to the 2007 ITS, incidental take of one adult male grizzly bear occurred in the Park in November 2012. As a result, Mr. Steve Cain of your staff contacted our office to discuss the Park reaching its limit of incidental take and the Park's desire to reinitiate formal consultation before take is exceeded. As provided in 50 CFR 402.16, "reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded;

..." The Park reinitiated formal consultation in a memorandum dated May 2, 2013, which was received in our office on May 3.

The Park's and Refuge's original Plan Environmental Impact Statement (EIS) analyses covered the Park, Refuge, and adjacent lands, including portions of the Bridger-Teton National Forest (Forest); however, the final Plan EIS decision covered only the Park and Refuge. In addition to incidental take of one grizzly bear in the Park, we also anticipated take of two grizzly bears on the Forest during the 15-year time period for which the biological opinion was valid. There was no incidental take anticipated for the Refuge due to lack of grizzly bear presence or conflict on the Refuge at that time.

In response to the Park's reinitiation of formal consultation and after review of the 2007 biological opinion, the Service believes authorization of incidental take for the Forest was in error as the Forest was not covered by the final Plan EIS decision. Therefore, we are rescinding incidental take of two grizzly bears on the Forest and the following biological opinion addendum covers only the Park and Refuge.

The Park's May 2013 memo provided an update of activities relevant to the 2007 Plan EIS and Service's biological opinion. The 2007 Plan EIS described all proposed actions and potential effects to listed species; therefore, those documents may be referenced for detailed background information. This memo/addendum to our 2007 biological opinion documents our analysis of the Park's new information, tiers off of our original biological opinion, and provides a new Incidental Take Statement (ITS) for grizzly bears, which reflects current conditions within the Park and Refuge. Our new ITS below anticipates incidental take for the Refuge and increases the amount of take for the Park. This addendum and new ITS supersede the previous 2007 ITS, and this addendum and new ITS are valid for the remaining 9 years under the 2007 biological opinion, through the year 2022.

Your memo indicated incidental take of one adult male grizzly bear occurred in November 2012 by a group of hunters participating in the ERP, in the Park's Snake River bottoms area of Hunt Area 75. The Plan anticipated grizzlies would occur in the Park's Hunt Area 75, particularly along the Snake River bottoms and on Blacktail Butte. Conditions associated with the ERP remain largely the same as they were in 2007 except that, as anticipated in the Plan, grizzly bear distribution and numbers in the south end of the Park appear to have increased. These changes were documented based on research done by the Interagency Grizzly Bear Study Team and on opportunistic observations. Since 2007, several grizzly bears have been observed seeking out gut piles left on the landscape during the ERP on Park lands and just recently on Refuge lands. It is likely grizzly bears will continue this behavior, resulting in a relatively high risk of hunter-grizzly bear contacts as long as the ERP is necessary.

To help mitigate the potential for hunter-grizzly bear conflicts during the ERP, Park staff, in collaboration with the Wyoming Game and Fish Department, proposed several new measures. These include (verbatim from your memo, p. 2): 1) closing the Snake River bottoms between Ditch Creek and Dead Man's Bar; 2) beginning the hunt two weeks later; 3) limiting ammunition carried in the field to seven cartridges per day; and 4) limiting the number of shots hunters can take at a group of running elk to one (the latter two measures aim to reduce elk wounding loss).

These new measures were proposed specifically for the 2013 season and in the future, they may change. Specific area openings or closures and associated timing have varied over time (items 1 and 2); however, items 2 and 3 will likely remain in the future as conditions of the permit (S. Cain 2013, email).

Existing measures to help minimize human-bear encounters during the ERP include (verbatim from your memo, p. 2): "1) requiring all hunters to carry bear spray; 2) maintaining a significant ranger presence and contacting a high percentage of program participants in the field; 3) not allowing artificial elk calls, which can draw bears to hunters; 4) providing a secure camping area for participants where carcasses can be safely stored out of reach of bears; 5) providing an abundance of bear safety educational materials to all permit holders, including warnings that hunters can expect to encounter bears while hunting in the park; and 6) significantly reducing numbers of hunters in the field (elk reduction program permits issued have declined from 1,150 in 2007 to 725 in 2012, and are proposed to further decrease to 650 in 2013."

The Park has also developed and implemented several new grizzly bear conservation measures since 2007 as follows (your memo, pp. 2-3): 1) a "Be Bear Aware" campaign which emphasizes improved management of visitors in bear country through information and education materials; 2) the "Wildlife Brigade", a corps of paid and volunteer staff to respond to traffic jams caused by grizzly and black bear sightings along roads ('bear jams'), to patrol, educate, and enforce food storage at campgrounds, picnic areas, and other developed areas, and other activities; 3) install additional bear-resistant food storage boxes; and 4) evaluate the effectiveness of the Park's "Be Bear Aware" message (subsequent results provided valuable feedback about current messaging systems and how to improve them in the future). Overall, the Park's program has been highly successful at minimizing human-grizzly bear conflicts, with no management removals or relocations required since 2007.

Your memo indicated the Park has complied with all requirements and recommendations in the Service's 2007 biological opinion and has been highly successful at minimizing human-grizzly bear conflicts through intensive management and conservation actions and programs. In addition, the need for the ERP is evaluated annually, and seasons are set in coordination with the Wyoming Game and Fish Department.

In 2011, the IGBST's total Greater Yellowstone Ecosystem (GYE) population estimate was 593 bears (95% CI 533-652; Haroldson 2012). The estimated population growth rate trajectory has changed from 4-7% during the 1980s and 1990s to currently stable to slightly increasing, depending on what segment of the population is considered (e.g., in versus outside of the Recovery Zone). The slowing population growth rate has been anticipated and currently may be due to one or a combination of density-dependent effects or declines in key food resources. We also acknowledge the GYE grizzly bear distribution has expanded in various areas in the ecosystem, including in the Park (Schwartz et al. 2006, Bjornlie et al. 2013, as cited in your memo).

The Service agrees that continued implementation of the Plan is likely to incur additional losses of grizzly bears from hunter-grizzly bear conflicts, which will adversely affect grizzly bears. However, we believe that given the current estimated population of grizzly bears in the GYE and

overall sustainable annual mortality levels (based on the last 5 years of IGBST annual reporting of mortalities and population trends), the number of bears affected by the Plan will be small and will not jeopardize the continued existence of the Yellowstone ecosystem grizzly bear population. Therefore, given the existing Plan and likelihood for additional grizzly bear mortalities by hunters participating in the ERP and hunting bison; and the stable to slightly increasing grizzly bear population and expanding distribution, we anticipate an increase in the number of grizzly bear/hunter conflicts and subsequent mortality within the Park and Refuge. Given the existing and new conservation measures, we believe the Plan and ERP will not affect the recovery of grizzly bears in the ecosystem or result in jeopardy to the species.

Based on the above information, the Service anticipates up to 4 additional grizzly bears in the Park and 2 grizzly bears on the Refuge may be incidentally taken directly or indirectly as a result of the Plan during the remaining 9 years this biological opinion is valid. The cumulative amount of take now equals 5 grizzly bears in the Park and 2 grizzly bears on the Refuge for the remaining 9-year duration of this biological opinion (through 2022); to date, 1 incidental take has occurred in the Park. We are also adding a Term and Condition #4 (see p. 26 of 2007 biological opinion) that will require the Park and Refuge to submit an annual report regarding: (1) the previous year's level of incidental take, and (2) a brief narrative on any of our Conservation Recommendations the Park and Refuge could not adhere to, and other relevant information. This report will be due by April 15 of the subsequent year (e.g., 2013 season report will be submitted to the Service by April 15, 2014). The Service can provide you with a report template to assist you with this reporting requirement. This addendum to the 2007 biological opinion and new Incidental Take Statement supersede the relevant portions of our 2007 biological opinion. In addition, the Service agrees with the new measures being implemented and believes that the Park has adhered to all original conservation measures as required and that these measures are appropriate, adequate, and do not need revising.

This concludes formal consultation on the action described in your May 2013 request for re-initiation of formal consultation on the Grand Teton National Park and National Elk Refuge Bison and Elk Management Plan EIS. If you have any questions regarding this letter or your responsibilities under the Act, please contact Ann Belleman at (307) 421-5839 or our office at the letterhead address.

Enclosure (Appendix E: Biological Opinion)

cc: BTNF, Forest Supervisor, Jackson, WY (C. Kyhl)
BTNF, Forest Biologist, Jackson, WY (G. Hanvey; ghanvey@fs.fed.us)
GTNP, Senior Biologist, Moose, WY (S. Cain; steve_cain@nps.gov)
WGFD, Non-game Coordinator, Lander, WY (B. Oakleaf)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (M. Flanderka)

Literature Cited:

Cain, S. 2013. Email from Cain to Belleman (USFWS) regarding clarification of proposed Park conservation measures for GTNP and NER BEMP. September 4, 2013.

Haroldson, M.A. 2012. Assessing trend and estimating population size from counts of unduplicated females. Pages 10–15 *in* F.T. van Manen, M.A. Haroldson, and K. West, editors. Yellowstone grizzly bear investigations: annual report of the Interagency Grizzly Bear Study Team, 2011. U.S. Geological Survey, Bozeman, Montana, USA.

USFWS. 2007. Memorandum, from Wyoming Field Supervisor to National Elk Refuge Manager. Final Biological Opinion for the Bison and Elk Management Plan (Formal Consultation No. WY07F014). U.S. Fish and Wildlife Service, Cheyenne, Wyoming.

USFWS and USNPS. 2007. Bison and Elk Management Plan: National Elk Refuge and Grand Teton National Park. U.S. Fish and Wildlife Service and U.S. National Park Service. Lakewood, CO. 25lpp.

USNPS. 2013. Memorandum, from Park Superintendent to Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office. Re-initiation of formal consultation on Grand Teton National Park and National Elk Refuge Bison and Elk Management Plan/EIS.

From: Paul Santavy
To: Will Meeks; Bridget Fahey
Cc: Kathy Perez
Subject: Fwd: info
Date: Thursday, April 10, 2014 8:52:49 AM
Attachments: 20140307_NOI_ERP Grand Teton.pdf

FYI

-Paul

Begin forwarded message:

> **From:** Steve Kallin <steve_kallin@fws.gov>
> **To:** Paul Santavy <paul_santavy@fws.gov>
> **Subject: FW: info**
>
> Paul:
>
> See the attached "60-day Notice of Violations of the Endangered Species Act in Connection With Grand Teton National Park's 'Elk Reduction Program' and Annual Hunting of Elk in the Park." Not sure how involved the NER would be in this litigation. The BEMP and NER Supplemental Feeding programs are mentioned. Although I haven't had a chance to read this, I understand the concern is the incidental take of grizzly bears. Certainly the FWS and ES will be involved.
>
> Take care,
>
> Steve Kallin
> Project Leader
> National Elk Refuge
> PO Box 510
> 675 East Broadway
> Jackson, WY 83001
> Phone: (307) 733-9212, extension 2
> Fax: (307) 733-9729
> steve_kallin@fws.gov
>
> **From:** Cain, Steven (Steve) [mailto:steve_cain@nps.gov]
> **Sent:** Monday, April 07, 2014 10:07 AM
> **To:** Steve Kallin
> **Subject:** Fwd: info
>
> ---------- Forwarded message ----------
> From: **Belleman, Ann** <ann_belleman@fws.gov>
> Date: Fri, Apr 4, 2014 at 10:22 AM
> Subject: info
> To: "Steven (Steve) Cain" <steve_cain@nps.gov>
>
> Ann Belleman
> U.S. Fish and Wildlife Service
> Wyoming Ecological Svcs. Field Office
> 5353 Yellowstone Rd., Suite 308A
> Cheyenne, WY 82009

ann_belleman@fws.gov

307-421-5839 (work cell)
307-772-2374 (FWS-Cheyenne)
218-529-5171 (EPA-MN)

--
****
Steve Cain, senior wildlife biologist
Grand Teton National Park and John D. Rockefeller, Jr. Memorial Parkway
PO Drawer 170
Moose, WY 83012
(307)739-3485
****
"*If there are no dogs in heaven, then when I die I want to go where they went" Will Rogers*

DEPARTMENT OF THE INTERIOR
TASKING PROFILE

ACCN #:	ESO-00053947	Status:	Closed	Fiscal Year:	2014
Document Date:	**Received Date:**	**Due Date:**	**Action Office:**	**Signature Level:**	**Doc Source:**
02/28/2014	03/07/2014		FWS	AA	ATTY

To (Recipient): Jewell, Sally

From (Author): Glitzenstein, Eric R.

Attorney at Law/SMC Science Director
Meyer & Glitzenstein
Washington,, DC 20009

Subject Text: Notice of ESA violations in connection with Grand Teton NP Elk Reduction Program and annual hunting of Elk in the Park.

Req. Surnames:

Mail Carrier: **Mail Track #:**

Cross Ref:

Copies To: SIO-OES

Status Tracking:

Correspondence Specialist and Phone: SIO-OES Tim Feeney/202-208-6701

Closed Comments:

Signed:

Meyer Glitzenstein & Crystal
1601 Connecticut Avenue, N.W.
Suite 700
Washington, D.C. 20009-1063

Katherine A. Meyer
Eric R. Glitzenstein
Howard M. Crystal
William S. Eubanks II
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Michelle D. Sinnott (Admitted in VA)

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February 28, 2014

Via Certified and Electronic Mail

Sally Jewel, Secretary
United States Department of the Interior
1849 C Street, N.W.
Washington, D.C. 20240
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Dan Ashe, Director
United States Fish & Wildlife Service
1849 C Street, N.W.
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Jonathan Jarvis, Director
National Park Service
1849 C Street, N.W.
Washington, D.C. 20240
Jon_jarvis@nps.gov

RECEIVED
2014 MAR -7 PM 2:50
OFFICE OF THE EXECUTIVE SECRETARIAT
64610

Re: **60-Day Notice of Violations of the Endangered Species Act in Connection With Grand Teton National Park's "Elk Reduction Program" and Annual Hunting of Elk in the Park**

Dear Secretary Jewel, Director Ashe, and Director Jarvis:

On behalf of conservationist Timothy C. Mayo and wildlife photographer and advocate W. Kent Nelson, we hereby put you on formal notice, pursuant to section 11(g) of the Endangered Species Act, 16 U.S.C. § 1540(g) ("ESA"), that the National Park Service ("NPS") is in violation of the ESA in connection with the Grand Teton National Park's ("Grand Teton" or the "Park") so-called "Elk Reduction Program" ("ERP") pursuant to which NPS, in conjunction with the State of Wyoming, authorizes significant numbers of elk to be hunted within the Park each year. In particular, as set forth below, the Park Service and Fish and Wildlife Service ("FWS") are in violation of section 7 of the ESA, 16 U.S.C. § 1536, by recently increasing the permissible

recycled paper

"take" of threatened grizzly bears caused by the ERP without providing any biological (or any other) rationale for the specific number of grizzly bears that may now be killed or otherwise taken in connection with the hunt, and without even reconciling the significant increase in authorized grizzly bear takes with the FWS's purported commitment to phase out the supplemental feeding of elk on the National Elk Refuge ("NER" or "Refuge") – which, in turn, is used to justify the hunting of elk in the Park.

STATUTORY AND REGULATORY FRAMEWORK

Congress enacted the ESA to ensure that "the ecosystems upon which endangered and threatened species depend [are] conserved, [and] to provide a program for the conservation of such endangered species and threatened species." 16 U.S.C. § 1531. The ESA reflects "an explicit congressional decision to afford first priority to the declared national policy of saving endangered species." *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 185 (1978).

Section 9 of the ESA prohibits any "person" from "taking" any member of an endangered species. 16 U.S.C. § 1538(a). The term "take" is defined broadly to include "harass, harm, pursue, hunt, wound, kill, trap, capture, or collect." *Id.* § 1532(19). The Service has further defined "harass" to include "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, including breeding, feeding, or sheltering." 50 C.F.R. § 17.3. In addition, "harm" is defined to include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering." *Id.*

Section 7 of the ESA directs all federal agencies, in consultation with the FWS, to use their existing authorities to conserve threatened or endangered species. 16 U.S.C. § 1536(a)(1); *see id.* § 1532(3) (defining "conservation"). Section 7 further requires all agencies to "insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species." *Id.* § 1536(a)(2). To carry out this obligation, an agency formally "consults" with the FWS when it undertakes an action that may affect listed species. 50 C.F.R. § 402.14. The consultation must be based on the "best scientific and commercial data available," *id.*, and culminates in a Biological Opinion, which must assess whether the action will jeopardize the continued existence of the species and, if not, set forth a "written statement" – known as an "incidental take statement" ("ITS") – that specifies the amount of "incidental taking" that is authorized, as well as "those reasonable and prudent measures," along with implementing "terms and conditions" that "the [Service] considers necessary or appropriate to minimize" the impact on the species. 16 U.S.C. § 1536(b)(4).

Reinitation of formal consultation "is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law" and, among other factors, "the amount or extent of taking specified in the incidental take statement" is exceeded, or "if new information reveals

effects of the action that may affect listed species . . . in a manner or to an extent not previously considered." 50 C.F.R. § 402.16.

FACTUAL BACKGROUND

In 2007, NPS and FWS engaged in formal consultation regarding the Bison and Elk Management Plan ("Plan") for the Park and the NER and, as part of the Plan, the ERP in the Park. The Plan, which is supposed to be in effect for fifteen years (i.e., until 2022), calls for phasing out the environmentally destructive practice of supplemental feeding of elk and bison on the Refuge, *see* 2007 Final Biological Opinion for the Bison and Elk Management Plan (Formal Consultation No. ES-6-WY-07-F014) ("BiOp") (Attachment A) at 171 ; *id.* at 19 ("supplemental feeding would be reduced from current levels and replaced by greater ungulate reliance on standing forage"); see *also Defenders of Wildlife v. Salazar*, 651 F.3d 112, 113 (D.C. Cir. 2011) ("[p]art of this plan includes ending the longstanding agency practice of feeding these animals during the winter"), as well as taking certain other management actions affecting elk and other wildlife in the Park and Refuge.

Of particular relevance here, under the Plan as analyzed in the 2007 BiOp, over the long term it was "estimated that the number of deputized [elk] hunters [in the Park] would decline from an average of 1,600 hunters per year to 773-957" hunters." BiOp at 4. Similarly, it was anticipated that the number of elk "harvested" in the Park over the "long term" would decrease from 480 to 232-287. *Id.* at 20.[1]

In analyzing the impacts of the Plan as a whole and the ERP in particular on the threatened Grizzly Bear, the BiOp explained that the Park represents a significant part of the Yellowstone Grizzly Bear Ecoystem recovery zone. BiOp at 8, 9. The BiOp also acknowledged that "[a]voiding human-caused bear mortality is a goal of the Grizzly Bear Recovery Plan and *is essential to maintaining a viable grizzly bear population.*" *Id.* at 6 (emphasis added). The BiOp further recognized that "[i]solation from human activities is extremely important for bear survival, due to the tendency of grizzly bears to rapidly habituate to human foods," but that "[h]uman-bear interactions have been increasing in the YGBE" and that the "greatest increase in recent years is self-defense in fall by big game hunters." *Id.* at 11; *id.* at 17 ("Hunting-related deaths resulting from human-grizzly conflict remain the most significant source of known grizzly bear mortality in the GYE . . . While the high level of hunting-related grizzly mortality has not been directly linked to hunter numbers in the [primary conservation area], it is nonetheless

[1] The BiOp also stated that the "elk hunting opportunities on the Refuge would decline from an average of 733 hunters per year to 420-487," while the number of elk hunters in the Bridger-Teton National Forest "and other areas outside the Refuge and Park would increase to an estimated 5,000-5,870 hunters per year, an increase of 29-35 percent." BiOp at 4. This is because, as a result of the Plan's commitment to return elk management to a more natural regime, "in the long-term it is expected that herd reductions in the Grant Teton segment will cause individuals to radiate into and be sustained in other herd segments [outside the Park and Refuge], allowing proportionately more elk to be" killed in those areas. BiOp at 21.

primarily the result of chance encounters between bears and hunters in the field, conflicts over ungulate carcasses and conflicts in hunter camps often as a result of game meat being kept in campsites."). The BiOp also recognized that "[w]inter-killed ungulates are an important food supply" for grizzlies, and that other traditional food sources – such as whitebark pine, army cutthroat worms, and cutthroat trout – are themselves threatened for various reasons. *Id.* at 11-12.

The BiOp concluded that "unlike on the Refuge, the variability of terrain and densely wooded areas in the Park contribute to an elevated risk of hunting-related conflicts occurring," although "[t]his increased risk would be minimal in the long term as a result of the proposed action, but would be higher in the short-term, especially within Area 79." BiOp at 24. In light of the Service's prediction that the "proposed action will exacerbate the short-term risk for hunting-related grizzly bear mortality within the Park," while resulting in a "minimal risk in the long term," the BiOp established a limit of "1 grizzly bear (adult or juvenile) over the 15-year implementation period of the Plan [that] could be incidentally taken as a result of the proposed action" in the Park. *Id.* at 25. The BiOp established a single "reasonable and prudent measure" as "necessary and appropriate to minimize impacts of incidental take on grizzly bears" – i.e., "[m]inimize the likelihood of hunting-related human/grizzly bear conflict associated with the Project through education of hunters" – and stated that it should be sufficient to ensure that the incidental take limit was not exceeded. *Id.* at 26. However, the BiOp also made clear that "[i]f, during the course of the action, this level of incidental take is reached, such incidental take represents new information requiring re-initiation of consultation and review of the reasonable and prudent measures provided." *Id.*

As explained in a 2013 NPS memorandum requesting reinitiation of formal consultation, "[o]n November 22, 2012, a group of 3 hunters participating in the ERP shot and killed an adult male grizzly bear in the Snake River bottoms area of Hunt Area 75, within [Grand Teton]. This leaves the park with no additional grizzly bear take related to the ERP during the remaining 9 years of the plan's intended 15 years year life span." *See* 4/29/13 Memorandum from Superintendent, Grant Teton National Park to Field Supervisor, U.S. FWS, Wyoming Field Office (Attachment B) at 1. Consequently, NPS "request[ed] to re-open formal consultation on the [Plan]." *Id.*

Although the 2007 BiOp was expressly premised on the assumption that the ERP component of the Plan would result in "***minimal*** risk" to grizzly bears "in the long term," BiOp at 25 (emphasis added), NPS's request for reinitiation of consultation asserted that the "risk of hunter-grizzly contacts *will continue to be* ***relatively high*** *as long as the ERP is necessary*." Attachment B at 2 (emphasis added). The reinitation request did not explain why a long-term risk that was deemed to be "minimal" in 2007 was being described as "relatively high" in 2012, nor did it explain over what period of time an ERP in the Park would be deemed necessary or the criteria that would be used to make that assessment. *See also id.* at 4 (asserting that the

"need for the program is evaluated annually" without explaining how that occurs or what standards are used).[2]

The request for reinitiation stated that in 2013, NPS, along with the Wyoming Game and Fish Department, "proposed several new measures" purportedly designed to "help mitigate the potential for hunter-grizzly bear conflicts during the ERP," including "1) closing the Snake River bottoms between Ditch Creek and Dead Man's Bar; 2) beginning the hunt 2 weeks later; 3) limiting ammunition carried in the field to 7 cartridges per day; and 4) limiting the number of shots hunters can take at a group of elk to one . . . ." Attachment B at 4. The request did not explain the rationale for these particular measures with respect to the mitigation of grizzly bear take, nor did it commit to continuing them for the remainder of the ERP or describe other measures that may have been considered but were rejected (such as closing more areas with documented grizzly bear presence to elk hunting). However, the request did state that NPS "believe[s] continued implementation of the BEMP is likely to incur additional losses of grizzly bears from hunter-grizzly bear conflicts, which will adversely affect grizzly bears," *id.* at 5, although the request made no effort to estimate the number of grizzly bear "takes" that will "likely" occur as a result of the Plan.

On September 13, 2013, the FWS issued a cursory "addendum" to the BiOp and a new ITS that the FWS stated "supersede the previous 2007 ITS, and this addendum and new ITS are valid for the remaining 9 years under the 2007 [BiOp], through the year 2022." 9/13/13 Memorandum from the Field Supervisor, U.S. FWS Wyoming Field Office, to Superintendent, Grand Teton (Attachment C) at 1. While asserting that "this memo/addendum . . . tiers off our 2007 biological opinion," *id.* at 2, the addendum also makes clear that the 2007 BiOp was premised on a seriously flawed assumption, i.e., that activities occurring in the Bridger-Teton National Forest were covered by the Plan and hence should also be addressed in the formal consultation and ITS for the Plan. *See id.* at 2 ("In response to the Park's reinitiation of formal consultation and after review of the 2007 biological opinion, the Service believes authorization of incidental take for the Forest was in error as the Forest was not covered by the final Plan EIS decision. Therefore, we are rescinding incidental take [authorization] of two grizzly bears on the Forest and the following biological opinion addendum covers only the Park and Refuge.") (emphasis in original).

The addendum does not analyze at all the legal and environmental implications of the FWS's elimination of one of the three federal agencies from the scope of the consultation analysis. Instead, the addendum repeats, virtually verbatim, the reinitation request – even when it totally contradicts factual findings and assumptions in the 2007 BiOp. Most notably,

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[2] Far from asserting that conditions had dramatically changed since 2007, the request for reinitiation stated that "[c]onditions associated with the ERP remain largely the same as they were in 2007 except, as anticipated in the plan, grizzly bear distribution and numbers in the south end of the park appear to have increased," Attachment B at 2, and that "several grizzly bears have been observed seeking out gut piles left on the landscape during the elk reduction program, just as they have throughout the ecosystem for decades during hunting seasons." Attachment B at 2.

the addendum reiterates NPS's assertion that there will be a "relatively high risk of hunter-grizzly contacts as long as the ERP is necessary," Attachment C at 2, without making any effort to reconcile that prediction with the BiOp's contrary finding that the long-term risk for grizzly bears in the Park would be "minimal." Likewise, the addendum asserts that the "Service *agrees* that continued implementation of the Plan is likely to incur additional losses of grizzly bears from hunter-grizzly bear conflicts, which will likely adversely affect grizzly bears," *id.* at 3 (emphasis added), but, again, makes no effort to explain – or even to acknowledge – the contradiction between that prediction and the assessment in the BiOp that the entire 15-year Plan would result in the "take" of only a single grizzly bear.

The addendum reiterates the "new measures" proposed by NPS "specifically for the 2013 season," but does not analyze their efficacy or biological rationale in any manner, nor does it even suggest that these measures will remain in effect for the life of the Plan. Addendum C at 3. To the contrary, the addendum merely says that these measures "may change" – without saying why, how, or based on which criteria – that "[s]pecific area openings or closures and associated timing have varied over time," and that two of the items proposed for 2013 (i.e., beginning the hunt two weeks later and limiting the number of shots hunters may take at a group of running elk) "will likely remain in the future as conditions of the [hunting] permit[s]." *Id.* at 2, 3. Assuming that the Service believes that all of the "new measures" are indeed important for limiting grizzly bear take, *see id.* at 4 ("the Service agrees with the new measures being implemented"), the addendum never explains why these measures (or some permutation of them) are not being made permanent reasonable and prudent measures/terms and conditions that must be followed by NPS for incidental take authorization under the rubric of the consultation.[3]

Finally, the addendum significantly increases the authorized level of take associated with the Plan, stating that the "***Service anticipates up to 4 additional grizzly bears in the Park and 2 grizzly bears on the refuge may be incidentally taken directly or indirectly as a result of the Plan during the remaining 9 years this biological opinion is valid***." Attachment C at 4 (emphasis added); *id.* ("The cumulative amount of take now equals 5 grizzly bears in the Park and 2 grizzly bears on the Refuge for the remaining 9-year duration of this biological opinion[.])." Although this increases the authorized take in the Park and on the Refuge *seven-fold* from that embodied in the 2007 BiOp, and does so for an agency action of *significantly smaller scope* than previously analyzed – since impacts on the Forest are no longer deemed to be part of the authorized federal action, Attachment C at 2 – the addendum sets forth no explanation whatsoever of how the Service derived these "take" figures from the available documentation.

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[3] Instead, again without explanation, the addendum adds a single term and condition, which is merely an obligation by NPS to submit an "annual report" regarding the "previous year's level of incidental take" and a "brief narrative of any of [non-binding] Conservation Recommendations the Park and Refuge could not adhere to." Attachment C at 4.

DISCUSSION

NPS's request for reinitiation of consultation, the FWS's addendum to the BiOp and accompanying ITS, and NPS's reliance on that document to authorize activities in the Park that will adversely affect Grizzly bears violate the ESA and implementing regulations in a number of ways.

First, the ESA and its implementing regulations do not provide for an "addendum" that "tiers" off an earlier BiOp. As a general matter, although regulations implementing the National Environmental Policy Act expressly provide for "tiering" in appropriate circumstances – i.e., where a site-specific project is "included within" a broader program that has already undergone NEPA review, 40 C.F.R. § 15-2.20 – nothing in the ESA regulations authorizes such an approach. Rather, those regulations simply provide that when one or more of the reinitation criteria are triggered – as is indisputably the case here – "[r]einitiation of formal consultation is required." 50 C.F.R. § 402.16. In turn, "formal consultation," culminating in a *comprehensive biological opinion* – not a cursory "addendum" – entails consideration of a number of specific items, including, e.g., a review of the "current status of the listed species," 50 C.F.R. § 402.14(g)(2); a consideration of the effects of the action along with "cumulative effects," *id.* § 402.14(g)(3); and a "detailed discussion of the effects of the action on listed species." *Id.* § 402.14(h)2).

The Service's addendum does not remotely satisfy these requirements. For example, other than a general assertion of a "stable to slightly increasing grizzly bear population and expanding distribution" in the GYE, Attachment C at 4, there is no analysis whatsoever of the "current status" of the species and the threats facing it. Of particular relevance here, although the 2007 BiOp explained that various Grizzly Bear food sources are under threat, and that the species is heavily dependent on ungulate consumption, the addendum makes no mention of the Service's views concerning the *existing and projected* availability of various food sources and their importance to the species' long-term survival and recovery.

Likewise, the addendum contains no analysis whatsoever of cumulative effects, which is a particularly glaring omission in view of the statement in the addendum that the 2007 "authorization of incidental take for the Forest was in error as the Forest was not covered by the final Plan EIS decision." BiOp at 2. By "rescinding incidental take of two grizzly bears on the Forest" and confining the addendum to "only the Park and the Refuge," the addendum not only significantly modifies the entire agency action under review – further undermining any possible rationale for truncating the formal consultation process that would normally be required – but the FWS overlooked (or ignored) the fact that if Grizzly Bear impacts on the Forest are no longer deemed to be subject to analysis and regulation as part of the agency action under review, ***then they must at least be analyzed as cumulative effects***. But the addendum totally ignores such impacts along with all other cumulative effects, as defined in the ESA regulations. *See* 50 C.F.R. § 402.02.

Second, the addendum and revised ITS not only are not based on the "best scientific" data available, as required by section 7 of the ESA and implementing regulations, they

contradict without explanation statements and predictions made in the 2007 BiOp concerning the impacts of the action. To begin with, even apart from any inconsistency with prior statements, if there is some rationale for the particular take limits set forth in the addendum, they are not explained in the addendum itself. Numbers that appear to have been plucked out of thin air merely to allow the annual hunts to proceed unabated in the Park are based on *no* science, let alone the "best available" science. *See Bennett v. Spear*, 520 U.S. 154, 169 (1997) (the "obvious purpose" of the requirement that agencies rely on the best available science in implementing the ESA is "to ensure that that the ESA not be implemented haphazardly, on the basis of speculation or surmise").

Here, however, the new take limits are not only devoid of any scientific explanation, they make no sense in light of what the Service said when it issued the 2007 BiOp. When it issued the 2007 BiOp the Service stated that there was virtually no threat of grizzly bear take on the Refuge – and thus authorized *zero* incidental take in connection with implementation of the Plan on the Refuge – and that any "increased risk [in the Park] would be *minimal* in the long term as a result of the proposed action." BiOp at 24-25 (emphasis added). Indeed, the overall risk of take associated with the Plan *should* decline over time if NPS is truly committed to doing what it has claimed it will do, i.e., phase out the supplemental feeding program that has been used as the main justification for the ERP. *See Defenders of Wildlife*, 651 F.3d at 231 ("Part of this plan includes ending the longstanding practice of feeding these animals during the winter."). Instead, however, the FWS has significantly and arbitrarily increased the take prediction and authorization – from a single Grizzly Bear in the Park and Refuge for the *entire* fifteen-year Plan to *seven* Grizzly bears in the Park and Refuge for a Plan that is now due to last only eight more years and is supposed to *lessen* the need for hunting-related impacts over that time span – without even acknowledging the inconsistency with the Service's prior analysis, let alone explaining why a dramatically different result should now be reached.

Third, while vastly increasing the take authorization, the addendum does not [?] even address all of the forms of take that may be associated with the ERP. The Addendum acknowledges that "[s]ince 2007, several grizzly bears have been observed seeking out gut piles left on the landscape during the ERP on Park lands . . . ." Attachment C at 2. Although this constitutes a clear example of "harassment" as defined by the ESA regulations, *see* 50 C.F.R. § 17.3 (defining "harassment" to include any "intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly *disrupt normal behavioral patterns, including . . . feeding*") (emphasis added), the addendum does not address or account for this form of take in the ITS which is distinct from the hunter-related killing that may *result* from disrupting the bears' "normal behavioral patterns." Nor does the ITS address the adverse impact on Grizzly Bears of depriving them of an essential food source in the Park and the Refuge, i.e., elk taken by hunters – especially as other critical Grizzly food sources are subject to myriad threats – although that also qualifies as harassment, as well as take through adverse habitat modification. *Id.*

Fourth, although it is well-established that the Service's evaluation of whether a federal action will "jeopardize" a listed species "must adequately consider the proposed action's

impacts on the listed species' chances of recovery," National Wildlife Federation v. NMFS, 524 F.3d 917, 933 (9th Cir. 2008) (emphasis added), the Addendum here contains no analysis of the extent to which ongoing Grizzly Bear take associated with the Plan and the ERP in particular – and especially the depletion of an important Grizzly food source – will impair Grizzly Bear recovery. Rather, the Addendum simply asserts that "[g]iven the existing and new conservation measures, we believe that Plan and ERP will not affect the recovery of grizzly bears in the ecosystem," without explaining that conclusion or even specifying those specific "conservation measures" on which it is based.

Fifth, related to the foregoing point, while significantly increasing the take prediction and authorization, the addendum sets forth no explanation for why it is not also adding additional "reasonable and prudent measures"/"terms and conditions" in order to "minimize" the impact of the anticipated take on Grizzly Bears, as required by section 7(b)(4) of the ESA, 16 U.S.C. § 1536(b)(4). As noted, the only new obligation imposed on the NPS is to "submit an annual report" describing the "previous year's level of incidental take" and a "brief narrative on any of our Conservation Recommendations the Park and Refuge could not adhere to, and other relevant information." Attachment C at 4. There is no explanation in the addendum of what this additional "report" is intended to accomplish.

More important, there is no discussion of why the FWS is not even considering imposing additional *substantive* measures in view of the significant increase in Grizzly take that is being authorized. For example, while asserting that "[s]pecific area openings or closures and associated timing [in the Park] have varied over time," Attachment C at 3, the addendum provides no explanation for why the Service does not simply make it a condition of any additional authorized take that NPS *close* to elk hunting all of the areas in the Park where "hunter-grizzly bear conflicts, which will adversely affect grizzly bears," are now anticipated to occur. *Id.* Assuming that there is any justification for elk hunting in any national park or in Grant Teton in particular – which we strongly dispute – there is certainly no legal or practical need for such hunting in those parts of Grant Teton that are used as habitat of a federally threatened species. At the very least, the FWS has not complied with section 7(b)(4) of the ESA when the Service has failed, without explanation, to even consider such measures for further "minimiz[ing]" the seven-fold increase in Grizzly Bear take in the Park and the Refuge that the Service now anticipates and authorizes. By the same token, the Service has failed to "implement" its own recovery plan for the Grizzly Bear – as mandated by section 4(f) of the ESA, 16 U.S.C. § 1533(f) – which calls for avoiding sources of human-caused Grizzly mortality. *See supra* at 3.

Sixth, under these circumstances, NPS has also violated its obligation under section 7(a)(1) of the ESA, 16 U.S.C. § 1536(a)(1). In addition to the obligation to avoid jeopardizing species under section 7(a)(2), section 7(a)(1) of the Act imposes an obligation on all federal agencies, in consultation with the FWS, to "carry[] out programs for the conservation" of listed species. 16 U.S.C. § 1536(a)(1); *see also Pyramid Lake Paiute Tribe of Indians v. Dep't of the Navy*, 898 F.2d 1410, 1416-17 (9th Cir. 1990) (noting that federal agencies have 'affirmative obligations to conserve under [S]ection 7(a)(1)"). Plainly, NPS is not carrying out an effective

program for the "conservation" of Grizzly bears by continuing to allow for substantial elk hunting in any portions of Grand Teton where NPS itself believes that Grizzly bear conflicts with hunters are likely to occur in the future.

CONCLUSION

We would be happy to discuss with you or your representatives any of the issues raised in this letter. However, unless the agencies commit that they will not rely upon the legally flawed addendum and ITS and will promptly rectify the ESA violations set forth in this letter, we will have no choice but to consider pursuing other appropriate relief.

Sincerely,



Eric R. Glitzenstein
Rosemary Greene

cc:

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APPENDIX E: BIOLOGICAL OPINION

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

In Reply Refer To:
ES-61411/W.25/WY07FA0209
ES-6-WY-07-F014

Memorandum

To: Barry Reiswig, Refuge Manager, U.S. Fish and Wildlife Service, National Elk Refuge, Jackson, Wyoming

From: Brian T. Kelly, Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming

Subject: Final Biological Opinion for the Bison and Elk Management Plan (Formal Consultation No. ES-6-WY-07-F014)

This memorandum transmits the U.S. Fish and Wildlife Service's (Service) final biological opinion based on our review of the January 2007 Bison and Elk Management Plan (Plan or Project) and Final Environmental Impact Statement (FEIS) and the Project's effects on endangered, threatened, proposed and experimental non-essential species.

This final biological opinion addresses the effects of the Project on the threatened grizzly bear (*Ursus arctos horribilis*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act; 50 CFR § 402.14). Your February 07, 2007 letter requesting formal consultation, and including the Intra-Service Section 7 Biological Evaluation (BE) form, was received on February 7, 2007.

The National Elk Refuge (NER or Refuge) and Grand Teton National Park (GTNP or Park)/John D. Rockefeller, Jr., (JDR) Memorial Parkway are proposing to implement a bison and elk management plan that will address adaptive management of the Jackson bison and elk herds and their habitat on the Refuge and in the Park with an emphasis on improving range quality, and insuring long term sustainability of biotic integrity and environmental health. The Plan includes development and implementation of a dynamic framework for decreasing the need for supplemental feeding on the Refuge based on existing conditions, trends, new research findings, and other changing circumstances. The Park and NER will work in close cooperation with the Wyoming Game and Fish Department (WGFD) during both development and implementation of

Attachment A

this framework which will include population management through methods including implementation of special, organized elk and bison hunts, vegetation restoration, ongoing monitoring, and public education as integral components.

The Service concurs with the Refuge's assessment that the Project is likely to have "no affect/no adverse modification" for Canada lynx (*Lynx canadensis*), "may affect, not likely to adversely affect species/adversely modify critical habitat" for the gray wolf (*Canis lupus)* and bald eagle (*Haliaeetus leucocephalus*), and "no effect" for the yellow-billed cuckoo (*Coccyzus americanus*).

This final biological opinion is based on information provided in the FEIS, BE, telephone conversations with Laurie Shannon, Project Manager, of the Service's Mountain-Prairie Region Lakewood, Colorado office, Steve Cain, Senior Wildlife Biologist for GTNP, and other sources of information. A complete administrative record of this consultation is on file in the Cheyenne Field Office.

CONSULTATION HISTORY

Initial discussions regarding the Bison and Elk Management Plan/EIS began several years ago. A summary of pertinent sections of the draft EIS dealing with threatened and endangered species was received by the Service's Wyoming Field Office on July 14, 2004. A full copy of the Draft Bison and Elk Management Plan/EIS was received on July 20, 2005; however, consultation was delayed pending completion of a BE for the Project. The Final Bison and Elk Management Plan/EIS was received on February 2, 2007, and both the BE and the request for initiation of formal consultation were received on February 7, 2007. The consultation was assigned log number ES-6-WY-07-F014. Since January 2007, numerous telephone conversations regarding the Project have taken place between all involved parties.

BIOLOGICAL OPINION
Grizzly Bear and Gray Wolf

DESCRIPTION OF THE PROPOSED ACTION

The Final Bison and Elk Management Plan and EIS for the NER and GTNP addresses adaptive management of the Jackson bison and elk herds and their habitat on the Refuge and in the Park with an emphasis on improving range quality and insuring long term sustainability of biotic integrity and environmental health. It includes development and implementation of a dynamic framework for decreasing the need for supplemental feeding on the refuge based on existing conditions, trends, new research findings, and other changing circumstances. The Park and NER will work in close cooperation with the WGFD during both development and implementation of this framework which will include population management through methods including implementation of special, organized elk and bison hunts, vegetation restoration, ongoing monitoring, and public education as integral components.

Chronic Wasting Disease/Brucellosis

Efforts would be made to coordinate with the WGFD to increase surveillance in elk for chronic wasting disease (CWD), a fatal transmissible disease of white-tailed deer, mule deer, and elk. The objective of surveillance would be to provide a 95 percent confidence level of discovering infection at 1 percent prevalence in the Jackson elk herd. If infection was found, strategies from the state's *Chronic Wasting Disease Management Plan* (WGFD 2006) would be implemented to reduce transmission. These strategies include removing clinically consistent elk, removing 50 animals within 5 miles of the index case, and another 50 within 10 miles if an additional positive animal is found during collection of the first 50; enforcing carcass movement and disposal restrictions; decreasing duration of feeding and expanding the distribution of feeding to the extent possible; and potentially decreasing elk densities through hunting or other management strategies. Any difference from this general approach is detailed under the alternative strategies. Plans to follow the state's *Chronic Wasting Disease Management Plan* have been made in deference to the State and could change if the National Park Service and/or the Service adopted management requirements that differed from what is currently being done. Potential changes would be communicated to the State.

The NER and GTNP/ John D. Rockefeller, Jr., Memorial Parkway will work cooperatively with the state of Wyoming and others to reduce the prevalence of brucellosis in the elk and bison populations in order to protect the economic interests and viability of the livestock industry, and reduce the risk of adverse effects for other non-endemic diseases not currently present in the Jackson elk and bison populations.

Strategies for Hunting/Reduction Programs

The Service and the NPS would work cooperatively with the WGFD to achieve population objectives (including herd ratios and elk herd segment sizes), to develop hunting seasons, and to evaluate hunting or elk reduction areas. The WGFD would formally establish objectives and strategies after public review and approval by the Wyoming Game and Fish Commission.

In the long term, elk hunting opportunities on the Refuge would decline from an average of 733 hunters per year to 420–487. In the Park it is estimated that the number of deputized hunters would decline from an average of 1,600 hunters per year to 773–957. The number of elk hunters in the Bridger-Teton National Forest (B-TNF) and other areas outside the Refuge and Park would increase to an estimated 5,600–5,870 hunters per year, an increase of 29–35 percent. For the herd unit as a whole, the number of elk hunters could range from an estimated 6,793 to 7,314 per year, which is an increase of 2–10 percent compared to average baseline conditions.

In the short term an estimated 140–150 bison would be harvested each year to reduce bison numbers to a herd of approximately 500 animals. An average of about 50 bison would continue to be harvested in the national forest and the remaining 90–100 bison on the Refuge. This would allow an average of about 175–190 bison hunters in Jackson Hole each year.

In the long term the number of bison harvested each year would decline to about 70 bison. The number of bison harvested on the Refuge and the national forest could be equally split, or up to 50 bison could be harvested in the national forest. This would allow an average of about 90 bison hunters in Jackson Hole each year.

Adaptive Management of Habitat and Populations

Under the proposed action, the NER will provide secure, sustainable ungulate grazing habitat characterized primarily by native composition that is healthy, productive and sustained for the benefit of elk, bison and other native species. Actions included under the proposed plan would be implemented in concert with restoring and perpetuating natural ecosystem functions of native habitats used by bison and elk in GTNP and the JDR. The proposed action would contribute to maintaining sustainable population of elk and bison that are healthy, at a reduced risk of contracting non-endemic diseases, and able to adapt to changing environmental conditions.

Four goals outlined in the Plan and developed based upon the desired conditions and purposes of the NER and GTNP, the missions of the National Wildlife Refuge System and the National Park System, and other legal and policy directives include:

i. Habitat Conservation
ii. Maintaining Sustainable Populations
iii. Managing Numbers of Elk and Bison
iv. Disease Management

The aforementioned goals laid out under the proposed action would be accomplished through the following objectives:

- Initiate habitat restoration projects to improve native and cultivated forage and achieve desired conditions and goals.
- Protect woody vegetation on the refuge by rotating small exclosures until habitats have recovered. Prescribed fire could be used and logging allowed on the refuge inside exclosures.
- Initiate restoration of about 4,500 acres (1,821 ha) of previously cultivated areas in the Park to native plant communities.
- Work with private and agency partners to minimize bison/elk conflicts with adjacent landowners (e.g., by providing human and/or financial resources to manage co-mingling and reduce crop depredation by elk and bison on private lands).
- Initiate a public education effort to build understanding of natural elk and bison behavior, ecology, distribution, disease implications, and effects to other species.
- Identify criteria for beginning and ending feeding each year in consultation with the WGFD.
- In collaboration with the WGFD, develop a structured framework of adaptive management actions that include established criteria for progressively transitioning from intensive supplemental winter feeding to greater reliance on free-standing forage, based on some or all of the following considerations:
    1. level of forage production and availability on the NER
    2. desired herd sizes and sex and age ratios
    3. effective mitigation of bison and elk co-mingling with livestock on private lands
    4. winter distribution patterns of elk and bison
    5. prevalence of brucellosis, chronic wasting disease, and other wildlife diseases
    6. public support
- Work in collaboration with the WGFD to maintain the Jackson elk herd objective of 11,000 (after the initial phased approach, approximately 5,000 elk would be expected to winter on the refuge). As herd sizes and habitat objectives are achieved, further reduce feeding or elk numbers, based on established criteria and changing social, political, or biological conditions. Use hunting on the Refuge, and when necessary, the elk herd reduction program in the Park, to assist the State in managing herd sizes, sex and age ratios, and summer distributions.
- Recommend that the WGFD establish a genetically viable bison herd of approximately 500 animals, with as close to an even sex ratio as possible to maximize maintenance of genetic variation over time. Initiate a WGFD-administered bison hunt on the Refuge.
- Allow the WGFD to vaccinate elk and bison for brucellosis on the Refuge as long as logistically feasible.

Other Wildlife-dependent Recreation

- Over time wildlife viewing opportunities would be concentrated during some winters and would be more natural and sporadic during milder winters.
- Build public understanding and support for bison and elk management actions.

STATUS OF THE SPECIES

Grizzly Bear

Life History

Home range and dispersal. Much of the following information is summarized from the Grizzly Bear Recovery Plan (U.S. Fish and Wildlife Service 1993); additional information including species description can be obtained in that document. Grizzly bears require large areas to fulfill all their basic biological needs, as well as dense forest cover for hiding and security. In the Greater Yellowstone Ecosystem (GYE), defined as an area of relative ecological intactness covering some 19 million acres (7,689,027 ha), lodgepole pine (*Pinus contorta*) forests are a large and dynamic part of grizzly bear habitat. Grizzly bears generally do not use areas with human-caused habitat disturbances, and often, the lack of security cover and overstory cover are believed to be major causes of this (Gillian et al. 1994). Grizzly bear home range size averages 50 to 500 mi^2 (130 to 1,300 km^2). Within these home ranges the grizzly bear uses a diverse mixture of forests, moist meadows, grasslands, and riparian habitats to complete its life cycle. Grizzly bears generally prefer large, remote areas of habitat that are isolated from human development for feeding, denning, and reproduction (USFWS 1993). Long distance travel habits of some grizzly bears increase the risk of contact with highway crossings, hunters, recreationists, and a variety of other human congregations. Isolation from human activities is extremely important for bear survival, as grizzly bears habituate to human foods quickly. Food-conditioned bears often must be eliminated or removed from developed areas. Avoiding human-caused bear mortality is a goal of the Grizzly Bear Recovery Plan (USFWS 1993) and is essential to maintaining a viable grizzly bear population.

Diet. The grizzly bear is an opportunistic omnivore that uses a wide variety of plant and animal food sources. Grizzly bears in the Yellowstone Grizzly Bear Ecosystem (YGBE), a 9,500 sq. mi. (23,300 km^2) area consisting of Yellowstone National Park (YNP), GTNP, JDR Memorial Parkway, the Gallatin, Shoshone, Bridger-Teton, Targhee, Beaverhead, and Custer national forests, as well as state, private and Bureau of Land Management (BLM) lands, have the highest percentage of meat consumption in their diet of any inland grizzly bear population (Hilderbrand *et al.* 1999). Meat constitutes as much as 79 percent of the diet of male, and 45 percent of the diet of female grizzly bears in the YGBE (Jacoby et al. 1999). Ungulates, both adult and neonate, are an especially important food source for bears in the spring and fall (Zager and Beecham, 2006), and use of these carcasses in the YGBE is well documented (Podruzny and

Gunther 2001). Grizzly bears also eat small mammals such as pika and marmots; however, these mammals form a relatively minor portion of the bear's diet. Spawning cutthroat trout in streams surrounding Yellowstone Lake in YNP have been documented as an important food source for grizzly bears there (Mattson and Reinhart 1995). Army cutworm moths (*Euxoa auxiliaries*, ACMs) are also an important food source for bears in the YGBE (Mattson *et al.* 1991a). ACMs congregate in remote, high altitude alpine talus areas and feed on alpine flowers. These moths provide important dietary fat in the fall, when grizzly bears are preparing for hibernation, and are also positively correlated with bear reproductive success (Bjornlie and Haroldson 2001). During times of great moth abundance, grizzly bears may eat up to 40,000 moths per day totaling 20,000 kcal/day (USGS 2005). Surviving moths migrate back to lower elevations to deposit their eggs, leaving the alpine areas between August and October. ACM congregation sites are in remote areas, and therefore potentially reduce human-bear conflicts by isolating the bears. Grizzly bears will also eat ants (Mattson 2001) and earthworms (Mattson *et al.* 2002).

The grizzly bear also makes use of a variety of vegetative food sources. Whitebark pine (*Pinus albicaulis*) seeds are an important fall source of food for grizzly bears in the YGBE (Mattson and Reinhard 1997), and bears are known to consume whitebark pine seeds contained in red squirrel cone caches (Mattson and Reinhard 1997). In addition to supplying a food source high in fat, whitebark pine seed crops also serve grizzly bears by keeping them occupied at high elevations far from intense human use. Studies show that in years when high quality bear foods are low, there is an increase in human-bear conflicts (Gunther et al. 2004) as well as human-caused grizzly bear mortality (Mattson et al. 1992). Other vegetative food sources such as exotic clover species, yampa (*Perideridiea gairdneri*), biscuit root (*Lomatium cous*), and sweet cicily (*Osmorhiza chilensis*) are eaten almost exclusively in some years and seasons (Mattson et al. 1991). Other grizzly bear seasonal forage may include graminoids, horsetail, forbs, and fruits (whortleberry and huckleberry) and fungi (Mattson and Knight 1991).

Den site selection. Grizzly bears generally construct dens in areas far from human disturbance at an elevation of about 6,500 to 10,000 ft. (2,000 to 3,050 m). Grizzly bears in the GYE den from the end of September to the last week in April or early May, with entrance and emergence dates affected by the gender and reproductive status of the bears. Denning bears can be disturbed by winter sport activities such as snowmobiling as well as by human den encroachment, and late season hunting, and current studies are focused on minimizing disturbance by controlling access to important denning areas (Haroldson *et al.* 2002, Podruzny *et al.* 2002). If pregnant female bears are disturbed in their dens and this disturbance causes them to relocate to a new den prior to parturition, negative consequences can occur in the form of reduced cub fitness and survival (Linnell *et al.* 2000, Swenson *et al.* 1997).

Population Dynamic/Status and Distribution

Grizzly bear numbers have greatly declined during the past two centuries. It is believed that the grizzly bear population numbered over 50,000 individuals prior to the 18th century (USFWS 1993). More recently, the estimated total population of grizzly bears as of 1993 stood at 800 to

1,000 individuals (USFWS 1993). The exact size of the grizzly bear population in the YGBE is currently unknown, as the very nature of the grizzly bear and the rugged terrain it inhabits makes any census efforts extremely difficult. Eberhardt and Knight (1996) used several different estimates of population parameters to determine a minimum total population size of 245 grizzly bears, an estimated population size of 390 grizzly bears using marked females, and an estimated population size of 344 grizzly bears using distinct family groups. In 2003, the Interagency Conservation Strategy team identified the minimum population estimate for the grizzly bear population in the YGBE as of 2001 as 365 grizzly bears with a total population estimate of 531. Haroldson and Frey (2004) determined a minimum population estimate of 416 in both 2002 and 2003. The Interagency Grizzly Bear Study Team more recently estimated the population at 580 bears (USFWS 2005).

The grizzly bear was listed as a threatened species on July 28, 1975 (USFWS 1975). Historically, the grizzly bear ranged from the Great Plains to the Pacific Coast, and from the northern U.S. border with Canada to the southern border with Mexico. Currently in the contiguous United States, the grizzly population has been reduced to roughly two percent of its former range. It presently occupies portions of Canadian British Columbia and Alberta, and portions of Montana, Idaho, Wyoming, Washington, and Alaska in the United States. The grizzly bear population in the YGBE and surrounding area was proposed for delisting from the list of endangered and threatened species in November 2005 (USFWS 2005).

Conservation

In an effort to facilitate consistency in the management of grizzly bear habitat within and across ecosystems, the Interagency Grizzly Bear Guidelines were developed by the Interagency Grizzly Bear Committee (IGBC)(51 FR 42863; November 26, 1986) for use by land managers. The IGBC developed specific land management guidelines for use in each of the five ecosystems including the YGBE.

Recovery zones also have been established for the grizzly bear and include areas large enough and of sufficient habitat quality to support a recovered bear population. According to the Grizzly Bear Recovery Plan (USFWS 1993), a recovery zone is defined as that area in each grizzly bear ecosystem within which the population and habitat criteria for achievement of recovery will be measured. Areas outside of recovery zones may provide habitat that grizzly bears will use, but are not considered necessary for the survival and recovery of this species. The area outside the recovery zone but within the 10-mile buffer area is managed to consider and protect grizzlies and their habitat whenever possible, recognizing that population and mortality data within this zone are collected and pertinent to recovery criteria. Beyond the 10-mile buffer, grizzly bear mortalities or populations are not considered when determining whether recovery goals have been met, although protection is still accorded to the grizzly bear under the Act.

The Yellowstone Grizzly Bear Recovery Zone (Recovery Zone) covers approximately 5,438,000 acres (2,200,729 ha) of primarily NPS and National Forest Service (NFS) lands, roughly 89

percent of the currently known distribution of the grizzly bears in the YGBE. Yellowstone and Grand Teton National Parks make up 39.4 percent of the YGBE recovery zone. Private holdings and other ownership make up 2.1 percent of the recovery zone and the remaining 58.5 percent occurs on lands managed by the NFS (ICST 2003).

Areas within the Recovery Zone are stratified into Management Situation Zones 1, 2, or 3; each having a specific management direction according to the Interagency Grizzly Bear Guidelines (IGBC 1986).

> **Management Situation 1** (MS1): lands contain population centers of grizzlies, are key to the survival of the species, and are where management decisions will favor the needs of the bear even when other land use values compete.
>
> **Management Situation 2** (MS2): lands are those areas that lack distinct population centers and the need for this habitat for survival of the grizzly bear is more uncertain. The status of such lands is subject to review. Here, management will at least maintain those habitat conditions that resulted in the area being classified as MS2.
>
> **Management Situation 3** (MS3): designation is intended for lands where grizzly bears may occur infrequently. There is high probability that Federal activities here may affect the species survival and recovery. Management focus is on human-bear conflict minimization, rather than habitat maintenance and protection.

Recovery zones are divided into smaller areas called Bear Management Units (BMUs) for the purpose of habitat evaluation and monitoring. BMUs were designed to:

(1) assess the effects of existing and proposed activities on grizzly bear habitat without having the effects diluted by consideration of too large an area;

(2) address unique habitat characteristics and bear activity and use patterns;

(3) identify contiguous complexes of habitat which meet year-long needs of the grizzly bear; and,

(4) establish priorities for areas where land use management needs would require cumulative effects assessments.

The low survival of adult females was identified as the single most important factor in causing the decline in the Yellowstone population prior to the mid-1980s (Knight and Eberhardt 1985). The current Grizzly Bear Recovery Plan (USFWS 1993) outlines demographic goals to objectively measure and monitor the recovery of the Yellowstone grizzly bear population. That plan defines a recovered population as one that can sustain the existing level of known and

unknown human-caused mortality that exists in the ecosystem and is well-distributed throughout the recovery zone. Demographic recovery criteria outlined for the Yellowstone recovery zone include:

(1) observation of 15 females with cubs of the year annually (unduplicated sightings) over a 6-year running average;

(2) occupation of 16 of the 18 BMUs by females with young from a running 6-year sum of verified observations, and no 2 adjacent BMUs unoccupied with a study to be initiated in the Plateau and Henry's Lake BMUs to determine the capability of these units to support females with cubs;

(3) known, human-caused mortality not to exceed 4 percent of the current population estimate (based on most recent 3-year sum of females with young); with no more than 30 percent of this total mortality limit incurred by females; and,

(4) these mortality limits cannot be exceeded during any 2 consecutive years.

In addition, the existence of adequate regulatory mechanisms for population and habitat management through the development of a conservation strategy must be demonstrated.

In 1994, all population recovery parameters were achieved for the first time, and since 1997 these recovery criteria have not been exceeded in 2 consecutive years. In 2005, a revised method for calculating total population size and sustainable mortality levels for the YGBE was established (IGBST 2005). The revised method was appended to the Recovery Plan and included in the Conservation Strategy. By the end of 2005, the number of unduplicated females with cubs-of-the-year stood at 31 within the recovery zone and 10-mile perimeter (Haroldson 2006), resulting in a 6-year running average of 40 unduplicated females with cubs – more than double the recovery target of 15 females identified in the Recovery Plan (USFWS 1993). Sixteen of 18 BMUs had verified observations of female grizzly bears with young during 2003, 17 of 18 BMUs during 2004 (Podruzny 2005) and 18 of 18 BMUs in 2005 (Schwartz et al. 2006).

Threats

Isolation from human activities is extremely important for bear survival, due to the tendency of grizzly bears to rapidly habituate to human foods. Food-conditioned bears often must be eliminated or removed from developed areas. Avoiding human-caused bear mortality is a goal of the Recovery Plan and is essential to maintaining a viable grizzly bear population (USFWS 1993).

Primary threats to grizzly bears are associated with motorized and dispersed recreational use and forest management activities, including timber harvest. Recreation use includes hunting, fishing, camping, horseback riding, hiking, biking, off-road vehicle (ORV) use, and snowmobiling. Direct human-caused mortality is the most obvious threat to the grizzly bear. This kind of mortality can occur in several ways: (1) defense of human life or property, (2) management removals, (3) mistaken identification by big game hunters, or (4) malicious killing. Nuisance bears are removed to defend human life or property, usually because they have become dangerously bold as a result of food conditioning and habituation at campsites, lodges, resorts, and private residences or they become habituated predators of livestock (Knight and Judd 1983).

Human-grizzly bear interactions have been increasing in the YGBE due, in part, to increasing human use and development, increasing bear numbers, and bears and people both expanding their range of occupancy, increasing the chances of adverse encounters. The frequency of grizzly bear-human conflicts is inversely associated with the abundance of natural bear foods (Gunther *et al.* 2004). Most grizzly bear mortalities are directly related to grizzly bear-human conflicts. The Interagency Conservation Strategy Team (2000, pp. 1-2) reported known human-caused mortalities from 1992-98. Of 58 human-caused mortalities, 43 percent were hunting-related, 10 percent were poaching, 28 percent were food-conditioned bears, 7 percent were related to livestock and 12 percent were accidental deaths. The greatest increase in recent years is self-defense in fall by big game hunters. According to a study by Gunther *et al.* (2004a), three areas were identified as having 71 percent of the 136 conflicts in the GYE in 2003. These were (1) the headwaters region of the Green, Snake, and Wind Rivers, (2) the Crandall Creek/Sunlight Basin area, and (3) the north and south forks of the Shoshone River.

There are a number of naturally or semi-naturally occurring factors that also may influence Yellowstone grizzly bear population levels. Whitebark pine provides an important food source for grizzly bears. Blister rust, which has severe consequences on whitebark pine in the Northern Continental Divide Ecosystem, has been observed in the Yellowstone area. The Yellowstone cutthroat trout, which is an important food source for grizzly bears in the area, has been negatively influenced by introduced lake trout, which are less available to bears due to their deeper water habits (Reinhart *et al.* 2001). Winter-killed ungulates are an important food supply, but ungulate populations vary widely in numbers and are influenced by weather conditions. The reintroduction of wolves has increased competition for ungulate prey and winter-killed carrion. Recent fires may have impacts on available food and cover over the short term, particularly to individual bears with heavily burned home ranges. Fire, in general, over time stimulates many forage species and berries preferred by bears, provided alternate food supplies and cover is available to maintain bears through the immediate aftermath of the fire.

Army cutworm moths in some areas could be affected by agricultural pesticide use, and due to their reliance on this food resource, there has been concern that certain pesticides may bioaccumulate in bears. Recent investigation into this possibility indicates that, while pesticides are present in ACMs in trace quantities, they are most likely not sufficient to cause direct adverse effects on, or biomagnify in bears (Robinson et al. 2006). This study cautions, however, that

pesticide use is a relevant concern when addressing bear conservation issues. Due to their unique physiology including hyperphagia, brown fat accumulation and torpor, bears may assimilate and excrete certain chemicals in unique ways. Further research is recommended including sampling and analysis of blood, hair and fat samples in order to monitor this potential threat as available pesticides and their listed uses change.

Grizzly bears have also experienced displacement from available habitat (loss of habitat effectiveness due to human disturbance) due to increased human uses from (1) expanding road access in wilderness areas (Kasworm and Manley 1989), (2) ORV use and (3) recreation use. They have also experienced loss of existing available habitat due to (1) increased development on private land related primarily to residential housing, and (2) potential for increased development on public land related primarily to oil/gas and recreation development. The grizzly bear also faces a decrease in value of available habitat due to (1) a loss of biodiversity (especially early-succession related vegetative types), and (2) sub-optimal composition, structure, and juxtaposition of vegetation as a result of fire suppression, management strategies, and advancing succession. Finally the bear faces isolation due to fragmentation of available habitat due to (1) major development of private land, (2) construction of major highways that block or restrict movement, (3) inadequate provision for linkage on minor roads and highways, and (4) large blocks of clearcuts.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed State or Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation process.

The action area is defined at 50 CFR 402 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." While the proposed action directly affects the areas located within the NER, GTNP and JDR Memorial Parkway, it will indirectly affect other areas outside of the Refuge and within the B-TNF.

The action area/decision area defined in the EIS includes the NER, GTNP, and the JDR Memorial Parkway.

- The NER is a 24,700 acre (9,996 hectare) unit of the National Wildlife Refuge System administered by the Service. The GTNP is 309,995 acres (125,453 ha), and JDR Memorial Parkway is an additional 23,777 acres (9,622 ha), for a total of 333,772 (135,076 ha) acres administered by them NPS.

- The GTNP is 22.5 miles (36 kilometers) wide and 41 miles (66 km) long from north to south. Elevations range from 6,420 feet (1,957 m) on the valley floor to 13,766 ft. (4,196 m) (the summit of Grand Teton). The Park is bordered to the northwest, west, and southwest by Targhee National Forest. On the south the Park surrounds a wedge of private land and a small section of Bridger-Teton National Forest (B-TNF). The Teton Wilderness in the B-TNF borders the Park to the northeast.

- The JDR Memorial Parkway extends for 82 miles (132 km) from West Thumb in YNP to the north entrance of GTNP. The management area between the two parks includes 7.5 miles (12 km) of parkway and 23,778 acres (9,623 ha).

Ecologically, the NER, GTNP, JDR Memorial Parkway, and YNP are part of a larger area referred to as the GYE.

For the purposes of this biological opinion, we will also consider portions of surrounding lands in the B-TNF and other areas outside of the Refuge as part of the action area due to the projected long-term increase in the number of hunters as a result of the proposed action. The action area will be discussed in terms of Game Management Units (GMU) or Existing Elk Hunting Areas (Area). The following is a brief description of their general locations within the action area:

NER GMUs

Area 77. National Elk Refuge. Beginning where U.S. Highway 26 crosses the Gros Ventre River; easterly up said river to the B-TNF boundary; southerly along said boundary to Flat Creek; westerly along said creek approximately 3.5 miles to the second road crossing; southerly along said road .8 mile to a trail junction; westerly along a marked boundary to the NER fence; northerly along said fence to the Gros Ventre River.

GTNP GMUs

Area 72. Webb Canyon/Moose Creek. All of the drainages of Berry Creek, Owl Creek and Webb Canyon Creek and that area north of Berry Creek to the GTNP boundary.
Area 75. Snake River. Beginning at the junction of the Gros Ventre-Kelly Road and U.S. Highway 26-89-191; northerly along said highway to Ditch Creek; westerly along said creek to the Snake River proper; northerly along the easternmost bank of the main channel of the Snake river to the northernmost channel of Spread Creek; easterly along said creek to U.S. Highway 26-89-191; southwesterly along said highway to U.S.F.S. Road 30310 at the Cunningham Cabin; southerly along said road to the GTNP boundary; southerly along said boundary to the intersection with the Shadow Mountain-Kelly Road (U.S.F.S. Road 30340); southwesterly along said road to the junction of the Teton Science School road; northeasterly along said road one and one-quarter (1¼) miles to a marked boundary; easterly one (1) mile to the GTNP boundary; southerly along the GTNP boundary to the Gros Ventre-Kelly Road; southwesterly along said road to U.S. Highway 26-89-191.

Area 79. Teton Park. Beginning where the U.S. Forest Service access road (U.S.F.S. Road 30310) near Cunningham Cabin intersects U.S. Highway 26-89-191; northerly along said highway to the junction of U.S. Highway 89-287 at Moran; northwesterly along said highway to the Grand Teton National Park boundary easterly and southerly along said boundary to the U.S. Forest Service access road (U.S. F.S. Road 30310) near Cunningham Cabin; westerly along said road to U.S. Highway 26-89-191.

B-TNF GMUs

Area 70. Buffalo Fork. Beginning where U.S. Highway 26-287 intersects the GTNP boundary; northerly along said boundary to Pacific Creek; northeasterly up said creek to Gravel Creek; northerly up said creek to the Snake River Trail; northerly along said trail to the south boundary of YNP; easterly along said boundary to the Continental Divide; southerly and easterly along said divide to U.S. Highway 26-287 at Togwotee Pass; westerly along said highway to the east boundary of GTNP.

Area 71. Pacific Creek. Beginning where Pacific Creek crosses the GTNP boundary; northerly along said boundary to the Targhee National Forest boundary; northerly along said boundary to the southern boundary of YNP; easterly along said boundary to the Snake River Trail at Fox Park; southwesterly along said trail over Big Game Ridge to Gravel Creek; southerly along said creek to Pacific Creek; southerly down said creek to the GTNP boundary.

Area 74. Ditch Creek. Beginning where Ditch Creek crosses the GTNP boundary; northeasterly along said boundary to Brush Creek; southerly up said creek to the divide between Brush Creek and Ditch Creek; southerly along a posted boundary to Ditch Creek; southerly down said creek to the GTNP boundary.

Area 78. Wilson. Beginning at the junction of Wyoming Highway 22 and Wyoming Highway 390; northerly along Wyoming Highway 390 to the GTNP boundary; northerly and southerly along said boundary to U.S. Highway 26-89-191; southerly along said highway to its junction with Wyoming Highway 22; westerly along said highway to its junction with Wyoming Highway 390.

Area 80. Sheep Creek. All of the drainages of Flat Creek, Sheep Creek and Nowlin Creek east of the NER.

Area 81. Spread Creek. Beginning where the GTNP boundary crosses the Gros Ventre River; northerly along said boundary to Ditch Creek; up said creek to a posted boundary; straight north along the posted boundary to the divide between Brush Creek and Ditch Creek; northerly down Brush Creek to the GTNP boundary; northerly along said boundary to U.S. Highway 26-287; easterly along said highway to Togwotee Pass and the Continental Divide; southerly along said divide to the Moccasin Basin Road (U.S.F.S. Road 30750); southerly down said road to the North Fork of Fish Creek at Calf Creek; southerly down said creek to Fish Creek; southeasterly down said creek to the Gros Ventre River; westerly down said river to the GTNP Park boundary.

Area 82. Crystal Peak. Beginning where the Gros Ventre River crosses the NER boundary near the town of Kelly; easterly up said river to Kinky Creek; easterly up said creek to the Darwin Ranch Road (U.S.F.S. Road 620); easterly along said road to the divide between the Green River and Gros Ventre River; southwesterly along said divide to the divide between the Green River

and Hoback River at Hodges Peak; westerly along the divide between Flat Creek and the Gros Ventre River; northerly along said divide to the NER boundary; northerly along said boundary to the Gros Ventre River.

Area 84. Lower Hoback. Beginning where U.S. Highway 191 crosses Flat Creek at the north edge of the town of Jackson; due east to the NER boundary; easterly along said boundary to the B-TNF boundary and the ridge between Twin Creeks and Cache Creek; easterly along said ridge to Jackson Peak; southerly along the divide between Flat Creek and Cache Creek to Cache Peak; easterly along the divide between Flat Creek and Granite Creek to Pyramid Peak; southerly along the divide between the Gros Ventre River and the Hoback River to Steamboat Peak; southerly and westerly along the divide between Shoal Creek and Dell Creek; westerly along said divide to the Riling Draw Road; southerly along said road to the Dell Creek Road; westerly along said road to the Hoback River; westerly down said river to Cliff Creek; southerly up Cliff Creek to the divide between the Greys River and the Hoback River; northwesterly along said divide to the divide between the Greys River and Willow Creek; northerly along said divide to the divide between the Bailey Creek and Willow Creek (Greyback Ridge); northerly along said divide to Dry Wash Draw; westerly down said draw to Bailey Creek; northwesterly down said creek to the Snake River; northerly up said river to Wyoming Highway 22; easterly along said highway to U.S. Highway 191; easterly along said highway to Flat Creek at the north edge of the town of Jackson.

Past projects, their effects on grizzly bears, and the level of incidental take have also been considered in the environmental baseline. Previous formal consultation in the vicinity of the action area addressed transportation projects and grazing permits. The projects are: (1) the Grand Teton National Park Transportation Plan (WY003, February 9, 2007); (2) domestic livestock grazing in Grand Teton National Park (WY9351, May 2, 2006); (3) the Federal Highway Administration's Highway 287/26 Reconstruction project, a.k.a. Togwotee Pass Highway (WY5998, August 22, 2003); and (4) the Forest Services' issuance of commercial grazing permits on the Bridger-Teton National Forest (WY4715, December 3, 2002). These projects, their effects to the grizzly bears, and the level of incidental take have been considered in the environmental baseline for this biological opinion.

Status of the Species within the Action Area

Portions of the action area are within the Yellowstone Recovery Zone and Primary Conservation Area (PCA) for grizzly bears identified in the Conservation Strategy for the Grizzly Bears in the GYE (USFWS 2003). The PCA, or grizzly bear recovery zone as it was initially described (USFWS 1982), was delineated to define an area within which to focus grizzly bear recovery efforts after the species was listed in 1975. At the time the boundary was delineated, grizzly bears were uncommon in GTNP and surrounding areas. Currently, however, grizzly bears are established in large areas outside of the PCA in GTNP (Schwartz et al. 2002), and the line does not represent grizzly bear distribution in the GTNP area.

Grizzly bears are relatively common in the southern GYE, including the Gros Ventre Mountains southeast of GTNP, and are regularly observed in the Teton Mountain Range north of Paintbrush Canyon and the Badger Creek drainage. Grizzly bears have been observed on the valley floor south of Triangle X Ranch, at Jackson Lake, in Death Canyon, and south of GTNP in the vicinity of Teton Village and along the Snake River south of Jackson (Schwartz et al. 2002). In addition, a young male radio-collared grizzly bear used the Bradley-Taggart Lakes and White Grass areas for several weeks in 2005, providing empirical evidence for the continued southward movement of grizzly bears in the Teton Range.

There have been no grizzly bears sighted on the NER since 1994; however, bears occupy areas immediately north and east of the Refuge. As the GYE bear population continues to expand southward into presently unoccupied areas, and with continued habituation of bears to human presence and activity, the potential for the occurrence of bears on the Refuge will likely increase.

Management of grizzly bears and their habitat in the Park follows IGBC guidelines (1986) and the Park's Human-Bear Management Plan (NPS 1989). These guidelines were developed to provide effective direction for the conservation of grizzly bears and their habitat to Federal agencies responsible for managing land within the recovery zone. The objectives for managing grizzly bears in the Park under the 1989 NPS plan are to: (1) restore and maintain the natural integrity, distribution, and behavior of grizzly bears, (2) provide opportunities for visitors to understand, observe, and appreciate grizzly bears, and (3) provide for visitor safety by minimizing bear/human conflicts, by reducing human-generated food sources, and by regulating visitor distribution.

The Park has been highly successful in promoting grizzly bear recovery and reducing bear-human conflicts (e.g., property damages, incidents of bears obtaining human food, bear-inflicted human injuries) and human-caused bear mortalities in the Park. Recreational and administrative facilities, human activities, and human waste (garbage and sewage) in GTNP are managed in a manner that minimizes the potential for human-caused grizzly bear mortalities. Management actions also include implementation of backcountry food storage requirements. Bears that are typically wary of humans will often tolerate people at close distances when carcasses or other high quality foods are available.

Shifts in grizzly bear seasonal distribution within the GYE appear to be directly related to resource availability. Recent research indicates that bears in YNP are 2 times more likely to be found outside of the park during the early hunting season. This movement occurred regardless of the relative yearly production and abundance of whitebark pine seed production (Haroldson et al. 2004). Elk hunting seasons in the GYE begin as early as September 10 and run through December 3. This period coincides with late hyperphagia in GYE grizzly bears, as well as the time period (September-October) during which the majority of hunting-related grizzly bear mortalities have occurred (Haroldson et al. 2004)

Hunting-related deaths resulting from human-grizzly conflict remain the most significant source of known grizzly bear mortality in the GYE (Haroldson et al. 2004; USFWS 2003). In the PCA itself, analysis of the potential correlation between hunter numbers and levels of known and probable grizzly bear mortality from 1987 to 1997 indicated little relationship (USFWS 2003). This analysis did not consider the relationship between hunter numbers and grizzly bear mortality in areas outside of the PCA. While the high level of hunting-related grizzly mortality has not been directly linked to hunter numbers in the PCA, it is nonetheless primarily the result of chance encounters between bears and hunters in the field, conflicts over ungulate carcasses and conflicts in hunter camps often as a result of game meat being kept in campsites (USFWS 2003; Haroldson et al. 2004).

Status of Species Habitat within the Action Area

The following is a brief description of habitat and cover types within existing elk hunting areas/GMUs:

Within the NER, elk hunting area (77) is dominated by mixed shrub and sagebrush shrubland interspersed with grassland. Riparian woodland habitat consists primarily of narrowleaf cottonwood (*Populus angustifolia*) and willow (*Salix* spp.) stands. Aspen woodlands occur on many hillsides, often some distance from water sources. Small patches of conifer forest occur within the hunt area and consist of Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*) and junipers. Agricultural areas and cultivated fields occur throughout the hunt area. The relatively even and open nature of terrain within the hunt area provides excellent foraging habitat for ungulates, but largely precludes grizzly-bear use and occupancy.

Within the GTNP, elk hunting areas (72, 75, 79) have quite different topographical and vegetational characteristics. Area 72 ranges from valley floor to alpine, with coniferous woodlands of lodgepole pine as well as whitebark pine, Englemann spruce (*Picea engelmannii*), sub-alpine fir (*Abies bifolia*), and Douglas-fir. Area 75 is predominately covered in sagebrush, with rolling terrain punctuated by areas of steeper relief. Small patches of grassland are located along the eastern border, with cultivated fields to the south. Patches of coniferous woodlands are located south of Ditch Creek and in the Snake River bottom. The relative lack of tree cover across most of the hunt area makes it less suitable for grizzly bears, with the exception of areas within the Snake River bottom, Blacktail Butte, and other small forested patches. Area 79 is composed of highly variable terrain predominately covered in dense coniferous woodlands composed of lodgepole pine, whitebark pine, Douglas and subalpine fir, and spruce; but it also includes some large expanses of sagebrush grasslands and willow habitats. The extensive areas of tree cover throughout the hunt area provide a large amount of suitable habitat for both elk and grizzly bear.

Within the B-TNF, elk hunting areas (70, 71, 74, 78, 80, 81, 82, 84) are highly variable in terms of terrain and are predominately forested with dense stands of conifers dominated by lodgepole pine, as well as whitebark pine, Englemann spruce, sub-alpine fir, and Douglas-fir.

Willow and quaking aspen (*Populus tremuloides*) occur in valley bottoms in association with streams, and sagebrush shrubland and grassland habitat grow in the lower elevations. The varied topography, dense woodland cover and general lack of human development offer extensive suitable habitat for grizzly bear north the Gros Ventre River and provide important transitional, and migration habitat for elk.

Factors Affecting Species Environment within the Action Area

General Factors

Past and ongoing actions within the action area and within the grizzly bear Recovery Zone are likely to affect GYE grizzly bears moving through the action area whether their home range is within or adjacent to the action area. These actions include:

- livestock grazing (which would impact grizzly bears through management actions),
- private land development,
- firewood cutting,
- road use/management/improvements,
- timber harvest,
- recreation activities that lead to human-bear conflicts,
- vegetation management,
- wild and prescribed fire, and
- loss or decline of important food sources (e.g., whitebark pine seeds due to fire suppression).

EFFECTS OF THE ACTION

Under section 7(a)(2) of the Act, "effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, with the effects of other activities interrelated or interdependent with that action. Direct effects are immediate effects of the proposed action on the species or its habitat. Indirect effects are those caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). The effects of the action are added to the environmental baseline to determine the future baseline and to form the basis for the determination in this opinion. Should the Federal action result in a jeopardy situation and/or adverse modification conclusion, the Service may propose reasonable and prudent alternatives that the Federal agency can take to avoid violation of section 7(a)(2). The effects discussed below are the result of direct and indirect impacts of implementing the proposed project and are addressed according to the four management goals outlined in the Plan. They are broken down and discussed further according to key actions occurring under each goal.

Habitat conservation

Under the proposed action 800-2,000 acres/year (324-809 ha/yr) of cultivated land would continue to be flood irrigated, while up to 1,100 acres (445 ha) would be converted from flood to sprinkler irrigation. Restoration of native species to 4,500 acres (1,821 ha) of existing agriculture fields would occur in GTNP and exclosures would be used on the Refuge to allow recovery of willow, aspen and cottonwood stands. These actions would likely result in an overall minor decrease in total herbaceous forage available for elk and bison, but would improve the overall quality of available forage. While these actions may alter ungulate distributions and densities, and cause elk in the Jackson herd to alter their movements within and outside of the Refuge in response to the changes, it is unlikely that these factors would have any significant impact on the GYE grizzly bear population.

Sustainable populations/ Elk and bison numbers

Supplemental feeding

Under the proposed action, supplemental feeding would be reduced from current levels and replaced by greater ungulate reliance on standing forage. The reduction in food supplementation may lead to changes in ungulate distribution and mortality and would likely cause elk and bison to return to a more natural pattern of existence influenced to a greater degree by factors such as climate and availability of native forage. Supplemental feeding likely reduces the effects of density in the Jackson elk herd (Lubow and Smith 2004); therefore, density-dependent effects on seasonal juvenile survival and dispersal may become more apparent as supplemental feeding is reduced. These effects, however, along with any associated decrease in adult and juvenile elk survival rates, are likely to be negligible since the Jackson elk herd is maintained below carrying capacity (Lubow and Smith 2004). While minor increases in elk mortality as a result of reduced supplemental feeding may be beneficial to grizzly bears in the GYE due to increased availability of carcasses, the effect would not likely be significant.

Elk hunt

The Jackson elk herd comprises one of the largest concentrations of elk in North America, with an estimated 13,000 individuals whose seasonal distributions allow them to be considered as being divided into four herd segments (Grand Teton, Yellowstone, Teton Wilderness, and Gros Ventre). The elk migrate across several jurisdictional boundaries, including the NER, GTNP, JDR Memorial Parkway, YNP, B-TNF, BLM resource areas, and state and private lands. Because of its large size, wide distribution, effects on vegetation, and importance to the area's predators and scavengers, the Jackson elk herd contributes significantly to the ecology of the southern GYE.

Elk hunting has been an annual event on the NER since 1955 and is the primary management tool used to control the Jackson elk herd population both on the Refuge and throughout the

Jackson elk herd units. As part of the proposed action, there will be a short-term increase in hunter numbers on the Refuge from 733 to 1,000 and an increase from 220 to 300 elk harvested annually. In the long term, overall hunter numbers on the Refuge will likely decrease to 470-487, as will the number of elk harvested (126-146). Hunting on the Refuge currently occurs in Area 77; however, a small hunt area may potentially be added in the southern portion of the Refuge in order to force elk back into other hunt areas. Hunting will be strictly managed and the areas available to hunting frequently patrolled. Hunting permits issued for the Refuge are day-use only and do not allow hunters to camp overnight. Due to these aforementioned factors, and the fact that habitat on the Refuge is relatively open and generally lacks densely forested areas, it is unlikely that the risk of elk hunters killing grizzly bears will be greater in either the short or long term as a result of the proposed action.

Elk hunting as part of the Park's annual elk reduction, occurs on approximately 66,600 acres (26,952 ha) of the Park's backcountry, 29,100 acres (11,776.4 ha) of which is in the recovery zone. Under the proposed action, there will be a short-term increase in the number of hunters permitted and deputized to hunt in the Park from 1,600 currently, to 2,200, and an increase in the number of elk harvested from 480 to 650. In the long term, the overall number of hunters in the Park will decrease to 773-957 per year, and the number of elk harvested will decrease to 232-287. Unlike the Refuge, overnight camping is permitted in certain areas.

There are 3 elk hunting areas (Areas 72, 79, 75) located within the boundaries of the GTNP. The terrain of Area 75 is largely open and lacking densely forested areas. This open, shrubland characteristic and general absence of dense woodland cover would tend to reduce the risk of surprise encounters between elk hunters and grizzly bears in these areas that might potentially result in human-caused grizzly mortality. Exceptions include the Snake River bottom where thicker cover exists and grizzly bears are known to frequent, and Blacktail Butte where grizzly bears might be expected to occur (Steve Cain, National Park Service, person. comm. 2007). Hunters in this area may face a higher risk of grizzly conflict than in other portions of Area 75. Portions of Area 71 are located within the 23,778 acres (9,623 ha) of the JDR Memorial Parkway managed by the Park; however, hunting for elk and other wildlife is largely managed by the WGFD. Area 72 has been closed to hunting since 1967. It is the only area in the Park west of the Snake River where hunting was authorized in the Park's 1950 enabling legislation and, although the potential for it to be reopened exists, this is not expected to occur within the foreseeable future. Compared with Area 75, Area 79 contains large expanses of dense woodland that provide ideal grizzly bear cover. Portions of the hunting area are located within the Buffalo Spread Creek BMU and represent a region where human-bear conflicts have occurred in the past (Haroldson et al. 2004; Gunther et al. 2004). The short-term risk for future human-bear conflicts resulting in potential grizzly bear mortality as a result of the proposed action is considered high for this hunting area both south of Elk Ranch and north of Moran and highway 26/287. However, a later start date of the elk hunting season relative to surrounding areas, a 30 to 40 percent yearly hunter-ranger contact rate, restricted backcountry camping, required use of bear-deterrence spray and supplemental educational materials addressing hunter-grizzly conflict

provided to deputized hunters (Steve Cain, National Park Service, person. comm. 2007) may limit this potential risk. The long term risk is considered to be equivalent to current levels.

Most of the remainder of the Jackson elk herd unit is comprised of the Buffalo and Jackson ranger districts of B-TNF. Elevation ranges from about 6,300 ft. (1,920 m) to nearly 12,200 ft. (3,719 m) at the headwaters of the Yellowstone River. There is not expected to be a substantial short-term increase in the short term in either the number of elk hunters using the forest or the number of elk harvested unless hunts on the Refuge cause more elk to move into these areas. As a result of the proposed action, in the long-term it is expected that herd reductions in the Grand Teton segment will cause individuals to radiate into and be sustained in other herd segments, allowing proportionately more elk to be harvested. In the long-term, it is estimated that there will be a 29-35 percent increase in hunter numbers in the B-TNF (from 4,227 currently to 5,600-5,870) as a result of the proposed action. The number of elk harvested per year in the B-TNF is predicted to increase from 1,268 to between 1,680 and 1,761.

There are 6 hunting areas (Area 70, 71, 74, 80, 81, 82) located in the B-TNF and surrounding the Park. These areas are dotted with dense coniferous woodlands interspersed with more open woods, and sagebrush and mixed grasslands at lower elevations and in the valleys. The terrain is highly variable with elevations ranging from 6,396 to 9,676 ft. (1,950 to 2,950 m). Multiple human-bear conflicts have been recorded throughout these areas in the past including hunting-related grizzly bear mortalities (Haroldson et al. 2004; Gunther et al. 2004, USFWS 2003). Elk season start dates in these areas range from September 10 to September 26, which corresponds both with the period when bears are actively foraging and preparing for hibernation and with the time during which most known and probable hunting-related grizzly bear mortalities occur (Haroldson et al. 2004; Gunther et al. 2004). Traditional early fall elk hunts in these areas have created a reliable food source for hyperphagous bears which take advantage of ungulate remains left by hunters, and this brings them into close proximity to hunters themselves (Haroldson et al. 2004). As a result of these factors, the risk of human-bear conflict resulting in potential hunting-related grizzly bear mortality is considered high in Areas 70, 71, and 81. Hunting Areas 73, 78, 84, and 85 are considered to represent regions with low risk of human-bear conflict due to the relatively high level of human occupation and their location outside of the main fall migration routes of the Jackson herd.

Bison hunt

A bison hunt would occur under the proposed action in order to reduce the herd size on the Refuge, increase bison distribution, limit bison-elk conflict along feed lines and reduce the potential for disease transmission. A reduction in herd size would also contribute to enhancement of habitat through a decrease in the damage caused by excessive grazing and browsing of willow, aspen and cottonwood stands. Initially, the bison hunt would reduce herd size by 140-150 bison/year, of which, 90-100 would be removed on the Refuge and 50 would be removed from the B-TNF. This would involve an average of 175-190 bison hunters each year. In the long term, the Plan estimates that an average of 70 bison will be killed annually, with an

average of 90 hunters participating in the hunt. This nevertheless represents a substantial increase over recent numbers of bison being harvested and bison hunters on the Refuge. Despite the increase in the number of hunters on the NER, due to the aforementioned factors and conditions associated with hunts on Refuge, the risk of human-grizzly conflict resulting in hunting-caused grizzly bear mortality is considered to be low, both in the short and the long term. The risk of hunter-caused grizzly mortality associated with bison hunts in the B-TNF is considered to be higher than on the Refuge, especially in the northern portions of Area 81 east of Elk Ranch and between Buffalo Fork and Spread Creek.

Disease management

In order to maintain the health of elk and bison populations while continuing supplemental feeding at reduced levels, a variety of disease management techniques will be explored (e.g., vaccination, selective fertility control, age- and sex-specific harvest). Under the proposed action, WGFD personnel will be allowed to use brucellosis vaccine Strain 19 on elk and RB51 on calf and nonpregnant female bison along feedlines during feedline operations. Grizzly bears may consume elk or bison exposed to these brucellosis vaccines; however, research indicates that there are no significant adverse effects of the RB51 vaccine on nontarget species (Januszewski et al. 2001). No clinical trials have been conducted to determine if vaccine Strain 19 is safe for nontarget species; however, the vaccine has been used on WGFD feedgrounds for 17 years without any noticeable adverse clinical, histological or reproductive effects on nontarget species. Since vaccination activities will occur within the Refuge along feedlines, it is not expected that there would be a risk of disturbance to grizzly bear associated with the action.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Cumulative Effects within the Action Area

Several privately owned and State of Wyoming-owned in-holdings are present in GTNP; depending upon future human activities occurring on these properties, grizzly bears could be negatively affected. For many years, GTNP has attempted to secure these in-holdings with lifetime leases and out-right purchases and has been very successful in doing so. No large-scale developments or land-based projects have been proposed for these in-holdings.

There are plans to convey the Laurance S. Rockefeller (LSR) Preserve (approximately 1,100 acres [445 ha]) in southern GTNP to the Federal government in 2007. However, the LSR Preserve is presently a private in-holding in the Park. Although the future plans include removal

of most of the development that has been present on the ranch, the current owners will develop an interpretive facility and trail system prior to the conveyance of the property.

Cumulative Effects Adjacent to the Action Area and Grizzly Bear Recovery Zone

Cumulative effects of actions outside the action area and within the grizzly bear Recovery Zone are likely to affect resident grizzly bears moving through the action area whether their home range is within or adjacent to the action area. These actions include:

- livestock grazing (which would impact grizzly bears through management actions),
- private land development,
- firewood cutting,
- road use/management/improvement,
- timber harvest,
- recreation activities that lead to human-bear conflicts,
- vegetation management,
- wild and prescribed fire, and
- loss or decline of important food sources (e.g., whitebark pine seeds due to fire suppression),

The recent Teton County, Wyoming, approval of the Snake River Associates development plan for Teton Village on private land adjacent to the Park's southern boundary could have additional cumulative, long-term impacts on grizzly bears. This development will likely result in a higher number of visitors to the Park and an increase in associated dispersed recreational use. This may be particularly true in the southwest corner of the Park, where excellent bear habitat exists. Grizzly bears will likely colonize this area, even though it is several miles outside of the PCA.

These activities would cumulatively contribute to increased mortality risks, reduce availability of secure habitat, and diminish habitat effectiveness for grizzly bears. However, the total cumulative impact of the above-listed activities, as well as other unidentified actions occurring within the grizzly bear recovery zone, do not appear to be adversely affecting population recovery, as evidenced by the expanding grizzly bear population in the GYA (Eberhardt and Knight 1996; Schwartz et al. 2002; Pyare et al. 2004).

CONCLUSION

After reviewing the current status of the threatened grizzly bear, the environmental baseline for the species in the action area, the effects of the action and the cumulative effects, it is the Service's opinion that the Final Bison and Elk Management Plan, as proposed, is not likely to jeopardize the continued existence of the grizzly bear. No critical habitat has been designated for grizzly bears, therefore, none will be affected. Implementing regulations for section 7 (50 CFR

402) define "jeopardize the continued existence of" as to "engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." Our conclusion that the proposed action is not likely to jeopardize the continued existence of grizzly bears is based primarily on the information presented in the FEIS and BE prepared for the proposed Bison and Elk Management Plan, information in our files, and informal discussions between the Service, the Park and other personnel from other agencies and groups.

Grizzly bears in the GYE have increased in numbers and expanded in range during the past two decades (Schwartz et al. 2006). Female grizzly bears with young have been observed out side of the recovery zone, leading to the assumption that females are able to establish home ranges and find the resources needed to survive and reproduce in these areas.

The Service concludes that some adverse affects may occur to grizzly bears as a result of the proposed bison and elk management plan. The existing level of hunting on the Refuge has not presented a problem of grizzly-human conflict and, though the best available information suggests the GYE grizzly bear population is stable to increasing and is expanding its range to the south, the open nature of terrain on the Refuge and high levels of human activity and visibility will limit the risk of conflicts in both the short and long terms. As on the Refuge, existing hunting within the Park has not presented a substantial problem of hunting-caused grizzly bear mortality; however, unlike on the Refuge, the variability of terrain and densely wooded areas in the Park contribute to an elevated risk of hunting-related conflicts occurring. This increased risk would be minimal in the long term as a result of the proposed action, but would be higher in the short-term, especially within Area 79. Within the B-TNF, the short term risk of increased hunting-related grizzly bear mortality would be relatively unchanged as a result of the proposed plan under current conditions. The long-term risk, however, would be considerably higher in all areas where grizzly bear occur.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation when it actually kills or injures listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent act or omission which creates the likelihood of injury to listed species by annoying it such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to

and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary and must be implemented by the Park and Refuge so that they become binding conditions of any permit issued by the Park or Refuge, as appropriate, in order for the exemption from prohibited taking of the species concerned, as described in section 7(o)(2), to apply. The Park and Refuge have a continuing duty to regulate the activity covered by this incidental take statement. If the Park or Refuge (1) fails to assume and implement the terms and conditions or (2) fails to require permittees to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or other documents, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Park and Refuge must report the progress of the action and its impact on the species to the Service as specified in the Incidental Take Statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

Considering the history of hunting-related conflicts in the GYE, differing strategies for management of hunters by the Park and the B-TNF, and differences in landscape and habitat characteristics, the risk of hunting-related grizzly bear mortality and associated incidental take are addressed separately for the Park and the B-TNF. The Service anticipates that the proposed action will exacerbate the short-term risk for hunting-related grizzly bear mortality within the Park and the long-term risk for hunting-related grizzly bear mortality in the B-TNF and JDR Memorial Parkway as a result of the Plan.

The Service anticipates 1 grizzly bear (adult or juvenile) over the 15-year implementation period of the Plan could be incidentally taken as a result of the proposed action in GTNP and 2 grizzly bears (adult or juvenile) in a 15-year period could be incidentally taken as a result of the proposed action in the B-TNF. It is expected that all grizzly bears would be lethally taken through hunting-related conflicts. In the period 1987-2001, an average of 2 human-caused grizzly bear mortalities occurred per year in the B-TNF. During the same time period the average human-caused grizzly bear mortality was less than 1 per year in the Park (USFWS 2003). The incidental take of 2 grizzly bears in the B-TNF and 1 in GTNP as a result of the proposed action is considered to be in addition to this baseline level of mortality.

EFFECT OF THE TAKE

As analyzed in this biological opinion, the Service concludes that this level of anticipated incidental take is not likely to result in jeopardy to the species. Critical habitat has not been designated for the grizzly bear; therefore none would be affected.

REASONABLE AND PRUDENT MEASURES

The Service believes the following Reasonable and Prudent Measures (RPM) are necessary and appropriate to minimize impacts of incidental take of grizzly bears:

RPM 1 Minimize the likelihood of hunting-related human/grizzly bear conflict associated with the Project through education of hunters

TERMS AND CONDITIONS

The Service believes no more than 3 grizzly bears will be incidentally taken as a result of the proposed action. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is reached, such incidental take represents new information requiring re-initiation of consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

1. The Park and Refuge shall continue ongoing educational measures related to limiting the risk of hunter-grizzly conflict and hunting-caused grizzly bear mortality and shall adapt or modify these measures as changing circumstances and information warrant.

2. If incidental take of grizzly bears in the B-TNF above the baseline level reaches 1 grizzly bear, Service and Park representatives shall meet with representatives from the WGFD and B-TNF to discuss whether additional educational and/or preventative measures or other changes could be implemented within the action area to minimize additional take of grizzly bears within the B-TNF.

3. In the event that a grizzly bear is killed within the action area as a result of hunting-related conflict, the Park, Refuge or B-TNF shall notify the Service's Wyoming Field Office (307-772-2374) and the Service's Law Enforcement Office (307-261-6365) within 24 hours.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation Recommendations (CR) are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

CR1. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects, or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

CR2. The Refuge and Park should participate in ongoing interagency efforts to identify, map and manage linkage habitats essential to grizzly bear movement. Please contact the Service's grizzly bear recovery coordinator at (406) 243-4903 for information.

CR3. If grizzly bears are sighted on the NER during the implementation period of the project, all hunting activities on the NER should be reassessed in order to determine the potential risk of hunter-grizzly conflict.

CR4. The Park should encourage hunters to move their kills out from underneath thick tree cover or undergrowth into more open areas as quickly as possible in order to reduce the risk of surprise encounters with grizzly bears.

CR5. The Park should encourage hunters to retrieve and remove or hang their kills as quickly as possible after making a kill in order to reduce the risk of hunter-grizzly conflict over ungulate carcasses.

CR6. The Park should recommend that after making a kill or tagging a kill, any hunter that finds a grizzly bear is already on the carcass will forfeit that kill and/or tag.

CR7. The Park should place educational signs/information addressing the risks of hunter-grizzly conflict, including information on daily and seasonal periods that represent the highest risk for hunter-grizzly conflict and how to diffuse grizzly bear confrontations, in any parking area, maintained camp site and high use trail head where such signs/information are not already in place.

CR8. The Park should continue encouraging hunters to maintain at least 100m distance between any campsite and any carcass or meat that is hung in order to elevate it beyond the reach of scavenging grizzly bears.

CR9. As a non-action agency indirectly affected by the proposed project, the B-TNF should implement the abovementioned conservation measures whenever possible and appropriate.

REINITIATION REQUIREMENT

This concludes formal consultation on the action outlined in your February 7, 2007, request for formal consultation on the Final Bison and Elk Management Plan and Environmental Impact

Statement. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your assistance in the conservation of endangered, threatened, and proposed species. If you have any questions or comments on this final biological opinion or your responsibilities under the Act, please contact Tyler Fox of our staff at the letterhead address or by phone at (307) 772-2374, extension 237.

cc: B-TNF, Forest Supervisor, Jackson, WY (K. Hamilton)
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FWS, Planning Team Leader, Lakewood, CO (L. Shannon)
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WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (V. Stelter)
WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)

Literature Cited

Bjornlie, D. and M. Haroldson. 2001. Grizzly bear use of insect aggregation sites documented from aerial telemetry and observations. Pages 44-51 *in* C. C. Schwartz and M. A. Haroldson, Eds. Yellowstone grizzly bear investigations: Annual report of the Interagency Grizzly Bear Study Team, 2000. U.S. Geological Survey, Bozeman, Montana.

Eberhardt, L. L. and R. Knight. 1996. How many grizzlies in Yellowstone? Journal of Wildlife Management 60:416-421.

Gillian, C.M., F.M. Hammond, and C.M. Peterson. 1994. "Evaluation of an aversive conditioning technique used on female grizzly bears in the Yellowstone ecosystem." Pp. 503-512 in Proceeedings and papers of the Ninth International Conference on Bear Research and Management. Bears—Their Biology and Management (Claar, J.J. and P. Schullery, eds). Missoula, MT.

Gunther, K. A., M. A. Haroldson, K. Frey, S. L. Cain, J. Copeland, and C. C. Schwartz. 2004. Grizzly bear--human conflicts in the Greater Yellowstone Ecosystem, 1992-2000. Ursus 15(1):10-22.

Gunther, K.A, M.T. Bruscino, S.L. Cain, K. Frey, L. Hanauska-Brown, M. Haroldson and C.C. Schwartz. 2004a. Grizzly Bear-Human Conflicts in the Greater Yellowstone Ecosystem. Pages 53-56 *in* C. C. Schwartz and M. A. Haroldson, Eds. Yellowstone grizzly bear investigations: Annual report of the Interagency Grizzly Bear Study Team, 2003. U.S. Geological Survey, Bozeman, Montana.

Haroldson, M.A. 2006. Grizzly bear mortalities. Pages 16-22 *in* C.C. Schwartz, M.A. Haroldson, and K. West, editors. Yellowstone grizzly bear investigations: annual report of the Interagency Grizzly Bear Study Team, 2005. U.S. Geological Survey, Bozeman, Montana.

Haroldson, M. A. and K. Frey. 2004. Grizzly bear mortalities. Pages 22-25 in C. C. Schwartz and M. A. Haroldson, eds. Yellowstone grizzly bear investigations: annual reports of the Interagency Grizzly Bear Study Team, 2003. U.S. Geological Survey, Bozeman, MT.

Haroldson, M. A. Ternant, K. A. Gunther, and C. C. Schwartz. 2002. Grizzly bear denning chronology and movements in the Greater Yellowstone Ecosystem. Ursus 13:29-37.

Hilderbrand, G. V., S. G. Jenkins, C. C. Schwartz, T. A. Hanley, and C. T. Robbins. 1999. Effect of seasonal differences in dietary meat intake on changes in body mass and composition in wild and captive bears. Canadian Journal of Zoology 77:1623-1630.

Interagency Grizzly Bear Study Team (IGBST). 2005. Reassessing methods to estimate population size and sustainable mortality limits for the Yellowstone grizzly bear. Interagency Grizzly Bear Study Team, U.S. Geological Survey, Northern Rocky Mountain Science Center, Montana State University, Bozeman, Montana, U.S.A.

IGBST. 2000. Yellowstone Grizzly Bear Investigations, Report of the Interagency Study Team 2000. U.S. Geological Survey, Wyoming Game and Fish Department, U.S. Fish and Wildlife Service, Montana Fish, Wildlife and Parks Department, U.S.D.A. Forest Service, Idaho Fish and Game Department (Charles C. Schwartz and Mark A. Haroldson, Eds).

Interagency Conservation Strategy Team (ICST). 2003. Final Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Area. The Interagency Conservation Strategy Team. 174 pp.

Interagency Grizzly Bear Committee (IGBC). 1986. Interagency grizzly bear guidelines. U.S. Forest Service, Washington, D.C.

Jacoby, M. E., G. V. Hilderbrand, C. Servheen, C. C. Schwartz, S. M. Arthur, T. A. Hanley, C. C. Robbins, and R. Michner. 1999. Trophic relations of brown and black bears in several western North American ecosystems. Journal of Wildlife Management 63:921–929.

Januszewski, M.C., S.C. Olsen, R.G. McLean, L. Clark, and J.C. Rhyan. 2001. Experimental infection of nontarget species of rodents and birds with Brucella abortus strain RB51 vaccine. Journal of Wildlife Diseases 37(3):532-537.

Kasworm, W. F., and T. L. Manley. 1989. Road and trail influences on grizzly bears and black bears in northwest Montana. International Conference on Bear Research and Management 8:79-84.

Knight, R. R. and L. L. Eberhardt. 1985. Population dynamics of Yellowstone grizzly bears. Ecology 66(2):323-334.

Knight, R. R. and S. L. Judd. 1983. Grizzly bears that kill livestock. International Conference for Bear Research and Management 5:186-190.

Linnell, J. D. C., J. E. Swenson, R. Anderson, and B. Barnes. 2000. How vulnerable are denning bears to disturbance? Wildlife Society Bulletin 28(2):400-413.

Lubow, B.C., and B.L. Smith. 2004. Population dynamics of the Jackson elk herd. Journal of Wildlife Management. 68(4):810-829

Mattson, D. J. 2001. Myrmecophagy by Yellowstone grizzly bears. Canadian Journal of Zoology 79:779-793.

Mattson, D. J. and D. P. Reinhart. 1997. Excavation of red squirrel middens by grizzly bears in the whitebark pine zone. Journal of Applied Ecology 34:926-940.

Mattson, D. J. and D. P. Reinhart. 1995. Influences of cutthroat trout (*Onchorhynchus clarki*) on behavior and reproduction of Yellowstone grizzly bears (*Ursus arctos*), 1975-1989. Canadian Journal of Zoology 73:2072-2079.

Mattson, D. J. and R. R. Knight. 1991. Effects of access on human-caused mortality of Yellowstone grizzly bears. USDI National Park Service, Interagency Grizzly Bear Study Team Report 1991B.

Mattson, D. J., M. G. French, and S. P. French. 2002. Consumption of earthworms by Yellowstone grizzly bears. Ursus 13:105-110.

Mattson, D. J., B.M. Blanchard, and R.R. Knight. 1992. Yellowstone grizzly bear mortality, human habituation, and whitebark pine seed crops. Journal of Wildlife Management 56:432-442.

Mattson, D. J., B. M Blanchard, and R. R. Knight. 1991. Food habits of Yellowstone grizzly bears, 1977-1987. Canadian Journal Zoology 69:1619-1629.

Mattson, D. J., C. M. Gillin, S. A. Benson, and R. R. Knight. 1991a. Bear feeding activity at alpine insect aggregation sites in the Yellowstone ecosystem. Canadian Journal of Zoology 69:2430-2435.

Podruzny, S. 2005. Occupancy of Bear Management Units by Females with Young. Page 17 *in* C.C. Schwartz, M.A. Haroldson and S. Podruzny, editors. Yellowstone Grizzly Bear Investigations: Annual report of the Interagency Grizzly Bear Study Team, 2004. U.S. Geological Survey. Bozeman, Montana. 131 pp.

Podruzny, S. Cherry, C. C. Schwartz, and L. A. Landenburger. 2002. Grizzly Bear Denning and Potential Conflict Areas in the Greater Yellowstone Ecosystem. Ursus 13:19-28.

Podruzny, S. and K. Gunther. 2001. Spring Ungulate Availability and Use by Grizzly Bears in Yellowstone National Park. Pages 33-36 *in* C. C. Schwartz and M. A. Haroldson, editors. Yellowstone Grizzly Bear Investigations: Annual report of the Interagency Grizzly Bear Study Team, 2000. U.S. Geological Survey. Bozeman, MT.

Pyare, S., S. Cain, D. Moody, C. Schwartz, and J. Berger. 2004. Carnivore re-colonization: reality, possibility and a non-equilibrium century for grizzly bears in the Southern Yellowstone Ecosystem. Animal Conservation 7:1-7.

Reinhart, D. P., M. A. Haroldson, D. J. Mattson, and K. A. Gunther. 2001. Effects of exotic species on Yellowstone grizzly bears. Western North American Naturalist 61(3):227-288.

Robinson, H.L., C.C. Schwartz, J.D. Petty and P.F. Brussard. 2006. Assessment of pesticide residues in army cutworm moths (*Euxoa auxiliaries*) from the Greater Yellowstone Ecosystem and their potential consequences to foraging grizzly bears (*Ursos arctos horribilis*). Chemosphere 64:1704-1712

Schwartz, C.C., M.A. Haroldson, K. West, editors. 2006. Yellowstone grizzly bear investigations: annual report of the Interagency Grizzly Bear Study Team, 2005. U.S. Geological Survey, Bozeman, Montana. 90 pp.

Schwartz, C.C., M.A. Haroldson, K.A. Gunther, and D. Moody. 2002. Distribution of grizzly bears in the Greater Yellowstone Ecosystem 1990-2000. Ursus 13:203-212.

U.S. Fish and Wildlife Service (USFWS). 2005. Endangered and Threatened Wildlife and Plants; Designating the Greater Yellowstone Ecosystem Population of Grizzly Bears as a Distinct Population Segment; Removing the Yellowstone Distinct Population Segment of Grizzly Bears From the Federal List of Endangered and Threatened Wildlife; Proposed Rule. Federal Register 70 (221):69854-69884.

USFWS. 2003. Final conservation strategy for the grizzly bear in the Yellowstone ecosystem. U.S. Fish and Wildlife Service, Missoula, Montana 87 pp.

USFWS. 1993. Grizzly Bear Recovery Plan. Missoula, MT 181 pp.

USFWS. 1982. Grizzly bear recovery plan. Fish and Wildlife Reference Service. Denver, Colorado.

USFWS. 1975. Endangered and Threatened Wildlife: Amendment Listing the Grizzly Bear of the 48 Conterminous States as a Threatened Species. Federal Register 40(145):31734-31736.

U.S. Geological Survey (USGS). 2005. Website accessed January 2006. Katherine Kendall, Principal Investigator. http://nrmsc.usgs.gov/research/grizzlyb.htm

Zager, B., and J. Beecham. 2006. The role of American black bears and brown bears as predators on ungulates in North America. Ursus 17(2):95-108

April 29, 2013

Memorandum

To: Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming

From: Superintendent, Grand Teton National Park, Moose, Wyoming

Subject: Re-initiation of formal consultation on Grand Teton National Park and National Elk Refuge Bison and Elk Management Plan/EIS (Formal Consultation No. ES-6-WY-07-F014)

In February 2007, Grand Teton National Park (GRTE) and the National Elk Refuge (NER) submitted to your office the Bison and Elk Management Plan (BEMP) and related materials necessary to initiate formal consultation regarding potential impacts to threatened and endangered species (Formal Consultation No. ES-6-WY-07-F014). The final biological opinion for this consultation provided for an incidental take of 1 grizzly bear related to GRTE's elk reduction program (ERP). On November 22, 2012, a group of 3 hunters participating in the ERP shot and killed an adult male grizzly bear in the Snake River bottoms area of Hunt Area 75, within GRTE. This leaves the park with no additional grizzly bear take related to the ERP during the remaining 9 years of the plan's intended 15 year life span. Accordingly, with this letter we are requesting to re-open formal consultation on the BEMP.

The BEMP acknowledged that grizzlies occurred in GRTE's Hunt Area 79 and that they were anticipated to occur in Hunt Area 75, particularly along the Snake River bottoms and on Blacktail Butte, where hunters "may experience a higher risk of grizzly conflict than in other portions of Area 75" (p. 190 final BEMP, cited from the FWS biological opinion). The Draft BEMP/EIS further stated:

- "The ecosystem's grizzly bears number an estimated 400-600, and their distribution has been increasing over the past two decades. They widely use the northern two-thirds of the park, but can occur throughout the park and surrounding areas" (p.153).
- Under ***Impacts Common to All Alternatives***... "*Hunting Risks to Grizzly Bears* – As the grizzly bear population continues to expand southward, the risk of conflicts between hunters and grizzlies would increase and could result in increased mortality for bears and hunters under Alternatives 1,3,4,5, and 6, which would continue....., when necessary, an elk reduction program in the park" (p. 345).

Similarly, the biological opinion acknowledged that "the long term risk [of hunting related grizzly mortality]...would be considerably higher in all areas where grizzly bear occur," and that "the service anticipates that the proposed action will exacerbate the short-term risk for hunting-related grizzly bear mortality with the park..."(final BEMP p.194-195).

Conditions associated with the ERP remain largely the same as they were in 2007 except, as anticipated in the plan, grizzly bear distribution and numbers in the south end of the park appear to have increased. We have documented these changes based on opportunistic observations. Since 2007, several grizzly bears have been observed seeking out gut piles left on the landscape during the elk reduction program, just as they have throughout the ecosystem for decades during hunting seasons. We believe that grizzly bears will continue this behavior and that the risk of hunter-grizzly bear contacts will continue to be relatively high as long as the ERP is necessary.

In 2013, GRTE, in collaboration with the Wyoming Game and Fish Department, proposed several new measures to help mitigate the potential for hunter-grizzly bear conflicts during the ERP. These include: 1) closing the Snake River bottoms between Ditch Creek and Dead Man's Bar; 2) beginning the hunt 2 weeks later; 3) limiting ammunition carried in the field to 7 cartridges per day; and 4) limiting the number of shots hunters can take at a group of running elk to one (the latter two measures aim to reduce elk wounding loss).

Existing measures to help minimize human-bear encounters during the elk reduction program include: 1) requiring all hunters to carry bear spray; 2) maintaining a significant ranger presence and contacting a high percentage of program participants in the field; 3) not allowing artificial elk calls, which can draw bears to hunters; 4) providing a secure camping area for participants where carcasses can be safely stored out of reach of bears; 5) providing an abundance of bear safety educational materials to all permit holders, including warnings that hunters can expect to encounter bears while hunting in the park; and 6) significantly reducing numbers of hunters in the field (elk reduction program permits issued have declined from 1,150 in 2007 to 725 in 2012, and are proposed to further decrease to 650 in 2013; Table 2).

In addition, GRTE has developed and implemented several new grizzly bear conservation measures since 2007. First, we initiated a new "Be Bear Aware" campaign in 2007. This effort emphasized improving management of visitors in bear country through development, purchase, and placement of a variety of new information and education materials. Second, in 2007 we created the "Wildlife Brigade", a corps of paid and volunteer staff to respond to the rapidly escalating number of traffic jams caused by grizzly and black bear sightings along roads ('bear jams'); enforce food storage at campgrounds, picnic areas, and other developed areas; and continue refining the park's bear management program. This new program has been highly successful. In recent years the crew has consisted of one full-time bear management specialist, 2 paid seasonal rangers, and 10-12 seasonal volunteers and interns. They manage hundreds of bear jams annually, patrol park facilities and trails daily for food storage compliance, write courtesy food storage warnings for visitors, and educate thousands of visitors through direct contacts in the process. Third, we initiated a campaign in 2008 to purchase and install additional bear-resistant food storage boxes in collaboration with the Grand Teton National Park Foundation and park concessionaires. To date, nearly 400 boxes have been installed in camp sites and other developed areas. Fourth, in 2009, the park contracted the Wyoming Survey and Analysis Center at the University of Wyoming to evaluate effectiveness of our "Be Bear Aware" message. The results of this work provided valuable feedback on which park visitors were being reached and how the message affected their behaviors. Finally, in 2012 the park contracted a marketing specialist from Montana State University to study and evaluate "Be

Bear Aware" messaging ecosystem-wide. Results of this work also provided valuable feedback to land and wildlife management agencies about current messaging systems and how to improve them in the future. Overall, GRTE's program has been highly successful at minimizing human-grizzly bear conflicts, with no management removals or relocations required since 2007 (Table 1).

Table 1. Grizzly bear conflicts in Grand Teton National Park 2007-2012.

Date	Type	Location	Action	Comments
6-13-2007	Human injury	Willow Flats	None	Mauling
7-14-2007	Mortality	Hwy 89/191/287 near Arizona Creek	None	Road kill male cub of year
6-26-08	Property damage	Grassy Lake Rd campsite #2	None	Bear ripped tent, no attractants
5-9-10	Property damage, food reward	Huckleberry Hot Springs	Area temporarily closed, bear box installed	Adult bear closely approached and obtained food in day pack
6-2-10	Mortality	Hwy 89/191/26 near Spread Creek	None	Road kill male 3 year old G133
6-21-10	Property damage	Grassy Lake Rd campsite #1	None	Bear ripped tarp off tent, no attractants
10-25-11	Food Reward	Hwy 89/191/26 near Moose	None	Family group (610 plus 3 COY) observed rummaging through trash bag along highway
10-30-11	Human injury	Snake River Bottom near Schwabacher Landing	Area temporarily closed	Mauling
5-27-12	Food Reward	Colter Bay Developed Area	None	Yearling grizzly bear allegedly fed from a car
6-21-2012	Mortality	Hwy 89/191/26 near Lost Creek Road	None	Road kill male yearling
11-22-2012	Mortality	Snake River Bottom near Schwabacher Landing	Area closed for remainder of Elk Reduction Program	Adult male grizzly killed in self-defense

The ERP has occurred annually since 2007 and has been developed and administered as per conditions

set for in the park's establishing legislation (Public Law 81-787, 64 STAT 849). The need for the program is evaluated annually, and seasons are set in coordination with the Wyoming Game and Fish Department (Table 2).

Table 2. Grand Teton National Park elk reduction program permits and harvest, 2007-2013.

Year	Area 75 Permits	Area 79 Permits	Total Permits	Total Harvest	Comments
2007	500	650	1150	214	Some A79 permits also valid in A75
2008	550	600	1150	264	Some A79 permits also valid in A75
2009	325	575	900	361	Some A79 permits also valid in A75
2010	325	150	475	341	Some A79 permits also valid in A75
2011	675	75	750	278	Some A79 permits also valid in A75
2012	700	25	725	187	100% antlerless tags
2013[1]	650	0	650		A75 Type 4 permits valid in A79 Oct 19 – November 3, 2013

[1]Proposed

The Final Biological Opinion (USFWS 2007) identified 1 broad Reasonable and Prudent Measure, 3 specific Terms and Conditions, and 9 Conservation Recommendations. The park has complied with each of these.

Summary

GRTE is requesting to re-initiate formal consultation on its 2007 BEMP/EIS, completed with the NER, because the level of ERP grizzly bear incidental take (1) in the FWS's 2007 Final Biological Opinion (USFWS 2012) was reached in 2012. The Yellowstone ecosystem grizzly bear population has appeared to remain relatively steady since 2007 (IGBST 2012), but its distribution has increased in the GRTE vicinity (Schwartz et al. 2006, Bjornlie et al. 2013), corroborating increased sightings of grizzly bears, including females with young, in the southern half of the park.

GRTE has complied with all requirements and recommendations set forth by the FWS in the biological opinion (USFWS 2007), and has been highly successful at minimizing human-grizzly bear conflicts through intensive programs for food and garbage storage, management of bear jams, public education, hunting-specific conflict reduction measures, and other conservation actions.

We believe continued implementation of the BEMP is likely to incur additional losses of grizzly bears from hunter-grizzly bear conflicts, which will adversely affect grizzly bears. However, we also believe the number of bears affected will be small and will not jeopardize the continued existence of the Yellowstone ecosystem grizzly bear population.

If you have questions or need additional information regarding this matter, please contact senior wildlife biologist Steve Cain at 307-739-3485.

Literature Cited

Bjiornlie, D. D., D. J. Thompson, M. A. Haroldson, C. C. Schwartz, K. A. Gunther, S. L. Cain, and D. B. Tyers. 2013. Methods to estimate distribution and range extent of grizzly bears in the Greater Yellowstone Ecosystem. *In Review.*

Haroldson, M.A., C.C. Schwartz, S. Cherry, and D.S. Moody. 2004. Possible effects of elk harvest on fall distribution of grizzly bears in the Greater Yellowstone Ecosystem. Journal of Wildlife Management 68(1):129-137.

Schwartz, C. C., Haroldson M. A., Gunther K. A., Moody D. 2006. Distribution of grizzly bears in the Greater Yellowstone Ecosystem in 2004. Ursus 17(1):63-66.

Interagency Grizzly Bear Study Team (IGBST). 2012. Unpublished data. USGS Northern Rocky Mountain Science Center, Interagency Grizzly Bear Study Team, Bozeman, Montana.

USFWS. 2007. Memorandum, from Wyoming Field Supervisor to National Elk Refuge Manager. Final Biological Opinion for the Bison and Elk Management Plan Grand Teton National Park Transprotation Plan (Formal Consultation No. ES-6-WY-07-F014). U.S. Fish and Wildlife Service, Cheyenne, Wyoming.

USFWS and USNPS. 2007. Bison and Elk Management Plan: National Elk Refuge and Grand Teton National Park. U.S. Fish and Wildlife Service and U.S. National Park Service. Lakewood, CO. 251pp.

CC: Manager, National Elk Refuge.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

SEP 13 2013

In Reply Refer To:
06E13000/WY13F0094

Memorandum

To: Superintendent, National Park Service, Grand Teton National Park, Moose, Wyoming

Refuge Manager, U.S. Fish and Wildlife Service, National Elk Refuge, Jackson, Wyoming

From: Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming

Subject: Re-initiation of formal consultation on Grand Teton National Park and National Elk Refuge Bison and Elk Management Plan/EIS

This memorandum transmits the U.S. Fish and Wildlife Service's (Service) addendum to our biological opinion on the 2007 Bison and Elk Management Plan for the National Elk Refuge and Grand Teton National Park Environmental Impact Statement and a correction regarding the Bridger-Teton National Forest (Forest). Grand Teton National Park (Park) and the National Elk Refuge (Refuge) formally consulted with the Service on the Bison and Elk Management Plan (hereafter, Plan) in 2007, and the Service issued a subsequent biological opinion (our memorandum WY07F014). Our biological opinion included an Incidental Take Statement (ITS) for an anticipated level of incidental take of one grizzly bear (*Ursus arctos horribilis*) in the Park as a result of hunter-related mortality related to the legislatively permitted elk reduction program (ERP; part of the Plan).

Subsequent to the 2007 ITS, incidental take of one adult male grizzly bear occurred in the Park in November 2012. As a result, Mr. Steve Cain of your staff contacted our office to discuss the Park reaching its limit of incidental take and the Park's desire to reinitiate formal consultation before take is exceeded. As provided in 50 CFR 402.16, "reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded;

..." The Park reinitiated formal consultation in a memorandum dated May 2, 2013, which was received in our office on May 3.

The Park's and Refuge's original Plan Environmental Impact Statement (EIS) analyses covered the Park, Refuge, and adjacent lands, including portions of the Bridger-Teton National Forest (Forest); however, the final Plan EIS decision covered only the Park and Refuge. In addition to incidental take of one grizzly bear in the Park, we also anticipated take of two grizzly bears on the Forest during the 15-year time period for which the biological opinion was valid. There was no incidental take anticipated for the Refuge due to lack of grizzly bear presence or conflict on the Refuge at that time.

In response to the Park's reinitiation of formal consultation and after review of the 2007 biological opinion, the Service believes authorization of incidental take for the Forest was in error as the Forest was not covered by the final Plan EIS decision. Therefore, we are rescinding incidental take of two grizzly bears on the Forest and the following biological opinion addendum covers only the Park and Refuge.

The Park's May 2013 memo provided an update of activities relevant to the 2007 Plan EIS and Service's biological opinion. The 2007 Plan EIS described all proposed actions and potential effects to listed species; therefore, those documents may be referenced for detailed background information. This memo/addendum to our 2007 biological opinion documents our analysis of the Park's new information, tiers off of our original biological opinion, and provides a new Incidental Take Statement (ITS) for grizzly bears, which reflects current conditions within the Park and Refuge. Our new ITS below anticipates incidental take for the Refuge and increases the amount of take for the Park. This addendum and new ITS supersede the previous 2007 ITS, and this addendum and new ITS are valid for the remaining 9 years under the 2007 biological opinion, through the year 2022.

Your memo indicated incidental take of one adult male grizzly bear occurred in November 2012 by a group of hunters participating in the ERP, in the Park's Snake River bottoms area of Hunt Area 75. The Plan anticipated grizzlies would occur in the Park's Hunt Area 75, particularly along the Snake River bottoms and on Blacktail Butte. Conditions associated with the ERP remain largely the same as they were in 2007 except that, as anticipated in the Plan, grizzly bear distribution and numbers in the south end of the Park appear to have increased. These changes were documented based on research done by the Interagency Grizzly Bear Study Team and on opportunistic observations. Since 2007, several grizzly bears have been observed seeking out gut piles left on the landscape during the ERP on Park lands and just recently on Refuge lands. It is likely grizzly bears will continue this behavior, resulting in a relatively high risk of hunter-grizzly bear contacts as long as the ERP is necessary.

To help mitigate the potential for hunter-grizzly bear conflicts during the ERP, Park staff, in collaboration with the Wyoming Game and Fish Department, proposed several new measures. These include (verbatim from your memo, p. 2): 1) closing the Snake River bottoms between Ditch Creek and Dead Man's Bar; 2) beginning the hunt two weeks later; 3) limiting ammunition carried in the field to seven cartridges per day; and 4) limiting the number of shots hunters can take at a group of running elk to one (the latter two measures aim to reduce elk wounding loss).

These new measures were proposed specifically for the 2013 season and in the future, they may change. Specific area openings or closures and associated timing have varied over time (items 1 and 2); however, items 2 and 3 will likely remain in the future as conditions of the permit (S. Cain 2013, email).

Existing measures to help minimize human-bear encounters during the ERP include (verbatim from your memo, p. 2): "1) requiring all hunters to carry bear spray; 2) maintaining a significant ranger presence and contacting a high percentage of program participants in the field; 3) not allowing artificial elk calls, which can draw bears to hunters; 4) providing a secure camping area for participants where carcasses can be safely stored out of reach of bears; 5) providing an abundance of bear safety educational materials to all permit holders, including warnings that hunters can expect to encounter bears while hunting in the park; and 6) significantly reducing numbers of hunters in the field (elk reduction program permits issued have declined from 1,150 in 2007 to 725 in 2012, and are proposed to further decrease to 650 in 2013."

The Park has also developed and implemented several new grizzly bear conservation measures since 2007 as follows (your memo, pp. 2-3): 1) a "Be Bear Aware" campaign which emphasizes improved management of visitors in bear country through information and education materials; 2) the "Wildlife Brigade", a corps of paid and volunteer staff to respond to traffic jams caused by grizzly and black bear sightings along roads ('bear jams'), to patrol, educate, and enforce food storage at campgrounds, picnic areas, and other developed areas, and other activities; 3) install additional bear-resistant food storage boxes; and 4) evaluate the effectiveness of the Park's "Be Bear Aware" message (subsequent results provided valuable feedback about current messaging systems and how to improve them in the future). Overall, the Park's program has been highly successful at minimizing human-grizzly bear conflicts, with no management removals or relocations required since 2007.

Your memo indicated the Park has complied with all requirements and recommendations in the Service's 2007 biological opinion and has been highly successful at minimizing human-grizzly bear conflicts through intensive management and conservation actions and programs. In addition, the need for the ERP is evaluated annually, and seasons are set in coordination with the Wyoming Game and Fish Department.

In 2011, the IGBST's total Greater Yellowstone Ecosystem (GYE) population estimate was 593 bears (95% CI 533-652; Haroldson 2012). The estimated population growth rate trajectory has changed from 4-7% during the 1980s and 1990s to currently stable to slightly increasing, depending on what segment of the population is considered (e.g., in versus outside of the Recovery Zone). The slowing population growth rate has been anticipated and currently may be due to one or a combination of density-dependent effects or declines in key food resources. We also acknowledge the GYE grizzly bear distribution has expanded in various areas in the ecosystem, including in the Park (Schwartz et al. 2006, Bjornlie et al. 2013, as cited in your memo).

The Service agrees that continued implementation of the Plan is likely to incur additional losses of grizzly bears from hunter-grizzly bear conflicts, which will adversely affect grizzly bears. However, we believe that given the current estimated population of grizzly bears in the GYE and

overall sustainable annual mortality levels (based on the last 5 years of IGBST annual reporting of mortalities and population trends), the number of bears affected by the Plan will be small and will not jeopardize the continued existence of the Yellowstone ecosystem grizzly bear population. Therefore, given the existing Plan and likelihood for additional grizzly bear mortalities by hunters participating in the ERP and hunting bison; and the stable to slightly increasing grizzly bear population and expanding distribution, we anticipate an increase in the number of grizzly bear/hunter conflicts and subsequent mortality within the Park and Refuge. Given the existing and new conservation measures, we believe the Plan and ERP will not affect the recovery of grizzly bears in the ecosystem or result in jeopardy to the species.

Based on the above information, the Service anticipates up to 4 additional grizzly bears in the Park and 2 grizzly bears on the Refuge may be incidentally taken directly or indirectly as a result of the Plan during the remaining 9 years this biological opinion is valid. The cumulative amount of take now equals 5 grizzly bears in the Park and 2 grizzly bears on the Refuge for the remaining 9-year duration of this biological opinion (through 2022); to date, 1 incidental take has occurred in the Park. We are also adding a Term and Condition #4 (see p. 26 of 2007 biological opinion) that will require the Park and Refuge to submit an annual report regarding: (1) the previous year's level of incidental take, and (2) a brief narrative on any of our Conservation Recommendations the Park and Refuge could not adhere to, and other relevant information. This report will be due by April 15 of the subsequent year (e.g., 2013 season report will be submitted to the Service by April 15, 2014). The Service can provide you with a report template to assist you with this reporting requirement. This addendum to the 2007 biological opinion and new Incidental Take Statement supersede the relevant portions of our 2007 biological opinion. In addition, the Service agrees with the new measures being implemented and believes that the Park has adhered to all original conservation measures as required and that these measures are appropriate, adequate, and do not need revising.

This concludes formal consultation on the action described in your May 2013 request for re-initiation of formal consultation on the Grand Teton National Park and National Elk Refuge Bison and Elk Management Plan EIS. If you have any questions regarding this letter or your responsibilities under the Act, please contact Ann Belleman at (307) 421-5839 or our office at the letterhead address.

Enclosure (Appendix E: Biological Opinion)

cc: BTNF, Forest Supervisor, Jackson, WY (C. Kyhl)
BTNF, Forest Biologist, Jackson, WY (G. Hanvey; ghanvey@fs.fed.us)
GTNP, Senior Biologist, Moose, WY (S. Cain; steve_cain@nps.gov)
WGFD, Non-game Coordinator, Lander, WY (B. Oakleaf)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (M. Flanderka)

Literature Cited:

Cain, S. 2013. Email from Cain to Belleman (USFWS) regarding clarification of proposed Park conservation measures for GTNP and NER BEMP. September 4, 2013.

Haroldson, M.A. 2012. Assessing trend and estimating population size from counts of unduplicated females. Pages 10–15 *in* F.T. van Manen, M.A. Haroldson, and K. West, editors. Yellowstone grizzly bear investigations: annual report of the Interagency Grizzly Bear Study Team, 2011. U.S. Geological Survey, Bozeman, Montana, USA.

USFWS. 2007. Memorandum, from Wyoming Field Supervisor to National Elk Refuge Manager. Final Biological Opinion for the Bison and Elk Management Plan (Formal Consultation No. WY07F014). U.S. Fish and Wildlife Service, Cheyenne, Wyoming.

USFWS and USNPS. 2007. Bison and Elk Management Plan: National Elk Refuge and Grand Teton National Park. U.S. Fish and Wildlife Service and U.S. National Park Service. Lakewood, CO. 25lpp.

USNPS. 2013. Memorandum, from Park Superintendent to Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office. Re-initiation of formal consultation on Grand Teton National Park and National Elk Refuge Bison and Elk Management Plan/EIS.

From: Will Meeks
To: Matt Hogan
Subject: Fwd: info
Date: Thursday, April 10, 2014 8:58:40 AM
Attachments: 20140307_NOI_ERP Grand Teton.pdf

Not sure we'll get dragged into this, but here's a heads up.

Will Meeks
U.S. Fish and Wildlife Service
R6 - Assistant Regional Director
NWRS and PFW
303-236-4303

Begin forwarded message:

> **From:** Paul Santavy <paul_santavy@fws.gov>
> **To:** Will Meeks <will_meeks@fws.gov>, Bridget Fahey <bridget_fahey@fws.gov>
> **Cc:** Kathy Perez <kathy_perez@fws.gov>
> **Subject: Fwd: info**
>
> FYI
>
> -Paul
>
> Begin forwarded message:
>
> *From:* Steve Kallin <steve_kallin@fws.gov>
> *To:* Paul Santavy <paul_santavy@fws.gov>
> *Subject:* *FW: info*
>
> Paul:
>
> See the attached "60-day Notice of Violations of the Endangered Species Act in Connection With Grand Teton National Park's 'Elk Reduction Program' and Annual Hunting of Elk in the Park." Not sure how involved the NER would be in this litigation. The BEMP and NER Supplemental Feeding programs are mentioned. Although I haven't had a chance to read this, I understand the concern is the incidental take of grizzly bears. Certainly the FWS and ES will be involved.
>
> Take care,
>
> *Steve Kallin*
>
> Project Leader
>
> National Elk Refuge
>
> PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 733-9212, extension 2

Fax: (307) 733-9729

steve_kallin@fws.gov

From: Cain, Steven (Steve) [mailto:steve_cain@nps.gov]
Sent: Monday, April 07, 2014 10:07 AM
To: Steve Kallin
Subject: Fwd: info

---------- Forwarded message ----------
From: *Belleman, Ann* <ann_belleman@fws.gov>
Date: Fri, Apr 4, 2014 at 10:22 AM
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To: "Steven (Steve) Cain" <steve_cain@nps.gov>

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Steve Cain, senior wildlife biologist

Grand Teton National Park and John D. Rockefeller, Jr. Memorial Parkway

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"*If there are no dogs in heaven, then when I die I want to go where they went" Will Rogers*

DEPARTMENT OF THE INTERIOR
TASKING PROFILE

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02/28/2014	03/07/2014		FWS	AA	ATTY

To (Recipient): Jewell, Sally

From (Author): Glitzenstein, Eric R.

Attorney at Law/SMC Science Director
Meyer & Glitzenstein
Washington,, DC 20009

Subject Text: Notice of ESA violations in connection with Grand Teton NP Elk Reduction Program and annual hunting of Elk in the Park.

Req. Surnames:

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February 28, 2014

Via Certified and Electronic Mail

Sally Jewel, Secretary
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RECEIVED
2014 MAR -7 PM 2:50
OFFICE OF THE EXECUTIVE SECRETARIAT
64610

Re: **60-Day Notice of Violations of the Endangered Species Act in Connection With Grand Teton National Park's "Elk Reduction Program" and Annual Hunting of Elk in the Park**

Dear Secretary Jewel, Director Ashe, and Director Jarvis:

On behalf of conservationist Timothy C. Mayo and wildlife photographer and advocate W. Kent Nelson, we hereby put you on formal notice, pursuant to section 11(g) of the Endangered Species Act, 16 U.S.C. § 1540(g) ("ESA"), that the National Park Service ("NPS") is in violation of the ESA in connection with the Grand Teton National Park's ("Grand Teton" or the "Park") so-called "Elk Reduction Program" ("ERP") pursuant to which NPS, in conjunction with the State of Wyoming, authorizes significant numbers of elk to be hunted within the Park each year. In particular, as set forth below, the Park Service and Fish and Wildlife Service ("FWS") are in violation of section 7 of the ESA, 16 U.S.C. § 1536, by recently increasing the permissible

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"take" of threatened grizzly bears caused by the ERP without providing any biological (or any other) rationale for the specific number of grizzly bears that may now be killed or otherwise taken in connection with the hunt, and without even reconciling the significant increase in authorized grizzly bear takes with the FWS's purported commitment to phase out the supplemental feeding of elk on the National Elk Refuge ("NER" or "Refuge") – which, in turn, is used to justify the hunting of elk in the Park.

STATUTORY AND REGULATORY FRAMEWORK

Congress enacted the ESA to ensure that "the ecosystems upon which endangered and threatened species depend [are] conserved, [and] to provide a program for the conservation of such endangered species and threatened species." 16 U.S.C. § 1531. The ESA reflects "an explicit congressional decision to afford first priority to the declared national policy of saving endangered species." *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 185 (1978).

Section 9 of the ESA prohibits any "person" from "taking" any member of an endangered species. 16 U.S.C. § 1538(a). The term "take" is defined broadly to include "harass, harm, pursue, hunt, wound, kill, trap, capture, or collect." *Id.* § 1532(19). The Service has further defined "harass" to include "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, including breeding, feeding, or sheltering." 50 C.F.R. § 17.3. In addition, "harm" is defined to include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering." *Id.*

Section 7 of the ESA directs all federal agencies, in consultation with the FWS, to use their existing authorities to conserve threatened or endangered species. 16 U.S.C. § 1536(a)(1); *see id.* § 1532(3) (defining "conservation"). Section 7 further requires all agencies to "insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species." *Id.* § 1536(a)(2). To carry out this obligation, an agency formally "consults" with the FWS when it undertakes an action that may affect listed species. 50 C.F.R. § 402.14. The consultation must be based on the "best scientific and commercial data available," *id.*, and culminates in a Biological Opinion, which must assess whether the action will jeopardize the continued existence of the species and, if not, set forth a "written statement" – known as an "incidental take statement" ("ITS") – that specifies the amount of "incidental taking" that is authorized, as well as "those reasonable and prudent measures," along with implementing "terms and conditions" that "the [Service] considers necessary or appropriate to minimize" the impact on the species. 16 U.S.C. § 1536(b)(4).

Reinitation of formal consultation "is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law" and, among other factors, "the amount or extent of taking specified in the incidental take statement" is exceeded, or "if new information reveals

effects of the action that may affect listed species . . . in a manner or to an extent not previously considered." 50 C.F.R. § 402.16.

FACTUAL BACKGROUND

In 2007, NPS and FWS engaged in formal consultation regarding the Bison and Elk Management Plan ("Plan") for the Park and the NER and, as part of the Plan, the ERP in the Park. The Plan, which is supposed to be in effect for fifteen years (i.e., until 2022), calls for phasing out the environmentally destructive practice of supplemental feeding of elk and bison on the Refuge, *see* 2007 Final Biological Opinion for the Bison and Elk Management Plan (Formal Consultation No. ES-6-WY-07-F014) ("BiOp") (Attachment A) at 171 ; *id.* at 19 ("supplemental feeding would be reduced from current levels and replaced by greater ungulate reliance on standing forage"); see *also Defenders of Wildlife v. Salazar*, 651 F.3d 112, 113 (D.C. Cir. 2011) ("[p]art of this plan includes ending the longstanding agency practice of feeding these animals during the winter"), as well as taking certain other management actions affecting elk and other wildlife in the Park and Refuge.

Of particular relevance here, under the Plan as analyzed in the 2007 BiOp, over the long term it was "estimated that the number of deputized [elk] hunters [in the Park] would decline from an average of 1,600 hunters per year to 773-957" hunters." BiOp at 4. Similarly, it was anticipated that the number of elk "harvested" in the Park over the "long term" would decrease from 480 to 232-287. *Id.* at 20.[1]

In analyzing the impacts of the Plan as a whole and the ERP in particular on the threatened Grizzly Bear, the BiOp explained that the Park represents a significant part of the Yellowstone Grizzly Bear Ecoystem recovery zone. BiOp at 8, 9. The BiOp also acknowledged that "[a]voiding human-caused bear mortality is a goal of the Grizzly Bear Recovery Plan and *is essential to maintaining a viable grizzly bear population.*" *Id.* at 6 (emphasis added). The BiOp further recognized that "[i]solation from human activities is extremely important for bear survival, due to the tendency of grizzly bears to rapidly habituate to human foods," but that "[h]uman-bear interactions have been increasing in the YGBE" and that the "greatest increase in recent years is self-defense in fall by big game hunters." *Id.* at 11; *id.* at 17 ("Hunting-related deaths resulting from human-grizzly conflict remain the most significant source of known grizzly bear mortality in the GYE . . . While the high level of hunting-related grizzly mortality has not been directly linked to hunter numbers in the [primary conservation area], it is nonetheless

[1] The BiOp also stated that the "elk hunting opportunities on the Refuge would decline from an average of 733 hunters per year to 420-487," while the number of elk hunters in the Bridger-Teton National Forest "and other areas outside the Refuge and Park would increase to an estimated 5,000-5,870 hunters per year, an increase of 29-35 percent." BiOp at 4. This is because, as a result of the Plan's commitment to return elk management to a more natural regime, "in the long-term it is expected that herd reductions in the Grant Teton segment will cause individuals to radiate into and be sustained in other herd segments [outside the Park and Refuge], allowing proportionately more elk to be" killed in those areas. BiOp at 21.

primarily the result of chance encounters between bears and hunters in the field, conflicts over ungulate carcasses and conflicts in hunter camps often as a result of game meat being kept in campsites."). The BiOp also recognized that "[w]inter-killed ungulates are an important food supply" for grizzlies, and that other traditional food sources – such as whitebark pine, army cutthroat worms, and cutthroat trout – are themselves threatened for various reasons. *Id.* at 11-12.

The BiOp concluded that "unlike on the Refuge, the variability of terrain and densely wooded areas in the Park contribute to an elevated risk of hunting-related conflicts occurring," although "[t]his increased risk would be minimal in the long term as a result of the proposed action, but would be higher in the short-term, especially within Area 79." BiOp at 24. In light of the Service's prediction that the "proposed action will exacerbate the short-term risk for hunting-related grizzly bear mortality within the Park," while resulting in a "minimal risk in the long term," the BiOp established a limit of "1 grizzly bear (adult or juvenile) over the 15-year implementation period of the Plan [that] could be incidentally taken as a result of the proposed action" in the Park. *Id.* at 25. The BiOp established a single "reasonable and prudent measure" as "necessary and appropriate to minimize impacts of incidental take on grizzly bears" – i.e., "[m]inimize the likelihood of hunting-related human/grizzly bear conflict associated with the Project through education of hunters" – and stated that it should be sufficient to ensure that the incidental take limit was not exceeded. *Id.* at 26. However, the BiOp also made clear that "[i]f, during the course of the action, this level of incidental take is reached, such incidental take represents new information requiring re-initiation of consultation and review of the reasonable and prudent measures provided." *Id.*

As explained in a 2013 NPS memorandum requesting reinitiation of formal consultation, "[o]n November 22, 2012, a group of 3 hunters participating in the ERP shot and killed an adult male grizzly bear in the Snake River bottoms area of Hunt Area 75, within [Grand Teton]. This leaves the park with no additional grizzly bear take related to the ERP during the remaining 9 years of the plan's intended 15 years year life span." *See* 4/29/13 Memorandum from Superintendent, Grant Teton National Park to Field Supervisor, U.S. FWS, Wyoming Field Office (Attachment B) at 1. Consequently, NPS "request[ed] to re-open formal consultation on the [Plan]." *Id.*

Although the 2007 BiOp was expressly premised on the assumption that the ERP component of the Plan would result in "***minimal*** risk" to grizzly bears "in the long term," BiOp at 25 (emphasis added), NPS's request for reinitiation of consultation asserted that the "risk of hunter-grizzly contacts *will continue to be* ***relatively high*** *as long as the ERP is necessary*." Attachment B at 2 (emphasis added). The reinitation request did not explain why a long-term risk that was deemed to be "minimal" in 2007 was being described as "relatively high" in 2012, nor did it explain over what period of time an ERP in the Park would be deemed necessary or the criteria that would be used to make that assessment. *See also id.* at 4 (asserting that the

"need for the program is evaluated annually" without explaining how that occurs or what standards are used).[2]

The request for reinitiation stated that in 2013, NPS, along with the Wyoming Game and Fish Department, "proposed several new measures" purportedly designed to "help mitigate the potential for hunter-grizzly bear conflicts during the ERP," including "1) closing the Snake River bottoms between Ditch Creek and Dead Man's Bar; 2) beginning the hunt 2 weeks later; 3) limiting ammunition carried in the field to 7 cartridges per day; and 4) limiting the number of shots hunters can take at a group of elk to one . . . ." Attachment B at 4. The request did not explain the rationale for these particular measures with respect to the mitigation of grizzly bear take, nor did it commit to continuing them for the remainder of the ERP or describe other measures that may have been considered but were rejected (such as closing more areas with documented grizzly bear presence to elk hunting). However, the request did state that NPS "believe[s] continued implementation of the BEMP is likely to incur additional losses of grizzly bears from hunter-grizzly bear conflicts, which will adversely affect grizzly bears," *id.* at 5, although the request made no effort to estimate the number of grizzly bear "takes" that will "likely" occur as a result of the Plan.

On September 13, 2013, the FWS issued a cursory "addendum" to the BiOp and a new ITS that the FWS stated "supersede the previous 2007 ITS, and this addendum and new ITS are valid for the remaining 9 years under the 2007 [BiOp], through the year 2022." 9/13/13 Memorandum from the Field Supervisor, U.S. FWS Wyoming Field Office, to Superintendent, Grand Teton (Attachment C) at 1. While asserting that "this memo/addendum . . . tiers off our 2007 biological opinion," *id.* at 2, the addendum also makes clear that the 2007 BiOp was premised on a seriously flawed assumption, i.e., that activities occurring in the Bridger-Teton National Forest were covered by the Plan and hence should also be addressed in the formal consultation and ITS for the Plan. *See id.* at 2 ("In response to the Park's reinitiation of formal consultation and after review of the 2007 biological opinion, the Service believes authorization of incidental take for the Forest was in error as the Forest was not covered by the final Plan EIS decision. Therefore, we are rescinding incidental take [authorization] of two grizzly bears on the Forest and the following biological opinion addendum covers only the Park and Refuge.") (emphasis in original).

The addendum does not analyze at all the legal and environmental implications of the FWS's elimination of one of the three federal agencies from the scope of the consultation analysis. Instead, the addendum repeats, virtually verbatim, the reinitation request – even when it totally contradicts factual findings and assumptions in the 2007 BiOp. Most notably,

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[2] Far from asserting that conditions had dramatically changed since 2007, the request for reinitiation stated that "[c]onditions associated with the ERP remain largely the same as they were in 2007 except, as anticipated in the plan, grizzly bear distribution and numbers in the south end of the park appear to have increased," Attachment B at 2, and that "several grizzly bears have been observed seeking out gut piles left on the landscape during the elk reduction program, just as they have throughout the ecosystem for decades during hunting seasons." Attachment B at 2.

the addendum reiterates NPS's assertion that there will be a "relatively high risk of hunter-grizzly contacts as long as the ERP is necessary," Attachment C at 2, without making any effort to reconcile that prediction with the BiOp's contrary finding that the long-term risk for grizzly bears in the Park would be "minimal." Likewise, the addendum asserts that the "Service *agrees* that continued implementation of the Plan is likely to incur additional losses of grizzly bears from hunter-grizzly bear conflicts, which will likely adversely affect grizzly bears," *id.* at 3 (emphasis added), but, again, makes no effort to explain – or even to acknowledge – the contradiction between that prediction and the assessment in the BiOp that the entire 15-year Plan would result in the "take" of only a single grizzly bear.

The addendum reiterates the "new measures" proposed by NPS "specifically for the 2013 season," but does not analyze their efficacy or biological rationale in any manner, nor does it even suggest that these measures will remain in effect for the life of the Plan. Addendum C at 3. To the contrary, the addendum merely says that these measures "may change" – without saying why, how, or based on which criteria – that "[s]pecific area openings or closures and associated timing have varied over time," and that two of the items proposed for 2013 (i.e., beginning the hunt two weeks later and limiting the number of shots hunters may take at a group of running elk) "will likely remain in the future as conditions of the [hunting] permit[s]." *Id.* at 2, 3. Assuming that the Service believes that all of the "new measures" are indeed important for limiting grizzly bear take, *see id.* at 4 ("the Service agrees with the new measures being implemented"), the addendum never explains why these measures (or some permutation of them) are not being made permanent reasonable and prudent measures/terms and conditions that must be followed by NPS for incidental take authorization under the rubric of the consultation.[3]

Finally, the addendum significantly increases the authorized level of take associated with the Plan, stating that the "***Service anticipates up to 4 additional grizzly bears in the Park and 2 grizzly bears on the refuge may be incidentally taken directly or indirectly as a result of the Plan during the remaining 9 years this biological opinion is valid***." Attachment C at 4 (emphasis added); *id.* ("The cumulative amount of take now equals 5 grizzly bears in the Park and 2 grizzly bears on the Refuge for the remaining 9-year duration of this biological opinion[.])." Although this increases the authorized take in the Park and on the Refuge *seven-fold* from that embodied in the 2007 BiOp, and does so for an agency action of *significantly smaller scope* than previously analyzed – since impacts on the Forest are no longer deemed to be part of the authorized federal action, Attachment C at 2 – the addendum sets forth no explanation whatsoever of how the Service derived these "take" figures from the available documentation.

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[3] Instead, again without explanation, the addendum adds a single term and condition, which is merely an obligation by NPS to submit an "annual report" regarding the "previous year's level of incidental take" and a "brief narrative of any of [non-binding] Conservation Recommendations the Park and Refuge could not adhere to." Attachment C at 4.

DISCUSSION

NPS's request for reinitiation of consultation, the FWS's addendum to the BiOp and accompanying ITS, and NPS's reliance on that document to authorize activities in the Park that will adversely affect Grizzly bears violate the ESA and implementing regulations in a number of ways.

First, the ESA and its implementing regulations do not provide for an "addendum" that "tiers" off an earlier BiOp. As a general matter, although regulations implementing the National Environmental Policy Act expressly provide for "tiering" in appropriate circumstances – i.e., where a site-specific project is "included within" a broader program that has already undergone NEPA review, 40 C.F.R. § 15-2.20 – nothing in the ESA regulations authorizes such an approach. Rather, those regulations simply provide that when one or more of the reinitation criteria are triggered – as is indisputably the case here – "[r]einitiation of formal consultation is required." 50 C.F.R. § 402.16. In turn, "formal consultation," culminating in a *comprehensive biological opinion* – not a cursory "addendum" – entails consideration of a number of specific items, including, e.g., a review of the "current status of the listed species," 50 C.F.R. § 402.14(g)(2); a consideration of the effects of the action along with "cumulative effects," *id.* § 402.14(g)(3); and a "detailed discussion of the effects of the action on listed species." *Id.* § 402.14(h)2).

The Service's addendum does not remotely satisfy these requirements. For example, other than a general assertion of a "stable to slightly increasing grizzly bear population and expanding distribution" in the GYE, Attachment C at 4, there is no analysis whatsoever of the "current status" of the species and the threats facing it. Of particular relevance here, although the 2007 BiOp explained that various Grizzly Bear food sources are under threat, and that the species is heavily dependent on ungulate consumption, the addendum makes no mention of the Service's views concerning the *existing and projected* availability of various food sources and their importance to the species' long-term survival and recovery.

Likewise, the addendum contains no analysis whatsoever of cumulative effects, which is a particularly glaring omission in view of the statement in the addendum that the 2007 "authorization of incidental take for the Forest was in error as the Forest was not covered by the final Plan EIS decision." BiOp at 2. By "rescinding incidental take of two grizzly bears on the Forest" and confining the addendum to "only the Park and the Refuge," the addendum not only significantly modifies the entire agency action under review – further undermining any possible rationale for truncating the formal consultation process that would normally be required – but the FWS overlooked (or ignored) the fact that if Grizzly Bear impacts on the Forest are no longer deemed to be subject to analysis and regulation as part of the agency action under review, ***then they must at least be analyzed as cumulative effects***. But the addendum totally ignores such impacts along with all other cumulative effects, as defined in the ESA regulations. *See* 50 C.F.R. § 402.02.

Second, the addendum and revised ITS not only are not based on the "best scientific" data available, as required by section 7 of the ESA and implementing regulations, they

contradict without explanation statements and predictions made in the 2007 BiOp concerning the impacts of the action. To begin with, even apart from any inconsistency with prior statements, if there is some rationale for the particular take limits set forth in the addendum, they are not explained in the addendum itself. Numbers that appear to have been plucked out of thin air merely to allow the annual hunts to proceed unabated in the Park are based on *no* science, let alone the "best available" science. *See Bennett v. Spear*, 520 U.S. 154, 169 (1997) (the "obvious purpose" of the requirement that agencies rely on the best available science in implementing the ESA is "to ensure that that the ESA not be implemented haphazardly, on the basis of speculation or surmise").

Here, however, the new take limits are not only devoid of any scientific explanation, they make no sense in light of what the Service said when it issued the 2007 BiOp. When it issued the 2007 BiOp the Service stated that there was virtually no threat of grizzly bear take on the Refuge – and thus authorized *zero* incidental take in connection with implementation of the Plan on the Refuge – and that any "increased risk [in the Park] would be *minimal* in the long term as a result of the proposed action." BiOp at 24-25 (emphasis added). Indeed, the overall risk of take associated with the Plan *should* decline over time if NPS is truly committed to doing what it has claimed it will do, i.e., phase out the supplemental feeding program that has been used as the main justification for the ERP. *See Defenders of Wildlife*, 651 F.3d at 231 ("Part of this plan includes ending the longstanding practice of feeding these animals during the winter."). Instead, however, the FWS has significantly and arbitrarily increased the take prediction and authorization – from a single Grizzly Bear in the Park and Refuge for the *entire* fifteen-year Plan to *seven* Grizzly bears in the Park and Refuge for a Plan that is now due to last only eight more years and is supposed to *lessen* the need for hunting-related impacts over that time span – without even acknowledging the inconsistency with the Service's prior analysis, let alone explaining why a dramatically different result should now be reached.

Third, while vastly increasing the take authorization, the addendum does not [?] even address all of the forms of take that may be associated with the ERP. The Addendum acknowledges that "[s]ince 2007, several grizzly bears have been observed seeking out gut piles left on the landscape during the ERP on Park lands . . . ." Attachment C at 2. Although this constitutes a clear example of "harassment" as defined by the ESA regulations, *see* 50 C.F.R. § 17.3 (defining "harassment" to include any "intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly *disrupt normal behavioral patterns, including . . . feeding*") (emphasis added), the addendum does not address or account for this form of take in the ITS which is distinct from the hunter-related killing that may *result* from disrupting the bears' "normal behavioral patterns." Nor does the ITS address the adverse impact on Grizzly Bears of depriving them of an essential food source in the Park and the Refuge, i.e., elk taken by hunters – especially as other critical Grizzly food sources are subject to myriad threats – although that also qualifies as harassment, as well as take through adverse habitat modification. *Id.*

Fourth, although it is well-established that the Service's evaluation of whether a federal action will "jeopardize" a listed species "must adequately consider the proposed action's

impacts on the listed species' chances of recovery," National Wildlife Federation v. NMFS, 524 F.3d 917, 933 (9th Cir. 2008) (emphasis added), the Addendum here contains no analysis of the extent to which ongoing Grizzly Bear take associated with the Plan and the ERP in particular – and especially the depletion of an important Grizzly food source – will impair Grizzly Bear recovery. Rather, the Addendum simply asserts that "[g]iven the existing and new conservation measures, we believe that Plan and ERP will not affect the recovery of grizzly bears in the ecosystem," without explaining that conclusion or even specifying those specific "conservation measures" on which it is based.

Fifth, related to the foregoing point, while significantly increasing the take prediction and authorization, the addendum sets forth no explanation for why it is not also adding additional "reasonable and prudent measures"/"terms and conditions" in order to "minimize" the impact of the anticipated take on Grizzly Bears, as required by section 7(b)(4) of the ESA, 16 U.S.C. § 1536(b)(4). As noted, the only new obligation imposed on the NPS is to "submit an annual report" describing the "previous year's level of incidental take" and a "brief narrative on any of our Conservation Recommendations the Park and Refuge could not adhere to, and other relevant information." Attachment C at 4. There is no explanation in the addendum of what this additional "report" is intended to accomplish.

More important, there is no discussion of why the FWS is not even considering imposing additional *substantive* measures in view of the significant increase in Grizzly take that is being authorized. For example, while asserting that "[s]pecific area openings or closures and associated timing [in the Park] have varied over time," Attachment C at 3, the addendum provides no explanation for why the Service does not simply make it a condition of any additional authorized take that NPS *close* to elk hunting all of the areas in the Park where "hunter-grizzly bear conflicts, which will adversely affect grizzly bears," are now anticipated to occur. *Id.* Assuming that there is any justification for elk hunting in any national park or in Grant Teton in particular – which we strongly dispute – there is certainly no legal or practical need for such hunting in those parts of Grant Teton that are used as habitat of a federally threatened species. At the very least, the FWS has not complied with section 7(b)(4) of the ESA when the Service has failed, without explanation, to even consider such measures for further "minimiz[ing]" the seven-fold increase in Grizzly Bear take in the Park and the Refuge that the Service now anticipates and authorizes. By the same token, the Service has failed to "implement" its own recovery plan for the Grizzly Bear – as mandated by section 4(f) of the ESA, 16 U.S.C. § 1533(f) – which calls for avoiding sources of human-caused Grizzly mortality. *See supra* at 3.

Sixth, under these circumstances, NPS has also violated its obligation under section 7(a)(1) of the ESA, 16 U.S.C. § 1536(a)(1). In addition to the obligation to avoid jeopardizing species under section 7(a)(2), section 7(a)(1) of the Act imposes an obligation on all federal agencies, in consultation with the FWS, to "carry[] out programs for the conservation" of listed species. 16 U.S.C. § 1536(a)(1); *see also Pyramid Lake Paiute Tribe of Indians v. Dep't of the Navy*, 898 F.2d 1410, 1416-17 (9th Cir. 1990) (noting that federal agencies have 'affirmative obligations to conserve under [S]ection 7(a)(1)"). Plainly, NPS is not carrying out an effective

program for the "conservation" of Grizzly bears by continuing to allow for substantial elk hunting in any portions of Grand Teton where NPS itself believes that Grizzly bear conflicts with hunters are likely to occur in the future.

CONCLUSION

We would be happy to discuss with you or your representatives any of the issues raised in this letter. However, unless the agencies commit that they will not rely upon the legally flawed addendum and ITS and will promptly rectify the ESA violations set forth in this letter, we will have no choice but to consider pursuing other appropriate relief.

Sincerely,



Eric R. Glitzenstein
Rosemary Greene

cc:

Kevin Schneider
Acting Superintendent
Grand Teton National Park
P.O. Drawer 170
Moose, Wyoming 83012-0170
Kevin_schneider@nps.gov

APPENDIX E: BIOLOGICAL OPINION

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

In Reply Refer To:
ES-61411/W.25/WY07FA0209
ES-6-WY-07-F014

Memorandum

To: Barry Reiswig, Refuge Manager, U.S. Fish and Wildlife Service, National Elk Refuge, Jackson, Wyoming

From: Brian T. Kelly, Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming

Subject: Final Biological Opinion for the Bison and Elk Management Plan (Formal Consultation No. ES-6-WY-07-F014)

This memorandum transmits the U.S. Fish and Wildlife Service's (Service) final biological opinion based on our review of the January 2007 Bison and Elk Management Plan (Plan or Project) and Final Environmental Impact Statement (FEIS) and the Project's effects on endangered, threatened, proposed and experimental non-essential species.

This final biological opinion addresses the effects of the Project on the threatened grizzly bear (*Ursus arctos horribilis*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act; 50 CFR § 402.14). Your February 07, 2007 letter requesting formal consultation, and including the Intra-Service Section 7 Biological Evaluation (BE) form, was received on February 7, 2007.

The National Elk Refuge (NER or Refuge) and Grand Teton National Park (GTNP or Park)/John D. Rockefeller, Jr., (JDR) Memorial Parkway are proposing to implement a bison and elk management plan that will address adaptive management of the Jackson bison and elk herds and their habitat on the Refuge and in the Park with an emphasis on improving range quality, and insuring long term sustainability of biotic integrity and environmental health. The Plan includes development and implementation of a dynamic framework for decreasing the need for supplemental feeding on the Refuge based on existing conditions, trends, new research findings, and other changing circumstances. The Park and NER will work in close cooperation with the Wyoming Game and Fish Department (WGFD) during both development and implementation of

Attachment A

this framework which will include population management through methods including implementation of special, organized elk and bison hunts, vegetation restoration, ongoing monitoring, and public education as integral components.

The Service concurs with the Refuge's assessment that the Project is likely to have "no affect/no adverse modification" for Canada lynx (*Lynx canadensis*), "may affect, not likely to adversely affect species/adversely modify critical habitat" for the gray wolf (*Canis lupus)* and bald eagle (*Haliaeetus leucocephalus*), and "no effect" for the yellow-billed cuckoo (*Coccyzus americanus*).

This final biological opinion is based on information provided in the FEIS, BE, telephone conversations with Laurie Shannon, Project Manager, of the Service's Mountain-Prairie Region Lakewood, Colorado office, Steve Cain, Senior Wildlife Biologist for GTNP, and other sources of information. A complete administrative record of this consultation is on file in the Cheyenne Field Office.

CONSULTATION HISTORY

Initial discussions regarding the Bison and Elk Management Plan/EIS began several years ago. A summary of pertinent sections of the draft EIS dealing with threatened and endangered species was received by the Service's Wyoming Field Office on July 14, 2004. A full copy of the Draft Bison and Elk Management Plan/EIS was received on July 20, 2005; however, consultation was delayed pending completion of a BE for the Project. The Final Bison and Elk Management Plan/EIS was received on February 2, 2007, and both the BE and the request for initiation of formal consultation were received on February 7, 2007. The consultation was assigned log number ES-6-WY-07-F014. Since January 2007, numerous telephone conversations regarding the Project have taken place between all involved parties.

BIOLOGICAL OPINION
Grizzly Bear and Gray Wolf

DESCRIPTION OF THE PROPOSED ACTION

The Final Bison and Elk Management Plan and EIS for the NER and GTNP addresses adaptive management of the Jackson bison and elk herds and their habitat on the Refuge and in the Park with an emphasis on improving range quality and insuring long term sustainability of biotic integrity and environmental health. It includes development and implementation of a dynamic framework for decreasing the need for supplemental feeding on the refuge based on existing conditions, trends, new research findings, and other changing circumstances. The Park and NER will work in close cooperation with the WGFD during both development and implementation of this framework which will include population management through methods including implementation of special, organized elk and bison hunts, vegetation restoration, ongoing monitoring, and public education as integral components.

Chronic Wasting Disease/Brucellosis

Efforts would be made to coordinate with the WGFD to increase surveillance in elk for chronic wasting disease (CWD), a fatal transmissible disease of white-tailed deer, mule deer, and elk. The objective of surveillance would be to provide a 95 percent confidence level of discovering infection at 1 percent prevalence in the Jackson elk herd. If infection was found, strategies from the state's *Chronic Wasting Disease Management Plan* (WGFD 2006) would be implemented to reduce transmission. These strategies include removing clinically consistent elk, removing 50 animals within 5 miles of the index case, and another 50 within 10 miles if an additional positive animal is found during collection of the first 50; enforcing carcass movement and disposal restrictions; decreasing duration of feeding and expanding the distribution of feeding to the extent possible; and potentially decreasing elk densities through hunting or other management strategies. Any difference from this general approach is detailed under the alternative strategies. Plans to follow the state's *Chronic Wasting Disease Management Plan* have been made in deference to the State and could change if the National Park Service and/or the Service adopted management requirements that differed from what is currently being done. Potential changes would be communicated to the State.

The NER and GTNP/ John D. Rockefeller, Jr., Memorial Parkway will work cooperatively with the state of Wyoming and others to reduce the prevalence of brucellosis in the elk and bison populations in order to protect the economic interests and viability of the livestock industry, and reduce the risk of adverse effects for other non-endemic diseases not currently present in the Jackson elk and bison populations.

Strategies for Hunting/Reduction Programs

The Service and the NPS would work cooperatively with the WGFD to achieve population objectives (including herd ratios and elk herd segment sizes), to develop hunting seasons, and to evaluate hunting or elk reduction areas. The WGFD would formally establish objectives and strategies after public review and approval by the Wyoming Game and Fish Commission.

In the long term, elk hunting opportunities on the Refuge would decline from an average of 733 hunters per year to 420–487. In the Park it is estimated that the number of deputized hunters would decline from an average of 1,600 hunters per year to 773–957. The number of elk hunters in the Bridger-Teton National Forest (B-TNF) and other areas outside the Refuge and Park would increase to an estimated 5,600–5,870 hunters per year, an increase of 29–35 percent. For the herd unit as a whole, the number of elk hunters could range from an estimated 6,793 to 7,314 per year, which is an increase of 2–10 percent compared to average baseline conditions.

In the short term an estimated 140–150 bison would be harvested each year to reduce bison numbers to a herd of approximately 500 animals. An average of about 50 bison would continue to be harvested in the national forest and the remaining 90–100 bison on the Refuge. This would allow an average of about 175–190 bison hunters in Jackson Hole each year.

In the long term the number of bison harvested each year would decline to about 70 bison. The number of bison harvested on the Refuge and the national forest could be equally split, or up to 50 bison could be harvested in the national forest. This would allow an average of about 90 bison hunters in Jackson Hole each year.

Adaptive Management of Habitat and Populations

Under the proposed action, the NER will provide secure, sustainable ungulate grazing habitat characterized primarily by native composition that is healthy, productive and sustained for the benefit of elk, bison and other native species. Actions included under the proposed plan would be implemented in concert with restoring and perpetuating natural ecosystem functions of native habitats used by bison and elk in GTNP and the JDR. The proposed action would contribute to maintaining sustainable population of elk and bison that are healthy, at a reduced risk of contracting non-endemic diseases, and able to adapt to changing environmental conditions.

Four goals outlined in the Plan and developed based upon the desired conditions and purposes of the NER and GTNP, the missions of the National Wildlife Refuge System and the National Park System, and other legal and policy directives include:

i. Habitat Conservation
ii. Maintaining Sustainable Populations
iii. Managing Numbers of Elk and Bison
iv. Disease Management

The aforementioned goals laid out under the proposed action would be accomplished through the following objectives:

- Initiate habitat restoration projects to improve native and cultivated forage and achieve desired conditions and goals.
- Protect woody vegetation on the refuge by rotating small exclosures until habitats have recovered. Prescribed fire could be used and logging allowed on the refuge inside exclosures.
- Initiate restoration of about 4,500 acres (1,821 ha) of previously cultivated areas in the Park to native plant communities.
- Work with private and agency partners to minimize bison/elk conflicts with adjacent landowners (e.g., by providing human and/or financial resources to manage co-mingling and reduce crop depredation by elk and bison on private lands).
- Initiate a public education effort to build understanding of natural elk and bison behavior, ecology, distribution, disease implications, and effects to other species.
- Identify criteria for beginning and ending feeding each year in consultation with the WGFD.
- In collaboration with the WGFD, develop a structured framework of adaptive management actions that include established criteria for progressively transitioning from intensive supplemental winter feeding to greater reliance on free-standing forage, based on some or all of the following considerations:
    1. level of forage production and availability on the NER
    2. desired herd sizes and sex and age ratios
    3. effective mitigation of bison and elk co-mingling with livestock on private lands
    4. winter distribution patterns of elk and bison
    5. prevalence of brucellosis, chronic wasting disease, and other wildlife diseases
    6. public support
- Work in collaboration with the WGFD to maintain the Jackson elk herd objective of 11,000 (after the initial phased approach, approximately 5,000 elk would be expected to winter on the refuge). As herd sizes and habitat objectives are achieved, further reduce feeding or elk numbers, based on established criteria and changing social, political, or biological conditions. Use hunting on the Refuge, and when necessary, the elk herd reduction program in the Park, to assist the State in managing herd sizes, sex and age ratios, and summer distributions.
- Recommend that the WGFD establish a genetically viable bison herd of approximately 500 animals, with as close to an even sex ratio as possible to maximize maintenance of genetic variation over time. Initiate a WGFD-administered bison hunt on the Refuge.
- Allow the WGFD to vaccinate elk and bison for brucellosis on the Refuge as long as logistically feasible.

Other Wildlife-dependent Recreation

- Over time wildlife viewing opportunities would be concentrated during some winters and would be more natural and sporadic during milder winters.
- Build public understanding and support for bison and elk management actions.

STATUS OF THE SPECIES

Grizzly Bear

Life History

Home range and dispersal. Much of the following information is summarized from the Grizzly Bear Recovery Plan (U.S. Fish and Wildlife Service 1993); additional information including species description can be obtained in that document. Grizzly bears require large areas to fulfill all their basic biological needs, as well as dense forest cover for hiding and security. In the Greater Yellowstone Ecosystem (GYE), defined as an area of relative ecological intactness covering some 19 million acres (7,689,027 ha), lodgepole pine (*Pinus contorta*) forests are a large and dynamic part of grizzly bear habitat. Grizzly bears generally do not use areas with human-caused habitat disturbances, and often, the lack of security cover and overstory cover are believed to be major causes of this (Gillian et al. 1994). Grizzly bear home range size averages 50 to 500 mi^2 (130 to 1,300 km^2). Within these home ranges the grizzly bear uses a diverse mixture of forests, moist meadows, grasslands, and riparian habitats to complete its life cycle. Grizzly bears generally prefer large, remote areas of habitat that are isolated from human development for feeding, denning, and reproduction (USFWS 1993). Long distance travel habits of some grizzly bears increase the risk of contact with highway crossings, hunters, recreationists, and a variety of other human congregations. Isolation from human activities is extremely important for bear survival, as grizzly bears habituate to human foods quickly. Food-conditioned bears often must be eliminated or removed from developed areas. Avoiding human-caused bear mortality is a goal of the Grizzly Bear Recovery Plan (USFWS 1993) and is essential to maintaining a viable grizzly bear population.

Diet. The grizzly bear is an opportunistic omnivore that uses a wide variety of plant and animal food sources. Grizzly bears in the Yellowstone Grizzly Bear Ecosystem (YGBE), a 9,500 sq. mi. (23,300 km^2) area consisting of Yellowstone National Park (YNP), GTNP, JDR Memorial Parkway, the Gallatin, Shoshone, Bridger-Teton, Targhee, Beaverhead, and Custer national forests, as well as state, private and Bureau of Land Management (BLM) lands, have the highest percentage of meat consumption in their diet of any inland grizzly bear population (Hilderbrand *et al.* 1999). Meat constitutes as much as 79 percent of the diet of male, and 45 percent of the diet of female grizzly bears in the YGBE (Jacoby et al. 1999). Ungulates, both adult and neonate, are an especially important food source for bears in the spring and fall (Zager and Beecham, 2006), and use of these carcasses in the YGBE is well documented (Podruzny and

Gunther 2001). Grizzly bears also eat small mammals such as pika and marmots; however, these mammals form a relatively minor portion of the bear's diet. Spawning cutthroat trout in streams surrounding Yellowstone Lake in YNP have been documented as an important food source for grizzly bears there (Mattson and Reinhart 1995). Army cutworm moths (*Euxoa auxiliaries*, ACMs) are also an important food source for bears in the YGBE (Mattson *et al.* 1991a). ACMs congregate in remote, high altitude alpine talus areas and feed on alpine flowers. These moths provide important dietary fat in the fall, when grizzly bears are preparing for hibernation, and are also positively correlated with bear reproductive success (Bjornlie and Haroldson 2001). During times of great moth abundance, grizzly bears may eat up to 40,000 moths per day totaling 20,000 kcal/day (USGS 2005). Surviving moths migrate back to lower elevations to deposit their eggs, leaving the alpine areas between August and October. ACM congregation sites are in remote areas, and therefore potentially reduce human-bear conflicts by isolating the bears. Grizzly bears will also eat ants (Mattson 2001) and earthworms (Mattson *et al.* 2002).

The grizzly bear also makes use of a variety of vegetative food sources. Whitebark pine (*Pinus albicaulis*) seeds are an important fall source of food for grizzly bears in the YGBE (Mattson and Reinhard 1997), and bears are known to consume whitebark pine seeds contained in red squirrel cone caches (Mattson and Reinhard 1997). In addition to supplying a food source high in fat, whitebark pine seed crops also serve grizzly bears by keeping them occupied at high elevations far from intense human use. Studies show that in years when high quality bear foods are low, there is an increase in human-bear conflicts (Gunther et al. 2004) as well as human-caused grizzly bear mortality (Mattson et al. 1992). Other vegetative food sources such as exotic clover species, yampa (*Perideridiea gairdneri*), biscuit root (*Lomatium cous*), and sweet cicily (*Osmorhiza chilensis*) are eaten almost exclusively in some years and seasons (Mattson et al. 1991). Other grizzly bear seasonal forage may include graminoids, horsetail, forbs, and fruits (whortleberry and huckleberry) and fungi (Mattson and Knight 1991).

Den site selection. Grizzly bears generally construct dens in areas far from human disturbance at an elevation of about 6,500 to 10,000 ft. (2,000 to 3,050 m). Grizzly bears in the GYE den from the end of September to the last week in April or early May, with entrance and emergence dates affected by the gender and reproductive status of the bears. Denning bears can be disturbed by winter sport activities such as snowmobiling as well as by human den encroachment, and late season hunting, and current studies are focused on minimizing disturbance by controlling access to important denning areas (Haroldson *et al.* 2002, Podruzny *et al.* 2002). If pregnant female bears are disturbed in their dens and this disturbance causes them to relocate to a new den prior to parturition, negative consequences can occur in the form of reduced cub fitness and survival (Linnell *et al.* 2000, Swenson *et al.* 1997).

Population Dynamic/Status and Distribution

Grizzly bear numbers have greatly declined during the past two centuries. It is believed that the grizzly bear population numbered over 50,000 individuals prior to the 18th century (USFWS 1993). More recently, the estimated total population of grizzly bears as of 1993 stood at 800 to

1,000 individuals (USFWS 1993). The exact size of the grizzly bear population in the YGBE is currently unknown, as the very nature of the grizzly bear and the rugged terrain it inhabits makes any census efforts extremely difficult. Eberhardt and Knight (1996) used several different estimates of population parameters to determine a minimum total population size of 245 grizzly bears, an estimated population size of 390 grizzly bears using marked females, and an estimated population size of 344 grizzly bears using distinct family groups. In 2003, the Interagency Conservation Strategy team identified the minimum population estimate for the grizzly bear population in the YGBE as of 2001 as 365 grizzly bears with a total population estimate of 531. Haroldson and Frey (2004) determined a minimum population estimate of 416 in both 2002 and 2003. The Interagency Grizzly Bear Study Team more recently estimated the population at 580 bears (USFWS 2005).

The grizzly bear was listed as a threatened species on July 28, 1975 (USFWS 1975). Historically, the grizzly bear ranged from the Great Plains to the Pacific Coast, and from the northern U.S. border with Canada to the southern border with Mexico. Currently in the contiguous United States, the grizzly population has been reduced to roughly two percent of its former range. It presently occupies portions of Canadian British Columbia and Alberta, and portions of Montana, Idaho, Wyoming, Washington, and Alaska in the United States. The grizzly bear population in the YGBE and surrounding area was proposed for delisting from the list of endangered and threatened species in November 2005 (USFWS 2005).

Conservation

In an effort to facilitate consistency in the management of grizzly bear habitat within and across ecosystems, the Interagency Grizzly Bear Guidelines were developed by the Interagency Grizzly Bear Committee (IGBC)(51 FR 42863; November 26, 1986) for use by land managers. The IGBC developed specific land management guidelines for use in each of the five ecosystems including the YGBE.

Recovery zones also have been established for the grizzly bear and include areas large enough and of sufficient habitat quality to support a recovered bear population. According to the Grizzly Bear Recovery Plan (USFWS 1993), a recovery zone is defined as that area in each grizzly bear ecosystem within which the population and habitat criteria for achievement of recovery will be measured. Areas outside of recovery zones may provide habitat that grizzly bears will use, but are not considered necessary for the survival and recovery of this species. The area outside the recovery zone but within the 10-mile buffer area is managed to consider and protect grizzlies and their habitat whenever possible, recognizing that population and mortality data within this zone are collected and pertinent to recovery criteria. Beyond the 10-mile buffer, grizzly bear mortalities or populations are not considered when determining whether recovery goals have been met, although protection is still accorded to the grizzly bear under the Act.

The Yellowstone Grizzly Bear Recovery Zone (Recovery Zone) covers approximately 5,438,000 acres (2,200,729 ha) of primarily NPS and National Forest Service (NFS) lands, roughly 89

percent of the currently known distribution of the grizzly bears in the YGBE. Yellowstone and Grand Teton National Parks make up 39.4 percent of the YGBE recovery zone. Private holdings and other ownership make up 2.1 percent of the recovery zone and the remaining 58.5 percent occurs on lands managed by the NFS (ICST 2003).

Areas within the Recovery Zone are stratified into Management Situation Zones 1, 2, or 3; each having a specific management direction according to the Interagency Grizzly Bear Guidelines (IGBC 1986).

> **Management Situation 1** (MS1): lands contain population centers of grizzlies, are key to the survival of the species, and are where management decisions will favor the needs of the bear even when other land use values compete.
>
> **Management Situation 2** (MS2): lands are those areas that lack distinct population centers and the need for this habitat for survival of the grizzly bear is more uncertain. The status of such lands is subject to review. Here, management will at least maintain those habitat conditions that resulted in the area being classified as MS2.
>
> **Management Situation 3** (MS3): designation is intended for lands where grizzly bears may occur infrequently. There is high probability that Federal activities here may affect the species survival and recovery. Management focus is on human-bear conflict minimization, rather than habitat maintenance and protection.

Recovery zones are divided into smaller areas called Bear Management Units (BMUs) for the purpose of habitat evaluation and monitoring. BMUs were designed to:

(1) assess the effects of existing and proposed activities on grizzly bear habitat without having the effects diluted by consideration of too large an area;

(2) address unique habitat characteristics and bear activity and use patterns;

(3) identify contiguous complexes of habitat which meet year-long needs of the grizzly bear; and,

(4) establish priorities for areas where land use management needs would require cumulative effects assessments.

The low survival of adult females was identified as the single most important factor in causing the decline in the Yellowstone population prior to the mid-1980s (Knight and Eberhardt 1985). The current Grizzly Bear Recovery Plan (USFWS 1993) outlines demographic goals to objectively measure and monitor the recovery of the Yellowstone grizzly bear population. That plan defines a recovered population as one that can sustain the existing level of known and

unknown human-caused mortality that exists in the ecosystem and is well-distributed throughout the recovery zone. Demographic recovery criteria outlined for the Yellowstone recovery zone include:

(1) observation of 15 females with cubs of the year annually (unduplicated sightings) over a 6-year running average;

(2) occupation of 16 of the 18 BMUs by females with young from a running 6-year sum of verified observations, and no 2 adjacent BMUs unoccupied with a study to be initiated in the Plateau and Henry's Lake BMUs to determine the capability of these units to support females with cubs;

(3) known, human-caused mortality not to exceed 4 percent of the current population estimate (based on most recent 3-year sum of females with young); with no more than 30 percent of this total mortality limit incurred by females; and,

(4) these mortality limits cannot be exceeded during any 2 consecutive years.

In addition, the existence of adequate regulatory mechanisms for population and habitat management through the development of a conservation strategy must be demonstrated.

In 1994, all population recovery parameters were achieved for the first time, and since 1997 these recovery criteria have not been exceeded in 2 consecutive years. In 2005, a revised method for calculating total population size and sustainable mortality levels for the YGBE was established (IGBST 2005). The revised method was appended to the Recovery Plan and included in the Conservation Strategy. By the end of 2005, the number of unduplicated females with cubs-of-the-year stood at 31 within the recovery zone and 10-mile perimeter (Haroldson 2006), resulting in a 6-year running average of 40 unduplicated females with cubs – more than double the recovery target of 15 females identified in the Recovery Plan (USFWS 1993). Sixteen of 18 BMUs had verified observations of female grizzly bears with young during 2003, 17 of 18 BMUs during 2004 (Podruzny 2005) and 18 of 18 BMUs in 2005 (Schwartz et al. 2006).

Threats

Isolation from human activities is extremely important for bear survival, due to the tendency of grizzly bears to rapidly habituate to human foods. Food-conditioned bears often must be eliminated or removed from developed areas. Avoiding human-caused bear mortality is a goal of the Recovery Plan and is essential to maintaining a viable grizzly bear population (USFWS 1993).

Primary threats to grizzly bears are associated with motorized and dispersed recreational use and forest management activities, including timber harvest. Recreation use includes hunting, fishing, camping, horseback riding, hiking, biking, off-road vehicle (ORV) use, and snowmobiling. Direct human-caused mortality is the most obvious threat to the grizzly bear. This kind of mortality can occur in several ways: (1) defense of human life or property, (2) management removals, (3) mistaken identification by big game hunters, or (4) malicious killing. Nuisance bears are removed to defend human life or property, usually because they have become dangerously bold as a result of food conditioning and habituation at campsites, lodges, resorts, and private residences or they become habituated predators of livestock (Knight and Judd 1983).

Human-grizzly bear interactions have been increasing in the YGBE due, in part, to increasing human use and development, increasing bear numbers, and bears and people both expanding their range of occupancy, increasing the chances of adverse encounters. The frequency of grizzly bear-human conflicts is inversely associated with the abundance of natural bear foods (Gunther *et al.* 2004). Most grizzly bear mortalities are directly related to grizzly bear-human conflicts. The Interagency Conservation Strategy Team (2000, pp. 1-2) reported known human-caused mortalities from 1992-98. Of 58 human-caused mortalities, 43 percent were hunting-related, 10 percent were poaching, 28 percent were food-conditioned bears, 7 percent were related to livestock and 12 percent were accidental deaths. The greatest increase in recent years is self-defense in fall by big game hunters. According to a study by Gunther *et al.* (2004a), three areas were identified as having 71 percent of the 136 conflicts in the GYE in 2003. These were (1) the headwaters region of the Green, Snake, and Wind Rivers, (2) the Crandall Creek/Sunlight Basin area, and (3) the north and south forks of the Shoshone River.

There are a number of naturally or semi-naturally occurring factors that also may influence Yellowstone grizzly bear population levels. Whitebark pine provides an important food source for grizzly bears. Blister rust, which has severe consequences on whitebark pine in the Northern Continental Divide Ecosystem, has been observed in the Yellowstone area. The Yellowstone cutthroat trout, which is an important food source for grizzly bears in the area, has been negatively influenced by introduced lake trout, which are less available to bears due to their deeper water habits (Reinhart *et al.* 2001). Winter-killed ungulates are an important food supply, but ungulate populations vary widely in numbers and are influenced by weather conditions. The reintroduction of wolves has increased competition for ungulate prey and winter-killed carrion. Recent fires may have impacts on available food and cover over the short term, particularly to individual bears with heavily burned home ranges. Fire, in general, over time stimulates many forage species and berries preferred by bears, provided alternate food supplies and cover is available to maintain bears through the immediate aftermath of the fire.

Army cutworm moths in some areas could be affected by agricultural pesticide use, and due to their reliance on this food resource, there has been concern that certain pesticides may bioaccumulate in bears. Recent investigation into this possibility indicates that, while pesticides are present in ACMs in trace quantities, they are most likely not sufficient to cause direct adverse effects on, or biomagnify in bears (Robinson et al. 2006). This study cautions, however, that

pesticide use is a relevant concern when addressing bear conservation issues. Due to their unique physiology including hyperphagia, brown fat accumulation and torpor, bears may assimilate and excrete certain chemicals in unique ways. Further research is recommended including sampling and analysis of blood, hair and fat samples in order to monitor this potential threat as available pesticides and their listed uses change.

Grizzly bears have also experienced displacement from available habitat (loss of habitat effectiveness due to human disturbance) due to increased human uses from (1) expanding road access in wilderness areas (Kasworm and Manley 1989), (2) ORV use and (3) recreation use. They have also experienced loss of existing available habitat due to (1) increased development on private land related primarily to residential housing, and (2) potential for increased development on public land related primarily to oil/gas and recreation development. The grizzly bear also faces a decrease in value of available habitat due to (1) a loss of biodiversity (especially early-succession related vegetative types), and (2) sub-optimal composition, structure, and juxtaposition of vegetation as a result of fire suppression, management strategies, and advancing succession. Finally the bear faces isolation due to fragmentation of available habitat due to (1) major development of private land, (2) construction of major highways that block or restrict movement, (3) inadequate provision for linkage on minor roads and highways, and (4) large blocks of clearcuts.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed State or Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation process.

The action area is defined at 50 CFR 402 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." While the proposed action directly affects the areas located within the NER, GTNP and JDR Memorial Parkway, it will indirectly affect other areas outside of the Refuge and within the B-TNF.

The action area/decision area defined in the EIS includes the NER, GTNP, and the JDR Memorial Parkway.

- The NER is a 24,700 acre (9,996 hectare) unit of the National Wildlife Refuge System administered by the Service. The GTNP is 309,995 acres (125,453 ha), and JDR Memorial Parkway is an additional 23,777 acres (9,622 ha), for a total of 333,772 (135,076 ha) acres administered by them NPS.

- The GTNP is 22.5 miles (36 kilometers) wide and 41 miles (66 km) long from north to south. Elevations range from 6,420 feet (1,957 m) on the valley floor to 13,766 ft. (4,196 m) (the summit of Grand Teton). The Park is bordered to the northwest, west, and southwest by Targhee National Forest. On the south the Park surrounds a wedge of private land and a small section of Bridger-Teton National Forest (B-TNF). The Teton Wilderness in the B-TNF borders the Park to the northeast.

- The JDR Memorial Parkway extends for 82 miles (132 km) from West Thumb in YNP to the north entrance of GTNP. The management area between the two parks includes 7.5 miles (12 km) of parkway and 23,778 acres (9,623 ha).

Ecologically, the NER, GTNP, JDR Memorial Parkway, and YNP are part of a larger area referred to as the GYE.

For the purposes of this biological opinion, we will also consider portions of surrounding lands in the B-TNF and other areas outside of the Refuge as part of the action area due to the projected long-term increase in the number of hunters as a result of the proposed action. The action area will be discussed in terms of Game Management Units (GMU) or Existing Elk Hunting Areas (Area). The following is a brief description of their general locations within the action area:

NER GMUs

Area 77. National Elk Refuge. Beginning where U.S. Highway 26 crosses the Gros Ventre River; easterly up said river to the B-TNF boundary; southerly along said boundary to Flat Creek; westerly along said creek approximately 3.5 miles to the second road crossing; southerly along said road .8 mile to a trail junction; westerly along a marked boundary to the NER fence; northerly along said fence to the Gros Ventre River.

GTNP GMUs

Area 72. Webb Canyon/Moose Creek. All of the drainages of Berry Creek, Owl Creek and Webb Canyon Creek and that area north of Berry Creek to the GTNP boundary.
Area 75. Snake River. Beginning at the junction of the Gros Ventre-Kelly Road and U.S. Highway 26-89-191; northerly along said highway to Ditch Creek; westerly along said creek to the Snake River proper; northerly along the easternmost bank of the main channel of the Snake river to the northernmost channel of Spread Creek; easterly along said creek to U.S. Highway 26-89-191; southwesterly along said highway to U.S.F.S. Road 30310 at the Cunningham Cabin; southerly along said road to the GTNP boundary; southerly along said boundary to the intersection with the Shadow Mountain-Kelly Road (U.S.F.S. Road 30340); southwesterly along said road to the junction of the Teton Science School road; northeasterly along said road one and one-quarter (1¼) miles to a marked boundary; easterly one (1) mile to the GTNP boundary; southerly along the GTNP boundary to the Gros Ventre-Kelly Road; southwesterly along said road to U.S. Highway 26-89-191.

Area 79. Teton Park. Beginning where the U.S. Forest Service access road (U.S.F.S. Road 30310) near Cunningham Cabin intersects U.S. Highway 26-89-191; northerly along said highway to the junction of U.S. Highway 89-287 at Moran; northwesterly along said highway to the Grand Teton National Park boundary easterly and southerly along said boundary to the U.S. Forest Service access road (U.S. F.S. Road 30310) near Cunningham Cabin; westerly along said road to U.S. Highway 26-89-191.

B-TNF GMUs

Area 70. Buffalo Fork. Beginning where U.S. Highway 26-287 intersects the GTNP boundary; northerly along said boundary to Pacific Creek; northeasterly up said creek to Gravel Creek; northerly up said creek to the Snake River Trail; northerly along said trail to the south boundary of YNP; easterly along said boundary to the Continental Divide; southerly and easterly along said divide to U.S. Highway 26-287 at Togwotee Pass; westerly along said highway to the east boundary of GTNP.

Area 71. Pacific Creek. Beginning where Pacific Creek crosses the GTNP boundary; northerly along said boundary to the Targhee National Forest boundary; northerly along said boundary to the southern boundary of YNP; easterly along said boundary to the Snake River Trail at Fox Park; southwesterly along said trail over Big Game Ridge to Gravel Creek; southerly along said creek to Pacific Creek; southerly down said creek to the GTNP boundary.

Area 74. Ditch Creek. Beginning where Ditch Creek crosses the GTNP boundary; northeasterly along said boundary to Brush Creek; southerly up said creek to the divide between Brush Creek and Ditch Creek; southerly along a posted boundary to Ditch Creek; southerly down said creek to the GTNP boundary.

Area 78. Wilson. Beginning at the junction of Wyoming Highway 22 and Wyoming Highway 390; northerly along Wyoming Highway 390 to the GTNP boundary; northerly and southerly along said boundary to U.S. Highway 26-89-191; southerly along said highway to its junction with Wyoming Highway 22; westerly along said highway to its junction with Wyoming Highway 390.

Area 80. Sheep Creek. All of the drainages of Flat Creek, Sheep Creek and Nowlin Creek east of the NER.

Area 81. Spread Creek. Beginning where the GTNP boundary crosses the Gros Ventre River; northerly along said boundary to Ditch Creek; up said creek to a posted boundary; straight north along the posted boundary to the divide between Brush Creek and Ditch Creek; northerly down Brush Creek to the GTNP boundary; northerly along said boundary to U.S. Highway 26-287; easterly along said highway to Togwotee Pass and the Continental Divide; southerly along said divide to the Moccasin Basin Road (U.S.F.S. Road 30750); southerly down said road to the North Fork of Fish Creek at Calf Creek; southerly down said creek to Fish Creek; southeasterly down said creek to the Gros Ventre River; westerly down said river to the GTNP Park boundary.

Area 82. Crystal Peak. Beginning where the Gros Ventre River crosses the NER boundary near the town of Kelly; easterly up said river to Kinky Creek; easterly up said creek to the Darwin Ranch Road (U.S.F.S. Road 620); easterly along said road to the divide between the Green River and Gros Ventre River; southwesterly along said divide to the divide between the Green River

and Hoback River at Hodges Peak; westerly along the divide between Flat Creek and the Gros Ventre River; northerly along said divide to the NER boundary; northerly along said boundary to the Gros Ventre River.

Area 84. Lower Hoback. Beginning where U.S. Highway 191 crosses Flat Creek at the north edge of the town of Jackson; due east to the NER boundary; easterly along said boundary to the B-TNF boundary and the ridge between Twin Creeks and Cache Creek; easterly along said ridge to Jackson Peak; southerly along the divide between Flat Creek and Cache Creek to Cache Peak; easterly along the divide between Flat Creek and Granite Creek to Pyramid Peak; southerly along the divide between the Gros Ventre River and the Hoback River to Steamboat Peak; southerly and westerly along the divide between Shoal Creek and Dell Creek; westerly along said divide to the Riling Draw Road; southerly along said road to the Dell Creek Road; westerly along said road to the Hoback River; westerly down said river to Cliff Creek; southerly up Cliff Creek to the divide between the Greys River and the Hoback River; northwesterly along said divide to the divide between the Greys River and Willow Creek; northerly along said divide to the divide between the Bailey Creek and Willow Creek (Greyback Ridge); northerly along said divide to Dry Wash Draw; westerly down said draw to Bailey Creek; northwesterly down said creek to the Snake River; northerly up said river to Wyoming Highway 22; easterly along said highway to U.S. Highway 191; easterly along said highway to Flat Creek at the north edge of the town of Jackson.

Past projects, their effects on grizzly bears, and the level of incidental take have also been considered in the environmental baseline. Previous formal consultation in the vicinity of the action area addressed transportation projects and grazing permits. The projects are: (1) the Grand Teton National Park Transportation Plan (WY003, February 9, 2007); (2) domestic livestock grazing in Grand Teton National Park (WY9351, May 2, 2006); (3) the Federal Highway Administration's Highway 287/26 Reconstruction project, a.k.a. Togwotee Pass Highway (WY5998, August 22, 2003); and (4) the Forest Services' issuance of commercial grazing permits on the Bridger-Teton National Forest (WY4715, December 3, 2002). These projects, their effects to the grizzly bears, and the level of incidental take have been considered in the environmental baseline for this biological opinion.

Status of the Species within the Action Area

Portions of the action area are within the Yellowstone Recovery Zone and Primary Conservation Area (PCA) for grizzly bears identified in the Conservation Strategy for the Grizzly Bears in the GYE (USFWS 2003). The PCA, or grizzly bear recovery zone as it was initially described (USFWS 1982), was delineated to define an area within which to focus grizzly bear recovery efforts after the species was listed in 1975. At the time the boundary was delineated, grizzly bears were uncommon in GTNP and surrounding areas. Currently, however, grizzly bears are established in large areas outside of the PCA in GTNP (Schwartz et al. 2002), and the line does not represent grizzly bear distribution in the GTNP area.

Grizzly bears are relatively common in the southern GYE, including the Gros Ventre Mountains southeast of GTNP, and are regularly observed in the Teton Mountain Range north of Paintbrush Canyon and the Badger Creek drainage. Grizzly bears have been observed on the valley floor south of Triangle X Ranch, at Jackson Lake, in Death Canyon, and south of GTNP in the vicinity of Teton Village and along the Snake River south of Jackson (Schwartz et al. 2002). In addition, a young male radio-collared grizzly bear used the Bradley-Taggart Lakes and White Grass areas for several weeks in 2005, providing empirical evidence for the continued southward movement of grizzly bears in the Teton Range.

There have been no grizzly bears sighted on the NER since 1994; however, bears occupy areas immediately north and east of the Refuge. As the GYE bear population continues to expand southward into presently unoccupied areas, and with continued habituation of bears to human presence and activity, the potential for the occurrence of bears on the Refuge will likely increase.

Management of grizzly bears and their habitat in the Park follows IGBC guidelines (1986) and the Park's Human-Bear Management Plan (NPS 1989). These guidelines were developed to provide effective direction for the conservation of grizzly bears and their habitat to Federal agencies responsible for managing land within the recovery zone. The objectives for managing grizzly bears in the Park under the 1989 NPS plan are to: (1) restore and maintain the natural integrity, distribution, and behavior of grizzly bears, (2) provide opportunities for visitors to understand, observe, and appreciate grizzly bears, and (3) provide for visitor safety by minimizing bear/human conflicts, by reducing human-generated food sources, and by regulating visitor distribution.

The Park has been highly successful in promoting grizzly bear recovery and reducing bear-human conflicts (e.g., property damages, incidents of bears obtaining human food, bear-inflicted human injuries) and human-caused bear mortalities in the Park. Recreational and administrative facilities, human activities, and human waste (garbage and sewage) in GTNP are managed in a manner that minimizes the potential for human-caused grizzly bear mortalities. Management actions also include implementation of backcountry food storage requirements. Bears that are typically wary of humans will often tolerate people at close distances when carcasses or other high quality foods are available.

Shifts in grizzly bear seasonal distribution within the GYE appear to be directly related to resource availability. Recent research indicates that bears in YNP are 2 times more likely to be found outside of the park during the early hunting season. This movement occurred regardless of the relative yearly production and abundance of whitebark pine seed production (Haroldson et al. 2004). Elk hunting seasons in the GYE begin as early as September 10 and run through December 3. This period coincides with late hyperphagia in GYE grizzly bears, as well as the time period (September-October) during which the majority of hunting-related grizzly bear mortalities have occurred (Haroldson et al. 2004)

Hunting-related deaths resulting from human-grizzly conflict remain the most significant source of known grizzly bear mortality in the GYE (Haroldson et al. 2004; USFWS 2003). In the PCA itself, analysis of the potential correlation between hunter numbers and levels of known and probable grizzly bear mortality from 1987 to 1997 indicated little relationship (USFWS 2003). This analysis did not consider the relationship between hunter numbers and grizzly bear mortality in areas outside of the PCA. While the high level of hunting-related grizzly mortality has not been directly linked to hunter numbers in the PCA, it is nonetheless primarily the result of chance encounters between bears and hunters in the field, conflicts over ungulate carcasses and conflicts in hunter camps often as a result of game meat being kept in campsites (USFWS 2003; Haroldson et al. 2004).

Status of Species Habitat within the Action Area

The following is a brief description of habitat and cover types within existing elk hunting areas/GMUs:

Within the NER, elk hunting area (77) is dominated by mixed shrub and sagebrush shrubland interspersed with grassland. Riparian woodland habitat consists primarily of narrowleaf cottonwood (*Populus angustifolia*) and willow (*Salix* spp.) stands. Aspen woodlands occur on many hillsides, often some distance from water sources. Small patches of conifer forest occur within the hunt area and consist of Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*) and junipers. Agricultural areas and cultivated fields occur throughout the hunt area. The relatively even and open nature of terrain within the hunt area provides excellent foraging habitat for ungulates, but largely precludes grizzly-bear use and occupancy.

Within the GTNP, elk hunting areas (72, 75, 79) have quite different topographical and vegetational characteristics. Area 72 ranges from valley floor to alpine, with coniferous woodlands of lodgepole pine as well as whitebark pine, Englemann spruce (*Picea engelmannii*), sub-alpine fir (*Abies bifolia*), and Douglas-fir. Area 75 is predominately covered in sagebrush, with rolling terrain punctuated by areas of steeper relief. Small patches of grassland are located along the eastern border, with cultivated fields to the south. Patches of coniferous woodlands are located south of Ditch Creek and in the Snake River bottom. The relative lack of tree cover across most of the hunt area makes it less suitable for grizzly bears, with the exception of areas within the Snake River bottom, Blacktail Butte, and other small forested patches. Area 79 is composed of highly variable terrain predominately covered in dense coniferous woodlands composed of lodgepole pine, whitebark pine, Douglas and subalpine fir, and spruce; but it also includes some large expanses of sagebrush grasslands and willow habitats. The extensive areas of tree cover throughout the hunt area provide a large amount of suitable habitat for both elk and grizzly bear.

Within the B-TNF, elk hunting areas (70, 71, 74, 78, 80, 81, 82, 84) are highly variable in terms of terrain and are predominately forested with dense stands of conifers dominated by lodgepole pine, as well as whitebark pine, Englemann spruce, sub-alpine fir, and Douglas-fir.

Willow and quaking aspen (*Populus tremuloides*) occur in valley bottoms in association with streams, and sagebrush shrubland and grassland habitat grow in the lower elevations. The varied topography, dense woodland cover and general lack of human development offer extensive suitable habitat for grizzly bear north the Gros Ventre River and provide important transitional, and migration habitat for elk.

Factors Affecting Species Environment within the Action Area

General Factors

Past and ongoing actions within the action area and within the grizzly bear Recovery Zone are likely to affect GYE grizzly bears moving through the action area whether their home range is within or adjacent to the action area. These actions include:

- livestock grazing (which would impact grizzly bears through management actions),
- private land development,
- firewood cutting,
- road use/management/improvements,
- timber harvest,
- recreation activities that lead to human-bear conflicts,
- vegetation management,
- wild and prescribed fire, and
- loss or decline of important food sources (e.g., whitebark pine seeds due to fire suppression).

EFFECTS OF THE ACTION

Under section 7(a)(2) of the Act, "effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, with the effects of other activities interrelated or interdependent with that action. Direct effects are immediate effects of the proposed action on the species or its habitat. Indirect effects are those caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). The effects of the action are added to the environmental baseline to determine the future baseline and to form the basis for the determination in this opinion. Should the Federal action result in a jeopardy situation and/or adverse modification conclusion, the Service may propose reasonable and prudent alternatives that the Federal agency can take to avoid violation of section 7(a)(2). The effects discussed below are the result of direct and indirect impacts of implementing the proposed project and are addressed according to the four management goals outlined in the Plan. They are broken down and discussed further according to key actions occurring under each goal.

Habitat conservation

Under the proposed action 800-2,000 acres/year (324-809 ha/yr) of cultivated land would continue to be flood irrigated, while up to 1,100 acres (445 ha) would be converted from flood to sprinkler irrigation. Restoration of native species to 4,500 acres (1,821 ha) of existing agriculture fields would occur in GTNP and exclosures would be used on the Refuge to allow recovery of willow, aspen and cottonwood stands. These actions would likely result in an overall minor decrease in total herbaceous forage available for elk and bison, but would improve the overall quality of available forage. While these actions may alter ungulate distributions and densities, and cause elk in the Jackson herd to alter their movements within and outside of the Refuge in response to the changes, it is unlikely that these factors would have any significant impact on the GYE grizzly bear population.

Sustainable populations/ Elk and bison numbers

Supplemental feeding

Under the proposed action, supplemental feeding would be reduced from current levels and replaced by greater ungulate reliance on standing forage. The reduction in food supplementation may lead to changes in ungulate distribution and mortality and would likely cause elk and bison to return to a more natural pattern of existence influenced to a greater degree by factors such as climate and availability of native forage. Supplemental feeding likely reduces the effects of density in the Jackson elk herd (Lubow and Smith 2004); therefore, density-dependent effects on seasonal juvenile survival and dispersal may become more apparent as supplemental feeding is reduced. These effects, however, along with any associated decrease in adult and juvenile elk survival rates, are likely to be negligible since the Jackson elk herd is maintained below carrying capacity (Lubow and Smith 2004). While minor increases in elk mortality as a result of reduced supplemental feeding may be beneficial to grizzly bears in the GYE due to increased availability of carcasses, the effect would not likely be significant.

Elk hunt

The Jackson elk herd comprises one of the largest concentrations of elk in North America, with an estimated 13,000 individuals whose seasonal distributions allow them to be considered as being divided into four herd segments (Grand Teton, Yellowstone, Teton Wilderness, and Gros Ventre). The elk migrate across several jurisdictional boundaries, including the NER, GTNP, JDR Memorial Parkway, YNP, B-TNF, BLM resource areas, and state and private lands. Because of its large size, wide distribution, effects on vegetation, and importance to the area's predators and scavengers, the Jackson elk herd contributes significantly to the ecology of the southern GYE.

Elk hunting has been an annual event on the NER since 1955 and is the primary management tool used to control the Jackson elk herd population both on the Refuge and throughout the

Jackson elk herd units. As part of the proposed action, there will be a short-term increase in hunter numbers on the Refuge from 733 to 1,000 and an increase from 220 to 300 elk harvested annually. In the long term, overall hunter numbers on the Refuge will likely decrease to 470-487, as will the number of elk harvested (126-146). Hunting on the Refuge currently occurs in Area 77; however, a small hunt area may potentially be added in the southern portion of the Refuge in order to force elk back into other hunt areas. Hunting will be strictly managed and the areas available to hunting frequently patrolled. Hunting permits issued for the Refuge are day-use only and do not allow hunters to camp overnight. Due to these aforementioned factors, and the fact that habitat on the Refuge is relatively open and generally lacks densely forested areas, it is unlikely that the risk of elk hunters killing grizzly bears will be greater in either the short or long term as a result of the proposed action.

Elk hunting as part of the Park's annual elk reduction, occurs on approximately 66,600 acres (26,952 ha) of the Park's backcountry, 29,100 acres (11,776.4 ha) of which is in the recovery zone. Under the proposed action, there will be a short-term increase in the number of hunters permitted and deputized to hunt in the Park from 1,600 currently, to 2,200, and an increase in the number of elk harvested from 480 to 650. In the long term, the overall number of hunters in the Park will decrease to 773-957 per year, and the number of elk harvested will decrease to 232-287. Unlike the Refuge, overnight camping is permitted in certain areas.

There are 3 elk hunting areas (Areas 72, 79, 75) located within the boundaries of the GTNP. The terrain of Area 75 is largely open and lacking densely forested areas. This open, shrubland characteristic and general absence of dense woodland cover would tend to reduce the risk of surprise encounters between elk hunters and grizzly bears in these areas that might potentially result in human-caused grizzly mortality. Exceptions include the Snake River bottom where thicker cover exists and grizzly bears are known to frequent, and Blacktail Butte where grizzly bears might be expected to occur (Steve Cain, National Park Service, person. comm. 2007). Hunters in this area may face a higher risk of grizzly conflict than in other portions of Area 75. Portions of Area 71 are located within the 23,778 acres (9,623 ha) of the JDR Memorial Parkway managed by the Park; however, hunting for elk and other wildlife is largely managed by the WGFD. Area 72 has been closed to hunting since 1967. It is the only area in the Park west of the Snake River where hunting was authorized in the Park's 1950 enabling legislation and, although the potential for it to be reopened exists, this is not expected to occur within the foreseeable future. Compared with Area 75, Area 79 contains large expanses of dense woodland that provide ideal grizzly bear cover. Portions of the hunting area are located within the Buffalo Spread Creek BMU and represent a region where human-bear conflicts have occurred in the past (Haroldson et al. 2004; Gunther et al. 2004). The short-term risk for future human-bear conflicts resulting in potential grizzly bear mortality as a result of the proposed action is considered high for this hunting area both south of Elk Ranch and north of Moran and highway 26/287. However, a later start date of the elk hunting season relative to surrounding areas, a 30 to 40 percent yearly hunter-ranger contact rate, restricted backcountry camping, required use of bear-deterrence spray and supplemental educational materials addressing hunter-grizzly conflict

provided to deputized hunters (Steve Cain, National Park Service, person. comm. 2007) may limit this potential risk. The long term risk is considered to be equivalent to current levels.

Most of the remainder of the Jackson elk herd unit is comprised of the Buffalo and Jackson ranger districts of B-TNF. Elevation ranges from about 6,300 ft. (1,920 m) to nearly 12,200 ft. (3,719 m) at the headwaters of the Yellowstone River. There is not expected to be a substantial short-term increase in the short term in either the number of elk hunters using the forest or the number of elk harvested unless hunts on the Refuge cause more elk to move into these areas. As a result of the proposed action, in the long-term it is expected that herd reductions in the Grand Teton segment will cause individuals to radiate into and be sustained in other herd segments, allowing proportionately more elk to be harvested. In the long-term, it is estimated that there will be a 29-35 percent increase in hunter numbers in the B-TNF (from 4,227 currently to 5,600-5,870) as a result of the proposed action. The number of elk harvested per year in the B-TNF is predicted to increase from 1,268 to between 1,680 and 1,761.

There are 6 hunting areas (Area 70, 71, 74, 80, 81, 82) located in the B-TNF and surrounding the Park. These areas are dotted with dense coniferous woodlands interspersed with more open woods, and sagebrush and mixed grasslands at lower elevations and in the valleys. The terrain is highly variable with elevations ranging from 6,396 to 9,676 ft. (1,950 to 2,950 m). Multiple human-bear conflicts have been recorded throughout these areas in the past including hunting-related grizzly bear mortalities (Haroldson et al. 2004; Gunther et al. 2004, USFWS 2003). Elk season start dates in these areas range from September 10 to September 26, which corresponds both with the period when bears are actively foraging and preparing for hibernation and with the time during which most known and probable hunting-related grizzly bear mortalities occur (Haroldson et al. 2004; Gunther et al. 2004). Traditional early fall elk hunts in these areas have created a reliable food source for hyperphagous bears which take advantage of ungulate remains left by hunters, and this brings them into close proximity to hunters themselves (Haroldson et al. 2004). As a result of these factors, the risk of human-bear conflict resulting in potential hunting-related grizzly bear mortality is considered high in Areas 70, 71, and 81. Hunting Areas 73, 78, 84, and 85 are considered to represent regions with low risk of human-bear conflict due to the relatively high level of human occupation and their location outside of the main fall migration routes of the Jackson herd.

Bison hunt

A bison hunt would occur under the proposed action in order to reduce the herd size on the Refuge, increase bison distribution, limit bison-elk conflict along feed lines and reduce the potential for disease transmission. A reduction in herd size would also contribute to enhancement of habitat through a decrease in the damage caused by excessive grazing and browsing of willow, aspen and cottonwood stands. Initially, the bison hunt would reduce herd size by 140-150 bison/year, of which, 90-100 would be removed on the Refuge and 50 would be removed from the B-TNF. This would involve an average of 175-190 bison hunters each year. In the long term, the Plan estimates that an average of 70 bison will be killed annually, with an

average of 90 hunters participating in the hunt. This nevertheless represents a substantial increase over recent numbers of bison being harvested and bison hunters on the Refuge. Despite the increase in the number of hunters on the NER, due to the aforementioned factors and conditions associated with hunts on Refuge, the risk of human-grizzly conflict resulting in hunting-caused grizzly bear mortality is considered to be low, both in the short and the long term. The risk of hunter-caused grizzly mortality associated with bison hunts in the B-TNF is considered to be higher than on the Refuge, especially in the northern portions of Area 81 east of Elk Ranch and between Buffalo Fork and Spread Creek.

Disease management

In order to maintain the health of elk and bison populations while continuing supplemental feeding at reduced levels, a variety of disease management techniques will be explored (e.g., vaccination, selective fertility control, age- and sex-specific harvest). Under the proposed action, WGFD personnel will be allowed to use brucellosis vaccine Strain 19 on elk and RB51 on calf and nonpregnant female bison along feedlines during feedline operations. Grizzly bears may consume elk or bison exposed to these brucellosis vaccines; however, research indicates that there are no significant adverse effects of the RB51 vaccine on nontarget species (Januszewski et al. 2001). No clinical trials have been conducted to determine if vaccine Strain 19 is safe for nontarget species; however, the vaccine has been used on WGFD feedgrounds for 17 years without any noticeable adverse clinical, histological or reproductive effects on nontarget species. Since vaccination activities will occur within the Refuge along feedlines, it is not expected that there would be a risk of disturbance to grizzly bear associated with the action.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Cumulative Effects within the Action Area

Several privately owned and State of Wyoming-owned in-holdings are present in GTNP; depending upon future human activities occurring on these properties, grizzly bears could be negatively affected. For many years, GTNP has attempted to secure these in-holdings with lifetime leases and out-right purchases and has been very successful in doing so. No large-scale developments or land-based projects have been proposed for these in-holdings.

There are plans to convey the Laurance S. Rockefeller (LSR) Preserve (approximately 1,100 acres [445 ha]) in southern GTNP to the Federal government in 2007. However, the LSR Preserve is presently a private in-holding in the Park. Although the future plans include removal

of most of the development that has been present on the ranch, the current owners will develop an interpretive facility and trail system prior to the conveyance of the property.

Cumulative Effects Adjacent to the Action Area and Grizzly Bear Recovery Zone

Cumulative effects of actions outside the action area and within the grizzly bear Recovery Zone are likely to affect resident grizzly bears moving through the action area whether their home range is within or adjacent to the action area. These actions include:

- livestock grazing (which would impact grizzly bears through management actions),
- private land development,
- firewood cutting,
- road use/management/improvement,
- timber harvest,
- recreation activities that lead to human-bear conflicts,
- vegetation management,
- wild and prescribed fire, and
- loss or decline of important food sources (e.g., whitebark pine seeds due to fire suppression),

The recent Teton County, Wyoming, approval of the Snake River Associates development plan for Teton Village on private land adjacent to the Park's southern boundary could have additional cumulative, long-term impacts on grizzly bears. This development will likely result in a higher number of visitors to the Park and an increase in associated dispersed recreational use. This may be particularly true in the southwest corner of the Park, where excellent bear habitat exists. Grizzly bears will likely colonize this area, even though it is several miles outside of the PCA.

These activities would cumulatively contribute to increased mortality risks, reduce availability of secure habitat, and diminish habitat effectiveness for grizzly bears. However, the total cumulative impact of the above-listed activities, as well as other unidentified actions occurring within the grizzly bear recovery zone, do not appear to be adversely affecting population recovery, as evidenced by the expanding grizzly bear population in the GYA (Eberhardt and Knight 1996; Schwartz et al. 2002; Pyare et al. 2004).

CONCLUSION

After reviewing the current status of the threatened grizzly bear, the environmental baseline for the species in the action area, the effects of the action and the cumulative effects, it is the Service's opinion that the Final Bison and Elk Management Plan, as proposed, is not likely to jeopardize the continued existence of the grizzly bear. No critical habitat has been designated for grizzly bears, therefore, none will be affected. Implementing regulations for section 7 (50 CFR

402) define "jeopardize the continued existence of" as to "engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." Our conclusion that the proposed action is not likely to jeopardize the continued existence of grizzly bears is based primarily on the information presented in the FEIS and BE prepared for the proposed Bison and Elk Management Plan, information in our files, and informal discussions between the Service, the Park and other personnel from other agencies and groups.

Grizzly bears in the GYE have increased in numbers and expanded in range during the past two decades (Schwartz et al. 2006). Female grizzly bears with young have been observed out side of the recovery zone, leading to the assumption that females are able to establish home ranges and find the resources needed to survive and reproduce in these areas.

The Service concludes that some adverse affects may occur to grizzly bears as a result of the proposed bison and elk management plan. The existing level of hunting on the Refuge has not presented a problem of grizzly-human conflict and, though the best available information suggests the GYE grizzly bear population is stable to increasing and is expanding its range to the south, the open nature of terrain on the Refuge and high levels of human activity and visibility will limit the risk of conflicts in both the short and long terms. As on the Refuge, existing hunting within the Park has not presented a substantial problem of hunting-caused grizzly bear mortality; however, unlike on the Refuge, the variability of terrain and densely wooded areas in the Park contribute to an elevated risk of hunting-related conflicts occurring. This increased risk would be minimal in the long term as a result of the proposed action, but would be higher in the short-term, especially within Area 79. Within the B-TNF, the short term risk of increased hunting-related grizzly bear mortality would be relatively unchanged as a result of the proposed plan under current conditions. The long-term risk, however, would be considerably higher in all areas where grizzly bear occur.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation when it actually kills or injures listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent act or omission which creates the likelihood of injury to listed species by annoying it such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to

and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary and must be implemented by the Park and Refuge so that they become binding conditions of any permit issued by the Park or Refuge, as appropriate, in order for the exemption from prohibited taking of the species concerned, as described in section 7(o)(2), to apply. The Park and Refuge have a continuing duty to regulate the activity covered by this incidental take statement. If the Park or Refuge (1) fails to assume and implement the terms and conditions or (2) fails to require permittees to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or other documents, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Park and Refuge must report the progress of the action and its impact on the species to the Service as specified in the Incidental Take Statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

Considering the history of hunting-related conflicts in the GYE, differing strategies for management of hunters by the Park and the B-TNF, and differences in landscape and habitat characteristics, the risk of hunting-related grizzly bear mortality and associated incidental take are addressed separately for the Park and the B-TNF. The Service anticipates that the proposed action will exacerbate the short-term risk for hunting-related grizzly bear mortality within the Park and the long-term risk for hunting-related grizzly bear mortality in the B-TNF and JDR Memorial Parkway as a result of the Plan.

The Service anticipates 1 grizzly bear (adult or juvenile) over the 15-year implementation period of the Plan could be incidentally taken as a result of the proposed action in GTNP and 2 grizzly bears (adult or juvenile) in a 15-year period could be incidentally taken as a result of the proposed action in the B-TNF. It is expected that all grizzly bears would be lethally taken through hunting-related conflicts. In the period 1987-2001, an average of 2 human-caused grizzly bear mortalities occurred per year in the B-TNF. During the same time period the average human-caused grizzly bear mortality was less than 1 per year in the Park (USFWS 2003). The incidental take of 2 grizzly bears in the B-TNF and 1 in GTNP as a result of the proposed action is considered to be in addition to this baseline level of mortality.

EFFECT OF THE TAKE

As analyzed in this biological opinion, the Service concludes that this level of anticipated incidental take is not likely to result in jeopardy to the species. Critical habitat has not been designated for the grizzly bear; therefore none would be affected.

REASONABLE AND PRUDENT MEASURES

The Service believes the following Reasonable and Prudent Measures (RPM) are necessary and appropriate to minimize impacts of incidental take of grizzly bears:

RPM 1 Minimize the likelihood of hunting-related human/grizzly bear conflict associated with the Project through education of hunters

TERMS AND CONDITIONS

The Service believes no more than 3 grizzly bears will be incidentally taken as a result of the proposed action. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is reached, such incidental take represents new information requiring re-initiation of consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

1. The Park and Refuge shall continue ongoing educational measures related to limiting the risk of hunter-grizzly conflict and hunting-caused grizzly bear mortality and shall adapt or modify these measures as changing circumstances and information warrant.

2. If incidental take of grizzly bears in the B-TNF above the baseline level reaches 1 grizzly bear, Service and Park representatives shall meet with representatives from the WGFD and B-TNF to discuss whether additional educational and/or preventative measures or other changes could be implemented within the action area to minimize additional take of grizzly bears within the B-TNF.

3. In the event that a grizzly bear is killed within the action area as a result of hunting-related conflict, the Park, Refuge or B-TNF shall notify the Service's Wyoming Field Office (307-772-2374) and the Service's Law Enforcement Office (307-261-6365) within 24 hours.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation Recommendations (CR) are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

CR1. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects, or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

CR2. The Refuge and Park should participate in ongoing interagency efforts to identify, map and manage linkage habitats essential to grizzly bear movement. Please contact the Service's grizzly bear recovery coordinator at (406) 243-4903 for information.

CR3. If grizzly bears are sighted on the NER during the implementation period of the project, all hunting activities on the NER should be reassessed in order to determine the potential risk of hunter-grizzly conflict.

CR4. The Park should encourage hunters to move their kills out from underneath thick tree cover or undergrowth into more open areas as quickly as possible in order to reduce the risk of surprise encounters with grizzly bears.

CR5. The Park should encourage hunters to retrieve and remove or hang their kills as quickly as possible after making a kill in order to reduce the risk of hunter-grizzly conflict over ungulate carcasses.

CR6. The Park should recommend that after making a kill or tagging a kill, any hunter that finds a grizzly bear is already on the carcass will forfeit that kill and/or tag.

CR7. The Park should place educational signs/information addressing the risks of hunter-grizzly conflict, including information on daily and seasonal periods that represent the highest risk for hunter-grizzly conflict and how to diffuse grizzly bear confrontations, in any parking area, maintained camp site and high use trail head where such signs/information are not already in place.

CR8. The Park should continue encouraging hunters to maintain at least 100m distance between any campsite and any carcass or meat that is hung in order to elevate it beyond the reach of scavenging grizzly bears.

CR9. As a non-action agency indirectly affected by the proposed project, the B-TNF should implement the abovementioned conservation measures whenever possible and appropriate.

REINITIATION REQUIREMENT

This concludes formal consultation on the action outlined in your February 7, 2007, request for formal consultation on the Final Bison and Elk Management Plan and Environmental Impact

Statement. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your assistance in the conservation of endangered, threatened, and proposed species. If you have any questions or comments on this final biological opinion or your responsibilities under the Act, please contact Tyler Fox of our staff at the letterhead address or by phone at (307) 772-2374, extension 237.

cc: B-TNF, Forest Supervisor, Jackson, WY (K. Hamilton)
FWS, Grizzly Bear Recovery Coordinator, Montana (C. Servheen)
FWS, Planning Team Leader, Lakewood, CO (L. Shannon)
GTNP, Superintendent, Jackson, WY (M. Gibson-Scott)
GTNP, Management Assistant, Moose, WY (G. Pollock)
GTNP, Senior Wildlife Biologist, Moose, WY (S. Cain)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (V. Stelter)
WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)

Literature Cited

Bjornlie, D. and M. Haroldson. 2001. Grizzly bear use of insect aggregation sites documented from aerial telemetry and observations. Pages 44-51 *in* C. C. Schwartz and M. A. Haroldson, Eds. Yellowstone grizzly bear investigations: Annual report of the Interagency Grizzly Bear Study Team, 2000. U.S. Geological Survey, Bozeman, Montana.

Eberhardt, L. L. and R. Knight. 1996. How many grizzlies in Yellowstone? Journal of Wildlife Management 60:416-421.

Gillian, C.M., F.M. Hammond, and C.M. Peterson. 1994. "Evaluation of an aversive conditioning technique used on female grizzly bears in the Yellowstone ecosystem." Pp. 503-512 in Proceeedings and papers of the Ninth International Conference on Bear Research and Management. Bears—Their Biology and Management (Claar, J.J. and P. Schullery, eds). Missoula, MT.

Gunther, K. A., M. A. Haroldson, K. Frey, S. L. Cain, J. Copeland, and C. C. Schwartz. 2004. Grizzly bear--human conflicts in the Greater Yellowstone Ecosystem, 1992-2000. Ursus 15(1):10-22.

Gunther, K.A, M.T. Bruscino, S.L. Cain, K. Frey, L. Hanauska-Brown, M. Haroldson and C.C. Schwartz. 2004a. Grizzly Bear-Human Conflicts in the Greater Yellowstone Ecosystem. Pages 53-56 *in* C. C. Schwartz and M. A. Haroldson, Eds. Yellowstone grizzly bear investigations: Annual report of the Interagency Grizzly Bear Study Team, 2003. U.S. Geological Survey, Bozeman, Montana.

Haroldson, M.A. 2006. Grizzly bear mortalities. Pages 16-22 *in* C.C. Schwartz, M.A. Haroldson, and K. West, editors. Yellowstone grizzly bear investigations: annual report of the Interagency Grizzly Bear Study Team, 2005. U.S. Geological Survey, Bozeman, Montana.

Haroldson, M. A. and K. Frey. 2004. Grizzly bear mortalities. Pages 22-25 in C. C. Schwartz and M. A. Haroldson, eds. Yellowstone grizzly bear investigations: annual reports of the Interagency Grizzly Bear Study Team, 2003. U.S. Geological Survey, Bozeman, MT.

Haroldson, M. A. Ternant, K. A. Gunther, and C. C. Schwartz. 2002. Grizzly bear denning chronology and movements in the Greater Yellowstone Ecosystem. Ursus 13:29-37.

Hilderbrand, G. V., S. G. Jenkins, C. C. Schwartz, T. A. Hanley, and C. T. Robbins. 1999. Effect of seasonal differences in dietary meat intake on changes in body mass and composition in wild and captive bears. Canadian Journal of Zoology 77:1623-1630.

Interagency Grizzly Bear Study Team (IGBST). 2005. Reassessing methods to estimate population size and sustainable mortality limits for the Yellowstone grizzly bear. Interagency Grizzly Bear Study Team, U.S. Geological Survey, Northern Rocky Mountain Science Center, Montana State University, Bozeman, Montana, U.S.A.

IGBST. 2000. Yellowstone Grizzly Bear Investigations, Report of the Interagency Study Team 2000. U.S. Geological Survey, Wyoming Game and Fish Department, U.S. Fish and Wildlife Service, Montana Fish, Wildlife and Parks Department, U.S.D.A. Forest Service, Idaho Fish and Game Department (Charles C. Schwartz and Mark A. Haroldson, Eds).

Interagency Conservation Strategy Team (ICST). 2003. Final Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Area. The Interagency Conservation Strategy Team. 174 pp.

Interagency Grizzly Bear Committee (IGBC). 1986. Interagency grizzly bear guidelines. U.S. Forest Service, Washington, D.C.

Jacoby, M. E., G. V. Hilderbrand, C. Servheen, C. C. Schwartz, S. M. Arthur, T. A. Hanley, C. C. Robbins, and R. Michner. 1999. Trophic relations of brown and black bears in several western North American ecosystems. Journal of Wildlife Management 63:921–929.

Januszewski, M.C., S.C. Olsen, R.G. McLean, L. Clark, and J.C. Rhyan. 2001. Experimental infection of nontarget species of rodents and birds with Brucella abortus strain RB51 vaccine. Journal of Wildlife Diseases 37(3):532-537.

Kasworm, W. F., and T. L. Manley. 1989. Road and trail influences on grizzly bears and black bears in northwest Montana. International Conference on Bear Research and Management 8:79-84.

Knight, R. R. and L. L. Eberhardt. 1985. Population dynamics of Yellowstone grizzly bears. Ecology 66(2):323-334.

Knight, R. R. and S. L. Judd. 1983. Grizzly bears that kill livestock. International Conference for Bear Research and Management 5:186-190.

Linnell, J. D. C., J. E. Swenson, R. Anderson, and B. Barnes. 2000. How vulnerable are denning bears to disturbance? Wildlife Society Bulletin 28(2):400-413.

Lubow, B.C., and B.L. Smith. 2004. Population dynamics of the Jackson elk herd. Journal of Wildlife Management. 68(4):810-829

Mattson, D. J. 2001. Myrmecophagy by Yellowstone grizzly bears. Canadian Journal of Zoology 79:779-793.

Mattson, D. J. and D. P. Reinhart. 1997. Excavation of red squirrel middens by grizzly bears in the whitebark pine zone. Journal of Applied Ecology 34:926-940.

Mattson, D. J. and D. P. Reinhart. 1995. Influences of cutthroat trout (*Onchorhynchus clarki*) on behavior and reproduction of Yellowstone grizzly bears (*Ursus arctos*), 1975-1989. Canadian Journal of Zoology 73:2072-2079.

Mattson, D. J. and R. R. Knight. 1991. Effects of access on human-caused mortality of Yellowstone grizzly bears. USDI National Park Service, Interagency Grizzly Bear Study Team Report 1991B.

Mattson, D. J., M. G. French, and S. P. French. 2002. Consumption of earthworms by Yellowstone grizzly bears. Ursus 13:105-110.

Mattson, D. J., B.M. Blanchard, and R.R. Knight. 1992. Yellowstone grizzly bear mortality, human habituation, and whitebark pine seed crops. Journal of Wildlife Management 56:432-442.

Mattson, D. J., B. M Blanchard, and R. R. Knight. 1991. Food habits of Yellowstone grizzly bears, 1977-1987. Canadian Journal Zoology 69:1619-1629.

Mattson, D. J., C. M. Gillin, S. A. Benson, and R. R. Knight. 1991a. Bear feeding activity at alpine insect aggregation sites in the Yellowstone ecosystem. Canadian Journal of Zoology 69:2430-2435.

Podruzny, S. 2005. Occupancy of Bear Management Units by Females with Young. Page 17 *in* C.C. Schwartz, M.A. Haroldson and S. Podruzny, editors. Yellowstone Grizzly Bear Investigations: Annual report of the Interagency Grizzly Bear Study Team, 2004. U.S. Geological Survey. Bozeman, Montana. 131 pp.

Podruzny, S. Cherry, C. C. Schwartz, and L. A. Landenburger. 2002. Grizzly Bear Denning and Potential Conflict Areas in the Greater Yellowstone Ecosystem. Ursus 13:19-28.

Podruzny, S. and K. Gunther. 2001. Spring Ungulate Availability and Use by Grizzly Bears in Yellowstone National Park. Pages 33-36 *in* C. C. Schwartz and M. A. Haroldson, editors. Yellowstone Grizzly Bear Investigations: Annual report of the Interagency Grizzly Bear Study Team, 2000. U.S. Geological Survey. Bozeman, MT.

Pyare, S., S. Cain, D. Moody, C. Schwartz, and J. Berger. 2004. Carnivore re-colonization: reality, possibility and a non-equilibrium century for grizzly bears in the Southern Yellowstone Ecosystem. Animal Conservation 7:1-7.

Reinhart, D. P., M. A. Haroldson, D. J. Mattson, and K. A. Gunther. 2001. Effects of exotic species on Yellowstone grizzly bears. Western North American Naturalist 61(3):227-288.

Robinson, H.L., C.C. Schwartz, J.D. Petty and P.F. Brussard. 2006. Assessment of pesticide residues in army cutworm moths (*Euxoa auxiliaries*) from the Greater Yellowstone Ecosystem and their potential consequences to foraging grizzly bears (*Ursos arctos horribilis*). Chemosphere 64:1704-1712

Schwartz, C.C., M.A. Haroldson, K. West, editors. 2006. Yellowstone grizzly bear investigations: annual report of the Interagency Grizzly Bear Study Team, 2005. U.S. Geological Survey, Bozeman, Montana. 90 pp.

Schwartz, C.C., M.A. Haroldson, K.A. Gunther, and D. Moody. 2002. Distribution of grizzly bears in the Greater Yellowstone Ecosystem 1990-2000. Ursus 13:203-212.

U.S. Fish and Wildlife Service (USFWS). 2005. Endangered and Threatened Wildlife and Plants; Designating the Greater Yellowstone Ecosystem Population of Grizzly Bears as a Distinct Population Segment; Removing the Yellowstone Distinct Population Segment of Grizzly Bears From the Federal List of Endangered and Threatened Wildlife; Proposed Rule. Federal Register 70 (221):69854-69884.

USFWS. 2003. Final conservation strategy for the grizzly bear in the Yellowstone ecosystem. U.S. Fish and Wildlife Service, Missoula, Montana 87 pp.

USFWS. 1993. Grizzly Bear Recovery Plan. Missoula, MT 181 pp.

USFWS. 1982. Grizzly bear recovery plan. Fish and Wildlife Reference Service. Denver, Colorado.

USFWS. 1975. Endangered and Threatened Wildlife: Amendment Listing the Grizzly Bear of the 48 Conterminous States as a Threatened Species. Federal Register 40(145):31734-31736.

U.S. Geological Survey (USGS). 2005. Website accessed January 2006. Katherine Kendall, Principal Investigator. http://nrmsc.usgs.gov/research/grizzlyb.htm

Zager, B., and J. Beecham. 2006. The role of American black bears and brown bears as predators on ungulates in North America. Ursus 17(2):95-108

April 29, 2013

Memorandum

To: Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming

From: Superintendent, Grand Teton National Park, Moose, Wyoming

Subject: Re-initiation of formal consultation on Grand Teton National Park and National Elk Refuge Bison and Elk Management Plan/EIS (Formal Consultation No. ES-6-WY-07-F014)

In February 2007, Grand Teton National Park (GRTE) and the National Elk Refuge (NER) submitted to your office the Bison and Elk Management Plan (BEMP) and related materials necessary to initiate formal consultation regarding potential impacts to threatened and endangered species (Formal Consultation No. ES-6-WY-07-F014). The final biological opinion for this consultation provided for an incidental take of 1 grizzly bear related to GRTE's elk reduction program (ERP). On November 22, 2012, a group of 3 hunters participating in the ERP shot and killed an adult male grizzly bear in the Snake River bottoms area of Hunt Area 75, within GRTE. This leaves the park with no additional grizzly bear take related to the ERP during the remaining 9 years of the plan's intended 15 year life span. Accordingly, with this letter we are requesting to re-open formal consultation on the BEMP.

The BEMP acknowledged that grizzlies occurred in GRTE's Hunt Area 79 and that they were anticipated to occur in Hunt Area 75, particularly along the Snake River bottoms and on Blacktail Butte, where hunters "may experience a higher risk of grizzly conflict than in other portions of Area 75" (p. 190 final BEMP, cited from the FWS biological opinion). The Draft BEMP/EIS further stated:

- "The ecosystem's grizzly bears number an estimated 400-600, and their distribution has been increasing over the past two decades. They widely use the northern two-thirds of the park, but can occur throughout the park and surrounding areas" (p.153).
- Under ***Impacts Common to All Alternatives***... "*Hunting Risks to Grizzly Bears* – As the grizzly bear population continues to expand southward, the risk of conflicts between hunters and grizzlies would increase and could result in increased mortality for bears and hunters under Alternatives 1,3,4,5, and 6, which would continue....., when necessary, an elk reduction program in the park" (p. 345).

Similarly, the biological opinion acknowledged that "the long term risk [of hunting related grizzly mortality]...would be considerably higher in all areas where grizzly bear occur," and that "the service anticipates that the proposed action will exacerbate the short-term risk for hunting-related grizzly bear mortality with the park..."(final BEMP p.194-195).

Conditions associated with the ERP remain largely the same as they were in 2007 except, as anticipated in the plan, grizzly bear distribution and numbers in the south end of the park appear to have increased. We have documented these changes based on opportunistic observations. Since 2007, several grizzly bears have been observed seeking out gut piles left on the landscape during the elk reduction program, just as they have throughout the ecosystem for decades during hunting seasons. We believe that grizzly bears will continue this behavior and that the risk of hunter-grizzly bear contacts will continue to be relatively high as long as the ERP is necessary.

In 2013, GRTE, in collaboration with the Wyoming Game and Fish Department, proposed several new measures to help mitigate the potential for hunter-grizzly bear conflicts during the ERP. These include: 1) closing the Snake River bottoms between Ditch Creek and Dead Man's Bar; 2) beginning the hunt 2 weeks later; 3) limiting ammunition carried in the field to 7 cartridges per day; and 4) limiting the number of shots hunters can take at a group of running elk to one (the latter two measures aim to reduce elk wounding loss).

Existing measures to help minimize human-bear encounters during the elk reduction program include: 1) requiring all hunters to carry bear spray; 2) maintaining a significant ranger presence and contacting a high percentage of program participants in the field; 3) not allowing artificial elk calls, which can draw bears to hunters; 4) providing a secure camping area for participants where carcasses can be safely stored out of reach of bears; 5) providing an abundance of bear safety educational materials to all permit holders, including warnings that hunters can expect to encounter bears while hunting in the park; and 6) significantly reducing numbers of hunters in the field (elk reduction program permits issued have declined from 1,150 in 2007 to 725 in 2012, and are proposed to further decrease to 650 in 2013; Table 2).

In addition, GRTE has developed and implemented several new grizzly bear conservation measures since 2007. First, we initiated a new "Be Bear Aware" campaign in 2007. This effort emphasized improving management of visitors in bear country through development, purchase, and placement of a variety of new information and education materials. Second, in 2007 we created the "Wildlife Brigade", a corps of paid and volunteer staff to respond to the rapidly escalating number of traffic jams caused by grizzly and black bear sightings along roads ('bear jams'); enforce food storage at campgrounds, picnic areas, and other developed areas; and continue refining the park's bear management program. This new program has been highly successful. In recent years the crew has consisted of one full-time bear management specialist, 2 paid seasonal rangers, and 10-12 seasonal volunteers and interns. They manage hundreds of bear jams annually, patrol park facilities and trails daily for food storage compliance, write courtesy food storage warnings for visitors, and educate thousands of visitors through direct contacts in the process. Third, we initiated a campaign in 2008 to purchase and install additional bear-resistant food storage boxes in collaboration with the Grand Teton National Park Foundation and park concessionaires. To date, nearly 400 boxes have been installed in camp sites and other developed areas. Fourth, in 2009, the park contracted the Wyoming Survey and Analysis Center at the University of Wyoming to evaluate effectiveness of our "Be Bear Aware" message. The results of this work provided valuable feedback on which park visitors were being reached and how the message affected their behaviors. Finally, in 2012 the park contracted a marketing specialist from Montana State University to study and evaluate "Be

Bear Aware" messaging ecosystem-wide. Results of this work also provided valuable feedback to land and wildlife management agencies about current messaging systems and how to improve them in the future. Overall, GRTE's program has been highly successful at minimizing human-grizzly bear conflicts, with no management removals or relocations required since 2007 (Table 1).

Table 1. Grizzly bear conflicts in Grand Teton National Park 2007-2012.

Date	Type	Location	Action	Comments
6-13-2007	Human injury	Willow Flats	None	Mauling
7-14-2007	Mortality	Hwy 89/191/287 near Arizona Creek	None	Road kill male cub of year
6-26-08	Property damage	Grassy Lake Rd campsite #2	None	Bear ripped tent, no attractants
5-9-10	Property damage, food reward	Huckleberry Hot Springs	Area temporarily closed, bear box installed	Adult bear closely approached and obtained food in day pack
6-2-10	Mortality	Hwy 89/191/26 near Spread Creek	None	Road kill male 3 year old G133
6-21-10	Property damage	Grassy Lake Rd campsite #1	None	Bear ripped tarp off tent, no attractants
10-25-11	Food Reward	Hwy 89/191/26 near Moose	None	Family group (610 plus 3 COY) observed rummaging through trash bag along highway
10-30-11	Human injury	Snake River Bottom near Schwabacher Landing	Area temporarily closed	Mauling
5-27-12	Food Reward	Colter Bay Developed Area	None	Yearling grizzly bear allegedly fed from a car
6-21-2012	Mortality	Hwy 89/191/26 near Lost Creek Road	None	Road kill male yearling
11-22-2012	Mortality	Snake River Bottom near Schwabacher Landing	Area closed for remainder of Elk Reduction Program	Adult male grizzly killed in self-defense

The ERP has occurred annually since 2007 and has been developed and administered as per conditions

set for in the park's establishing legislation (Public Law 81-787, 64 STAT 849). The need for the program is evaluated annually, and seasons are set in coordination with the Wyoming Game and Fish Department (Table 2).

Table 2. Grand Teton National Park elk reduction program permits and harvest, 2007-2013.

Year	Area 75 Permits	Area 79 Permits	Total Permits	Total Harvest	Comments
2007	500	650	1150	214	Some A79 permits also valid in A75
2008	550	600	1150	264	Some A79 permits also valid in A75
2009	325	575	900	361	Some A79 permits also valid in A75
2010	325	150	475	341	Some A79 permits also valid in A75
2011	675	75	750	278	Some A79 permits also valid in A75
2012	700	25	725	187	100% antlerless tags
2013[1]	650	0	650		A75 Type 4 permits valid in A79 Oct 19 – November 3, 2013

[1]Proposed

The Final Biological Opinion (USFWS 2007) identified 1 broad Reasonable and Prudent Measure, 3 specific Terms and Conditions, and 9 Conservation Recommendations. The park has complied with each of these.

Summary

GRTE is requesting to re-initiate formal consultation on its 2007 BEMP/EIS, completed with the NER, because the level of ERP grizzly bear incidental take (1) in the FWS's 2007 Final Biological Opinion (USFWS 2012) was reached in 2012. The Yellowstone ecosystem grizzly bear population has appeared to remain relatively steady since 2007 (IGBST 2012), but its distribution has increased in the GRTE vicinity (Schwartz et al. 2006, Bjornlie et al. 2013), corroborating increased sightings of grizzly bears, including females with young, in the southern half of the park.

GRTE has complied with all requirements and recommendations set forth by the FWS in the biological opinion (USFWS 2007), and has been highly successful at minimizing human-grizzly bear conflicts through intensive programs for food and garbage storage, management of bear jams, public education, hunting-specific conflict reduction measures, and other conservation actions.

We believe continued implementation of the BEMP is likely to incur additional losses of grizzly bears from hunter-grizzly bear conflicts, which will adversely affect grizzly bears. However, we also believe the number of bears affected will be small and will not jeopardize the continued existence of the Yellowstone ecosystem grizzly bear population.

If you have questions or need additional information regarding this matter, please contact senior wildlife biologist Steve Cain at 307-739-3485.

Literature Cited

Bjiornlie, D. D., D. J. Thompson, M. A. Haroldson, C. C. Schwartz, K. A. Gunther, S. L. Cain, and D. B. Tyers. 2013. Methods to estimate distribution and range extent of grizzly bears in the Greater Yellowstone Ecosystem. *In Review.*

Haroldson, M.A., C.C. Schwartz, S. Cherry, and D.S. Moody. 2004. Possible effects of elk harvest on fall distribution of grizzly bears in the Greater Yellowstone Ecosystem. Journal of Wildlife Management 68(1):129-137.

Schwartz, C. C., Haroldson M. A., Gunther K. A., Moody D. 2006. Distribution of grizzly bears in the Greater Yellowstone Ecosystem in 2004. Ursus 17(1):63-66.

Interagency Grizzly Bear Study Team (IGBST). 2012. Unpublished data. USGS Northern Rocky Mountain Science Center, Interagency Grizzly Bear Study Team, Bozeman, Montana.

USFWS. 2007. Memorandum, from Wyoming Field Supervisor to National Elk Refuge Manager. Final Biological Opinion for the Bison and Elk Management Plan Grand Teton National Park Transprotation Plan (Formal Consultation No. ES-6-WY-07-F014). U.S. Fish and Wildlife Service, Cheyenne, Wyoming.

USFWS and USNPS. 2007. Bison and Elk Management Plan: National Elk Refuge and Grand Teton National Park. U.S. Fish and Wildlife Service and U.S. National Park Service. Lakewood, CO. 251pp.

CC: Manager, National Elk Refuge.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

SEP 13 2013

In Reply Refer To:
06E13000/WY13F0094

Memorandum

To: Superintendent, National Park Service, Grand Teton National Park, Moose, Wyoming

Refuge Manager, U.S. Fish and Wildlife Service, National Elk Refuge, Jackson, Wyoming

From: Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming

Subject: Re-initiation of formal consultation on Grand Teton National Park and National Elk Refuge Bison and Elk Management Plan/EIS

This memorandum transmits the U.S. Fish and Wildlife Service's (Service) addendum to our biological opinion on the 2007 Bison and Elk Management Plan for the National Elk Refuge and Grand Teton National Park Environmental Impact Statement and a correction regarding the Bridger-Teton National Forest (Forest). Grand Teton National Park (Park) and the National Elk Refuge (Refuge) formally consulted with the Service on the Bison and Elk Management Plan (hereafter, Plan) in 2007, and the Service issued a subsequent biological opinion (our memorandum WY07F014). Our biological opinion included an Incidental Take Statement (ITS) for an anticipated level of incidental take of one grizzly bear (*Ursus arctos horribilis*) in the Park as a result of hunter-related mortality related to the legislatively permitted elk reduction program (ERP; part of the Plan).

Subsequent to the 2007 ITS, incidental take of one adult male grizzly bear occurred in the Park in November 2012. As a result, Mr. Steve Cain of your staff contacted our office to discuss the Park reaching its limit of incidental take and the Park's desire to reinitiate formal consultation before take is exceeded. As provided in 50 CFR 402.16, "reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded;

..." The Park reinitiated formal consultation in a memorandum dated May 2, 2013, which was received in our office on May 3.

The Park's and Refuge's original Plan Environmental Impact Statement (EIS) analyses covered the Park, Refuge, and adjacent lands, including portions of the Bridger-Teton National Forest (Forest); however, the final Plan EIS decision covered only the Park and Refuge. In addition to incidental take of one grizzly bear in the Park, we also anticipated take of two grizzly bears on the Forest during the 15-year time period for which the biological opinion was valid. There was no incidental take anticipated for the Refuge due to lack of grizzly bear presence or conflict on the Refuge at that time.

In response to the Park's reinitiation of formal consultation and after review of the 2007 biological opinion, the Service believes authorization of incidental take for the Forest was in error as the Forest was not covered by the final Plan EIS decision. Therefore, we are rescinding incidental take of two grizzly bears on the Forest and the following biological opinion addendum covers only the Park and Refuge.

The Park's May 2013 memo provided an update of activities relevant to the 2007 Plan EIS and Service's biological opinion. The 2007 Plan EIS described all proposed actions and potential effects to listed species; therefore, those documents may be referenced for detailed background information. This memo/addendum to our 2007 biological opinion documents our analysis of the Park's new information, tiers off of our original biological opinion, and provides a new Incidental Take Statement (ITS) for grizzly bears, which reflects current conditions within the Park and Refuge. Our new ITS below anticipates incidental take for the Refuge and increases the amount of take for the Park. This addendum and new ITS supersede the previous 2007 ITS, and this addendum and new ITS are valid for the remaining 9 years under the 2007 biological opinion, through the year 2022.

Your memo indicated incidental take of one adult male grizzly bear occurred in November 2012 by a group of hunters participating in the ERP, in the Park's Snake River bottoms area of Hunt Area 75. The Plan anticipated grizzlies would occur in the Park's Hunt Area 75, particularly along the Snake River bottoms and on Blacktail Butte. Conditions associated with the ERP remain largely the same as they were in 2007 except that, as anticipated in the Plan, grizzly bear distribution and numbers in the south end of the Park appear to have increased. These changes were documented based on research done by the Interagency Grizzly Bear Study Team and on opportunistic observations. Since 2007, several grizzly bears have been observed seeking out gut piles left on the landscape during the ERP on Park lands and just recently on Refuge lands. It is likely grizzly bears will continue this behavior, resulting in a relatively high risk of hunter-grizzly bear contacts as long as the ERP is necessary.

To help mitigate the potential for hunter-grizzly bear conflicts during the ERP, Park staff, in collaboration with the Wyoming Game and Fish Department, proposed several new measures. These include (verbatim from your memo, p. 2): 1) closing the Snake River bottoms between Ditch Creek and Dead Man's Bar; 2) beginning the hunt two weeks later; 3) limiting ammunition carried in the field to seven cartridges per day; and 4) limiting the number of shots hunters can take at a group of running elk to one (the latter two measures aim to reduce elk wounding loss).

These new measures were proposed specifically for the 2013 season and in the future, they may change. Specific area openings or closures and associated timing have varied over time (items 1 and 2); however, items 2 and 3 will likely remain in the future as conditions of the permit (S. Cain 2013, email).

Existing measures to help minimize human-bear encounters during the ERP include (verbatim from your memo, p. 2): "1) requiring all hunters to carry bear spray; 2) maintaining a significant ranger presence and contacting a high percentage of program participants in the field; 3) not allowing artificial elk calls, which can draw bears to hunters; 4) providing a secure camping area for participants where carcasses can be safely stored out of reach of bears; 5) providing an abundance of bear safety educational materials to all permit holders, including warnings that hunters can expect to encounter bears while hunting in the park; and 6) significantly reducing numbers of hunters in the field (elk reduction program permits issued have declined from 1,150 in 2007 to 725 in 2012, and are proposed to further decrease to 650 in 2013."

The Park has also developed and implemented several new grizzly bear conservation measures since 2007 as follows (your memo, pp. 2-3): 1) a "Be Bear Aware" campaign which emphasizes improved management of visitors in bear country through information and education materials; 2) the "Wildlife Brigade", a corps of paid and volunteer staff to respond to traffic jams caused by grizzly and black bear sightings along roads ('bear jams'), to patrol, educate, and enforce food storage at campgrounds, picnic areas, and other developed areas, and other activities; 3) install additional bear-resistant food storage boxes; and 4) evaluate the effectiveness of the Park's "Be Bear Aware" message (subsequent results provided valuable feedback about current messaging systems and how to improve them in the future). Overall, the Park's program has been highly successful at minimizing human-grizzly bear conflicts, with no management removals or relocations required since 2007.

Your memo indicated the Park has complied with all requirements and recommendations in the Service's 2007 biological opinion and has been highly successful at minimizing human-grizzly bear conflicts through intensive management and conservation actions and programs. In addition, the need for the ERP is evaluated annually, and seasons are set in coordination with the Wyoming Game and Fish Department.

In 2011, the IGBST's total Greater Yellowstone Ecosystem (GYE) population estimate was 593 bears (95% CI 533-652; Haroldson 2012). The estimated population growth rate trajectory has changed from 4-7% during the 1980s and 1990s to currently stable to slightly increasing, depending on what segment of the population is considered (e.g., in versus outside of the Recovery Zone). The slowing population growth rate has been anticipated and currently may be due to one or a combination of density-dependent effects or declines in key food resources. We also acknowledge the GYE grizzly bear distribution has expanded in various areas in the ecosystem, including in the Park (Schwartz et al. 2006, Bjornlie et al. 2013, as cited in your memo).

The Service agrees that continued implementation of the Plan is likely to incur additional losses of grizzly bears from hunter-grizzly bear conflicts, which will adversely affect grizzly bears. However, we believe that given the current estimated population of grizzly bears in the GYE and

overall sustainable annual mortality levels (based on the last 5 years of IGBST annual reporting of mortalities and population trends), the number of bears affected by the Plan will be small and will not jeopardize the continued existence of the Yellowstone ecosystem grizzly bear population. Therefore, given the existing Plan and likelihood for additional grizzly bear mortalities by hunters participating in the ERP and hunting bison; and the stable to slightly increasing grizzly bear population and expanding distribution, we anticipate an increase in the number of grizzly bear/hunter conflicts and subsequent mortality within the Park and Refuge. Given the existing and new conservation measures, we believe the Plan and ERP will not affect the recovery of grizzly bears in the ecosystem or result in jeopardy to the species.

Based on the above information, the Service anticipates up to 4 additional grizzly bears in the Park and 2 grizzly bears on the Refuge may be incidentally taken directly or indirectly as a result of the Plan during the remaining 9 years this biological opinion is valid. The cumulative amount of take now equals 5 grizzly bears in the Park and 2 grizzly bears on the Refuge for the remaining 9-year duration of this biological opinion (through 2022); to date, 1 incidental take has occurred in the Park. We are also adding a Term and Condition #4 (see p. 26 of 2007 biological opinion) that will require the Park and Refuge to submit an annual report regarding: (1) the previous year's level of incidental take, and (2) a brief narrative on any of our Conservation Recommendations the Park and Refuge could not adhere to, and other relevant information. This report will be due by April 15 of the subsequent year (e.g., 2013 season report will be submitted to the Service by April 15, 2014). The Service can provide you with a report template to assist you with this reporting requirement. This addendum to the 2007 biological opinion and new Incidental Take Statement supersede the relevant portions of our 2007 biological opinion. In addition, the Service agrees with the new measures being implemented and believes that the Park has adhered to all original conservation measures as required and that these measures are appropriate, adequate, and do not need revising.

This concludes formal consultation on the action described in your May 2013 request for re-initiation of formal consultation on the Grand Teton National Park and National Elk Refuge Bison and Elk Management Plan EIS. If you have any questions regarding this letter or your responsibilities under the Act, please contact Ann Belleman at (307) 421-5839 or our office at the letterhead address.

Enclosure (Appendix E: Biological Opinion)

cc: BTNF, Forest Supervisor, Jackson, WY (C. Kyhl)
BTNF, Forest Biologist, Jackson, WY (G. Hanvey; ghanvey@fs.fed.us)
GTNP, Senior Biologist, Moose, WY (S. Cain; steve_cain@nps.gov)
WGFD, Non-game Coordinator, Lander, WY (B. Oakleaf)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (M. Flanderka)

Literature Cited:

Cain, S. 2013. Email from Cain to Belleman (USFWS) regarding clarification of proposed Park conservation measures for GTNP and NER BEMP. September 4, 2013.

Haroldson, M.A. 2012. Assessing trend and estimating population size from counts of unduplicated females. Pages 10–15 *in* F.T. van Manen, M.A. Haroldson, and K. West, editors. Yellowstone grizzly bear investigations: annual report of the Interagency Grizzly Bear Study Team, 2011. U.S. Geological Survey, Bozeman, Montana, USA.

USFWS. 2007. Memorandum, from Wyoming Field Supervisor to National Elk Refuge Manager. Final Biological Opinion for the Bison and Elk Management Plan (Formal Consultation No. WY07F014). U.S. Fish and Wildlife Service, Cheyenne, Wyoming.

USFWS and USNPS. 2007. Bison and Elk Management Plan: National Elk Refuge and Grand Teton National Park. U.S. Fish and Wildlife Service and U.S. National Park Service. Lakewood, CO. 25lpp.

USNPS. 2013. Memorandum, from Park Superintendent to Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office. Re-initiation of formal consultation on Grand Teton National Park and National Elk Refuge Bison and Elk Management Plan/EIS.

From: Will Meeks
To: Matt Hogan
Subject: Re: info
Date: Thursday, April 10, 2014 10:47:55 AM

Yes . . . in a bison management meeting. ☺Want me to yank him out of it. ☺

Will Meeks
U.S. Fish and Wildlife Service
R6 - Assistant Regional Director
NWRS and PFW
303-236-4303

On Apr 10, 2014, at 10:47 AM, Matt Hogan <matt_hogan@fws.gov> wrote:

> Thanks. Is Santavy in the office today?
>
> On Apr 10, 2014, at 11:02 AM, Will Meeks <will_meeks@fws.gov> wrote:
>
> > Not sure we'll get dragged into this, but here's a heads up. ☺
> >
> > Will Meeks
> > U.S. Fish and Wildlife Service
> > R6 - Assistant Regional Director
> > NWRS and PFW
> > 303-236-4303
> >
> > Begin forwarded message:
> >
> > **From:** Paul Santavy <paul_santavy@fws.gov>
> > **To:** Will Meeks <will_meeks@fws.gov>, Bridget Fahey <bridget_fahey@fws.gov>
> > **Cc:** Kathy Perez <kathy_perez@fws.gov>
> > **Subject: Fwd: info**
> >
> > FYI
> >
> > -Paul
> >
> > Begin forwarded message:
> >
> > *From:* Steve Kallin <steve_kallin@fws.gov>
> > *To:* Paul Santavy <paul_santavy@fws.gov>
> > *Subject:* *FW: info*
> >
> > Paul:
> >
> > See the attached "60-day Notice of Violations of the Endangered Species Act in Connection With Grand Teton National Park's 'Elk Reduction Program' and Annual Hunting of Elk in the Park." ☺Not sure how involved the NER ☺would be in this litigation. ☺The BEMP and NER Supplemental Feeding programs are mentioned. ☺Although I haven't had a chance to read this, I understand the concern is the incidental take of grizzly bears. ☺Certainly the FWS and ES will be involved.
> >
> > Take care,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 733-9212, extension 2

Fax: (307) 733-9729

steve_kallin@fws.gov

From: Cain, Steven (Steve) [mailto:steve_cain@nps.gov]
Sent: Monday, April 07, 2014 10:07 AM
To: Steve Kallin
Subject: Fwd: info

---------- Forwarded message ----------
From: *Belleman, Ann* <ann_belleman@fws.gov>
Date: Fri, Apr 4, 2014 at 10:22 AM
Subject: info
To: "Steven (Steve) Cain" <steve_cain@nps.gov>

Ann Belleman

U.S. Fish and Wildlife Service

Wyoming Ecological Svcs. Field Office

5353 Yellowstone Rd., Suite 308A

Cheyenne, WY 82009

ann_belleman@fws.gov

307-421-5839 (work cell)

307-772-2374 (FWS-Cheyenne)

218-529-5171 (EPA-MN)

--

****

Steve Cain, senior wildlife biologist

Grand Teton National Park and John D. Rockefeller, Jr. Memorial Parkway

PO Drawer 170

Moose, WY 83012

(307)739-3485

****

"*If there are no dogs in heaven, then when I die I want to go where they went" Will Rogers*

<20140307_NOI_ERP Grand Teton.pdf>

From: Jeffrey Warren
To: Steve Kallin
Subject: Wording for JEH objective setting
Date: Friday, April 11, 2014 6:15:22 AM

Steve,

I forgot to get your comments on the wording in the draft plan for the WGFD objective setting process. I believe you had them written on a hard copy – could you scan and email that to me?

The pass may be open now – the county was plowing the road this week and Idaho had started on their side. The warm weather has the water moving a bit; I talked to one person who said the creek was pretty turbid from the runoff. That should get some fish moving out of the lake. I may check it out this weekend.

Thanks,

Jeff

From:	Steve Kallin
To:	Dale Deiter; Kerry Murphy; Tim Fuchs; Doug Brimeyer; Steve Cain; Sarah Dewey; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Kallin
Cc:	Elizabeth Schooner
Subject:	Next BEMP Adaptive Management Planning session at NER Headquarters on Monday, May 5 at 8:30 AM
Date:	Monday, April 14, 2014 9:56:57 AM

Thank you for replying to the last Doodle Poll. The next AMP meeting will be held at the National Elk Refuge Headquarters on Monday, May 5 at 8:30 AM.

We certainly appreciate the time you have devoted to the development of this plan. Look forward to seeing you on May 5th.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Steve Kallin
To: Jeffrey Warren
Cc: Cris Dippel; Eric Cole
Subject: RE: Wording for JEH objective setting
Date: Monday, April 14, 2014 1:42:07 PM

Jeff:

If I recall, I was going to send you a description of a "hard boundary" concerning hazing bison. If you wanted something other than below, let me know.

Bison Hazing Boundary:

Bison will be hazed to the north to prevent entry into the Town of Jackson, if they travel south of a boundary which starts at the Twin Creek Subdivision, follows the Elk Refuge Road west to the Nowlin Gate, then north and west along the refuge administrative road (Hunter Retrieval Road 22), then north along the administrative road to the Refuge Barns, then west along Nowlin Creek to the confluence of Flat Creek, then north along Flat Creek to the northern boundary of the Jackson National Fish Hatchery Compound.

Call if you need any clarification for the above.

Any luck this past weekend?

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Friday, April 11, 2014 6:15 AM
To: Steve Kallin
Subject: Wording for JEH objective setting

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Thanks,

Jeff

From: Steve Kallin
To: Jeffrey Warren
Cc: Cris Dippel; Eric Cole
Subject: RE: Wording for JEH objective setting
Date: Monday, April 14, 2014 3:54:51 PM

Jeff:

The management units where we could potentially use Service-accompanied hunters to condition the bison not to approach Jackson, would be the units south of the bison haze line; the Nowlin and Headquarters units.

Thanks for the update on Red Rock Creek. Hope the conditions improve soon.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
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Jackson, WY 83001
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Fax: (307) 733-9729
steve_kallin@fws.gov

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Monday, April 14, 2014 3:37 PM
To: Steve Kallin
Cc: Cris Dippel; Eric Cole
Subject: RE: Wording for JEH objective setting

Thanks, I made the changes to the plan. What management units would be considered for Service-accompanied hunters.

Walked about a mile of Red Rock Creek downstream of Elk Lake Road yesterday and didn't see a fish. Water was up a little and a bit dark, but not bad, and it was 6° F this morning so runoff must have slowed down quite a bit. The trap is getting put in today.

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Monday, April 14, 2014 1:42 PM
To: Jeffrey Warren
Cc: Cris Dippel; Eric Cole
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Fax: (307) 733-9729
steve_kallin@fws.gov

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steve_kallin@fws.gov

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Thanks,

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From: Steve Kallin
To: Jeffrey Warren
Cc: Cris Dippel; Eric Cole
Subject: RE: Wording for JEH objective setting
Date: Monday, April 14, 2014 3:54:48 PM

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Fax: (307) 733-9729
steve_kallin@fws.gov

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Monday, April 14, 2014 3:37 PM
To: Steve Kallin
Cc: Cris Dippel; Eric Cole
Subject: RE: Wording for JEH objective setting

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Sent: Monday, April 14, 2014 1:42 PM
To: Jeffrey Warren
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Subject: RE: Wording for JEH objective setting

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Thanks,

Jeff

From:	Jeffrey Warren
To:	Cris Dippel; Dale Deiter; Doug Brimeyer; Eric Cole; Kerry Murphy; Sarah Dewey; Steve Kallin; Steven (Steve) Cain; Tim Fuchs
Subject:	Draft statement
Date:	Monday, April 14, 2014 4:03:20 PM

All,

I've pasted below a few sentences to capture the idea that culling, fertility control, etc., may be considered and would fall outside the scope of the current plan. I've purposefully left it vague, but can add more specificity if the group prefers to go that route. Options for the latter could, for example, include setting a running average for population growth while over objective (i.e., >600 bison). Any edits/comments would be appreciated.

Thanks,

Jeff Warren

"Continuous review of population management actions implemented for reaching the bison population objective will be undertaken during the life of this plan. If management actions outlined in this plan prove ineffective for reaching objective other actions that fall outside the scope of this plan may be considered, e.g., agency cull, herd-wide fertility control, and may require NEPA evaluation."

From:	Jeffrey Warren
To:	Cris Dippel; Dale Deiter; Doug Brimeyer; Eric Cole; Kerry Murphy; Sarah Dewey; Steve Kallin; Steven (Steve) Cain; Tim Fuchs
Subject:	Elk fertility control question
Date:	Tuesday, April 15, 2014 3:14:33 PM

Hello all,

I have a quick question/clarification for the group. Last week we changed the wording on a sentence describing one of the elk management strategies (pg. 22 of the draft plan) to clarify that targeted fertility control for the non-migratory segment would occur specifically on private land.

The old sentence:
Targeted fertility control on summer range would also be considered, but would need to go through the proper approval process (i.e., WGFD Commission).

The new sentence:
Targeted fertility control on **private land** summer range **could also be explored by WGFD,** but would need to go through the proper approval process (i.e., WGFD Commission).

My question:
The management action these sentences discuss is described as fertility control for Hunt Area 78 & GTNP South (table 3, pg 16 and 17 of the draft plan). Should this be changed to just Hunt Area 78 to be consistent with the new sentence above? Including GTNP south would trigger NEPA, which is why I believe we made the recent change to explicitly constrain this action to private lands.

Thanks,

Jeff Warren
Wildlife Biologist
US Fish and Wildlife Service
27650B South Valley Rd.
Lima, MT 59739
406.276.3536 ext. 304

From: Jeffrey Warren
To: Steve Kallin; Cris Dippel; Eric Cole
Subject: Updated bison model
Date: Tuesday, April 22, 2014 2:23:32 PM
Attachments: Bison_popn_model.R
NER_Bison_harvest_simulation.docx

I've attached an updated bison population projection for your review. I incorporated a number of recommendations from the group, but couldn't get to all of them. If there is anything you'd like to see added/changed please let me know. I attached the R script for Eric.

Cheers,

Jeff Warren
Wildlife Biologist
US Fish and Wildlife Service
27650B South Valley Rd.
Lima, MT 59739
406.276.3536 ext. 304

Jackson Hole Bison Population Response to Harvest – a Simulation Study

Introduction

The current Jackson Hole Bison population is over objective as defined by the Wyoming Game and Fish Department and in the interagency Bison and Elk Management Plan (BEMP) (USFWS and NPS 2007). Hunter harvest is the primary management action used to manage this population; uncertainty exists as to the efficacy of this action. To better understanding the influence of current harvest levels on bison population, we created a simple recursion equation population model that included harvest. The number of bison, *N*, in year *t*+1 is predicted as

$$N_{t+1} = S(N_{obs,t} + f_t N_{obs,t} R_t) - H_t, \quad (1)$$

with variables defined as

$N_{obs,t} =$ the observed number of bison in year t.

$S =$ survival excluding hunter harvest, assumed constant across age classes (juvenile and adult) and among years**.**

$f_t =$ proportion of adult females in the population after harvest.

$R_t =$ annual reproductive rate, i.e., calf to cow ratio.

$H_t =$ annual hunter harvest

Classification count data provided annual estimates of $N_{obs,t}$, f_t, R_t, H_t. We fitted the model to data from 2006–2013 to obtain a maximum likelihood estimate of S, and then used that estimate to project the amount of time necessary to reach bison population objective. We used eqn. 1 with four stochastic processes – annual reproductive rate, the proportion of females in the population, harvest, and observation error, to conduct 5000 simulations for *t* = 10 years. Reproductive rate and the proportion of females in the population were allowed to vary according to observed variation during 2006–2013; harvest was allowed to vary based on observed variation during 2007–2013. Survival excluding mortality associated with hunter harvest was assumed to be constant. We assumed density-independent growth rates based on observed population growth with no to minimal harvest, 1970–2007 (Fig. 1). Simulations (*n* = 5000)

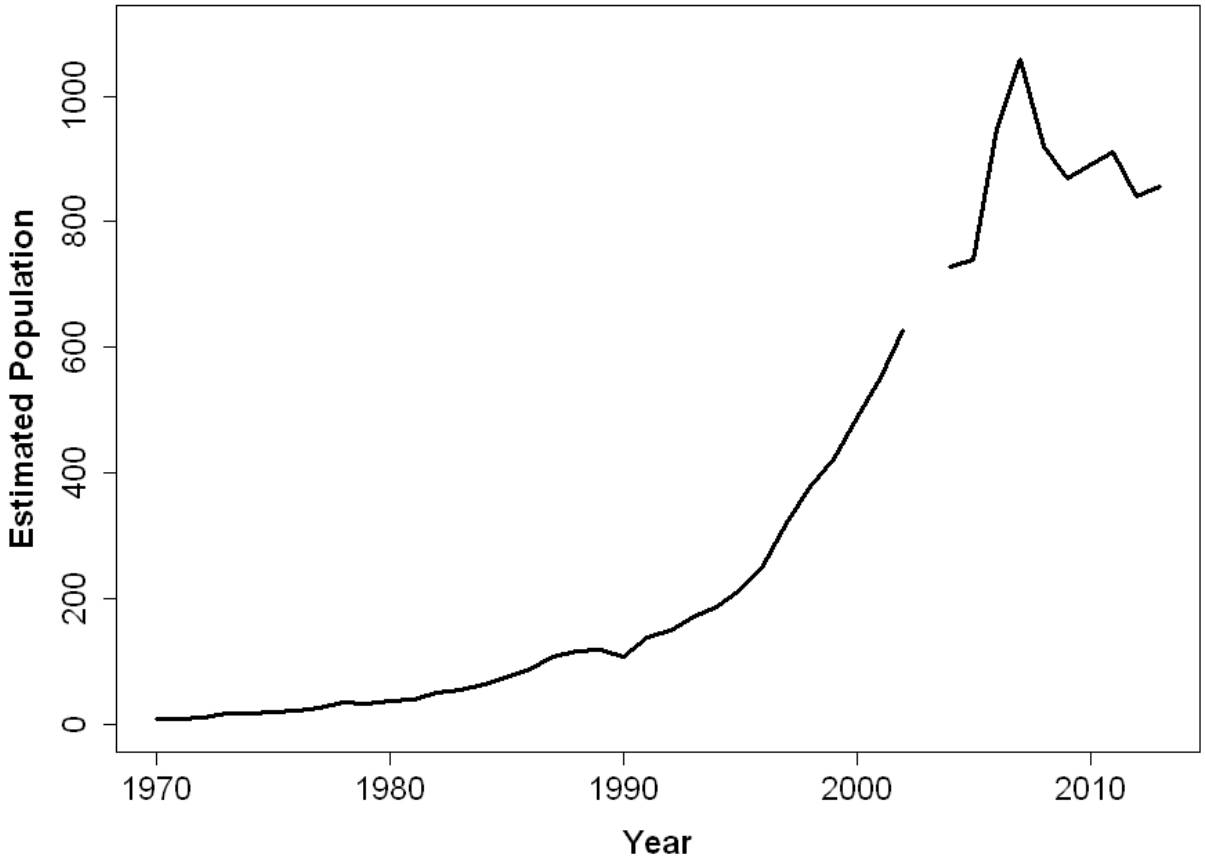


Fig. 1. Bison winter population in the Jackson Hole area, 1970–2013. Minimal to no harvest occurred from 1970–2007**.**

Observation error in the bison population survey, i.e., variation due to imperfect enumeration of the population of interest, was included in the model. If we assume observation error is log-normally distributed, observation error will be

$$N_{obs,t} = N_t V, \tag{2}$$

$$V = exp\left(Z\sigma_v - \frac{\sigma_v^2}{2}\right), \tag{3}$$

where *Z* is normally distributed with a mean of zero and a standard deviation of 1, and the standard deviation of the observation uncertainty is σ_V (Hilborn and Mangel 1997). We assumed observation uncertainty was relatively low and set $\sigma_V = 0.05$.

Results

The MLE of bison survival during 2006-2013, excluding mortality associated with hunter harvest, was 0.994. The population model provided a reasonable fit to the observed data (Fig. 2). During this same period mean annual reproductive rate was 0.420 (SD=0.032) (Fig. 3) and the proportion of females in the population was 0.458 (SD=0.035) (Fig. 4). Hunter harvest during 2007–2013 averaged 210 bison (SD=45.5) (Fig. 5).

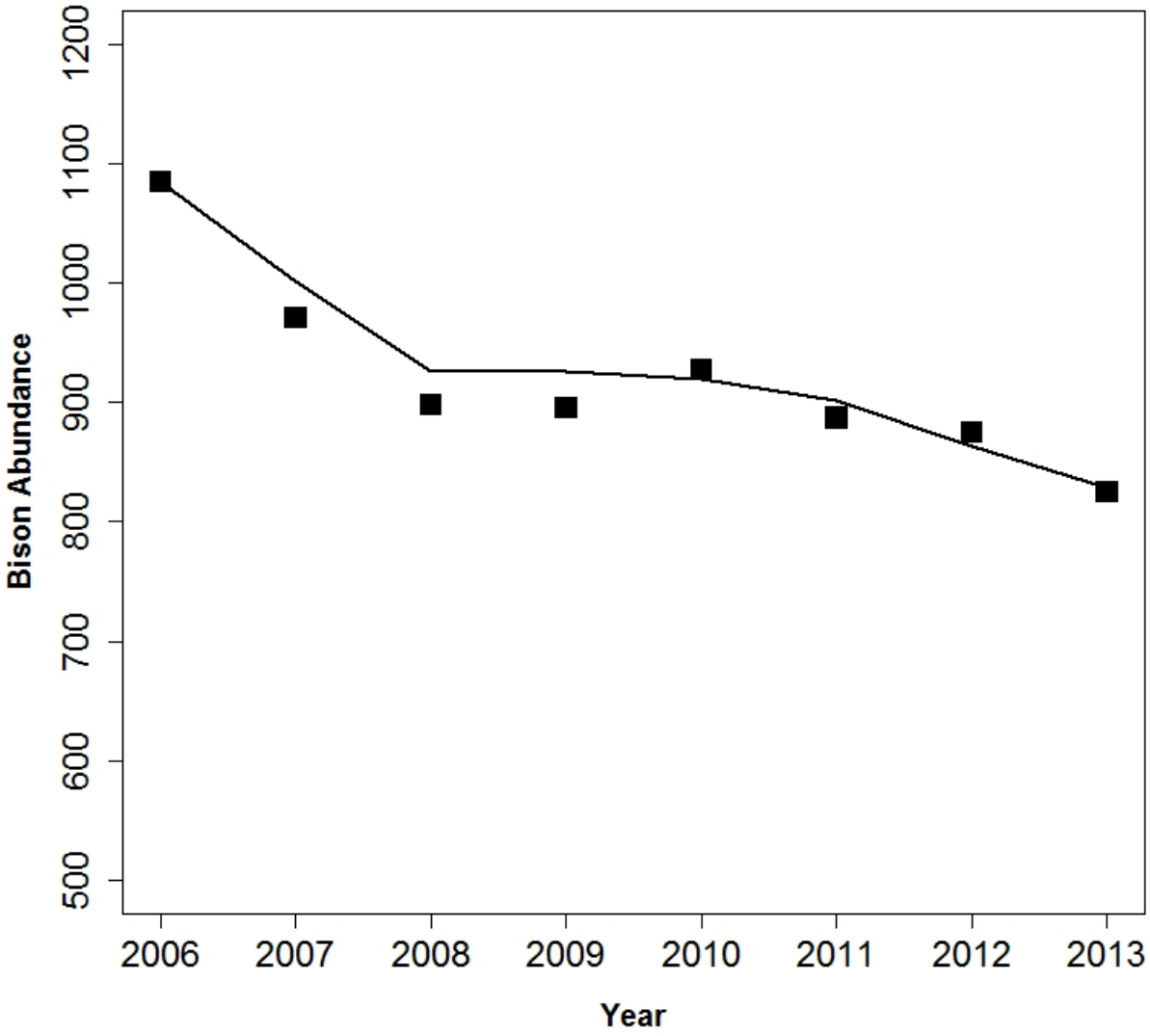


Fig. 2. Predicted (line) and observed (squares) bison population abundance between 2006–2013, Jackson Bison Herd. The population model was fit using maximum likelihood estimation to obtain estimates of bison survival (*S* = 0.994) and annual abundance.

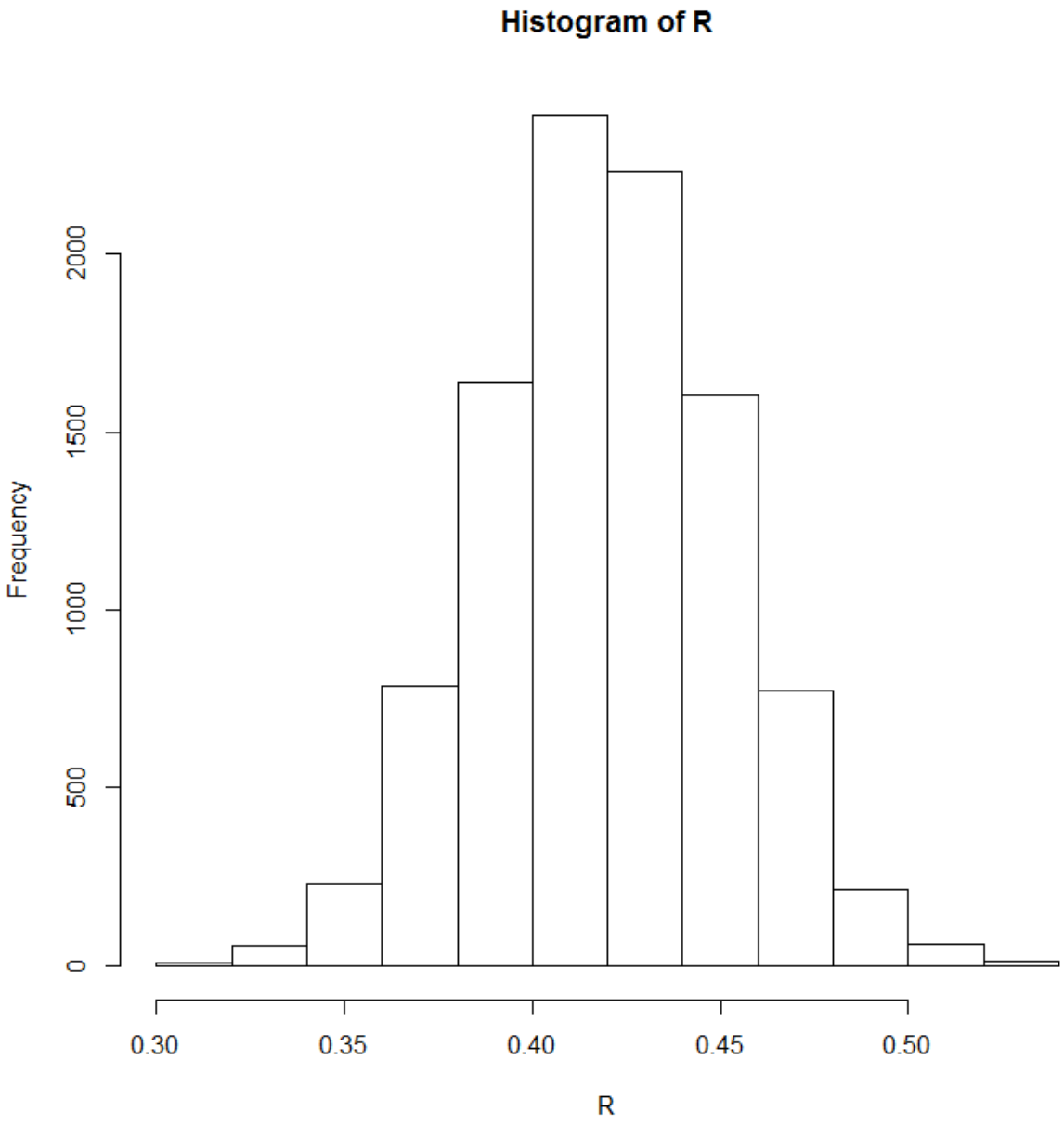


Figure 3. Histogram of simulated reproductive rate, i.e., calves/100 cows, (*n* = 10,000) assuming a normal distribution with mean = 0.420 and SD = 0.032.

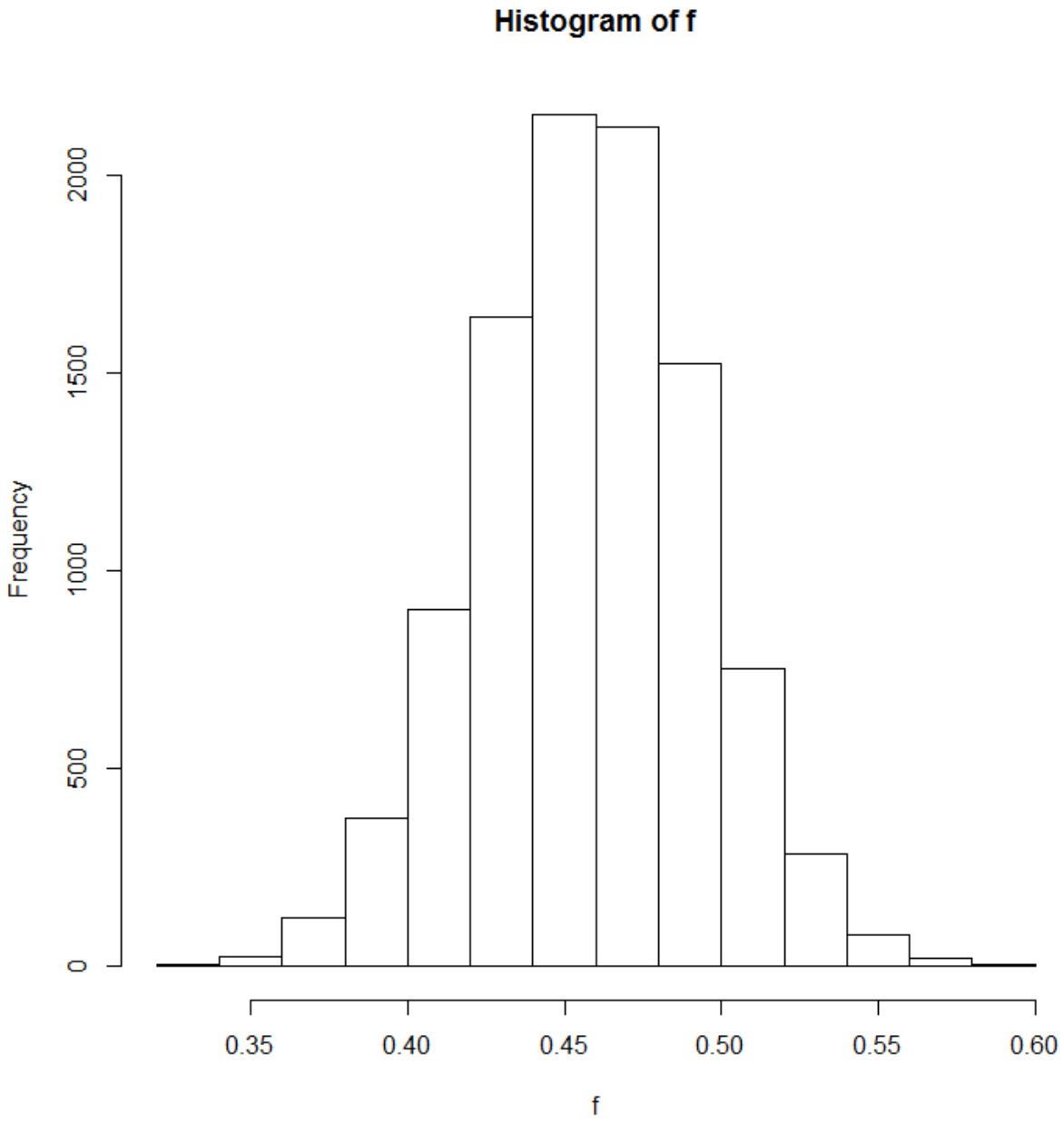


Figure 4. Histogram of simulated proportion of females in the population (*n* = 10,000) assuming a normal distribution with mean = 0.458 and SD = 0.035.

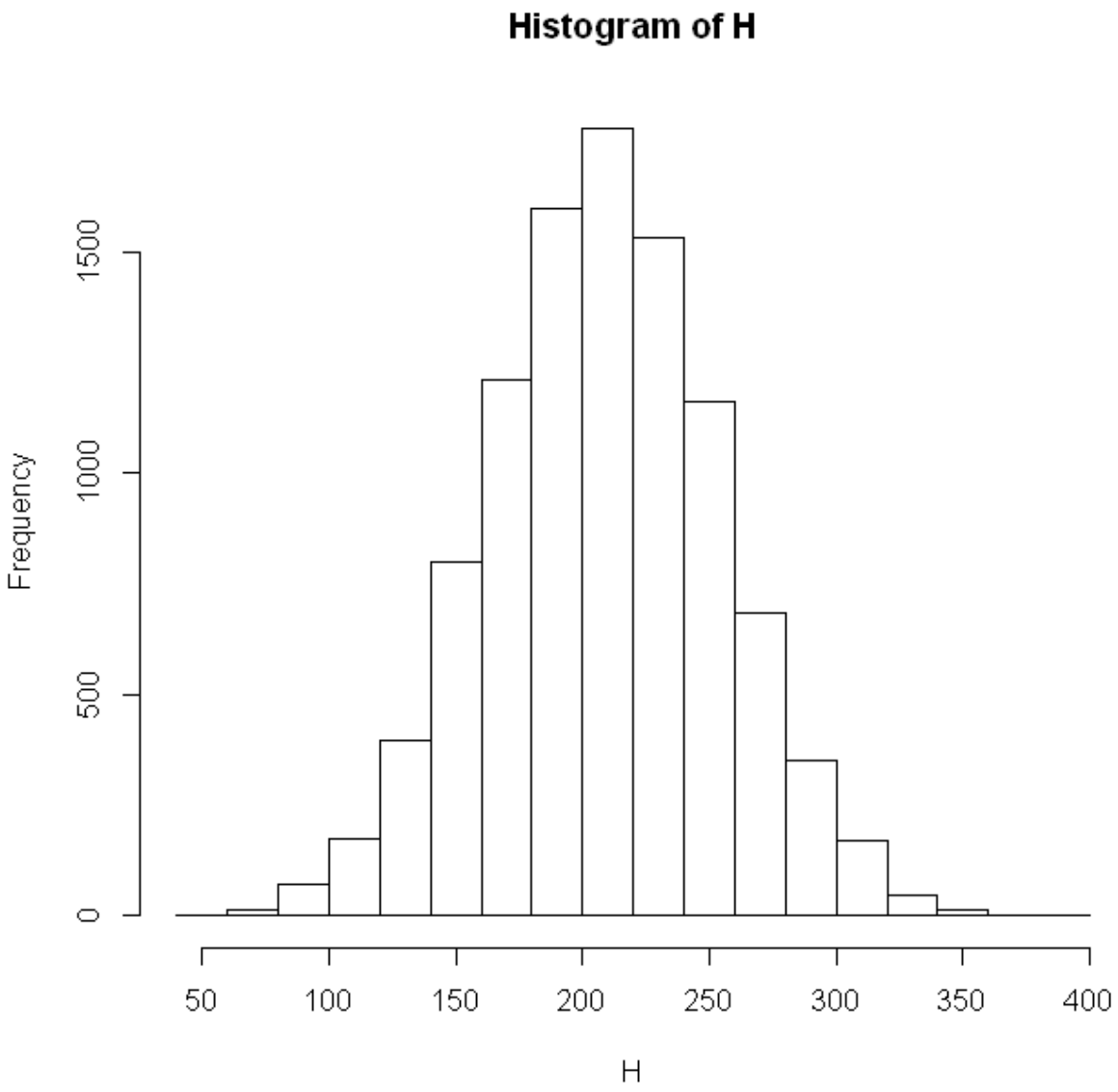


Figure 5. Histogram of simulated hunter harvest values (*n* = 10,000) assuming a normal distribution with mean = 210 and SD = 45.5.

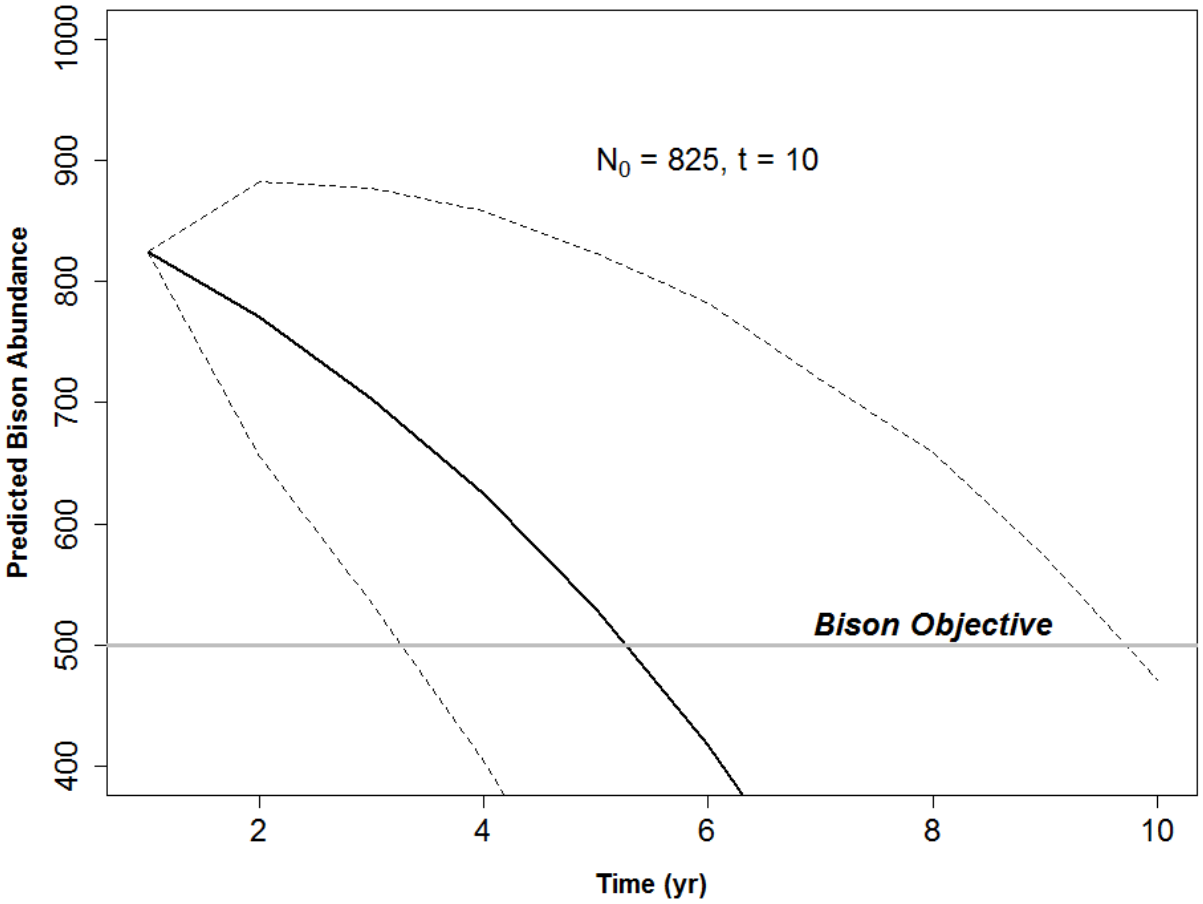


Figure 4. Projected Jackson Bison Herd population based on a stochastic population model with fixed survival (0.994) and stochastically-varying annual reproductive rate (*N*(0.420, 0.032)), proportion of females in the population (*N*(0.458, 0.035), and harvest (*N*(210, 45.5)). Initial population (N_0) was 1000 bison. Horizontal gray line is the current population objective for the Jackson Bison Herd. Dashed lines represent the 90% confidence interval.

Literature Cited

Hilborn, R. and M. Mangel. 1997. The ecological detective: confronting models with data. Monographs in Population Biology 28. Princeton University Press, Princeton, NJ.

[USFWS and NPS] U.S. Fish and Wildlife Service and National Park Service. 2007. Bison and elk management plan. National Elk Refuge and Grand Teton National Park.

From: Steve Kallin
To: Jeffrey Warren
Subject: RE: Strategy for May 5th
Date: Monday, April 28, 2014 11:40:09 AM

Jeff:

Tomorrow, I will try to nail down a time (lunch hour) to discuss with you on Wednesday or Thursday of this week. Are you still in the Mountain Time Zone?

Will be in touch,

Steve Kallin
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steve_kallin@fws.gov

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Monday, April 28, 2014 10:12 AM
To: Steve Kallin
Cc: Eric Cole; Cris Dippel
Subject: Strategy for May 5th

Steve,

I wanted to check in with you to see if you had an idea of how you would like to approach the discussion with the group regarding the influence of the court case on NER perspectives for the ultimate goals of the current plan (i.e., importance of minimizing CWD risk and termination of winter feeding). I'm on the road this week and could set up a time to talk during lunch or a break. I'll have my work cell (406.548.8487).

We're at a place with the process where we'll likely start to need more time between meetings to make meaningful progress on linking desired conditions to elk/bison use. Eric, Kerry and I are working on outlining an example for the group to consider but may not have it developed enough to present it effectively next Monday (you can check in with Eric on that and get his thoughts; I'll defer to him).

Cheers,

Jeff Warren
Wildlife Biologist
US Fish and Wildlife Service
27650B South Valley Rd.
Lima, MT 59739

406.276.3536 ext. 304

From:	Cole, Eric
To:	Steve Kallin; Cris Dippel; Claire Scolnick; Daniel Sharps
Subject:	2014 feed season summary and feed purchase recommendations
Date:	Thursday, May 01, 2014 10:40:56 AM
Attachments:	2014 Feeding Review.pdf

Please see the attached summary which provides considerable detail about the 2014 feed season.

Based on this information I recommend purchase of 1,500 tons of alfalfa pellets. 500 tons will be delivered to the west end of Shed 11 at McBride and 1,000 tons will be delivered to the east end of Shed 4 at Nowlin.

Dan and Cris, please note specific management recommendations regarding removal of feed that was damaged by flooding this winter at the east end of Shed 3, and several recommendations to assure access to the feed grounds during flooding events in future feed seasons.

Thanks,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.733.9212 ext. 7

2014 Feeding Review
5/1/2014
Eric Cole, Refuge Biologist

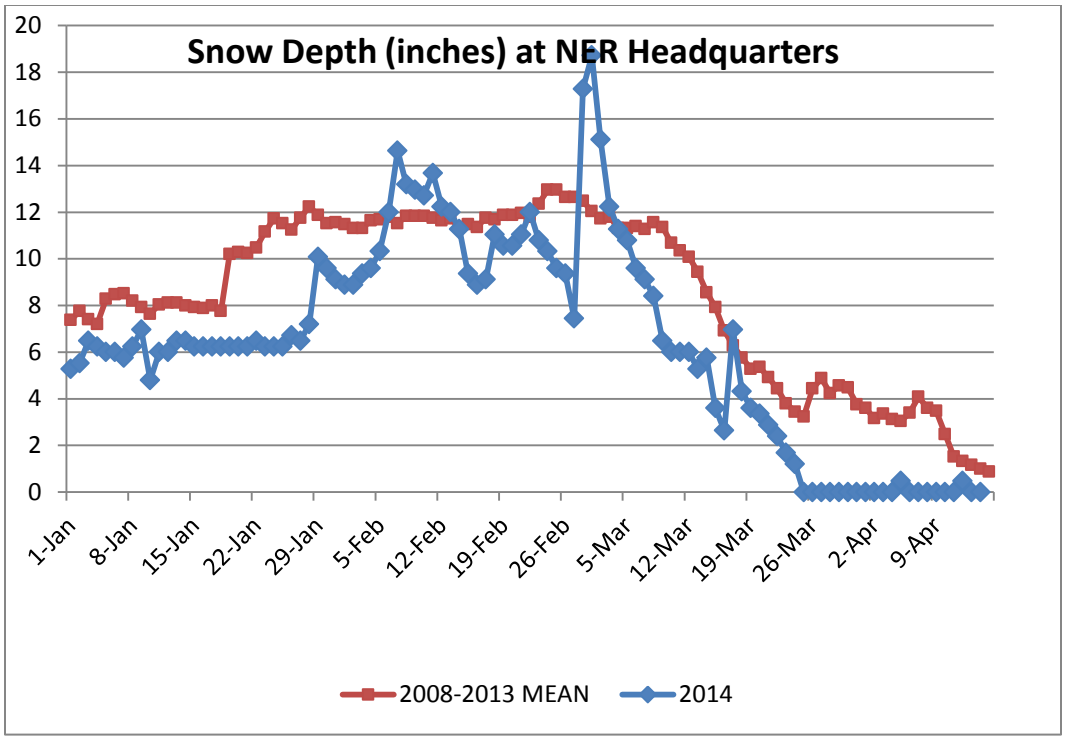
Feeding Initiation:

Initiation of supplemental feeding is dependent on the amount of forage that is available to elk, which is influenced by the following factors:

1)Forage production in the previous growing season:
Estimated refuge-wide herbaceous forage production was 10,885 tons (23% below the 1998-2013 average). Estimated total Refuge-wide forage production, which includes herbaceous and woody plants, was 13,708 tons (21% below the 1998-2013 average). Relatively low 2013 forage production was attributed to below average precipitation in each month from May through August. Although precipitation in September was well above average, these rains occurred too late in the growing season to have a major effect on forage quantity. However high September precipitation did cause grasses to green up and caused a flush of new forbs to develop. This greatly improved the nutritional value of forage for elk and bison. NER staff irrigated 3,136 acres. 3,056 acres were irrigated using the K-line system and approximately 80 acres were flood irrigated in the Pedersen Management Unit. Estimated refuge wide-forage herbaceous production would have been 9,685 tons in the complete absence of irrigation, which suggests that the NER irrigation program produced 1,200 tons of additional forage in 2013 and increased refuge-wide herbaceous forage production by 12%. Although irrigation significantly bolstered forage production it did not completely mitigate drought effects.

2) Forage consumption rates determined by the number of elk and bison using the south end of the refuge during the fall and early winter period: Although forage production was below average, relatively low elk and bison numbers during the fall and early winter periods reduced forage consumption rates and allowed us to delay the start of supplemental feeding. Beginning in 2007, additional areas were opened to elk hunting on the south end of the refuge and a bison hunt was initiated. Disturbance associated with these hunts and late season closing dates (December 15, 2013 for elk and January 12, 2014 for bison) resulted in low numbers of elk and bison on the refuge in the fall and early winter. There were not significant elk congregations on southern NER until December 11, 2013 and significant sustained bison congregations until the third week of January. After these dates there were 5,000-6,000 elk and approximately 500 bison regularly using the south half of NER. After the closure of the bison season on January 12, bison began foraging on the north end of NER in the vicinity of Long Hollow and in irrigated areas at McBride. By January 28, most of the McBride forage had been consumed and bison moved south into the Chambers Ben Goe, and marsh portions of the Nowlin Management units. As of January 31, 2014 there were approximately 6,000 elk and 600 bison on southern NER.

3) Snow Conditions: Refuge staff has consistently monitored daily snow-pack depths at NER headquarters since 2008, and 2014 daily snow depths were well below average until January 30, 2014, when snow depths increased to just below average. Low snow depths in December and January allowed elk and bison to easily access forage.

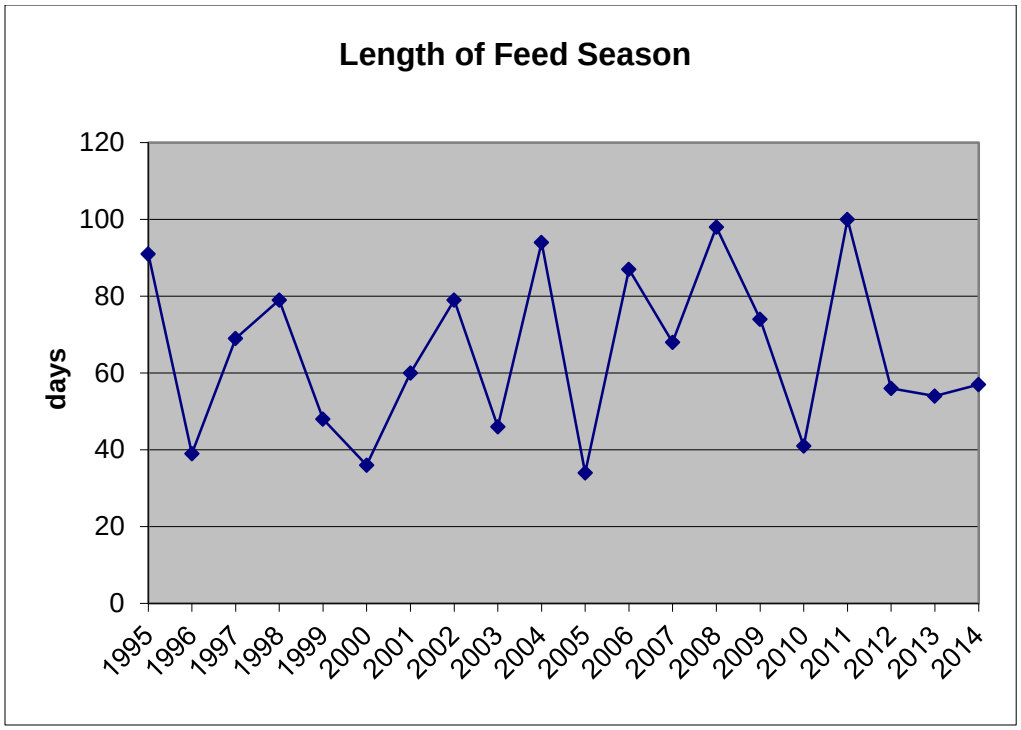


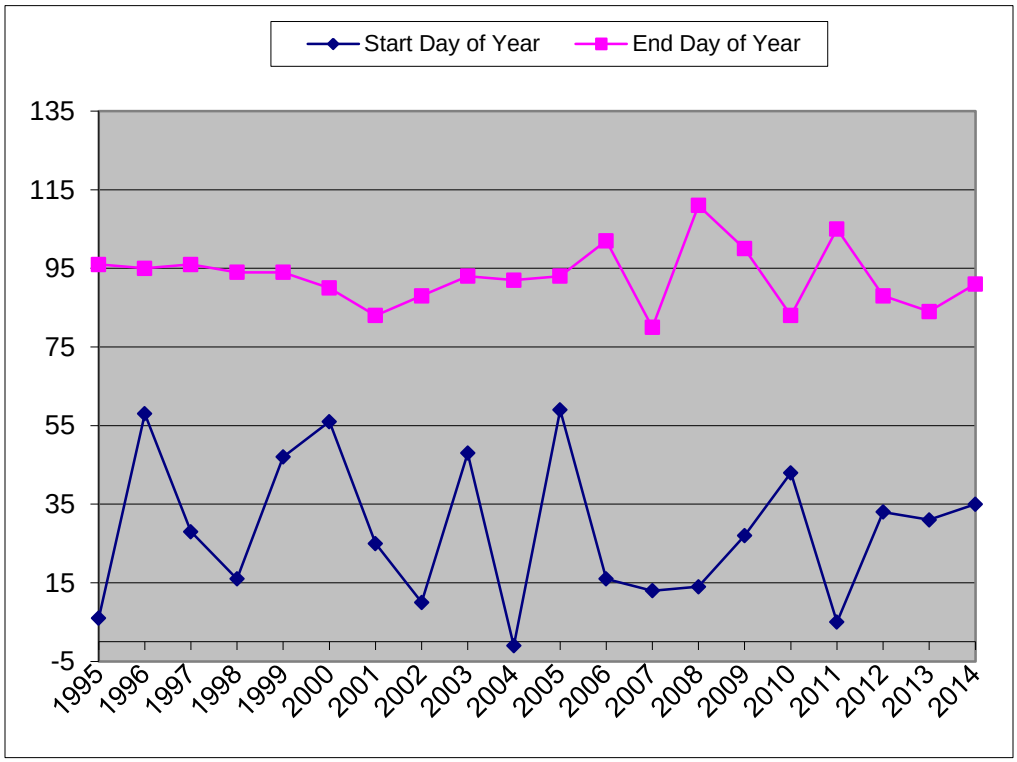
Refuge biologist Eric Cole and WGFD staff monitored snow and forage conditions on NER on 12/30, 1/10, 1/15, 1/17, 1/23, 1/28, and 1/31. By January 28, available forage had declined to levels near or below the 300 lbs. per acre threshold at most sites. The only area with significant forage remaining was the wet meadow complex north of Nowlin Creek and west of Poverty Flats. By January 31 we estimated 680 lbs. per acre remained in the wet meadow complex north of Nowlin Creek and west of Poverty Flats. With heavy elk use in this area, we predicted that available forage would soon decline below threshold levels at this site and recommended that feeding be initiated on Tuesday February 4, 2014. Refuge manager Steve Kallin and WGFD supervisor Tim Fuchs accepted this recommendation.

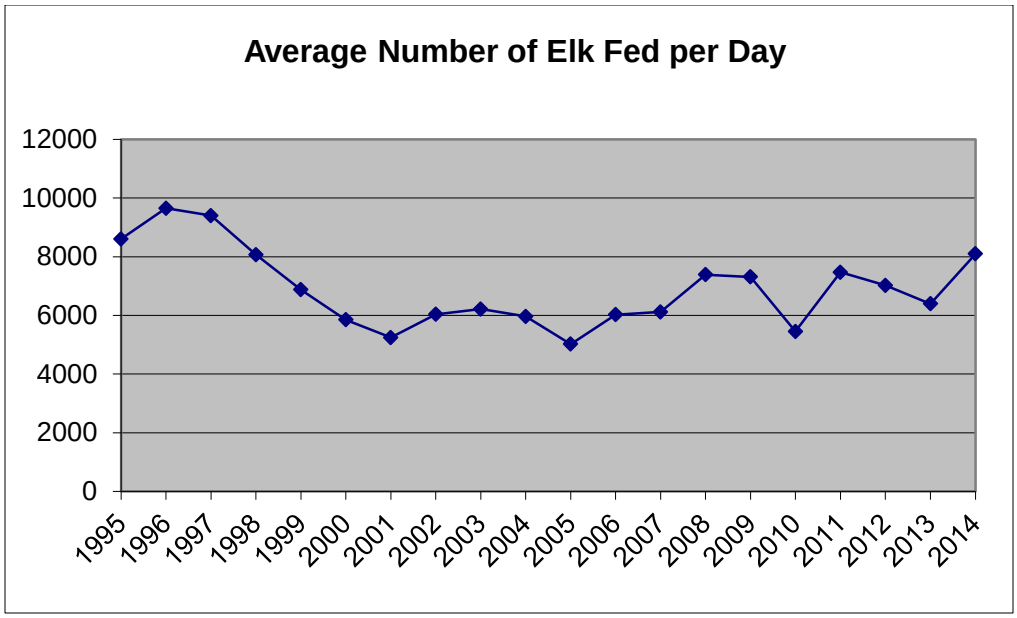
The February 4 feeding start date was 1 week later than the 1995-2013 average, and approximately 1.5 weeks later than the 10-year moving average. In general late migration of elk and bison to NER and below average valley snowpack allowed us to delay supplemental feeding despite below average forage production during the previous growing season.

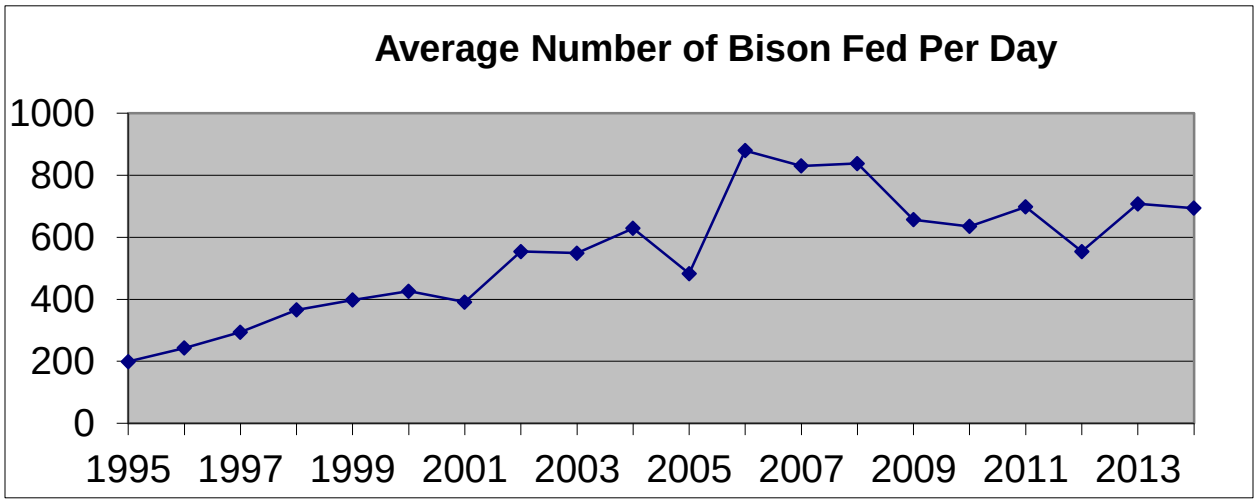
Operations:

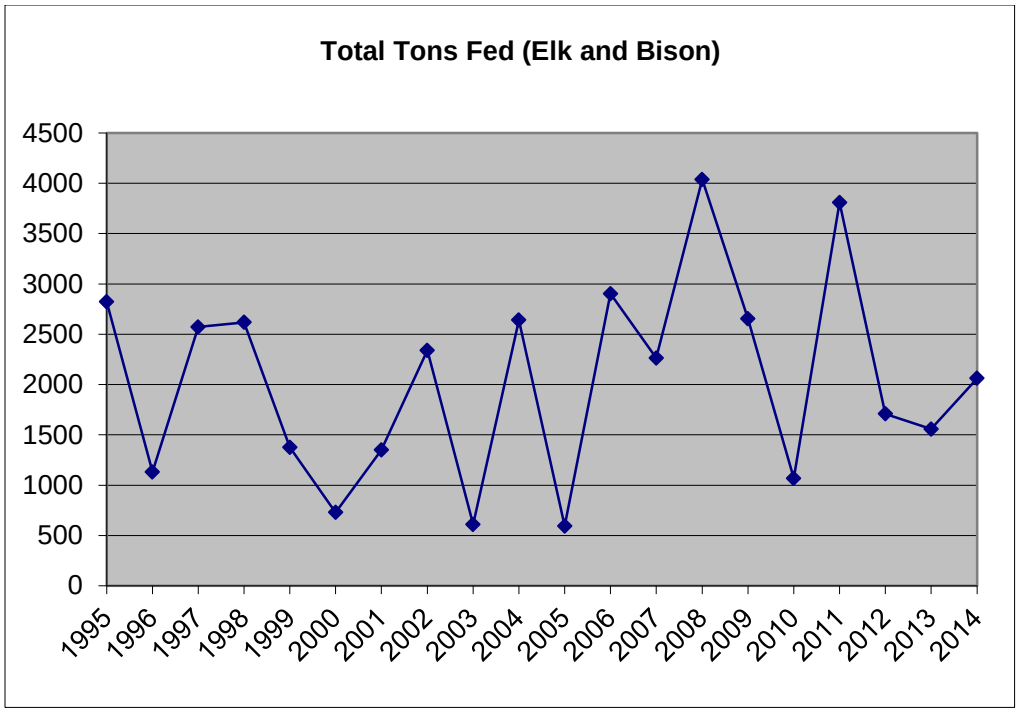
See graphs on following pages, which summarize key 2014 feed season metrics compared to previous years. In general, snow pack was above average at high elevations around Jackson Hole (approximately 140% of average by late winter), but below average for most of the winter on NER. The discrepancy between high and low elevation snowpack likely contributed to the relatively high percentage of elk on feedgrounds compared to native winter range. This phenomenon along with a slight population increase in the Jackson Elk Herd explains the high number of elk on NER feedgrounds (8,100 average elk fed per day, the highest number since 1997).


Length of Feed Season
days
120
100
80
60
40
20
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014


Start Day of Year
End Day of Year
135
115
95
75
55
35
15
-5
1995
1996
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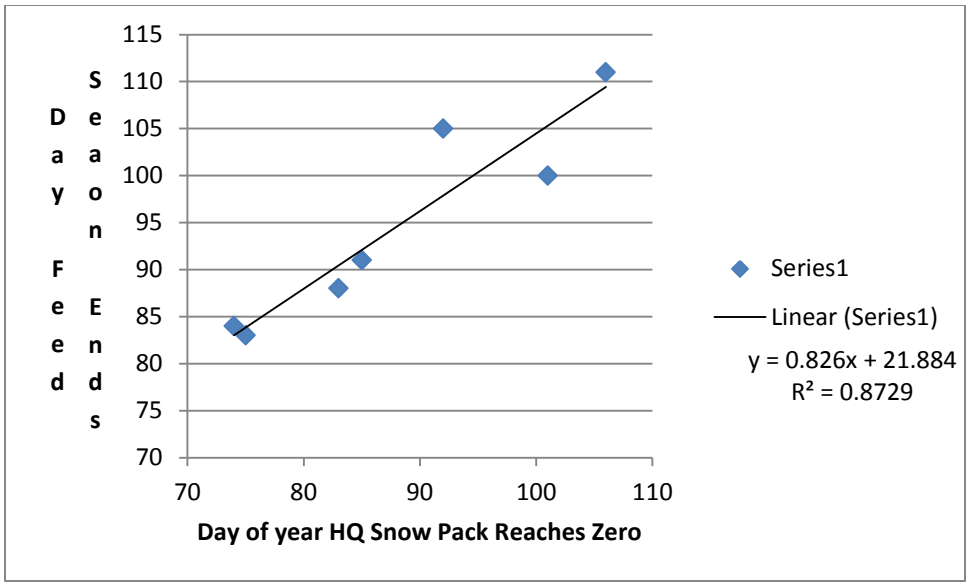

Average Number of Elk Fed per Day
12000
10000
8000
6000
4000
2000
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014


Average Number of Bison Fed Per Day
1000
800
600
400
200
0
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013



There was a major melt event in mid-February and another melt event in early March that almost resulted in the loss of the dike road. We completely drained the Nowlin 1 pond to accommodate excess flows, but water still overtopped the dike. Because ice flows in Twin Creek had previously blocked the refuge road north of the Twin Creek subdivision, the dike road was the only access to the Flats and McBride feedgrounds. I recommend an assessment of refuge drainage patterns, possible construction of new drainage ditches, installation of an emergency overflow culvert on the dike road along the Nowlin 1 pond, and resolution of the drainage problem where Twin Creek crosses the Refuge Road to avoid future problems with access to the feedgrounds.

Despite much higher elk numbers on the refuge compared to recent years, the length of the feed season was only 57 days long (approximately 10 days shorter than the 10-year average). This was largely attributed to the late start date (February 4) and partially due to the early end date (April 1). Feeding cessation is strongly correlated with the first day that snow pack depth drops to zero at the Headquarters monitoring site (see figure below).



Feed Usage, Amount on Hand and Recommended 2014 Feed Purchase

We began the feed season with approximately 3,900 tons of alfalfa pellets on hand, and used approximately 2,100 tons. This leaves approximately 1800 tons on hand, which will not be sufficient for average conditions.

I recommend purchasing 1,500 tons of alfalfa pellets in 2014, with 1,000 tons delivered to the east end of Shed #4, and 500 tons delivered to the west end of Shed 11. Assuming delivery of 1,500 tons, our stockpile will be 3,300 tons. There have only been 2 years since 1995 where feed use has exceeded 3,300 tons, and feed use in excess of this amount is very unlikely in the future given changes to our hunt seasons which limit elk and bison use of the south end of the refuge during the autumn months.

Due to a flood event in March 2014 there was approximately 6" of water in the east end of Shed #3, and unknown, albeit probably small quantities of pellets were damaged. I recommend excavating and removing damaged pellets from the east end of Shed #3 to ensure that damaged alfalfa is not loaded onto feed trailers in future feed seasons. Pellets that were saturated are likely moldy and clumped, which will be unpalatable to elk and will clog the feed trailer chutes.

From:	Steve Kallin
To:	Steve Cain; Sarah Dewey; Tim Fuchs; Doug Brimeyer; Dale Deiter; Kerry Murphy; Jeffrey Warren; Cris Dippel; Eric Cole
Subject:	May 5, 2014 AMP Meeting Cancelled
Date:	Thursday, May 01, 2014 1:23:00 PM

Hi All:

After a discussion with the AMP Habitat/Population Subcommittee (Kerry Murphy, Jeff Warren and Eric Cole) it was decided to cancel the upcoming AMP meeting scheduled for May 5. The subcommittee is drafting a framework to link habitat conditions to elk/bison use which will be shared with the full committee. Additional time is needed to develop this framework before it is ready for discussion. They will meet to continue this process the morning of Monday, May 5.

In the interest of efficiency and to be sensitive to your busy schedules, I decided to wait until the subcommittee is ready so our next AMP meeting will be as productive as possible. I will send out a Doodle Poll for the next AMP meeting after the subcommittee meets on Monday.

Sorry for the change, but hopefully this delay will enable us to make the best use of our time.

Thanks again for all of your assistance with this planning effort,

Steve Kallin
Project Leader
National Elk Refuge
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675 East Broadway
Jackson, WY 83001
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Fax: (307) 733-9729
steve_kallin@fws.gov

From: Steve Kallin
To: steve_suder@fws.gov
Cc: Cris Dippel; Eric Cole
Subject: WTI Technical Support for the National Elk Refuge (NER)
Date: Thursday, May 08, 2014 10:26:26 AM

Hi Steve:

Highway 89 forms the western boundary of the NER . Each Spring and Fall, thousands of elk exit and enter the refuge by crossing this highway. The preferred alternative in our draft NER CCP includes the need to consider wildlife crossing solutions along Hwy 89 to reduce vehicle/elk collisions and improve safety for motorists.

I recently had a conversation with Rob Ament, Road Ecology Program Manager for the Western Transportation Institute (WTI), Montana State University. Rob mentioned that the U.S. Fish and Wildlife Service has transportation funding available for an analysis of site-specific wildlife crossing options for National Wildlife Refuges. If funding is available, I would like to request a WTI analysis to identify potential solutions to improve wildlife connectivity, reduce vehicle/elk collisions and improve motorist safety along Hwy 89.

Please let me know if funding is available and if so, how I would move forward with this effort.

Thanks for the help,

Steve Kallin
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Jackson, WY 83001
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Fax: (307) 733-9729
steve_kallin@fws.gov

From: Steve Kallin
To: Tim Fuchs
Cc: Eric Cole; Cris Dippel; Claire Scolnick
Subject: Alfalfa Pellet Order
Date: Tuesday, May 13, 2014 9:49:39 AM

Tim:

Looks like we will need to purchase about 1,500 tons of pellets this year. Our initial market research indicates the price will be similar to last year's price of $326/ton. Total estimated cost would be approximately $489,000 with the WGFD contribution at $244,500. We would anticipate receiving deliveries this August/September and processing the WGFD contribution by the end of September like we did last year. We are planning on submitting a request to our Regional Office by this Friday. Let me know if you have any concerns about this quantity, price or commitment by the WGFD.

Bill/funding coordination with Jennifer Dorring went especially smoothly last year. We are still open to meeting again to examine the process and make improvements if you desire.

We can discuss this subject in more detail if you want, when we meet later this week.

Take care,

Steve Kallin
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Fax: (307) 733-9729
steve_kallin@fws.gov

From: Steve Kallin
To: Steve Cain
Subject: BEMP Court Opinions
Date: Friday, May 16, 2014 3:22:11 PM
Attachments: CircuitCourtFeedgroundRuling8-3-11.pdf
NERCourtDecision3-26-10.pdf

Steve:

See attached court opinions concerning the BEMP per our conversation today.

Hope you have a great vacation!

Steve Kallin
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steve_kallin@fws.gov

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued May 12, 2011 Decided August 3, 2011

No. 10-5144

DEFENDERS OF WILDLIFE, ET AL.,
APPELLANTS

v.

KENNETH LEE SALAZAR, IN HIS OFFICIAL CAPACITY AS SECRETARY OF THE INTERIOR, ET AL.,
APPELLEES

Appeal from the United States District Court
for the District of Columbia
(No. 1:08-cv-00945)

Timothy J. Preso argued the cause for appellants. With him on the briefs were *Douglas L. Honnold* and *Sean M. Helle. Sierra B. Weaver* entered an appearance.

Mark R. Haag, Attorney, U.S. Department of Justice, argued the cause for federal appellees. With him on the brief was *Robert H. Oakley*, Attorney.

James Kaste, Senior Assistant Attorney General, Office of the Attorney General for the State of Wyoming, was on the brief for intervenor State of Wyoming in support of federal

appellees. *R. Craig Lawrence*, Assistant U.S. Attorney, entered an appearance.

Before: ROGERS, TATEL, and GRIFFITH, *Circuit Judges*.

Opinion for the Court filed by *Circuit Judge* GRIFFITH.

GRIFFITH, *Circuit Judge*: As required by the National Wildlife Refuge System Improvement Act, the U.S. Fish and Wildlife Service and the National Park Service devised a plan to manage the elk and bison populations in the National Elk Refuge and Grand Teton National Park. Part of this plan includes ending the longstanding agency practice of feeding these animals during the winter. The Defenders of Wildlife challenge the plan because it fails to include a time certain for ending the practice. The district court rejected the challenge, and, for the reasons set forth below, we affirm its judgment.

I

The National Wildlife Refuge System includes over 550 refuges and 150 million acres of protected land. The Department of the Interior, acting through the U.S. Fish and Wildlife Service, manages these properties pursuant to the National Wildlife Refuge Administration Act, Pub. L. No. 89-669, 80 Stat. 926 (1966), as amended by the National Wildlife Refuge System Improvement Act ("Improvement Act"), Pub L. No. 105-57, 111 Stat. 1252 (1997) (codified at 16 U.S.C. §§ 668dd-668ee).

The National Elk Refuge is part of that system. Located just north of Jackson, Wyoming, and adjacent to Grand Teton National Park, the Refuge was established in 1912 when Congress designated 2000 acres in Jackson Hole as a "winter game (elk) reserve." Act of Aug. 10, 1912, Pub. L. No. 62-261, 37 Stat. 293 (codified as amended at 16 U.S.C. § 673). The Refuge is now a 24,700-acre expanse that the Secretary

holds "for the grazing of, and as a refuge for, American elk and other big game animals." 16 U.S.C. § 673a. Its landscape consists of meadows, marshes, streams, ponds, and open fields across a valley floor that includes sagebrush and rock outcroppings, all set against the majestic backdrop of the Teton and Gros Ventre mountain ranges. Lucky wayfarers may spot wolves, grizzly bears, trumpeter swans, and any number of the area's magnificent ungulates, including bison, bighorn sheep, pronghorn, mule deer, and, of course, elk. The National Elk Refuge's eponymous herd comprises one of the largest concentrations of elk in North America. It goes without saying that these elk are of considerable ecological, economic, and cultural value.

Around the turn of the last century, a series of severe winters in Wyoming strained the elk populations and spurred the good people of Jackson to save the elk by feeding them. When Congress created the Refuge in 1912, the federal government continued this practice, which the parties refer to as supplemental feeding. For roughly seventy days each winter, approximately 7000 elk and 1000 bison are drawn daily to the federal trough.

In recent years, it has become apparent that this practice, though born of benevolence, causes significant problems. According to the Department of the Interior, supplemental feeding leads to a seasonal concentration of elk and bison that is "an unnatural situation that has contributed to . . . an increased risk of potentially major outbreaks of exotic diseases . . . [and] damage to and loss of habitat." Final Bison and Elk Management Plan and Environmental Impact Statement for the National Elk Refuge / Grand Teton National Park / John D. Rockefeller, Jr., Memorial Parkway 9 (Feb. 1, 2007) [hereinafter February 2007 Management Plan and EIS]. This risk poses an existential threat to the elk and bison and puts the very purpose of the Refuge at jeopardy. *See id.*

(noting that the risk of diseases posed by increased concentrations of the animals has "the greatest potential to hinder . . . [the] purposes . . . [of] the National Elk Refuge").

One major problem is brucellosis—also known as "Bangs disease, undulant fever, and contagious abortion," *id.* at 564—which causes an infected female to abort her first calf, leaving behind contaminated fetal tissue on the ground capable of transmitting the disease to other animals, *id.* at 129. Brucellosis rates within normal Wyoming elk herds are approximately two percent, but rates among elk that frequent the Refuge feeding lines have averaged around seventeen percent in recent years. *Id.* at 130. Another major problem, chronic wasting disease (CWD), is the elk version of mad cow disease: Like its bovine counterpart, CWD assaults the central nervous system, causing brain lesions, behavioral changes, a loss of body condition, and ultimately death. CWD is caused by abnormal, non-living proteins known as prions that persist in the soil where infected animals graze, even after intensive efforts to remove them. *Id.* at 136-40. Statistical sampling suggests that in open, elk-hunt areas in Wyoming, the prevalence of CWD in elk averages around four percent. *Id.* at 137. But in confined areas—like those created by the feed lines—the prevalence can exceed ninety percent. *Id.* CWD is not yet prevalent in the Refuge, but if that changes, "environmental contamination will become a major concern due to the disease's ability to persist in the environment for a long period of time." *Id.*

All agree that supplemental feeding increases the risk of such diseases. Without supplemental feeding, the elk would gather in smaller groups, meaning that one sick elk would infect only the handful of others around it. But because the feeding lines bring so many together, the disease of one can quickly become that of many, if not all.

Spurred by a district court order requiring reassessment of the winter feeding operation, *see Fund for Animals v. Clark*, 27 F. Supp. 2d 8, 12-15 (D.D.C. 1998), the Fish and Wildlife Service teamed with the National Park Service,[*] also part of the Department of the Interior, to prepare a management plan for the elk and bison populations. The agencies analyzed six alternatives for managing the herds over the next fifteen years. These plans ran the gamut from maintaining the status quo to ending the practice of supplemental feeding within five years.

In April 2007, the agencies settled on an approach that would, over time, create conditions that would allow the elk and bison to survive the winter without supplemental feeding and, in the meantime, manage the risk of contagion until the practice ended. In essence, their plan seeks to restore natural forage that will allow the animals to sustain themselves during wintertime without the help of supplemental feeding. Bison and Elk Management Plan: National Elk Refuge and Grand Teton National Park 129-34 (Apr. 2007) [hereinafter April 2007 Management Plan]. For example, it provides for substantial reductions in the numbers of elk and bison, primarily through short-term increases in hunting, so that their populations will be closer to levels that would have existed had there never been a practice of supplemental feeding. *Id.* at 134-37. The plan also seeks to reduce disease transmission by rotating feed sites, spreading feed in long lines, separating elk and bison from neighboring livestock, providing increased CWD monitoring, and allowing Wyoming to vaccinate the herds. *Id.* at 138-39. Ultimately, over a fifteen-year period, "[a]s habitat and population objectives are achieved, [the agencies will aim to] decrease reliance on intensive

[*] Because the plan in this case also addresses management of elk and bison populations in nearby Grand Teton National Park, the National Park Service, which manages the park, joined in the effort.

supplemental winter feeding, including complete transition to free-standing forage if and when several established criteria are met, including support from the Wyoming Game and Fish Department and the public." *Id.* at 137.

Before adopting this approach, the agencies considered and rejected the petitioners' preferred alternative, which would have committed the Secretary to ending supplemental feeding within five years. As described in their brief, the agencies recognized that this alternative "would provide some advantages in terms of habitat benefits, a lower prevalence of brucellosis over the long term, and a lower risk for the spread of chronic wasting disease." Appellees' Br. 19 (citing Record of Decision, Final Bison and Elk Management Plan and Environmental Impact Statement: National Elk Refuge and Grand Teton National Park 10 (Apr. 2007) [hereinafter Record of Decision]). But they also found that "[this alternative] would likely result in an increase in elk mortality from starvation, predation, and disease related to poor body condition, particularly in severe winters." *Id.* (citing Record of Decision 10). This in turn would lead to a "long-term decrease in elk hunting and viewing opportunities in the Refuge, with attendant impacts on the area economy, and could cause elk herd numbers to fall below [the Wyoming Game and Fish Department's] statewide objective in some years." *Id.* at 19-20 (citing Record of Decision 10).

The agencies concluded that their preferred plan "[is more] consistent with regional herd management objectives, better balances divergent stakeholder interests, builds upon success on the ground, and enables managers to adapt to new information and changing conditions," all while preparing the animals for the eventual cessation of supplemental feeding and providing most of the benefits offered by the petitioners' preferred alternative. *Id.* at 20 (citing Record of Decision 14). On the issue of when to end supplemental feeding, the

agencies stressed that although they are committed to abandoning the practice, they would "not preclude the use of supplemental feeding or other management tools as [they] work to resolve the bison and elk management issues . . . . [N]or [would they] make predictions about how fast [they could] implement the phased approach for improving forage, reducing the [elk and bison populations], and reducing the need for supplemental feed . . . . When the biological, social, and political conditions enable [them] to consider a phase-out of feeding, [the plan's] adaptive framework provides [the agencies] with that flexibility." Record of Decision 13. In essence, the agencies determined that a deadline for ceasing supplemental feeding would be unduly restrictive in light of the many variables and concerns that need to be accounted for in managing the Refuge.

The Defenders of Wildlife, the Jackson Hole Conservation Alliance, the National Wildlife Refuge Association, the Greater Yellowstone Coalition, and the Wyoming Outdoor Council (collectively, the Defenders) filed suit in the district court, challenging the Secretary's plan under the Administrative Procedure Act. They argue the plan's failure to commit to a deadline for ending supplemental feeding was arbitrary and capricious given the Secretary's duty under the Improvement Act to "provide for the conservation of . . . wildlife" and "ensure that the biological integrity, diversity, and environmental health of the [wildlife refuge system] are maintained." 16 U.S.C. § 668dd(a)(4)(A)-(B). The district court granted summary judgment for the agencies, reasoning that the plan accounted for and managed the dangers of supplemental feeding and also created a program for phasing out the practice over a fifteen-year period. *Defenders of Wildlife v. Salazar*, 698 F. Supp. 2d 141, 147-48 (D.D.C. 2010). The Defenders of Wildlife filed a timely appeal, and we take jurisdiction pursuant to 28 U.S.C. § 1291.

We review the district court's grant of summary judgment de novo. *Castlewood Prods., LLC v. Norton*, 365 F.3d 1076, 1082 (D.C. Cir. 2004). Under the Administrative Procedure Act, we set aside agency action that is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). Our review focuses on whether the agency examined the relevant data, articulated a satisfactory explanation for its action, based its decision on the relevant factors, and committed no clear error of judgment. *Bluewater Network v. EPA*, 370 F.3d 1, 11 (D.C. Cir. 2004).

II

The parties agree that supplemental feeding poses serious risks for the elk and bison in the Refuge. The only question this case presents is whether it was arbitrary and capricious for the Secretary to transition away from supplemental feeding without committing himself to ending the practice on a particular date.

The Defenders argue it was, inasmuch as the very purpose of the National Wildlife Refuge System, as set out in the Improvement Act, "is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." 16 U.S.C. § 668dd(a)(2). To that end, the Defenders point out, the Act mandates that the Secretary manage refuges to "provide for the *conservation* of fish, wildlife, and plants, and their habitats within the System" and to "ensure that the *biological integrity, diversity, and environmental health* of the System are maintained for the benefit of present and future generations of Americans." *Id.* § 668dd(a)(4)(A), (B) (emphases added). The Act also instructs the Secretary to

"sustain and, where appropriate, restore and enhance, healthy populations of fish, wildlife, and plants utilizing . . . methods and procedures associated with modern scientific resource programs." *Id.* § 668ee(4). The Defenders argue that the Secretary's plan is unlawful because it does not fix a definite time for ending supplemental feeding, even though the agencies have acknowledged that the dangers posed by this practice imperil explicit statutory objectives. *See* February 2007 Management Plan and EIS 9. Underlying this statutory argument is some common sense: the whole point of a National Elk *Refuge* is to provide a sanctuary in which populations of healthy, reproducing elk can be sustained. *See* 16 U.S.C. § 673a (creating a "refuge" for the elk). The Refuge can hardly provide such a sanctuary if, every winter, elk and bison are drawn by the siren song of human-provided food to what becomes, through the act of gathering, a miasmic zone of life-threatening diseases.

The Defenders acknowledge that the Improvement Act also requires the Secretary to consider other factors such as the importance of recreation on refuge lands and cooperation with state officials in pursuing the objectives of the Act. *See id.* § 668dd(4)(I), (M). They argue, however, that such considerations may be pursued only when "compatible" or "consistent with" the conservation mission of the System and the purposes of each refuge. *See id.* § 668dd(a)(3)(B), (e)(3). Reading the several provisions of the Act that emphasize the importance of wildlife conservation together with the general purpose of the National Wildlife Refuge System, the Defenders contend that the agencies' top priority in managing the Refuge must be conservation, and other considerations must not hinder that objective.

For their part, the Secretary and Wyoming (intervening as a defendant-appellee in this case) argue that the Improvement Act confers upon the Secretary broad managerial discretion in

how to pursue the Act's objectives. They concede that conservation is the overarching objective, but argue that it cannot be the sole consideration. After all, the Act lists fourteen factors that the Secretary "shall" consider in administering the System, including, among others, "ensur[ing] effective coordination, interaction, and cooperation" with adjoining landowners and State fish and wildlife agencies in pursuit of the objectives of the Act. *Id.* § 668dd(a)(4)(E).

Given the discretion afforded him, the Secretary argues that the agencies reasonably determined that the plan is consistent with the objectives of the Act and the purposes of the Refuge. The plan addresses the risk of diseases by (1) increasing natural forage and decreasing the herd sizes, which will work in tandem to create conditions under which supplemental feeding can be stopped without unduly increasing the risk of starvation, (2) monitoring and managing the diseases that accompany gathering at the feed lines, and (3) progressively reducing reliance on supplemental feeding when certain criteria have been met.

There is no doubt that unmitigated continuation of supplemental feeding would undermine the conservation purpose of the National Wildlife Refuge System. But we cannot conclude that the agencies acted unlawfully by adopting a plan that contained no deadline for ending the practice, and that is the only issue before us. The record amply demonstrates that the agencies collected the relevant data, identified the dangers posed by supplemental feeding, and adopted a plan to mitigate those dangers. That they also determined that the many objectives of the Act, including conservation, could best be met without implementation of a fixed deadline for stopping supplemental feeding was not arbitrary or capricious.

The district court was right that the plan "might well have been unreasonable had the agencies categorically refused to phase out the winter feeding program in spite of all the evidence in the record about the dangers of supplemental feeding." *Defenders of Wildlife*, 698 F. Supp. 2d at 148. But they did no such thing. Instead, they selected an approach that is geared toward ending the practice over time while maintaining the flexibility needed to respond to facts on the ground. The Defenders are understandably concerned that this flexibility could be used to continue the practice indefinitely. But the agencies must proceed in a manner that is consistent with the science and accounts for the risks posed by supplemental feeding. There is nothing the agencies have said or done that causes us to doubt that they will. It is highly significant and indeed dispositive to us, as it was to the district court, that the agencies are committed to ending supplemental feeding. We do not know precisely how they will proceed, and that makes it impossible, at this stage, to declare that their plan is arbitrary and capricious simply because it does not specify a particular date by which the practice will cease. Should the agencies act unreasonably in establishing criteria for the transition or in otherwise carrying out the plan, that will be a different issue for another panel.

III

The Defenders also argue that the plan unlawfully gives the Wyoming Fish and Game Department a veto over whether supplemental feeding will end. They point to language in the plan stating that the agencies will seek to "decrease reliance on intensive supplemental winter feeding, including complete transition to free-standing forage *if and when several established criteria are met, including support from the Wyoming Game and Fish Department* and the public." April 2007 Management Plan 137 (emphasis added).

Regardless of how we might have read this language in the first instance, the Secretary has assured us in his briefs and at oral argument that the language confers no veto. *See* Appellees' Br. 34 (characterizing the disputed provision as "aspirational" rather than a grant of any power to Wyoming); Wyoming's Br. 28 n.6 (also agreeing that Wyoming does not have a veto); *cf. Wyoming v. United States*, 279 F.3d 1214, 1234 (10th Cir. 2002) ("[F]ederal management and regulation of federal wildlife refuges preempts state management and regulation of such refuges . . . where state management and regulation stand as an obstacle to the accomplishment of the full purposes and objectives of the Federal Government."). We take the Secretary at his word that Wyoming has no veto over the Secretary's duty to end a practice that is concededly at odds with the long-term health of the elk and bison in the Refuge.

IV

For the foregoing reasons, the district court's judgment is

Affirmed.

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

DEFENDERS OF WILDLIFE, *et al.*,	)	
	)	
Plaintiffs,	)	
	)	
v.	)	**Civil Case No. 08-0945 (RJL)**
	)	
KENNETH L. SALAZAR, in his official capacity as Secretary of the Interior, *et al.*,[1]	)	
	)	
Defendants,	)	
	)	
and	)	
	)	
STATE OF WYOMING,	)	
	)	
Defendant-Intervenor.	)	

MEMORANDUM OPINION
(March 26, 2010) [#24, 26, and 27]

Before the Court are dueling Motions for Summary Judgment arising from a dispute over the management of the National Elk Refuge in Jackson Hole, Wyoming. Defenders of Wildlife and their fellow plaintiffs challenge the comprehensive Bison and Elk Management Plan adopted jointly by the United States Fish and Wildlife Service ("FWS") and the National Park Service ("Park Service") (collectively, "the agencies"). The plaintiffs ask that the plan be set aside because it permits the indefinite feeding of elk on the Refuge despite

[1] Former Secretary of the Interior, Dirk Kempthorne, and former Director of the United States Fish and Wildlife Service, H. Dale Hall, were originally named as defendants in this case. Pursuant to Federal Rule of Civil Procedure 25(d), if a public officer named as a party to an action in his official capacity ceases to hold office, the court will automatically substitute that officer's successor. Accordingly, the Court substitutes Kenneth L. Salazar for Kempthorne and Sam D. Hamilton for Hall.

what they regard as overwhelming evidence that continued artificial feeding will lead to the catastrophic spread of disease and will disrupt the biological integrity of the Refuge, in violation of the National Wildlife Refuge System Improvement Act ("the Improvement Act"). The plaintiffs also contend that the plan and the accompanying environmental impact statement ("EIS") violate the National Environmental Policy Act ("NEPA") because they are insufficiently detailed to allow a reasonably complete discussion of mitigation. The defendants include the federal officials charged with administering the Refuge and the intervenor State of Wyoming. Together they contend that the plan constitutes a valid exercise of discretion and that it and the EIS are sufficiently detailed to satisfy the requirements of NEPA. Based on a review of the record and pleadings, the plaintiffs' Motion for Summary Judgment is DENIED, and the defendants' respective Cross Motions for Summary Judgment are GRANTED.

BACKGROUND

About a decade ago, the FWS and the Park Service initiated a process to develop a comprehensive plan for the management of bison and elk on the National Elk Refuge ("the Refuge") and other federal land. (*See* Final Bison and Elk Management Plan and Environmental Impact Statement (AR FR017a) ("FEIS Vol. 1") at 3).[2] The agencies considered a wide range of issues in formulating the plan, one of which was the wintertime practice of feeding the bison and elk. (*Id.* at 20-22). Supplemental feeding of elk began about a century ago as a means to reduce elk mortality during the winter and to minimize

[2] The Park Service joined the planning process because, in addition to the Refuge, the plan also addresses the management of bison and elk in the Grand Teton National Park. (*See* FEIS Vol. 1 at 3).

the likelihood of elk feeding on hay meant for livestock. (*Id.* at 6). More recently, bison also began eating the supplemental elk feed provided on the Refuge. (*Id.* at 7). Over the years, this practice has had the salutary effect of reducing elk winter mortality, sustaining a larger elk population than would have otherwise survived on the region's winter range, and reducing elk contact with haystacks and pastures for livestock. (*Id.* at 10).

Notwithstanding these benefits, the winter feeding program is not without potential costs. For instance, artificial feeding attracts more bison and elk than the Refuge can support, thus damaging the native habitat. (*Id.* at 9). The large concentration of elk and bison along the feedlines also contributes to the spread of disease. (*Id.* at 9-10; Smith Report (AR S007) at 3-4, 15-19). Of particular concern is the threat of Chronic Wasting Disease ("CWD"), the equivalent of "mad cow disease." (FEIS Vol. 1 at 136). Although CWD has not yet been detected on the Refuge, experts believe that it will eventually infect the elk and bison population. (*Id.* at 137; FEIS Vol. 2 at 200). The disease is generally fatal, and because it is difficult to eradicate, it could lead to population decline and possibly to the extinction of bison and elk on the Refuge. (FEIS Vol. 1 at 274, 514; Peterson CWD Report (AR S008) at 3). CWD is not the only disease that could spread as a result of artificial feeding practices; there are a host of other debilitating diseases as well. (*See, e.g.*, FEIS Vol. 1 at 129-33; *id.* at 133 (footrot); *id.* at 134-35 (bovine tuberculosis); *id.* at 133-34 (scabies); *id.* at 135 (bovine paratuberculosis)).

During the planning process, the agencies developed six alternatives to address the effects of the winter feeding program. The agencies' preferred alternative—Alternative 4—aims over a fifteen-year period to "decrease reliance on intensive supplemental winter

feeding, including complete transition to free-standing forage if and when several established criteria are met, including support from the Wyoming Game and Fish Department and the public." (FEIS Vol. 1 at 67). This alternative is predicated on the view that the agencies must improve the natural habitat supporting the bison and elk before they can discontinue supplemental feeding. Lest there be any doubt that the agencies intend to eliminate the feeding program, they rejected Alternative 5, which proposed the indefinite continuation of the program. (*Id.* at 50). In contrast to the conditions-based approach preferred by the agencies, Alternative 6, which the plaintiffs prefer, sets a time-sensitive goal of phasing out the winter feeding program within five years. (*Id.* at 52, 68).

To implement Alternative 4, the agencies developed and approved the Bison and Elk Management Plan now under review. The plan establishes four goals: (1) conserving the native habitat, (2) promoting sustainable populations of bison and elk, (3) helping the Wyoming Game and Fish Department ("WGFD") maintain its herd objectives, and (4) preventing the spread of disease. (Final Bison and Elk Management Plan (AF FR018a) ("FBEMP") at 129-39). To achieve these goals, the plan provides for the adaptive management of the bison and elk herds and their habitat with an "emphasis on improving winter, summer, and transitional range on refuge and park lands, while at the same time ensuring that the biotic integrity and environmental health of the resources will be sustained over the long term." (*Id.* at 125). More specifically, the plan directs the agencies to initiate habitat conservation projects for the improvement of forage and to work with adjacent landowners and the WGFD to minimize bison and elk feeding on private land. (*Id.*). Under the plan, the agencies will also coordinate with the WGFD to maintain an elk herd

population of approximately 11,000—almost half of which will be expected to winter on the Refuge—and to sustain a genetically viable bison herd of about 500. (*Id.* at 126). As these measures are implemented, the agencies will gradually transition away from supplemental feeding based on yet-to-be-determined triggers derived from some or all of the following factors: (1) the "level of forage production and availability" on the Refuge; (2) the "desired herd sizes and sex and age ratios"; (3) the "effective mitigation of bison and elk co-mingling with livestock on private lands"; (4) the "winter distribution patterns of elk and bison"; (5) the "prevalence of brucellosis, chronic wasting disease, and other wildlife diseases"; and (6) "public support." (*Id.* at 125-26). In short, the plan is designed "for progressively transitioning from intensive supplemental winter feeding to greater reliance on free-standing forage." (*Id.*).

DISCUSSION

I. Standard of Review

The plaintiffs seek to set aside the agencies' comprehensive Bison and Elk Management Plan and the accompanying Final Environmental Impact Statement on grounds that the agencies violated the Improvement Act and NEPA. The plaintiffs bring their challenge under the Administrative Procedure Act ("APA"), which requires this Court to set aside agency action found to be "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). "The scope of review under the 'arbitrary and capricious' standard is narrow and a court is not to substitute its judgment for that of the agency." *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983). To satisfy that standard, an agency need only "examine the

relevant data and articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made." *Id.* (internal quotation marks omitted). Because this case involves judicial review of final agency action, the normal summary judgment standard under Federal Rule of Civil Procedure 56(c) does not apply. *N.C. Fisheries Ass'n, Inc. v. Gutierrez*, 518 F. Supp. 2d 62, 79 (D.D.C. 2007).

II. Improvement Act Claim

The crux of the plaintiffs' claim is that the Bison and Elk Management Plan does not commit to a date-certain termination of the winter feeding program. Instead of phasing out the program in five years, as the plaintiffs think is necessary, the agencies have decided to phase out the program over time as certain conditions are met. Because this conditions-based approach leaves open the possibility that supplemental feeding will continue indefinitely, the plaintiffs contend that the plan adopted by the agencies is contrary to the Improvement Act or is—at a minimum—arbitrary, capricious, or an abuse of discretion. I disagree.

The Improvement Act established the National Wildlife Refuge System, the mission of which "is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." 16 U.S.C. § 668dd(a)(2). To carry out this mission, the Act directs the Secretary of the Interior to perform a wide range of duties. For instance, the Secretary must "provide for the conservation of fish, wildlife, and plants, and their habitats within the System." *Id.* § 668dd(a)(4)(A). Under the Act, "conservation" means "to sustain and,

where appropriate, restore and enhance, healthy populations of fish, wildlife, and plants utilizing . . . methods and procedures associated with modern scientific resource programs." *Id.* § 668ee(4). The Secretary must also "ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans." *Id.* § 668dd(a)(4)(B). In addition to these conservation duties, the Secretary must, among many others things, "ensure effective coordination, interaction, and cooperation with owners of land adjoining refuges," *id.* § 668dd(a)(4)(E); "ensure that opportunities are provided within the System for compatible wildlife-dependent recreational uses," *id.* § 668dd(a)(4)(I); and "ensure timely and effective cooperation and collaboration with Federal agencies and State fish and wildlife agencies," *id.* § 668dd(a)(4)(M).

The plaintiffs contend that the Bison and Elk Management Plan defeats the overarching mission of the Refuge and violates specific mandates of the Improvement Act concerning conservation. In particular, they claim that the plan fails to provide for the conservation of bison and elk, as well as their habitats, *see id.* § 668dd(a)(4)(A), and to ensure that the biological integrity, diversity, and environmental health of the Refuge are maintained, *see id.* § 668dd(a)(4)(B). Central to this claim is the presumably indefinite continuation of the winter feeding program, the adverse effects of which the plaintiffs take great care to detail. They explain how the unnaturally large density of bison and elk caused by supplemental feeding damages the surrounding habitat and facilitates the transmission of debilitating and deadly diseases that could lead to the decline, if not extinction, of bison and elk on the Refuge. Because the plan does not mitigate these adverse effects by requiring the elimination of the feeding program within at least five years, the plaintiffs contend that the

plan fails its clear statutory obligations to sustain a healthy population of bison and elk, to conserve the Refuge's habitat, and to ensure the biological integrity, diversity, and environmental health of the Refuge. Furthermore, the plaintiffs contend that the Improvement Act's conservation mandates "trump" whatever other duties the agencies have under the statute. (Pl. Reply [#30] at 8). Therefore, because the plan elevates the agencies' duties to coordinate with private landowners, to ensure recreational opportunities, and to work with the WGFD all at the expense of its conservation duties, the plaintiffs assert that the plan is contrary to the Improvement Act and must be set aside. Not so.

As an initial matter, at least one thing is clear: The Improvement Act does not mandate that any *particular* plan be adopted. The statute gives broad direction, not precise instruction. *Wyoming v. United States*, 279 F.3d 1214, 1239-40 (10th Cir. 2002) (noting the "broad language and general directives" of the Improvement Act). It requires, for instance, that agencies "provide for the conservation" of wildlife, "ensure . . . the biological integrity, diversity, and environmental health" of the Refuge, and "plan and direct the continued growth of the [Refuge] System in a manner that is best designed to accomplish the mission of the System." 16 U.S.C. § 668dd(a)(4)(A)-(C). How the agencies carry out these sweeping directives is a matter of considerable, though not unlimited, discretion. The statute says nothing about whether supplemental feeding should be phased out based on an established timeline or based on specific conditions. Indeed, it says nothing at all about supplemental feeding. The question before the Court, therefore, is not whether the Bison and Elk Management Plan violates any specific statutory provision (it does not), but whether the plan is arbitrary, capricious, or an abuse of discretion. It is not.

In making that determination, this Court, of course, does not stand in the agencies' shoes. Rather, its task is limited to determining whether the agencies have, at a minimum, articulated a "satisfactory explanation" that establishes a "rational connection between the facts found and the choice made." *Motor Vehicle Mfrs. Ass'n*, 463 U.S. at 43 (internal quotation marks omitted). In particular, I must consider whether the agencies' explanation "was based on a consideration of the relevant factors and whether there has been a clear error of judgment." *Id.* (internal quotation marks omitted). Simply stated, the Court has no legal authority to disturb the agencies' plan so long as it takes account of all the relevant factors set forth in the Improvement Act (and no others) and is reasonable based on the facts.

Having examined the administrative record and considered the rationale for the agencies' chosen course of action, I cannot say that the Bison and Elk Management Plan either fails to account for relevant factors or is unreasonable for phasing out the winter feeding program over a fifteen-year time horizon as conditions for doing so are met. Indeed, the plaintiffs themselves acknowledge that an immediate cessation of supplemental feeding would have "significant adverse environmental consequences." (Pl. Mot. for Summ. J. [#24-2] at 37). Instead, their chief complaint is that the adopted plan does not commit to certain elimination of the feeding program within an established timeline. The agencies' decision, however, is a reasonable one in light of the provisions and purposes of the Improvement Act. As the plaintiffs concede, supplemental feeding is necessary, for now, to maintain natural population levels during the winter. According to the agencies' environmental impact statement, "the wintering of unnaturally high densities of elk on the

refuge helps sustain a more natural population level at the larger landscape level by mitigating the loss of winter range." (FEIS Vol. 1 at 13). Because the pace at which the feeding program can be phased out depends upon the pace at which winter forage on the Refuge can be improved, the "[p]remature termination of feeding, while elk and bison numbers exceed winter habitat capacity, could result in unacceptable winter losses." (Smith Report (AR S007) at 9). For this reason, the agencies' decision to discontinue the program based on conditions on the ground, as opposed to a fixed timeline, makes considerable sense.[3]

That the agencies seek to avoid losses of bison and elk caused by the lack of winter habitat is hardly contrary to the conservationist provisions of the Improvement Act or the overarching purposes of the Refuge. After all, the point of a "refuge" is to shelter wildlife displaced by human development. *See* 16 U.S.C. § 673a (providing that Refuge land is to be used "for the grazing of, and as a refuge for, American elk and other big game animals").

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[3] The plaintiffs' argument that the plan gives the WGFD an effective veto over any decision to terminate the winter feeding program is overblown. To be sure, the plan provides that a "complete transition to free-standing forage" will occur "when several established criteria are met, *including support from the Wyoming Game and Fish Department and the public*." (FBEMP at 137 (emphasis added)). But this requirement to gain the support of the WGFD and the public is consistent with, if not required by, the Improvement Act itself, which directs the agencies "to increase support for the [Refuge] and participation from conservation partners and the public," 16 U.S.C. § 668dd(a)(4)(C), and to "ensure effective coordination, interaction, and cooperation with . . . the fish and wildlife agency" of the state in which the Refuge is located, *id.* § 668dd(a)(4)(E). Of course, if the WGFD and the public refuse to support termination of the feeding program even once the conditions are ripe for doing so, then nothing would prohibit the agencies from discontinuing the program without WGFD or public support. *See Wyoming*, 279 F.3d at 1234 ("[F]ederal management and regulation of federal wildlife refuges preempts state management and regulation of such refuges . . . where state management and regulation stand as an obstacle to the accomplishment of the full purposes and objectives of the Federal Government.").

And while the threat of disease is real and must be addressed, it makes little sense to avert population decline caused by disease only to bring about population decline caused by starvation. Thus, the agencies did not err by defining "healthy populations," which the Improvement Act does not specifically define, as including "a stable and continuing population (i.e., the population returns to an initial equilibrium after being disturbed) and a minimized likelihood of irreversible long-term effects." (FEIS Vol. 1 at 12). This interpretation of the Improvement Act, which the agencies administer, is entitled to deference. *See Chevron, U.S.A., Inc. v. Natural Res. Def. Council, Inc.*, 467 U.S. 837, 844 (1984) (stating that the Supreme Court has "long recognized that considerable weight should be accorded to an executive department's construction of a statutory scheme it is entrusted to administer").

Of course, the Bison and Elk Management Plan might well have been unreasonable had the agencies categorically refused to phase out the winter feeding program in spite of all the evidence in the record about the dangers of supplemental feeding. But the agencies did not do that. Far from mandating a continuation of the feeding program in perpetuity, the agencies have adopted a plan that takes measures to improve the Refuge so that the bison and elk that winter there can survive without supplemental feeding. The rate at which the program should be discontinued is necessarily a fact-dependent determination. Thus, by making the termination of winter feeding contingent, not on an arbitrary timeline, but on the Refuge's ability to support the bison and elk herd, the plan strikes a reasonable balance between maintaining population levels and mitigating disease, both of which are necessary to achieve the overarching conservationist purpose of the Refuge as a natural shelter for

displaced bison and elk. It matters not whether this Court believes it to be the right balance. The Court's sole task is to determine whether the agencies have articulated a satisfactory explanation for the balance they have struck given the factual record. They have!

III. NEPA Claim

The plaintiffs also seek to set aside the Bison and Elk Management Plan on the ground that the environmental impact statement, which accompanies the plan, violates NEPA. Under that statute, agencies proposing a major federal action must include a "detailed statement" of, among other things, "the environmental impact of the proposed action" and "any adverse environmental effects which cannot be avoided should the proposal be implemented." 42 U.S.C. § 4332(2)(C)(i), (ii). To satisfy the latter requirement, the EIS must contain "a reasonably complete discussion of possible mitigation measures." *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 351-52 (1989). The plaintiffs do not contend that the EIS lacks a detailed statement of the environmental impacts; instead, they contend that the adaptive management plan, which they regard as a "plan to make a plan," (Pl. Mot. for Summ. J. [#24-2] at 21), is insufficiently detailed to allow for a reasonably complete discussion of mitigation measures. I disagree.

This Court has rejected that kind of argument once before and will do so again in this case. In *Theodore Roosevelt Conservation Partnership v. Salazar*, I disagreed with TRCP's argument—nearly identical to the one here—that an "adaptive-management-mitigation plan [was] 'so amorphous and ill-defined' that the agency was unable to determine the environmental consequences of the project and thus unable to take the requisite 'hard look' at the project's effect on the environment." 605 F. Supp. 2d 263, 279 (D.D.C. 2009) (Leon,

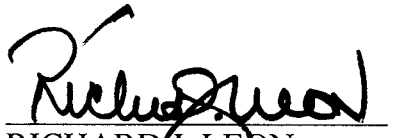
J.). In rejecting that argument, I noted that the agency's plan incorporated numerous specific mitigation techniques. *Id.* I also rejected TRCP's characterization of the plan as "equivalent to a decision to 'act now and deal with environmental consequences later,'" and I emphasized that "NEPA does not prevent agencies from adopting mitigation techniques and acknowledging they may be adjusted later depending on their effectiveness." *Id.* at 280.

Even though the agencies have yet to fill in every detail (which is to be expected of an adaptive management plan), the Bison and Elk Management Plan and EIS incorporate enough mitigation measures to provide a reasonably complete discussion of mitigation. For instance, the plan aims to mitigate the adverse effects of supplemental feeding by dispersing the feeding areas, (*see* FBEMP at 139); changing feed sites daily, (*id.*); spreading feed along meandering lines, (*id.*); delaying the onset of feeding each year, (FEIS Vol. 1 at 67); reducing the average daily ration of feed per elk or bison, (*id.*); decreasing the number of days each year of supplemental feeding, (*id.*); increasing harvest levels, (*id.*); vaccinating the bison and elk for brucellosis, (FEIS Vol. 1 at 73; FBEMP at 139); and increasing surveillance for CWD, (FEIS Vol. 1 at 40, 73; FBEMP at 126-27, 139). Again, the Court's role is a limited one—"to determine whether the EIS was compiled with objective good faith and whether the resulting statement would permit a decisionmaker to fully consider and balance the environmental factors." *Sierra Club v. Adams*, 578 F.2d 389, 393 (D.C. Cir. 1978) (internal quotation marks omitted). Having reviewed the administrative record, which includes a thorough two-volume EIS, I am confident that the agencies' preferred alternative and the plan based upon it are sufficiently detailed to provide a reasonably complete discussion of mitigation. In short, I conclude that the agencies have satisfied their

obligations under NEPA and that they have adequately addressed the possible environmental impacts and mitigation measures relating to their Bison and Elk Management Plan.

CONCLUSION

This case is an excellent example of how policy disputes too often end up in federal courts. Although the plaintiffs prefer a plan that would phase out the winter feeding program within five years, other stakeholders, including other environmental groups, prefer plans that would phase out the program over longer periods.[4] Fearing that premature termination of the program would adversely affect population levels, the agencies ultimately rejected the rigid five-year deadline that the plaintiffs advocate and opted instead for a plan that would phase out supplemental feeding as conditions for doing so were achieved. Unhappy with that result, the plaintiffs—quite predictably—turned to the courts. Unfortunately for the plaintiffs, this Court will not insinuate itself into the business of managing a wildlife refuge—a task that is well beyond its competence. Content that the agencies have articulated a satisfactory explanation for their chosen course of action and have adequately addressed mitigation for purposes of NEPA, I DENY the plaintiffs' Motion for Summary Judgment and GRANT the defendants' respective Cross Motions for Summary Judgment.



RICHARD J. LEON
United States District Judge

[4] The National Wildlife Federation, for instance, supported the agencies' preferred alternative, stating that "it is in the best interest of wildlife to discontinue winter feeding, however, a strategic, methodical approach to reducing feeding is preferable than eliminating feeding too quickly." (FEIS Vol. 2 at 150).

From:	Steve Kallin
To:	Kathy Perez
Cc:	Paul Santavy
Subject:	RE: Brief - National Elk Refuge Adaptive Management Plan
Date:	Tuesday, May 20, 2014 1:31:21 PM

Kathy:

I have been in contact with the Grand Teton National Park who have asked to collaborate on developing briefing material on the status of the Adaptive Management Plan. They would like to brief their Regional Director in early June. I will be working with them next week to develop this material.

I have also updated Paul Santavy about this issue.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 733-9212, extension 2
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Perez, Kathy [mailto:kathy_perez@fws.gov]
Sent: Monday, May 19, 2014 3:45 PM
To: Steve Kallin
Cc: Paul Santavy; Will Meeks
Subject: Brief - National Elk Refuge Adaptive Management Plan

Hi Steve -
As part of the RDT meeting this morning, I brought up the subject plan.

Noreen would like a briefing on the status, i.e., potential pushback from State and any other concerns.

While I have the summary and timeline you provided, could you please synthesize elements into a short briefing? We could then schedule a time with Noreen and Matt Hogan in the not too distant future.

Thanks!
Kathy

--
Kathy M. Perez
Acting Refuge Supervisor (MT, UT, WY)
National Wildlife Refuge System, Region 6
Lakewood, CO

303-236-4306 (office)
208-861-8154 (cell)

From: Perez, Kathy
To: Steve Kallin
Cc: Paul Santavy
Subject: Re: Brief - National Elk Refuge Adaptive Management Plan
Date: Tuesday, May 20, 2014 1:33:02 PM

Great! Thanks. I just wanted to pass along the request from Noreen.

Take care.
Kathy

On Tue, May 20, 2014 at 1:31 PM, Steve Kallin <steve_kallin@fws.gov> wrote:

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>
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From: Jeffrey Warren
To: Eric Cole
Cc: Steve Kallin
Subject: First week of June
Date: Thursday, May 22, 2014 10:36:23 AM

Eric,

I was planning on coming down to help Jenny get started on the aspen project June 2nd – 4th (Monday – Wednesday, possibly coming down Sunday night). Do you know if there is a bed available during that time?

I was also wondering if you would like to set up a time to talk about the AMP models; if there is I can check with Kerry to see if he is available. I need to get a timeframe to Steve for our next group meeting and am struggling doing that, I think because we need to make a bit more progress on the models.

Thanks,

Jeff Warren
Wildlife Biologist
US Fish and Wildlife Service
27650B South Valley Rd.
Lima, MT 59739
406.276.3536 ext. 304

From:	Jeffrey Warren
To:	Eric Cole; Kerry Murphy
Cc:	Steve Kallin; Cris Dippel; Jenny Edwards
Subject:	Next steps for connecting desired conditions and animal use
Date:	Friday, June 06, 2014 3:07:24 PM
Attachments:	Warton and Aarts 2013 Advancing our thinking in presence only and used available analysis.pdf Warton_Shepherd_2010_Poisson point process models solve the pseudo absence problem for presence only data in ecology.pdf

Eric and Kerry,

I've been thinking more about how we move forward with linking desired conditions and animal use on the refuge, especially as it relates to aspen condition. I think we should consider using location data from marked elk to quantify 'intensity' of use spatially using Poisson regression. There are some benefits to this approach outlined in the attached papers (we're currently doing something similar for molt habitat selection of female scaup based on observations of uniquely marked individuals). The 2013 paper uses an example from GPS collared bighorn sheep in Wyoming. Once use is quantified for a block we can see how that correlates with aspen stand structure and/or browse levels using Jenny Edwards's aspen transect data (Kerry – Jenny is a new master's student working on NER who will be collecting data on aspen structure and browse at 35 random transects in aspen stands >2.3 ha in area). We could potentially interpolate her random transects across aspen stands using something like inverse distance weight mapping to give us a continuous map of aspen 'condition'. Probably overly simplistic, but it is a start to get us moving toward a workable solution. It is also something we have existing data for (collared animals and the aspen data currently being collected).

Thoughts?

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Journal of Animal Ecology

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LOCATION-ONLY AND USE-AVAILABILITY DATA: ANALYSIS METHODS CONVERGE

Advancing our thinking in presence-only and used-available analysis

David Warton[1] and Geert Aarts[2,3]

[1]*School of Mathematics and Statistics and Evolution & Ecology Research Centre, The University of New South Wales, NSW 2052, Australia;* [2]*IMARES, Wageningen UR, PO Box 167, 1790 AD, Den Burg, The Netherlands; and* [3]*Department of Aquatic Ecology & Waterquality Management, Wageningen University, Droevendaalsesteeg 3a, 6708 PB, Wageningen, The Netherlands*

Summary

1. The problems of analysing used-available data and presence-only data are equivalent, and this paper uses this equivalence as a platform for exploring opportunities for advancing analysis methodology.

2. We suggest some potential methodological advances in used-available analysis, made possible via lessons learnt in the presence-only literature, for example, using modern methods to improve predictive performance. We also consider the converse – potential advances in presence-only analysis inspired by used-available methodology.

3. Notwithstanding these potential advances in methodology, perhaps a greater opportunity is in advancing our thinking about how to apply a given method to a particular data set.

4. It is shown by example that strikingly different results can be achieved for a single data set by applying a given method of analysis in different ways – hence having chosen a method of analysis, the next step of working out how to apply it is critical to performance.

5. We review some key issues to consider in deciding how to apply an analysis method: apply the method in a manner that reflects the study design; consider data properties; and use diagnostic tools to assess how reasonable a given analysis is for the data at hand.

Key-words: goodness-of-fit, habitat model, MAXENT, point process models, pseudo-absences, resource selection function, species distribution model, use-availability design

Introduction

Technological and data storage advances have led to an enormous increase in data on the location and habitat preferences of species. In this paper, we specifically focus on examples where we have data on where a species has been found, without corresponding data on where they were not located. Such a model is most commonly fitted by comparing the environmental conditions at the presence locations with those elsewhere in the study region, sometimes referred to as 'used-available' data or a 'use-availability' design (Manly *et al*. 2002). A model fitted in this way is commonly referred to as a resource selection function (Boyce & McDonald 1999; Manly *et al*. 2002, Fig. 1).

The 'classical' approach to resource selection function estimation is to apply logistic regression to used-available data – the response variable takes the value one or zero depending whether a point is *used* (a known presence) or *available* (typically randomly selected points). The resource selection function is then defined as the exponential function of the linear predictor from the fitted logistic regression model (Boyce & McDonald 1999; Manly *et al*. 2002; Johnson *et al*. 2006). The literature on resource selection functions has its origins over thirty years ago (Johnson 1980), and the seminal text on the topic was first published twenty years ago (Manly *et al*. 2002, first edition 1992).

A related topic has recently emerged in the species distribution modelling literature, on methods for analysing presence-only data (Pearce & Boyce 2006; Elith & Leathwick 2009). Presence-only data typically consist of digitized opportunistic sightings or museum records of where a species occurs, over a broad geographic scale. By coupling these data with maps of environmental variables, we can model the spatial distribution of a species using generalizations of logistic regression (Pearce & Boyce 2006) or modern methods of classification (Phillips *et al*. 2006; Elith *et al*. 2006).

Although these approaches are called presence-only methods, they rely on environmental background layers, which act as a set of 'pseudo-absence' points (Pearce &

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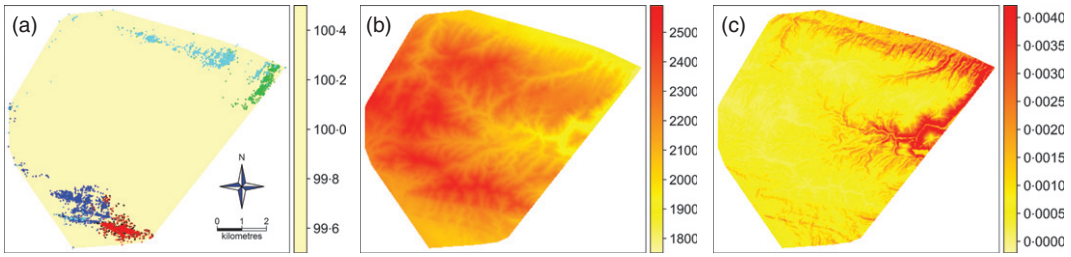


Fig. 1. Example used-available data: (a) the hourly locations of five bighorn sheep; (b) elevation (in metres), one of five measured environmental variables considered in analyses; (c) an estimated resource selection function, as an exponential function of the five environmental variables (more specifically, the exponent of the map produced in Fig. 3a). The question considered in this paper is how to improve on current practice in how to produce a model as in (c).

Boyce 2006). Typically, the response variable in analyses is an indicator which takes the value one for presence points and zero for pseudo-absences. Presence-only analysis is a relatively recent topic in the species distribution modelling literature, which has exploded in recent times – ISI Essential Science Indicators rate it as one of the fastest-moving research fronts in the environmental sciences (accessed December 2012).

This paper is a contribution of a *Journal of Animal Ecology* Special Feature that arose from recognition that the two problems described above – estimating a resource selection function from used-available data and estimating a species distribution model from presence-only data – are equivalent. The equivalence of these two problems has been known for some time (Ferrier *et al.* 2002, for example), but despite this, the used-available and presence-only literatures appear to have developed largely in parallel with little cross-fertilization of ideas. The following section (*Implications of equivalence*) considers the question: how can we advance one literature by leveraging from lessons learnt in the other? Then (in *It's not what you use, it's how you use it*), we consider more broadly the question of how to advance current practice in used-available and presence-only data modelling, in particular, the importance of thinking about how best to apply a given analysis method to the data set at hand. Finally (*Which way should you apply a given method?*), we review three key considerations when applying a given analysis method – study design, data properties and using goodness-of-fit tools to inform analyses.

Implications of equivalence

In this section, we will study recent trends in each of the resource selection and species distribution modelling literatures. A particular focus will be seeking opportunities where ideas developed in one literature can be transferred to advance the other.

TRENDS IN THE USE-AVAILABILITY LITERATURE

Resource selection studies were initially aimed at understanding which resources were selected preferentially by the study species, via comparing use and availability of discrete resources (Manly *et al.* 2002). With the increase of geographic information systems (GIS) and detailed data on species distributions, the approaches have slowly moved towards explaining and predicting species distributions (Boyce & McDonald 1999), and the term 'resource' has been interpreted more broadly; for example, topological variables such as aspect and elevation are often considered to represent resources (Manly *et al.* 2002).

There has been some conjecture in the use-availability literature on how a resource selection function should be interpreted and how to specify a valid data model for estimating a resource selection function. Manly *et al.* (2002) and Johnson *et al.* (2006) argue that a resource selection function computed from used-available data does not give probabilities of use, rather it is proportional to this probability ('relative probabilities'). However, Keating & Cherry (2004) criticized logistic regression and the 'classical' exponential function approach to estimation (Boyce & McDonald 1999; Manly *et al.* 2002), arguing that the probabilities so calculated are not valid (because they can exceed one) and that they can be biased by 'contaminated controls' (Lancaster & Imbens 1996), that is, points designated as *available* may have actually been *used*. However, a valid model for use-availability designs can be derived as a weighted distribution (Johnson 1980; Johnson *et al.* 2006; Lele & Keim 2006), and slope parameters obtained using logistic regression approximate those of the weighted distribution approach. Aarts *et al.* (2012) noticed that the weighted distribution likelihood is identical to a type of Poisson point process likelihood, from which they deduced that the resource selection function actually models intensity (or density of observations) rather than a probability. This alleviates difficulties interpreting values that exceed one and perhaps clarifies what was previously (Manly *et al.* 2002; Johnson *et al.* 2006) intended by a 'relative' probability. Another important point to note is that both a point process approach and weighted distribution theory clarify the role of *available* points – they should not be viewed as true zeros, but as a numerical trick to approximate the integral of the likelihood function (Warton & Shepherd 2010)

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When modelling used-available data, decisions on what entails *used* and *available* have to be made. It will be seen later that similar issues arise when modelling species distributions based on presence-only data. For habitat analysis, *used* is most often defined as the relative time spent in different habitats, in which case it is important to consider location detection bias (Nielson *et al*. 2009; Frair *et al*. 2010). Defining *available* is perhaps less straightforward. First of all, not all regions in space are equally accessible, and this changes when an animal moves from one place to the next. Incorrectly defining *available* may have important repercussions on the fitted function; for example, Beyer *et al*. (2010) showed that changes in the definition of *available* may even lead to changes in the sign of model coefficients. Several solutions have been put forward, such as only considering the habitats in the direct vicinity of the animal (e.g. using discrete choice models – McCracken *et al*. 1998), sampling *available* points based on a null model of usage, by incorporating accessibility as a covariate (Manly *et al*. 2002; Aarts *et al*. 2008), or by analysing used-available data as a movement model (Moorcroft & Barnett 2008).

The influence of resource availability on the estimated resource selection function is poorly understood. Changes in the availability of resources may lead to drastic changes in the perceived preference for those resources (Mysterud & Ims 1998), even when an organism uses the same movement rule to explore and exploit space, known as functional response in habitat use (Mauritzen *et al*. 2003; Matthiopoulos *et al*. 2011). When data can be obtained on individuals or subpopulations that experience very different environmental conditions, the effect of changes in availability on resource selection can be accounted for in population-level models. Hebblewhite & Merrill (2008) proposed a mixed-effects approach to capture variations in the resource selection function and related these to variation in resource availability. Matthiopoulos *et al*. (2011) extended the method to directly incorporate as covariates the available amount of each resource to each individual at each sampling time.

A theme in the original text on resource selection function estimation (Manly *et al*. 2002) was that of model-based vs. design-based inference. That is, one can test hypotheses and assess uncertainty in parameter estimates either using a model-based approach that assumes the model is correct (e.g. using a Z-test of a model coefficient) or using a design-based approach that makes use of independent sampling units in the study design to make valid inferences despite possible model misspecification (e.g. bootstrapping individuals to estimate the sampling error of a model coefficient). Boyce *et al*. (2002) and Manly *et al*. (2002) specifically discussed the jackknife and bootstrap, design-based methods which can be used to make inferences about resource selection functions that are robust to model misspecification. While design-based inference is on occasion implemented in the use-availability literature (e.g. Matthiopoulos *et al*. 2011), such methods are especially rare in presence-only analysis.

IMPLICATIONS FOR PRESENCE-ONLY ANALYSIS

By taking the above trends and reframing them in terms of species distribution modelling, we can develop 'new' ideas for ways to advance current practice in presence-only modelling. Below is a summary of some subsequent opportunities for advancing presence-only analysis.

Accounting for heterogenous sampling and detection bias in presence-only records

The problem of accounting for detection bias has received some recent attention (Phillips *et al*. 2009; Dorazio 2012) in presence-only modelling, but ideas from the use-availability literature are worthy of consideration, for example modelling such bias via additional covariates (Manly *et al*. 2002; Aarts *et al*. 2008).

Methods for studying drivers of change in species distribution

A key concern in species distribution modelling is predicting the response of species distribution to a changing environment, whether such change is driven by habitat fragmentation, climate change or some other cause (Elith & Leathwick 2009). Fitting a species distribution model in a changing environment corresponds directly to the problem of estimating a resource selection function under changing resource availability (Matthiopoulos *et al*. 2011). The ideal approach would be to model species presence-only data that arose in a range of environmental conditions and to model it as a function, not just of environmental variables, but also as a function of the availability of these environments. Location-only data are sometimes collected under a broad variety of environmental conditions, for example, when the distribution of a species has been fragmented into several spatially isolated populations, or when long-term data give information on species distribution under a range of different sets of climatic conditions. Such circumstances present an opportunity to directly study the effect on species distribution of changes in availability of different environments, using the methods of Matthiopoulos *et al*. (2011).

Design-based inference for species distribution models

While the focus in species distribution modelling has been largely on obtaining accurate predictions of species distribution, design-based tools (Manly *et al*. 2002) offer the opportunity to assess uncertainty in predictions, in model parameters and in differences in predictive performance between competing analysis methods. For example, the block bootstrap (Lahiri 2003) has potential – it can be applied to large spatial blocks to make approximately valid inferences despite spatial autocorrelation (assuming weaker dependence between observations separated by larger distances).

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TRENDS IN THE PRESENCE-ONLY LITERATURE

Presence-only analysis is a relatively new and fast-moving literature, with rapid development and uptake of new analysis methods (for example Phillips *et al.* 2006, cited over 2000 times within 6 years). In comparisons of the predictive performance of different analysis methods (such as Elith *et al.* 2006), the more successful methods tend to be those with some form of regularization (Phillips *et al.* 2006; Reineking & Schröder 2006), community-level approaches (Ferrier & Guisan 2006; Elith & Leathwick 2007; Ovaskainen & Soininen 2011) or ensemble approaches where predictions are averaged across competing models (Araújo & New 2007; Elith *et al.* 2008). Although having said this, it must be emphasized that the results of methodological comparisons depend heavily on how the comparisons are made, and if not designed carefully, comparisons can be biased towards more complex models (Wenger & Olden 2012; Hijmans 2012).

Such a range of different methods has been proposed that it is an ongoing challenge to understand the properties of different methods and their interrelationships. Indeed, there have been calls for conceptual unification (Elith & Leathwick 2009; Aarts *et al.* 2012). Particular points at issue have been the lack of a formal model framework for presence-only data, and the question of how to select pseudo-absences, a problem known to have important implications for model outcomes (Chefaoui & Lobo 2008, for example) and which tends to be investigated via an *ad hoc* simulation perspective (Barbet-Massin *et al.* 2012, for example) as opposed to via a more systematic approach. This issue is very much related to the challenge of defining *available* points in used-availability analysis.

We think that a significant step in addressing the above issues is the proposal of point process models (Warton & Shepherd 2010; Baddeley *et al.* 2010; Aarts *et al.* 2012) as a natural statistical framework for modelling presence-only data, and the demonstration that in the Poisson case this is equivalent to MAXENT (Renner & Warton 2013), some used-available methods (Aarts *et al.* 2012) and (approximately) logistic regression on randomly chosen pseudo-absences (Warton & Shepherd 2010). These results are an important step forward for two reasons. Firstly, point process models offer a framework for choosing the number and location of pseudo-absences – treating pseudo-absences not as false absences but instead as a mathematical construct which we use to help estimate the likelihood function (via numerical integration, Warton & Shepherd 2010). Secondly, point process models come with a set of tools for inference about parameters and for assessing goodness-of-fit (Diggle 2003; Cressie 1993). MAXENT and related methods have previously lacked such tools, but their equivalence with point process models implies that point process methods can be applied directly.

IMPLICATIONS FOR USED-AVAILABLE ANALYSIS

As before, we can take the above trends and reframe them in terms of resource selection function estimation, in order to identify some potential ways to advance current practice in used-available modelling.

Modern methods of estimating resource selection functions

There is the potential to improve predictive performance in used-available analyses, using modern tools that have had success in the presence-only literature. Particular examples include methods involving regularization (such as the LASSO, Phillips *et al.*, 2006; Reineking & Schröder 2006), or some form of model averaging (Araújo & New 2007; Elith *et al.* 2008). Such ideas are explored elsewhere in this special issue.

Community-level used-available models

In cases where there are used-available data for multiple species in the same study region, one might be able to 'borrow strength' across species to improve predictions, in much the same way as community-level species distribution models (Ferrier & Guisan 2006; Ovaskainen & Soininen 2011).

A point process framework for used-available analysis

Point process models, as a valid approach to modelling any form of point event data (Cressie 1993), have considerable potential to assist in constructing readily interpretable models and can inform choice of the number and location of *available* points (Warton & Shepherd 2010; Aarts *et al.* 2012).

It's not what you use, it's how you use it

The above suggestions, and more broadly, any advance in methods for analysing used-available or presence-only data, have the potential to improve predictive performance. It is well understood that applying different analysis methods to a data set can give very different results and very different predictive performance (Elith *et al.* 2006). However, it should also be understood that when different methods are applied in a similar way, differences in performance are typically more modest, and in some instances, seemingly different analysis methods can lead to near-identical results.

These ideas are illustrated on a bighorn sheep data set (T. Ryder, Wyoming Game and Fish Department, unpublished data). Five bighorn sheep (*Ovis canadensis*) were GPS-collared, and their location (in the Seminoe Mountains, Wyoming, USA) recorded hourly between 1 January and 15 April 2010 (Fig. 1). Maps of five environmental variables were also available over the whole study

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region, giving information on topology (aspect, slope, elevation) and exposure (distance from nearest tree, and distance from nearest 'escape terrain'). It was of interest to estimate the resource selection function characterizing the behaviour of these five sheep and estimate the relative importance of the five environmental variables to the sheep.

We applied three quite different analysis methods to the bighorn sheep data – logistic regression (Warton & Shepherd 2010), maximum entropy (MAXENT, Phillips *et al*., 2006) and multivariate adaptive regression splines (MARS, Elith & Leathwick, 2007). These three methods were applied in similar ways – using the same random set of 2617 pseudo-absences, the same five environmental variables, included as linear, quadratic and interaction terms. Results were very similar across methods, as seen from inspection of maps of predicted values (Fig. 2) or from consideration of the relative importance of different environmental variables (Table 1).

However, precisely *how* a method is applied to data can have dramatic effects on results and predictive performance. For example, consider analyses of the bighorn sheep data using the same method, a Poisson point process model, with the same five environmental variables (as listed in Table 1). However, we have applied this analysis method in three different ways:

(a). As a static model – using the five environmental variables only, and not accounting for the time-sequencing of the data in any way.
(b). As a movement model (described below) – using raw data without transformation.
(c). As a movement model – using transformed data, where appropriate.

The movement model was fitted using the same modelling framework as the static model, but it additionally included three 'movement variables' in analyses, and pseudo-absences or 'quadrature points' (Warton & Shepherd 2010) were chosen in a different way. The three additional movement variables were a function of a sheep's last known sighting (distance from last location, direction of movement, time-of-day). By including these terms, the interpretation of model output changes – instead of modelling where a sheep is, we are modelling where a sheep will go next (given where it last was and when it was there). Pseudo-absences were chosen in the neighbourhood of a sheep's current location (similar to Forester *et al*. 2009), whereas for the static model, a regularly-spaced 30×30 m grid consisting of 78 182 pseudo-absences was used (Warton & Shepherd 2010). Further details are included in an Appendix S1.

When a point process model was applied to the bighorn sheep data in the above three ways, results differed substantially, both in terms of the appearance of maps of predicted sheep intensity (Fig. 3) or the relative importance of different variables (Table 2).

While we can advance the methodology for presence-only and used-available analysis, and in so doing make some performance gains, there is clearly significant potential to make gains by advancing our thinking about *how to use* a given analysis method. This potential is evident in comparing results in Figs 2 and 3 or Tables 1 and 2 – while changing the analysis methodology had some effects on results, changing how a given method was applied had a more substantial effect. This raises the question: once you have chosen an analysis method, how should you decide how to apply it?

Table 1. Different methods can give not-so-different results: the relative importance of different environmental variables (reported as % of explained deviance estimated via a leave-one-out approach) in (a) Logistic regression; (b) MAXENT; (c) MARS; when modelling the bighorn sheep data as in Fig. 2. Note that results are broadly similar across models; for example, the rank order of the five environmental variables is unchanged across the three models

Variable	(a) Logistic regression	(b) MAXENT	(c) MARS
Aspect	7·7	8·3	12·8
Distance to escape	20·7	13·9	14·5
Slope	0·9	0·7	0·1
Elevation	34·4	49·7	41·9
Distance to tree	31·5	18·2	18·0

Table 2. Changing how you apply method can dramatically affect results. The relative importance of different explanatory variables (reported as % of explained deviance estimated via a leave-one-out approach) when using a (a) static model; (b) movement model on raw data; (c) movement model on suitably transformed data. BIC of the fitted models is also included as a measure of goodness-of-fit

Variable	(a) Static model	(b) Movement model, raw data	(c) Movement model, transformed data
Static variables			
Aspect	32·5	0·29	0·21
Distance to escape	1·5	0·04	0·02
Slope	0·1	0·03	0·04
Elevation	3·1	0·04	0·04
Distance to tree	0·5	0·02	0·01
Movement variables			
Distance moved	–	78·3	76·3
Direction of movement	–	0·05	0·15
Distance moved × Time of day	–	0·96	3·85
BIC	657 713	500 261	496 544

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Which way should you apply a given method?

Given that the way a method is applied substantially influences results, it is important to consider carefully how to apply any chosen analysis method to the data at hand. A key consideration when analysing data in ecology is that the assumptions and approach make ecological sense (Austin 2002), a consideration which has implications for the choice of variables for analysis, and their form of inclusion in the model. In addition, there are some important statistical considerations:

- Study design – match the analysis method to the method by which the data were collected.
- Data properties – study the properties of data to be analysed and ensure variables are analysed on the appropriate scale.
- Goodness-of-fit – apply diagnostic tools to assess how well the given method of analysis fits the data.

These points are illustrated by example below, using the bighorn sheep data.

STUDY DESIGN

How data are analysed needs to be directly related to how it was collected. What were the independent sampling units (subjects) that were sampled? How were data collected on these subjects? See Cressie *et al.* (2009) for some additional considerations, including analysis when subjects had unequal probabilities of being sampled.

In the case of the bighorn sheep data (Fig. 1), the study involved putting radiocollars onto five sheep, and using GPS to track sheep movement at hourly intervals. Hence, the five sheep were the independent sampling units, and the data that were collected are best described as *movement* data. The data did not arise as some 'static' list of points where the sheep have been located. This means that static models (as in Figs 2 and 3a) which do not take account of the time-sequencing in the data are inappropriate, due to a mismatch between the way the data were collected and the way the data are treated in analysis. A high level of temporal autocorrelation has been introduced through repeated sampling, which needs to be accounted for to validly infer the nature of the environmental association (Patterson *et al.* 2008).

A more natural model for the bighorn sheep data aims to predict future sheep locations not only as a function of environmental variables, but also as a function of previous location(s) as in Fig. 3b,c. This changes the interpretation of the model from a static model, of where the sheep is standing, to a movement model, of where the sheep is going. Hence, we were able to directly model the resource selection decisions that a sheep was making. Distance from last known location proved to be by far the most important predictor of where a sheep was next

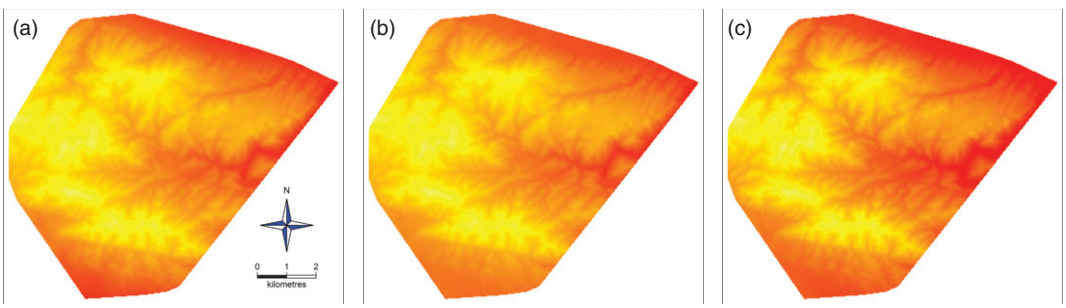


Fig. 2. Different methods can give not-so-different results: predicted bighorn sheep distribution (on the scale of the linear predictor) for (a) logistic regression; (b) MAXENT; (c) MARS; all models were fitted to the bighorn sheep as quadratic functions of the same set of environmental variables, using the same set of 2617 random pseudo-absences. Redder (darker) regions indicate higher sheep density.

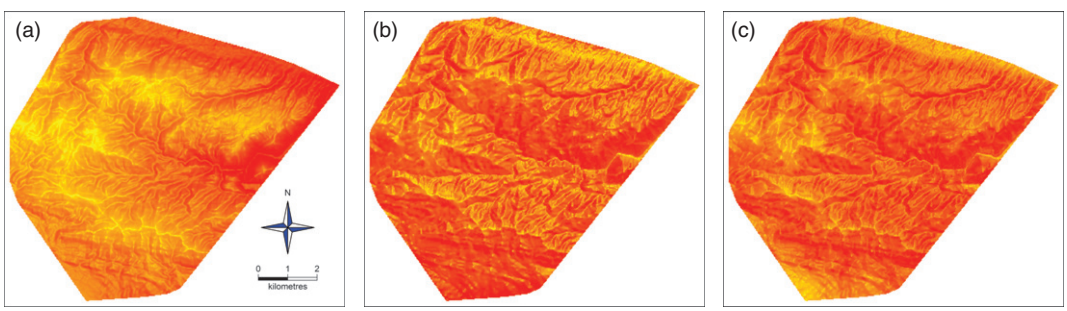


Fig. 3. Changing how you apply a method can dramatically affect results, as demonstrated here when predicting intensity of bighorn sheep (on the log-scale) using a Poisson point process model fitted as a: (a) static model; (b) movement model on raw data; (c) movement model on suitably transformed data. Redder (darker) regions indicate higher density.

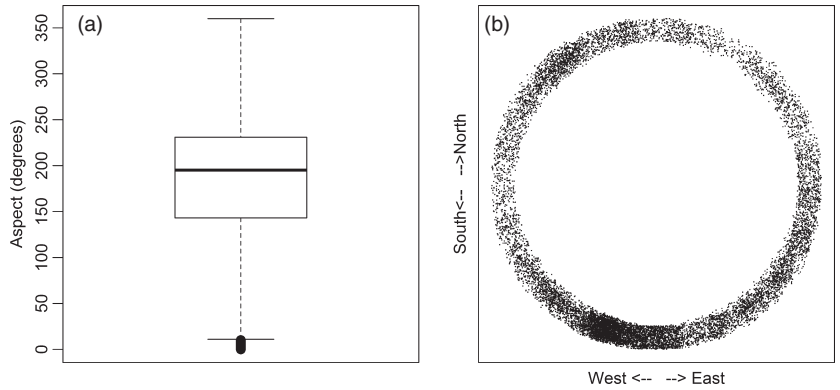


Fig. 4. Aspect is a circular variable that should be transformed for analysis, rather than treating it as quantitative as in (a), values should be sine- and cosine-transformed prior to analysis, to map them onto a circle as in (b), which plots the aspect at all locations where a bighorn sheep was recorded as present. Note we can see from (b) that sheep are found especially often on slopes with a southerly aspect.

seen, accounting for over 75% of explained deviance in the movement models (Table 2b,c). This is not a particularly surprising result – obviously the best place to look for a sheep is where you last saw it! However, given how important previous location was in predicting a sheep's future location, it was important to incorporate this information into analysis.

Movement might be expected to show some diurnal variation, so because sheep were tracked at hourly intervals, time-of-day should also be incorporated into the model. In fact, analyses suggested that time-of-day (and its interaction with distance moved) was the second most important variable in the model. Further inspection suggested that sheep were most active at night and least active early in the morning.

The identities of the five different sheep were not made use of in the analyses of Fig. 2 and incorporating that knowledge could further improve models. One way to make use of sheep identity is to make design-based inferences (Manly *et al.* 2002) about predictive performance. For example, we can use a leave-one-out approach to consider how well a model predicts the movement of sheep *i*, when the model was constructed using all data except that for sheep *i*. Such use of independent 'test data' to assess predictive performance is an important idea in model validation (Boyce *et al.* 2002), and using different sheep as the test data, we can assess how well the model transfers from one sheep to the next.

DATA PROPERTIES

Some variables should not be analysed in their raw form, but instead routinely require transformation. A common example in biology is size variables, which tend to be the outcome of multiplicative processes and hence are quite naturally interpreted on a logarithmic scale (Kerkhoff & Enquist 2009). A different example, encountered in the bighorn sheep data set, is circular variables (Fisher 1993). Aspect is a circular variable measured from 0 to 360 degrees, with 0 and 360 both meaning the same thing – a due north aspect. Hence, this variable makes little sense when analysed on an arithmetic scale (Fig. 4a), but should be transformed in some way to reflect its circularity. A second circular variable in the sheep data set is time-of-day, which is circular in time (0 to 24 h).

A simple way to modify a circular variable for regression analyses is to include its sine- and cosine-transformations as predictors – $\sin\left(\frac{2\pi x}{K}\right)$ and $\cos\left(\frac{2\pi x}{K}\right)$, where K is the periodicity of the circular variable ($K = 360$ and $K = 24$, respectively, for aspect measured in degrees and time-of-day measured in hours). The sine and cosine functions map a circular variable onto the unit circle such that it can be interpreted as a directional quantity (Fisher 1993). Figure 4b plots the aspects at which sheep were located, with 'jittering', such that a high density of points suggests an aspect highly favoured by sheep. Contrary to Fig. 4a, a pattern can be seen – the sheep tend to favour southerly aspects.

With reference to the point process models introduced previously (Fig. 3), model (b) was fitted using aspect and time-of-day without transformation. On more careful consideration of data properties, both variables should have been sine- and cosine-transformed, as in model (c). The implications of these changes on results were relatively modest – the maps of predicted sheep intensity were broadly similar in Fig. 3b,c, and in Table 2b,c, the main gains seemed to come from treating time-of-day as a circular variable, which captured an additional 3% of deviance.

GOODNESS-OF-FIT

The precise diagnostic tools that can be used to assess goodness-of-fit depend on the method of data analysis. Generalized linear models for example can typically be diagnosed using residual plots (Dunn & Smyth 1996) and using information criteria. A conspicuous shortcoming of some machine learning methods is the lack of diagnostic tools – having fitted a support vector machine (Hastie *et al.* 2009) to data, for example, what model assumptions were made, and how can we check that they were reasonable?

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A range of diagnostic tools have been developed for point process models (Baddeley *et al.* 2000; Diggle 2003; Baddeley & Turner 2005). We can use information criteria, for example, applying BIC to the three point process models of Table 2 suggests model (c) is the most appropriate. Graphical tools can also be applied, for example *K*-functions (Baddeley *et al.* 2000; Diggle 2003). For Fig. 5, the cumulative conditional intensity of latitude $\Lambda(y) = \int_{x_2 < y} \lambda(x)|\mathrm{d}x|$ (Cressie 1993) was calculated separately for each sheep using a leave-one-out approach, then plotted as a function of time. If the model fitted were valid, values of $\Lambda(y)$ at points where sheep were observed would be approximately uniformly distributed, and importantly, they would be independent of time (or any other variable). This is evidently not the case for the static model (Fig. 5a), where each sheep's location in a north-south direction 'drifts', because of the dependence between a sheep's current location and its most recent known location. Models (b) and (c) account for this dependence sufficiently well that spatial dependence is no longer detectable (Fig. 5b,c).

Discussion

The equivalence of the problems of analysing used-available and presence-only data presents some opportunities to advance on current practice in each discipline, by leveraging ideas developed in their corresponding contexts. Several ideas on this front have been suggested in this paper, by noticing ideas developed in one literature that have seemingly been under-developed in the other – some particularly interesting examples include the application of modern analysis methods (Elith *et al.* 2006) in used-available analysis, and the development of presence-only models of functional response to environment (Matthiopoulos *et al.* 2011) as a means to study the potential effects of a changing environment on species distribution.

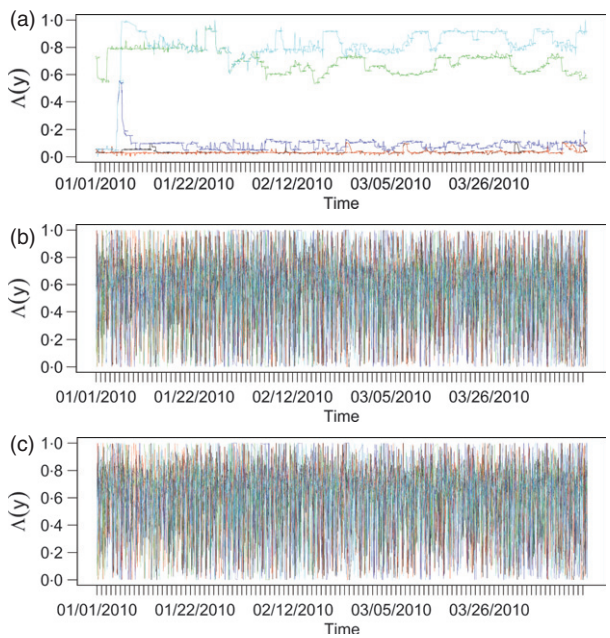


Fig. 5. Goodness-of-fit of the different models to the bighorn sheep data. Cumulative intensity of latitude, $\Lambda(y)$, is presented for a point process model fitted as a (a) static model; (b) movement model on raw data; (c) movement model on suitably transformed data. $\Lambda(y)$ is plotted against time using a different colour for each of the five sheep. A model which fits the data well would have a cumulative intensity that takes uniformly random values which are independent over time – the 'drift' observed in (a) is clear evidence of lack-of-fit, suggesting that we need to use a movement model which predicts sheep location as a function of last known location (b) and (c).

While there are some ideas that have been developed in one literature and not the other, some insight can also be gained by studying commonalities. An important common theme in the used-available and location-only literatures is that of how to select *available* points or pseudo-absences to include in analyses (Chefaoui & Lobo 2008; Forester *et al.* 2009; Barbet-Massin *et al.* 2012). The significant potential influence of this decision is evident in the analyses of Tables 1 and 2, where method of pseudo-absence choice seemed the most striking source of differences in results. In the models of Table 1, a random set of 2617 pseudo-absences was analysed. This gave completely different results to Table 2a, which analysed 78 182 pseudo-absences in a uniform rectangular grid at a fine spatial resolution. The latter is a natural and effective sampling scheme for a static model (Warton & Shepherd 2010), and the substantial differences in results suggest that for this data set, 2617 random pseudo-absences was grossly insufficient. Results were different again in Table 2b,c, where for each presence point, a set of pseudo-absences was chosen in a radial design around the last known location (similar to Forester *et al.* 2009). On the question of precisely how to choose the number and location of pseudo-absences, point process models (Warton & Shepherd 2010) and animal movement models (Moorcroft & Barnett 2008; Forester *et al.* 2009) seem to have particular potential – when the role of the pseudo-absences is implicit in the modelling framework, there is no need to make *ad hoc* decisions to specify their number and location.

Although not the focus of this paper, it should be noted that there is a vast and growing body of literature on methods for modelling animal movement (Patterson *et al.* 2008; Moorcroft & Barnett 2008, for example), suitable for data such as the bighorn sheep example considered here. The Poisson point process approach considered in Fig. 3 was not a typical animal movement modelling approach, rather it was an 'omnibus' approach for analysing point patterns adapted to the problem of modelling movement. However, the approach was sufficiently flexible that it could construct quite reasonable regression models of presence-only data in either the static or movement context, to illustrate some key ideas.

The key idea demonstrated in Table 2 and Fig. 3 was that the most important consideration in analysis is perhaps not which analysis method to use, but how to apply any given method in a manner that is appropriate for the

data at hand. Both the used-available and presence-only literatures are rife with papers proposing advances in analysis methodology (for example, Phillips *et al*. 2006; Elith & Leathwick 2007; Elith *et al*. 2008; Matthiopoulos *et al*. 2011), but less attention tends to be paid to the perhaps more important question of how to apply a method appropriately. Key statistical considerations are as follows: analyse data in a manner which reflects the study design; consider data properties; use diagnostic tools to assess how reasonable a given analysis is for the data at hand. Yet, some methods of analysis lack the flexibility to handle different study designs (e.g. incorporating animal movement), and some are seriously deficient in diagnostic tools for assessing goodness-of-fit. Perhaps, this is where the greatest gains can be made in advancing methods for used-available and presence-only analysis.

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References

Aarts, G., Fieberg, J. & Matthiopoulos, J. (2012) Comparative interpretation of count, presence–absence and point methods for species distribution models. *Methods in Ecology and Evolution*, **3**, 177–187.

Aarts, G., MacKenzie, M., McConnell, B., Fedak, M. & Matthiopoulos, J. (2008) Estimating space-use and habitat preference from wildlife telemetry data. *Ecography*, **31**, 140–160.

Araújo, M.B. & New, M. (2007) Ensemble forecasting of species distributions. *Trends in Ecology & Evolution*, **22**, 42–47.

Austin, M.P. (2002) Spatial prediction of species distribution: an interface between ecological theory and statistical modelling. *Ecological Modelling*, **157**, 101–118.

Baddeley, A., Berman, M., Fisher, N.I., Hardegen, A., Milne, R.K., Schuhmacher, D., Shah, R. & Turner, R. (2010) Spatial logistic regression and change-of-support in Poisson point processes. *Electronic Journal of Statistics*, **4**, 1151–1201.

Baddeley, A. & Turner, R. (2005) Spatstat: an R package for analyzing spatial point patterns. *Journal of Statistical Software*, **12**, 1–42.

Baddeley, A.J., Moller, J. & Waagepetersen, R. (2000) Non- and semi-parametric estimation of interaction in inhomogeneous point patterns. *Statistica Neerlandica*, **54**, 329–350.

Barbet-Massin, M., Jiguet, F., Albert, C.H. & Thuiller, W. (2012) Selecting pseudo-absences for species distribution models: how, where and how many? *Methods in Ecology and Evolution*, **3,** 327–338.

Beyer, H.L., Haydon, D.T., Morales, J.M., Frair, J.L., Hebblewhite, M., Mitchell, M. & Matthiopoulos, J. (2010) The interpretation of habitat preference metrics under use-availability designs. *Philosophical Transactions of the Royal Society B – Biological Sciences*, **365**, 2245–2254.

Boyce, M.S. & McDonald, L.L. (1999) Relating populations to habitats using resource selection functions. *Trends in Ecology and Evolution*, **14**, 268–272.

Boyce, M.S., Vernier, P.R., Nielsen, S.E. & Schmiegelow, F.K.A. (2002) Evaluating resource selection functions. *Ecological Modelling*, **157**, 281–300.

Chefaoui, R.M. & Lobo, J.M. (2008) Assessing the effects of pseudo-absences on predictive distribution model performance. *Ecological Modelling*, **210**, 478–486.

Cressie, N., Calder, C.A., Clark, J.S., Hoef, J.M.V. & Wikle, C.K. (2009) Accounting for uncertainty in ecological analysis: the strengths and limitations of hierarchical statistical modeling. *Ecological Applications*, **19**, 553–570.

Cressie, N.A.C. (1993) *Statistics for Spatial Data*. John Wiley & Sons, New York.

Diggle, P.J. (2003) *Statistical Analysis of Spatial Point Patterns*. Arnold, London.

Dorazio, R.M. (2012). Predicting the geographic distribution of a species from presence-only data subject to detection errors. *Biometrics*, **68**, 1303–1312.

Dunn, P.K. & Smyth, G.K. (1996) Randomized quantile residuals. *Journal of Computational and Graphical Statistics*, **5**, 236–244.

Elith, J., Graham, C.H., Anderson, R.P., Dudik, M., Ferrier, S., Guisan, A., Hijmans, R.J., Huettmann, F., Leathwick, J.R., Lehmann, A., Li, J., Lohmann, L.G., Loiselle, B.A., Manion, G., Moritz, C., Nakamura, M., Nakazawa, Y., Overton, J.M., Peterson, A.T., Phillips, S.J., Richardson, K., Scachetti-Pereira, R., Schapire, R.E., Soberon, J., Williams, S., Wisz, M.S. & Zimmermann, N.E. (2006) Novel methods improve prediction of species' distributions from occurrence data. *Ecography*, **29**, 129–151.

Elith, J. & Leathwick, J. (2007) Predicting species distributions from museum and herbarium records using multiresponse models fitted with multivariate adaptive regression splines. *Diversity and Distributions*, **13**, 265–275.

Elith, J. & Leathwick, J. (2009) Species distribution models: ecological explanation and prediction across space and time. *Annual Review of Ecology, Evolution, and Systematics*, **40**, 677–697.

Elith, J., Leathwick, J.R. & Hastie, T. (2008) A working guide to boosted regression trees. *Journal of Animal Ecology*, **77**, 802–813.

Ferrier, S. & Guisan, A. (2006) Spatial modelling of biodiversity at the community level. *Journal of Applied Ecology*, **43**, 393–404.

Ferrier, S., Watson, G., Pearce, J. & Drielsma, M. (2002) Extended statistical approaches to modelling spatial pattern in biodiversity in northeast New South Wales. I. Species-level modelling. *Biodiversity and Conservation*, **11**, 2275–2307.

Fisher, N.I. (1993) *Statistical Analysis of Circular Data*. Cambridge University Press, Cambridge, UK.

Forester, J.D., Im, H.K. & Rathouz, P.J. (2009) Accounting for animal movement in estimation of resource selection functions: sampling and data analysis. *Ecology*, **90**, 3554–3565.

Frair, J.L., Fieberg, J., Hebblewhite, M., Cagnacci, F., DeCesare, N.J. & Pedrotti, L. (2010) Resolving issues of imprecise and habitat-biased locations in ecological analyses using GPS telemetry data. *Philosophical Transactions of the Royal Society B – Biological Sciences*, **365**, 2187–2200.

Hastie, T., Tibshirani, R. & Friedman, J. (2009) *The Elements of Statistical Learning*, 2nd edn. Springer-Verlag, New York.

Hebblewhite, M. & Merrill, E. (2008) Modelling wildlife-human relationships for social species with mixed-effects resource selection models. *Journal of Applied Ecology*, **45**, 834–844.

Hijmans, R.J. (2012) Cross-validation of species distribution models: removing spatial sorting bias and calibration with a null model. *Ecology*, **93**, 679–688.

Johnson, C.J., Nielsen, S.E., Merrill, E.H., Mcdonald, T.L. & Boyce, M.S. (2006) Resource selection functions based on use-availability data: theoretical motivation and evaluation methods. *Journal of Wildlife Management*, **70**, 347–357.

Johnson, D. (1980) The comparison of usage and availability measurements for evaluating resource preference. *Ecology*, **61**, 65–71.

Keating, K.A. & Cherry, S. (2004) Use and interpretation of logistic regression in habitat selection studies. *Journal of Wildlife Management*, **68**, 774–789.

Kerkhoff, A.J. & Enquist, B.J. (2009) Multiplicative by nature: Why logarithmic transformation is necessary in allometry. *Journal of Theoretical Biology*, **257**, 519–521.

Lahiri, S.N. (2003) *Resampling Methods for Dependent Data*. Springer, New York.

Lancaster, T. & Imbens, G. (1996) Case-control studies with contaminated controls. *Journal of Econometrics*, **71**, 145–160.

Lele, S.R. & Keim, J.L. (2006) Weighted distributions and estimation of resource selection probability functions. *Ecology*, **87**, 3021–3028.

Manly, B.F.J., McDonald, L.L., Thomas, D.L., McDonald, T.L. & Erickson, W.P. (2002) *Resource Selection by Animals – Statistical Design and*

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Analysis for Field Studies. Kluwer Academic Publishes, Dordrecht, The Netherlands.
Matthiopoulos, J., Hebblewhite, M., Aarts, G. & Fieberg, J. (2011) Generalized functional responses for species distributions. *Ecology*, **92**, 583–589.
Mauritzen, M., Belikov, S.E., Boltunov, A.N., Derocher, A.E., Hansen, E., Ims, R.A., Wiig, O. & Yoccoz, N. (2003) Functional responses in polar bear habitat selection. *Oikos*, **100**, 112–124.
McCracken, M.L., Manly, B.F.J. & Heyden, M.V. (1998) The use of discrete-choice models for evaluating resource selection. *Journal of Agricultural, Biological, and Environmental Statistics*, **3**, 268–279.
Moorcroft, P.R. & Barnett, A. (2008) Mechanistic home range models and resource selection analysis: a reconciliation and unification. *Ecology*, **89**, 1112–1119.
Mysterud, A. & Ims, R.A. (1998) Functional responses in habitat use: availability influences relative use in trade-off situations. *Ecology*, **79**, 1435–1441.
Nielson, R., Manly, B., McDonald, L., Sawyer, H. & McDonald, T. (2009) Estimating habitat selection when GPS fix success is less than 100%. Ecology, **90**, 2956–2962.
Ovaskainen, O. & Soininen, J. (2011) Making more out of sparse data: hierarchical modeling of species communities. *Ecology*, **92**, 289–295.
Patterson, T., Thomas, L., Wilcox, C., Ovaskainen, O. & Matthiopoulos, J. (2008) State-space models of individual animal movement. *Trends in Ecology & Evolution*, **23**, 87–94.
Pearce, J.L. & Boyce, M.S. (2006) Modelling distribution and abundance with presence-only data. *Journal of Applied Ecology*, **43**, 405–412.
Phillips, S.J., Anderson, R.P. & Schapire, R.E. (2006) Maximum entropy modeling of species geographic distributions. *Ecological Modelling*, **190**, 231–259.
Phillips, S.J., Dudík, M., Elith, J., Graham, C.H., Lehmann, A., Leathwick, J. & Ferrier, S. (2009) Sample selection bias and presence-only distribution models: implications for background and pseudo-absence data. *Ecological Applications*, **19**, 181–197.
Reineking, B. & Schröder, B. (2006) Constrain to perform: regularization of habitat models. *Ecological Modelling*, **19**, 675–690.
Renner, I.W. & Warton, D.I. (2013) Equivalence of MAXENT and Poisson point process models for species distribution modeling in ecology. *Biometrics*, DOI: 10.1111/j.1541-0420.2012.01824.x.
Warton, D.I. & Shepherd, L.C. (2010) Poisson point process models solve the "pseudo-absence problem" for presence-only data in ecology. *Annals of Applied Statistics*, **4**, 1383–1402.
Wenger, S.J. & Olden, J.D. (2012) Assessing transferability of ecological models: an underappreciated aspect of statistical validation. *Methods in Ecology and Evolution*, **3**, 260–267.

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Supporting Information

Additional Supporting Information may be found in the online version of this article.

Appendix S1. This appendix gives further details on the data analyses leading to Figs 2 and 3.

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POISSON POINT PROCESS MODELS SOLVE THE "PSEUDO-ABSENCE PROBLEM" FOR PRESENCE-ONLY DATA IN ECOLOGY[1]

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Presence-only data, point locations where a species has been recorded as being present, are often used in modeling the distribution of a species as a function of a set of explanatory variables—whether to map species occurrence, to understand its association with the environment, or to predict its response to environmental change. Currently, ecologists most commonly analyze presence-only data by adding randomly chosen "pseudo-absences" to the data such that it can be analyzed using logistic regression, an approach which has weaknesses in model specification, in interpretation, and in implementation. To address these issues, we propose Poisson point process modeling of the intensity of presences. We also derive a link between the proposed approach and logistic regression—specifically, we show that as the number of pseudo-absences increases (in a regular or uniform random arrangement), logistic regression slope parameters and their standard errors converge to those of the corresponding Poisson point process model. We discuss the practical implications of these results. In particular, point process modeling offers a framework for choice of the number and location of pseudo-absences, both of which are currently chosen by ad hoc and sometimes ineffective methods in ecology, a point which we illustrate by example.

1. Background. Pearce and Boyce (2006) define presence-only data as "consisting only of observations of the organism but with no reliable data on where the species was not found. Sources for these data include atlases, museum and herbarium records, species lists, incidental observation databases and radio-tracking studies." Note that such data arise as *point locations* where the organism is observed, which we denote as $\mathbf{y}$ in this article. An example is given in Figure 1(a). This figure gives all locations where a particular tree species (*Angophora costata*) has been reported by park rangers since 1972, within 100 km of the Greater Blue Mountains World Heritage Area, near Sydney, Australia. Note that this does not consist of all locations where an *Angophora costata* tree is found—rather it is the locations where the species has been *reported* to be found. We would like to use these presence points, together with maps of explanatory variables describing the environment (often referred to in ecology as "environmental variables"), to predict

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Key words and phrases. Habitat modeling, quadrature points, occurrence data, pseudo-absences, species distribution modeling.

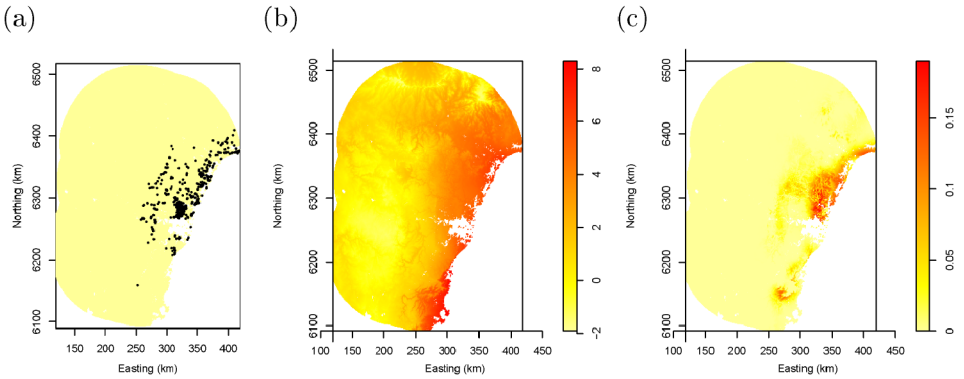


FIG. 1. (a) *Example presence-only data—atlas records of where the tree species* Angophora costata *has been reported to be present, west of Sydney, Australia. The study region is shaded.* (b) *A map of minimum temperature* (°C) *over the study region. Variables such as this are used to model how intensity of* A. costata *presence relates to the environment.* (c) *A species distribution model, modeling the association between* A. costata *and a suite of environmental variables. This is the fitted intensity function for* A. costata *records per* km^2, *modeled as a quadratic function of four environmental variables using a point process model as in Section* 4.

the location of *A. costata* and how it varies as a function of explanatory variables (Figure 1).

Presence-only data are used extensively in ecology to model species distributions—while the term "presence-only data" was rarely used before the 1990s, ISI Web of Science reports that it was used in 343 publications from 2005 to 2008. The use of presence-only data in modeling is a relatively recent development, presumably aided by the movement toward electronic record keeping and recent advances in Geographic Information Systems. One reason for the current widespread usage of presence-only data is that often this is the best available information concerning the distribution of a species, as there is often little or no information on species distribution being available from systematic surveys [Elith and Leathwick (2007)].

Species distribution models, sometimes referred to as habitat models or habitat classification models [Zarnetske, Edwards and Moisen (2007)], are regression models for the likelihood that a species is present at a given location, as a function of explanatory variables that are available over the whole study region. Such models are used to construct maps predicting the full spatial distribution of a species [given GIS maps of explanatory variables such as in Figure 1(b)]. When surveys have recorded the presence and absence of a species in a pre-defined study area ("presence/absence data"), logistic regression approaches and modern generalizations [Elith, Leathwick and Hastie (2008)] are typically used for species distribution modeling. If instead presence-only data are to be used in species distribution modeling, then a common approach to analysis is to first create "pseudo-absences," denoted as $\mathbf{y}_0$, usually achieved by randomly choosing point locations in the region of interest and treating them as absences. Then the presence/pseudo-absence data

set is analyzed using standard analysis methods for presence/absence data [Pearce and Boyce (2006); Elith and Leathwick (2007)], which have been used in species distribution modeling for a long time [Austin (1985)]. Ward et al. (2009) recently proposed a modification of the pseudo-absence logistic regression approach for the analysis of presence-only data, when the probability π that a randomly chosen pseudo-absence point of a presence is known. However, π is not known in practice.

We see three key weaknesses of the "pseudo-absence" approach so widely used in ecology for analyzing presence-only data, which we describe concisely as problems of model specification, interpretation, and implementation. A sounder *model specification* would involve constructing a model for the observed data $\mathbf{y}$ *only*, rather than requiring us to generate new data $\mathbf{y}_0$ prior to constructing a model. *Interpretation* of results is difficult, because some model parameters of interest (such as p_i of Section 3) are a function of the number of pseudo-absences and their location. For example, we explain in Section 3 that as the number of pseudo-absences approaches infinity, $p_i \to 0$, for a given presence-only data set $\mathbf{y}$. *Implementation* of the approach is problematic because it is unclear how pseudo-absences should be chosen [Elith and Leathwick (2007); Guisan et al. (2007); Zarnetske, Edwards and Moisen (2007); Phillips et al. (2009)], and one can obtain qualitatively different results depending on the method of choice of pseudo-absences [Chefaoui and Lobo (2008)].

In this paper we make two key contributions. First, we propose point process models (Section 2) as an appropriate tool for species distribution modeling of presence-only data, given that presence-only data arise as a set of point events—a set of locations where a species has been reported to have been seen. A point process model specification addresses each of the three concerns raised above regarding pseudo-absence approaches. Our second key contribution is a proof that the pseudo-absence logistic regression approach, when applied with an increasing number of regularly spaced or randomly chosen pseudo-absences, yields estimates of slope parameters that converge to the point process slope estimates (Section 3). These two key results have important ramifications for species distribution modeling in ecology (Section 5), in particular, we provide a solution to the problem of how to select pseudo-absences. We illustrate our results for the *A. costata* data of Figure 1(a) (Section 4).

2. Poisson point process models for presence-only data. Presence-only data are a set $\mathbf{y} = \{y_1, \ldots, y_n\}$ of point locations in a two-dimensional region $\mathcal{A}$, where the locations where presences are recorded (the y_i) are out of the control of the researcher, as is the total number of presence points n. We also observe a "map" of values over the entire region $\mathcal{A}$ for each of k explanatory variables, and we denote the values of these variables at y_i as $(x_{i1}, \ldots, x_{ik})$.

We propose analyzing $\mathbf{y} = \{y_1, \ldots, y_n\}$ as a point process, hence, we jointly model number of presence points n and their location (y_i). This has not previously

been proposed for the analysis of presence-only data, despite the extensive literature on the analysis of presence-only data. We consider inhomogeneous Poisson point process models [Cressie (1993); Diggle (2003)], which make the following two assumptions:

1. The locations of the n point events $(y_1, \ldots, y_n)$ are independent.
2. The intensity at point y_i [$\lambda(y_i)$, denoted as λ_i for convenience], the limiting expected number of presences per unit area [Cressie (1993)], can be modeled as a function of the k explanatory variables. We assume a log-linear specification:

$$\log(\lambda_i) = \beta_0 + \sum_{j=1}^{k} x_{ij}\beta_j, \tag{2.1}$$

although note that the linearity assumption can be relaxed in the usual way (e.g., using quadratic terms or splines). The parameters of the model for the λ_i are stored in the vector $\beta = (\beta_0, \beta_1, \ldots, \beta_k)$.

Note that the process being modeled here is locations where an organism *has been reported* rather than locations where individuals of the organism occur. Hence, the independence assumption would only be violated by interactions between records of sightings rather than by interactions between individual organisms per se. The atlas data of Figure 1 consist of 721 *A. costata* records accumulated over a period of 35 years in a region of 86,000 km^2, so independence of records seems a reasonable assumption in this case, given the rarity of event reporting. Nevertheless, the methods we review here can be generalized to handle dependence between point events [Baddeley and Turner (2005)].

Cressie (1993) shows that the log-likelihood for $\mathbf{y}$ can be written as

$$l(\beta; \mathbf{y}) = \sum_{i=1}^{n} \log(\lambda_i) - \int_{y \in \mathcal{A}} \lambda(y)\, dy - \log(n!). \tag{2.2}$$

Berman and Turner (1992) showed that if the integral is estimated via numerical quadrature as $\int_{y\in\mathcal{A}} \lambda(y)\, dy \approx \sum_{i=1}^{m} w_i \lambda_i$, then the log-likelihood is (approximately) proportional to a weighted Poisson likelihood:

$$l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{w}) = \sum_{i=1}^{m} w_i \big(z_i \log(\lambda_i) - \lambda_i\big), \tag{2.3}$$

where $z_i = \frac{I(i\in\{1,\ldots,n\})}{w_i}$, $\mathbf{y}_0 = \{y_{n+1}, \ldots, y_m\}$ are quadrature points, the vector $\mathbf{w} = (w_1, \ldots, w_m)$ stores all quadrature weights, and $I(\cdot)$ is the indicator function. Being able to write $l(\beta; \mathbf{y})$ as a weighted Poisson likelihood has important practical significance because it implies that generalized linear modeling (GLM) techniques can be used for estimation and inference about β. Further, adaptations of GLM techniques to other settings, such as generalized additive models [Hastie

and Tibshirani (1990)], can then be readily applied to Poisson point process models also.

Before implementing this approach, however, we need to make two key decisions—how to choose quadrature points $\mathbf{y}_0 = \{y_{n+1}, \ldots, y_m\}$ and how to calculate the quadrature weight w_i at each point y_i.

We propose choosing quadrature points in a regular rectangular grid, and considering grids of increasing spatial resolution until the estimate of the maximized log-likelihood $l_{\mathrm{ppm}}(\hat{\beta}; \mathbf{y}, \mathbf{y}_0, \mathbf{w})$ has converged. A rectangular grid provides reasonably efficient coverage of the region $\mathcal{A}$, and is an arrangement for which environmental data $x_{i1}, \ldots, x_{ik}$ can be easily obtained via GIS software. We illustrate this method in Section 4. Note a large data set may be required—in Section 4 convergence was achieved at a spatial scale that required inclusion of approximately 86,000 quadrature points.

Quadrature weights are calculated as the area of the neighborhood A_i around each point y_i, according to some definition of the A_i such that $y_i \in A_i$ for each i, $A_i \cap A_{i'} = \varnothing$ for each $i \neq i'$, and $\bigcup_i A_i = \mathcal{A}$. In Section 4 we calculated quadrature weights using the tiling method implemented in the `R` package `spatstat` [Baddeley and Turner (2005)]. This crude approach breaks the region $\mathcal{A}$ into rectangular tiles and calculates the weight of a point as the inverse of the number of points per unit area in its tile. We fixed tile size at the size of the regular grid used to sample quadrature points, such that all tiles contained exactly one quadrature point. Dirichlet tessellation [Baddeley and Turner (2005)] offers an alternative method of estimating weights, but this was not practical for our sample sizes.

3. Asymptotic equivalence of pseudo-absence logistic regression and Poisson point process models. Ecologists typically analyze presence-only data points $\mathbf{y} = \{y_1, \ldots, y_n\}$ by generating a set of "pseudo-absence" points $\mathbf{y}_0 = \{y_{n+1}, \ldots, y_m\}$, then using logistic regression to model the "response variable" $I(i \in \{1, \ldots, n\})$ as a function of explanatory variables [Pearce and Boyce (2006)]. Note that $I(i \in \{1, \ldots, n\})$ is not actually a stochastic quantity, nevertheless, the use of logistic regression to model this quantity as a Bernoulli response variable can be motivated via a case-control argument along the lines of Diggle (2003), Section 9.3.

In this section we will show that the approach to analysis currently used in ecology, logistic regression using pseudo-absences, is closely related to the Poisson point process model introduced in Section 2. Specifically, if the pseudo-absences are either generated on a regular grid or completely at random over the region $\mathcal{A}$, then as the number of pseudo-absences increase, all parameter estimators except for the intercept in the logistic regression model converge to the maximum likelihood estimators of the Poisson process model of Section 2. This asymptotic relationship between logistic regression and Poisson point process models does not appear to have been recognized previously in the literature.

First, we will specify a probability model for $I(i \in \{1, \ldots, n\})$ that permits a logistic regression model, and the study of its properties as $m \to \infty$. This can be achieved by considering a point chosen at random from $\{y_1, \ldots, y_m\}$ and defining U as the event that the randomly chosen point y_i is a presence. We are interested in modeling U conditionally on the explanatory variables observed at the randomly chosen point, $\mathbf{x}_i = (x_{i1}, \ldots, x_{ik})$. In this setting, U is a Bernoulli variable with conditional mean p_i, and we assume that

$$\log\left(\frac{p_i}{1-p_i}\right) = \gamma_0 - \log(m-n) + \sum_{j=1}^{k} x_{ij}\gamma_j. \tag{3.1}$$

The intercept term is written as $\gamma_0 - \log(m-n)$ because

$$\frac{p_i}{1-p_i} = \frac{f_1(\mathbf{x}_i|U=1)}{f_0(\mathbf{x}_i|U=0)} \cdot \frac{P(U=1)}{P(U=0)} = \frac{f_1(\mathbf{x}_i|U=1)}{f_0(\mathbf{x}_i|U=0)} \frac{n}{m-n}, \tag{3.2}$$

where $f_1(\cdot)$ and $f_0(\cdot)$ are the densities of $\mathbf{x}_i$ conditional on $U=1$ and $U=0$ respectively. Provided that $f_0(\mathbf{x}_i|U=0)$ is not a function of m (which is ensured, e.g., by using an identical process to select all pseudo-absence points), then the odds of a presence point $\frac{p_i}{1-p_i}$ is a function of m only via the multiplier $(m-n)^{-1}$.

It can be seen from equation (3.2) that if $m \to \infty$ in such a way that $f_0(\mathbf{x}_i|U=0)$ is not a function of i, then $p_i \to 0$ at an asymptotic rate that is proportional to m^{-1}, and the intercept term in the logistic regression model approaches $-\infty$ at the rate $\log(m)$. This in turn means that the logistic regression log-likelihood, defined below, will also diverge as $m \to \infty$:

$$l_{\text{bin}}(\gamma; \mathbf{y}, \mathbf{y}_0) = \sum_{i=1}^{n} \log(p_i) + \sum_{i=n+1}^{m} \log(1-p_i). \tag{3.3}$$

Clearly, as $p_i \to 0$, $\log(p_i) \to -\infty$ and, hence, $l_{\text{bin}}(\gamma; \mathbf{y}, \mathbf{y}_0) \to -\infty$. Such divergence is a symptom that the original model has been incorrectly specified. The use of the more appropriate spatial point process model of Section 2 will not encounter such problems. However, it is shown in the following theorems that despite the problems inherent in the logistic regression model specification, and despite divergence of the intercept term, the remaining parameters converge to the corresponding parameters from the Poisson process model of equation (2.3). Further, pseudo-absences play the same role in the logistic regression model that quadrature points played in Section 2.

For notational convenience, we will define J_m to be the single-entry matrix whose first element is $\log m$:

$$J_m = (\log m, 0, \ldots, 0). \tag{3.4}$$

This definition will be used in each of the theorems that follow. The J_m notation is immediately useful in writing out the parameters of the model for p_i in equation (3.1) as $\gamma - J_{m-n}$ where $\gamma = (\gamma_0, \gamma_1, \ldots, \gamma_k)$.

THEOREM 3.1. *Consider a fixed set of n observations from a point process* $\mathbf{y} = \{y_1, \ldots, y_n\}$, *and a set of pseudo-absences* $\mathbf{y}_0 = \{y_{n+1}, \ldots, y_m\}$ *of variable size that is chosen via some identical process on* $\mathcal{A}$ *for* $i \in \{n+1, \ldots, m\}$. *We model* U, *whether or not a randomly chosen point is a presence point, via logistic regression as in equation* (3.1).

As $m \to \infty$, *the logistic regression log-likelihood of equation* (3.3) *approaches the Poisson point process log-likelihood* [*equation* (2.3)] *but with all quadrature weights set to one*:

$$l_{\text{bin}}(\gamma; \mathbf{y}, \mathbf{y}_0) = l_{\text{ppm}}(\gamma - J_m; \mathbf{y}, \mathbf{y}_0, \mathbf{1}) + O(m^{-1}),$$

where $\mathbf{1}$ *is a m-vector of ones, and* J_m *is defined in equation* (3.4).

The proofs to Theorem 3.1 and all other theorems are given in Appendix A.

Theorem 3.1 has two interesting practical implications.

First, it implies that the pseudo-absence points of presence-only logistic regression play the same role as quadrature points of a point process model, and so established guidelines on how to choose quadrature points (such as those of Section 2) can inform choice of pseudo-absences. Previously pseudo-absences have been generated according to ad hoc recommendations [Pearce and Boyce (2006); Zarnetske, Edwards and Moisen (2007)], given the lack of a theoretical framework for their selection. In contrast, quadrature points are generated in order to estimate the log-likelihood to a pre-determined level of accuracy, a criterion which guides the choice of locations and numbers of quadrature points $m - n$, as explained in Section 2 and as illustrated later in Section 4 [Figure 2(a)]. Interestingly, current methods of selecting pseudo-absences in ecology [Pearce and Boyce (2006); Zarnetske, Edwards and Moisen (2007)] do not appear to be consistent with the best practice in low-dimensional numerical quadrature—points are usually selected at random rather than on a regular grid, and the number of pseudo-absences $(m - n)$ is more commonly chosen relative to the magnitude of the number of presences (n) rather than based on some convergence criterion as in Figure 2(a).

Second, Theorem 3.1 implies that despite the apparent ad hoc nature of the pseudo-absence approach, *some form of point process model is being estimated.* However, logistic regression is only equivalent to a Poisson point process when $\mathbf{w} = \mathbf{1}$, that is, all quadrature weights are ignored. The implications of ignoring weights is considered in Theorems 3.2 and 3.3 below.

It should also be noted that Theorem 3.1 is closely related to results due to Owen (2007) and Ward (2007), although Theorem 3.1 differs from these results by relating pseudo-absence logistic regression specifically to point process modeling.

Owen (2007) also considered the logistic regression setting where the number of presence points is fixed, and the number of pseudo-absences increases to infinity, and referred to this as "infinitely unbalanced logistic regression." Owen (2007) derived conditions under which convergence of model parameters could be achieved as the number of pseudo-absences increased. The key condition is that the centroid

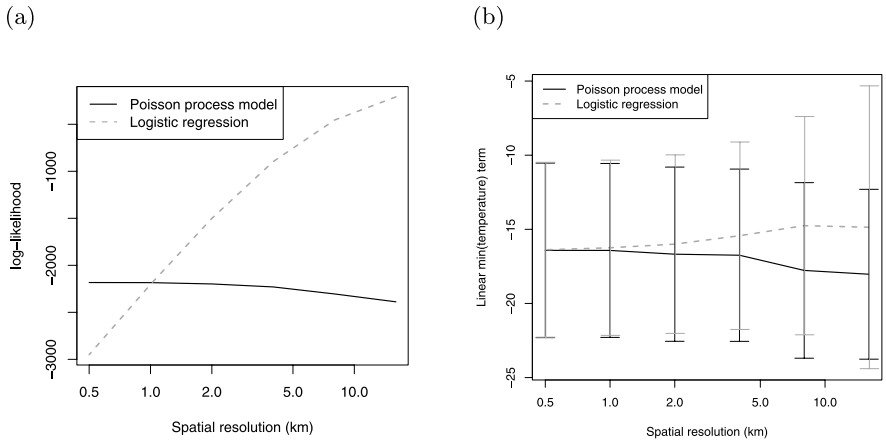


FIG. 2. *Asymptotic behavior of Poisson point process and pseudo-absence logistic regression models when the number of quadrature points becomes large* (*via sampling in a regular grid with increasing spatial resolution*). (a) *The maximized log-likelihood converges for a Poisson point process, but not for pseudo-absence logistic regression.* (b) *The parameters and their standard errors converge for Poisson point process and logistic regression models, for sufficiently high spatial resolution. Linear coefficient of "minimum temperature" is given here* (*corresponding to the second entry in Table* 2).

of the points $\{y_1, \ldots, y_n\}$ in the design space is "surrounded"—see Definition 3 of Owen (2007) for details.

Along the lines of Ward et al. (2009), Ward (2007) considered a pseudo-absence logistic regression formulation of the presence-only data problem, and defined the "population logistic model" as the model across "the full population" of locations in the region $\mathcal{A}$. The unconstrained log-likelihood of the population logistic model [Ward (2007), equation (7.6)] has a similar form to the point process log-likelihood $l(\beta; \mathbf{y})$ of Section 2. For presence-only logistic regression as in Ward et al. (2009), Ward (2007) shows that as the number of pseudo-absences approaches infinity, the log-likelihood converges to that of the population logistic model, a result that is analogous to Theorem 3.1.

Having shown that pseudo-absence logistic regression is equivalent to a point process model where weights are ignored, the implications of ignoring weights is now considered in Theorems 3.2 and 3.3.

THEOREM 3.2. *Consider a point process model with quadrature points* $y_{n+1}, \ldots, y_m$ *selected such that for all* i $w_i = \frac{|\mathcal{A}|}{m}$, *where* $|\mathcal{A}|$ *is the total area of the region* $\mathcal{A}$. *Assume also that the design matrix* $\mathbf{X}$ *has full rank.*

The maximum likelihood estimators of $l_{\text{ppm}}(\gamma - J_m; \mathbf{y}, \mathbf{y}_0, \mathbf{1})$ *and* $l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \frac{|\mathcal{A}|}{m}\mathbf{1})$, $\hat{\gamma} - J_m$ *and* $\hat{\beta}$ *respectively, satisfy*

$$\hat{\gamma} = \hat{\beta} + J_{|\mathcal{A}|}.$$

Further, the Fisher information for $\hat{\gamma}$ and $\hat{\beta}$ is equal.

That is, provided that quadrature points have been selected such that quadrature weights are equal, ignoring quadrature weights in a Poisson point process model does not change slope parameters nor their standard errors, although the intercept term will differ by $\log(|\mathcal{A}|/m)$.

Theorem 3.2 refers to the special case where all points (including presence points) are sampled on a regular grid. This arises in the special case where the region $\mathcal{A}$ has been divided into grid cells of equal area, and each grid cell is assigned the value 1 only if it contains a presence point. This form of presence-only analysis is sometimes used in ecology [Phillips, Anderson and Schapire (2006), e.g.]. In addition, the setting of Theorem 3.2 provides a reasonable approximation to the approach to quadrature-point selection proposed in Section 2.

Note that together Theorems 3.1–3.2 suggest that when quadrature points (or, equivalently, pseudo-absences) are sampled in a regular grid at increasing resolution, the logistic regression parameter estimates and their standard errors will approach those of the point process model—with the exception of the intercept term, which diverges slowly to $-\infty$ as all $p_i \to 0$ at a rate inversely proportional to m. This nonconvergence of the intercept was also noticed by Owen (2007). Figure 2 illustrates these results for the *A. costata* data.

Theorem 3.3 below links the above results with the case where pseudo-absences are randomly sampled within the region $\mathcal{A}$, which is a more common approach in ecology than sampling on a regular grid [e.g., Elith and Leathwick (2007); Hernandez et al. (2008)].

THEOREM 3.3. *Consider again the conditions of Theorem 3.2, but now assume that the quadrature points* $\mathbf{y}_0$ *are selected uniformly at random within the region* $\mathcal{A}$. *As previously,* $\hat{\gamma}$ *is the maximum likelihood estimator of* $l_{\mathrm{ppm}}(\gamma - J_m; \mathbf{y}, \mathbf{y}_0, \mathbf{1})$, *but now let* $\hat{\beta}$ *be the maximum likelihood estimator of* $l(\beta; \mathbf{y})$ *from equation (2.2). As* $m \to \infty$,

$$\hat{\gamma} \xrightarrow{\mathcal{P}} \hat{\beta} + J_{|\mathcal{A}|}.$$

That is, if quadrature points are randomly selected instead of being sampled on a regular grid, the result of Theorem 3.2 holds in probability rather than exactly.

Note that the stochastic convergence in Theorem 3.3 is with respect to m not n, that is, it is conditional on the observed point process.

Note also that one can think of randomly selecting pseudo-absence points as an implementation of "crude" Monte Carlo integration [Lepage (1978)] for estimating $\int_{y\in\mathcal{A}} \lambda(y)\,dy$ in the point process likelihood [equation (2.2)].

4. Modeling *Angophora costata* species distribution. As an illustration, we construct Poisson point process models for the intensity of *Angophora costata* records as a function of a set of explanatory variables. We consider modeling the log of intensity using linear and quadratic functions of the variables minimum and maximum temperature, mean annual rainfall, number of fires since 1943, and "wetness," a coefficient which can be considered as an indicator of local moisture. These five variables were recommended by local experts as likely to be important in determining *A. costata* distribution.

Our full model for intensity of *A. costata* records at the point y_i has the following form:

$$\log(\lambda_i) = \beta_0 + \mathbf{x}_i^T \beta_1 + \mathbf{x}_i^T \mathbf{B} \mathbf{x}_i, \tag{4.1}$$

where β_1 is a vector of linear coefficients, $\mathbf{B}$ is a matrix of quadratic coefficients, and $\mathbf{x}_i$ is a vector containing measurements of the five environmental variables at point y_i. We consider a quadratic model for $\log(\lambda_i)$ because this enables fitting a nonlinear function and interaction between different environmental variables, both considered important in species distribution modeling [Elith, Leathwick and Hastie (2008)].

All analyses were carried out using purpose-written code on the R program [R Development Core Team (2009)].

We first considered the spatial resolution at which quadrature points needed to be sampled in order for the log-likelihood $l(\beta; \mathbf{y})$ to be suitably well approximated by $l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{w})$. We found [as in Figure 2(a)] that on increasing the number of quadrature points, the estimate of the maximized log-likelihood converged, and that there was minimal change in the solution beyond a resolution of one quadrature point every 1 km (the maximized log-likelihood changed by less than one when the number of quadrature points was increased 4-fold). Hence, the 1 km resolution was used in model-fitting, and these results are reported here. This involved a total of 86,227 quadrature points.

In order to study which environmental variables are associated with *A. costata* and how they are associated, we performed model selection where we considered different forms of models for log-intensity as a function of environmental variables, and we considered different subsets of the environmental variables via all-subsets selection. In both cases we used AIC as our model selection criterion, a simple and widely-used penalty-based model selection criterion [Burnham and Anderson (1998)].

Comparison of AIC values for linear and quadratic models suggest that a much better fit is achieved when using a quadratic model with interactions terms for all coefficients (Table 1). Hence, we have evidence that environmental variables interact in their effect on *A. costata*. Judging from the model coefficients and their relative size compared to standard errors, the interactions between maximum temperature, minimum temperature, and annual rainfall appear to be the major contributors.

TABLE 1
AIC values for linear and quadratic Poisson point process models for $\log(\lambda)$ *of* Angophora costata *presence. Model fitted at the* 1 *km by* 1 *km resolution*

Model	**AIC**
Linear terms only	5363.6
Quadratic (additive terms only)	4763.4
Quadratic (interactions included)	4400.6

All-subsets selection considered a total of 32 models, and found that the best-fitting model included four variables (Figure 3)—all except for "wetness." Parameter estimates and standard errors for this best-fitting model are given in Table 2(a).

An image of the fitted intensity surface from the best-fitting model is presented in Figure 1(c). The regions of highest predicted intensity are near the coast and just north of Sydney, which are indeed where the highest density of presence points appeared in Figure 1(a). We also compared intensity surfaces fitted at different spatial resolutions, and note that they appear identical when quadrature points are selected in a 500×500 m, 1×1 km, or 2×2 km grid, and that irrespective of spatial resolution, regions of higher intensity had 0.05–0.2 expected *A. costata* records per square kilometer, as in Figure 1(c). Note this is in contrast to logistic regression, where fitted probabilities in any given location are a function of number of pseudo-absences, and vary by a factor of 16 when moving from a 2×2 km to a 500×500 m grid.

To assist in interpreting parameters from the best-fitting model, we have constructed image plots of the fitted intensity in "environmental space" to elucidate

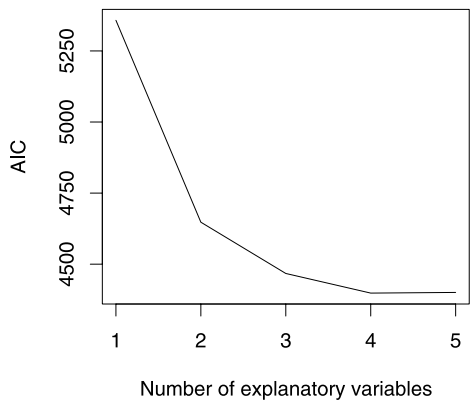


FIG. 3. *Results of all-subsets selection, expressed as AIC of the best-fitting model at each level of complexity. The respective best-fitting models included minimum temperature, then minimum and maximum temperature, then annual rainfall was added, then fire count, and finally wetness. The best-fitting model included four explanatory variables* (*all variables except wetness*).

TABLE 2

Parameter estimates and their standard errors for (a) *the Poisson point process model with a* 1×1 *km regular grid of quadrature points*; (b) *The logistic regression model with a* 1×1 *km regular grid of pseudo-absences*; (c) *The logistic model with* 1000 *randomly chosen pseudo-absence points. In each case we fitted a quadratic model of minimum temperature* (*MNT*), *maximum temperature* (*MXT*), *annual rainfall* (*RA*), *and fire count* (*FC*). *Notice that with few exceptions, terms are equivalent to* 2–3 *significant figures for the models fitted over a regular grid. But this is not the case for* (c), *and, in particular, standard errors are all* 30–80% *larger*

	(a)		(b)		(c)	
Term	$\hat{\beta}_j$	$se(\hat{\beta}_j)$	$\hat{\beta}_j$	$se(\hat{\beta}_j)$	$\hat{\beta}_j$	$se(\hat{\beta}_j)$
Intercept	−2130	169.4	−2119	171	−1999	227
MNT	−16.3	3.0	−16.2	3.0	−9.91	4.2
MNT^2	−0.21	0.027	−0.205	0.028	−0.185	0.050
MXT	128.7	10.1	128.1	10.1	120.2	13
MNT ∗ MXT	0.539	0.090	0.535	0.091	0.377	0.13
MXT^2	−1.98	0.15	−1.97	0.15	−1.84	0.20
RA	0.759	0.065	0.755	0.066	0.714	0.089
MNT ∗ RA	0.00345	0.00065	0.00339	0.00065	0.00147	0.00096
MXT ∗ RA	−0.0218	0.0019	−0.0216	0.0019	−0.0203	0.0025
$RA^2/1000$	−0.0819	0.0072	−0.0815	0.0072	−0.0749	0.010
FC	6.24	3.37	5.98	3.42	4.08	4.9
MNT ∗ FC	−0.101	0.040	−0.101	0.041	−0.207	0.070
MXT ∗ FC	−0.123	0.10	−0.115	0.010	−0.0601	0.15
RA ∗ FC	−0.00174	0.00066	−0.00171	0.00067	−0.000952	0.00095
FC^2	−0.127	0.024	−0.123	0.024	−0.107	0.041

the nature of the effect of each environmental variable on intensity of *A. costata* records (Figure 4). It can be seen in Figure 4 that there is a strong and negatively correlated response to maximum temperature and annual rainfall. Of the four environmental variables, the response to number of fires appears to be the weakest, with little apparent change in predicted intensity as number of fires increased, and no observable interaction with the three climatic variables.

For the purpose of comparison, parameter estimates and their standard errors are reported not just for the point-process model fit, but also for the analogous logistic regression model in Table 2(b), for a model fitted with quadrature points sampled in a 1×1 km regular grid. Note that most parameter estimates and standard errors differ by less than 1% between the logistic regression and point process models, as expected given Theorems 3.1–3.2.

We also report results when logistic regression is applied to $m - n = 1000$ pseudo-absences at randomly selected locations [Table 2(c)]. This is at the lower end of the range typically used [Pearce and Boyce (2006); Elith and Leathwick (2007); Hernandez et al. (2008)] for pseudo-absence selection in ecology. Note that the standard errors are substantially larger in this case, and no parameter esti-

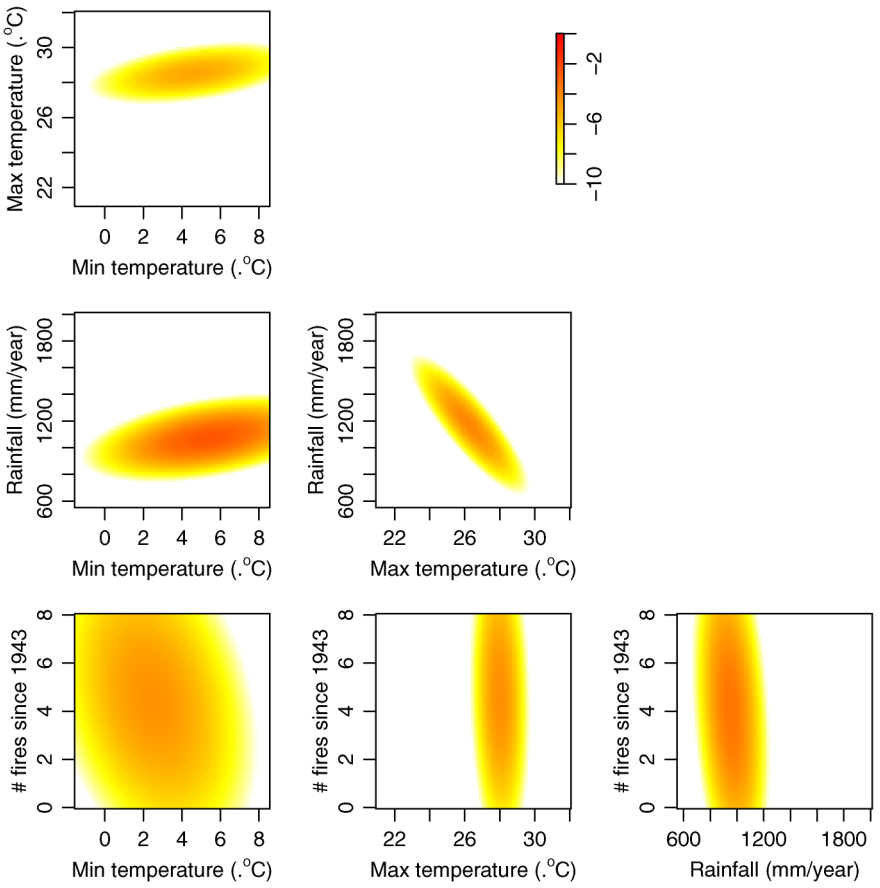


FIG. 4. *Image plots of the joint effects of environmental variables on predicted log (intensity) of* A. costata *records. Darker areas of the image correspond to higher predicted values of* $\log(\lambda_i)$. *Note the strong and highly correlated response of intensity to maximum temperature and annual rainfall, and the relatively weak response to # fires.*

mates are correct past the first significant figure. This result exemplifies how current practice in ecology regarding the number of pseudo-absences $(m - n)$ can lead to poor results. Instead, it is advisable to consider the sensitivity of results to different choices of $m - n$, along the lines of Figure 2.

To explore the goodness of fit of the best-fitting model, an inhomogeneous K-function [Baddeley, Moller and Waagepetersen (2000)] was plotted using the `kinhom` function from the `spatstat` package on `R` [Baddeley and Turner (2005)], and simulation envelopes around the fitted model were constructed. See Diggle (2003) for details concerning the use of K-functions to explore goodness of fit of point process models. The inhomogeneous K-function, as its name suggests, is a generalization of the K-function to the nonstationary case. It is defined over

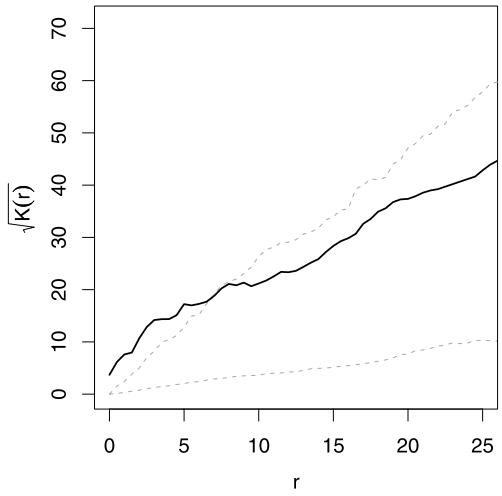


FIG. 5. *Goodness of fit plot of the quadratic Poisson process model—inhomogeneous K-function (solid line) with simulation envelope (broken lines). The envelope gives 95% confidence bands as estimated from 500 simulated data sets. Note that the K-function falls within those bounds over most of its range, although with a possible departure for $r < 6$ km.*

the region $\mathcal{A}$ as

$$K_{\text{inhom}}(r) = \frac{1}{|\mathcal{A}|} E\left\{ \sum_{y_i \in \mathbf{y}} \sum_{y_j \in \mathbf{y} \setminus \{y_i\}} \frac{I(\|y_i - y_j\| < r)}{\lambda_i \lambda_j} \right\}.$$

K_{inhom} reduces to the usual K function for a stationary process, and like the usual K-function, can be used to diagnose whether there are interactions in the point pattern $\mathbf{y}$ [Baddeley, Moller and Waagepetersen (2000)]. Results (Figure 5) suggest a reasonable fit of this model to the data, although with some lack of fit at small spatial scales ($r < 6$ km) suggestive of possible clustering in the data. One possible method of modeling this clustering is to fit an area-interaction process [Baddeley and van Lieshout (1995)], using the `spatstat` package. We have repeated analyses using such a model and found results to be generally consistent with those presented here, except of course that the equivalence with logistic regression no longer holds.

5. Discussion. In this paper we have proposed the use of Poisson point process models for the analysis of presence-only data in ecology, an important and widely-studied problem to which this methodology is well suited. We have also shown that this method is approximately equivalent to logistic regression, when a suitable number of regularly or randomly spaced pseudo-absences are used, hence, we provide a link between the proposed method and the approach most commonly used in ecology at the moment. But this raises the question: why use point process

models, if the method currently being used is (asymptotically) equivalent to logistic regression anyway? Several reasons are listed below.

Recall that in Section 1 we argued that the pseudo-absence approach has problems with model specification, interpretation, and implementation. We argue that each of these difficulties is resolved by using a point process modeling framework. *Model specification*—we believe that a point process model as in Section 2 is a plausible model for the data generation mechanism for presence-only data. In contrast, the logistic regression approach involves generating new data in order to fit a model originally designed for a different problem (analysis of binary data not analysis of point-events). Hence, the pseudo-absence approach as it is usually applied appears to involve coercing the data to fit the model rather than choosing a model that fits the original data. *Interpretation*—in the logistic regression approach we model p_i, the probability that a given point event is a presence not a pseudo-absence. This quantity has no physical meaning and clearly its interpretation is sensitive to our method of choice of pseudo-absences (and typically each $p_i \to 0$ as $m \to \infty$). In contrast, the intensity at a point λ_i has a natural interpretation as the (limiting) expected number of presences per unit area, and will *not* be sensitive to choice of quadrature points, provided that the number of quadrature points is sufficiently large. *Implementation*—in Section 2 we explain that point process models offer a framework for choosing quadrature points. Specifically, equation (2.3) is used to estimate the point process log-likelihood, and progressively more quadrature points are added until convergence of $l_{\text{ppm}}(\hat{\beta}; \mathbf{y}, \mathbf{y}_0, \mathbf{w})$ is achieved as in Figure 2(a). No such framework for choice of pseudo-absences is offered by logistic regression, and instead choice of the location and number of pseudo-absences is ad hoc, with potentially poor results [Table 2(c)]. Ecologists are concerned about the issues of how many pseudo-absences to choose [Pearce and Boyce (2006)], where to put them [Elith and Leathwick (2007); Zarnetske, Edwards and Moisen (2007); Phillips et al. (2009)], and what spatial resolution to use in model-fitting [Guisan et al. (2007); Elith and Leathwick (2009)], all issues that have natural solutions given a point process model specification of the problem, as in Section 2.

It should be emphasized that we have demonstrated equivalence of point process modeling and pseudo-absence logistic regression only for large numbers of pseudo-absences and only for pseudo-absences that are either regularly spaced or located uniformly at random over $\mathcal{A}$. Current practice concerning selection of pseudo-absences in the ecology literature does not always involve sampling at random over $\mathcal{A}$ [e.g., Hernandez et al. (2008)] and does not involve sampling sufficiently many pseudo-absences for model convergence. Instead, choice of the number of pseudo-absences is ad hoc, and a total of 1000–10,000 pseudo-absences is usually used [Elith and Leathwick (2007); Hernandez et al. (2008)], although sometimes even fewer [Zarnetske, Edwards and Moisen (2007)]. On Figure 2, 1000–10,000 corresponds to a resolution of about 4–8 km, for which model convergence has not been achieved. When fitting a model using just 1000 pseudo absences, some parameter estimates are not equivalent to the high-resolution fits to

even one significant figure, and all standard error estimates were larger by 30–80% (Table 2).

While only Poisson point processes were considered in this paper, the methodology implemented in Section 4 can be generalized to incorporate interactions between points in a straightforward fashion [Baddeley and Turner (2005)]. However, the links between point process models and logistic regression identified in Section 3 may be lost in this more general setting.

One issue not touched on in this paper is the problem of observer bias—that the likelihood of a species being reported is a function of additional variables related to properties of the observer and not of the target species, such as variation in the level of accessibility of different parts of the region $\mathcal{A}$. For example, the high number of *A. costata* records just north of Sydney may be due in part to proximity to a large city, rather than simply being due to environmental conditions being suitable for *A. costata*. This issue will be addressed in a related article.

APPENDIX A: PROOF OF THEOREMS

A.1. Proof of Theorem 3.1. The proof involves two steps. The first step involves showing that $l_{\text{bin}}(\cdot)$, as a function of p_i, is asymptotically equivalent to $l_{\text{ppm}}(\cdot)$ when written as a function of λ_i. The second step involves showing that given the definitions of p_i and λ_i in equations (2.1) and (3.1), we can replace one with the other without affecting the order of approximation.

Specifically, the log-likelihood function for U can be written as

$$l_{\text{bin}}(\gamma; \mathbf{y}, \mathbf{y}_0) = \sum_{i=1}^{n} \log(p_i) + \sum_{i=n+1}^{m} \log(1 - p_i)$$

and a Taylor expansion of $\log(1 - p_i)$ yields

$$= \sum_{i=1}^{n} \log(p_i) + \sum_{i=n+1}^{m} \{p_i + O(p_i^2)\},$$

but it can be seen from equation (3.2) that $p_i = O(m^{-1})$ and, hence, $\sum_{i=1}^{n} p_i = O(m^{-1})$ for fixed n, so

$$\begin{aligned} l_{\text{bin}}(\gamma; \mathbf{y}, \mathbf{y}_0) &= \sum_{i=1}^{n} \log(p_i) + \sum_{i=n+1}^{m} p_i + O(m^{-1}) \\ &= \sum_{i=1}^{n} \log(p_i) + \sum_{i=1}^{m} p_i + O(m^{-1}) \\ &= \sum_{i=1}^{m} \{I(i \in \{1, \ldots, n\}) \log(p_i) - p_i\} + O(m^{-1}). \end{aligned} \tag{A.1}$$

Note that equation (A.1) has the form of the Poisson point process log-likelihood, but with all weights set to one and p_i being used in place of λ_i. We will now derive a relation between p_i and λ_i which motivates the replacement of p_i by λ_i.

First note that the Taylor expansion of $\log(1-x)$ implies both that $\log(1-p_i) = O(m^{-1})$, and that $\log(m-n) = \log(m) + \log(1-n/m) = \log(m) + O(m^{-1})$. So from equation (3.1),

$$\log p_i = \gamma_0 - \log(m-n) + \sum_{j=1}^{k} x_{ij}\gamma_j - \log(1-p_i)$$

$$= \gamma_0 - \log(m) + \sum_{j=1}^{k} x_{ij}\gamma_j + O(m^{-1}).$$

This has the form of equation (2.1), where $\beta = \gamma - J_m$. So when $\beta = \gamma - J_m$, $\log p_i = \log\lambda_i + O(m^{-1})$, and $\sum_{i=1}^{m} p_i = \sum_{i=1}^{m}\lambda_i\{1 + O(m^{-1}\} = \sum_{i=1}^{m}\lambda_i + O(m^{-1})$. Now plugging these results into equation (A.1) yields $l_{\mathrm{ppm}}(\gamma - J_m; \mathbf{y}, \mathbf{y}_0, \mathbf{1}) + O(m^{-1})$, completing the proof. □

A.2. Proof of Theorem 3.2. The proof follows by inspection of the score equations. Specifically, let $s_j(\beta; \mathbf{w}) = \frac{\partial}{\partial\beta_j} l_{\mathrm{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{w})$. From equation (2.3), for $j \in \{1, \ldots, k\}$,

$$s_j(\beta; \mathbf{w}) = \sum_{i=1}^{m} x_{ij}\lambda_i w_i\left(\frac{z_i - \lambda_i}{\lambda_i}\right) = \sum_{i=1}^{m} x_{ij} w_i (z_i - \lambda_i), \tag{A.2}$$

where $z_i = \frac{I(i\in 1,\ldots,n)}{w_i}$. If $j = 0$, equation (A.2) holds but with $x_{ij} = 1$ for each i.

Now $\hat\beta$ satisfies $s_j(\hat\beta; \frac{|\mathcal{A}|}{m}\mathbf{1}) = 0$ for each j, that is,

$$0 = \sum_{i=1}^{m} x_{ij}\left(I(i \in 1, \ldots, n) - \hat\lambda_i \frac{|\mathcal{A}|}{m}\right), \tag{A.3}$$

where from equation (2.1), $\log(\hat\lambda_i) = \hat\beta_0 + \sum_{j=1}^{k} x_{ij}\hat\beta_1$.

$\hat\gamma$ satisfies $s_j(\hat\gamma - J_m; \mathbf{1}) = 0$, for each j,

$$0 = \sum_{i=1}^{m} x_{ij}\big(I(i \in 1, \ldots, n) - \tilde\lambda_i\big), \tag{A.4}$$

where $\tilde\lambda_i$ is the maximum likelihood estimator of λ_i for $l_{\mathrm{ppm}}(\gamma - J_m; \mathbf{y}, \mathbf{y}_0, \mathbf{1})$, which satisfies $\log(\tilde\lambda_i) = \hat\gamma_0 - \log m + \sum_{j=1}^{k} x_{ij}\hat\gamma_1$.

The solutions to equations (A.3) and (A.4) are related by the identity $\tilde\lambda_i = \hat\lambda_i \frac{|\mathcal{A}|}{m}$ for each i, and if we take the logarithm of both sides,

$$\hat\gamma_0 - \log m + \sum_{j=1}^{k} x_{ij}\hat\gamma_j = \hat\beta_0 + \sum_{j=1}^{k} x_{ij}\hat\beta_j + \log|\mathcal{A}| - \log m.$$

Provided that the design matrix X has full rank, $\hat{\gamma} = \hat{\beta} + J_{|\mathcal{A}|}$.

Also, note that the (j, j')th element of the Fisher information matrix of $l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{w})$ is

$$I_{jj'}(\beta; \mathbf{w}) = -E\left(\frac{\partial^2}{\partial\beta_j\beta_{j'}} l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{w})\right) = \sum_{i=1}^{m} x_{ij} w_i x_{ij'} \lambda_i \tag{A.5}$$

and so $I_{jj'}(\hat{\beta}; \frac{|\mathcal{A}|}{m}\mathbf{1}) = \sum_{i=1}^{m} x_{ij}x_{ij'}\frac{|\mathcal{A}|}{m}\hat{\lambda}_i = \sum_{i=1}^{m} x_{ij}x_{ij'}\tilde{\lambda}_i = I_{jj'}(\hat{\gamma} - J_m; \mathbf{1})$ for each (j, j'). This completes the proof. □

A.3. Proof of Theorem 3.3. Let $\delta = \hat{\gamma} - \hat{\beta} - J_{|\mathcal{A}|}$. We will prove the theorem by using a Taylor expansion of the score equations for $l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{1})$ to show that for fixed n and $m \to \infty$, $\delta \xrightarrow{\mathcal{P}} 0$.

Let $\mathbf{S}(\beta; \mathbf{1})$ be the vector of score equations whose jth element is $s_j(\beta; \mathbf{1}) = \frac{\partial}{\partial\beta_j} l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{1})$ and let $\mathbf{I}(\beta; \mathbf{1})$ be the corresponding Fisher information matrix. A Taylor expansion of $\mathbf{S}(\hat{\gamma} - J_m; \mathbf{1})$ about $\mathbf{S}(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1})$ yields

$$\mathbf{S}(\hat{\gamma} - J_m; \mathbf{1}) = \mathbf{S}(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1}) - \mathbf{I}(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1})\delta + O_p(\|\delta\|^2). \tag{A.6}$$

The left-hand side is zero, because it is evaluated at the maximizer of $l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{1})$. Also, evaluating λ_i at $\hat{\beta} + J_{|\mathcal{A}|/m}$ gives $\hat{\lambda}_i \frac{|\mathcal{A}|}{m}$, and substituting this into equation (A.2) at $\mathbf{w} = \mathbf{1}$,

$$\begin{aligned} s_j(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1}) &= \sum_{i=1}^{n} x_{ij} - \sum_{i=1}^{m} x_{ij}\hat{\lambda}_i \frac{|\mathcal{A}|}{m} \\ &\xrightarrow{\mathcal{P}} \int_{y\in\mathcal{A}} x_j(y)\hat{\lambda}(y)\, dy \end{aligned}$$

from the weak law of large numbers. But this is the derivative of $l(\beta; \mathbf{y})$ from equation (2.2), evaluated at the maximum likelihood estimate $\hat{\beta}$, and so it equals zero for each j and, hence, $\mathbf{S}(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1}) \xrightarrow{\mathcal{P}} \mathbf{0}$. Similarly, for each (j, j'), $I_{jj'}(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1}) \xrightarrow{\mathcal{P}} I_{jj'}(\hat{\beta})$, the (j, j')th element of the Fisher information matrix for $\hat{\beta}$ from $l(\beta; \mathbf{y})$. So returning to equation (A.6),

$$\delta = \mathbf{I}(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1})^{-1}\mathbf{S}(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1}) + O_p(\|\delta\|^2) \xrightarrow{\mathcal{P}} 0,$$

completing the proof. □

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REFERENCES

AUSTIN, M. P. (1985). Continuum concept, ordination methods and niche theory. *Annual Review of Ecology, Evolution, and Systematics* **16** 39–61.

BADDELEY, A. and TURNER, R. (2005). Spatstat: An R package for analyzing spatial point patterns. *Journal of Statistical Software* **12** 1–42.

BADDELEY, A. J. and VAN LIESHOUT, M. (1995). Area-interaction point processes. *Ann. Inst. Statist. Math.* **47** 601–619. MR1370279

BADDELEY, A. J., MOLLER, J. and WAAGEPETERSEN, R. (2000). Non- and semiparametric estimation of interaction in inhomogeneous point patterns. *Statist. Neerlandica* **54** 329–350. MR1804002

BERMAN, M. and TURNER, T. (1992). Approximating point process likelihoods with GLIM. *J. Roy. Statist. Soc. Ser. C* **41** 31–38.

BURNHAM, K. P. and ANDERSON, D. R. (1998). *Model Selection and Inference—A Practical Information-Theoretic Approach*. Springer, New York. MR1919620

CHEFAOUI, R. M. and LOBO, J. M. (2008). Assessing the effects of pseudo-absences on predictive distribution model performance. *Ecological Modelling* **210** 478–486.

CRESSIE, N. A. C. (1993). *Statistics for Spatial Data*. Wiley, New York. MR1239641

DIGGLE, P. J. (2003). *Statistical Analysis of Spatial Point Patterns*, 2nd ed. Arnold, London. MR0743593

ELITH, J. and LEATHWICK, J. (2007). Predicting species distributions from museum and herbarium records using multiresponse models fitted with multivariate adaptive regression splines. *Diversity and Distributions* **13** 265–275.

ELITH, J. and LEATHWICK, J. (2009). Species distribution models: Ecological explanation and prediction across space and time. *Annual Review of Ecology, Evolution, and Systematics* **40** 677–697.

ELITH, J., LEATHWICK, J. R. and HASTIE, T. (2008). A working guide to boosted regression trees. *Journal of Animal Ecology* **77** 802–813.

GUISAN, A., GRAHAM, C. H., ELITH, J. and HUETTMANN, F. (2007). Sensitivity of predictive species distribution models to change in grain size. *Diversity and Distributions* **13** 332–340.

HASTIE, T. and TIBSHIRANI, R. (1990). *Generalized Additive Models*. Chapman & Hall, Boca Raton, FL. MR1082147

HERNANDEZ, P. A., FRANKE, I., HERZOG, S. K., PACHECO, V., PANIAGUA, L., QUINTANA, H. L., SOTO, A., SWENSON, J. J., TOVAR, C., VALQUI, T. H., VARGAS, J. and YOUNG, B. E. (2008). Predicting species distributions in poorly-studied landscapes. *Biodiversity and Conservation* **17** 1353–1366.

LEPAGE, G. (1978). A new algorithm for adaptive multidimensional integration. *J. Comput. Phys.* **27** 192–203.

OWEN, A. B. (2007). Infinitely imbalanced logistic regression. *J. Mach. Learn. Res.* **8** 761–773. MR2320678

PEARCE, J. L. and BOYCE, M. S. (2006). Modelling distribution and abundance with presence-only data. *Journal of Applied Ecology* **43** 405–412.

PHILLIPS, S. J., ANDERSON, R. P. and SCHAPIRE, R. E. (2006). Maximum entropy modeling of species geographic distributions. *Ecological Modelling* **190** 231–259.

PHILLIPS, S. J., DUDÍK, M., ELITH, J., GRAHAM, C. H., LEHMANN, A., LEATHWICK, J. and FERRIER, S. (2009). Sample selection bias and presence-only distribution models: Implications for background and pseudo-absence data. *Ecological Applications* **19** 181–197.

R DEVELOPMENT CORE TEAM (2009). *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria.

WARD, G. (2007). Statistics in ecological modelling; presence-only data and boosted MARS. PhD thesis, Dept. Statistics, Stanford Univ. Available at http://www-stat.stanford.edu/~hastie/THESES/Gill_Ward.pdf.

WARD, G., HASTIE, T., BARRY, S., ELITH, J. and LEATHWICK, J. R. (2009). Presence-only data and the EM algorithm. *Biometrics* **65** 554–563.

ZARNETSKE, P. L., EDWARDS, T. C., JR. and MOISEN, G. G. (2007). Habitat classification modeling with incomplete data: Pushing the habitat envelope. *Ecological Applications* **17** 1714–1726.

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POISSON POINT PROCESS MODELS SOLVE THE "PSEUDO-ABSENCE PROBLEM" FOR PRESENCE-ONLY DATA IN ECOLOGY[1]

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Presence-only data, point locations where a species has been recorded as being present, are often used in modeling the distribution of a species as a function of a set of explanatory variables—whether to map species occurrence, to understand its association with the environment, or to predict its response to environmental change. Currently, ecologists most commonly analyze presence-only data by adding randomly chosen "pseudo-absences" to the data such that it can be analyzed using logistic regression, an approach which has weaknesses in model specification, in interpretation, and in implementation. To address these issues, we propose Poisson point process modeling of the intensity of presences. We also derive a link between the proposed approach and logistic regression—specifically, we show that as the number of pseudo-absences increases (in a regular or uniform random arrangement), logistic regression slope parameters and their standard errors converge to those of the corresponding Poisson point process model. We discuss the practical implications of these results. In particular, point process modeling offers a framework for choice of the number and location of pseudo-absences, both of which are currently chosen by ad hoc and sometimes ineffective methods in ecology, a point which we illustrate by example.

1. Background. Pearce and Boyce (2006) define presence-only data as "consisting only of observations of the organism but with no reliable data on where the species was not found. Sources for these data include atlases, museum and herbarium records, species lists, incidental observation databases and radio-tracking studies." Note that such data arise as *point locations* where the organism is observed, which we denote as $\mathbf{y}$ in this article. An example is given in Figure 1(a). This figure gives all locations where a particular tree species (*Angophora costata*) has been reported by park rangers since 1972, within 100 km of the Greater Blue Mountains World Heritage Area, near Sydney, Australia. Note that this does not consist of all locations where an *Angophora costata* tree is found—rather it is the locations where the species has been *reported* to be found. We would like to use these presence points, together with maps of explanatory variables describing the environment (often referred to in ecology as "environmental variables"), to predict

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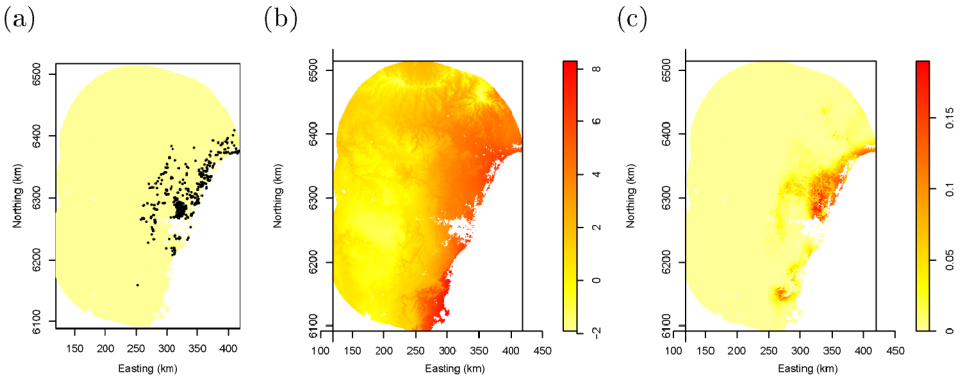


FIG. 1. (a) *Example presence-only data—atlas records of where the tree species* Angophora costata *has been reported to be present, west of Sydney, Australia. The study region is shaded.* (b) *A map of minimum temperature* (°C) *over the study region. Variables such as this are used to model how intensity of* A. costata *presence relates to the environment.* (c) *A species distribution model, modeling the association between* A. costata *and a suite of environmental variables. This is the fitted intensity function for* A. costata *records per* km^2, *modeled as a quadratic function of four environmental variables using a point process model as in Section* 4.

the location of *A. costata* and how it varies as a function of explanatory variables (Figure 1).

Presence-only data are used extensively in ecology to model species distributions—while the term "presence-only data" was rarely used before the 1990s, ISI Web of Science reports that it was used in 343 publications from 2005 to 2008. The use of presence-only data in modeling is a relatively recent development, presumably aided by the movement toward electronic record keeping and recent advances in Geographic Information Systems. One reason for the current widespread usage of presence-only data is that often this is the best available information concerning the distribution of a species, as there is often little or no information on species distribution being available from systematic surveys [Elith and Leathwick (2007)].

Species distribution models, sometimes referred to as habitat models or habitat classification models [Zarnetske, Edwards and Moisen (2007)], are regression models for the likelihood that a species is present at a given location, as a function of explanatory variables that are available over the whole study region. Such models are used to construct maps predicting the full spatial distribution of a species [given GIS maps of explanatory variables such as in Figure 1(b)]. When surveys have recorded the presence and absence of a species in a pre-defined study area ("presence/absence data"), logistic regression approaches and modern generalizations [Elith, Leathwick and Hastie (2008)] are typically used for species distribution modeling. If instead presence-only data are to be used in species distribution modeling, then a common approach to analysis is to first create "pseudo-absences," denoted as $\mathbf{y}_0$, usually achieved by randomly choosing point locations in the region of interest and treating them as absences. Then the presence/pseudo-absence data

set is analyzed using standard analysis methods for presence/absence data [Pearce and Boyce (2006); Elith and Leathwick (2007)], which have been used in species distribution modeling for a long time [Austin (1985)]. Ward et al. (2009) recently proposed a modification of the pseudo-absence logistic regression approach for the analysis of presence-only data, when the probability π that a randomly chosen pseudo-absence point of a presence is known. However, π is not known in practice.

We see three key weaknesses of the "pseudo-absence" approach so widely used in ecology for analyzing presence-only data, which we describe concisely as problems of model specification, interpretation, and implementation. A sounder *model specification* would involve constructing a model for the observed data $\mathbf{y}$ *only*, rather than requiring us to generate new data $\mathbf{y}_0$ prior to constructing a model. *Interpretation* of results is difficult, because some model parameters of interest (such as p_i of Section 3) are a function of the number of pseudo-absences and their location. For example, we explain in Section 3 that as the number of pseudo-absences approaches infinity, $p_i \to 0$, for a given presence-only data set $\mathbf{y}$. *Implementation* of the approach is problematic because it is unclear how pseudo-absences should be chosen [Elith and Leathwick (2007); Guisan et al. (2007); Zarnetske, Edwards and Moisen (2007); Phillips et al. (2009)], and one can obtain qualitatively different results depending on the method of choice of pseudo-absences [Chefaoui and Lobo (2008)].

In this paper we make two key contributions. First, we propose point process models (Section 2) as an appropriate tool for species distribution modeling of presence-only data, given that presence-only data arise as a set of point events—a set of locations where a species has been reported to have been seen. A point process model specification addresses each of the three concerns raised above regarding pseudo-absence approaches. Our second key contribution is a proof that the pseudo-absence logistic regression approach, when applied with an increasing number of regularly spaced or randomly chosen pseudo-absences, yields estimates of slope parameters that converge to the point process slope estimates (Section 3). These two key results have important ramifications for species distribution modeling in ecology (Section 5), in particular, we provide a solution to the problem of how to select pseudo-absences. We illustrate our results for the *A. costata* data of Figure 1(a) (Section 4).

2. Poisson point process models for presence-only data. Presence-only data are a set $\mathbf{y} = \{y_1, \ldots, y_n\}$ of point locations in a two-dimensional region $\mathcal{A}$, where the locations where presences are recorded (the y_i) are out of the control of the researcher, as is the total number of presence points n. We also observe a "map" of values over the entire region $\mathcal{A}$ for each of k explanatory variables, and we denote the values of these variables at y_i as $(x_{i1}, \ldots, x_{ik})$.

We propose analyzing $\mathbf{y} = \{y_1, \ldots, y_n\}$ as a point process, hence, we jointly model number of presence points n and their location (y_i). This has not previously

been proposed for the analysis of presence-only data, despite the extensive literature on the analysis of presence-only data. We consider inhomogeneous Poisson point process models [Cressie (1993); Diggle (2003)], which make the following two assumptions:

1. The locations of the n point events $(y_1, \ldots, y_n)$ are independent.
2. The intensity at point y_i [$\lambda(y_i)$, denoted as λ_i for convenience], the limiting expected number of presences per unit area [Cressie (1993)], can be modeled as a function of the k explanatory variables. We assume a log-linear specification:

$$\log(\lambda_i) = \beta_0 + \sum_{j=1}^{k} x_{ij}\beta_j, \tag{2.1}$$

although note that the linearity assumption can be relaxed in the usual way (e.g., using quadratic terms or splines). The parameters of the model for the λ_i are stored in the vector $\beta = (\beta_0, \beta_1, \ldots, \beta_k)$.

Note that the process being modeled here is locations where an organism *has been reported* rather than locations where individuals of the organism occur. Hence, the independence assumption would only be violated by interactions between records of sightings rather than by interactions between individual organisms per se. The atlas data of Figure 1 consist of 721 *A. costata* records accumulated over a period of 35 years in a region of 86,000 km^2, so independence of records seems a reasonable assumption in this case, given the rarity of event reporting. Nevertheless, the methods we review here can be generalized to handle dependence between point events [Baddeley and Turner (2005)].

Cressie (1993) shows that the log-likelihood for $\mathbf{y}$ can be written as

$$l(\beta; \mathbf{y}) = \sum_{i=1}^{n} \log(\lambda_i) - \int_{y \in \mathcal{A}} \lambda(y)\, dy - \log(n!). \tag{2.2}$$

Berman and Turner (1992) showed that if the integral is estimated via numerical quadrature as $\int_{y\in\mathcal{A}} \lambda(y)\, dy \approx \sum_{i=1}^{m} w_i \lambda_i$, then the log-likelihood is (approximately) proportional to a weighted Poisson likelihood:

$$l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{w}) = \sum_{i=1}^{m} w_i \big(z_i \log(\lambda_i) - \lambda_i\big), \tag{2.3}$$

where $z_i = \frac{I(i\in\{1,\ldots,n\})}{w_i}$, $\mathbf{y}_0 = \{y_{n+1}, \ldots, y_m\}$ are quadrature points, the vector $\mathbf{w} = (w_1, \ldots, w_m)$ stores all quadrature weights, and $I(\cdot)$ is the indicator function. Being able to write $l(\beta; \mathbf{y})$ as a weighted Poisson likelihood has important practical significance because it implies that generalized linear modeling (GLM) techniques can be used for estimation and inference about β. Further, adaptations of GLM techniques to other settings, such as generalized additive models [Hastie

and Tibshirani (1990)], can then be readily applied to Poisson point process models also.

Before implementing this approach, however, we need to make two key decisions—how to choose quadrature points $\mathbf{y}_0 = \{y_{n+1}, \ldots, y_m\}$ and how to calculate the quadrature weight w_i at each point y_i.

We propose choosing quadrature points in a regular rectangular grid, and considering grids of increasing spatial resolution until the estimate of the maximized log-likelihood $l_{\mathrm{ppm}}(\hat{\beta}; \mathbf{y}, \mathbf{y}_0, \mathbf{w})$ has converged. A rectangular grid provides reasonably efficient coverage of the region $\mathcal{A}$, and is an arrangement for which environmental data $x_{i1}, \ldots, x_{ik}$ can be easily obtained via GIS software. We illustrate this method in Section 4. Note a large data set may be required—in Section 4 convergence was achieved at a spatial scale that required inclusion of approximately 86,000 quadrature points.

Quadrature weights are calculated as the area of the neighborhood A_i around each point y_i, according to some definition of the A_i such that $y_i \in A_i$ for each i, $A_i \cap A_{i'} = \varnothing$ for each $i \neq i'$, and $\bigcup_i A_i = \mathcal{A}$. In Section 4 we calculated quadrature weights using the tiling method implemented in the `R` package `spatstat` [Baddeley and Turner (2005)]. This crude approach breaks the region $\mathcal{A}$ into rectangular tiles and calculates the weight of a point as the inverse of the number of points per unit area in its tile. We fixed tile size at the size of the regular grid used to sample quadrature points, such that all tiles contained exactly one quadrature point. Dirichlet tessellation [Baddeley and Turner (2005)] offers an alternative method of estimating weights, but this was not practical for our sample sizes.

3. Asymptotic equivalence of pseudo-absence logistic regression and Poisson point process models. Ecologists typically analyze presence-only data points $\mathbf{y} = \{y_1, \ldots, y_n\}$ by generating a set of "pseudo-absence" points $\mathbf{y}_0 = \{y_{n+1}, \ldots, y_m\}$, then using logistic regression to model the "response variable" $I(i \in \{1, \ldots, n\})$ as a function of explanatory variables [Pearce and Boyce (2006)]. Note that $I(i \in \{1, \ldots, n\})$ is not actually a stochastic quantity, nevertheless, the use of logistic regression to model this quantity as a Bernoulli response variable can be motivated via a case-control argument along the lines of Diggle (2003), Section 9.3.

In this section we will show that the approach to analysis currently used in ecology, logistic regression using pseudo-absences, is closely related to the Poisson point process model introduced in Section 2. Specifically, if the pseudo-absences are either generated on a regular grid or completely at random over the region $\mathcal{A}$, then as the number of pseudo-absences increase, all parameter estimators except for the intercept in the logistic regression model converge to the maximum likelihood estimators of the Poisson process model of Section 2. This asymptotic relationship between logistic regression and Poisson point process models does not appear to have been recognized previously in the literature.

First, we will specify a probability model for $I(i \in \{1, \ldots, n\})$ that permits a logistic regression model, and the study of its properties as $m \to \infty$. This can be achieved by considering a point chosen at random from $\{y_1, \ldots, y_m\}$ and defining U as the event that the randomly chosen point y_i is a presence. We are interested in modeling U conditionally on the explanatory variables observed at the randomly chosen point, $\mathbf{x}_i = (x_{i1}, \ldots, x_{ik})$. In this setting, U is a Bernoulli variable with conditional mean p_i, and we assume that

$$\log\left(\frac{p_i}{1-p_i}\right) = \gamma_0 - \log(m-n) + \sum_{j=1}^{k} x_{ij}\gamma_j. \tag{3.1}$$

The intercept term is written as $\gamma_0 - \log(m-n)$ because

$$\frac{p_i}{1-p_i} = \frac{f_1(\mathbf{x}_i|U=1)}{f_0(\mathbf{x}_i|U=0)} \cdot \frac{P(U=1)}{P(U=0)} = \frac{f_1(\mathbf{x}_i|U=1)}{f_0(\mathbf{x}_i|U=0)} \frac{n}{m-n}, \tag{3.2}$$

where $f_1(\cdot)$ and $f_0(\cdot)$ are the densities of $\mathbf{x}_i$ conditional on $U=1$ and $U=0$ respectively. Provided that $f_0(\mathbf{x}_i|U=0)$ is not a function of m (which is ensured, e.g., by using an identical process to select all pseudo-absence points), then the odds of a presence point $\frac{p_i}{1-p_i}$ is a function of m only via the multiplier $(m-n)^{-1}$.

It can be seen from equation (3.2) that if $m \to \infty$ in such a way that $f_0(\mathbf{x}_i|U=0)$ is not a function of i, then $p_i \to 0$ at an asymptotic rate that is proportional to m^{-1}, and the intercept term in the logistic regression model approaches $-\infty$ at the rate $\log(m)$. This in turn means that the logistic regression log-likelihood, defined below, will also diverge as $m \to \infty$:

$$l_{\text{bin}}(\gamma; \mathbf{y}, \mathbf{y}_0) = \sum_{i=1}^{n} \log(p_i) + \sum_{i=n+1}^{m} \log(1-p_i). \tag{3.3}$$

Clearly, as $p_i \to 0$, $\log(p_i) \to -\infty$ and, hence, $l_{\text{bin}}(\gamma; \mathbf{y}, \mathbf{y}_0) \to -\infty$. Such divergence is a symptom that the original model has been incorrectly specified. The use of the more appropriate spatial point process model of Section 2 will not encounter such problems. However, it is shown in the following theorems that despite the problems inherent in the logistic regression model specification, and despite divergence of the intercept term, the remaining parameters converge to the corresponding parameters from the Poisson process model of equation (2.3). Further, pseudo-absences play the same role in the logistic regression model that quadrature points played in Section 2.

For notational convenience, we will define J_m to be the single-entry matrix whose first element is $\log m$:

$$J_m = (\log m, 0, \ldots, 0). \tag{3.4}$$

This definition will be used in each of the theorems that follow. The J_m notation is immediately useful in writing out the parameters of the model for p_i in equation (3.1) as $\gamma - J_{m-n}$ where $\gamma = (\gamma_0, \gamma_1, \ldots, \gamma_k)$.

THEOREM 3.1. *Consider a fixed set of n observations from a point process* $\mathbf{y} = \{y_1, \ldots, y_n\}$, *and a set of pseudo-absences* $\mathbf{y}_0 = \{y_{n+1}, \ldots, y_m\}$ *of variable size that is chosen via some identical process on* $\mathcal{A}$ *for* $i \in \{n+1, \ldots, m\}$. *We model* U, *whether or not a randomly chosen point is a presence point, via logistic regression as in equation* (3.1).

As $m \to \infty$, *the logistic regression log-likelihood of equation* (3.3) *approaches the Poisson point process log-likelihood* [*equation* (2.3)] *but with all quadrature weights set to one*:

$$l_{\text{bin}}(\gamma; \mathbf{y}, \mathbf{y}_0) = l_{\text{ppm}}(\gamma - J_m; \mathbf{y}, \mathbf{y}_0, \mathbf{1}) + O(m^{-1}),$$

where $\mathbf{1}$ *is a m-vector of ones, and* J_m *is defined in equation* (3.4).

The proofs to Theorem 3.1 and all other theorems are given in Appendix A.

Theorem 3.1 has two interesting practical implications.

First, it implies that the pseudo-absence points of presence-only logistic regression play the same role as quadrature points of a point process model, and so established guidelines on how to choose quadrature points (such as those of Section 2) can inform choice of pseudo-absences. Previously pseudo-absences have been generated according to ad hoc recommendations [Pearce and Boyce (2006); Zarnetske, Edwards and Moisen (2007)], given the lack of a theoretical framework for their selection. In contrast, quadrature points are generated in order to estimate the log-likelihood to a pre-determined level of accuracy, a criterion which guides the choice of locations and numbers of quadrature points $m - n$, as explained in Section 2 and as illustrated later in Section 4 [Figure 2(a)]. Interestingly, current methods of selecting pseudo-absences in ecology [Pearce and Boyce (2006); Zarnetske, Edwards and Moisen (2007)] do not appear to be consistent with the best practice in low-dimensional numerical quadrature—points are usually selected at random rather than on a regular grid, and the number of pseudo-absences $(m - n)$ is more commonly chosen relative to the magnitude of the number of presences (n) rather than based on some convergence criterion as in Figure 2(a).

Second, Theorem 3.1 implies that despite the apparent ad hoc nature of the pseudo-absence approach, *some form of point process model is being estimated.* However, logistic regression is only equivalent to a Poisson point process when $\mathbf{w} = \mathbf{1}$, that is, all quadrature weights are ignored. The implications of ignoring weights is considered in Theorems 3.2 and 3.3 below.

It should also be noted that Theorem 3.1 is closely related to results due to Owen (2007) and Ward (2007), although Theorem 3.1 differs from these results by relating pseudo-absence logistic regression specifically to point process modeling.

Owen (2007) also considered the logistic regression setting where the number of presence points is fixed, and the number of pseudo-absences increases to infinity, and referred to this as "infinitely unbalanced logistic regression." Owen (2007) derived conditions under which convergence of model parameters could be achieved as the number of pseudo-absences increased. The key condition is that the centroid

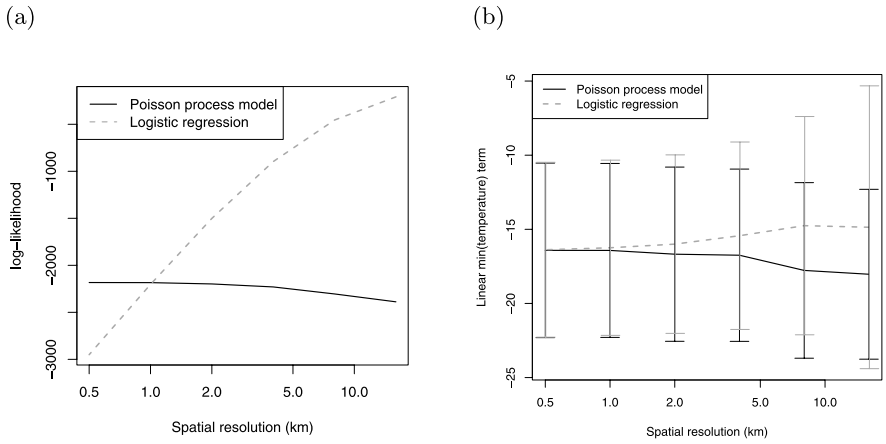


FIG. 2. *Asymptotic behavior of Poisson point process and pseudo-absence logistic regression models when the number of quadrature points becomes large* (*via sampling in a regular grid with increasing spatial resolution*). (a) *The maximized log-likelihood converges for a Poisson point process, but not for pseudo-absence logistic regression.* (b) *The parameters and their standard errors converge for Poisson point process and logistic regression models, for sufficiently high spatial resolution. Linear coefficient of "minimum temperature" is given here* (*corresponding to the second entry in Table* 2).

of the points $\{y_1, \ldots, y_n\}$ in the design space is "surrounded"—see Definition 3 of Owen (2007) for details.

Along the lines of Ward et al. (2009), Ward (2007) considered a pseudo-absence logistic regression formulation of the presence-only data problem, and defined the "population logistic model" as the model across "the full population" of locations in the region $\mathcal{A}$. The unconstrained log-likelihood of the population logistic model [Ward (2007), equation (7.6)] has a similar form to the point process log-likelihood $l(\beta; \mathbf{y})$ of Section 2. For presence-only logistic regression as in Ward et al. (2009), Ward (2007) shows that as the number of pseudo-absences approaches infinity, the log-likelihood converges to that of the population logistic model, a result that is analogous to Theorem 3.1.

Having shown that pseudo-absence logistic regression is equivalent to a point process model where weights are ignored, the implications of ignoring weights is now considered in Theorems 3.2 and 3.3.

THEOREM 3.2. *Consider a point process model with quadrature points* $y_{n+1}, \ldots, y_m$ *selected such that for all* i $w_i = \frac{|\mathcal{A}|}{m}$, *where* $|\mathcal{A}|$ *is the total area of the region* $\mathcal{A}$. *Assume also that the design matrix* $\mathbf{X}$ *has full rank.*

The maximum likelihood estimators of $l_{\text{ppm}}(\gamma - J_m; \mathbf{y}, \mathbf{y}_0, \mathbf{1})$ *and* $l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \frac{|\mathcal{A}|}{m}\mathbf{1})$, $\hat{\gamma} - J_m$ *and* $\hat{\beta}$ *respectively, satisfy*

$$\hat{\gamma} = \hat{\beta} + J_{|\mathcal{A}|}.$$

Further, the Fisher information for $\hat{\gamma}$ and $\hat{\beta}$ is equal.

That is, provided that quadrature points have been selected such that quadrature weights are equal, ignoring quadrature weights in a Poisson point process model does not change slope parameters nor their standard errors, although the intercept term will differ by $\log(|\mathcal{A}|/m)$.

Theorem 3.2 refers to the special case where all points (including presence points) are sampled on a regular grid. This arises in the special case where the region $\mathcal{A}$ has been divided into grid cells of equal area, and each grid cell is assigned the value 1 only if it contains a presence point. This form of presence-only analysis is sometimes used in ecology [Phillips, Anderson and Schapire (2006), e.g.]. In addition, the setting of Theorem 3.2 provides a reasonable approximation to the approach to quadrature-point selection proposed in Section 2.

Note that together Theorems 3.1–3.2 suggest that when quadrature points (or, equivalently, pseudo-absences) are sampled in a regular grid at increasing resolution, the logistic regression parameter estimates and their standard errors will approach those of the point process model—with the exception of the intercept term, which diverges slowly to $-\infty$ as all $p_i \to 0$ at a rate inversely proportional to m. This nonconvergence of the intercept was also noticed by Owen (2007). Figure 2 illustrates these results for the *A. costata* data.

Theorem 3.3 below links the above results with the case where pseudo-absences are randomly sampled within the region $\mathcal{A}$, which is a more common approach in ecology than sampling on a regular grid [e.g., Elith and Leathwick (2007); Hernandez et al. (2008)].

THEOREM 3.3. *Consider again the conditions of Theorem 3.2, but now assume that the quadrature points* $\mathbf{y}_0$ *are selected uniformly at random within the region* $\mathcal{A}$. *As previously,* $\hat{\gamma}$ *is the maximum likelihood estimator of* $l_{\mathrm{ppm}}(\gamma - J_m; \mathbf{y}, \mathbf{y}_0, \mathbf{1})$, *but now let* $\hat{\beta}$ *be the maximum likelihood estimator of* $l(\beta; \mathbf{y})$ *from equation (2.2). As* $m \to \infty$,

$$\hat{\gamma} \xrightarrow{\mathcal{P}} \hat{\beta} + J_{|\mathcal{A}|}.$$

That is, if quadrature points are randomly selected instead of being sampled on a regular grid, the result of Theorem 3.2 holds in probability rather than exactly.

Note that the stochastic convergence in Theorem 3.3 is with respect to m not n, that is, it is conditional on the observed point process.

Note also that one can think of randomly selecting pseudo-absence points as an implementation of "crude" Monte Carlo integration [Lepage (1978)] for estimating $\int_{y\in\mathcal{A}} \lambda(y)\,dy$ in the point process likelihood [equation (2.2)].

4. Modeling *Angophora costata* species distribution. As an illustration, we construct Poisson point process models for the intensity of *Angophora costata* records as a function of a set of explanatory variables. We consider modeling the log of intensity using linear and quadratic functions of the variables minimum and maximum temperature, mean annual rainfall, number of fires since 1943, and "wetness," a coefficient which can be considered as an indicator of local moisture. These five variables were recommended by local experts as likely to be important in determining *A. costata* distribution.

Our full model for intensity of *A. costata* records at the point y_i has the following form:

$$\log(\lambda_i) = \beta_0 + \mathbf{x}_i^T \beta_1 + \mathbf{x}_i^T \mathbf{B} \mathbf{x}_i, \tag{4.1}$$

where β_1 is a vector of linear coefficients, $\mathbf{B}$ is a matrix of quadratic coefficients, and $\mathbf{x}_i$ is a vector containing measurements of the five environmental variables at point y_i. We consider a quadratic model for $\log(\lambda_i)$ because this enables fitting a nonlinear function and interaction between different environmental variables, both considered important in species distribution modeling [Elith, Leathwick and Hastie (2008)].

All analyses were carried out using purpose-written code on the R program [R Development Core Team (2009)].

We first considered the spatial resolution at which quadrature points needed to be sampled in order for the log-likelihood $l(\beta; \mathbf{y})$ to be suitably well approximated by $l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{w})$. We found [as in Figure 2(a)] that on increasing the number of quadrature points, the estimate of the maximized log-likelihood converged, and that there was minimal change in the solution beyond a resolution of one quadrature point every 1 km (the maximized log-likelihood changed by less than one when the number of quadrature points was increased 4-fold). Hence, the 1 km resolution was used in model-fitting, and these results are reported here. This involved a total of 86,227 quadrature points.

In order to study which environmental variables are associated with *A. costata* and how they are associated, we performed model selection where we considered different forms of models for log-intensity as a function of environmental variables, and we considered different subsets of the environmental variables via all-subsets selection. In both cases we used AIC as our model selection criterion, a simple and widely-used penalty-based model selection criterion [Burnham and Anderson (1998)].

Comparison of AIC values for linear and quadratic models suggest that a much better fit is achieved when using a quadratic model with interactions terms for all coefficients (Table 1). Hence, we have evidence that environmental variables interact in their effect on *A. costata*. Judging from the model coefficients and their relative size compared to standard errors, the interactions between maximum temperature, minimum temperature, and annual rainfall appear to be the major contributors.

TABLE 1
AIC values for linear and quadratic Poisson point process models for $\log(\lambda)$ *of* Angophora costata *presence. Model fitted at the* 1 *km by* 1 *km resolution*

Model	**AIC**
Linear terms only	5363.6
Quadratic (additive terms only)	4763.4
Quadratic (interactions included)	4400.6

All-subsets selection considered a total of 32 models, and found that the best-fitting model included four variables (Figure 3)—all except for "wetness." Parameter estimates and standard errors for this best-fitting model are given in Table 2(a).

An image of the fitted intensity surface from the best-fitting model is presented in Figure 1(c). The regions of highest predicted intensity are near the coast and just north of Sydney, which are indeed where the highest density of presence points appeared in Figure 1(a). We also compared intensity surfaces fitted at different spatial resolutions, and note that they appear identical when quadrature points are selected in a 500×500 m, 1×1 km, or 2×2 km grid, and that irrespective of spatial resolution, regions of higher intensity had 0.05–0.2 expected *A. costata* records per square kilometer, as in Figure 1(c). Note this is in contrast to logistic regression, where fitted probabilities in any given location are a function of number of pseudo-absences, and vary by a factor of 16 when moving from a 2×2 km to a 500×500 m grid.

To assist in interpreting parameters from the best-fitting model, we have constructed image plots of the fitted intensity in "environmental space" to elucidate

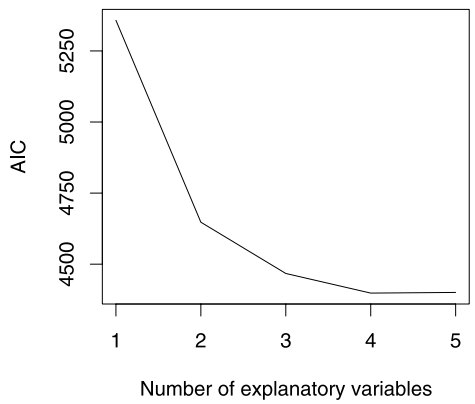


FIG. 3. *Results of all-subsets selection, expressed as AIC of the best-fitting model at each level of complexity. The respective best-fitting models included minimum temperature, then minimum and maximum temperature, then annual rainfall was added, then fire count, and finally wetness. The best-fitting model included four explanatory variables* (*all variables except wetness*).

TABLE 2

Parameter estimates and their standard errors for (a) *the Poisson point process model with a* 1×1 *km regular grid of quadrature points*; (b) *The logistic regression model with a* 1×1 *km regular grid of pseudo-absences*; (c) *The logistic model with* 1000 *randomly chosen pseudo-absence points. In each case we fitted a quadratic model of minimum temperature* (*MNT*), *maximum temperature* (*MXT*), *annual rainfall* (*RA*), *and fire count* (*FC*). *Notice that with few exceptions, terms are equivalent to* 2–3 *significant figures for the models fitted over a regular grid. But this is not the case for* (c), *and, in particular, standard errors are all* 30–80% *larger*

	(a)		(b)		(c)	
Term	$\hat{\beta}_j$	$se(\hat{\beta}_j)$	$\hat{\beta}_j$	$se(\hat{\beta}_j)$	$\hat{\beta}_j$	$se(\hat{\beta}_j)$
Intercept	−2130	169.4	−2119	171	−1999	227
MNT	−16.3	3.0	−16.2	3.0	−9.91	4.2
MNT^2	−0.21	0.027	−0.205	0.028	−0.185	0.050
MXT	128.7	10.1	128.1	10.1	120.2	13
MNT ∗ MXT	0.539	0.090	0.535	0.091	0.377	0.13
MXT^2	−1.98	0.15	−1.97	0.15	−1.84	0.20
RA	0.759	0.065	0.755	0.066	0.714	0.089
MNT ∗ RA	0.00345	0.00065	0.00339	0.00065	0.00147	0.00096
MXT ∗ RA	−0.0218	0.0019	−0.0216	0.0019	−0.0203	0.0025
$RA^2/1000$	−0.0819	0.0072	−0.0815	0.0072	−0.0749	0.010
FC	6.24	3.37	5.98	3.42	4.08	4.9
MNT ∗ FC	−0.101	0.040	−0.101	0.041	−0.207	0.070
MXT ∗ FC	−0.123	0.10	−0.115	0.010	−0.0601	0.15
RA ∗ FC	−0.00174	0.00066	−0.00171	0.00067	−0.000952	0.00095
FC^2	−0.127	0.024	−0.123	0.024	−0.107	0.041

the nature of the effect of each environmental variable on intensity of *A. costata* records (Figure 4). It can be seen in Figure 4 that there is a strong and negatively correlated response to maximum temperature and annual rainfall. Of the four environmental variables, the response to number of fires appears to be the weakest, with little apparent change in predicted intensity as number of fires increased, and no observable interaction with the three climatic variables.

For the purpose of comparison, parameter estimates and their standard errors are reported not just for the point-process model fit, but also for the analogous logistic regression model in Table 2(b), for a model fitted with quadrature points sampled in a 1×1 km regular grid. Note that most parameter estimates and standard errors differ by less than 1% between the logistic regression and point process models, as expected given Theorems 3.1–3.2.

We also report results when logistic regression is applied to $m - n = 1000$ pseudo-absences at randomly selected locations [Table 2(c)]. This is at the lower end of the range typically used [Pearce and Boyce (2006); Elith and Leathwick (2007); Hernandez et al. (2008)] for pseudo-absence selection in ecology. Note that the standard errors are substantially larger in this case, and no parameter esti-

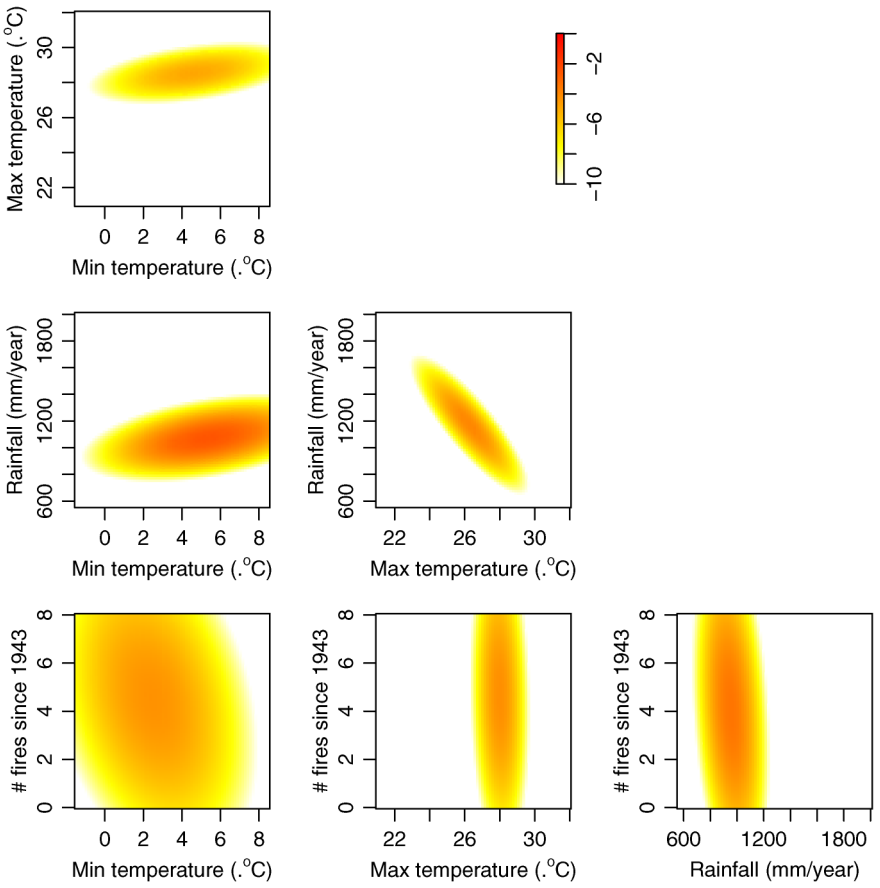


FIG. 4. *Image plots of the joint effects of environmental variables on predicted log (intensity) of* A. costata *records. Darker areas of the image correspond to higher predicted values of* $\log(\lambda_i)$. *Note the strong and highly correlated response of intensity to maximum temperature and annual rainfall, and the relatively weak response to # fires.*

mates are correct past the first significant figure. This result exemplifies how current practice in ecology regarding the number of pseudo-absences $(m - n)$ can lead to poor results. Instead, it is advisable to consider the sensitivity of results to different choices of $m - n$, along the lines of Figure 2.

To explore the goodness of fit of the best-fitting model, an inhomogeneous K-function [Baddeley, Moller and Waagepetersen (2000)] was plotted using the `kinhom` function from the `spatstat` package on `R` [Baddeley and Turner (2005)], and simulation envelopes around the fitted model were constructed. See Diggle (2003) for details concerning the use of K-functions to explore goodness of fit of point process models. The inhomogeneous K-function, as its name suggests, is a generalization of the K-function to the nonstationary case. It is defined over

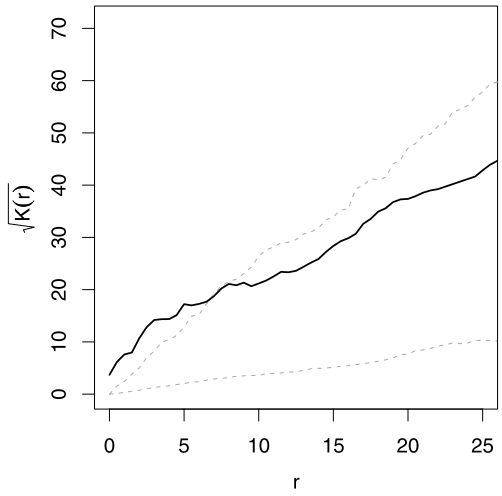


FIG. 5. *Goodness of fit plot of the quadratic Poisson process model—inhomogeneous K-function (solid line) with simulation envelope (broken lines). The envelope gives 95% confidence bands as estimated from 500 simulated data sets. Note that the K-function falls within those bounds over most of its range, although with a possible departure for $r < 6$ km.*

the region $\mathcal{A}$ as

$$K_{\text{inhom}}(r) = \frac{1}{|\mathcal{A}|} E\left\{ \sum_{y_i \in \mathbf{y}} \sum_{y_j \in \mathbf{y} \setminus \{y_i\}} \frac{I(\|y_i - y_j\| < r)}{\lambda_i \lambda_j} \right\}.$$

K_{inhom} reduces to the usual K function for a stationary process, and like the usual K-function, can be used to diagnose whether there are interactions in the point pattern $\mathbf{y}$ [Baddeley, Moller and Waagepetersen (2000)]. Results (Figure 5) suggest a reasonable fit of this model to the data, although with some lack of fit at small spatial scales ($r < 6$ km) suggestive of possible clustering in the data. One possible method of modeling this clustering is to fit an area-interaction process [Baddeley and van Lieshout (1995)], using the `spatstat` package. We have repeated analyses using such a model and found results to be generally consistent with those presented here, except of course that the equivalence with logistic regression no longer holds.

5. Discussion. In this paper we have proposed the use of Poisson point process models for the analysis of presence-only data in ecology, an important and widely-studied problem to which this methodology is well suited. We have also shown that this method is approximately equivalent to logistic regression, when a suitable number of regularly or randomly spaced pseudo-absences are used, hence, we provide a link between the proposed method and the approach most commonly used in ecology at the moment. But this raises the question: why use point process

models, if the method currently being used is (asymptotically) equivalent to logistic regression anyway? Several reasons are listed below.

Recall that in Section 1 we argued that the pseudo-absence approach has problems with model specification, interpretation, and implementation. We argue that each of these difficulties is resolved by using a point process modeling framework. *Model specification*—we believe that a point process model as in Section 2 is a plausible model for the data generation mechanism for presence-only data. In contrast, the logistic regression approach involves generating new data in order to fit a model originally designed for a different problem (analysis of binary data not analysis of point-events). Hence, the pseudo-absence approach as it is usually applied appears to involve coercing the data to fit the model rather than choosing a model that fits the original data. *Interpretation*—in the logistic regression approach we model p_i, the probability that a given point event is a presence not a pseudo-absence. This quantity has no physical meaning and clearly its interpretation is sensitive to our method of choice of pseudo-absences (and typically each $p_i \to 0$ as $m \to \infty$). In contrast, the intensity at a point λ_i has a natural interpretation as the (limiting) expected number of presences per unit area, and will *not* be sensitive to choice of quadrature points, provided that the number of quadrature points is sufficiently large. *Implementation*—in Section 2 we explain that point process models offer a framework for choosing quadrature points. Specifically, equation (2.3) is used to estimate the point process log-likelihood, and progressively more quadrature points are added until convergence of $l_{\text{ppm}}(\hat{\beta}; \mathbf{y}, \mathbf{y}_0, \mathbf{w})$ is achieved as in Figure 2(a). No such framework for choice of pseudo-absences is offered by logistic regression, and instead choice of the location and number of pseudo-absences is ad hoc, with potentially poor results [Table 2(c)]. Ecologists are concerned about the issues of how many pseudo-absences to choose [Pearce and Boyce (2006)], where to put them [Elith and Leathwick (2007); Zarnetske, Edwards and Moisen (2007); Phillips et al. (2009)], and what spatial resolution to use in model-fitting [Guisan et al. (2007); Elith and Leathwick (2009)], all issues that have natural solutions given a point process model specification of the problem, as in Section 2.

It should be emphasized that we have demonstrated equivalence of point process modeling and pseudo-absence logistic regression only for large numbers of pseudo-absences and only for pseudo-absences that are either regularly spaced or located uniformly at random over $\mathcal{A}$. Current practice concerning selection of pseudo-absences in the ecology literature does not always involve sampling at random over $\mathcal{A}$ [e.g., Hernandez et al. (2008)] and does not involve sampling sufficiently many pseudo-absences for model convergence. Instead, choice of the number of pseudo-absences is ad hoc, and a total of 1000–10,000 pseudo-absences is usually used [Elith and Leathwick (2007); Hernandez et al. (2008)], although sometimes even fewer [Zarnetske, Edwards and Moisen (2007)]. On Figure 2, 1000–10,000 corresponds to a resolution of about 4–8 km, for which model convergence has not been achieved. When fitting a model using just 1000 pseudo absences, some parameter estimates are not equivalent to the high-resolution fits to

even one significant figure, and all standard error estimates were larger by 30–80% (Table 2).

While only Poisson point processes were considered in this paper, the methodology implemented in Section 4 can be generalized to incorporate interactions between points in a straightforward fashion [Baddeley and Turner (2005)]. However, the links between point process models and logistic regression identified in Section 3 may be lost in this more general setting.

One issue not touched on in this paper is the problem of observer bias—that the likelihood of a species being reported is a function of additional variables related to properties of the observer and not of the target species, such as variation in the level of accessibility of different parts of the region $\mathcal{A}$. For example, the high number of *A. costata* records just north of Sydney may be due in part to proximity to a large city, rather than simply being due to environmental conditions being suitable for *A. costata*. This issue will be addressed in a related article.

APPENDIX A: PROOF OF THEOREMS

A.1. Proof of Theorem 3.1. The proof involves two steps. The first step involves showing that $l_{\text{bin}}(\cdot)$, as a function of p_i, is asymptotically equivalent to $l_{\text{ppm}}(\cdot)$ when written as a function of λ_i. The second step involves showing that given the definitions of p_i and λ_i in equations (2.1) and (3.1), we can replace one with the other without affecting the order of approximation.

Specifically, the log-likelihood function for U can be written as

$$l_{\text{bin}}(\gamma; \mathbf{y}, \mathbf{y}_0) = \sum_{i=1}^{n} \log(p_i) + \sum_{i=n+1}^{m} \log(1 - p_i)$$

and a Taylor expansion of $\log(1 - p_i)$ yields

$$= \sum_{i=1}^{n} \log(p_i) + \sum_{i=n+1}^{m} \{p_i + O(p_i^2)\},$$

but it can be seen from equation (3.2) that $p_i = O(m^{-1})$ and, hence, $\sum_{i=1}^{n} p_i = O(m^{-1})$ for fixed n, so

$$\begin{aligned} l_{\text{bin}}(\gamma; \mathbf{y}, \mathbf{y}_0) &= \sum_{i=1}^{n} \log(p_i) + \sum_{i=n+1}^{m} p_i + O(m^{-1}) \\ &= \sum_{i=1}^{n} \log(p_i) + \sum_{i=1}^{m} p_i + O(m^{-1}) \\ &= \sum_{i=1}^{m} \{I(i \in \{1, \ldots, n\}) \log(p_i) - p_i\} + O(m^{-1}). \end{aligned} \tag{A.1}$$

Note that equation (A.1) has the form of the Poisson point process log-likelihood, but with all weights set to one and p_i being used in place of λ_i. We will now derive a relation between p_i and λ_i which motivates the replacement of p_i by λ_i.

First note that the Taylor expansion of $\log(1-x)$ implies both that $\log(1-p_i) = O(m^{-1})$, and that $\log(m-n) = \log(m) + \log(1-n/m) = \log(m) + O(m^{-1})$. So from equation (3.1),

$$\log p_i = \gamma_0 - \log(m-n) + \sum_{j=1}^{k} x_{ij}\gamma_j - \log(1-p_i)$$

$$= \gamma_0 - \log(m) + \sum_{j=1}^{k} x_{ij}\gamma_j + O(m^{-1}).$$

This has the form of equation (2.1), where $\beta = \gamma - J_m$. So when $\beta = \gamma - J_m$, $\log p_i = \log\lambda_i + O(m^{-1})$, and $\sum_{i=1}^{m} p_i = \sum_{i=1}^{m}\lambda_i\{1 + O(m^{-1}\} = \sum_{i=1}^{m}\lambda_i + O(m^{-1})$. Now plugging these results into equation (A.1) yields $l_{\mathrm{ppm}}(\gamma - J_m; \mathbf{y}, \mathbf{y}_0, \mathbf{1}) + O(m^{-1})$, completing the proof. □

A.2. Proof of Theorem 3.2. The proof follows by inspection of the score equations. Specifically, let $s_j(\beta; \mathbf{w}) = \frac{\partial}{\partial\beta_j} l_{\mathrm{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{w})$. From equation (2.3), for $j \in \{1, \ldots, k\}$,

$$s_j(\beta; \mathbf{w}) = \sum_{i=1}^{m} x_{ij}\lambda_i w_i\left(\frac{z_i - \lambda_i}{\lambda_i}\right) = \sum_{i=1}^{m} x_{ij} w_i (z_i - \lambda_i), \tag{A.2}$$

where $z_i = \frac{I(i\in 1,\ldots,n)}{w_i}$. If $j = 0$, equation (A.2) holds but with $x_{ij} = 1$ for each i.

Now $\hat\beta$ satisfies $s_j(\hat\beta; \frac{|\mathcal{A}|}{m}\mathbf{1}) = 0$ for each j, that is,

$$0 = \sum_{i=1}^{m} x_{ij}\left(I(i \in 1, \ldots, n) - \hat\lambda_i \frac{|\mathcal{A}|}{m}\right), \tag{A.3}$$

where from equation (2.1), $\log(\hat\lambda_i) = \hat\beta_0 + \sum_{j=1}^{k} x_{ij}\hat\beta_1$.

$\hat\gamma$ satisfies $s_j(\hat\gamma - J_m; \mathbf{1}) = 0$, for each j,

$$0 = \sum_{i=1}^{m} x_{ij}\big(I(i \in 1, \ldots, n) - \tilde\lambda_i\big), \tag{A.4}$$

where $\tilde\lambda_i$ is the maximum likelihood estimator of λ_i for $l_{\mathrm{ppm}}(\gamma - J_m; \mathbf{y}, \mathbf{y}_0, \mathbf{1})$, which satisfies $\log(\tilde\lambda_i) = \hat\gamma_0 - \log m + \sum_{j=1}^{k} x_{ij}\hat\gamma_1$.

The solutions to equations (A.3) and (A.4) are related by the identity $\tilde\lambda_i = \hat\lambda_i \frac{|\mathcal{A}|}{m}$ for each i, and if we take the logarithm of both sides,

$$\hat\gamma_0 - \log m + \sum_{j=1}^{k} x_{ij}\hat\gamma_j = \hat\beta_0 + \sum_{j=1}^{k} x_{ij}\hat\beta_j + \log|\mathcal{A}| - \log m.$$

Provided that the design matrix X has full rank, $\hat{\gamma} = \hat{\beta} + J_{|\mathcal{A}|}$.

Also, note that the (j, j')th element of the Fisher information matrix of $l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{w})$ is

$$I_{jj'}(\beta; \mathbf{w}) = -E\left(\frac{\partial^2}{\partial\beta_j\beta_{j'}} l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{w})\right) = \sum_{i=1}^{m} x_{ij} w_i x_{ij'} \lambda_i \tag{A.5}$$

and so $I_{jj'}(\hat{\beta}; \frac{|\mathcal{A}|}{m}\mathbf{1}) = \sum_{i=1}^{m} x_{ij}x_{ij'}\frac{|\mathcal{A}|}{m}\hat{\lambda}_i = \sum_{i=1}^{m} x_{ij}x_{ij'}\tilde{\lambda}_i = I_{jj'}(\hat{\gamma} - J_m; \mathbf{1})$ for each (j, j'). This completes the proof. □

A.3. Proof of Theorem 3.3. Let $\delta = \hat{\gamma} - \hat{\beta} - J_{|\mathcal{A}|}$. We will prove the theorem by using a Taylor expansion of the score equations for $l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{1})$ to show that for fixed n and $m \to \infty$, $\delta \xrightarrow{\mathcal{P}} 0$.

Let $\mathbf{S}(\beta; \mathbf{1})$ be the vector of score equations whose jth element is $s_j(\beta; \mathbf{1}) = \frac{\partial}{\partial\beta_j} l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{1})$ and let $\mathbf{I}(\beta; \mathbf{1})$ be the corresponding Fisher information matrix. A Taylor expansion of $\mathbf{S}(\hat{\gamma} - J_m; \mathbf{1})$ about $\mathbf{S}(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1})$ yields

$$\mathbf{S}(\hat{\gamma} - J_m; \mathbf{1}) = \mathbf{S}(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1}) - \mathbf{I}(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1})\delta + O_p(\|\delta\|^2). \tag{A.6}$$

The left-hand side is zero, because it is evaluated at the maximizer of $l_{\text{ppm}}(\beta; \mathbf{y}, \mathbf{y}_0, \mathbf{1})$. Also, evaluating λ_i at $\hat{\beta} + J_{|\mathcal{A}|/m}$ gives $\hat{\lambda}_i \frac{|\mathcal{A}|}{m}$, and substituting this into equation (A.2) at $\mathbf{w} = \mathbf{1}$,

$$\begin{aligned} s_j(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1}) &= \sum_{i=1}^{n} x_{ij} - \sum_{i=1}^{m} x_{ij}\hat{\lambda}_i \frac{|\mathcal{A}|}{m} \\ &\xrightarrow{\mathcal{P}} \int_{y\in\mathcal{A}} x_j(y)\hat{\lambda}(y)\, dy \end{aligned}$$

from the weak law of large numbers. But this is the derivative of $l(\beta; \mathbf{y})$ from equation (2.2), evaluated at the maximum likelihood estimate $\hat{\beta}$, and so it equals zero for each j and, hence, $\mathbf{S}(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1}) \xrightarrow{\mathcal{P}} \mathbf{0}$. Similarly, for each (j, j'), $I_{jj'}(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1}) \xrightarrow{\mathcal{P}} I_{jj'}(\hat{\beta})$, the (j, j')th element of the Fisher information matrix for $\hat{\beta}$ from $l(\beta; \mathbf{y})$. So returning to equation (A.6),

$$\delta = \mathbf{I}(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1})^{-1}\mathbf{S}(\hat{\beta} + J_{|\mathcal{A}|/m}; \mathbf{1}) + O_p(\|\delta\|^2) \xrightarrow{\mathcal{P}} 0,$$

completing the proof. □

Acknowledgments. Thanks to the NSW Department of Environment and Climate Change for making the data available, and to Dan Ramp and Evan Webster at UNSW for assistance processing the data and advice. Thanks to David Nott, William Dunsmuir and Simon Barry for helpful discussions.

REFERENCES

AUSTIN, M. P. (1985). Continuum concept, ordination methods and niche theory. *Annual Review of Ecology, Evolution, and Systematics* **16** 39–61.

BADDELEY, A. and TURNER, R. (2005). Spatstat: An R package for analyzing spatial point patterns. *Journal of Statistical Software* **12** 1–42.

BADDELEY, A. J. and VAN LIESHOUT, M. (1995). Area-interaction point processes. *Ann. Inst. Statist. Math.* **47** 601–619. MR1370279

BADDELEY, A. J., MOLLER, J. and WAAGEPETERSEN, R. (2000). Non- and semiparametric estimation of interaction in inhomogeneous point patterns. *Statist. Neerlandica* **54** 329–350. MR1804002

BERMAN, M. and TURNER, T. (1992). Approximating point process likelihoods with GLIM. *J. Roy. Statist. Soc. Ser. C* **41** 31–38.

BURNHAM, K. P. and ANDERSON, D. R. (1998). *Model Selection and Inference—A Practical Information-Theoretic Approach*. Springer, New York. MR1919620

CHEFAOUI, R. M. and LOBO, J. M. (2008). Assessing the effects of pseudo-absences on predictive distribution model performance. *Ecological Modelling* **210** 478–486.

CRESSIE, N. A. C. (1993). *Statistics for Spatial Data*. Wiley, New York. MR1239641

DIGGLE, P. J. (2003). *Statistical Analysis of Spatial Point Patterns*, 2nd ed. Arnold, London. MR0743593

ELITH, J. and LEATHWICK, J. (2007). Predicting species distributions from museum and herbarium records using multiresponse models fitted with multivariate adaptive regression splines. *Diversity and Distributions* **13** 265–275.

ELITH, J. and LEATHWICK, J. (2009). Species distribution models: Ecological explanation and prediction across space and time. *Annual Review of Ecology, Evolution, and Systematics* **40** 677–697.

ELITH, J., LEATHWICK, J. R. and HASTIE, T. (2008). A working guide to boosted regression trees. *Journal of Animal Ecology* **77** 802–813.

GUISAN, A., GRAHAM, C. H., ELITH, J. and HUETTMANN, F. (2007). Sensitivity of predictive species distribution models to change in grain size. *Diversity and Distributions* **13** 332–340.

HASTIE, T. and TIBSHIRANI, R. (1990). *Generalized Additive Models*. Chapman & Hall, Boca Raton, FL. MR1082147

HERNANDEZ, P. A., FRANKE, I., HERZOG, S. K., PACHECO, V., PANIAGUA, L., QUINTANA, H. L., SOTO, A., SWENSON, J. J., TOVAR, C., VALQUI, T. H., VARGAS, J. and YOUNG, B. E. (2008). Predicting species distributions in poorly-studied landscapes. *Biodiversity and Conservation* **17** 1353–1366.

LEPAGE, G. (1978). A new algorithm for adaptive multidimensional integration. *J. Comput. Phys.* **27** 192–203.

OWEN, A. B. (2007). Infinitely imbalanced logistic regression. *J. Mach. Learn. Res.* **8** 761–773. MR2320678

PEARCE, J. L. and BOYCE, M. S. (2006). Modelling distribution and abundance with presence-only data. *Journal of Applied Ecology* **43** 405–412.

PHILLIPS, S. J., ANDERSON, R. P. and SCHAPIRE, R. E. (2006). Maximum entropy modeling of species geographic distributions. *Ecological Modelling* **190** 231–259.

PHILLIPS, S. J., DUDÍK, M., ELITH, J., GRAHAM, C. H., LEHMANN, A., LEATHWICK, J. and FERRIER, S. (2009). Sample selection bias and presence-only distribution models: Implications for background and pseudo-absence data. *Ecological Applications* **19** 181–197.

R DEVELOPMENT CORE TEAM (2009). *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria.

WARD, G. (2007). Statistics in ecological modelling; presence-only data and boosted MARS. PhD thesis, Dept. Statistics, Stanford Univ. Available at http://www-stat.stanford.edu/~hastie/THESES/Gill_Ward.pdf.

WARD, G., HASTIE, T., BARRY, S., ELITH, J. and LEATHWICK, J. R. (2009). Presence-only data and the EM algorithm. *Biometrics* **65** 554–563.

ZARNETSKE, P. L., EDWARDS, T. C., JR. and MOISEN, G. G. (2007). Habitat classification modeling with incomplete data: Pushing the habitat envelope. *Ecological Applications* **17** 1714–1726.

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From: Jeffrey Warren
To: Murphy, Kerry M -FS; Eric Cole
Cc: Steve Kallin; Cris Dippel; Jenny Edwards
Subject: RE: Next steps for connecting desired conditions and animal use
Date: Friday, June 06, 2014 4:03:36 PM

Perhaps using legacy data of 1) elk locations, 2) elk abundance, 3) winter severity, 4) harvest attributes (e.g., duration, number of hunters), and 5) winter feeding attributes (e.g., duration, per capita ration) we could start to understand how 2–5 influence elk intensity of use as estimated using 1. Eric, have you already done something similar?

Jeff Warren
Wildlife Biologist
US Fish and Wildlife Service
27650B South Valley Rd.
Lima, MT 59739
406.276.3536 ext. 304

From: Murphy, Kerry M -FS [mailto:kmmurphy02@fs.fed.us]
Sent: Friday, June 06, 2014 3:39 PM
To: Jeffrey Warren; Eric_Cole@fws.gov
Cc: Steve Kallin; Cris Dippel; Jenny Edwards
Subject: RE: Next steps for connecting desired conditions and animal use

Jeff: I like the idea of correlating animal use and aspen condition. This can lead to an spatially-explicit estimate of aspen condition under existing population and feeding conditions, assuming there is reasonably good correlation. Ok, then how do we get to an understanding of what the aspen landscape will look like under different feeding and management scenarios, which is where we ultimately would like to go (I think). We currently don't know how animal distribution will change under different feeding scenarios, at least at the extreme ranges of reduced numbers we are contemplating. ?? Tell us more.

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Sent: Friday, June 06, 2014 3:06 PM
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Cc: Steve Kallin; Cris Dippel; Jenny Edwards
Subject: Next steps for connecting desired conditions and animal use

Eric and Kerry,

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on NER who will be collecting data on aspen structure and browse at 35 random transects in aspen stands >2.3 ha in area). We could potentially interpolate her random transects across aspen stands using something like inverse distance weight mapping to give us a continuous map of aspen 'condition'. Probably overly simplistic, but it is a start to get us moving toward a workable solution. It is also something we have existing data for (collared animals and the aspen data currently being collected).

Thoughts?

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From: Cole, Eric
To: Jeffrey Warren
Cc: Murphy, Kerry M -FS; Steve Kallin; Cris Dippel; Jenny Edwards
Subject: Re: Next steps for connecting desired conditions and animal use
Date: Monday, June 09, 2014 11:09:59 AM

Your idea to use legacy data to model elk distribution based on past conditions make sense. I think that it would get us part of the way there, but unfortunately past data do not encompass the full range of likely future conditions. For example past data will not tell us what elk distribution and habitat use would look like in a March without feeding because it has never happened. I also suspect that it will take several years without any feeding before the full effects on elk distribution are realized. Elk have learned that they will be fed on the refuge if they stick it out long enough, and this likely affects elk distribution earlier in the season even when they are not actually being fed.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

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From: Steve Kallin
To: Steve Cain
Subject: Adaptive Management Plan (AMP) Briefing
Date: Monday, June 09, 2014 9:59:43 AM

Hi Steve:

Give a call at your convenience to discuss the timing for an AMP briefing to our respective Regional Offices. If I recall, we were going to get together on developing the briefing.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
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675 East Broadway
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Phone: (307) 201-5409
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steve_kallin@fws.gov

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Subject: Next steps for connecting desired conditions and animal use

Eric and Kerry,

I've been thinking more about how we move forward with linking desired conditions and animal use on the refuge, especially as it relates to aspen condition. I think we should consider using location data from marked elk to quantify 'intensity' of use spatially using Poisson regression. There are some benefits to this approach outlined in the attached papers (we're currently doing something similar for molt habitat selection of female scaup based on observations of uniquely marked individuals). The 2013 paper uses an example from GPS collared bighorn sheep in Wyoming. Once use is quantified for a block we can see how that correlates with aspen stand structure and/or browse levels using Jenny Edwards's aspen transect data (Kerry – Jenny is a new master's student working on NER who will be collecting data on aspen structure and browse at 35 random transects in aspen stands >2.3 ha in area). We could potentially interpolate her random transects across aspen stands using something like inverse distance weight mapping to give us a continuous map of aspen 'condition'. Probably overly simplistic, but it is a start to get us moving toward a workable solution. It is also something we have existing data for (collared animals and the aspen data currently being collected).

Thoughts?

Jeff Warren

Wildlife Biologist

US Fish and Wildlife Service

27650B South Valley Rd.

Lima, MT 59739

406.276.3536 ext. 304

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From: Jeffrey Warren
To: Steve Kallin; Cris Dippel
Cc: Eric Cole; Kerry Murphy; Jenny Edwards
Subject: Next NER meeting
Date: Monday, June 23, 2014 4:33:10 PM

Steve,

Kerry, Eric, and I have been making some progress on how we might link elk use on the refuge to desired conditions, specifically desired habitat conditions for aspen. We collectively believe we could provide an overview of our approach to the group late next month. This would include a brief summary of modeling elk habitat selection using existing location data from marked individuals, and a quick synopsis of Jenny's current aspen sampling methods and very preliminary results.

Eric and I are currently available to meet either July 24th or 25th. I don't know at this time if Kerry is available those dates. If one of those dates work for you and Cris, perhaps we could poll the group and see if we can get everyone together. The discussion of our current thoughts on linking elk use to desired conditions would not likely take up a full morning's meeting, so we can discuss other topics to cover once we set a date.

Cheers,

Jeff Warren
Wildlife Biologist
US Fish and Wildlife Service
27650B South Valley Rd.
Lima, MT 59739
406.276.3536 ext. 304

From: Steve Kallin
To: Jeffrey Warren
Cc: Cris Dippel; Eric Cole
Subject: RE: Meeting in July
Date: Wednesday, June 25, 2014 6:06:07 AM

Jeff:

I would be fine having Jenny present her study and sit in on the meeting. It would be a good learning opportunity for her.

Concerning the date. First we need to ensure our Regional Office and the Park Service Regional Office are briefed as we previously discussed. A briefing statement has been developed. I still need to finalize the timing with the GTNP and our RO. I will try to do both while at the PL meeting this week, but likely I won't know until next week. I can send out the Doodle Poll once we have nailed down the briefing questions.

I will get back to you as soon as I know more.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Tuesday, June 24, 2014 5:13 PM
To: Steve Kallin
Subject: Meeting in July

Steve,

If we have the meeting in late July Jenny would be available to present her work to the group if you think it would be o.k. to have her sit in at the meeting.

Cheers,

Jeff Warren
Wildlife Biologist
US Fish and Wildlife Service
27650B South Valley Rd.
Lima, MT 59739
406.276.3536 ext. 304

From:	Steve Kallin
To:	Amy Thornburg
Cc:	Steve Cain
Subject:	National Elk Refuge Briefing Material
Date:	Monday, July 07, 2014 2:55:13 PM
Attachments:	NATIONAL ELK REFUGE BRIEFING MATERIAL 7-7-2014.docx

---

Amy:

Please see the attached and call to discuss before 3:30 PM today.

Thank you,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

NATIONAL ELK REFUGE BRIEFING MATERIAL for RD Walsh – 7/7/2014

- Management of the Jackson bison and elk herds occurs in close collaboration between the Grand Teton NP (GRTE), the Wyoming Game and Fish Department (WGFD), Bridger-Teton National Forest (BTNF), and National Elk Refuge (NER).
- The NER initiated a process to develop a Bison and Elk Adaptive Management Plan (AMP) early in 2013. Staff from the NER, GRTE, WGFD, and BTNF have met approximately monthly for one-half day since then as part of this process.
- The AMP development process has largely focused on habitat and herd management attributes to date, but will soon begin discussions about incorporating methods to reduce bison and elk reliance on supplemental feeding and eventually phasing out feeding.
- The NER anticipates resistance from WGFD to include in the AMP a process and desire to phase out feeding on the NER.
- The number of elk wintering on the NER has averaged 7,066 since 2007, considerably above the objective of 5,000 established in the 2007 plan. The Jackson elk herd is currently estimated at 11,600 animals. WGFD has a herd objective of 11,000 and considers the herd to be within the overall objective. The Jackson bison herd is estimated at roughly 900 animals, considerably above the state objective of 500.

From: Steve Kallin
To: Paul Hansen
Subject: RE: Elk conversations
Date: Tuesday, July 08, 2014 10:09:30 AM

Hi Paul:

Let's chat in general terms. I still have some partner issues that need to be worked out before we would implement a series of meetings, but some planning would be helpful. My schedule should be a bit firmer by Friday morning. If you're around, let me call you then to set up a time to meet.

Thanks again for your interest,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Paul Hansen [mailto:paul@muriecenter.org]
Sent: Thursday, July 03, 2014 2:12 PM
To: Steve Kallin
Subject: Elk conversations

Should we talk next week about our idea to have some common ground conversations about elk here at The Murie Ranch?

Paul W. Hansen
Executive Director
The Murie Center
P.O. Box 399
Moose, WY 83012
307 739-2246
307 413-8879
paul@muriecenter.org

Bringing people together to inspire action that preserves nature.

From: Steve Kallin
To: Jeffrey Warren
Cc: Cris Dippel; Eric Cole
Subject: RE: Next week
Date: Monday, July 14, 2014 8:31:07 AM

Jeff:

My availability has unexpectedly changed. I will be out of State the week of July 21-25 visiting ill relatives. I will be out of the office this pm through Thursday. I should be back on Friday so call when you have time.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Monday, July 14, 2014 6:45 AM
To: Steve Kallin
Subject: Next week

Steve,

I wanted to check in and see if you still considering if a meeting late next week could work for getting the group together. I have a conflict on Friday the 25th, but am still available on Thursday the 24th. I would also like to talk to you prior to the meeting to discuss the termination of winter feeding as an outcome more than an objective. A bit of semantics, but an important distinction.

I'm in the field this week at Lee Metcalf but could talk Friday mid-morning or almost anytime early next week.

Cheers,

Jeff Warren
Wildlife Biologist
US Fish and Wildlife Service
27650B South Valley Rd.
Lima, MT 59739
406.276.3536 ext. 304

From: Steve Kallin
To: Jeffrey Warren
Cc: Cris Dippel; Eric Cole
Subject: FW: Next week
Date: Monday, July 14, 2014 9:44:39 AM

Jeff:

I just received a call from Steve Cain concerning the approval of the AMP Briefing statement. The GTNP would like to include a proposed completion deadline for the AMP. I know we have discussed this but I would like to revisit this with you considering we have had a delay for several months.

Talk with you on Friday,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Monday, July 14, 2014 8:31 AM
To: Jeffrey Warren
Cc: Cris Dippel; Eric Cole
Subject: RE: Next week

Jeff:

My availability has unexpectedly changed. I will be out of State the week of July 21-25 visiting ill relatives. I will be out of the office this pm through Thursday. I should be back on Friday so call when you have time.

Take care,

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steve_kallin@fws.gov

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Monday, July 14, 2014 6:45 AM
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Jeff Warren
Wildlife Biologist
US Fish and Wildlife Service
27650B South Valley Rd.
Lima, MT 59739
406.276.3536 ext. 304

From:	Cain, Steven (Steve)
To:	Steve Kallin
Subject:	Fwd: briefing statement draft
Date:	Tuesday, July 15, 2014 4:20:00 PM
Attachments:	bison and elk AMP June 2014 v1.3.docx

Hi Steve,

This version has been approved by the park, pending your revision of the timing statement if necessary. There are just a couple of minor changes in this one compared to what I sent yesterday, as a result of Kevin's input. Please get back to me when you have had a chance to talk to Jeff and address the timing statement for the AMP. Assuming no other changes beyond that, the park is ready for both agencies to begin briefing our Region folks using this joint briefing statement.

Thanks.....Steve

---------- Forwarded message ----------
From: **Cain, Steven (Steve)** <steve_cain@nps.gov>
Date: Mon, Jul 14, 2014 at 9:58 AM
Subject: Re: briefing statement draft
To: Steve Kallin <steve_kallin@fws.gov>

Hi Steve,

Here is the latest version with some minor modifications.

Steve

On Tue, Jun 17, 2014 at 10:21 AM, Steve Kallin <steve_kallin@fws.gov> wrote:

> Steve:
>
> I reviewed the Draft Briefing Statement again and read documents from the court case. I think the Draft Briefing Statement looks good; we provided several very minor additions. Please give me a call at your convenience to discuss in more detail concerning coordination between our agencies.
>
> Thank you,
>
> Steve Kallin
>
> Project Leader
>
> National Elk Refuge
>
> PO Box 510
>
> 675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

From: Cain, Steven (Steve) [mailto:steve_cain@nps.gov]
Sent: Tuesday, June 10, 2014 12:20 PM
To: Steve Kallin
Subject: briefing statement draft

Hey Steve,

Here is something to start with. I have not shared this with other park staff, thinking that will occur after you and I can agree to the general approach and details to include. Modify as you see fit and get back to me when you can. This one-page NPS format does not allow for a lot of material, so I clearly could have missed something you feel is important. Once we get a draft we are comfortable with we can discuss whether to make this officially a joint statement or to do separate agency statements that say the same thing, recognizing that FWS may use a much different format.

Steve

--
****

Steve Cain, senior wildlife biologist

Grand Teton National Park and John D. Rockefeller, Jr. Memorial Parkway

PO Drawer 170

Moose, WY 83012

(307)739-3485

****

"*If there are no dogs in heaven, then when I die I want to go where they went" Will Rogers*

--
****
Steve Cain, senior wildlife biologist
Grand Teton National Park and John D. Rockefeller, Jr. Memorial Parkway
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Briefing Statement **Grand Teton National Park** **DRAFT**
Bureau: **NPS**
Issue: **Bison and Elk Adaptive Management Planning**
Date: **~~June~~July 2014**

Key Points:

- Grand Teton NP (GRTE) manages the Jackson bison and elk herds in close collaboration with the Wyoming Game and Fish Department (WGFD), Bridger-Teton National Forest (BTNF), and National Elk Refuge (NER).
- In 2007 the NER and GRTE completed a joint bison and elk management plan/EIS that directed management of the herds for 15 years. WGFD was a cooperator in development of the plan/EIS, along with the BLM, BTNF, and USDA Animal Plant Health Inspection Service.
- The 2007 plan called for development of a subsequent, more detailed adaptive management plan (AMP) for reducing the reliance of bison and elk on supplemental winter feed provided by the NER.
- In a subsequent lawsuit, plaintiffs Defenders of Wildlife et al. challenged the plan because it lacked a specific time frame for ending feeding. The U.S. District and appellate courts in 2010 and 2011 ruled in favor of the federal government based on the agencies' stated intent in the 2007 plan to end supplemental feeding.
- The NER initiated a process to develop the Adaptive Management Plan (AMP) early in 2013. Staff from the NER, GRTE, WGFD, and BTNF have met approximately monthly for one-half day since then as part of this process. The Fish and Wildlife Service (FWS) anticipates completion of the AMP during 2014 or early 2015.
- The ~~AMP development process~~ discussion has largely focused on habitat and herd management actions~~tributes~~ to date, but the working group will soon begin to incorporate ~~discussions about incorporating~~ methods to reduce bison and elk reliance on supplemental feeding and eventually phas~~e~~~~ing~~ out feeding.

Background:

- The NER was established in 1912 and has provided supplemental winter feed to elk in all but nine years since. Bison from the Jackson herd discovered the feedlines and have consistently ~~been~~ fed there since 1980. Supplemental feeding artificially sustains more bison and elk than available winter habitat can support~~, and~~ increases the risk~~s~~ of transmitting diseases such as brucellosis and potentially chronic wasting disease, and contributes to the need for harvesting large numbers of elk during the park's elk reduction program. ~~.~~
- The 1950 law that created GRTE established a jointly managed program for the conservation of elk, including a controlled reduction when necessary for the proper management and protection of the elk herd. The program is managed by the NPS and the State of Wyoming, and u~~tiliz~~es hunters licensed by the state. Feeding on the NER and nearby state-operated feedground exacerbates the biological conditions that necessitate the park's elk reduction program. Recent increases in hunter-grizzly bear conflicts in the park have highlighted effects of inherent incompatibilities with current elk management on grizzly bear protection in the park.

Current Status:

- The number of elk wintering on the NER has averaged 7,066 since 2007, considerably above the objective of 5,000 established in the 2007 plan. The Jackson elk herd is currently estimated at 11,600 animals. WGFD has a herd objective of 11,000 and considers the herd to be within the overall objective. The GRTE elk herd segment is also considered to be near its objective of 1600. The Jackson bison herd is estimated at roughly 900 animals, considerably above the state objective of 500.
- The NER and GRTE anticipate resistance from WGFD to include in the AMP a process and desire to phase out feeding on the NER.
- National Park Service and FWS leadership should be prepared to be contacted by the State of Wyoming concerning this matter.

Interested Parties:

- Governor of Wyoming; Wyoming Game & Fish Department; various environmental groups; local communities; Wyoming congressional delegation.

Contact:
David Vela, Superintendent, 307-739-3410

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Comment [SLC1]: Steve, change this as you see fit.

From:	Steve Kallin
To:	Jeffrey Warren
Subject:	FW: briefing statement draft
Date:	Friday, July 18, 2014 8:06:10 AM
Attachments:	bison and elk AMP June 2014 v1.3.docx

Jeff:

For our conversation later today.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Cain, Steven (Steve) [mailto:steve_cain@nps.gov]
Sent: Tuesday, July 15, 2014 4:20 PM
To: Steve Kallin
Subject: Fwd: briefing statement draft

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Thanks.....Steve

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To: Steve Kallin <steve_kallin@fws.gov>

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Thank you,

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Steve

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Steve Cain, senior wildlife biologist
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Briefing Statement **Grand Teton National Park** **DRAFT**
Bureau: **NPS**
Issue: **Bison and Elk Adaptive Management Planning**
Date: **~~June~~July 2014**

Key Points:

- Grand Teton NP (GRTE) manages the Jackson bison and elk herds in close collaboration with the Wyoming Game and Fish Department (WGFD), Bridger-Teton National Forest (BTNF), and National Elk Refuge (NER).
- In 2007 the NER and GRTE completed a joint bison and elk management plan/EIS that directed management of the herds for 15 years. WGFD was a cooperator in development of the plan/EIS, along with the BLM, BTNF, and USDA Animal Plant Health Inspection Service.
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- In a subsequent lawsuit, plaintiffs Defenders of Wildlife et al. challenged the plan because it lacked a specific time frame for ending feeding. The U.S. District and appellate courts in 2010 and 2011 ruled in favor of the federal government based on the agencies' stated intent in the 2007 plan to end supplemental feeding.
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Current Status:

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- The NER and GRTE anticipate resistance from WGFD to include in the AMP a process and desire to phase out feeding on the NER.
- National Park Service and FWS leadership should be prepared to be contacted by the State of Wyoming concerning this matter.

Interested Parties:

- Governor of Wyoming; Wyoming Game & Fish Department; various environmental groups; local communities; Wyoming congressional delegation.

Contact:
David Vela, Superintendent, 307-739-3410

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Comment [SLC1]: Steve, change this as you see fit.

From: Cole, Eric
To: Jeffrey Warren
Subject: Re: Next week
Date: Thursday, July 24, 2014 8:21:59 AM

We will also need to discuss inclusion of Forest Service or limiting to NER in terms of the snow model. Coughenour is willing to do the snow model update, but some monetary support for his efforts will likely be necessary.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

On Thu, Jul 24, 2014 at 6:27 AM, Jeffrey Warren <jeffrey_warren@fws.gov> wrote:

> Perhaps this response is too late to be of use. I'll defer to you and Kerry on the scope of this effort; at one time I recall we discussed including NF lands adjacent to the refuge, so if you want to include them I'm good with that (if you already collated just the NER locations we can move forward with that and consider including NF locations with the broader group).
>
> Manipulating the 'raw' data in R sounds good to me.
>
> Jeff Warren
>
> Wildlife Biologist
>
> US Fish and Wildlife Service
>
> 27650B South Valley Rd.
>
> Lima, MT 59739
>
> 406.276.3536 ext. 304
>
> **From:** Cole, Eric [mailto:eric_cole@fws.gov]
> **Sent:** Monday, July 14, 2014 4:22 PM
> **To:** Jeffrey Warren
> **Subject:** Re: Next week

Hi Jeff,

Before I get too involved in the GIS analysis it would probably be good to confirm exactly what we are looking for in terms of aspen/elk relationships:

1) I assume that we are only interested in NER locations. If so I will clip the combined elk GPS shapefile and limit the time and space GIS analysis to NER locations. Otherwise the shapefile is quite unwieldy (220,000 total locations).

2)If our goal is to tally the locations per block by week, it might be easiest to do this in a program other than ArcGIS. The combined elk GPS collar shapefile currently has fields for MST date, MST time, and then additional fields to make analysis easier such as hour (0-22), month (1-12), Day (1-31) and year (2008-2014). I'm guessing that it would be much easier to write some code in R after the fact that would assign a week number based on this information rather than trying to do it in ArcGIS?

Let me know what you think,

Eric Cole

Refuge Biologist

U.S. Fish & Wildlife Service, National Elk Refuge

Jackson, WY

307.201.5432 (Note new phone # as of June 2014)

On Mon, Jul 14, 2014 at 6:47 AM, Jeffrey Warren <jeffrey_warren@fws.gov> wrote:

I just sent Steve Kallin a quick email to see if he was still considering getting the group together next week – I think it may have slipped off his radar.

Eric – have you had a chance to get location data sorted by blocks (time and space)? I'm at Lee Metcalf this week but will be checking email.

Cheers,

Jeff Warren

Wildlife Biologist

US Fish and Wildlife Service

27650B South Valley Rd.

Lima, MT 59739

406.276.3536 ext. 304

From: Cole, Eric
To: Jeffrey Warren
Subject: Re: Next week
Date: Thursday, July 24, 2014 8:21:59 AM

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Before I get too involved in the GIS analysis it would probably be good to confirm exactly what we are looking for in terms of aspen/elk relationships:

1) I assume that we are only interested in NER locations. If so I will clip the combined elk GPS shapefile and limit the time and space GIS analysis to NER locations. Otherwise the shapefile is quite unwieldy (220,000 total locations).

2)If our goal is to tally the locations per block by week, it might be easiest to do this in a program other than ArcGIS. The combined elk GPS collar shapefile currently has fields for MST date, MST time, and then additional fields to make analysis easier such as hour (0-22), month (1-12), Day (1-31) and year (2008-2014). I'm guessing that it would be much easier to write some code in R after the fact that would assign a week number based on this information rather than trying to do it in ArcGIS?

Let me know what you think,

Eric Cole

Refuge Biologist

U.S. Fish & Wildlife Service, National Elk Refuge

Jackson, WY

307.201.5432 (Note new phone # as of June 2014)

On Mon, Jul 14, 2014 at 6:47 AM, Jeffrey Warren <jeffrey_warren@fws.gov> wrote:

I just sent Steve Kallin a quick email to see if he was still considering getting the group together next week – I think it may have slipped off his radar.

Eric – have you had a chance to get location data sorted by blocks (time and space)? I'm at Lee Metcalf this week but will be checking email.

Cheers,

Jeff Warren

Wildlife Biologist

US Fish and Wildlife Service

27650B South Valley Rd.

Lima, MT 59739

406.276.3536 ext. 304

From: Jeffrey Warren
To: Steve Kallin
Cc: Kelly Hogan
Subject: Winter feeding at NER
Date: Friday, July 25, 2014 8:40:24 AM
Attachments: RecordOfDecision.pdf

Steve,

I spoke with Kelly Hogan today about updating the BEMP with a termination of winter feeding objective. It was a very helpful conversation that we can discuss when you return next week. He said much would hinge on the BEMP Record of Decision (attached); some current RODs have wording in them that provide the flexibility to adapt to new information and conditions. The BEMP ROD discusses 'phasing out supplemental feeding' and rejects it as an alternative, so I'm not sure we'll have that flexibility. Perhaps we could set a time in the near future to get Kelly and Laurie Shannon on a conference call with us to discuss our options.

Cheers,

Jeff Warren
Wildlife Biologist
US Fish and Wildlife Service
27650B South Valley Rd.
Lima, MT 59739
406.276.3536 ext. 304

Record of Decision

National Elk Refuge
Grand Teton National Park

Final Bison and Elk Management Plan and Environmental Impact Statement

April 2007

Prepared by

U.S. Department of the Interior
U.S. Fish and Wildlife Service
National Elk Refuge
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Introduction

This Record of Decision (ROD) for the Final Bison and Elk Management Plan (Plan) for the National Elk Refuge and Grand Teton National Park/John D. Rockefeller, Jr., Memorial Parkway provides the basis for management decisions made by the U.S. Fish and Wildlife Service and the National Park Service (FWS and NPS). The plan was prepared along with an Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act (NEPA), and relevant planning policies. We (FWS and NPS) propose to adopt and implement the plan which provides guidance on managing the Jackson bison and elk herds within our jurisdictions for a 15-year period.

The Final Plan/EIS described our proposal for management of the Jackson bison and elk populations within their respective jurisdictions and disclosed the effects of six management alternatives. The significant issues addressed in the Final Plan/EIS include: bison and elk populations and their ecology, restoration of habitat and management of other species of wildlife, supplemental winter feeding operations of bison and elk, disease prevalence and transmission, recreational opportunities, cultural opportunities and western traditions and lifestyles, commercial operations, and the local and regional economy.

In preparing the Final Plan/EIS, we worked closely with several cooperative agencies and partners including the Wyoming Game and Fish Department (WGFD), the U.S. Forest Service which administers the Bridger-Teton National Forest, the Bureau of Land Management (BLM) which administers BLM resource areas in Jackson Hole, and the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service, which is in part responsible for preventing the introduction and spread of significant livestock diseases.

Background

The planning area is located in Teton County, Wyoming near the town of Jackson and in the valley commonly known as Jackson Hole. The National Elk Refuge is a 24,700-acre unit of the National Wildlife Refuge System administered by the U.S. Fish and Wildlife Service. Grand Teton National Park is 309,995 acres, and John D. Rockefeller, Jr., Memorial Parkway is 23,777 acres, for a total of 333,772 acres administered by the National Park Service.

The Jackson elk and bison herds comprise one of the largest concentrations of elk and bison in North America, with an estimated 13,000 elk and over 1,000 bison. The elk migrate across several jurisdictional boundaries in northwestern Wyoming, including the National Elk Refuge and Grand Teton National Park/John D. Rockefeller, Jr., Memorial Parkway. The bison range largely within Grand Teton National Park and the National Elk Refuge, with some crossing into Bridger-Teton National Forest and onto state and private lands in the Jackson Hole area.

Before Euro-American settlement of the Jackson Hole area, the elk generally wintered in the southern portion of Jackson Hole and are believed by some to have migrated to the Green River, Wind River, and Snake River basins. Due to changes in land use and development in the late 1800s, the winter range area became less accessible resulting in an increasing number of elk wintering in Jackson Hole.

After substantial numbers of elk died during severe winters, local citizens,

along with state and federal officials, began feeding in the winter of 1910-1911. In 1912, Congress set aside land that would become the National Elk Refuge as a "winter game (elk) reserve" (37Stat. 293, 16 USC 673). Supplemental feeding has continued during most winters since then although this was not legislatively mandated.

While there have been many benefits associated with wintering large numbers of elk (and bison) on the refuge, high animal concentrations have created an unnatural situation that has contributed to the following problems: an increased risk for potentially major outbreaks of exotic diseases; damage to and loss of habitat due to browsing of willow, cottonwood, and aspen stands, thereby reducing other wildlife associated with woody vegetation; unusually low winter mortality which affects predators and other species and requires intensive hunting programs; and a high level of brucellosis in the elk and bison herds.

After having been extirpated from Jackson Hole in the 1880s, a small herd of bison was re-introduced to the Jackson Hole Wildlife Park near Moran in 1948 (approximately 20). Twenty years later, the herd escaped the park and began to range freely. In 1975, the small bison herd began wintering on the National Elk Refuge, and by 1980, began eating supplemental feed that was being provided for elk. Since discovering this supplemental food source, the Jackson bison herd has grown at a rate of about 13% each year to its 2007 level of about 1,100 animals. Concerns about the rapidly increasing bison herd include escalating damage to habitats, competition with elk, high prevalence of brucellosis, human safety concerns, damage to private property, and additional costs of providing supplemental feed for bison.

Many of the management issues surrounding the bison and elk herds are controversial. In 1996, a bison management plan (Jackson Bison Herd Long Term Management Plan and Environmental Assessment) was finalized by the NPS and the FWS, in cooperation with the WGFD and the Bridger-Teton National Forest. In 1998, a lawsuit was brought by the Fund for Animals enjoining most federal management actions proposed in the 1996 plan. The court ruled that the destruction of bison on federal lands for population control purposes could not be carried out until additional NEPA compliance was completed that considered the effects of supplemental winter feeding of elk on the National Elk Refuge on the Jackson bison population.

Purpose and Need for the Plan

The purpose of the Bison and Elk Management Plan is to provide managers with goals, objectives, and strategies for managing bison and elk on the National Elk Refuge and in Grand Teton National Park. The plan will contribute to the missions and management policies of the FWS and the NPS. Given the substantial role that the refuge and the park play in the overall habitat of the Jackson bison and elk herds and the effects that the herds can have on surrounding habitats, the plan will also contribute to the herd objectives set by the WGFD, as well as to several goals and objectives established by the U.S. Forest Service related to elk, bison, and their habitat in the Bridger-Teton National Forest.

This planning effort considered changes in how the bison and elk herds could be managed on the National Elk Refuge and in Grand Teton National Park in order to meet legal obligations and to address problems related to high animal concentrations in winter and effects on

habitat. Other factors that were considered in developing the plan included FWS and NPS policies, wildlife management principles, scientific information, and stakeholder issues and concerns.

Desired Conditions

By the end of the 15-year implementation period, the National Elk Refuge and Grand Teton National Park will provide winter, summer, and transitional range for large portions of the Jackson bison and elk herds. The environment will support a full complement of native plant, wildlife, and breeding bird species. Refuge and park staffs, working with others, will adaptively manage bison and elk in a manner that contributes to the state's herd objectives yet allows for the biotic integrity and environmental health of the resources to be sustained. As a result, the public enjoys a variety of compatible, wildlife-dependent recreational opportunities.

Management Goals

Four goals for the plan were developed based on the purposes of the National Elk Refuge and Grand Teton National Park/John D. Rockefeller, Jr., Memorial Parkway, the missions of the National Wildlife Refuge System and the National Park System, and other legal and policy directives. The goals also considered input from stakeholders. The alternatives developed and considered in the Final EIS respond to these four goals.

Goal 1. Habitat Conservation

National Elk Refuge – Provide secure, sustainable ungulate grazing habitat that is characterized primarily by native composition and structure within and among plant communities and that also provides for the needs of other native species.

Grand Teton National Park/John D. Rockefeller, Jr., Memorial Parkway – In concert with restoring and perpetuating the natural ecosystem functioning in the park, restore and maintain the full range of natural, structural, and compositional characteristics of native habitats used by bison and elk, emphasizing the plant species diversity that native habitats would support.

Goal 2. Sustainable Populations

National Elk Refuge – Contribute to elk and bison populations that are healthy and able to adapt to changing conditions in the environment and that are at reduced risk from the adverse effect of non-endemic diseases.

Grand Teton National Park/John D. Rockefeller, Jr., Memorial Parkway – Perpetuate to the greatest extent possible, natural processes and the interactions of bison and elk with natural environmental fluctuations influenced by fire, vegetation succession, weather, predation, and competition. At the same time support public elk reductions in Grand Teton National Park, when necessary, to achieve elk population objectives that have been jointly developed by the WGFD, the park, and the refuge. Support elk hunting in the John D. Rockefeller, Jr., Memorial Parkway that is consistent with its establishing legislation.

Goal 3. Numbers of Elk and Bison

Contribute to the WGFD herd objectives for the Jackson elk and bison herds to the extent compatible with Goals 1 and 2, and to the legal directives governing the management of the National Elk Refuge and Grand Teton National Park/John D. Rockefeller, Jr., Memorial Parkway.

Goal 4. Disease Management

Work cooperatively with the state of Wyoming and others to reduce the prevalence of brucellosis in the bison and elk populations in order to protect the economic interest and viability of the livestock industry, and reduce the risk of adverse effects of or from other non-endemic diseases not currently found in the Jackson bison and elk populations.

Stakeholder Issues

Seven significant stakeholder issues were identified during the planning process. These issues were considered in the formulation of alternative sets of objectives and strategies. The significant stakeholder issues are:

1. *Bison and Elk Populations and their Ecology* - Most members of the public generally want healthy bison and elk herds, whether for the abundance of recreational opportunities or for the benefit of the animals themselves and the ecosystem. There was no agreement about how many animals should be in each herd, or how to reach those numbers.

2. *Restoration of Habitat and Management of Other Species of Wildlife* - Some people want to see habitat restored and improved, but opinions differ on the specifics of this goal.

3. *Winter Feeding Operations for Bison and Elk* - Some stakeholders disagree with the concept of providing supplemental feed to elk and bison, while others believe supplemental feed should be provided every year.

4. *Disease Prevalence and Transmission* -Brucellosis and the high rates of infection in both the bison and elk herds is of concern because of the economic effect it could have on livestock producers if cattle contract the disease. Some stakeholders are concerned about the potential of more serious non-endemic diseases, such as bovine tuberculosis or chronic wasting disease, getting into the herds.

5. *Recreational Opportunities* - Many people are concerned that changes in the management of elk and bison on the National Elk Refuge and in Grand Teton National Park would impact hunting and wildlife viewing opportunities.

6. *Cultural Opportunities and Western Traditions and Lifestyles* - Tribal representatives and other members of the public have stated that American Indian tribes should be actively involved in decisions regarding bison. Some Native Americans have traditions and spiritual values that are closely associated with both elk and bison and would like the plan to include ceremonial take or hunting of bison by tribal members. Local residents are also concerned about how changes in elk and bison management would affect their own traditions and lifestyles, which are in part dependent on wide-open spaces and plentiful wildlife.

7. *Commercial Operations and the Local and Regional Economy* - Wildlife viewing and hunting opportunities contribute to the local economy, and many businesses, including outfitters and dude ranchers, depend on abundant wildlife.

Decision (Alternative 4)

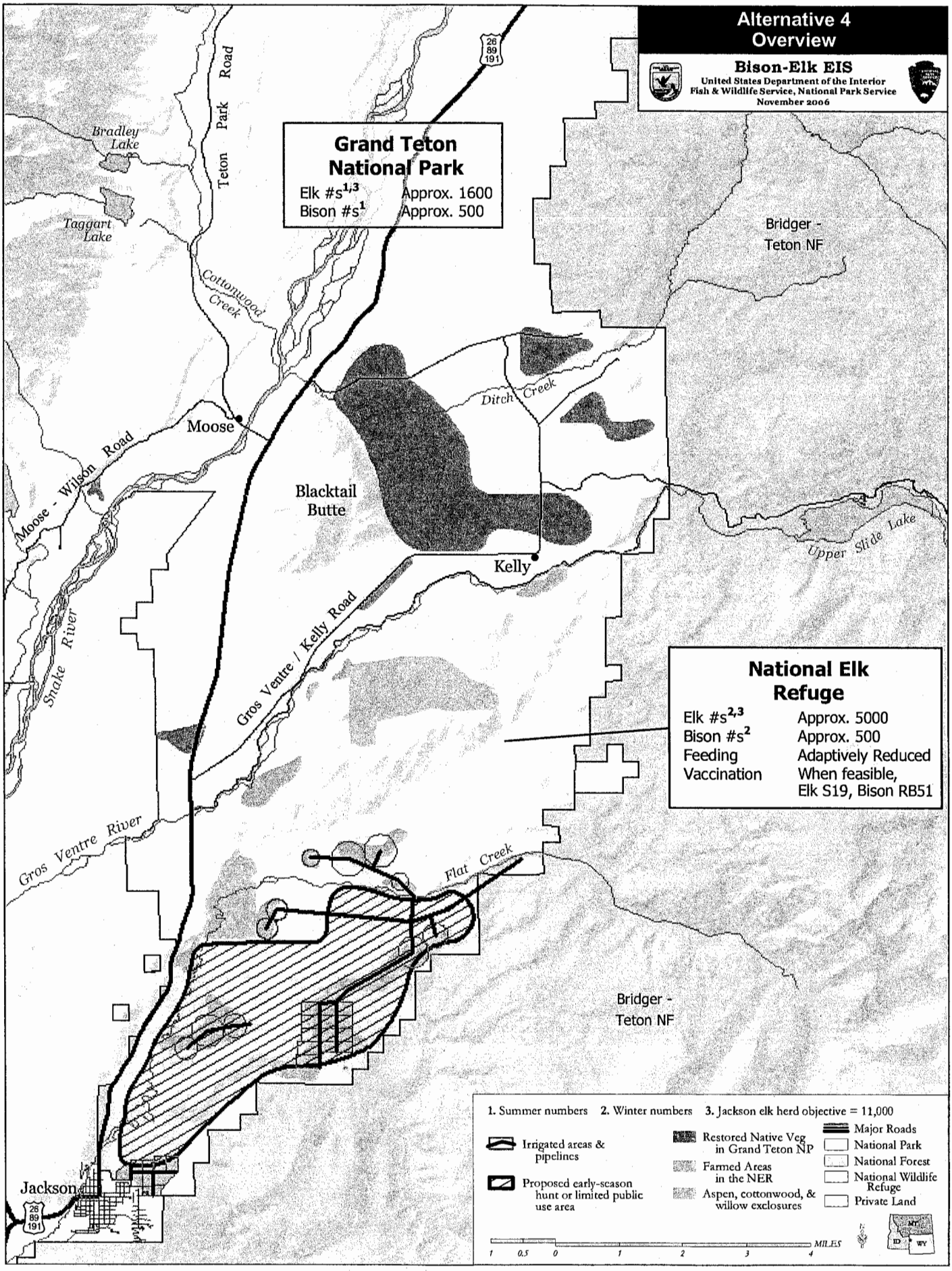
We select to implement Alternative 4 – Adaptively Manage Habitat and Populations as described in the Final Plan/EIS. Alternative 4 is selected for bison and elk management because it will adaptively manage habitat and populations to achieve desired conditions over 15 years. This alternative will balance the significant management

issues with the purposes, missions, and management policies of the FWS and NPS, as well as with the interests and perspectives of other agencies and stakeholders.

Under the proposed plan, the Jackson bison and elk herds and their habitat will be managed with an emphasis on improving winter, summer, and transitional range on the park and refuge and ensuring that the biotic integrity and environmental health of the resources are sustained over the long term. Working in close cooperation with WGFD, existing conditions, trends, new research findings, and other changing circumstances will provide the basis for developing and implementing a dynamic framework for decreasing the need for supplemental food on the refuge. Population management, vegetation restoration, on-going monitoring, and public education will be integral components of this framework (See Alternative 4 map below and FEIS pages 48-49 and 54-74 for complete description and objectives and strategies).

Key habitat conservation and population management elements of Alternative 4 are:

- Initiate habitat restoration projects to improve native and cultivated forage on the refuge and achieve desired conditions and goals.
- Initiate restoration of previously cultivated areas in the park to native plant communities.
- Work with private and agency partners to minimize bison and elk conflicts with adjacent land owners (e.g., by providing human and/or financial resources to manage co-mingling and reduce crop depredation by elk and/or bison on private lands).
- Initiate a public education effort to build understanding of natural elk and bison behavior, ecology, distribution, disease implications, and effects to other species.
- Identify criteria for beginning and ending feeding each year in consultation with WGFD.
- Develop a structured framework, in collaboration with WGFD, of adaptive management actions that include triggers for progressively transitioning from intensive supplemental winter feeding to greater reliance on free-standing forage, based on these considerations:
  1. Level of forage production and availability on the National Elk Refuge
  2. Desired herd size and ratios
  3. Effective mitigation of bison-elk-cattle mingling on private lands
  4. Winter distribution patterns of elk and bison
  5. Prevalence of brucellosis, chronic wasting disease, and other wildlife diseases
  6. Public support
- Working in collaboration with WGFD to maintain the Jackson elk herd objective of 11,000, following the initial implementation of a phased approach, about 5,000 elk will be expected to winter on the refuge. As herd sizes and habitat objectives are achieved, further reductions in feeding or elk numbers could occur based on established triggers and changing social, political, or biological conditions. Hunting (bison and elk on the refuge) and, when necessary, a herd reduction program in the park will be used to assist the state in managing herd sizes, sex and age ratios, and summer distributions.


Alternative 4
Overview
Bison-Elk EIS
United States Department of the Interior
Fish & Wildlife Service, National Park Service
November 2006
Grand Teton
National Park
Elk #s[1,3] Approx. 1600
Bison #s[1] Approx. 500
National Elk
Refuge
Elk #s[2,3] Approx. 5000
Bison #s[2] Approx. 500
Feeding Adaptively Reduced
Vaccination When feasible,
Elk S19, Bison RB51
Bradley Lake
Taggart Lake
Teton Park Road
Cottonwood Creek
Bridger - Teton NF
Ditch Creek
Moose
Moose - Wilson Road
Blacktail Butte
Kelly
Upper Slide Lake
Snake River
Gros Ventre / Kelly Road
Gros Ventre River
Flat Creek
Jackson
26 89 191
1. Summer numbers 2. Winter numbers 3. Jackson elk herd objective = 11,000
Irrigated areas & pipelines
Proposed early-season hunt or limited public use area
Restored Native Veg in Grand Teton NP
Farmed Areas in the NER
Aspen, cottonwood, & willow exclosures
Major Roads
National Park
National Forest
National Wildlife Refuge
Private Land
MILES
1 0.5 0 1 2 3 4
MT
ID
WY

- Work collaboratively with WGFD to maintain and ensure a genetically viable population of about 500 bison (currently bison number about 1,100). A public bison hunt will be initiated on the refuge and managed in accordance with the State of Wyoming's licensing regulations and an approved refuge hunting plan.
- Potentially allow for a small ceremonial taking of bison (approximately 5 each year) by the tribes traditionally associated with Jackson Hole. If implemented, this would be administered and managed by FWS.
- Permit WGFD to vaccinate elk and bison for brucellosis on the refuge as long as it is logistically feasible and vaccines are determined to be safe.

Alternative 4 was revised from the proposed action in the Draft Plan/EIS after consideration of many comments received from agencies, tribes, other organizations, and the public during the comment period.

Other Alternatives Considered

The Final Plan/EIS evaluated five other alternatives for the management of bison and elk in the refuge and park. These alternatives are summarized below, along with an explanation of why the alternative was not selected.

Alternative 1: No Action

In the No Action Alternative, few changes would occur in managing the elk and bison herds and their habitat on the National Elk Refuge and in Grand Teton National Park / John D. Rockefeller, Jr., Memorial Parkway. About half of the Jackson elk herd (5,600–7,500), and the entire bison herd (1,000+) would continue to winter on the refuge. Cultivated fields would continue to provide additional forage to existing native habitat, but a primary source of winter food would be imported feed. A limited elk hunt on the refuge and, when necessary, the elk reduction program in the park would continue. No bison hunting would be allowed on refuge or park lands.

The high prevalence of brucellosis in the elk and bison herds would continue because no new strategies would be used to reduce transmission between animals. No further measures would be taken to protect woody riparian habitat for the benefit of other species.

Alternative 1 was not selected for implementation. High numbers of elk and bison concentrated on the refuge during nearly annual winter supplemental feeding would continue to contribute to high brucellosis levels, cause the highest risk of potentially serious impacts from non-endemic diseases among all alternatives, and result in continued decline of woody vegetation. The lack of an established population objective for bison and limited population control outside the refuge and the park would allow essentially uncontrolled growth in bison numbers and exacerbate these negative effects. Habitat damage would also negatively impact other wildlife species, ranging from Neotropical birds to mule deer, moose, and bighorn sheep in localized areas. Efforts to cultivate additional refuge forage for ungulates would continue although less efficiently than under other alternatives, and former agricultural lands in the park would not be restored to native plant communities (native grasslands and sagebrush shrubland) which would likely surpass non-native species in palatability.

Finally, there was almost no public support expressed for Alternative 1

during the public comment period on the Draft Plan/EIS.

Alternative 2: Minimal Management of Habitat and Populations, with Support for Migrations

Efforts to actively manage the elk and bison herds and their habitat would be greatly reduced over time on the refuge and in the park. The Jackson elk and bison populations would fluctuate more naturally, with 1,200–6,000 elk and 250–500 bison estimated to winter on the refuge and 600–3,000 elk summering in the park at levels that could be supported by available habitat. Additionally, the FWS and NPS would support stakeholder efforts to establish elk migration out of Jackson Hole to other wintering areas. Cultivated areas would be restored with native grasses, and irrigation practices would be phased out. The use of imported supplemental feed during winter months would be phased out over 10–15 years. Eliminating hunting on the refuge and the elk reduction program in the park would allow elk to increase their use of transitional winter habitats. Over time, natural densities and concentrations would reduce the prevalence of brucellosis found in the elk and bison herds.

Alternative 2 was not selected for implementation. It would likely generate negative public reaction to increased elk and bison winter mortality and lower herd numbers in some years, increase competition for forage with other ungulates in some areas, increase the likelihood of higher depredation on stored hay and damage to crops and landscaping, and result in the immediate elimination of hunting opportunities on the refuge and the herd reduction in the park. Because Alternative 2's minimal management foundation would cause Jackson elk and bison numbers to fluctuate widely and mortality to rise in severe winters without supplemental feeding on the refuge, total Jackson elk and bison numbers could fall below established WGFD objectives in some years. There could also be impacts on grizzly bears due to lower elk numbers, especially in the park, and higher competition for forage in the Green River basin due to increased distribution. Fewer refuge elk could reduce sleigh ride viewing opportunities along with associated personal income and jobs.

While some stakeholders are opposed to hunting of any kind, overall most stakeholder groups and local, state and federal agencies did not support this alternative.

Alternative 3: Restore Habitat, Support Migrations, and Phase Back Supplemental Feeding

The Jackson elk and bison herds and their habitat would be actively managed on the refuge, with an emphasis on restoring habitat by reducing elk numbers. An estimated 1,000–2,000 elk would winter on the refuge, and 500–1,000 would summer on park lands. Bison numbers would be maintained at current levels (about 1,100) on the refuge and in the park.

Supplemental feeding would be reduced over 10 years on the refuge, in coordination with an increased elk harvest program, and eventually feed would only be provided during the severest winters (estimated in roughly 2 of 10 winters and depending on snow conditions). Additionally, the FWS and NPS would support stakeholder efforts to establish elk migration out of Jackson Hole to other wintering areas. Elk hunting on the refuge and, when necessary, the elk herd reduction program in the park would continue, but

some hunt areas would be closed after elk objectives were reached. Also, a bison hunt would be initiated on the refuge. The prevalence of brucellosis in the elk and bison herds could decrease over time as a result of fewer concentrated animals, and vaccines with higher efficacies or other techniques would be used when developed. Willow and cottonwood habitat would be sustained for the benefit of other species.

Alternative 3 was not selected for implementation. It would likely generate negative public reaction due to major decreases in elk numbers on the National Elk Refuge without decreases in bison numbers. The alternative would decrease elk hunting and viewing opportunities, slightly increase elk and bison winter mortality, and would likely lower Jackson elk herd numbers below the Wyoming Game and Fish objective in some years. In the short term, it would likely increase competition for forage with other ungulates in some areas and increase the likelihood of higher depredation on stored hay and damage to crops and landscaping (similar to Alternative 2 effects). There could also be impacts on grizzly bears due to lower elk numbers, especially in the park, and higher competition for forage in the Green River basin due to increased distribution. Fewer refuge elk could reduce contributions from the antler auction and sleigh ride elk viewing opportunities along with associated sleigh ride personal income and jobs.

Finally, there was no public support for Alternative 3.

Alternative 5: Restore Habitat, Improve Forage, and Continue Supplemental Feeding

The Jackson elk and bison herds and their habitat would be heavily managed on the refuge, with an emphasis on improving forage quality on cultivated lands through improved irrigation methods. About 5,000–7,500 elk and 400 bison would winter on the refuge. During the summer up to 2,500 elk would use habitat in the park. Imported supplemental feed would be used in average and above average winters (estimated to occur roughly 9 of 10 years). The elk hunt on the refuge and, when necessary, the elk reduction program in the park would continue. Also, a bison hunt would be initiated on the refuge. Efforts to minimize disease outbreaks would include spreading out feed and moving feed locations. To reduce the prevalence of brucellosis in the elk and bison herds, WGFD personnel would be permitted to use Strain 19 to vaccinate elk and RB51 to vaccinate bison. Woody vegetation would be restored for the benefit of other species.

Alternative 5 was not selected for implementation. Despite improved refuge forage production and protection of some woody vegetation areas, it remains similar to current management in that high numbers of elk and bison remain concentrated on the refuge during nearly annual winter supplemental feeding. These concentrations would continue to contribute to high brucellosis levels, high risk of potentially serious impacts from non-endemic diseases, and woody vegetation damage and destruction. Habitat damage would also negatively impact other wildlife species, ranging from Neotropical birds to mule deer, moose, and bighorn sheep. Large concentrations of elk and bison on refuge feedlines would continue the potential for mule deer and moose populations to be infected by a non-endemic infectious disease transmitted from elk or bison.

Many stakeholder groups, general public, and other agencies oppose this alternative while some stakeholder groups, general

public, and other agencies supported this alternative.

Alternative 6: Restore Habitat, Adaptively Manage Populations, and Phase Out Supplemental Feeding

The Jackson elk and bison herds and their habitat would be adaptively managed on the refuge to improve available winter grazing habitat and to respond to changing conditions. In the short term, about 2,400–2,700 elk would winter on the refuge, but over time could increase to 2,800–3,200. An estimated 1,200–1,600 elk would summer in the park. Native habitat and cultivated fields on the refuge would provide substantial standing winter forage, and winter feeding would be phased out within five years. Elk hunting would continue on the refuge and, when necessary, the herd reduction program in the park. Also, the FWS would implement a bison hunt on the refuge and eventually the herd would be reduced to about 500 animals. The prevalence of brucellosis in the elk and bison herds as a result of concentrated animals would decrease over time, and vaccines with higher efficacies or other techniques to reduce transmission would be used when developed. Woody vegetation would be initially protected and restored for the benefit of other species.

Alternative 6 was not selected for implementation. Its goal to eliminate refuge supplemental feeding and reduce elk and bison numbers on the refuge within 5 years could be difficult to achieve within the time frame, and it would not be acceptable for some stakeholder groups, many local residents, and the State of Wyoming including WGFD.

Implementation of Alternative 6 would require a substantial expanded harvest where large numbers of elk and bison would be killed annually. Further adverse winter conditions could prevent or delay eliminating refuge supplemental feeding during such a short time frame. If supplemental feeding was discontinued before herd size objectives were reached, the risk for depredation and disease associated with potentially large numbers of elk and bison would be greater. In the long term, Alternative 6 could decrease elk hunting and viewing opportunities, slightly increase elk and bison annual winter mortality, and would likely lower Jackson elk herd numbers below the WGFD's objective in some years. In the short term, competition for forage with other ungulates in some areas and the likelihood of higher depredation on stored hay and damage to crops and landscaping (similar to Alternative 2 effects) would increase.

Fewer refuge elk could reduce contributions from the antler auction and sleigh ride elk viewing opportunities along with associated sleigh ride personal income.

Many stakeholder groups, general public, and other agencies oppose this alternative while other stakeholder groups, general public, and other agencies supported this alternative.

Public Involvement

Project Scoping

The scoping process began with eight prescoping meetings between February 10 and May 5, 2001 in Jackson, Riverton, Casper, Cheyenne, and Rock Springs, Wyoming. The formal scoping period began on July 18, 2001, with the publication of a Notice of Intent in the Federal Register (66 FR 37489). The Notice of Intent notified the public of the agencies intent to begin the Plan/EIS process, announce the dates for public scoping meetings, and solicit public

comments. Ten scoping meetings were held throughout the country from July 20 to August 3, 2001; six meetings were held in Wyoming, and meetings were also held in Idaho, Montana, Colorado, and Virginia. The scoping period ended on August 24, 2001.

Interagency Working Group Meetings

Interagency working group meetings have been held as needed since October 2000. Agencies represented have included the U.S. Fish and Wildlife Service, National Park Service, U.S. Forest Service (Bridger-Teton National Forest), USDA-Animal and Plant Health Inspection Service, BLM, and the WGFD.

Tribal Involvement and Consultation

The FWS and NPS consulted with tribes with known traditional association to the project area. Those tribes included the Northern Arapaho, Blackfeet, Crow, Chippewa-Cree, Gros Ventre, Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, Nez Perce, Northern Cheyenne, Confederated Salish and Kootenai Tribes, Shoshone-Bannock Tribes, and Eastern Shoshone. Briefings were also provided at meetings of the Montana-Wyoming Tribal Fish and Game Commissioners, Montana-Wyoming Tribal Leaders Council, Intertribal Bison Cooperative, Northern Arapaho Business Council, Shoshone-Bannock Business Council, the Eastern Shoshone Business Council, and the Yellowstone National Park government-to-government consultation and/or information exchange meetings.

Other Meetings and Discussions

Agency representatives have given briefings and status updates to several interest group meetings, including county commissioners, Jackson Chamber of Commerce, and other organizations. Agency representatives have also met with numerous individuals during the planning process.

Alternative Development Meetings

Two alternative development meetings were held on November 28 and 29, 2001, in Riverton and Jackson, Wyoming. Public input represented a wide variety of opinions on all management issues.

Comments on the Draft Plan/EIS

A Notice of Availability for the Draft Plan/EIS was published in the Federal Register on July 21, 2005 (70 FR 42089). During the Draft Plan/EIS comment period that occurred from July 21, 2005 to November 7, 2005, we received over 11,900 written comments and public testimony from 241 individuals, 37 agencies or organizations, and 1,751 form letters or petitions. Public hearings were held in Bozeman, Montana, Jackson, Wyoming, and Riverton, Wyoming in late August 2005. All substantive issues raised in the comments were addressed in the Final Plan/EIS. Public comments, public hearing testimony, and responses will be available for review at the National Elk Refuge, 675 East Broadway, Jackson, Wyoming 83001 during normal business hours. Responses to comments are included as a companion document to the Final Plan/EIS.

Comments on the Final Plan/EIS

The Final Plan/EIS was published on February 2, 2007 (72 FR 5078) and the 30-day waiting period ended on March 12, 2007 (72 FR 6238). We received 938 emails from individuals and 5 letters from

organizations. The majority of the emails were form petitions in support of Alternative 6 with changes, while two individuals opposed hunting. A total of about 4,738 comments were recorded. In addition, we consulted with the Shoshone-Bannock Tribes on March 9, 2007 at Fort Hall, Idaho to discuss their concerns on the Final Plan/EIS. None of the comments that we received either raised new substantive issues or presented reasonable alternatives other than those presented in the Final Plan/EIS, or provided significant additional information relevant to the analysis.

Summary of FEIS Comments

Supplemental Feeding - While the Final Plan/EIS acknowledges that many biological issues on the refuge are related to supplemental feeding, Alternative 4 makes no commitment to phase out supplemental feeding.

Adaptive Management Framework - The proposed adaptive management framework to reduce reliance on supplemental feeding is not adequately described and analyzed, and presents no observable benchmarks or standards by which the public can gauge progress.

Legal Mandates – Alternative 4 does not conform to the existing laws and policies that govern management of the National Elk Refuge.

Fencing – The preferred alternative should include additional fencing and/or partnerships to reduce property damage and commingling of elk and bison with livestock.

Bison – Population targets for bison should be higher, and bison should be allowed to distribute over a larger geographic area than what is proposed in Alternative 4. The agencies should consider other habitat modeling data in determining the carrying capacity for bison.

Vaccination – Opposition to the use of vaccines (Strain 19 or RB51) in elk or bison

Tribal Concerns – A process has not been identified for how the tribes would participate in a ceremonial hunt. Alternative 4 only provides the potential that tribal ceremonial take could occur, and the numbers of bison that could be taken by the tribes (5 or possibly more depending on need) is too low. The importance of traditions and cultural values has not been adequately addressed in the Final Plan/EIS, and the agencies' trust responsibilities including treaty and subsistence rights were not addressed.

Other - Opposition to hunting

Discussion of FEIS Comments

Comments raised about opposing supplemental feeding, legal mandates, bison population objectives, habitat modeling assumptions, vaccination and hunting were addressed in Volume 2, Responses to Comments on the Final Plan/EIS and changes made in the Final Plan/EIS. These issues are not discussed further. We believe several topics warrant further clarification.

Adaptive Management Framework – The preferred alternative identified in the Final Plan/EIS was modified from the proposed action identified in Draft Plan/EIS as a result of the public comments received. The preferred alternative provides substantial guidance and direction for managing the Jackson bison and elk herds for the next 15 years. Even though this plan does not constitute a commitment for future funding, any significant deviation from implementing Alternative 4 will require further public review and analysis.

Throughout the planning process, the most significant issue identified is that there is not enough winter forage to

support the Jackson bison and elk herd sizes that are desired by many stakeholders groups, the public, and the State of Wyoming. Further complicating this issue is that these populations migrate across several jurisdictional boundaries, necessitating cooperation and coordination among several agencies and jurisdictions with differing legal mandates and constituents.

The preferred alternative clearly states that the FWS intends to progressively reduce the use of supplemental feeding on the National Elk Refuge, and specific objectives and strategies were outlined to address habitat conservation and wildlife management in order to achieve a greater reliance on free-standing forage. We understand that many commenters on the Final Plan/EIS desire a definitive answer about eliminating the use of supplemental feeding. We also recognize that many agencies, stakeholder groups, and the public have divergent opinions about phasing out supplemental feeding. The plan does not identify whether or not feeding will be phased out within 15 years; instead it focuses on achieving the desired conditions (described on page 2) through an adaptive, progressive, and collaborative approach that incorporates different objectives and tools (strategies) for managing these populations. We will not preclude the use of supplemental feeding or other management tool as we work to resolve the bison and elk management issues that have been at play for 100 years, nor will we make predictions about how fast we can implement the phased approach for improving forage, reducing the elk populations to about 5,000, reducing the bison herd to about 500, and reducing the need for supplemental feed as described on pages 4-5. When the biological, social, and political conditions enable us to consider a phase-out of feeding, this adaptive framework provides us with that flexibility. At the same time, we are committed to working collaboratively with other federal agencies and the State of Wyoming.

The integral components of the management framework described in the Final Plan/EIS— population management, habitat restoration, public education and monitoring— are not linear, separate components. They are dynamic and interwoven and require adaptable and workable solutions to changing biological, social, and political conditions. The primary elements in developing a structured framework are identified on pages 4-5 and in greater detail in the Final Plan/EIS.

Successful implementation of the preferred alternative will require flexibility and additional discussions between the agencies, particularly between the WGFD and the FWS, to address issues such as criteria for feeding, vaccination procedures, management of the bison and elk hunts, and continued coordination and cooperation. The outcome of these discussions will be documented in a new memorandum of understanding or other appropriate agreement document and will be made available to all stakeholders.

Fencing – We do not anticipate any need for additional fencing on the refuge other than what was identified in the preferred alternative as suggested by some commenters, and we believe there is flexibility and funding identified within the alternative to work with adjacent landowners, the WGFD and others to identify strategies (including fencing) for reducing conflicts on private lands.

Tribal Concerns – The option of potentially allowing the tribes to take a small number of bison for the purposes of a ceremonial

event was included in the preferred alternative. The population objectives for bison and the subsequent analysis presented in the Final Plan/EIS would remain unchanged irrespective of whether a small taking for ceremonial purposes was eventually allowed. We believe this issue can be resolved outside of this decision document, and consultation with the tribes and discussion with the State of Wyoming is ongoing. Other tribal concerns were addressed in the Responses to Comments, Volume 2 in the Final Plan/EIS.

Environmentally Preferable Alternative

The environmentally preferable alternative is defined as the "alternative that will promote the national environmental policy as expressed in NEPA's Section 101. Typically, this means the alternative that causes the least damage to the biological and physical environment. It also means the alternative that best protects, preserves and enhances historic, cultural and natural resources" (Forty Most Asked Questions Concerning Council of Environmental Quality's National Environmental Policy Act Regulations, 1981). Alternative 6, Restore Habitat, Adaptively Manage Populations, and Phase Out Supplemental Feeding, is the environmentally preferable alternative.

Alternative 6 would emphasize a more aggressive reduction in elk numbers on the refuge with additional measures to restore and enhance riparian and aspen woodlands. Compared to Alternative 4 (the preferred alternative), Alternative 6 would phase out supplemental feeding within 5 years rather than reduce feeding in an adaptive manner over 15 years. This would result in up to about 3,200 elk on the refuge, compared to 5,000 in the initial implementation under Alternative 4. With a smaller herd size under Alternative 6, habitat enhancements would be expected to have increased success. Alternative 6 would restore up to 4,540 acres of riparian and aspen woodlands on the refuge compared to 2,710 acres in Alternative 4. These habitat benefits would also benefit other wildlife species. Reduced herd sizes and other measures on the refuge would also be expected to result in greatly reduced risk of brucellosis in Alternative 6, compared to Alternative 4. In some habitat areas, including native grasslands and wet meadow habitat, Alternative 4 results in greater environmental benefits than Alternative 6. The environmental effects of Alternative 4 would be similar to Alternative 6 within Grand Teton National Park and in other areas.

Although Alternative 6 would result in the greatest overall benefit to the biological and physical environment, all of the action alternatives would promote the national environmental policy as expressed in NEPA's Section 101, and would be preferable to no action. Most of the habitat restoration and conservation objectives of Alternative 6 are also found in Alternative 4 (the preferred alternative), though the specific strategies for their implementation are different. While it is not the environmentally preferable alternative, Alternative 4 has been selected for implementation because it will contribute to significant environmental benefits in a manner that is consistent with regional herd management objectives; it better balances the divergent views and interests and perspectives of other agencies, stakeholders groups and the public; it builds upon success implemented on the ground; and it enables managers to adapt to new information and changing conditions.

Measures to Minimize Environmental Harm

Throughout the planning process, we took into account all practicable measures to avoid or minimize environmental impacts that could result from the implementation of Alternative 4. These measures include the following:

Grizzly Bear - Implementation of Alternative 4 could adversely affect individual grizzly bears in Grand Teton National Park/John D. Rockefeller, Jr., Memorial Parkway due to potential conflicts with hunters. As documented in the Biological Opinion, the NPS will continue to implement measures to reduce bear-human conflicts during elk reduction activities within Grand Teton National Park and hunting on the John D. Rockefeller Memorial Parkway as follows.

The NPS will provide "Bearwise" education programs and information for all hunters and personnel involved in hunting and elk management programs.

The NPS will instruct all hunters and personnel to properly store all food and other attractants at all times, and pack out all food materials, garbage, and other attractants on a daily basis if they cannot be stored in bear-resistant containers.

The NPS will train its staff, as well as hunters, in bear safety and standards for sanitation, attractant storage, and encourage them to carry bear pepper spray. In the park, hunters would continue to be required to carry bear spray while hunting.

Riparian and Aspen Woodlands - Habitat enhancements, including fencing exclosures and native winter range enhancement on the refuge, would be used to reduce the adverse impacts of excessive elk browsing on woody vegetation. Those enhancements will be coordinated with the reduction of supplemental feeding on the refuge.

Prescribed Fire – Prescribed fire may be used in restored vegetation communities to reduce the effects of excessive sagebrush establishment in formerly cultivated areas where herbaceous vegetation is preferred.

Other Resources – Measures to mitigate the potential impacts to other resources, including soils, water quantity/quality, views and marshlands are described individually in the Final Plan/EIS.

Consultation Requirements

Section 7 of the Endangered Species Act

All potential effects of Alternative 4 on species listed as threatened or endangered under the Endangered Species Act, along with specific measures to minimize or mitigate those impacts, were documented in an Intra-Service Section 7 Consultation. This consultation concluded that the preferred alternative may adversely affect grizzly bear in Grand Teton National Park/ John D. Rockefeller, Jr., Memorial Parkway due to potential hunter conflicts, and that it may affect but is not likely to adversely affect bald eagles and wolves on either Grand Teton National Park/ John D. Rockefeller, Jr., Memorial Parkway or the National Elk Refuge due to increased availability of elk carcasses. (Alternative 4 will have no effect on Canada lynx and yellow-billed cuckoo).

On April 10, 2007, the U.S. Fish and Wildlife Service (Ecological Services) issued a Biological Opinion stating that the proposed action is not likely to result in jeopardy to the continued existence of the grizzly bear or destruction or adverse

modification of critical habitat. In the Biological Opinion, the U.S. Fish and Wildlife Service (Ecological Services) concluded that the preferred alternative will increase the short-term risk for hunting-related grizzly bear mortality within Grand Teton National Park and the long-term risk for hunting-related grizzly bear mortality in the John D. Rockefeller Jr., Memorial Parkway and the Bridger-Teton National Forest as a result of implementing the plan. Habitat on the National Elk Refuge is relatively open and generally lacks densely forested areas, and it is unlikely that the risk of elk hunters killing grizzly bears will be greater in either the short or long term as a result of the proposed action.

The U.S. Fish and Wildlife Service (Ecological Services) concluded one grizzly bear (adult or juvenile) over the 15-year implementation plan could be incidentally taken as a result of the proposed action in Grand Teton National Park/John D. Rockefeller Jr., Memorial Parkway and two grizzly bears (adult or juvenile) could be incidentally taken as a result of the proposed action in the Bridger-Teton National Forest.

The U.S. Fish and Wildlife Service (Ecological Services) recommended the best reasonable and prudent measure is to minimize the likelihood of hunting-related human/grizzly bear conflicts through education. The NPS will continue its ongoing educational measures related to limiting the risk of human/grizzly conflicts and hunter-caused grizzly bear mortality and will modify measures as changing circumstances and information warrant. Further, if the level of incidental take is reached, such incidental take represents new information requiring re-initiation of consultation and review of the reasonable and prudent measures provided. If incidental take of grizzly bears in the Bridger-Teton National Forest reaches one grizzly bear, NPS and FWS representatives will meet with representatives from the WGFD and Bridger-Teton National Forest to discuss whether additional education and/or preventative measures or other changes could be implemented within the action area to minimize additional risks within the Bridger-Teton National Forest.

Section 106 of the National Historic Preservation Act

Alternative 4 will have no adverse effects to archaeological or historic resources on the refuge, and would not impair archaeological or historic resources in the park, and does not require consultation under Section 106 of the National Historic Preservation Act. Prior to any soil disturbance from new projects, archaeological resources within the proposed project area will be assessed for potential effects as well as their significance in accordance with Section 106 of the National Historic Preservation Act. Any unavoidable adverse effects will be mitigated in coordination with the Wyoming State Historic Preservation Office.

Impairment

The preferred alternative will not impair resources within Grand Teton National Park/John D. Rockefeller, Jr., Memorial Parkway and will not violate the National Park Service Organic Act.

Finding and Basis for Decision

We have considered the environmental and relevant concerns presented by agencies, tribes, organizations and individuals on the proposed action to develop and implement a Bison and Elk Management Plan for the National Elk Refuge and Grand Teton National Park/John D. Rockefeller, Jr., Memorial Parkway. Alternative 4 was selected for

implementation because it achieves a reasonable balance between significant resource management issues, the purposes, missions, and management policies of the FWS and NPS, and the interests and perspectives of all stakeholders.

All public, tribal, and agency comments received during the environmental process were reviewed. The issues and comments raised have been addressed in the Final Plan/EIS. Comments and responses on the Final Plan/EIS are addressed in this Record of Decision. Based on the above information, the FWS and NPS have selected Alternative 4 for implementation.

4/26/07

Mitch King **Date**
Regional Director, Region 6
U.S. Fish and Wildlife Service
Lakewood, Colorado

4/26/07

Michael D. Snyder **Date**
Regional Director,
Intermountain Region
National Park Service
Lakewood, Colorado

From: Jeffrey Warren
To: Steve Kallin
Subject: RE: briefing statement draft
Date: Friday, July 25, 2014 8:49:56 AM

The EIS considered alternatives to 'phase back' (Alt. 3) and 'phase out' (Alt. 6) supplemental feeding, so the approach we're talking about is essentially implementing an alternative that was considered but not selected?

I'm around all day on Monday if you're available to discuss.

Cheers,

Jeff Warren
Wildlife Biologist
US Fish and Wildlife Service
27650B South Valley Rd.
Lima, MT 59739
406.276.3536 ext. 304

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Friday, July 18, 2014 8:06 AM
To: Jeffrey Warren
Subject: FW: briefing statement draft

Jeff:

For our conversation later today.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Cain, Steven (Steve) [mailto:steve_cain@nps.gov]
Sent: Tuesday, July 15, 2014 4:20 PM
To: Steve Kallin
Subject: Fwd: briefing statement draft

Hi Steve,

This version has been approved by the park, pending your revision of the timing statement if necessary. There are just a couple of minor changes in this one compared to what I sent yesterday, as a result of Kevin's input. Please get back to me when you have had a chance to talk to Jeff and address the timing statement for the AMP. Assuming no other changes beyond that, the park is ready for both agencies to begin briefing our Region folks using this joint briefing statement.

Thanks.....Steve

---------- Forwarded message ----------

From: **Cain, Steven (Steve)** <steve_cain@nps.gov>
Date: Mon, Jul 14, 2014 at 9:58 AM
Subject: Re: briefing statement draft
To: Steve Kallin <steve_kallin@fws.gov>

Hi Steve,

Here is the latest version with some minor modifications.

Steve

On Tue, Jun 17, 2014 at 10:21 AM, Steve Kallin <steve_kallin@fws.gov> wrote:

Steve:

I reviewed the Draft Briefing Statement again and read documents from the court case. I think the Draft Briefing Statement looks good; we provided several very minor additions. Please give me a call at your convenience to discuss in more detail concerning coordination between our agencies.

Thank you,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Cain, Steven (Steve) [mailto:steve_cain@nps.gov]
Sent: Tuesday, June 10, 2014 12:20 PM
To: Steve Kallin
Subject: briefing statement draft

Hey Steve,

Here is something to start with. I have not shared this with other park staff, thinking that will occur after you and I can agree to the general approach and details to include. Modify as you see fit and get back to me when you can. This one-page NPS format does not allow for a lot of material, so I clearly could have missed something you feel is important. Once we get a draft we are comfortable with we can discuss whether to make this officially a joint statement or to do separate agency statements that say the same thing, recognizing that FWS may use a much different format.

Steve

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****
Steve Cain, senior wildlife biologist
Grand Teton National Park and John D. Rockefeller, Jr. Memorial Parkway
PO Drawer 170
Moose, WY 83012
(307)739-3485
****

"*If there are no dogs in heaven, then when I die I want to go where they went" Will Rogers*

--
****
Steve Cain, senior wildlife biologist
Grand Teton National Park and John D. Rockefeller, Jr. Memorial Parkway
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"*If there are no dogs in heaven, then when I die I want to go where they went" Will Rogers*

From:	Noreen Walsh
To:	Paul Santavy
Cc:	Matt Hogan; Will Meeks; Mike Blenden; Debbie Schreiner
Subject:	RE: National Elk Refuge (NER) Adaptive Management Plan Briefing
Date:	Monday, September 08, 2014 7:08:06 AM

Thanks Paul. I don't think we can squeeze in a briefing this week, but I would like to have a chance to visit with Steve and folks sometime in the next month. Copying Debbie so she can help us find a half hour.

Noreen

Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service

303 236 7920

The Mountain-Prairie Region of the U. S. Fish and Wildlife Service: *We provide conservation stewardship of some of America's most scenic lands, to ensure healthy fish and wildlife for the enjoyment and benefit of all people.*

From: Santavy, Paul [mailto:paul_santavy@fws.gov]
Sent: Friday, September 05, 2014 6:58 PM
To: Noreen Walsh
Cc: Matt Hogan; Will Meeks; Mike Blenden
Subject: Fwd: National Elk Refuge (NER) Adaptive Management Plan Briefing

Noreen -
Please see email and attached briefing paper from Steve Kallin regarding progress with the adaptive management plan and NPS regional leadership briefing schedule. Steve heard you were planning on meeting with the NPS RD on Sep 15, and wanted to make sure you had the most up to date and concurrent info in case a discussion ensued. Please let me know if you have questions or would like to squeeze in a briefing next week.

PAUL SANTAVY, *CFP, AWB*
Deputy Assistant Regional Director
NWRS and PFW
Mountain-Prairie Region
U.S. Fish & Wildlife Service
Phone: 303-236-4304
Cell: 303-515-0809

---------- Forwarded message ----------
From: **Blenden, Mike** <mike_blenden@fws.gov>
Date: Thu, Sep 4, 2014 at 11:48 AM
Subject: Fwd: National Elk Refuge (NER) Adaptive Management Plan Briefing
To: Paul Santavy <Paul_Santavy@fws.gov>

---------- Forwarded message ----------
From: **Steve Kallin** <steve_kallin@fws.gov>

Date: Wed, Aug 27, 2014 at 9:42 AM
Subject: National Elk Refuge (NER) Adaptive Management Plan Briefing
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>

Mike:

Attached is a final briefing statement concerning the Adaptive Management Plan, which we have previously discussed. This briefing statement has been developed in close coordination with the Grand Teton National Park (GTNP). The primary message is that the AMP committee (NER, GTNP, Wyoming Game and Fish, Bridger-Teton National Forest) is moving into a stage where the process and desire to phase out feeding on the NER will be discussed and included in the AMP. We anticipate resistance from the Wyoming Game and Fish. Regional FWS and NPS leadership should be prepared for contacts from the Wyoming Game and Fish Department.

We have been awaiting concurrence by the GTNP concerning this briefing statement. I was informed this week that a comparable version of this briefing statement was approved by the GTNP for use in briefing their regional leadership. They will begin briefing their Deputy Regional Director today.

The NPS Regional Director is scheduled to meet with RD Walsh on September 15 on another issue. I am uncertain if this topic will even be discussed at that meeting.

Please schedule a briefing with our regional leadership. We have postponed AMP meetings pending the completion of this briefing process. I believe this briefing can be adequately conducted by conference call.

Don't hesitate to call for more info,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

From:	Santavy, Paul
To:	Steve Kallin; Mike Blenden
Subject:	Fwd: National Elk Refuge (NER) Adaptive Management Plan Briefing
Date:	Wednesday, September 10, 2014 11:35:28 AM

Gentlemen - please make the appropriate plans. Thanks.

PAUL SANTAVY, *CFP, AWB*
Deputy Assistant Regional Director
NWRS and PFW
Mountain-Prairie Region
U.S. Fish & Wildlife Service
Phone: 303-236-4304
Cell: 303-515-0809

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From: **Noreen Walsh** <noreen_walsh@fws.gov>
Date: Mon, Sep 8, 2014 at 7:07 AM
Subject: RE: National Elk Refuge (NER) Adaptive Management Plan Briefing
To: Paul Santavy <paul_santavy@fws.gov>
Cc: Matt Hogan <matt_hogan@fws.gov>, Will Meeks <will_meeks@fws.gov>, Mike Blenden <mike_blenden@fws.gov>, Debbie Schreiner <debbie_schreiner@fws.gov>

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Noreen

Noreen Walsh

Regional Director

Mountain-Prairie Region

U. S. Fish and Wildlife Service

303 236 7920

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Sent: Friday, September 05, 2014 6:58 PM
To: Noreen Walsh
Cc: Matt Hogan; Will Meeks; Mike Blenden
Subject: Fwd: National Elk Refuge (NER) Adaptive Management Plan Briefing

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_____

PAUL SANTAVY, *CFP, AWB*

Deputy Assistant Regional Director

NWRS and PFW

Mountain-Prairie Region

U.S. Fish & Wildlife Service

Phone: 303-236-4304

Cell: 303-515-0809

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Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

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Fax: (307) 733-9729

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--

Michael Blenden

Refuge Supervisor - Montana, Wyoming and Utah

134 Union Boulevard

Lakewood, CO 80228

303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.

John F. Kennedy

From: Steve Kallin
To: Mike Blenden
Cc: Cris Dippel
Subject: FW: National Elk Refuge (NER) Adaptive Management Plan Briefing
Date: Wednesday, September 10, 2014 11:58:14 AM

Mike:

Do you want to schedule a ½ hour conference call briefing with Noreen or should I?

I am available the following mornings: 9/16,18,19, 23; and the afternoons on: 9/16,17,18,19,22.

By the way, you are invited to our CCP party on Sept. 25. The public meeting will be held from 6:00PM-8:00PM.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Santavy, Paul [mailto:paul_santavy@fws.gov]
Sent: Wednesday, September 10, 2014 11:35 AM
To: Steve Kallin; Mike Blenden
Subject: Fwd: National Elk Refuge (NER) Adaptive Management Plan Briefing

Gentlemen - please make the appropriate plans. Thanks.

PAUL SANTAVY, *CFP, AWB*
Deputy Assistant Regional Director
NWRS and PFW
Mountain-Prairie Region
U.S. Fish & Wildlife Service
Phone: 303-236-4304
Cell: 303-515-0809

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Date: Mon, Sep 8, 2014 at 7:07 AM
Subject: RE: National Elk Refuge (NER) Adaptive Management Plan Briefing
To: Paul Santavy <paul_santavy@fws.gov>
Cc: Matt Hogan <matt_hogan@fws.gov>, Will Meeks <will_meeks@fws.gov>, Mike Blenden <mike_blenden@fws.gov>, Debbie Schreiner <debbie_schreiner@fws.gov>

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Phone: 303-236-4304
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---------- Forwarded message ----------
From: **Blenden, Mike** <mike_blenden@fws.gov>
Date: Thu, Sep 4, 2014 at 11:48 AM
Subject: Fwd: National Elk Refuge (NER) Adaptive Management Plan Briefing
To: Paul Santavy <Paul_Santavy@fws.gov>

---------- Forwarded message ----------
From: **Steve Kallin** <steve_kallin@fws.gov>
Date: Wed, Aug 27, 2014 at 9:42 AM
Subject: National Elk Refuge (NER) Adaptive Management Plan Briefing
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>

Mike:

Attached is a final briefing statement concerning the Adaptive Management Plan, which we have previously discussed. This briefing statement has been developed in close coordination

with the Grand Teton National Park (GTNP). The primary message is that the AMP committee (NER, GTNP, Wyoming Game and Fish, Bridger-Teton National Forest) is moving into a stage where the process and desire to phase out feeding on the NER will be discussed and included in the AMP. We anticipate resistance from the Wyoming Game and Fish. Regional FWS and NPS leadership should be prepared for contacts from the Wyoming Game and Fish Department.

We have been awaiting concurrence by the GTNP concerning this briefing statement. I was informed this week that a comparable version of this briefing statement was approved by the GTNP for use in briefing their regional leadership. They will begin briefing their Deputy Regional Director today.

The NPS Regional Director is scheduled to meet with RD Walsh on September 15 on another issue. I am uncertain if this topic will even be discussed at that meeting.

Please schedule a briefing with our regional leadership. We have postponed AMP meetings pending the completion of this briefing process. I believe this briefing can be adequately conducted by conference call.

Don't hesitate to call for more info,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

From: Doodle
To: Steve Kallin
Subject: Doodle: BEMP Adaptive Management Meeting
Date: Tuesday, September 30, 2014 3:28:25 PM

View this poll on your dashboard

Do not forward this e-mail.*

Hi Steve Kallin,

You have created your Doodle poll

"BEMP Adaptive Management Meeting"

You should keep this e-mail in case you want to edit your poll or invite more participants later on.

Administer poll **Invite participants**

* You should not forward this e-mail in order to prevent others from modifying or deleting your poll. If you do not want to use the administrative functions, you can simply ignore or delete this e-mail. Besides, old polls at Doodle are deleted automatically from time to time.

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Meeting" Update
Date: Wednesday, October 01, 2014 8:15:08 AM

View this poll on your dashboard

Hi Steve Kallin,

"Steve Kallin" just provided information to the poll "BEMP Adaptive Management Meeting."

Go to poll **Close poll**

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Mike Blenden
To:	Steve Kallin
Cc:	Paul Santavy
Subject:	Fwd: Meeting request for Natl Elk Refuge briefing with Noreen Walsh
Date:	Saturday, October 11, 2014 6:42:52 AM

We'll we need a plan B. How about suggesting a few dates that you could call in?

Mike

Sent from my iPhone

Begin forwarded message:

> **From:** Debbie Schreiner <Debbie_Schreiner@fws.gov>
> **Date:** October 10, 2014 at 1:17:57 PM MDT
> **To:** Mike Blenden <mike_blenden@fws.gov>
> **Subject: FW: Meeting request for Natl Elk Refuge briefing with Noreen Walsh**
>
> Mike – Noreen isn't available on October 15 or 16. She will be on travel.
>
> **From:** Sanchez, Denise [mailto:denise_sanchez@fws.gov]
> **Sent:** Thursday, October 09, 2014 11:28 AM
> **To:** Debbie Schreiner
> **Subject:** Meeting request for Natl Elk Refuge briefing with Noreen Walsh
>
> Briefing: Natl Elk Refuge - Oct 15 or 16 (30 mins)
> Attendee's: Mike Blenden, Steve Kallin - Will Meeks or Paul Stantovy
>
> Please confirm with Mike Blenden.
>
> Thanks much.

--
Denise Sanchez | Administrative Assistant
USFWS Mountain-Prairie Region External Affairs
134 Union Blvd, Lakewood, CO 80228
denise_sanchez@fws.gov | 303-236-2985

http://www.fws.gov/mountain-prairie



Flickr - Photos linked in this email.

From:	Steve Kallin
To:	Tim Fuchs; Doug Brimeyer; Steve Cain; Sarah Dewey; Dale Deiter; Kerry Murphy; Jeffrey Warren; Cris Dippel; Eric Cole
Subject:	BEMP Adaptive Management Plan Meeting
Date:	Monday, October 13, 2014 8:56:58 AM

Hi All:

After enjoying a Summer/early Fall hiatus from AMP meetings, we hope to restart these meetings and complete the draft plan this winter. See the attached Doodle Poll link for possible meeting dates/times in November and reply at your earliest convenience.

http://doodle.com/2gnfug73evycxgs9

Thanks again for your contributions toward this effort,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

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steve_kallin@fws.gov

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675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Meeting" Update
Date: Monday, October 13, 2014 6:02:15 PM

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Hi Steve Kallin,

"Dale Deiter" just provided information to the poll "BEMP Adaptive Management Meeting."

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Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Meeting" Update
Date: Tuesday, October 14, 2014 7:54:38 AM

View this poll on your dashboard

Hi Steve Kallin,

"Cris" just provided information to the poll "BEMP Adaptive Management Meeting."

Go to poll | Close poll

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Steve Kallin
To:	Toni Griffin
Cc:	Jeffrey Warren; Cris Dippel; Eric Cole; Laurie Shannon
Subject:	RE: Hunting and grizzlies
Date:	Tuesday, October 21, 2014 3:42:39 PM

Hi Toni:

Are you and Laurie Shannon available for a conference call the afternoon of Monday, November 3? We have several procedural questions concerning the BEMP Adaptive Management Plan. We will be meeting with all agency partners on Tuesday, November 4, so it would be helpful to have the conference call with you and Laurie on Monday afternoon. We can be flexible on the time of the call; 2:00 PM would work well.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Griffin, Toni [mailto:toni_griffin@fws.gov]
Sent: Tuesday, October 21, 2014 9:52 AM
To: Steve Kallin
Subject: Re: Hunting and grizzlies

Hi Steve, I reviewed the comments received to date and have not found any comments that speak to hunting and grizzlies specifically. Some comments on hunting in general and the use of non-lead ammunition for hunting, but no comments related to impacts to grizzlies from hunting. The comment closes Friday. I'll bundle up all the comments and send them to the team ASAP after the comment period closes. :)

Toni Griffin
Acting Chief, Division of Refuge Planning
Mountain-Prairie Region
U.S. Fish & Wildlife Service
134 Union Blvd
Lakewood, CO 80228
Office Phone: 303-236-4378
Cell Phone: 303-594-4017

On Wed, Oct 15, 2014 at 4:32 PM, Steve Kallin <steve_kallin@fws.gov> wrote:
Toni:
Have we received any CCP comments on this topic?
Thanks, Steve

Sent from my iPhone

Begin forwarded message:

> **From:** "Iverson, Lori" <lori_iverson@fws.gov>
> **Date:** October 14, 2014 at 9:02:01 AM MDT
> **To:** Eric Cole <eric_cole@fws.gov>, Cris Dippel <cris_dippel@fws.gov>, Steve Kallin <steve_kallin@fws.gov>, Bryan Yetter <bryan_yetter@fws.gov>
> **Subject: Hunting and grizzlies**
>
> http://wyofile.com/angus_thuermer/park-hunters-likely-kill-grizzlies/
>
> No mention of who Angus spoke to. It just includes statements like "Fish and Wildlfie said."
>
> Lori
>
> --
> Lori Iverson
> Outreach & Visitor Services
> U.S. Fish & Wildlife Service
> National Elk Refuge
> PO Box 510 / 675 East Broadway
> Jackson, WY 83001
> Phone: 307.201.5433
> Cell: 307.690.4375
> lori_iverson@fws.gov
> National Elk Refuge photo gallery
> National Elk Refuge web site
> Twitter: @NatlElkRefuge

From:	Ryan Moehring
To:	Steve Kallin; lori_iverson@fws.gov
Subject:	FW: Is Teton hunt right in the 21st century?
Date:	Thursday, October 23, 2014 8:50:29 AM

From: Leith Edgar [mailto:leith_edgar@fws.gov]
Sent: Thursday, October 23, 2014 8:19 AM
To: Marla Trollan; John Bryan
Cc: Ryan Moehring; Robert Segin
Subject: Is Teton hunt right in the 21st century?

Is Teton hunt right in the 21st century?



Todd Wilkinson

Posted: Wednesday, October 22, 2014 4:30 am

The New West / By Todd Wilkinson

Tom Mangelsen savors the quiet fall. The renowned Jackson Hole wildlife photographer, who has traveled to every continent in search of remarkable animal imagery, considers the autumn mating ritual of North American elk to be among the greatest spectacles of nature.

Nowhere else is the scene more dramatic, Mangelsen said, than in his own backyard of Grand Teton National Park. He interacts with thousands of park visitors annually, and, he says, most are under the false impression that wapiti are protected.

Indeed, for most of the year Grand Teton rangers, like their counterparts in Yellowstone, aggressively warn tourists to refrain from doing anything that might cause duress to animals or disrupt wildlife behavior.

Violate the regulations by getting too close or feeding the wild inhabitants and one can be punished with a hefty fine. Do something truly egregious, such as harming or harassing a creature, and a visitor could be banished from the park.

However, it's all part of a strange illusion — a web of extraordinary contradictions — that shape wildlife management in Jackson Hole.

Last Saturday night Mangelsen and a group of wildlife watchers were positioned along the Grand Teton highway between the Oxbow Bend of the Snake River and Willow Flats rimming the southeastern flanks of Jackson Lake.

Few spots rival it in the Lower 48 for the diversity of fauna readily seen. The corridor is an anchor to Jackson Hole's growing multimillion-dollar, nonconsumptive ecotourism economy.

Three groups of elk, in succession, passed blithely across the Snake, sending camera motor drives aflutter. The bands headed eastward over the asphalt highway and then disappeared out of sight.

That's when Mangelsen heard the reverb of rifle fire on the first evening of Grand Teton's annual "elk reduction program," also known as the park hunt.

His heart sank.

"Once the hunters arrive in the park and the bullets start flying, it's time to put the cameras away because the elk get justifiably skittish. Their behavior changes," Mangelsen said. "They know they're running for their lives."

While the park elk hunt was codified in Grand Teton's 1950 founding legislation, many see it as an anachronism grossly out of step with shifting societal values in the modern world.

Elk vigorously safeguarded against human harm inside the boundaries of an iconic nature preserve on one day are suddenly subjected to intrusive stalking and killing by hunters the next.

Besides their anger over animals being hunted in a national park, local photographers Tim Mayo and Kent Nelson say the hunt drives hikers and other recreationists out of Grand Teton in October, represents a public safety hazard, results in resource damage from sportsmen behaving stupidly and creates grave dangers for species like grizzly bears that are attracted to the carcasses.

These contradictions prompted Mayo and Nelson, under the banner of their group, Wyoming Wildlife Advocates, to file a lawsuit this week seeking to get the hunt halted.

The legal action may not succeed but it raises important questions that state and federal officials have refused to meet head on, preferring to hide behind the excuse that the hunt is an old Western tradition — even when it flies in the face of logic.

Mayo and Nelson say it's absurd that millions of tax dollars are spent every winter artificially feeding thousands of elk on the National Elk Refuge — based on the rationale that it's necessary to prop up herd numbers. Meanwhile, just across the invisible park boundary, Grand Teton officials carry out an "elk reduction," claiming there are too many. Which is it?

The elk refuge feeding program also has made it a notorious reservoir for the bovine disease brucellosis and a potential hot spot for chronic wasting disease.

Further complicating the picture is the admission that Grand Teton's elk hunt will result in hunter-caused grizzly bear deaths inside the park.

Grand Teton senior biologist Steve Cain, a scientist I respect, has said that until the elk refuge stops feeding elk, Grand Teton's elk hunt will go on.

The elk refuge is managed by the U.S. Fish and Wildlife Service, Grand Teton by the National Park Service. Both are sister agencies within the U.S. Department of the Interior.

While Interior Secretary Sally Jewell talks a good game about being committed to ecosystem health and sound wildlife management, the arguments advanced by Mayo and Nelson expose hypocrisy.

Addressing it takes courage, but does Jewell have it in her?

Todd Wilkinson writes his column for the News & Guide every week.

http://www.jhnewsandguide.com/opinion/columnists/the_new_west_todd_wilkinson/is-teton-hunt-right-in-the-st-century/article_1b206ab2-eaea-5630-b3dd-e5c8a3c03c90.html

From:	Cole, Eric
To:	Bryan Yetter; troffe@exchange.montana.edu; Aly Coutemanch; Amanda Soliday; Arnie Dood; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Cris Dippel; Daniel Huckel; Daniel Sharps; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan Patla; Terry Roper; Tim Fuchs; Tim Pratt; Tom Reed; Ture Schoultz
Subject:	10/28/14 National Elk Refuge Biological Update
Date:	Tuesday, October 28, 2014 12:13:16 PM

10/28/2014 National Elk Refuge Biological Update

Forage Production

NER Forage production has been monitored annually using consistent methods since 1998. Sixty-two transects representing a combination of 33 plant community types and irrigated versus non-irrigated areas were sampled from September-October 2014.

Estimated 2014 refuge-wide herbaceous forage production was 16,517 tons. Estimated total refuge-wide forage production, which includes herbaceous and woody plants, was 20,195 tons. Both herbaceous and total forage production were 16% above 1998-2014 averages. In general NER forage sampling methods are best suited to evaluate annual differences in herbaceous rather than woody vegetation on the refuge, and therefore herbaceous measurements provide a useful index of the amount of forage that will be available for ungulates during the winter. For comparison record low refuge-wide herbaceous forage production occurred in the drought year of 2003 (6,710 tons) and record high herbaceous forage production occurred in the wet years of 1998 and 2004 (19,647 and 19,597 tons respectively).

NER staff irrigated 3,860 acres using the K-line irrigation system. Estimated herbaceous production in the irrigated area was 3,436 tons. Predicted herbaceous forage production in the irrigated area would have been 1,993 tons in the complete absence of irrigation, which suggests that the NER irrigation program produced 1,444 tons of additional forage in 2014. This represents a 10% increase in refuge-wide production and a 15% increase in production in the high elk and bison use area on the southern portion of NER.

Relatively high forage production on NER was attributed to average total precipitation during the May through August growing season, plus irrigation effects. Although precipitation in August and September was well above average, this precipitation occurred too late in the growing season to significantly increase forage quantity. However, late season precipitation did produce significant basal green up of grass plants, which increased the nutritional quality of the forage. Assuming that this greening effect also occurred on summer and transitional ranges, this could delay elk and bison migration to the refuge.

Forage quantity influences feeding start date. All else being equal, above average forage production on NER suggests that a later than average feeding initiation date is likely. However, snow conditions and cumulative forage consumption by elk and bison are also important factors, and NER and WGFD staff will closely monitor conditions to determine when supplemental feeding is necessary.

Summer-Fall Ungulate Distribution

As has been typical in recent years, there has been almost no elk and bison activity on NER during September and October. There were approximately 250 bison on NER just prior to the opening of the hunting season on 8/15/14. Eight bison were harvested on NER on the opening day, and the bison have remained in GTNP since that time. No elk have been harvested on NER since the season opener on October 11.

There have been as many as 92 pronghorn on NER during the summer months, and an average of 50 have been counted on the refuge in late October.

15 bighorn sheep have been sporadically observed in the vicinity of Miller Butte since mid-September.

I will provide additional updates in coming weeks. Thanks for your interest,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

From:	Cole, Eric
To:	Bryan Yetter; troffe@exchange.montana.edu; Aly Coutemanch; Amanda Soliday; Arnie Dood; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Cris Dippel; Daniel Huckel; Daniel Sharps; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan Patla; Terry Roper; Tim Fuchs; Tim Pratt; Tom Reed; Ture Schoultz
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Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

From:	Cole, Eric
To:	Sara Fagan
Cc:	Steve Kallin; Cris Dippel; Lori Iverson
Subject:	Abstract from Eric Cole for Jackson Hole Wildlife Symposium
Date:	Thursday, October 30, 2014 11:52:29 AM
Attachments:	JHWSymposium Eric Cole abstract.docx

Hello Sara,

Please see the attached abstract for my presentation at the 2014 Jackson Hole Wildlife Symposium. I look forward to attending and sharing information about the Jackson Elk Herd.

Take care,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

Abstract for the 2014 Jackson Hole Wildlife Symposium:

Challenges and Opportunities to Reduce Supplemental Feeding on the National Elk Refuge

Eric Cole, National Elk Refuge wildlife biologist

Introduction of chronic wasting disease or other novel density dependent diseases are a significant long-term threat to the Jackson Elk Herd. The 2007 Bison and Elk Management Plan (BEMP) for the National Elk Refuge (NER) and Grand Teton National Park (GTNP) calls for limiting reliance on supplemental feeding on NER to reduce the risk of density dependent disease transmission. This will be achieved by: 1) Increasing standing forage on NER through enhanced irrigation. 2) Reducing the number of bison in the Jackson population to 500 through hunting; and 3) Reducing the number of elk wintering on NER to 5,000 through hunting. However, 7 years since the implementation of the BEMP there has been no significant change in the average length of the NER supplemental feed season. Although average forage production has increased by 16% and exponential growth of the bison population has been halted, there are still approximately 850 bison that winter on NER, and the average number of elk wintering on NER has increased from 5,800 to 7,000. Challenges to meet BEMP objectives include seasonal bison and elk use of areas closed to hunting, a discrepancy between herd-wide and NER-specific elk population objectives, and high calf recruitment for elk that summer in the area between Wilson, WY and Beaver Creek in southern GTNP. Opportunities to achieve BEMP objectives include increasing areas open to hunting, lengthening hunting seasons, and modifying the criteria used to determine when supplemental feeding is necessary. Implementation of these strategies will require greater public acceptance of increased hunting opportunity, greater tolerance of elk and bison conflicts on private lands, and/or greater tolerance for elk winter mortality through starvation than currently exists.

From: Doodle
To: Steve Kallin
Subject: Doodle: Link for poll "BEMP Adaptive Management Plan Meeting"
Date: Tuesday, November 04, 2014 2:01:05 PM

Hi Steve Kallin,

You have initiated a poll "BEMP Adaptive Management Plan Meeting" at Doodle. The link to your poll is:

http://doodle.com/e7ecsytah7ufifsi

Share this link with all those who should cast their votes. Do not forget to cast your vote, too.
(If you did not initiate this poll, somebody must accidentally have used your e-mail address; simply ignore this e-mail, please.)
- Your Doodle Team

From:	Steve Kallin
To:	Dale Deiter; Kerry Murphy; Tim Fuchs; Doug Brimeyer; Steve Cain; Sarah Dewey; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Kallin
Subject:	Doodle Poll Link for Tentative AMP Meeting the week of December 15, 2014
Date:	Tuesday, November 04, 2014 2:10:26 PM

Hi All:

Thanks for attending the last meeting and helping the team regain the momentum we lost during the recent recess.

At today's meeting we agreed to try to hold another AMP meeting the week of December 15, 2014. Attached below is a link to a Doodle Poll for that week.

http://doodle.com/e7ecsytah7ufifsi

Great discussion at the last meeting. Thanks again for your help!

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

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Subject:	Doodle Poll Link for Tentative AMP Meeting the week of December 15, 2014
Date:	Tuesday, November 04, 2014 2:10:24 PM

Hi All:

Thanks for attending the last meeting and helping the team regain the momentum we lost during the recent recess.

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From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan Meeting" Update
Date: Tuesday, November 04, 2014 2:14:57 PM

View this poll on your dashboard

Hi Steve Kallin,

"Steve Kallin" just provided information to the poll "BEMP Adaptive Management Plan Meeting."

Go to poll | Close poll

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan Meeting" Update
Date: Tuesday, November 04, 2014 5:23:26 PM

View this poll on your dashboard

Hi Steve Kallin,

"Murphy" just provided information to the poll "BEMP Adaptive Management Plan Meeting."

Go to poll **Close poll**

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan Meeting" Update
Date: Wednesday, November 05, 2014 9:05:57 AM

View this poll on your dashboard

Hi Steve Kallin,

"Eric Cole" just provided information to the poll "BEMP Adaptive Management Plan Meeting."

Go to poll **Close poll**

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Jeffrey Warren
To:	Steve Kallin
Subject:	RE: Doodle Poll Link for Tentative AMP Meeting the week of December 15, 2014
Date:	Wednesday, November 05, 2014 1:24:20 PM

I'm open any time that week, although I'll be getting home from work travel on the 14th so a Monday morning meeting may be tough.

Jeff Warren
Wildlife Biologist
US Fish and Wildlife Service
27650B South Valley Rd.
Lima, MT 59739
406.276.3536 ext. 106

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Tuesday, November 04, 2014 2:10 PM
To: Dale Deiter; Kerry Murphy; Tim Fuchs; Doug Brimeyer; Steve Cain; Sarah Dewey; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Kallin
Subject: Doodle Poll Link for Tentative AMP Meeting the week of December 15, 2014

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From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan Meeting" Update
Date: Wednesday, November 05, 2014 3:41:19 PM

View this poll on your dashboard

Hi Steve Kallin,

"Steve Cain" just provided information to the poll "BEMP Adaptive Management Plan Meeting."

Go to poll | Close poll

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Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Doug Brimeyer
To:	Steven (Steve) Cain; Cris Dippel; eric_cole@fws.gov; Sarah_Dewey@nps.gov; Kallin, Steve; Jeffrey Warren; Tim Fuchs
Subject:	Elk numbers during EIS planning and current
Date:	Wednesday, November 05, 2014 4:10:00 PM
Attachments:	2014AMPElk.pdf

Attached are three images that portray elk numbers during the planning phase, what the Commission adopted following the ROD and what we observed last February.
I can go back and get you the actual numbers and the years used in the averages calculated for the first slide.

--

Doug Brimeyer
Jackson/Pinedale Wildlife Management Coordinator
Wyoming Game and Fish Department
doug.brimeyer@wyo.gov
307-733-2321 ext. 230

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JACKSON ELK

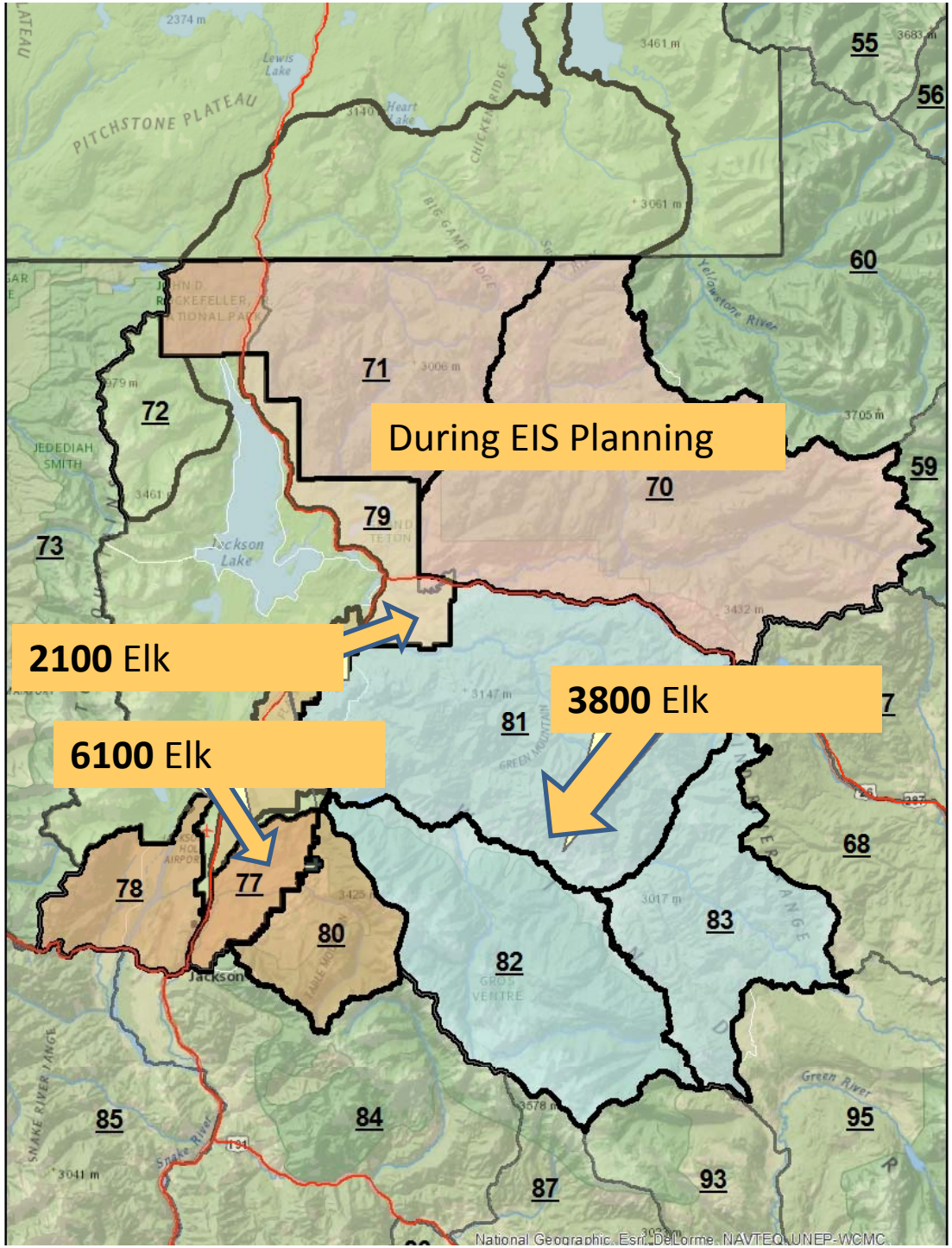
Management is driven by objectives

Bison and Elk Management Plan EIS

- 5,000 elk National Elk Refuge
- 1,600 elk summer in GTNP

WGFD objective - 11,000 elk

- 3,500 elk in the Gros Ventre
- 5,000 elk National Elk Refuge
- 2,500 elk on Native Ranges



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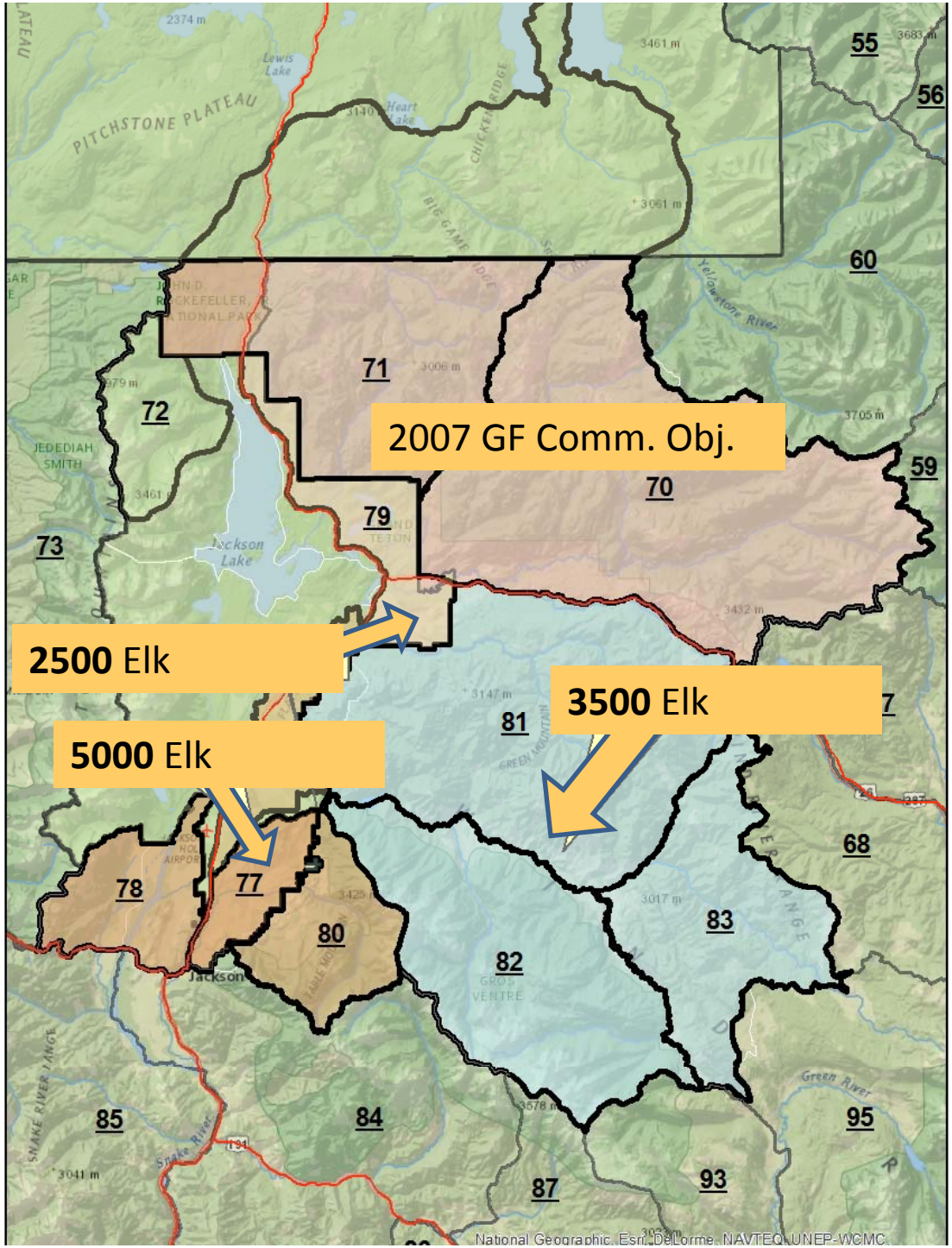
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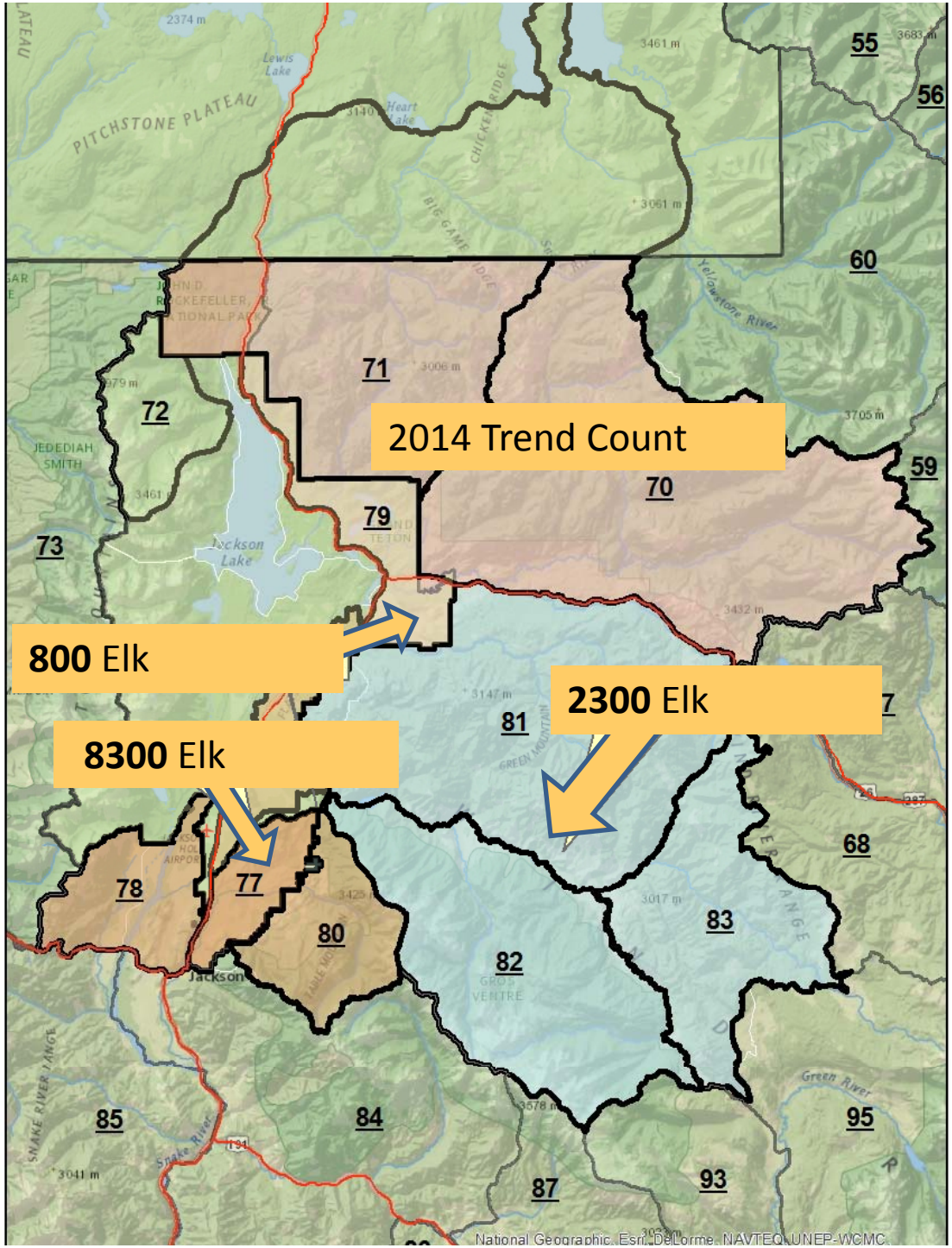
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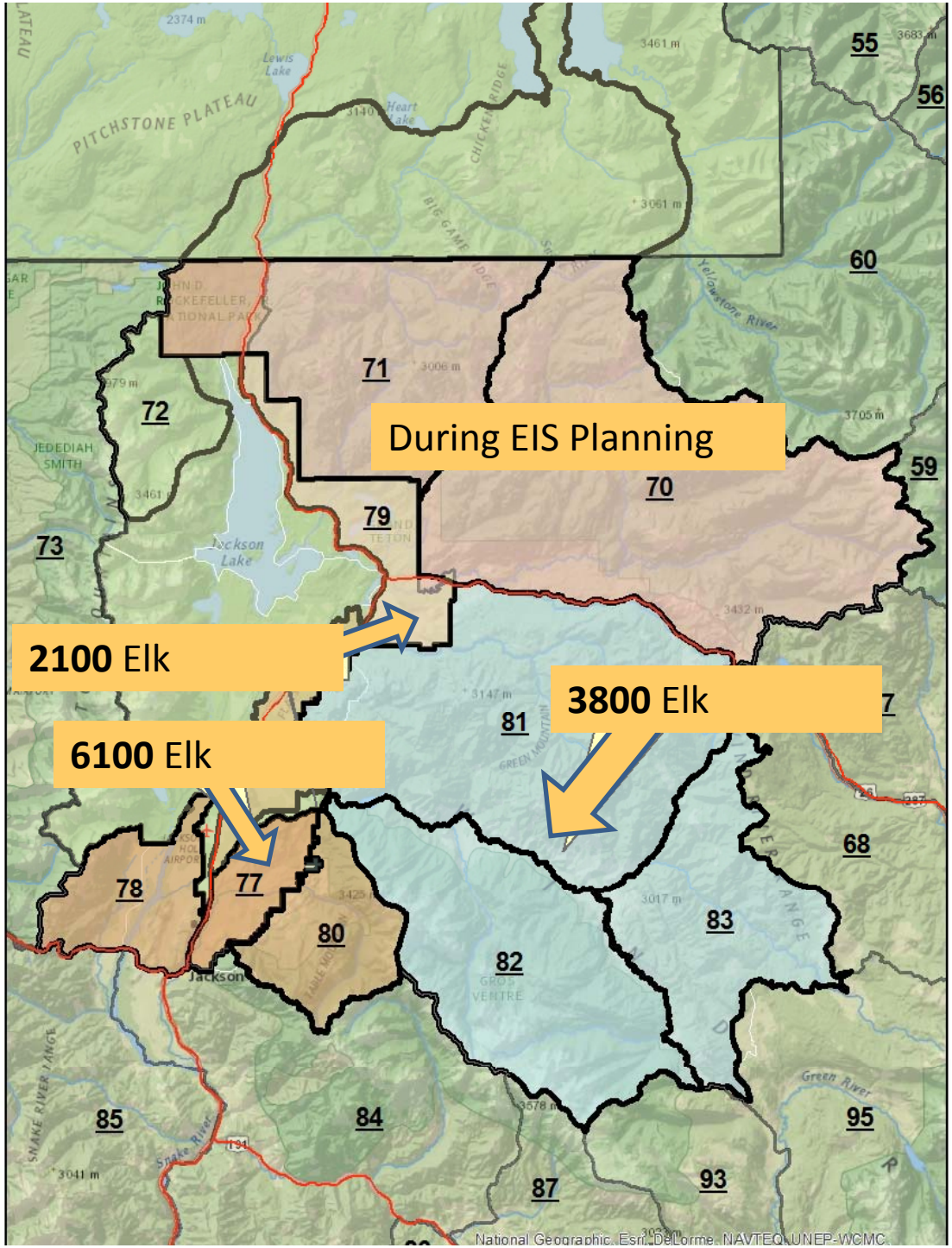
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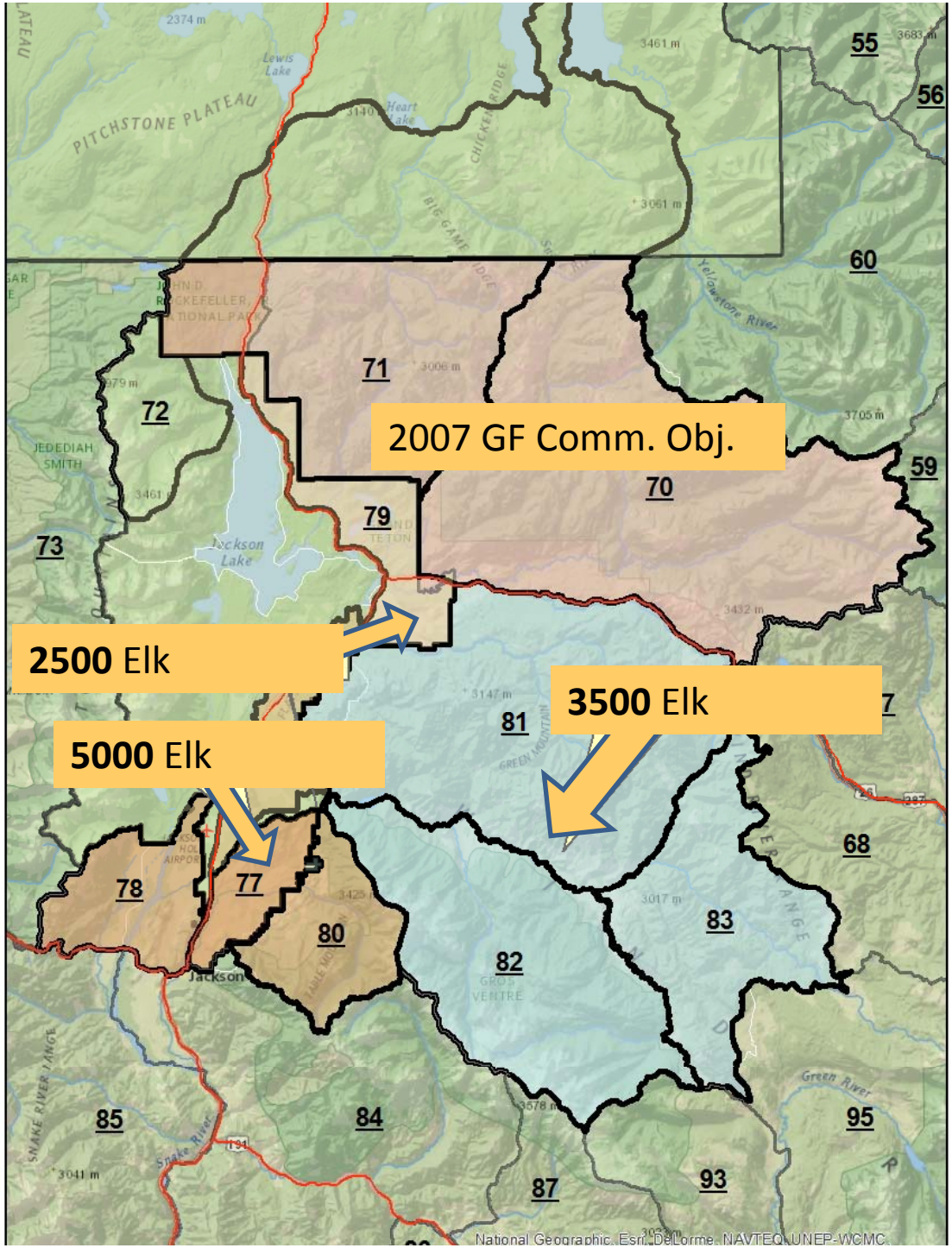
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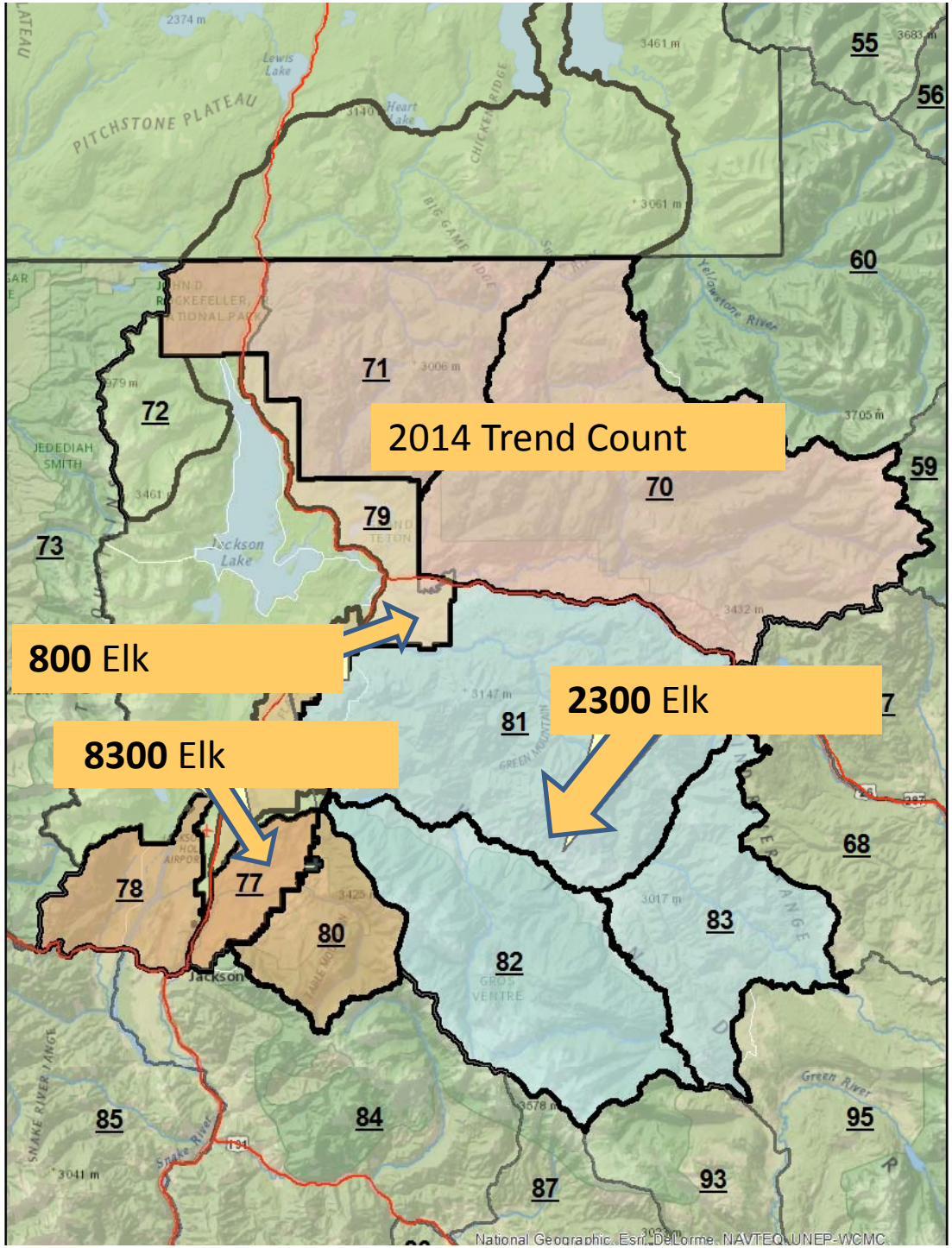
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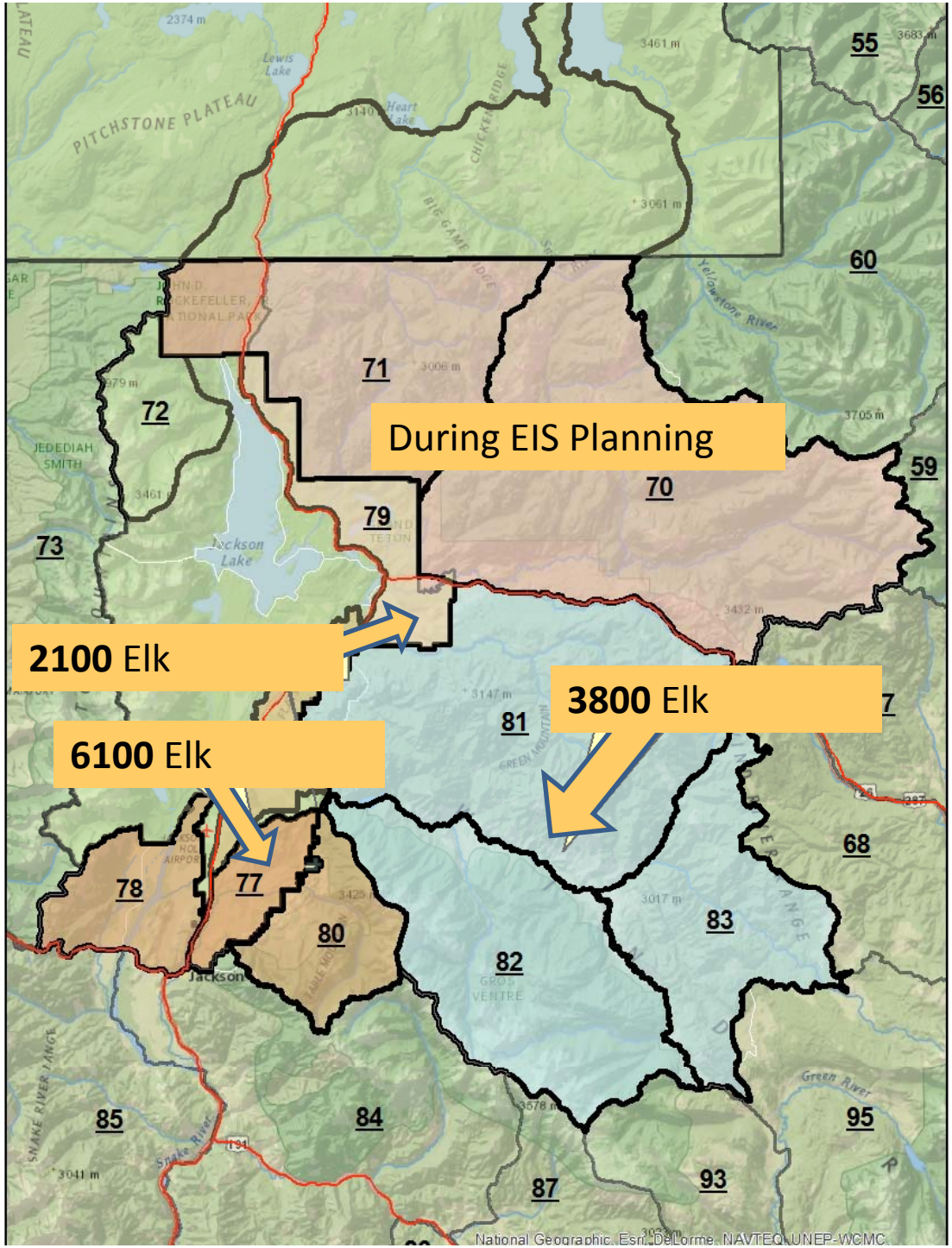
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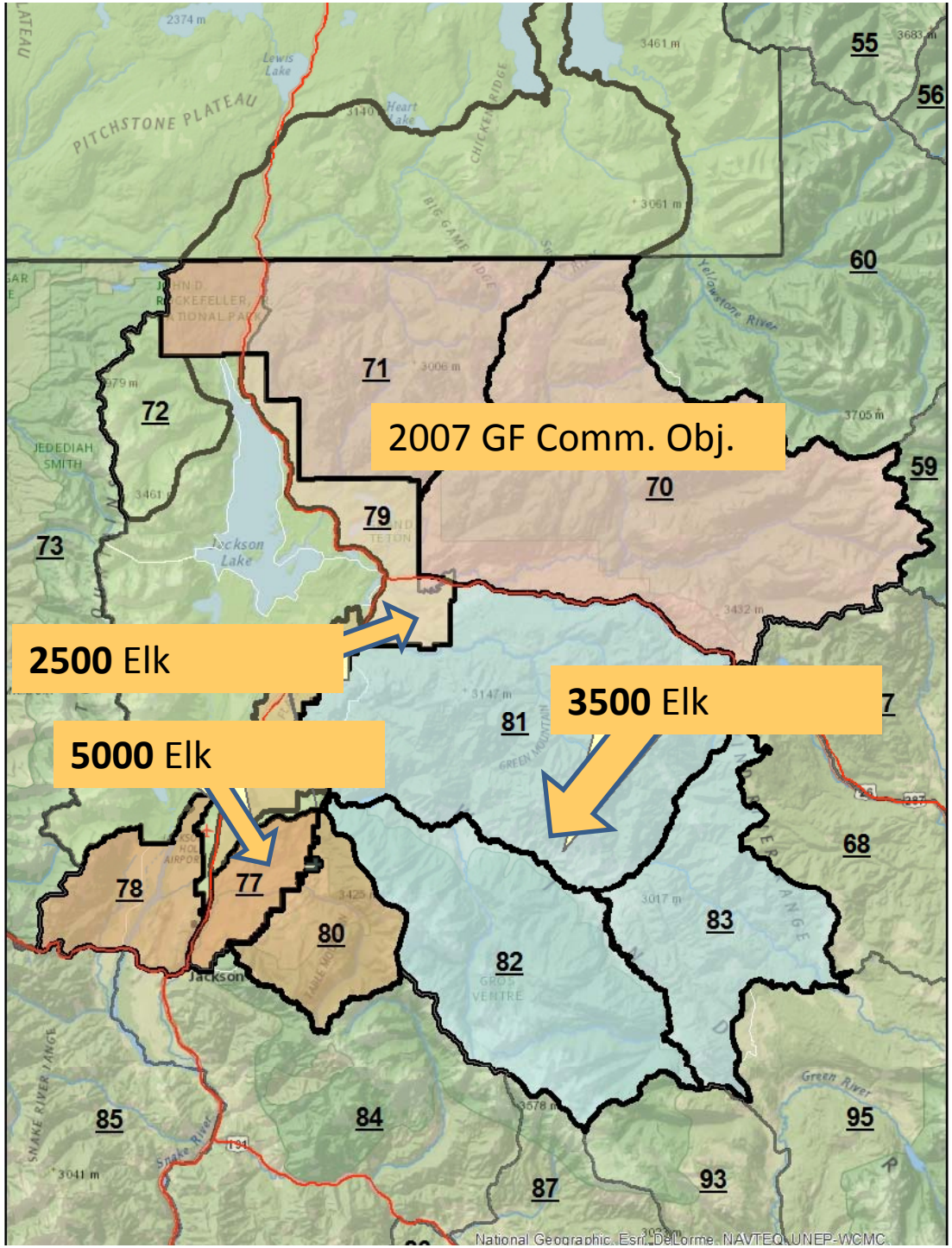
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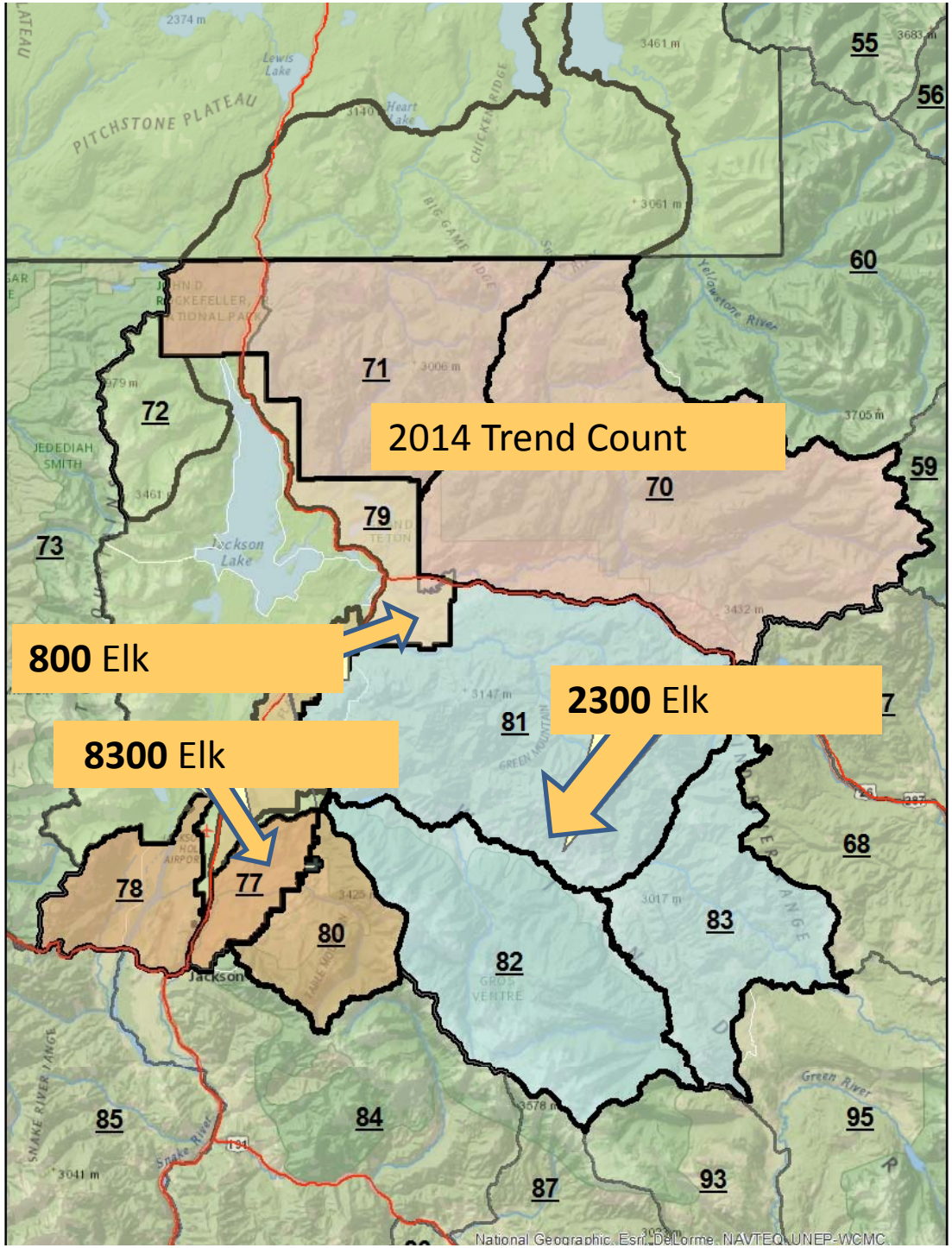
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From: Steve Kallin
To: Mike Blenden
Subject: RE: Meeting request for Natl Elk Refuge briefing with Noreen Walsh
Date: Friday, November 07, 2014 9:27:42 AM

Mike:

I would prefer to have you involved in the briefing. That said, I could make any of the dates/times work except Dec. 12. I will be in the RO for Supervisor Safety Training on Tues-Thurs., Dec. 9-11. If an opening becomes available then, I would prefer to give the briefing in person. I will be traveling back from the RO on Dec. 12.

Keep me posted.

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Blenden, Mike [mailto:mike_blenden@fws.gov]
Sent: Wednesday, October 29, 2014 12:49 PM
To: Steve Kallin
Subject: Fwd: Meeting request for Natl Elk Refuge briefing with Noreen Walsh

Well Steve, I guess no one said this would be easy. How does November 17 look for you? If not then what about December 12 or 15? I will be gone on November 24. I really doubt if my presence is essential so let me know if November 24 works for you. Maybe you and Paul could do the briefing if he's in a hurry.

Thanks,

Mike
---------- Forwarded message ----------
From: **Debbie Schreiner** <Debbie_Schreiner@fws.gov>
Date: Wed, Oct 29, 2014 at 12:20 PM
Subject: RE: Meeting request for Natl Elk Refuge briefing with Noreen Walsh
To: Mike Blenden <mike_blenden@fws.gov>

None of these dates will work. Here are some other dates/times.

November 17
10:00 – 11:00

November 24
2:00 – 3:00

December 12
10:00 – 12:00
1:00 – 4:00

December 15
10:00 – 11:00
2:00 – 3:00

From: Mike Blenden [mailto:mike_blenden@fws.gov]
Sent: Saturday, October 25, 2014 5:53 PM
To: Debbie Schreiner
Subject: Re: Meeting request for Natl Elk Refuge briefing with Noreen Walsh

Hi Debbie

Does Noreen have any time on November 6, 7, 13 or 14? Thirty minutes is what we need.

Thanks,
Mike

Sent from my iPhone

On Oct 10, 2014, at 1:18 PM, Debbie Schreiner <Debbie_Schreiner@fws.gov> wrote:

> Mike – Noreen isn't available on October 15 or 16. She will be on travel.
>
> **From:** Sanchez, Denise [mailto:denise_sanchez@fws.gov]
> **Sent:** Thursday, October 09, 2014 11:28 AM
> **To:** Debbie Schreiner
> **Subject:** Meeting request for Natl Elk Refuge briefing with Noreen Walsh
>
> Briefing: Natl Elk Refuge - Oct 15 or 16 (30 mins)
> Attendee's: Mike Blenden, Steve Kallin - Will Meeks or Paul Stantovy
>
> Please confirm with Mike Blenden.
>
> Thanks much.

--
Denise Sanchez | Administrative Assistant
USFWS Mountain-Prairie Region External Affairs
134 Union Blvd, Lakewood, CO 80228
denise_sanchez@fws.gov | 303-236-2985

http://www.fws.gov/mountain-prairie



<image001.jpg>Flickr - Photos linked in this email.

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

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Mike:

I am available by phone for a briefing any time on the 17th. Although it is better to do a briefing in person, I don't believe it is necessary to make a special trip to Denver for this briefing. However, I would gladly provide the briefing in person if I am already there for the Safety Training (Dec. 9-11).

Let me know your thoughts,

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Fax: (307) 733-9729
steve_kallin@fws.gov

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Sent: Friday, November 07, 2014 9:57 AM
To: Steve Kallin
Subject: Re: Meeting request for Natl Elk Refuge briefing with Noreen Walsh

OK, I just talked to Paul asking if this is worth you making a special trip. He knows this is important to Noreen, she's been concerned about the pace of the adaptive management plan so Paul thinks we ought to jump on the next opportunity to brief her.

If she still has time on November 17 can you make it here? I can shoot for an afternoon time slot if that will help.

Mike

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Michael Blenden
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From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan Meeting" Update
Date: Monday, November 10, 2014 7:35:10 AM

View this poll on your dashboard

Hi Steve Kallin,

"Tim Fuchs" just provided information to the poll "BEMP Adaptive Management Plan Meeting."

Go to poll | Close poll

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Doodle AG, Werdstrasse 21, 8021 Zürich

From: Steve Kallin
To: Mike Blenden
Subject: RE: Meeting request for Natl Elk Refuge briefing with Noreen Walsh
Date: Monday, November 10, 2014 10:30:43 AM

His sagacity is questionable but I absolutely disagree with the "beloved" description.

So, the earliest flight on the 17th arrives in Denver at 9:06 AM and doubt I could make a 10:00 AM meeting. Is it possible to make it an early afternoon meeting, then I could catch a 6:45 PM return flight and avoid the expense of spending the night.

Thanks,

Steve Kallin
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Fax: (307) 733-9729
steve_kallin@fws.gov

From: Blenden, Mike [mailto:mike_blenden@fws.gov]
Sent: Monday, November 10, 2014 9:01 AM
To: Steve Kallin
Subject: Re: Meeting request for Natl Elk Refuge briefing with Noreen Walsh

My boss disagrees with your logic and thinks it is worth you making a special trip on the 17th. Surely you aren't questioning the sagacity of our beloved leader...?

On Fri, Nov 7, 2014 at 10:09 AM, Steve Kallin <steve_kallin@fws.gov> wrote:
Mike:

I am available by phone for a briefing any time on the 17th. Although it is better to do a briefing in person, I don't believe it is necessary to make a special trip to Denver for this briefing. However, I would gladly provide the briefing in person if I am already there for the Safety Training (Dec. 9-11).

Let me know your thoughts,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Blenden, Mike [mailto:mike_blenden@fws.gov]
Sent: Friday, November 07, 2014 9:57 AM

To: Steve Kallin

Subject: Re: Meeting request for Natl Elk Refuge briefing with Noreen Walsh

OK, I just talked to Paul asking if this is worth you making a special trip. He knows this is important to Noreen, she's been concerned about the pace of the adaptive management plan so Paul thinks we ought to jump on the next opportunity to brief her.

If she still has time on November 17 can you make it here? I can shoot for an afternoon time slot if that will help.

Mike

On Fri, Nov 7, 2014 at 9:27 AM, Steve Kallin <steve_kallin@fws.gov> wrote:
Mike:

I would prefer to have you involved in the briefing. That said, I could make any of the dates/times work except Dec. 12. I will be in the RO for Supervisor Safety Training on Tues-Thurs., Dec. 9-11. If an opening becomes available then, I would prefer to give the briefing in person. I will be traveling back from the RO on Dec. 12.

Keep me posted.

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Blenden, Mike [mailto:mike_blenden@fws.gov]
Sent: Wednesday, October 29, 2014 12:49 PM
To: Steve Kallin
Subject: Fwd: Meeting request for Natl Elk Refuge briefing with Noreen Walsh

Well Steve, I guess no one said this would be easy. How does November 17 look for you? If not then what about December 12 or 15? I will be gone on November 24. I really doubt if my presence is essential so let me know if November 24 works for you. Maybe you and Paul could do the briefing if he's in a hurry.

Thanks,

Mike
---------- Forwarded message ----------
From: **Debbie Schreiner** <Debbie_Schreiner@fws.gov>
Date: Wed, Oct 29, 2014 at 12:20 PM
Subject: RE: Meeting request for Natl Elk Refuge briefing with Noreen Walsh
To: Mike Blenden <mike_blenden@fws.gov>

None of these dates will work. Here are some other dates/times.

November 17
10:00 – 11:00

November 24
2:00 – 3:00

December 12
10:00 – 12:00
1:00 – 4:00

December 15
10:00 – 11:00
2:00 – 3:00

From: Mike Blenden [mailto:mike_blenden@fws.gov]
Sent: Saturday, October 25, 2014 5:53 PM
To: Debbie Schreiner
Subject: Re: Meeting request for Natl Elk Refuge briefing with Noreen Walsh

Hi Debbie

Does Noreen have any time on November 6, 7, 13 or 14? Thirty minutes is what we need.

Thanks,
Mike

Sent from my iPhone

On Oct 10, 2014, at 1:18 PM, Debbie Schreiner <Debbie_Schreiner@fws.gov> wrote:

> Mike – Noreen isn't available on October 15 or 16. She will be on travel.
>
> **From:** Sanchez, Denise [mailto:denise_sanchez@fws.gov]
> **Sent:** Thursday, October 09, 2014 11:28 AM
> **To:** Debbie Schreiner
> **Subject:** Meeting request for Natl Elk Refuge briefing with Noreen Walsh
>
> Briefing: Natl Elk Refuge - Oct 15 or 16 (30 mins)
> Attendee's: Mike Blenden, Steve Kallin - Will Meeks or Paul Stantovy
>
> Please confirm with Mike Blenden.
>
> Thanks much.

--
Denise Sanchez | Administrative Assistant
USFWS Mountain-Prairie Region External Affairs
134 Union Blvd, Lakewood, CO 80228

denise_sanchez@fws.gov | 303-236-2985

http://www.fws.gov/mountain-prairie

<image001.jpg>Flickr - Photos linked in this email.

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

--
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John F. Kennedy

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan Meeting" Update
Date: Monday, November 10, 2014 6:04:46 PM

View this poll on your dashboard

Hi Steve Kallin,

"Deiter" just provided information to the poll "BEMP Adaptive Management Plan Meeting."

Go to poll | Close poll

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Steve Kallin
To:	Steve Cain; Sarah Dewey; Tim Fuchs; Doug Brimeyer; Dale Deiter; Kerry Murphy; Jeffrey Warren; Cris Dippel; Eric Cole
Cc:	Elizabeth Schooner
Subject:	Next BEMP Adaptive Management Planning Meeting on Wednesday, December 17 at 8:30 AM
Date:	Wednesday, November 12, 2014 9:39:14 AM

Thanks to those that completed the Doodle Poll. Looks like the above time works for most folks. We will again meet at the NER Headquarters.

Thanks again for helping with this effort,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Google Calendar on behalf of Mike Blenden
To: steve_kallin@fws.gov; Paul Santavy; Will Meeks; Keenan Adams
Subject: RD briefing NER AMP
Attachments: invite.ics

HYPERLINK "https://www.google.com/calendar/event?
action=VIEW&eid=MDRscjdwdjBwZzQ0aGJzMGU5M2h0N2xvNm8gc3RldmVfa2FsbGluQGZ3cy5nb3Y&tok=MjAjbWlrZV9ibGVuZGVuQGZ3cy5nb3YwNzE0NDg5YWMyNjk0ZDdhN2ZlMDI2MjY5MzQxNmMxYmY5ZWM4ZDMx&ctz=America/Denver&hl=en"more details »

RD briefing NER AMP

Brief RD on status of the Adaptive Management Plan for elk feeding at the National Bison Range
When
Mon Nov 17, 2014 10am – 10:30am Mountain Time
Where
RD conference room (HYPERLINK "https://maps.google.com/maps?q=RD+conference+room&hl=en"map)
Video call
HYPERLINK "https://plus.google.com/hangouts/_/doi.gov/mike?hceid=bWlrZV9ibGVuZGVuQGZ3cy5nb3Y.04lr7pv0pg44hbs0e93ht7lo6o"https://plus.google.com/hangouts/_/doi.gov/mike
Calendar
Steve Kallin
Who
• Mike Blenden
- organizer
• Paul Santavy
• Will Meeks
• Keenan Adams
• Steve Kallin

Going?
HYPERLINK "https://www.google.com/calendar/event?
action=RESPOND&eid=MDRscjdwdjBwZzQ0aGJzMGU5M2h0N2xvNm8gc3RldmVfa2FsbGluQGZ3cy5nb3Y&rst=1&tok=MjAjbWlrZV9ibGVuZGVuQGZ3cy5nb3YwNzE0NDg5YWMyNjk0ZDdhN2ZlMDI2MjY5MzQxNmMxYmY5ZWM4ZDMx&ctz=America/Denver&hl=en"Yes -
HYPERLINK "https://www.google.com/calendar/event?
action=RESPOND&eid=MDRscjdwdjBwZzQ0aGJzMGU5M2h0N2xvNm8gc3RldmVfa2FsbGluQGZ3cy5nb3Y&rst=3&tok=MjAjbWlrZV9ibGVuZGVuQGZ3cy5nb3YwNzE0NDg5YWMyNjk0ZDdhN2ZlMDI2MjY5MzQxNmMxYmY5ZWM4ZDMx&ctz=America/Denver&hl=en"Maybe -
HYPERLINK "https://www.google.com/calendar/event?
action=RESPOND&eid=MDRscjdwdjBwZzQ0aGJzMGU5M2h0N2xvNm8gc3RldmVfa2FsbGluQGZ3cy5nb3Y&rst=2&tok=MjAjbWlrZV9ibGVuZGVuQGZ3cy5nb3YwNzE0NDg5YWMyNjk0ZDdhN2ZlMDI2MjY5MzQxNmMxYmY5ZWM4ZDMx&ctz=America/Denver&hl=en"No HYPERLINK
"https://www.google.com/calendar/event?
action=VIEW&eid=MDRscjdwdjBwZzQ0aGJzMGU5M2h0N2xvNm8gc3RldmVfa2FsbGluQGZ3cy5nb3Y&tok=MjAjbWlrZV9ibGVuZGVuQGZ3cy5nb3YwNzE0NDg5YWMyNjk0ZDdhN2ZlMDI2MjY5MzQxNmMxYmY5ZWM4ZDMx&ctz=America/Denver&hl=en"more options »

Invitation from HYPERLINK "https://www.google.com/calendar/"Google Calendar

You are receiving this email at the account steve_kallin@fws.gov because you are subscribed for invitations on calendar Steve Kallin.

To stop receiving these emails, please log in to https://www.google.com/calendar/ and change your notification settings for this calendar.

From: Mike Blenden
To: Mike Blenden; Paul Santavy; Will Meeks; Keenan Adams; Steve Kallin
Subject: RD briefing NER AMP
Start: Monday, November 17, 2014 10:00:00 AM
End: Monday, November 17, 2014 10:30:00 AM
Location: RD conference room

Brief RD on status of the Adaptive Management Plan for elk feeding at the National Bison Range
View your event at https://www.google.com/calendar/event?
action=VIEW&eid=MDRscjdwdjBwZzQ0aGJzMGU5M2h0N2xvNm8gc3RldmVfa2FsbGluQGZ3cy5nb3Y&tok=MjAjbWlrZV9ibGVuZGVuQGZ3cy5nb3YwNzE0NDg5YWMyNjk0ZDdhN2ZlMDI2MjY5MzQxNmMxYmY5ZWM4ZDMx&ctz=America/Denver&hl=en.

From: Jeffrey Warren
To: Steve Kallin; Eric Cole
Subject: Sentences on changes since BEMP completion
Date: Wednesday, November 12, 2014 3:58:29 PM

Changes that have occurred since completion of BEMP – Winter distribution of elk has changed, calf ratios have declined excluding short-distance migrant segment, wolf presence may have exacerbated this, bison numbers, fires in Gros Ventre, habitat management to hold elk in GTNP. All agencies agreed the plan was doable but the distributional shifts challenge that currently – S.Cain…graph of proportional distribution of elk on feedgrounds (has increased as animals on native range have declined).

Jeff Warren
Wildlife Biologist
US Fish and Wildlife Service
27650B South Valley Rd.
Lima, MT 59739
406.276.3536 ext. 106

From:	Cole, Eric
To:	Bryan Yetter; troffe@exchange.montana.edu; Aly Coutemanch; Amanda Soliday; Arnie Dood; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Cris Dippel; Daniel Huckel; Daniel Sharps; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan Patla; Terry Roper; Tim Fuchs; Tim Pratt; Tom Reed; Ture Schoultz
Subject:	11/16/2014 National Elk Refuge Biological Update
Date:	Sunday, November 16, 2014 2:27:29 PM

First Significant Elk Movement to NER of the Season

There has been significant elk movement to the refuge in recent days, and this movement is likely associated with recent snowfall and cold temperatures. Average snow depth is 10" on southern NER, and it is likely much deeper at higher elevations. This is the deepest snow pack observed on NER in mid-November since 2003.

I counted approximately 250 elk on 11/13/14 in the Nowlin area northwest of Miller Butte. Approximately 70 of these were subsequently disturbed by a hunter into the Curtis Canyon area and several were harvested there. On 11/16/14 there were approximately 875 elk in the Nowlin area northwest of Miller Butte. Although the largest group of elk were within the open hunt area for limited range weapons, the animals were bedded down and not under any hunting pressure during the morning hours. Despite the recent influx of elk, we estimate that <10 elk have been harvested on NER to date. Higher harvest appears to be occurring in Hunt Area 80 east of NER.

250-875 elk is the largest number of elk counted during this period in November since 2008, but still well below typical elk numbers prior to 2007. The southern third of NER was completely closed to elk hunting prior to 2007, and 3,500-4,500 elk were commonly observed there during this period in November. Human disturbance associated with the south unit hunt since 2007 appears to have altered elk behavior and reduced the average number of elk observed on NER in November.

Other Ungulate Observations

No significant bison groups have been observed on NER since mid-August.

11-43 pronghorn were observed on southern NER in mid-November. A successful migration out of Hole seems unlikely for these animals. NER staff will monitor pronghorn numbers on southern NER throughout the winter and attempt to document mortality as applicable.

12-15 bighorn sheep have been observed around Miller Butte in mid-November.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

From:	Cole, Eric
To:	Bryan Yetter; troffe@exchange.montana.edu; Aly Coutemanch; Amanda Soliday; Arnie Dood; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Cris Dippel; Daniel Huckel; Daniel Sharps; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan Patla; Terry Roper; Tim Fuchs; Tim Pratt; Tom Reed; Ture Schoultz
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Subject:	11/24/2014 National Elk Refuge Biological Update
Date:	Monday, November 24, 2014 11:56:43 AM

11/24/2014 National Elk Refuge Biological Update

Average snow depth on southern NER is 12". It has been over a decade since we have had comparable snow pack depths on the south end of NER in late November.

Elk Movements and Harvest

I counted ~1,850 elk in the southern NER survey area on Sunday 11/23/2014. Although not part of an official count, there were likely >4,000 elk on the refuge on Friday 11/21. Many of these moved into the Bridger Teton National Forest south of Twin Creek that afternoon due to disturbance by hunters on NER. As of 11/21/14, 61 elk were reported harvested on NER, with much of that total occurring since 11/18. Because NER elk harvest information is derived from voluntary hunter permit return, 61 is a minimum estimate of the number of elk harvested on the refuge to date.

Other Ungulates

Although I did not observe any bison in the southern NER survey area on 11/23, there were reports that approximately 150 bison crossed the Gros Ventre River onto the north end of NER.

I observed 35 pronghorn immediately north of the town of Jackson on 11/23/14. These pronghorn are unlikely to make a successful migration out of Jackson Hole, and if current snow accumulation patterns continue, the animals will suffer high winter mortality this year.

I observed 59 bighorn sheep in the vicinity of Miller Butte on 11/23/14.

Trumpeter Swans

Susan Patla observed 103 trumpeter swans on the NER on 11/19/14. Most of these were foraging in open water habitat in the lower Flat Creek Marsh. The refuge provides important habitat for resident and migratory trumpeter swans, and there are excellent observation opportunities at the highway pull out just north of the visitor center.

Happy Thanksgiving to all,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

From:	Cole, Eric
To:	Bryan Yetter; troffe@exchange.montana.edu; Aly Coutemanch; Amanda Soliday; Arnie Dood; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Cris Dippel; Daniel Huckel; Daniel Sharps; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan Patla; Terry Roper; Tim Fuchs; Tim Pratt; Tom Reed; Ture Schoultz
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Happy Thanksgiving to all,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

From: Matt Hogan
To: Will Meeks
Subject: NER
Date: Friday, December 05, 2014 10:49:34 AM

Noreen visited with her counterpart at NPS….when you have a moment (not while you are on leave), I need to download what came of it.

Matt Hogan
Deputy Regional Director
Mountain-Prairie Region
U.S. Fish and Wildlife Service
(303) 236-7920

From:	Cole, Eric
To:	Bryan Yetter; troffe@exchange.montana.edu; Aly Coutemanch; Amanda Soliday; Arnie Dood; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Cris Dippel; Daniel Huckel; Daniel Sharps; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan Patla; Terry Roper; Tim Fuchs; Tim Pratt; Tom Reed; Ture Schoultz
Subject:	12/9/2014 National Elk Refuge Biological Update
Date:	Tuesday, December 09, 2014 11:59:59 AM

12/9/2014 National Elk Refuge Biological Update

Snow Conditions and Forage Resources

NER and WGFD biologists monitor the amount of available forage on NER to recommend when supplemental feeding will be necessary. Available forage is influenced by the amount of forage produced during the previous growing season, snow conditions, and consumption rates by elk and bison. As reported in a previous biological update, NER forage production was 16% above average this year. At the NER Headquarters monitoring site, snow pack depth peaked at 17 inches on 11/14/14, but since that time there was a gradual melt. All snow was gone as of 12/4/14. Therefore remaining forage on southern NER is now completely available to elk and bison. Given relatively high elk and bison activity on NER during the fall period, forage is being consumed at faster rate than in recent years. Aly Courtemanch of WGFD and I will begin quantifying the amount of forage remaining at key index sites starting next week, but for now it is clear that feeding will not be necessary anytime in the near future. For perspective the earliest that elk feeding has been initiated on NER in recent decades was December 31, 2003, and the latest was February 28, 2005.

Elk:
Elk numbers within the southern NER survey area remain high for this time of the year compared to recent years. Average elk numbers for this week from 2007-2013 were 1,125, but an average of 3,200 elk were counted on 12/7/14-12/8/14. Almost all animals counted on 12/7/14 and 12/8/14 were within the non-hunting zone immediately adjacent to Highway 89 and the Town of Jackson. Elk have been moving from this safe zone and foraging within the open hunt area, but most of this activity occurs at night. Hunt area 80 in the Bridger Teton National Forest immediately east of NER has been closed to hunting and all human activity since December 1. Elk have also been moving from hunt area 80 to forage on NER at night.

As of 12/8/14, 190 elk have been reported harvested in the NER hunt. This is a minimum estimate of the number of elk harvested because it is based on voluntary reporting by NER hunters. However current trends suggest that the total number of elk killed will be above average. The last day of the NER elk season is December 14.

Bison:
150-200 bison have been moving between GTNP and NER and have been as far south as the Poverty Flats area of the refuge since the week of November 17. Harvest from this group has been significant.

Ben Wise of WGFD reported the following bison harvest statistics:
Bison harvest between Nov. 30 and Dec. 7 was as follows
19 Males

33 cows (including both male and female calves)
---
52 total, 51 harvested on the NER

---

123 - Season total bison harvest through 12/7/2014
28 - harvested on forest
60 - cows/calves
63 - bulls

The last day of the bison season is January 18.

Pronghorn
55 pronghorn have been regularly observed on southern NER this week. As of 12/8/14 they were in the refuge's Ben Goe management area, just north of the Twin Creek subdivision.

Bighorn Sheep
An average of 50 bighorn sheep have been observed in the Miller Butte area this week. A smaller group of 15 sheep were well south of the Miller House area along the refuge road on 12/7/14.

Thanks for your interest,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

From: Matt Hogan
To: Will Meeks
Subject: FW: NER
Date: Wednesday, December 17, 2014 11:10:41 AM

I do not believe we have ever discussed this….let's do so this week. Thanks.

From: Matt Hogan [mailto:Matt_Hogan@fws.gov]
Sent: Friday, December 05, 2014 10:50 AM
To: Will Meeks (Will_Meeks@fws.gov)
Subject: NER

Noreen visited with her counterpart at NPS….when you have a moment (not while you are on leave), I need to download what came of it.

Matt Hogan
Deputy Regional Director
Mountain-Prairie Region
U.S. Fish and Wildlife Service
(303) 236-7920

From: Matt Hogan
To: Will Meeks
Subject: FW: NER
Date: Wednesday, December 17, 2014 11:10:41 AM

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From: Will Meeks
To: Matt Hogan
Subject: Re: NER
Date: Wednesday, December 17, 2014 11:25:07 AM

Will 8:00 am on Fri work? I'm out 'til then.

Will Meeks
U.S. Fish and Wildlife Service
R6 - Assistant Regional Director
NWRS and PFW
303-236-4303

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Date: Wednesday, December 17, 2014 11:55:32 AM

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From: Cole, Eric
To: Jeffrey Warren
Cc: Steve Kallin; Cris Dippel
Subject: Re: Winter feeding
Date: Thursday, December 18, 2014 11:41:16 AM

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Eric Cole
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U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

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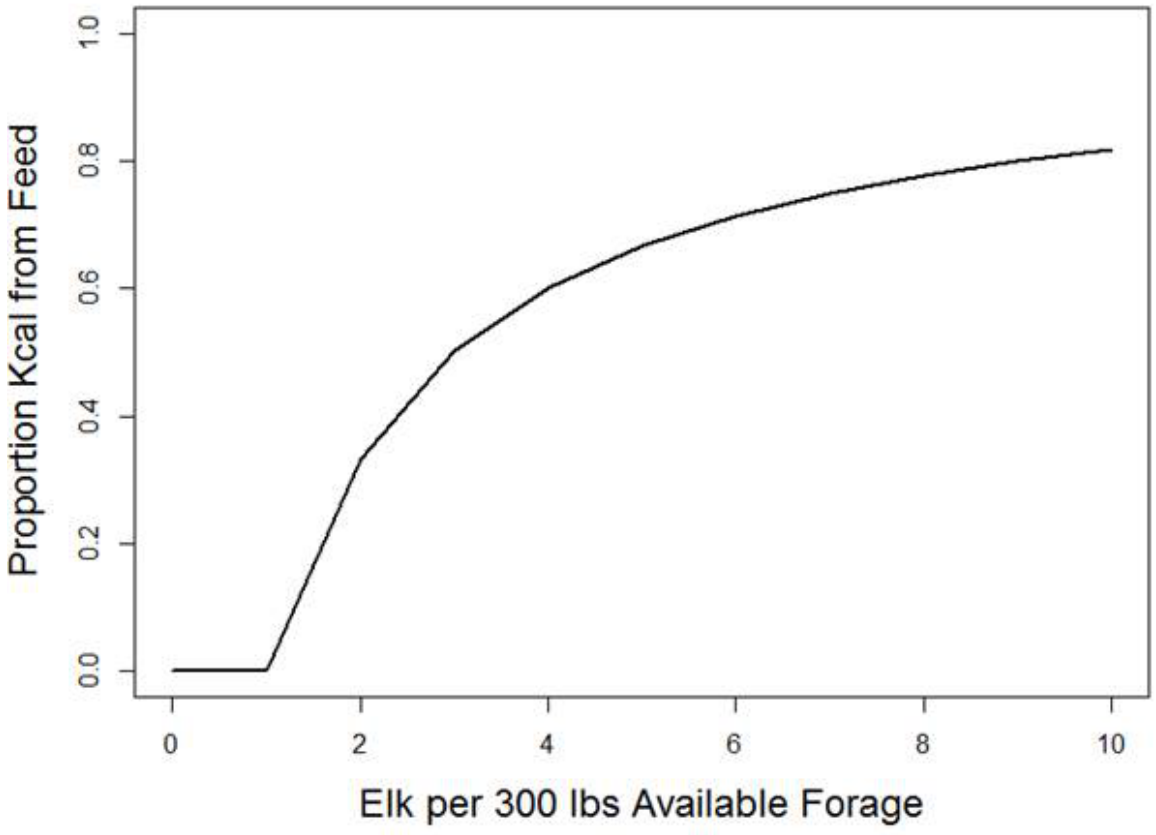
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From: Doodle
To: Steve Kallin
Subject: Doodle: BEMP Adaptive Management Plan
Date: Thursday, December 18, 2014 3:55:37 PM

View this poll on your dashboard

Do not forward this e-mail.*

Hi Steve Kallin,

You have created your Doodle poll

"BEMP Adaptive Management Plan"

You should keep this e-mail in case you want to edit your poll or invite more participants later on.

Administer poll **Invite participants**

* You should not forward this e-mail in order to prevent others from modifying or deleting your poll. If you do not want to use the administrative functions, you can simply ignore or delete this e-mail. Besides, old polls at Doodle are deleted automatically from time to time.

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Steve Kallin
To:	Dale Deiter; Kerry Murphy; Tim Fuchs; Doug Brimeyer; Steve Cain; Sarah Dewey; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Kallin
Subject:	Doodle Poll to schedule next BEMP AMP meeting between February 2 - 13, 2015
Date:	Thursday, December 18, 2014 4:18:54 PM

Hi All:

Please visit the Doodle poll link below to help schedule our next AMP meeting.

http://doodle.com/vk85avyq689dt8yk

Thanks again for your continued assistance and contributions toward the progress with this effort.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

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From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan" Update
Date: Thursday, December 18, 2014 4:42:45 PM



View this poll on your dashboard

Hi Steve Kallin,

"Steve Kallin" just provided information to the poll "BEMP Adaptive Management Plan."

Go to poll **Close poll**

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Jeffrey Warren
To: Eric Cole
Cc: Steve Kallin; Cris Dippel
Subject: RE: Winter feeding
Date: Thursday, December 18, 2014 5:29:00 PM

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Cheers,

Jeff Warren
406 276-3536 ext. 106

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From: Cole, Eric [mailto:eric_cole@fws.gov]
Sent: Thursday, December 18, 2014 11:41 AM
To: Jeffrey Warren
Cc: Steve Kallin; Cris Dippel
Subject: Re: Winter feeding

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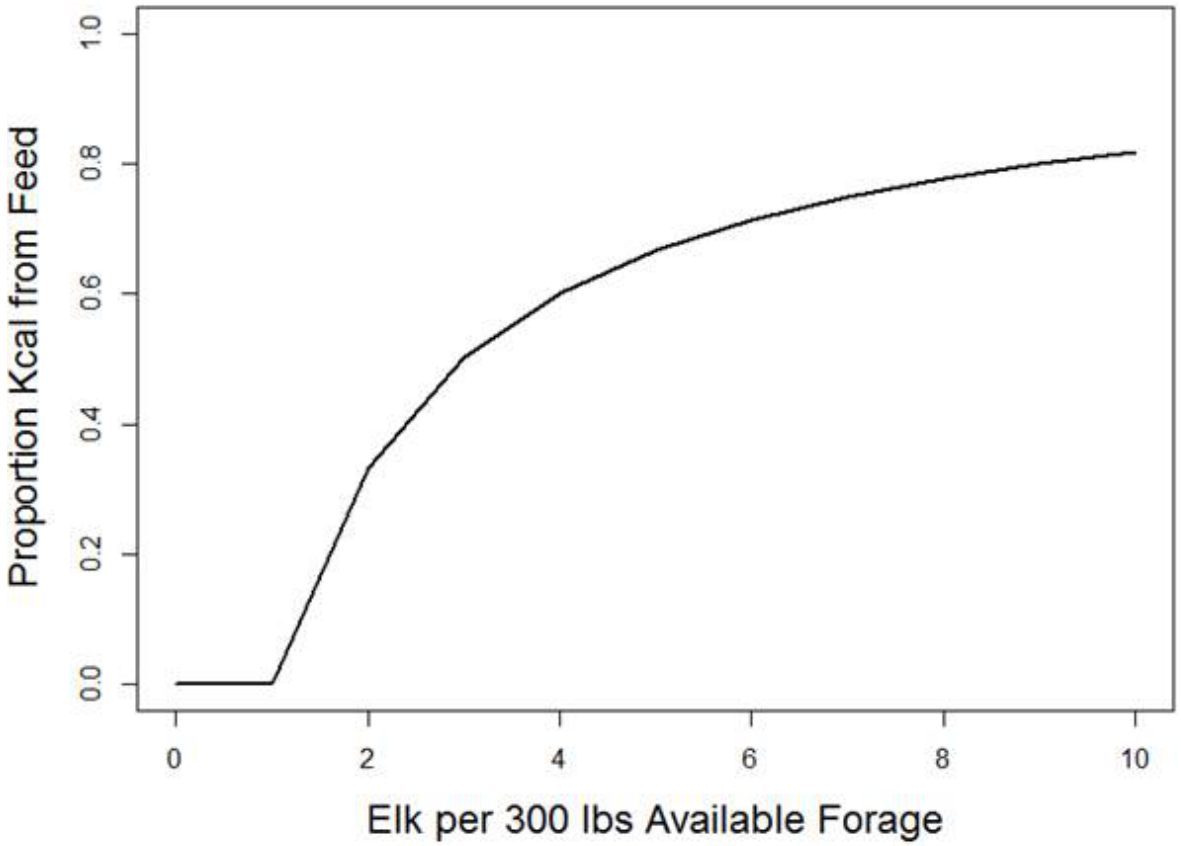
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0
2
4
6
8
10
Elk per 300 lbs Available Forage

From: Steve Kallin
To: Jeffrey Warren; Cris Dippel; Eric Cole
Subject: RE: Table of considerations
Date: Friday, December 19, 2014 10:02:13 AM

Jeff:

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Also, we were consumed with CCP prep and conference call yesterday and did not review the table you sent. Cris, Eric and I will review, discuss and reply next week.

Thanks for all your help and continued effort on this difficult but important process.

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Fax: (307) 733-9729
steve_kallin@fws.gov

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Thursday, December 18, 2014 6:36 AM
To: Steve Kallin; Cris Dippel; Eric Cole
Subject: Table of considerations

Steve, Cris, and Eric,

I put together a table to capture each of the six considerations defined in the BEMP for the adaptive management plan. I drafted triggers, descriptions, and recurrence intervals for assessing for each. Please review the table and make changes/provide comments as necessary. If you can review it together and send me a single revised copy that would be ideal. I can work on this project today and tomorrow, but won't get back to it until January after that.

I was thinking last night about how to speed up completion of the draft plan and a few ideas came to mind. First, given constraints on my time and the need to get a draft to the regional office this spring, I can't afford to spend a day and a half travelling for a 3.5 hour meeting. We need to either start having all day meetings or blocking off multiple days to work on this together. I'm willing to set aside 3 days for the next meeting (will likely need to be mid-February for me) with the intent of 1) having a meeting the first morning with the group (as usual), 2) spending the afternoon of the first

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Eric Cole
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Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

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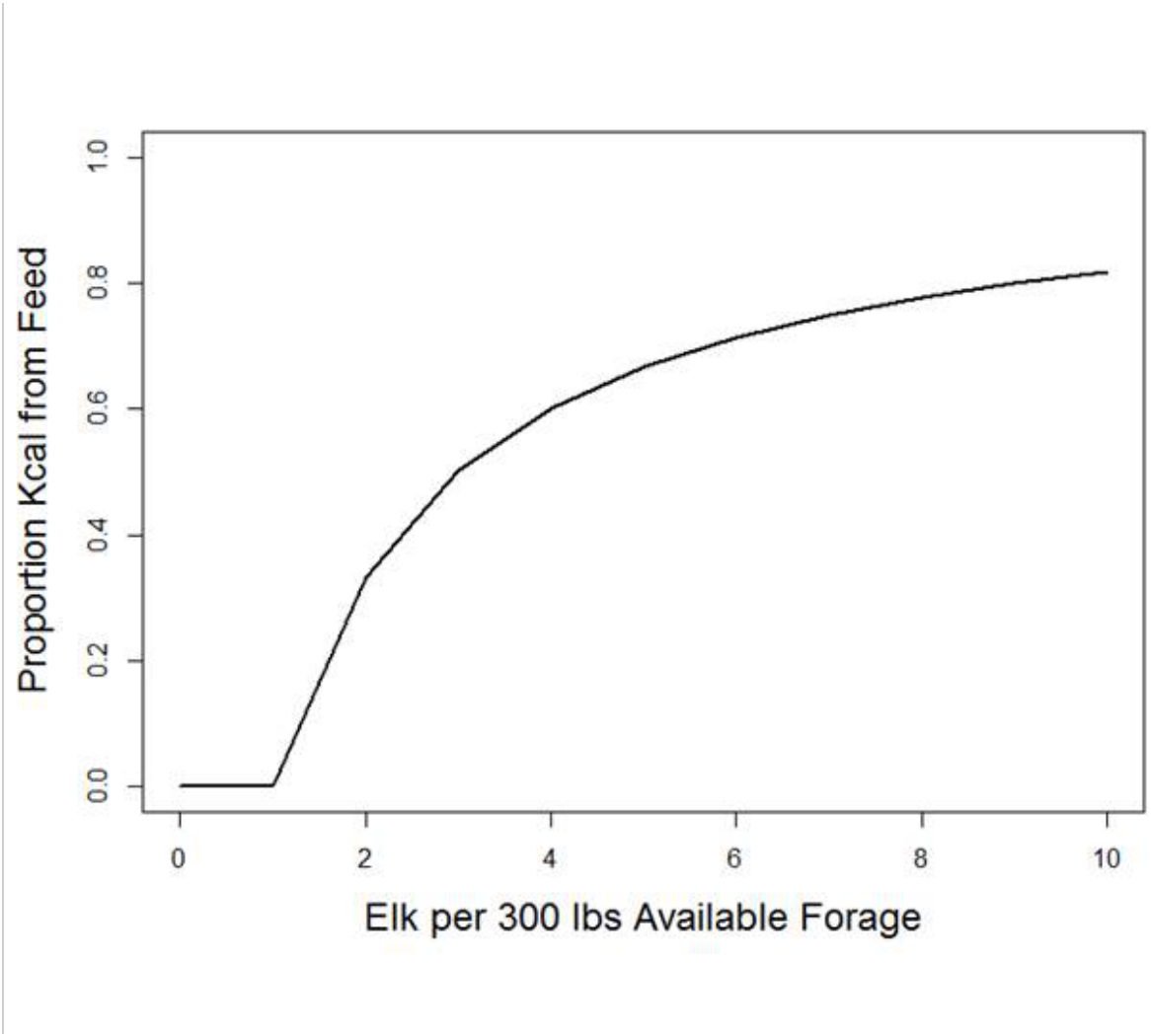
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From: Cole, Eric [mailto:eric_cole@fws.gov]
Sent: Thursday, December 18, 2014 11:41 AM
To: Jeffrey Warren
Cc: Steve Kallin; Cris Dippel
Subject: Re: Winter feeding

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Eric Cole

Refuge Biologist

U.S. Fish & Wildlife Service, National Elk Refuge

Jackson, WY

307.201.5432 (Note new phone # as of June 2014)

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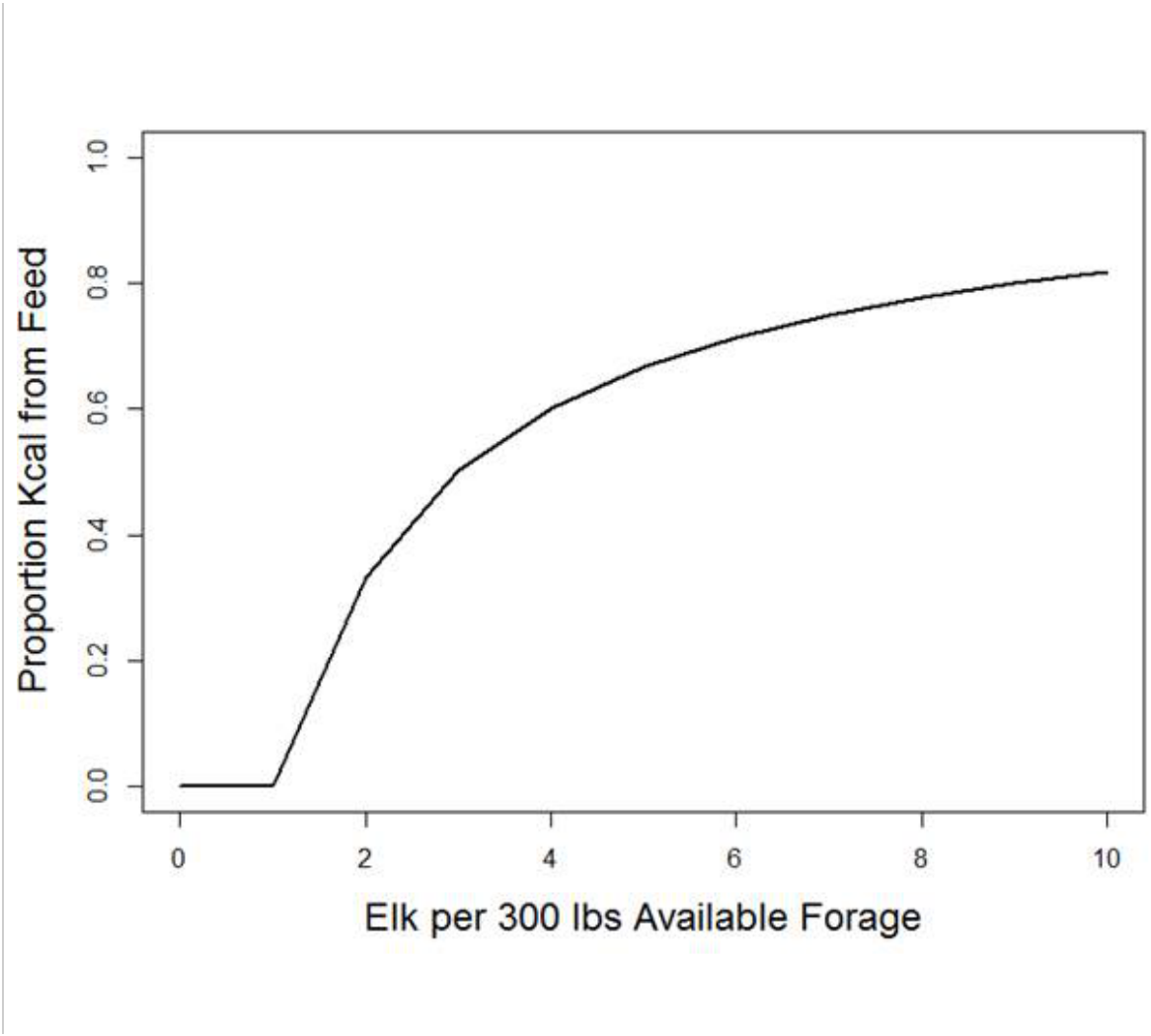
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Proportion Kcal from Feed
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0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
Elk per 300 lbs Available Forage

From: Cole, Eric
To: Jeffrey Warren
Cc: Steve Kallin; Cris Dippel
Subject: Re: Winter feeding
Date: Friday, December 19, 2014 11:10:08 AM

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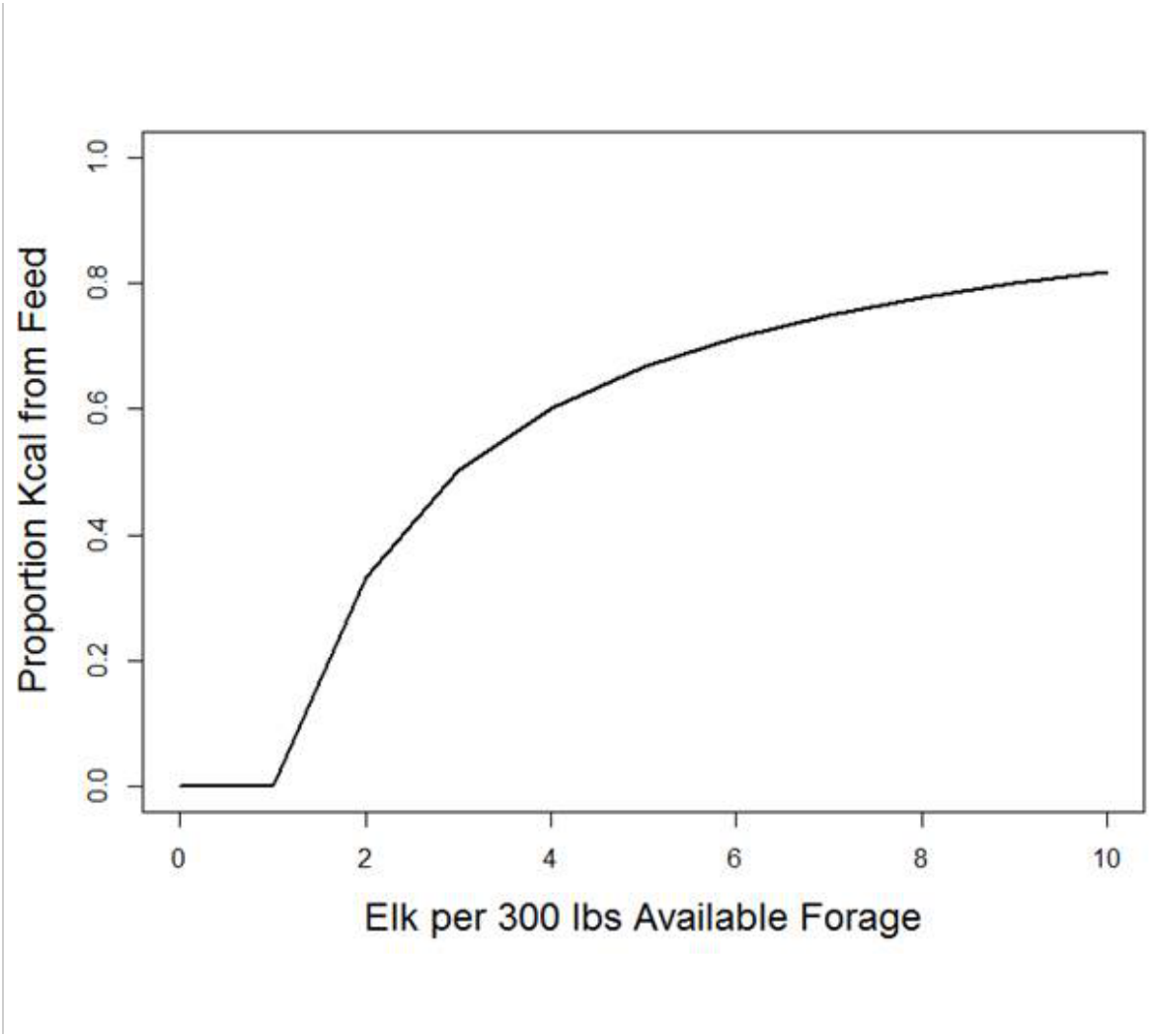
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From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan" Update
Date: Friday, December 19, 2014 11:32:53 AM

View this poll on your dashboard

Hi Steve Kallin,

"Eric Cole" just provided information to the poll "BEMP Adaptive Management Plan."

Go to poll **Close poll**

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Jeffrey Warren
To:	Eric Cole
Cc:	Steve Kallin; Cris Dippel
Subject:	RE: Winter feeding
Date:	Friday, December 19, 2014 5:04:00 PM

I'll move forward with that idea and we can see how it works.

Jeff Warren
406 276-3536 ext. 106

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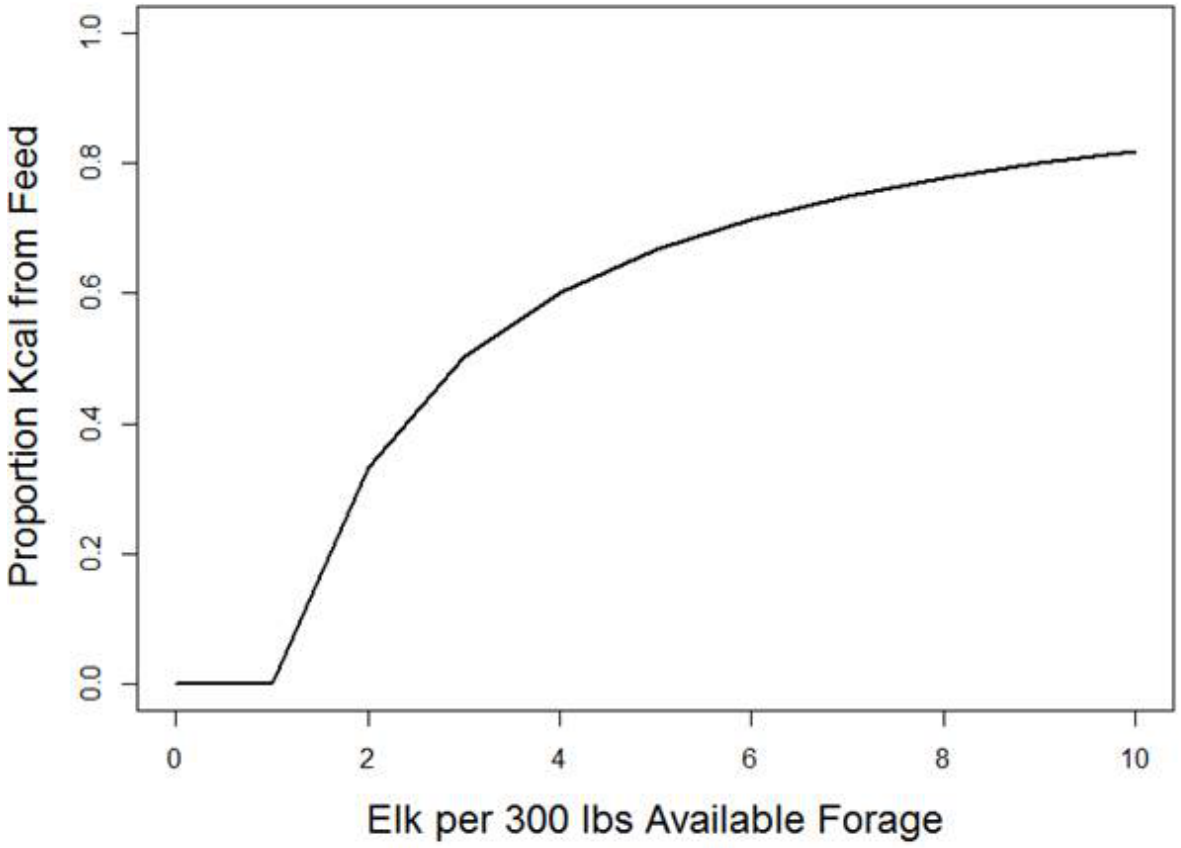
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To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan" Update
Date: Friday, December 19, 2014 5:06:42 PM

View this poll on your dashboard

Hi Steve Kallin,

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Go to poll | Close poll

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan" Update
Date: Saturday, January 03, 2015 12:41:54 PM

View this poll on your dashboard

Hi Steve Kallin,

"Murphy" just provided information to the poll "BEMP Adaptive Management Plan."

Go to poll | Close poll

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Santavy, Paul
To: Will Meeks
Subject: Fwd: FW: Deidre Bainbridge final letter to editor
Date: Monday, January 05, 2015 3:14:38 PM

FYI

PAUL SANTAVY, *CFP, AWB*
Deputy Assistant Regional Director
NWRS and PFW
Mountain-Prairie Region
U.S. Fish & Wildlife Service
Phone: 303-236-4304
Cell: 303-515-0809

---------- Forwarded message ----------
From: **Blenden, Mike** <mike_blenden@fws.gov>
Date: Mon, Jan 5, 2015 at 12:28 PM
Subject: Re: FW: Deidre Bainbridge final letter to editor
To: Steve Kallin <steve_kallin@fws.gov>
Cc: Paul Santavy <Paul_Santavy@fws.gov>

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Do you meet with NPS today regarding a joint RD briefing?

Happy New Year!

Mike

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> National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

From: Tim Fuchs [mailto:tim.fuchs@wyo.gov]
Sent: Monday, January 05, 2015 9:27 AM
To: Steve_Kallin@fws.gov
Subject: Fwd: Deidre Bainbridge final letter to editor

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From: **Deidre Bainbridge** <deidre@tennbain.com>
Date: Mon, Jan 5, 2015 at 9:23 AM
Subject: Fwd: Deidre Bainbridge final letter to editor
To: Tim Fuchs <tim.fuchs@wyo.gov>
Cc: Clark Allan <callan@wyoming.com>, Senator Christensen <LELANd.christensen@wyoleg.gov>, Steve Weichman <sweichman@wyoming.com>, Ruth.Petroff@wyoleg.gov, sara@flitner.net

MR. FUCHS THIS LETTER IS SUBMITTED. IT IS NOT HARD ON GAME AND FISH. HOWEVER, THE DANGER ON FRIDAY NIGHT WITH MANY ELK RUNNING ACROSS AND ON THE HIGHWAY APPROACHING TOWN, WITH TYPICAL WEEKEND HEAVY TRAFFIC IS VERY REAL AND NOT JUST TO ELK. THAT YOUR EMPLOYEE WAS HAZING THEM LITERALLY INTO ONCOMING TRAFFIC IS WORSE. PLEASE ADVISE WHEN THE FEEDING ON THE REFUGE SHALL COMMENCE AND DO SO ASAP. AFTER LAST NIGHTS STORM IT IS EVEN MORE CRITICAL. THIS LETTER IS COPIED TO OUR NEW TOWN MAYOR. I DO NOT BELIEVE IT IS APPROPRIATE TO PLACE RESPONSIBILITY ON THE CITY AND JPD TO CONTROL HUNGRY AND HARASSED BISON. ALSO TO THE COUNTY ATTORNEY. SAME CONCERN FOR TETON COUNTY SHERIFF DEPARTMENT. THEY SHOULD HAVE BEEN ON THE HIGHWAY SLOWING TRAFFIC IN THE OPPOSITE OR SB DIRECTION ON FRIDAY NIGHT. THEY HAVE OTHER IMPORTANT BUSINESS. THANK YOU. DEIDRE J. BAINBRIDGE (307) 739-0748

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Jackson, WY

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Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
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303-236-4306

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Date: Monday, January 05, 2015 3:14:38 PM

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John F. Kennedy

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To:	Bryan Yetter; troffe@exchange.montana.edu; Aly Coutemanch; Amanda Soliday; Arnie Dood; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Cris Dippel; Daniel Huckel; Daniel Sharps; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan Patla; Terry Roper; Tim Fuchs; Tim Pratt; Tom Reed; Ture Schoultz
Subject:	1/7/2015 National Elk Refuge Biological Update
Date:	Wednesday, January 07, 2015 8:45:05 AM

1/7/2015 National Elk Refuge Biological Update

Snow and Forage Conditions and Supplemental Feeding

Following the recent storm and warm temperatures yesterday, snow depth at the Headquarters monitoring site was 8 inches, which matches the long term average for January 7 at this site.

Aly Courtemanch of WGFD and I evaluated snow conditions and available forage at key index sites on 1/6/15. Average snow depth at key index sites was 4 inches. Due to warm temperatures snow was wet and dense, but forage was easily accessible all the way to ground level in most areas. Average accessible forage remaining was 665 lbs. per acre. Therefore supplemental feeding is not necessary at this time.

We typically recommend that supplemental feeding begin when available forage declines below the 300 lbs. per acre level at key index sites. Key index sites represent the highest quality forage on southern NER, and past observations suggest that elk are likely to leave NER for private lands in Spring Gulch when available forage falls below 300 lbs./acre at key index sites. For comparison, the 10-year moving average start of the NER feed season is January 28.

We will monitor conditions again early next week to determine if feeding is necessary.

Elk and Bison Numbers

The number of elk and bison counted in the southern NER survey area (south of the Gros Ventre Hills) has increased since mid-December. The average number of elk counted since 12/22/14 was 4850 (range 4650-5060) and the average number of bison was 375 (range 95-537). Bison have largely remained in the open hunt area despite the presence of hunters.

As of 1/6/15, WGFD reports that there have been 265 bison harvested since the beginning of the season. The last day of the bison season is January 18.

There have been no significant bison movements south of Miller Butte since 12/31/14, and hazing has not been necessary since that time.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

From:	Cole, Eric
To:	Bryan Yetter; troffe@exchange.montana.edu; Aly Coutemanch; Amanda Soliday; Arnie Dood; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Cris Dippel; Daniel Huckel; Daniel Sharps; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan Patla; Terry Roper; Tim Fuchs; Tim Pratt; Tom Reed; Ture Schoultz
Subject:	1/7/2015 National Elk Refuge Biological Update
Date:	Wednesday, January 07, 2015 8:45:05 AM

1/7/2015 National Elk Refuge Biological Update

Snow and Forage Conditions and Supplemental Feeding

Following the recent storm and warm temperatures yesterday, snow depth at the Headquarters monitoring site was 8 inches, which matches the long term average for January 7 at this site.

Aly Courtemanch of WGFD and I evaluated snow conditions and available forage at key index sites on 1/6/15. Average snow depth at key index sites was 4 inches. Due to warm temperatures snow was wet and dense, but forage was easily accessible all the way to ground level in most areas. Average accessible forage remaining was 665 lbs. per acre. Therefore supplemental feeding is not necessary at this time.

We typically recommend that supplemental feeding begin when available forage declines below the 300 lbs. per acre level at key index sites. Key index sites represent the highest quality forage on southern NER, and past observations suggest that elk are likely to leave NER for private lands in Spring Gulch when available forage falls below 300 lbs./acre at key index sites. For comparison, the 10-year moving average start of the NER feed season is January 28.

We will monitor conditions again early next week to determine if feeding is necessary.

Elk and Bison Numbers

The number of elk and bison counted in the southern NER survey area (south of the Gros Ventre Hills) has increased since mid-December. The average number of elk counted since 12/22/14 was 4850 (range 4650-5060) and the average number of bison was 375 (range 95-537). Bison have largely remained in the open hunt area despite the presence of hunters.

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Jackson, WY
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From: Cole, Eric
To: Steve Kallin
Subject: NER feeding information
Date: Thursday, January 08, 2015 10:14:10 AM
Attachments: NER feeding start day 1995-2014.pdf
JHWSymposium Eric Cole abstract.docx

She mentioned that she wanted to see information regarding average feeding start date. Please see attached. I also included a copy of my abstract from the wildlife symposium, and the presentation at the conference closely mirrored the abstract.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

WINTER	START	STARTDAYOFYEAR
1994-1995	1/6/1995	6
1995-1996	2/27/1996	58
1996-1997	1/28/1997	28
1997-1998	1/16/1998	16
1998-1999	2/16/1999	47
1999-2000	2/25/2000	56
2000-2001	1/25/2001	25
2001-2002	1/10/2002	10
2002-2003	2/17/2003	48
2003-2004	12/30/2003	-1
2004-2005	2/28/2005	59
2005-2006	1/16/2006	16
2006-2007	1/13/2007	13
2007-2008	1/14/2008	14
2008-2009	1/27/2009	27
2009-2010	2/12/2010	43
2010-2011	1/5/2011	5
2011-2012	2/2/2012	33
2012-2013	1/31/2013	31
2013-2014	2/4/2014	35

28 Mean feeding start date of year on NER is January 28.

Abstract for the 2014 Jackson Hole Wildlife Symposium:

Challenges and Opportunities to Reduce Supplemental Feeding on the National Elk Refuge

Eric Cole, National Elk Refuge wildlife biologist

Introduction of chronic wasting disease or other novel density dependent diseases are a significant long-term threat to the Jackson Elk Herd. The 2007 Bison and Elk Management Plan (BEMP) for the National Elk Refuge (NER) and Grand Teton National Park (GTNP) calls for limiting reliance on supplemental feeding on NER to reduce the risk of density dependent disease transmission. This will be achieved by: 1) Increasing standing forage on NER through enhanced irrigation. 2) Reducing the number of bison in the Jackson population to 500 through hunting; and 3) Reducing the number of elk wintering on NER to 5,000 through hunting. However, 7 years since the implementation of the BEMP there has been no significant change in the average length of the NER supplemental feed season. Although average forage production has increased by 16% and exponential growth of the bison population has been halted, there are still approximately 850 bison that winter on NER, and the average number of elk wintering on NER has increased from 5,800 to 7,000. Challenges to meet BEMP objectives include seasonal bison and elk use of areas closed to hunting, a discrepancy between herd-wide and NER-specific elk population objectives, and high calf recruitment for elk that summer in the area between Wilson, WY and Beaver Creek in southern GTNP. Opportunities to achieve BEMP objectives include increasing areas open to hunting, lengthening hunting seasons, and modifying the criteria used to determine when supplemental feeding is necessary. Implementation of these strategies will require greater public acceptance of increased hunting opportunity, greater tolerance of elk and bison conflicts on private lands, and/or greater tolerance for elk winter mortality through starvation than currently exists.

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan" Update
Date: Thursday, January 08, 2015 11:58:32 AM

View this poll on your dashboard

Hi Steve Kallin,

"Doug B" just provided information to the poll "BEMP Adaptive Management Plan."

Go to poll | Close poll

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Will Meeks
To: Mike Blenden
Cc: Paul Santavy
Subject: Re: Long Conversation with biologist for Game and Fish Yesterday he is surprised many people aren"t calling the refuge to demand feeding. thinks maybe they have not watched anitmals die
Date: Saturday, January 10, 2015 7:18:19 PM

Can you give me three sentences for the Monday meeting that summarizes this? Thanks.

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U.S. Fish and Wildlife Service
Mountain Prairie Region
Assistant Regional Director
National Wildlife Refuge System and
Partners for Fish and Wildlife Program
303-236-4303 (w)
720-541-0310 (c)

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> > Take care,
> >
> > Steve Kallin
> > Project Leader
> > National Elk Refuge
> > PO Box 510
> > 675 East Broadway
> > Jackson, WY 83001
> > Phone: (307) 201-5409
> > Fax: (307) 733-9729
> > steve_kallin@fws.gov
> >
> > **From:** Tim Fuchs [mailto:tim.fuchs@wyo.gov]
> > **Sent:** Saturday, January 10, 2015 9:47 AM

To: Steve_Kallin@fws.gov; eric_Cole@fws.gov; Lori_Iverson@fws.gov
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FYI

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To: Brian Nesvik <brian.nesvik@wyo.gov>, Scott Edberg <scott.edberg@wyo.gov>, Scott Smith <scott.smith1@wyo.gov>, Doug Brimeyer <doug.brimeyer@wyo.gov>, Alyson Courtemanch <Alyson.Courtemanch@wyo.gov>, Jonathan Stephens <jonathan.stephens@wyo.gov>

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Date: Saturday, January 10, 2015
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To: Armond Acri <anacri_wy@msn.com>, Michael Whitcomb <whitcombmj@bresnan.net>, Steve Sharkey <steve_sharkey@hotmail.com>
Cc: Lloyd Dorsey <lloydjdorsey@gmail.com>, "Fuchs, Tim" <tim.fuchs@wyo.gov>

FYI in case you have not seen this. As in past years as we get close to feeding on the NER in January the calls go out to start yesterday or soon. Bulls on Lucas feed line are not a brucellosis threat because they can't transmit disease to cattle but WGFD may feel the need to respond anyway…. Likely these bulls spent the summer in GTNP and lingered in the river bottom but who knows for sure. Given the way the winter has played out there are elk everywhere south of town and Star Valley not on feed but conditions have deteriorated since the mild weather in December. Warm weather up to Christmas and after New Years has shrunk early snow levels on south and west facing slopes at lower elevations but has resulted in several layers of dense crust. Bitter cold between Christmas and New Years day stressed animals and the weak and diseased (scabies) have started to die or end up in bad places. There are several large groups of elk around Alpine and Old Alpine that did not go to

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From: Lloyd Dorsey [mailto:lloydjdorsey@gmail.com]
Sent: Friday, January 09, 2015 3:51 PM
To: Joe Bohne
Subject: Fwd: Long Conversation with biologist for Game and Fish Yesterday he is surprised many people aren't calling the refuge to demand feeding. thinks maybe they have not watched anitmals die

FYI, from a concerned citizen.
/s/ Lloyd

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Date: Fri, Jan 9, 2015 at 9:16 AM
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Hello Everyone, This is long but please read and please help.

I have been pretty tenacious in my urgency to get the bison and elk on the National Elk Refuge fed. It has led to to many conversation with Steve Kallin and Game and Fish including Nesbet and Doug Brimeyer, I have insight as to future action but NOW, the bottom line is we all need to call, write, email asap game and fish and the refuge and urge feeding on the refuge now. We all need to ask our friends, colleagues with businesses in town and who care about elk and bison on the landscape to call and urge/demand feeding on the refuge now. We all need to ask our friends who care about the humane treatment of

animals to call and urge/demand feeding on the refuge now. Who to call, Steve Kallin and Eric Cole at National Elk Refuge 733 9212, Game and Fish, Talbot, Kennedy or Nesbet in Cheyenne at 777 4600/307 777 4581 and Jackson, Tim Fuchs and Doug Brimeyer at 739 8563, Fuchs cell is 699 3948.

WHY: Doug Brimeyer and I spoke for about 30 minutes last evening. I was concerned that there are 7 magnificent bulls on spring gulch road trying to eat hay with Lee Lucas cattle. They will be shot. As elk on spring gulch is a barometer to feed as per yesterday press I made phone calls, again. Please note below the content of Eric Cole's talk at the science school in a wildlife symposium in December. Lorna Miller and I attended. He did state the refuge needs public support for starvation of the elk on the refuge. No one commented. I spoke to Kallin yesterday and advised I will not watch the elk starve on the refuge and the public does not have to allow this nor will we. He was adamant there is plenty of food now. Then why are they all over the highway, East Gros Ventre Butte at the entrance of town and Spring Gulch Road trying to eat.

Doug Brimeyer after going around an around finally stated the elk are being fed on every feed lot in this area except the Patrol Cabin up the Gros Ventre, cuz no elk there. they have

been since January 1 or earlier. He admitted the very cold temperatures late December take a toll and there is some hard snow, ice on the refuge but the snow is not deep and they can dig through but some will die. He was a bureaucrat and was careful about what he said but bottom line he finally said that **he is "surprised that more people are not calling to demand feeding and maybe it is because they are just not used to watching an animal die".**

Cole topic in November:

Challenges and Opportunities to Reduce Supplemental Feeding on the National Elk Refuge

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There are so many problems with these goals of Eric Cole a wildlife biologist for the refuge in terms of the EIS they all proclaim to be following but the bottom line is the EIS calls for, requires 11,000 elk in the bison herd or a public comment. There is no discrepancy in the herd size. The EIS calls for 5,000 elk on the refuge wintering *as conditions allow. T*he conditions last winter required 8300 or they would have died. Right now the conditions require feeding.

Please call and demand feeding on the refuge today. State whatever you want there are many reasons for the problem right now but it comes down to politics. The refuge biologist and Steve Kallin want to starve the elk with our blessing. They don't have it. The EIS does not require or allow this nor

does best science indicate it and we demand feeding now.

FYI the environmental press correspondent for the News and Guide, Mike Kasmiri, advised that the elk should not be fed. We just had a few bad winters 100 years ago and if we would have just left them alone they would have bounced back!! Wow.

Thank you so much for doing what you can and for asking others for help. Nice New Year. Lets Make it better. Our voices for the voiceless matter. Blessings, deidre j. bainbridge 307 739 0748

PS A recent trip advisor for business concerns in town and area.

> *"Thought this was a refuge not a slaughter house!!"*
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> <x.gif>Reviewed November 30, 2014
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> We were very keen to come to what we thought was a refuge for wildlife. We were unprepared for the slaughterhouse we instead encountered. Watching hunters drag the beautiful wildlife down the trails and hoist them into the backs of their wagons was shameful to say the least. Skinned carcasses were visible too. Was just disgusting to see the animals there.
>
> Our two young children were horrified as were we at what we witnessed. In Australia, a Refuge is a safe haven not a place for killing and hunting. What made it worse was seeing bits of animals remains left near the roadside for the birds to come and scavenge.

Any wonder there were no Elk to view. They are hopefully smart enough to run for the hills from the hunters.

I have no problem with hunters doing what hunters need to do, but don't call the place a Refuge, or make an area elsewhere for the hunters to do their thing away from tourists who come here to view the wildlife.

We did see some large sheep which was lovely, (Just hope they are still alive). No elk or any other animals for that matter. I hope this place changes in the near future.

Visited November 2014

Was this review helpful?Yes 2

--
Siva Sundaresan
Conservation Director
Jackson Hole Conservation Alliance
307-733-9417
JHAlliance.org
Facebook.com/JHConservationAlliance
Twitter.com/JHAlliance
Protecting the wildlife, wild places, and community character of Jackson Hole.
Please join us for the launch of AGENDA 22 at our Annual Meeting, January 21. Full details at JHAlliance.org/AGENDA22.

--
Lloyd Dorsey
Policy Director
307-690-1967
<image001.jpg>
wyomingwildlifeadvocates.org

E-Mail to and from me, in connection with the transaction of public business, is subject to the Wyoming Public Records
Act and may be disclosed to third parties.

From: Will Meeks
To: Mike Blenden
Cc: Paul Santavy
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Visited November 2014

Was this review helpful?Yes 2

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Siva Sundaresan
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Lloyd Dorsey
Policy Director
307-690-1967
<image001.jpg>
wyomingwildlifeadvocates.org

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From:	Cole, Eric
To:	Tim Fuchs; Doug Brimeyer; Aly Coutemanch
Cc:	Steve_Kallin@fws.gov; Lori_Iverson@fws.gov
Subject:	Re: FW: Long Conversation with biologist for Game and Fish Yesterday he is surprised many people aren"t calling the refuge to demand feeding. thinks maybe they have not watched anitmals die
Date:	Saturday, January 10, 2015 9:39:21 PM

I appreciate the heads up about this.

Needless to say, I make my recommendations regarding when to begin feeding based on scientific observations in the field relative to our criteria. Letters or calls to me do not influence my decision unless they contain some sort of data relative to our criteria.

Regarding my talk at the wildlife symposium my main point was that the NER population needs to be reduced before attempting to reduce our reliance on supplemental feeding. That point however, appears to have been lost on Miss Bainbridge.

Take care,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

On Sat, Jan 10, 2015 at 9:46 AM, Tim Fuchs <tim.fuchs@wyo.gov> wrote:

> FYI
>
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> Date: Saturday, January 10, 2015
> Subject: FW: Long Conversation with biologist for Game and Fish Yesterday he is surprised many people aren't calling the refuge to demand feeding. thinks maybe they have not watched anitmals die
> To: Brian Nesvik <brian.nesvik@wyo.gov>, Scott Edberg <scott.edberg@wyo.gov>, Scott Smith <scott.smith1@wyo.gov>, Doug Brimeyer <doug.brimeyer@wyo.gov>, Alyson Courtemanch <Alyson.Courtemanch@wyo.gov>, Jonathan Stephens <jonathan.stephens@wyo.gov>
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> Date: Saturday, January 10, 2015
> Subject: FW: Long Conversation with biologist for Game and Fish Yesterday he is surprised many people aren't calling the refuge to demand feeding. thinks maybe they have not watched anitmals die
> To: Armond Acri <anacri_wy@msn.com>, Michael Whitcomb

<whitcombmj@bresnan.net>, Steve Sharkey <steve_sharkey@hotmail.com>
Cc: Lloyd Dorsey <lloydjdorsey@gmail.com>, "Fuchs, Tim" <tim.fuchs@wyo.gov>

FYI in case you have not seen this. As in past years as we get close to feeding on the NER in January the calls go out to start yesterday or soon. Bulls on Lucas feed line are not a brucellosis threat because they can't transmit disease to cattle but WGFD may feel the need to respond anyway…. Likely these bulls spent the summer in GTNP and lingered in the river bottom but who knows for sure. Given the way the winter has played out there are elk everywhere south of town and Star Valley not on feed but conditions have deteriorated since the mild weather in December. Warm weather up to Christmas and after New Years has shrunk early snow levels on south and west facing slopes at lower elevations but has resulted in several layers of dense crust. Bitter cold between Christmas and New Years day stressed animals and the weak and diseased (scabies) have started to die or end up in bad places. There are several large groups of elk around Alpine and Old Alpine that did not go to the feedground in November or early December and now 2 groups can't get there at the moment because ice on reservoir is unsafe. Several have fallen through and drowned and more may do so if the reservoir does not freeze up with thicker ice. Have not heard any calls for an emergency feeding operation at old Alpine for the 40-50 elk there.-jb

---

From: Lloyd Dorsey [mailto:lloydjdorsey@gmail.com]
Sent: Friday, January 09, 2015 3:51 PM
To: Joe Bohne
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FYI, from a concerned citizen.

/s/ Lloyd

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Date: Fri, Jan 9, 2015 at 9:16 AM
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Hello Everyone, This is long but please read and please help.

I have been pretty tenacious in my urgency to get the bison

and elk on the National Elk Refuge fed. It has led to to many conversation with Steve Kallin and Game and Fish including Nesbet and Doug Brimeyer, I have insight as to future action but NOW, the bottom line is we all need to call, write, email asap game and fish and the refuge and urge feeding on the refuge now. We all need to ask our friends, colleagues with businesses in town and who care about elk and bison on the landscape to call and urge/demand feeding on the refuge now. We all need to ask our friends who care about the humane treatment of animals to call and urge/demand feeding on the refuge now. Who to call, Steve Kallin and Eric Cole at National Elk Refuge 733 9212, Game and Fish, Talbot, Kennedy or Nesbet in Cheyenne at 777 4600/307 777 4581 and Jackson, Tim Fuchs and Doug Brimeyer at 739 8563, Fuchs cell is 699 3948.

WHY: Doug Brimeyer and I spoke for about 30 minutes last evening. I was concerned that there are 7 magnificent bulls on spring gulch road trying to eat hay with Lee Lucas cattle. They will be shot. As elk on spring gulch is a barometer to feed as per yesterday press I made phone calls, again. Please note below the content of Eric Cole's talk at the science school in a wildlife symposium in December. Lorna Miller and I attended. He did state the refuge needs public support for starvation of the elk on the refuge. No one commented. I spoke to Kallin yesterday and advised I will not watch the elk starve on the refuge and the public does not have to allow this nor will we. He was adamant there is plenty of food now. Then why are they all over the highway, East Gros Ventre Butte at the entrance of town and Spring Gulch Road trying

to eat.

Doug Brimeyer after going around an around finally stated the elk are being fed on every feed lot in this area except the Patrol Cabin up the Gros Ventre, cuz no elk there. they have been since January 1 or earlier. He admitted the very cold temperatures late December take a toll and there is some hard snow, ice on the refuge but the snow is not deep and they can dig through but some will die. He was a bureaucrat and was careful about what he said but bottom line he finally said that **he is "surprised that more people are not calling to demand feeding and maybe it is because they are just not used to watching an animal die".**

Cole topic in November:

Challenges and Opportunities to Reduce Supplemental Feeding on the National Elk Refuge

Eric Cole, Wildlife Biologist, National Elk Refuge

Introduction of chronic wasting disease or other novel density dependent diseases are a significant long-term threat to the Jackson Elk Herd. The 2007 Bison and Elk Management Plan (BEMP) for the National Elk Refuge (NER) and Grand Teton National Park (GTNP) calls for limiting reliance on supplemental feeding on NER to reduce the risk of density dependent disease transmission. This will be achieved by: 1) Increasing

standing forage on NER through enhanced irrigation. 2) Reducing the number of bison in the Jackson population to 500 through hunting; and 3) Reducing the number of elk wintering on NER to 5,000 through hunting. However, 7 years since the implementation of the BEMP there has been no significant change in the average length of the NER supplemental feed season. Although average forage production has increased by 16% and exponential growth of the bison population has been halted, there are still approximately 850 bison that winter on NER, and the average number of elk wintering on NER has increased from 5,800 to 7,000. **Challenges to meet BEMP objectives include seasonal bison and elk use of areas closed to hunting, a discrepancy between herd-wide and NER-specific elk population objectives,** and high calf recruitment for elk that summer in the area between Wilson, WY and Beaver Creek in southern GTNP. Opportunities to achieve BEMP objectives include increasing areas open to hunting, lengthening hunting seasons, and modifying the criteria used to determine when supplemental feeding is

necessary. Implementation of these strategies will require **greater public acceptance of increased hunting opportunity**, greater tolerance of elk and bison conflicts on private lands, and/or **greater tolerance for elk winter mortality through starvation than currently exists.**

There are so many problems with these goals of Eric Cole a wildlife biologist for the refuge in terms of the EIS they all proclaim to be following but the bottom line is the EIS calls for, requires 11,000 elk in the bison herd or a public comment. There is no discrepancy in the herd size. The EIS calls for 5,000 elk on the refuge wintering *as conditions allow. T*he conditions last winter required 8300 or they would have died. Right now the conditions require feeding.

Please call and demand feeding on the refuge today. State whatever you want there are many reasons for the problem right now but it comes down to politics. The refuge biologist and Steve Kallin want to starve the elk with our blessing. They don't have it. The EIS does not require or allow this nor does best science indicate it and we demand feeding now.

FYI the environmental press correspondent for the News and Guide, Mike Kasmiri, advised that the elk should not be fed. We just had a few bad winters 100 years ago and if we would have just left them alone they would have bounced back!! Wow.

Thank you so much for doing what you can and for asking others for help. Nice New Year. Lets Make it

better. Our voices for the voiceless matter. Blessings, deidre j. bainbridge 307 739 0748

PS A recent trip advisor for business concerns in town and area.

"Thought this was a refuge not a slaughter house!!"

Reviewed November 30, 2014

We were very keen to come to what we thought was a refuge for wildlife. We were unprepared for the slaughterhouse we instead encountered. Watching hunters drag the beautiful wildlife down the trails and hoist them into the backs of their wagons was shameful to say the least. Skinned carcasses were visible too. Was just disgusting to see the animals there.

Our two young children were horrified as were we at what we witnessed. In Australia, a Refuge is a safe haven not a place for killing and hunting. What made it worse was seeing bits of animals remains left near the roadside for the birds to come and scavenge.

Any wonder there were no Elk to view. They are hopefully smart enough to run for the hills from the hunters.

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Visited November 2014

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Policy Director

307-690-1967



wyomingwildlifeadvocates.org

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To:	Paul Santavy
Subject:	Fwd: Long Conversation with biologist for Game and Fish Yesterday he is surprised many people aren"t calling the refuge to demand feeding. thinks maybe they have not watched anitmals die
Date:	Monday, January 12, 2015 6:31:45 AM

Worth of Monday's meeting and HQ report.

Will Meeks
U.S. Fish and Wildlife Service
Mountain Prairie Region
Assistant Regional Director
National Wildlife Refuge System and
Partners for Fish and Wildlife Program
303-236-4303 (w)
720-541-0310 (c)

Begin forwarded message:

> **From:** Mike Blenden <mike_blenden@fws.gov>
> **Date:** January 10, 2015 at 7:34:56 PM MST
> **To:** Will Meeks <will_meeks@fws.gov>
> **Cc:** Paul Santavy <paul_santavy@fws.gov>
> **Subject: Re: Long Conversation with biologist for Game and Fish Yesterday he is surprised many people aren't calling the refuge to demand feeding. thinks maybe they have not watched anitmals die**
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> Yep.
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> > Project Leader
> > National Elk Refuge
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> > 675 East Broadway
> > Jackson, WY 83001
> > Phone: (307) 201-5409
> > Fax: (307) 733-9729
> > steve_kallin@fws.gov
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Subject: FW: Long Conversation with biologist for Game and Fish Yesterday he is surprised many people aren't calling the refuge to demand feeding. thinks maybe they have not watched anitmals die
To: Brian Nesvik <brian.nesvik@wyo.gov>, Scott Edberg <scott.edberg@wyo.gov>, Scott Smith <scott.smith1@wyo.gov>, Doug Brimeyer <doug.brimeyer@wyo.gov>, Alyson Courtemanch <Alyson.Courtemanch@wyo.gov>, Jonathan Stephens <jonathan.stephens@wyo.gov>

---------- Forwarded message ----------
From: **Joe Bohne** <jbohne@silverstar.com>
Date: Saturday, January 10, 2015
Subject: FW: Long Conversation with biologist for Game and Fish Yesterday he is surprised many people aren't calling the refuge to demand feeding. thinks maybe they have not watched anitmals die
To: Armond Acri <anacri_wy@msn.com>, Michael Whitcomb <whitcombmj@bresnan.net>, Steve Sharkey <steve_sharkey@hotmail.com>
Cc: Lloyd Dorsey <lloydjdorsey@gmail.com>, "Fuchs, Tim" <tim.fuchs@wyo.gov>

FYI in case you have not seen this. As in past years as we get close to feeding on the NER in January the calls go out to start yesterday or soon. Bulls on Lucas feed line are not a brucellosis threat because they can't transmit disease to cattle but WGFD may feel the need to respond anyway…. Likely these bulls spent the summer in GTNP and lingered in the river bottom but who knows for sure. Given the way the winter has played out there are elk everywhere south of town and Star Valley not

on feed but conditions have deteriorated since the mild weather in December. Warm weather up to Christmas and after New Years has shrunk early snow levels on south and west facing slopes at lower elevations but has resulted in several layers of dense crust. Bitter cold between Christmas and New Years day stressed animals and the weak and diseased (scabies) have started to die or end up in bad places. There are several large groups of elk around Alpine and Old Alpine that did not go to the feedground in November or early December and now 2 groups can't get there at the moment because ice on reservoir is unsafe. Several have fallen through and drowned and more may do so if the reservoir does not freeze up with thicker ice. Have not heard any calls for an emergency feeding operation at old Alpine for the 40-50 elk there.- jb

---

From: Lloyd Dorsey [mailto:lloydjdorsey@gmail.com]
Sent: Friday, January 09, 2015 3:51 PM
To: Joe Bohne
Subject: Fwd: Long Conversation with biologist for Game and Fish Yesterday he is surprised many people aren't calling the refuge to demand feeding. thinks maybe they have not watched anitmals die

FYI, from a concerned citizen.
/s/ Lloyd

---------- Forwarded message ----------
From: **Deidre Bainbridge** <deidre@tennbain.com>
Date: Fri, Jan 9, 2015 at 9:16 AM
Subject: Long Conversation with biologist for Game and Fish Yesterday he is surprised many people aren't calling the refuge to demand feeding. thinks maybe they have not watched anitmals die

Hello Everyone, This is long but please read and please help.

I have been pretty tenacious in my urgency to get the bison and elk on the National Elk Refuge fed. It has led to to many conversation with Steve Kallin and Game and Fish including Nesbet and Doug Brimeyer, I have insight as to future action but NOW, the bottom line is we all need to call, write, email asap game and fish and the refuge and urge feeding on the refuge now. We all need to ask our friends, colleagues with businesses in town and who care about elk and bison on the landscape to call and urge/demand feeding on the refuge now. We all need to ask our friends who care about the humane treatment of animals to call and urge/demand feeding on the refuge now. Who to call, Steve Kallin and Eric Cole at National Elk Refuge 733 9212, Game and Fish, Talbot, Kennedy or Nesbet in Cheyenne at 777 4600/307 777 4581 and Jackson, Tim

Fuchs and Doug Brimeyer at 739 8563, Fuchs cell is 699 3948.

WHY: Doug Brimeyer and I spoke for about 30 minutes last evening. I was concerned that there are 7 magnificent bulls on spring gulch road trying to eat hay with Lee Lucas cattle. They will be shot. As elk on spring gulch is a barometer to feed as per yesterday press I made phone calls, again. Please note below the content of Eric Cole's talk at the science school in a wildlife symposium in December. Lorna Miller and I attended. He did state the refuge needs public support for starvation of the elk on the refuge. No one commented. I spoke to Kallin yesterday and advised I will not watch the elk starve on the refuge and the public does not have to allow this nor will we. He was adamant there is plenty of food now. Then why are they all over

the highway, East Gros Ventre Butte at the entrance of town and Spring Gulch Road trying to eat.

Doug Brimeyer after going around an around finally stated the elk are being fed on every feed lot in this area except the Patrol Cabin up the Gros Ventre, cuz no elk there. they have been since January 1 or earlier. He admitted the very cold temperatures late December take a toll and there is some hard snow, ice on the refuge but the snow is not deep and they can dig through but some will die. He was a bureaucrat and was careful about what he said but bottom line he finally said that **he is "surprised that more people are not calling to demand feeding and maybe it is because they are just not used to watching an animal die".**

Cole topic in November:

Challenges and Opportunities to Reduce Supplemental Feeding on the National Elk Refuge

Eric Cole, Wildlife Biologist, National Elk Refuge

Introduction of chronic wasting disease or other novel density dependent diseases are a significant long-term threat to the Jackson Elk Herd. The 2007 Bison and Elk Management Plan (BEMP) for the National Elk Refuge (NER) and Grand Teton National Park (GTNP) calls for limiting reliance on supplemental feeding on NER to reduce the risk of density dependent disease transmission. This will be achieved by: 1) Increasing standing forage on NER through enhanced irrigation. 2) Reducing the number of bison in the Jackson population to 500 through hunting; and 3)

Reducing the number of elk wintering on NER to 5,000 through hunting. However, 7 years since the implementation of the BEMP there has been no significant change in the average length of the NER supplemental feed season. Although average forage production has increased by 16% and exponential growth of the bison population has been halted, there are still approximately 850 bison that winter on NER, and the average number of elk wintering on NER has increased from 5,800 to 7,000. **Challenges to meet BEMP objectives include seasonal bison and elk use of areas closed to hunting, a discrepancy between herd-wide and NER-specific elk population objectives,** and high calf recruitment for elk that summer in the area

between Wilson, WY and Beaver Creek in southern GTNP. Opportunities to achieve BEMP objectives include increasing areas open to hunting, lengthening hunting seasons, and modifying the criteria used to determine when supplemental feeding is [11]necessary. Implementation of these strategies will require **greater public acceptance of increased hunting opportunity**, greater tolerance of elk and bison conflicts on private lands, and/or **greater tolerance for elk winter mortality through starvation than currently exists.**

There are so many

problems with these goals of Eric Cole a wildlife biologist for the refuge in terms of the EIS they all proclaim to be following but the bottom line is the EIS calls for, requires 11,000 elk in the bison herd or a public comment. There is no discrepancy in the herd size. The EIS calls for 5,000 elk on the refuge wintering *as conditions allow. T*he conditions last winter required 8300 or they would have died. Right now the conditions require feeding.

Please call and demand feeding on the refuge today. State whatever you want there are many reasons for the problem right now but it comes down to politics. The refuge biologist and Steve Kallin want to starve the elk with our

blessing. They don't have it. The EIS does not require or allow this nor does best science indicate it and we demand feeding now.

FYI the environmental press correspondent for the News and Guide, Mike Kasmiri, advised that the elk should not be fed. We just had a few bad winters 100 years ago and if we would have just left them alone they would have bounced back!! Wow.

Thank you so much for doing what you can and for asking others for help. Nice New Year. Lets Make it better. Our voices for the voiceless matter. Blessings, deidre j. bainbridge 307 739 0748

PS A recent trip advisor for business concerns in town and area.

“Thought this was a refuge not a slaughter house!!”

<x.gif>Reviewed November 30, 2014

We were very keen to come to what we thought was a refuge for wildlife. We were unprepared for the slaughterhouse we instead encountered. Watching hunters drag the beautiful wildlife down the trails and hoist them into the backs of their wagons was shameful to say the least. Skinned carcasses were visible too. Was just disgusting to see the animals there.

Our two young children were horrified as were we at what we witnessed. In Australia, a Refuge is a safe haven not a place for killing and hunting. What made it worse was seeing bits of animals remains left near the roadside for the birds to come and scavenge.

Any wonder there were no Elk to view. They are hopefully smart enough to run for the hills from the hunters.

I have no problem with hunters doing what hunters need to do, but don't call the place a Refuge, or make an area elsewhere for the hunters to do their thing away from tourists who come here to view the wildlife.

We did see some large sheep which was lovely, (Just hope they are still alive). No elk or any other animals for that matter. I hope this place changes in the near future.

Visited November 2014

Was this review helpful? Yes 2

--
Siva Sundaresan
Conservation Director
Jackson Hole Conservation Alliance
307-733-9417
JHAlliance.org
Facebook.com/JHConservationAlliance
Twitter.com/JHAlliance
Protecting the wildlife, wild places, and community character of Jackson Hole.
Please join us for the launch of AGENDA 22 at our Annual Meeting, January 21. Full details at JHAlliance.org/AGENDA22.

--
Lloyd Dorsey
Policy Director
307-690-1967
<image001.jpg>
wyomingwildlifeadvocates.org

E-Mail to and from me, in connection with the transaction
of public business, is subject to the Wyoming Public Records
Act and may be disclosed to third parties.

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan" Update
Date: Monday, January 12, 2015 7:37:41 AM

View this poll on your dashboard

Hi Steve Kallin,

"Tim Fuchs" just provided information to the poll "BEMP Adaptive Management Plan."

Go to poll | Close poll

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Steve Kallin
To:	Dale Deiter; Kerry Murphy; Tim Fuchs; Doug Brimeyer; Steve Cain; Sarah Dewey; Jeffrey Warren; Cris Dippel; Eric Cole
Subject:	Next AMP Meeting - Wednesday, February 11, at 8:30 AM at NER Headquarters
Date:	Monday, January 12, 2015 8:55:25 AM

Hi All:

Let's get together on Wednesday, February 11, at 8:30 AM at NER Headquarters for the next AMP meeting.

In an effort to expedite the completion of the AMP, Jeff Warren will stay at the NER for several days after upcoming meetings, to incorporate our discussions into the Draft AMP. These updates will then be shared with the team in preparation for the next meeting, or discussed in a follow-up meeting with those team members that are available. We can discuss the details of this new schedule at the upcoming meeting.

Thanks again for all your help!

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From:	Steve Kallin
To:	Jeffrey Warren
Cc:	Eric Cole; Cris Dippel
Subject:	RE: Next AMP Meeting - Wednesday, February 11, at 8:30 AM at NER Headquarters
Date:	Monday, January 12, 2015 10:03:56 AM

Jeff:

Let's meet when you arrive and discuss how we can split up the work to be effective.

Steve Kallin
Project Leader
National Elk Refuge
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675 East Broadway
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Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Monday, January 12, 2015 9:42 AM
To: Steve Kallin
Cc: Eric Cole; Cris Dippel
Subject: RE: Next AMP Meeting - Wednesday, February 11, at 8:30 AM at NER Headquarters

I'll look at my calendar and see how much time that week I can spend at the refuge – I'll probably come down Tuesday morning and head home Friday afternoon. It would be great if you can each set aside as much time as possible from Tuesday afternoon through Friday morning and we can collectively work on the plan. I'm not certain exactly how that will work right now, but we can figure it out as the time approaches. We've been taking a similar approach to the grayling plan (i.e., two of us block off a week and work on the plan simultaneously) and it has helped out considerably.

Cheers,

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Monday, January 12, 2015 8:55 AM
To: Dale Deiter; Kerry Murphy; Tim Fuchs; Doug Brimeyer; Steve Cain; Sarah Dewey; Jeffrey Warren; Cris Dippel; Eric Cole
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Thanks again for all your help!

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steve_kallin@fws.gov

From:	Iverson, Lori
To:	Steve Kallin
Subject:	draft news release
Date:	Tuesday, January 13, 2015 10:34:56 AM
Attachments:	Refuge Announces Supplemental Feeding Start Date.docx

---

Here's the draft - please stress with Tim I have a tight afternoon schedule with this film crew, and they don't have any wiggle room in their agenda. I'll have to leave the office by 1:15 to meet with them.

Thanks,
Lori

Lori Iverson
Outreach & Visitor Services
U.S. Fish & Wildlife Service
National Elk Refuge
PO Box 510 / 675 East Broadway
Jackson, WY 83001
Phone: 307.201.5433
Cell: 307.690.4375
Fax: 307.733.9729
lori_iverson@fws.gov
National Elk Refuge photo gallery
National Elk Refuge web site
Twitter: @NatlElkRefuge

Refuge Announces Supplemental Feeding Start Date

National Elk Refuge and Wyoming Game & Fish Department wildlife managers have determined that available forage on the refuge has declined to levels where supplemental feeding of elk and bison is necessary. The winter feeding program is scheduled to begin on Monday, January 19.

Biologists have been regularly monitoring environmental conditions on the refuge during the past few weeks to measure and assess the quantity of remaining forage. Last week, the interagency crew calculated approximately 665 pounds per acre of standing forage at various key sites, or more than double the threshold for recommending the initiation of the supplemental feeding program. Yesterday, the team from both the US Fish and Wildlife Service and State of Wyoming measured 420 pounds per acre, indicating the rate at which forage is being consumed. Based on the established criteria for initiation of the supplemental feeding program, wildlife managers have agreed to start the seasonal feeding program early next week.

The Bison & Elk Management Plan, which guides management activities for habitat and wildlife management on the refuge, calls for a reduced reliance on supplemental feed. The same plan also calls for a reduction in the number of animals wintering on the refuge, an important step in scaling back the need for providing alfalfa pellets to wintering herds. Despite a relatively high forage production this past year, the refuge saw a large influx of animals migrating onto the federal property earlier than normal, thus resulting in less forage available later in January. Rather than ending the refuge's bison hunt several days early in order to initiate the feeding program, both State and refuge managers agree delaying feeding through the weekend provides the best balance between needed population controls and habitat management. "We need to balance the concerns with forage availability with our need to reduce the bison population," explained Refuge Manager Steve Kallin.

Since 1995, the average start date for initiating feeding has been January 28. The start date, ranging from December to February 28, varies widely depending on winter severity and available forage.

The number of elk and bison counted in the southern National Elk Refuge survey area has increased since mid-December. Approximately 5,000 elk are currently on the refuge, with additional elk on adjoining lands. Bison numbers have ranged as high as 530, with many of the remaining in the open hunt area despite the presence of hunters. However, more elk and bison are expected to move onto the refuge once the supplemental feeding program begins for the season. Travelers on nearby roads should continue to use caution for migrating animals.

From: Will Meeks
To: Mike Blenden
Subject: RE: Refuge To Start Feeding Newspaper Article
Date: Wednesday, January 14, 2015 2:38:58 PM

Thanks. Was there any follow-up on the not well described need for a joint NPS/FWS briefing?

Will Meeks
U.S. Fish and Wildlife Service, Region 6
ARD-NWRS and PFW
303-236-4303 (w)
720-541-0310 (c)

From: Mike Blenden [mailto:mike_blenden@fws.gov]
Sent: Wednesday, January 14, 2015 2:31 PM
To: Steve Kallin
Cc: Will Meeks; Paul Santavy
Subject: Re: Refuge To Start Feeding Newspaper Article

Looks like a good article to me too Steve. I assume that since feeding starts in a few days, Diedra's (?) complaints are even less likely to result in additional pressure to start feeding early.

Mike

Sent from my iPad

On Jan 14, 2015, at 6:37 AM, Steve Kallin <steve_kallin@fws.gov> wrote:

> Mike:
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> The link below is to today's JH News & Guide article about the delay in the NER supplemental feeding program. This a good article which could have easily been hyped to create the appearance of controversy based on criticism from some vocal locals.
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> http://www.jhnewsandguide.com/news/environmental/refuge-to-start-feeding-elk-bison-monday/article_3903fdff-b2de-5153-a631-4a49e713cbf5.html
>
> Take care,
>
> Steve Kallin
> Project Leader
> National Elk Refuge
> PO Box 510
> 675 East Broadway
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> Phone: (307) 201-5409
> Fax: (307) 733-9729
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From: Mike Blenden
To: Will Meeks
Subject: Re: Refuge To Start Feeding Newspaper Article
Date: Wednesday, January 14, 2015 5:27:31 PM

Yes, as it turns out Steve had a meeting scheduled with GTNP superintendent to discuss the very topic. They met but honestly let me call him tomorrow and be reminded of the direction they want to go and when. Bottom line today: they seemed well ahead of us. I'll give you a better update tomorrow (I'm thinking positively.)

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Fax: (307) 733-9729
steve_kallin@fws.gov

From: Steve Kallin
To: Jeffrey Warren
Cc: Cris Dippel; Eric Cole
Subject: AMP Work Schedule
Date: Thursday, January 22, 2015 10:48:15 AM

Hi Jeff:

Just wanted to touch base with you concerning the upcoming AMP meeting (Wed., Feb. 11) and scheduling work sessions either before or after the meeting. The frigid temps must have frozen the phone lines between NER and RRL. I can't seem to get through by phone. If there are issues, try calling me on my cell at 307/690-0905.

Take care,

Steve Kallin
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steve_kallin@fws.gov

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Cc: Cris Dippel; Eric Cole
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Fax: (307) 733-9729
steve_kallin@fws.gov

From: Blenden, Mike
To: Will Meeks
Subject: NER joint briefing
Date: Wednesday, January 28, 2015 4:44:08 PM

Will,

Just an update on the idea of an NPS/FWS RD briefing on Adaptive Management Plan (AMP)at NER.

Kallin has met with Grand Teton NP. Both he and the park feel that the next step is finish the AMP and do the joint briefing at or near completion of the plan. Right now they don't feel there is much to brief, unless something goes badly with the state in which case they think a briefing should be done immediately.

The cooperating association (?) is contracting with the recently retired chief biologist at the park as a consultant to work on the plan. Steve thinks this is an excellent move. Jeff Warren will be there in early February to meet with the planning partners and stay to work on the plan. Hopes are to finish the plan in March and brief at that point.

Is this what you needed?

Mike

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

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303-236-4306

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From: Will Meeks
To: Blenden, Mike
Subject: Re: NER joint briefing
Date: Thursday, January 29, 2015 5:08:41 AM

We may have to think about this a bit differently. I think Noreen wants a briefing regardless if we think it's worthy of one. Also, she is think more broadly than just AMP. Let's talk on Monday. Remind me please.

Will Meeks
U.S. Fish and Wildlife Service
Mountain Prairie Region
Assistant Regional Director
National Wildlife Refuge System and
Partners for Fish and Wildlife Program
303-236-4303 (w)
720-541-0310 (c)

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> Is this what you needed?
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> Mike
>
> --
> Michael Blenden
> Refuge Supervisor - Montana, Wyoming and Utah
> 134 Union Boulevard
> Lakewood, CO 80228
> 303-236-4306
>
> *Too often we...enjoy the comfort of opinion without the discomfort of thought.*
> John F. Kennedy

From: Will Meeks
To: Blenden, Mike
Subject: Re: NER joint briefing
Date: Thursday, January 29, 2015 5:08:41 AM

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Will Meeks
U.S. Fish and Wildlife Service
Mountain Prairie Region
Assistant Regional Director
National Wildlife Refuge System and
Partners for Fish and Wildlife Program
303-236-4303 (w)
720-541-0310 (c)

On Jan 28, 2015, at 6:44 PM, Blenden, Mike <mike_blenden@fws.gov> wrote:

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From: Mike Blenden
To: Will Meeks
Subject: Re: NER joint briefing
Date: Thursday, January 29, 2015 8:13:39 AM

Will do

Sent from my iPhone

On Jan 29, 2015, at 5:08 AM, Will Meeks <will_meeks@fws.gov> wrote:

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John F. Kennedy

From: Steve Kallin
To: Jeffrey Warren
Cc: Cris Dippel; Eric Cole
Subject: RE: AMP Discussion
Date: Thursday, January 29, 2015 11:07:43 AM

Hi Jeff:

The reason I have been calling was to confirm the dates you will be at the NER. I wanted to reinforce with Cris & Eric that we will need to spend more time working on the AMP that week than we have for past meetings.

Also, Steve Cain will retire prior to the next AMP meeting. I plan on hiring him as a contractor to continue to attend our AMP meetings. He may also be available to help write up some parts of the plan. Just letting you know about the new situation and opportunity.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Thursday, January 29, 2015 8:03 AM
To: Steve Kallin
Subject: RE: AMP Discussion

I'm at a grayling meeting this week and will give you a shout today during a break.

Cheers,

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

---

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Wednesday, January 28, 2015 3:07 PM
To: Jeffrey Warren
Subject: AMP Discussion

Hi Jeff:

I've tried the last several days, but can't seem to get through your station's telephone system. Could you try giving me a call.

Thanks,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Jeffrey Warren
To: Steve Kallin; Cris Dippel; Eric Cole
Subject: RE: current draft and last meeting presentation
Date: Wednesday, February 04, 2015 6:44:22 AM

As we're all reviewing the plan it will be good to ask the question of how we integrate the recent change in focus and objective, outlined in the presentation. We've streamlined our approach recently and shifted away from a focus on simultaneously achieving objectives from each of the 4 goals (i.e., habitat, population, numbers of elk and bison, and disease) in the plan to a more singular focus on the population goal and objective for a phased approach to reducing the numbers of animals on supplemental feed. With that change we're focusing on the criteria outlined in the ROC instead of the objectives for the other goals in the BEMP. I've started to capture the change in the current plan, but it will be good to get your feedback on how that could be accomplished.

Cheers,

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

---

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Tuesday, February 03, 2015 2:27 PM
To: Cris Dippel; Eric Cole
Cc: Jeffrey Warren
Subject: FW: current draft and last meeting presentation

Cris/Eric:

Jeff Warren will be arriving next Tuesday about noon. We will all meet with him at 1:30 PM on Tuesday to review, plan and develop strategy in preparation for the AMP meeting in order to maximize our progress in developing this Draft AMP. Jeff asked that we review the most recent Draft AMP (attached) in preparation for the Tuesday meeting with him.

Thank you,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001

Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Tuesday, February 03, 2015 2:11 PM
To: Steve Kallin
Subject: current draft and last meeting presentation

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

From: Iverson, Lori
To: Jeffrey Warren
Subject: Steve Cain article
Date: Tuesday, February 10, 2015 1:05:57 PM

---

http://www.wyofile.com/grand-teton-retiring-biologist-sees-wildlife-restored/

Lori Iverson
Outreach & Visitor Services
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National Elk Refuge web site
Twitter: @NatlElkRefuge

From: Iverson, Lori
To: Jeffrey Warren
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Date: Tuesday, February 10, 2015 1:05:57 PM

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From:	Jeffrey Warren
To:	Steve Kallin
Subject:	USFWS Adaptive Harvest Management
Date:	Thursday, February 12, 2015 11:12:48 AM
Attachments:	2014_ahm_report.pdf

Steve,

Regarding format and style for the plan one option would be to use the USFWS adaptive waterfowl harvest management plan/reports as an example. I've attached the most recent report for you to look through. We can discuss when you have a few minutes.

Cheers,

Jeff Warren
406 276-3536 ext. 106

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"A great many people think they are thinking when they are merely rearranging their prejudices." William James

U.S. Fish & Wildlife Service

Adaptive Harvest Management

2014 Hunting Season



Adaptive Harvest Management

2014 Hunting Season

PREFACE

The process of setting waterfowl hunting regulations is conducted annually in the United States (Blohm 1989). This process involves a number of meetings where the status of waterfowl is reviewed by the agencies responsible for setting hunting regulations. In addition, the U.S. Fish and Wildlife Service (USFWS) publishes proposed regulations in the Federal Register to allow public comment. This document is part of a series of reports intended to support development of harvest regulations for the 2014 hunting season. Specifically, this report is intended to provide waterfowl managers and the public with information about the use of adaptive harvest management (AHM) for setting waterfowl hunting regulations in the United States. This report provides the most current data, analyses, and decision-making protocols. However, adaptive management is a dynamic process and some information presented in this report will differ from that in previous reports.

Citation: U.S. Fish and Wildlife Service. 2014. Adaptive Harvest Management: 2014 Hunting Season. U.S. Department of Interior, Washington, D.C. 63 pp. Available online at http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/AHM/AHM-intro.htm

ACKNOWLEDGMENTS

A Harvest Management Working Group (HMWG) comprised of representatives from the USFWS, the U.S. Geological Survey (USGS), the Canadian Wildlife Service (CWS), and the four Flyway Councils (Appendix A) was established in 1992 to review the scientific basis for managing waterfowl harvests. The working group, supported by technical experts from the waterfowl management and research communities, subsequently proposed a framework for adaptive harvest management, which was first implemented in 1995. The USFWS expresses its gratitude to the HMWG and to the many other individuals, organizations, and agencies that have contributed to the development and implementation of AHM.

This report was prepared by the USFWS Division of Migratory Bird Management. G. S. Boomer, G. S. Zimmerman, and P. K. Devers were the principal authors. Individuals that provided essential information or otherwise assisted with report preparation included: N. Zimpfer, T. Sanders, K. Wilkins, and M. Gendron. Comments regarding this document should be sent to the Chief, Division of Migratory Bird Management, U.S. Fish & Wildlife Service Headquarters, MS: MB, 5275 Leesburg Pike, Falls Church, VA 22041-3803.

We are grateful for the continuing technical support from our USGS colleagues: F. A. Johnson, M. C. Runge, and J. A. Royle, and acknowledge that information provided by USGS in this report has not received the Director's approval and, as such, is provisional and subject to revision.

Cover art: 2013 Federal Duck stamp artist Adam Grimm's painting of a pair of canvasbacks (*Aythya valisineria*).

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1 EXECUTIVE SUMMARY

In 1995 the U.S. Fish and Wildlife Service (USFWS) implemented the Adaptive Harvest Management (AHM) program for setting duck hunting regulations in the United States. The AHM approach provides a framework for making objective decisions in the face of incomplete knowledge concerning waterfowl population dynamics and regulatory impacts.

The AHM protocol is based on the population dynamics and status of three mallard (*Anas platyrhynchos*) stocks. Mid-continent mallards are defined as those breeding in the Waterfowl Breeding Population and Habitat Survey (WBPHS) strata 13–18, 20–50, and 75–77 plus mallards breeding in the states of Michigan, Minnesota, and Wisconsin (state surveys). The prescribed regulatory alternative for the Mississippi and Central Flyways depends exclusively on the status of these mallards. Eastern mallards are defined as those breeding in WBPHS strata 51–54 and 56 and breeding in the states of Virginia northward into New Hampshire (Atlantic Flyway Breeding Waterfowl Survey [AFBWS]). The regulatory choice for the Atlantic Flyway depends exclusively on the status of these mallards. Western mallards are defined as those birds breeding in WBPHS strata 1–12 (hereafter Alaska) and those birds breeding in the states of California and Oregon (state surveys). The regulatory choice for the Pacific Flyway depends exclusively on the status of these mallards.

Mallard population models are based on the best available information and account for uncertainty in population dynamics and the impact of harvest. Model-specific weights reflect the relative confidence in alternative hypotheses and are updated annually using comparisons of predicted to observed population sizes. For mid-continent mallards, current model weights favor the weakly density-dependent reproductive hypothesis (98%) and the additive-mortality hypothesis (68%). Unlike mid-continent and eastern mallards, we consider a single functional form to predict western mallard population dynamics but consider a wide range of parameter values each weighted relative to the support from the data.

In 2013, mechanical problems and corresponding safety concerns with USFWS aircraft limited survey coverage in the eastern strata of the WBPHS, precluding the calculation of a total population estimate (see U.S. Fish and Wildlife Service 2013). In the absence of a 2013 eastern mallard breeding population estimate, we are unable to update eastern mallard model weights and optimal regulatory strategy. As a result, the 2014 eastern mallard AHM decision will be based on the 2014 eastern mallard population estimate and the optimal regulatory strategy derived for the Atlantic Flyway in 2012.

For the 2014 hunting season, the USFWS is considering the same regulatory alternatives as last year. The nature of the restrictive, moderate, and liberal alternatives has remained essentially unchanged since 1997, except that extended framework dates have been offered in the moderate and liberal alternatives since 2002. Harvest rates associated with each of the regulatory alternatives have been updated based on preseason band-recovery data. The expected harvest rates of adult males under liberal hunting seasons are 0.11 (SD = 0.02), 0.14 (SD = 0.04), and 0.12 (SD = 0.03) for mid-continent, eastern, and western mallards, respectively.

Optimal regulatory strategies for the 2014 hunting season were calculated using: (1) harvest-management objectives specific to each mallard stock; (2) the 2014 regulatory alternatives; and (3) current population models. Based on this year's survey results of 11.04 million mid-continent mallards, 4.63 million ponds in Prairie Canada, 0.86 million eastern mallards, and 0.82 million western mallards observed in Alaska (0.50 million) and California-Oregon (0.32 million), the optimal choice for all four flyways is the liberal regulatory alternative.

AHM concepts and tools have been successfully applied toward the development of formal adaptive harvest management protocols that inform American black duck (*Anas rubripes*), northern pintail (*Anas acuta*), and scaup (*Aythya affinis, A. marila*) harvest decisions.

For black ducks, the optimal country-specific regulatory strategies for the 2014 hunting season were calculated in September 2013 using: (1) an objective to achieve 98% of long-term cumulative harvest, (2) current country-specific black duck regulatory alternatives, and (3) current parameter estimates and model weights. Based on the 2013 survey results of 0.62 million breeding black ducks and 0.50 million breeding mallards in the

core survey area, the optimal regulatory choices are the moderate regulatory alternative in Canada and the restrictive regulatory alternative in the U.S.

For pintails, optimal regulatory strategies for the 2014 hunting season were calculated using: (1) an objective of maximizing long-term cumulative harvest, including a closed-season constraint of 1.75 million birds, (2) current pintail regulatory alternatives, and (3) current population models and their relative weights. Based on this year's survey results of 3.22 million pintails observed at a mean latitude of 53.9 degrees, the optimal regulatory choice for all four Flyways is the liberal regulatory alternative with a 2-bird daily bag limit.

For scaup, optimal regulatory strategies for the 2014 hunting season were calculated using: (1) an objective to achieve 95% of long term cumulative harvest, (2) current scaup regulatory alternatives, and (3) updated model parameters and weights. Based on this year's survey results of 4.61 million scaup, the optimal regulatory choice for all four Flyways is the moderate regulatory alternative.

2 BACKGROUND

The annual process of setting duck-hunting regulations in the United States is based on a system of resource monitoring, data analyses, and rule-making (Blohm 1989). Each year, monitoring activities such as aerial surveys and hunter questionnaires provide information on population size, habitat conditions, and harvest levels. Data collected from this monitoring program are analyzed each year, and proposals for duck-hunting regulations are developed by the Flyway Councils, States, and USFWS. After extensive public review, the USFWS announces regulatory guidelines within which States can set their hunting seasons.

In 1995, the USFWS adopted the concept of adaptive resource management (Walters 1986) for regulating duck harvests in the United States. This approach explicitly recognizes that the consequences of hunting regulations cannot be predicted with certainty and provides a framework for making objective decisions in the face of that uncertainty (Williams and Johnson 1995). Inherent in the adaptive approach is an awareness that management performance can be maximized only if regulatory effects can be predicted reliably. Thus, adaptive management relies on an iterative cycle of monitoring, assessment, and decision-making to clarify the relationships among hunting regulations, harvests, and waterfowl abundance.

In regulating waterfowl harvests, managers face four fundamental sources of uncertainty (Nichols et al. 1995*a*, Johnson et al. 1996, Williams et al. 1996):

(1) environmental variation – the temporal and spatial variation in weather conditions and other key features of waterfowl habitat; an example is the annual change in the number of ponds in the Prairie Pothole Region, where water conditions influence duck reproductive success;

(2) partial controllability – the ability of managers to control harvest only within limits; the harvest resulting from a particular set of hunting regulations cannot be predicted with certainty because of variation in weather conditions, timing of migration, hunter effort, and other factors;

(3) partial observability – the ability to estimate key population attributes (e.g., population size, reproductive rate, harvest) only within the precision afforded by extant monitoring programs; and

(4) structural uncertainty – an incomplete understanding of biological processes; a familiar example is the long-standing debate about whether harvest is additive to other sources of mortality or whether populations compensate for hunting losses through reduced natural mortality. Structural uncertainty increases contentiousness in the decision-making process and decreases the extent to which managers can meet long-term conservation goals.

AHM was developed as a systematic process for dealing objectively with these uncertainties. The key components of AHM include (Johnson et al. 1993, Williams and Johnson 1995):

(1) a limited number of regulatory alternatives, which describe Flyway-specific season lengths, bag limits, and framework dates;

(2) a set of population models describing various hypotheses about the effects of harvest and environmental factors on waterfowl abundance;

(3) a measure of reliability (probability or "weight") for each population model; and

(4) a mathematical description of the objective(s) of harvest management (i.e., an "objective function"), by which alternative regulatory strategies can be compared.

These components are used in a stochastic optimization procedure to derive a regulatory strategy. A regulatory strategy specifies the optimal regulatory choice, with respect to the stated management objectives, for each possible combination of breeding population size, environmental conditions, and model weights (Johnson et al. 1997). The setting of annual hunting regulations then involves an iterative process:

(1) each year, an optimal regulatory choice is identified based on resource and environmental conditions, and on current model weights;

(2) after the regulatory decision is made, model-specific predictions for subsequent breeding population size are determined;

(3) when monitoring data become available, model weights are increased to the extent that observations of population size agree with predictions, and decreased to the extent that they disagree; and

(4) the new model weights are used to start another iteration of the process.

By iteratively updating model weights and optimizing regulatory choices, the process should eventually identify which model is the best overall predictor of changes in population abundance. The process is optimal in the sense that it provides the regulatory choice each year necessary to maximize management performance. It is adaptive in the sense that the harvest strategy evolves to account for new knowledge generated by a comparison of predicted and observed population sizes.

3 MALLARD STOCKS AND FLYWAY MANAGEMENT

Since its inception AHM has focused on the population dynamics and harvest potential of mallards, especially those breeding in mid-continent North America. Mallards constitute a large portion of the total U.S. duck harvest, and traditionally have been a reliable indicator of the status of many other species. Geographic differences in the reproduction, mortality, and migrations of mallard stocks suggest that there may be corresponding differences in optimal levels of sport harvest. The ability to regulate harvests of mallards originating from various breeding areas is complicated, however, by the fact that a large degree of mixing occurs during the hunting season. The challenge for managers, then, is to vary hunting regulations among Flyways in a manner that recognizes each Flyway's unique breeding-ground derivation of mallards. Of course, no Flyway receives mallards exclusively from one breeding area; therefore, Flyway-specific harvest strategies ideally should account for multiple breeding stocks that are exposed to a common harvest.

The optimization procedures used in AHM can account for breeding populations of mallards beyond the mid-continent region, and for the manner in which these ducks distribute themselves among the Flyways during the hunting season. An optimal approach would allow for Flyway-specific regulatory strategies, which represent an average of the optimal harvest strategies for each contributing breeding stock weighted by the relative size of each stock in the fall flight. This joint optimization of multiple mallard stocks requires: (1) models of population dynamics for all recognized stocks of mallards; (2) an objective function that accounts for harvest-management goals for all mallard stocks in the aggregate; and (3) decision rules allowing Flyway-specific regulatory choices. At present, however, a joint optimization of western, mid-continent, and eastern stocks is not feasible due to computational hurdles. However, our preliminary analyses suggest that the lack of a joint optimization does not result in a significant decrease in performance.

Currently, three stocks of mallards are officially recognized for the purposes of AHM (Figure 1). We use a constrained approach to the optimization of these stocks' harvest, in which the Atlantic Flyway regulatory strategy is based exclusively on the status of eastern mallards, the regulatory strategy for the Mississippi and Central Flyways is based exclusively on the status of mid-continent mallards, and the Pacific Flyway regulatory strategy is based exclusively on the status of western mallards.

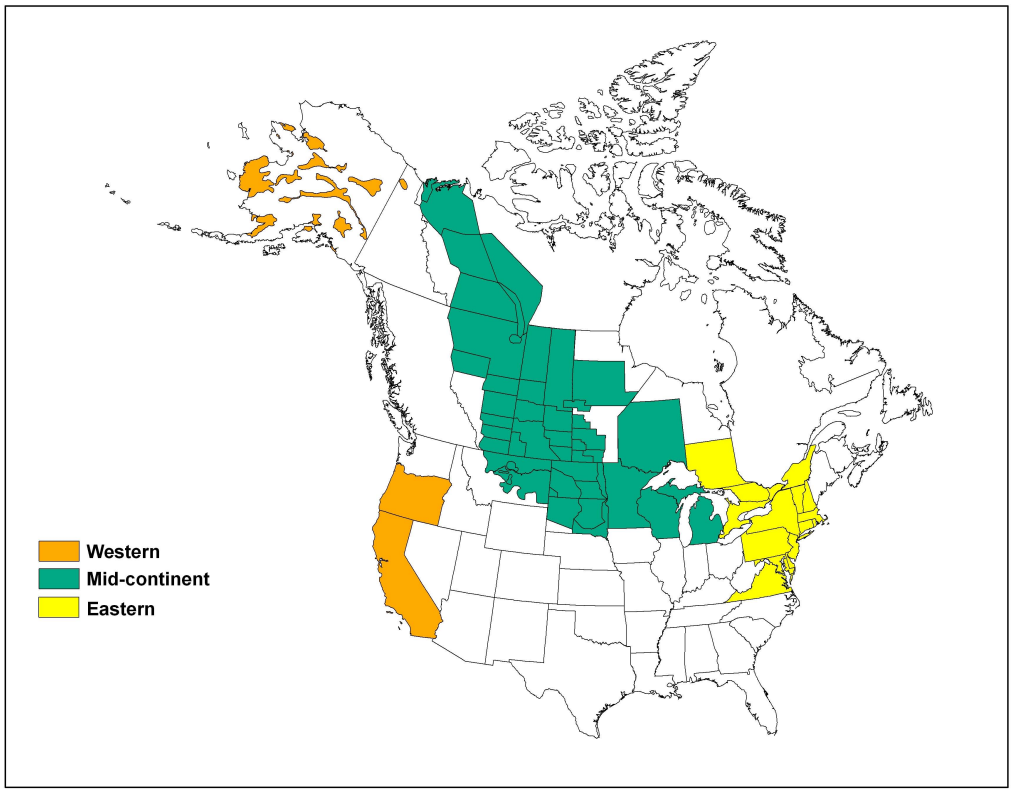


Figure 1 – Survey areas currently assigned to the mid-continent, eastern, and western stocks of mallards for the purposes of AHM.

4 MALLARD POPULATION DYNAMICS

4.1 Mid-continent Stock

Mid-continent mallards are defined as those breeding in WBPHS strata 13–18, 20–50, and 75–77, and in the Great Lakes region (Michigan, Minnesota, and Wisconsin; see Figure 1). Estimates of the size of this population are available since 1992, and have varied from 6.3 to 11.1 million (Table C.1, Figure 2). Estimated breeding-population size in 2014 was 11.04 million (SE = 0.35 million), including 10.4 million (SE = 0.34 million) from the WBPHS and 0.65 million (SE = 0.07 million) from the Great Lakes region.

Details describing the set of population models for mid-continent mallards are provided in Appendix C. The set consists of four alternatives, formed by the combination of two survival hypotheses (additive vs. compensatory hunting mortality) and two reproductive hypotheses (strongly vs. weakly density dependent). Relative weights for the alternative models of mid-continent mallards changed little until all models underpredicted the change in population size from 1998 to 1999, perhaps indicating there is a significant factor affecting population dynamics that is absent from all four models (Figure 3). Updated model weights suggest a preference for the additive-mortality models (68%) over those describing hunting mortality as compensatory (32%). For most of the time frame, model weights have strongly favored the weakly density-dependent reproductive models over the strongly density-dependent ones, with current model weights of 98% and 2%, respectively. The reader is cautioned, however, that models can sometimes make reliable predictions of population size for reasons having little to do with the biological hypotheses expressed therein (Johnson et al. 2002*b*).

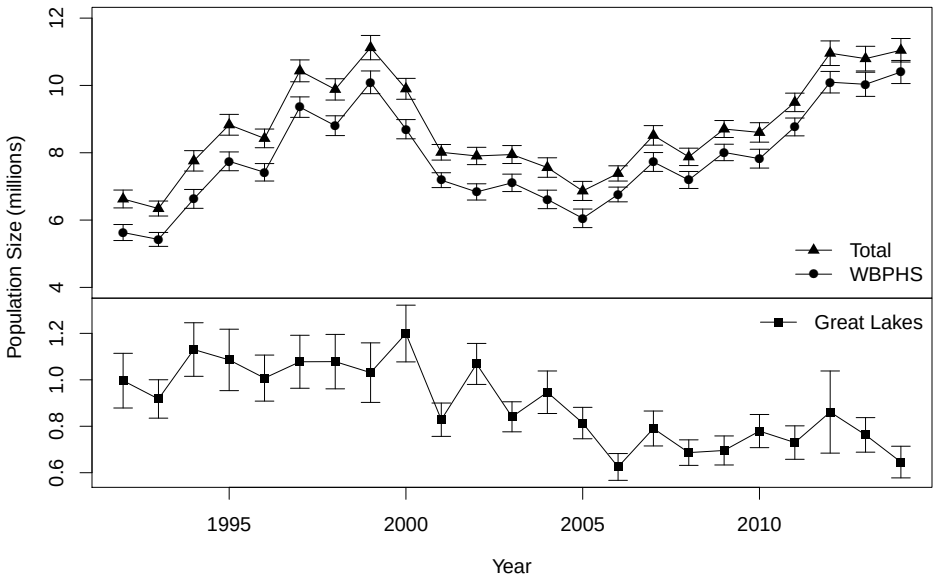


Figure 2 – Population estimates of mid-continent mallards observed in the WBPHS (strata: 13–18, 20–50, and 75–77) and the Great Lakes region (Michigan, Minnesota, and Wisconsin) from 1992 to 2014. Error bars represent one standard error.

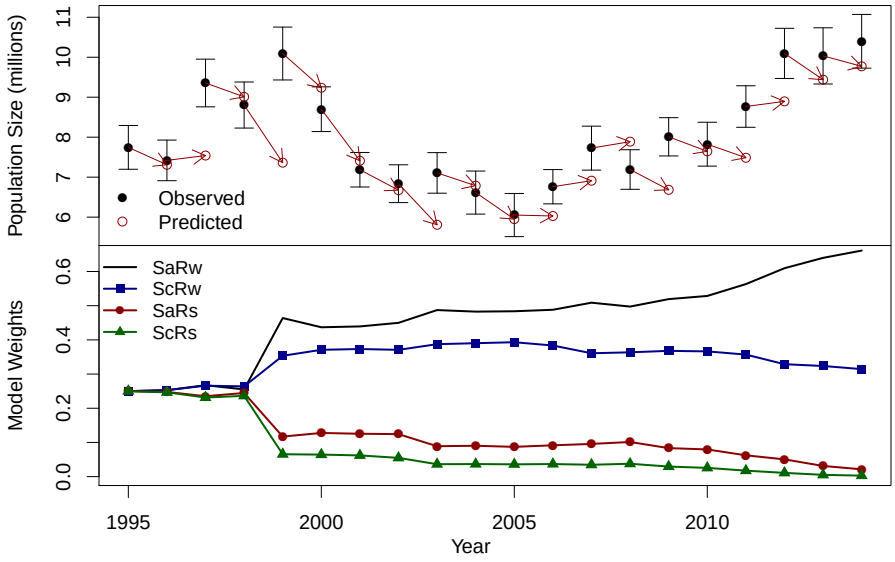


Figure 3 – Top panel: population estimates of mid-continent mallards observed in the WBPHS compared to mid-continent mallard model set predictions (weighted average based on 2014 model weight updates) from 1996 to 2014. Error bars represent 95% confidence intervals. Bottom panel: mid-continent mallard model weights (SaRw = additive mortality and weakly density-dependent reproduction, ScRw = compensatory mortality and weakly density-dependent reproduction, SaRs = additive mortality and strongly density-dependent reproduction, ScRs = compensatory mortality and strongly density-dependent reproduction). Model weights were assumed to be equal in 1995.

4.2 Eastern Stock

Eastern mallards are defined as those breeding in southern Ontario and Quebec (WBPHS strata 51–54 and 56) and in the northeastern U.S.(AFBWS; Heusmann and Sauer 2000, see Figure 1). Estimates of population size have varied from 0.75 to 1.1 million since 1990, with the majority of the population accounted for in the northeastern U.S.(Table D.1, Figure 4). For 2014, the estimated breeding-population size of eastern mallards was 0.86 million (SE = 0.06 million), including 0.22 million (SE = 0.04 million) from the WBPHS and 0.63 million (SE = 0.05 million) from the northeastern U.S.

During the spring of 2013, mechanical problems and corresponding safety concerns with USFWS planes limited survey coverage of the eastern survey strata in the WBPHS (for more details see U.S. Fish and Wildlife Service 2013). Because a 2013 population estimate for the eastern mallard stock is unavailable, we are unable to update model weights and derive a 2014 harvest policy with existing AHM protocols. As a result, the 2014 eastern mallard regulatory decision will be based on the 2014 eastern mallard population estimate and the optimal regulatory strategy derived for the Atlantic Flyway in 2012 (U.S. Fish and Wildlife Service 2012).

Details describing the population models used for eastern mallard AHM are provided in Appendix D. The set consists of four alternatives, formed by the combination of two reproductive hypotheses (strongly vs. weakly density dependent) and two survival hypotheses (additive vs. compensatory hunting mortality). Model weights for the eastern mallard model set were computed with a retrospective assessment of relative model performance based on the most reliable harvest rate information available from 2002 through 2011. The 2012 model weight updates calculated with the eastern mallard model set suggest support for the weakly density-dependent reproductive hypothesis 68% and the additive harvest mortality hypothesis 70% (Figure 5).

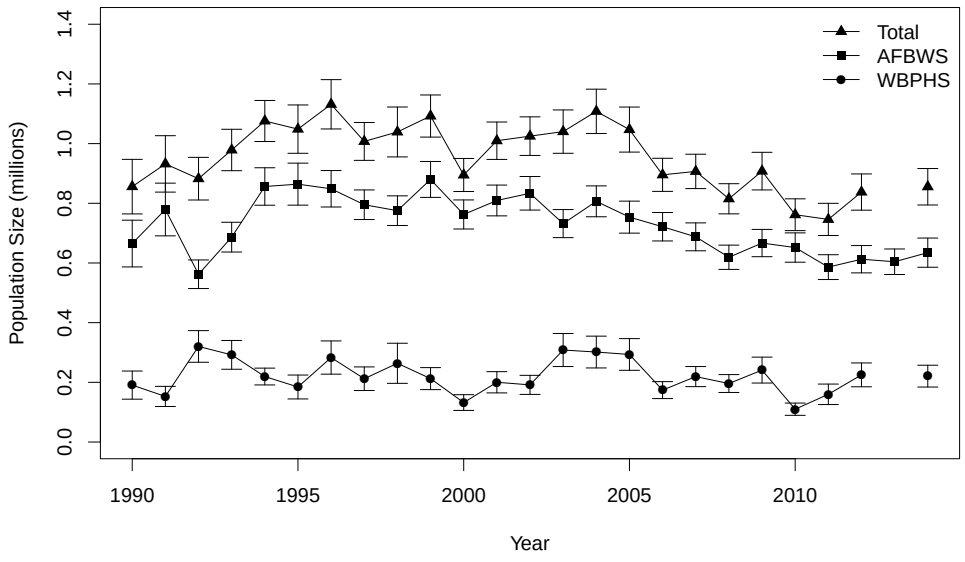


Figure 4 – Population estimates of eastern mallards observed in the northeastern states (AFBWS) and in southern Ontario and Quebec (WBPHS strata 51–54 and 56) from 1990 to 2014. In 2013, population estimates were only available for the northeastern states (AFBWS). Error bars represent one standard error.

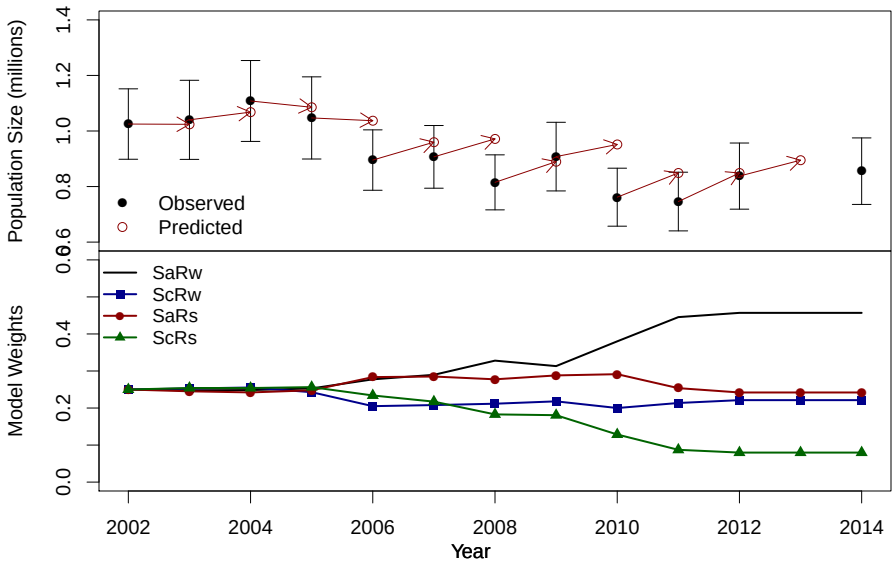


Figure 5 – Top panel: population estimates of eastern mallards observed in the WBPHS and the AFBWS compared to eastern mallard model set predictions (weighted average based on 2012 model weight updates) from 2003 to 2013. Error bars represent 95% confidence intervals. Bottom panel: eastern mallard model weights (SaRw = additive mortality and weakly density-dependent reproduction, ScRw = compensatory mortality and weakly density-dependent reproduction, SaRs = additive mortality and strongly density-dependent reproduction, ScRs = compensatory mortality and strongly density-dependent reproduction). Model weights were assumed to be equal in 2002. Model weights were not updated in 2013–14 because observed breeding population estimates were not available in 2013.

4.3 Western Stock

Western mallards consist of 2 substocks and are defined as those birds breeding in Alaska (WBPHS strata 1–12) and those birds breeding in California and Oregon (state surveys; see Figure 1). Estimates of the size of these subpopulations have varied from 0.28 to 0.84 million in Alaska since 1990 and 0.32 to 0.69 million in California-Oregon since 1992 (Table E.1, Figure 6). The total population size of western mallards has ranged from 0.72 to 1.40 million. For 2014, the estimated breeding-population size of western mallards was 0.82 million (SE = 0.08 million), including 0.50 million (SE = 0.06 million) from Alaska and 0.32 million (SE = 0.06 million) from California-Oregon.

Ideally, the western mallard stock assessment would account for mallards breeding in all states of the Pacific Flyway (including Alaska), British Columbia, and the Yukon Territory. However, we have had continuing concerns about our ability to determine changes in population size based on the collection of surveys conducted independently by Pacific Flyway States and the CWS in British Columbia. These surveys tend to vary in design and intensity, and in some cases lack measures of precision. We reviewed extant surveys to determine their adequacy for supporting a western-mallard AHM protocol and selected Alaska, California, and Oregon for modeling purposes. These three states likely harbor about 75% of the western-mallard breeding population. Nonetheless, this geographic delineation is considered temporary until surveys in other areas can be brought up to similar standards and an adequate record of population estimates is available for analysis.

Details concerning the set of population models for western mallards are provided in Appendix E. To predict changes in abundance we relied on a discrete logistic model, which combines reproduction and natural mortality into a single parameter, r, the intrinsic rate of growth. This model assumes density-dependent growth, which is regulated by the ratio of population size, N, to the carrying capacity of the environment,

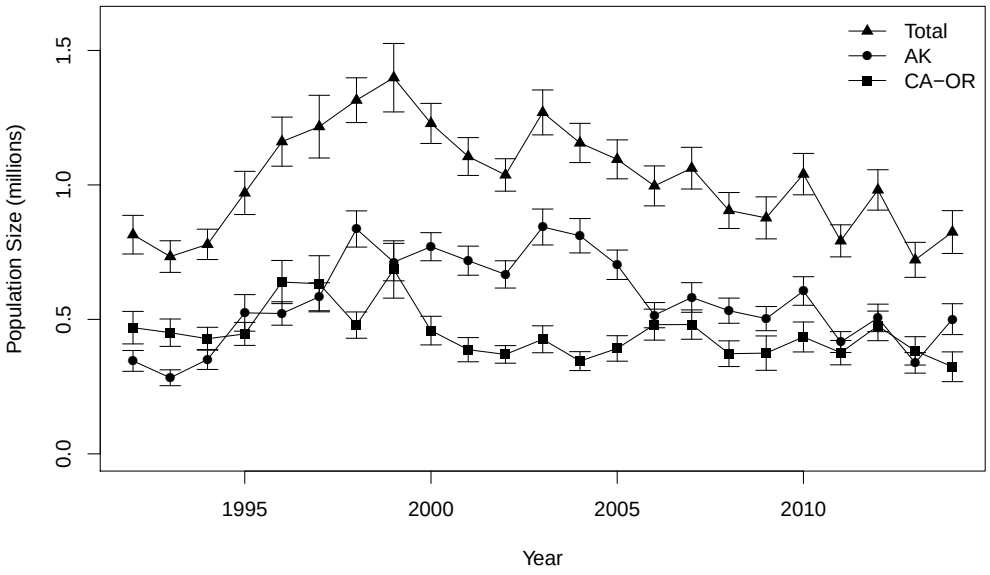


Figure 6 – Population estimates of western mallards observed in Alaska (WBPHS strata 1–12) and California-Oregon (state surveys) combined from 1992 to 2014. Error bars represent one standard error.

K (i.e., equilibrium population size in the absence of harvest). In the traditional formulation of the logistic model, harvest mortality is completely additive and any compensation for hunting losses occurs as a result of density-dependent responses beginning in the subsequent breeding season. To increase the model's generality we included a scaling parameter for harvest that allows for the possibility of compensation prior to the breeding season. It is important to note, however, that this parameterization does not incorporate any hypothesized mechanism for harvest compensation and, therefore, must be interpreted cautiously. We modeled Alaska mallards independently of those in California and Oregon because of differing population trajectories (see Figure 6) and substantial differences in the distribution of band recoveries.

We used Bayesian estimation methods in combination with a state-space model that accounts explicitly for both process and observation error in breeding population size (Meyer and Millar 1999). Breeding population estimates of mallards in Alaska are available since 1955, but we had to limit the time series to 1990–2013 because of changes in survey methodology and insufficient band-recovery data. The logistic model and associated posterior parameter estimates provided a reasonable fit to the observed time series of Alaska population estimates. The estimated median carrying capacity was 1.02 million and the intrinsic rate of growth was 0.27. The posterior median estimate of the scaling parameter was 1.26, suggesting that harvest mortality may be additive. Breeding population and harvest-rate data were available for California-Oregon mallards for the period 1992–2013. The logistic model also provided a reasonable fit to these data. The estimated median carrying capacity was 0.59 million, and the intrinsic rate of growth was 0.31. The posterior median estimate of the scaling parameter was 0.58, suggesting that harvest mortality may be partially compensatory.

The AHM protocol for western mallards is structured similarly to that used for eastern mallards, in which an optimal harvest strategy is based on the status of a single breeding stock and harvest regulations in a single flyway. Although the contribution of mid-continent mallards to the Pacific Flyway harvest is significant, we believe an independent harvest strategy for western mallards poses little risk to the mid-continent stock. Further analyses will be needed to confirm this conclusion, and to better understand the potential effect of mid-continent mallard status on sustainable hunting opportunities in the Pacific Flyway.

5 HARVEST-MANAGEMENT OBJECTIVES

The basic harvest-management objective for mid-continent mallards is to maximize cumulative harvest over the long term, which inherently requires perpetuation of a viable population. Moreover, this objective is constrained to avoid regulations that could be expected to result in a subsequent population size below the goal of the North American Waterfowl Management Plan (NAWMP). According to this constraint, the value of harvest decreases proportionally as the difference between the goal and expected population size increases. This balance of harvest and population objectives results in a regulatory strategy that is more conservative than that for maximizing long-term harvest, but more liberal than a strategy to attain the NAWMP goal (regardless of effects on hunting opportunity). The current objective for mid-continent mallards uses a population goal of 8.5 million birds, which consists of 7.9 million mallards from the WBPHS (strata 13–18, 20–50, and 75–77) corresponding to the mallard population goal in the 1998 update of the NAWMP (less the portion of the mallard goal comprised of birds breeding in Alaska) and a goal of 0.6 million for the combined states of Michigan, Minnesota, and Wisconsin.

For eastern and western mallards, there is no NAWMP goal or other established target for desired population size. Accordingly, the management objective for eastern and western mallards is to maximize long-term cumulative (i.e., sustainable) harvest. Additionally for western mallards, maximum long-term cumulative harvest is subject to a constraint intended to prevent extreme changes in regulations associated with relatively small changes in population sizes.

6 REGULATORY ALTERNATIVES

6.1 Evolution of Alternatives

When AHM was first implemented in 1995, three regulatory alternatives characterized as liberal, moderate, and restrictive were defined based on regulations used during 1979–84, 1985–87, and 1988–93, respectively. These regulatory alternatives also were considered for the 1996 hunting season. In 1997, the regulatory alternatives were modified to include: (1) the addition of a very-restrictive alternative; (2) additional days and a higher duck bag limit in the moderate and liberal alternatives; and (3) an increase in the bag limit of hen mallards in the moderate and liberal alternatives. In 2002, the USFWS further modified the moderate and liberal alternatives to include extensions of approximately one week in both the opening and closing framework dates.

In 2003, the very-restrictive alternative was eliminated at the request of the Flyway Councils. Expected harvest rates under the very-restrictive alternative did not differ significantly from those under the restrictive alternative, and the very-restrictive alternative was expected to be prescribed for $<5\%$ of all hunting seasons. Also in 2003, at the request of the Flyway Councils the USFWS agreed to exclude closed duck-hunting seasons from the AHM protocol when the population size of mid-continent mallards (as defined in 2003: WBPHS strata 1–18, 20–50, and 75–77 plus the Great Lakes region) was $\geq$5.5 million. Based on our original assessment, closed hunting seasons did not appear to be necessary from the perspective of sustainable harvesting when the mid-continent mallard population exceeded this level. The impact of maintaining open seasons above this level also appeared negligible for other mid-continent duck species, as based on population models developed by Johnson (2003).

In 2008, the mid-continent mallard stock was redefined to exclude mallards breeding in Alaska, necessitating a re-scaling of the closed-season constraint. Initially, we attempted to adjust the original 5.5 million closure threshold by subtracting out the 1985 Alaska breeding population estimate, which was the year upon which the original closed season constraint was based. Our initial re-scaling resulted in a new threshold equal to 5.25 million. Simulations based on optimal policies using this revised closed season constraint suggested that the Mississippi and Central Flyways would experience a 70% increase in the frequency of closed seasons. At

that time, we agreed to consider alternative re-scalings in order to minimize the effects on the mid-continent mallard strategy and account for the increase in mean breeding population sizes in Alaska over the past several decades. Based on this assessment, we recommended a revised closed season constraint of 4.75 million which resulted in a strategy performance equivalent to the performance expected prior to the re-definition of the mid-continent mallard stock. Because the performance of the revised strategy is essentially unchanged from the original strategy, we believe it will have no greater impact on other duck stocks in the Mississippi and Central Flyways. However, complete- or partial-season closures for particular species or populations could still be deemed necessary in some situations regardless of the status of mid-continent mallards. Details of the regulatory alternatives for each Flyway are provided in Table 1.

6.2 Regulation-Specific Harvest Rates

Harvest rates of mallards associated with each of the open-season regulatory alternatives were initially predicted using harvest-rate estimates from 1979–84, which were adjusted to reflect current hunter numbers and contemporary specifications of season lengths and bag limits. In the case of closed seasons in the U.S., we assumed rates of harvest would be similar to those observed in Canada during 1988–93, which was a period of restrictive regulations both in Canada and the U.S. All harvest-rate predictions were based only in part on band-recovery data, and relied heavily on models of hunting effort and success derived from hunter surveys (Appendix C in U.S. Fish and Wildlife Service 2002). As such, these predictions had large sampling variances and their accuracy was uncertain.

In 2002, we began relying on Bayesian statistical methods for improving regulation-specific predictions of harvest rates, including predictions of the effects of framework-date extensions. Essentially, the idea is to use existing (prior) information to develop initial harvest-rate predictions (as above), to make regulatory

Table 1 – Regulatory alternatives for the 2014 duck-hunting season.

	Flyway			
Regulation	**Atlantic**[a]	**Mississippi**	**Central**[b]	**Pacific**[c]
Shooting Hours	one-half hour before sunrise to sunset			
	Framework Dates			
Restrictive	Oct 1–Jan 20	Saturday nearest Oct 1 to the Sunday nearest Jan 20		
Moderate	Saturday nearest September 24 to the last Sunday in January			
Liberal				
	Season Length (days)			
Restrictive	30	30	39	60
Moderate	45	45	60	86
Liberal	60	60	74	107
	Bag Limit (total / mallard / hen mallard)			
Restrictive	3 / 3 / 1	3 / 2 / 1	3 / 3 / 1	4 / 3 / 1
Moderate	6 / 4 / 2	6 / 4 / 1	6 / 5 / 1	7 / 5 / 2
Liberal	6 / 4 / 2	6 / 4 / 2	6 / 5 / 2	7 / 7 / 2

[a] The states of Maine, Massachusetts, Connecticut, Pennsylvania, New Jersey, Maryland, Delaware, West Virginia, Virginia, and North Carolina are permitted to exclude Sundays, which are closed to hunting, from their total allotment of season days.

[b] The High Plains Mallard Management Unit is allowed 12, 23, and 23 extra days in the restrictive, moderate, and liberal alternatives, respectively.

[c] The Columbia Basin Mallard Management Unit is allowed seven extra days in the restrictive and moderate alternatives.

decisions based on those predictions, and then to observe realized harvest rates. Those observed harvest rates, in turn, are treated as new sources of information for calculating updated (posterior) predictions. Bayesian methods are attractive because they provide a quantitative, formal, and an intuitive approach to adaptive management.

Annual harvest rate estimates for each mallard stock are updated with band-recovery information from a cooperative banding program between the USFWS, CWS, along with state, provincial, and other participating partners. Recovery rate estimates from these data are adjusted with reporting rate probabilities resulting from a recent reward band study from 2002 to 2010 (Boomer et al. 2013). For mid-continent mallards, we have empirical estimates of harvest rate from the recent period of liberal hunting regulations (1998–2013). Bayesian methods allow us to combine these estimates with our prior predictions to provide updated estimates of harvest rates expected under the liberal regulatory alternative. Moreover, in the absence of experience (so far) with the restrictive and moderate regulatory alternatives, we reasoned that our initial predictions of harvest rates associated with those alternatives should be re-scaled based on a comparison of predicted and observed harvest rates under the liberal regulatory alternative. In other words, if observed harvest rates under the liberal alternative were 10% less than predicted, then we might also expect that the mean harvest rate under the moderate alternative would be 10% less than predicted. The appropriate scaling factors currently are based exclusively on prior beliefs about differences in mean harvest rate among regulatory alternatives, but they will be updated once we have experience with something other than the liberal alternative. A detailed description of the analytical framework for modeling mallard harvest rates is provided in Appendix F.

Our models of regulation-specific harvest rates also allow for the marginal effect of framework-date extensions in the moderate and liberal alternatives. A previous analysis by the U.S. Fish and Wildlife Service (2001) suggested that implementation of framework-date extensions might be expected to increase the harvest rate of mid-continent mallards by about 15%, or in absolute terms by about 0.02 (SD = 0.01). Based on the observed harvest rates during the 2002–2013 hunting seasons, the updated (posterior) estimate of the marginal change in harvest rate attributable to the framework-date extension is 0.006 (SD = 0.007). The estimated effect of the framework-date extension has been to increase harvest rate of mid-continent mallards by about 6% over what would otherwise be expected in the liberal alternative. However, the reader is strongly cautioned that reliable inference about the marginal effect of framework-date extensions ultimately depends on a rigorous experimental design (including controls and random application of treatments).

Current predictions of harvest rates of adult-male mid-continent mallards associated with each of the regulatory alternatives are provided in Table 2. Predictions of harvest rates for the other age and sex cohorts are based on the historical ratios of cohort-specific harvest rates to adult-male rates (Runge et al. 2002). These ratios are considered fixed at their long-term averages and are 1.5407, 0.7191, and 1.1175 for young males, adult females, and young females, respectively. We make the simplifying assumption that the harvest rates of mid-continent mallards depend solely on the regulatory choice in the Mississippi and Central Flyways.

The predicted harvest rates of eastern mallards are updated in the same fashion as that for mid-continent mallards based on preseason banding conducted in eastern Canada and the northeastern U.S.(Appendix F). Like mid-continent mallards, harvest rates of age and sex cohorts other than adult male mallards are based

Table 2 – Predictions of harvest rates of adult, male, mid-continent, eastern, and western mallards expected with application of the 2014 regulatory alternatives in the Mississippi and Central, Atlantic, and Pacific Flyways.

	Mid-continent		Eastern		Western	
Regulatory Alternative	Mean	SD	Mean	SD	Mean	SD
Closed (U.S.)	0.0088	0.0019	0.0797	0.0231	0.0081	0.0181
Restrictive	0.0553	0.0129	0.1064	0.0393	0.0612	0.0173
Moderate	0.0987	0.0215	0.1294	0.0472	0.1020	0.0288
Liberal	0.1146	0.0184	0.1415	0.0368	0.1203	0.0290

on constant rates of differential vulnerability as derived from band-recovery data. For eastern mallards, these constants are 1.1534, 1.3306, and 1.5090 for adult females, young males, and young females, respectively (Johnson et al. 2002*a*). Regulation-specific predictions of harvest rates of adult-male eastern mallards are provided in Table 2.

In contrast to mid-continent mallards, framework-date extensions were expected to increase the harvest rate of eastern mallards by only about 5% (U.S. Fish and Wildlife Service 2001), or in absolute terms by about 0.01 (SD = 0.01). Based on the observed harvest rates during the 2002–2013 hunting seasons, the updated (posterior) estimate of the marginal change in harvest rate attributable to the framework-date extension is 0.002 (SD = 0.009). The estimated effect of the framework-date extension has been to increase harvest rate of eastern mallards by about 1.5% over what would otherwise be expected in the liberal alternative.

Based on available estimates of harvest rates of mallards banded in California and Oregon during 1990–1995 and 2002–2007, there was no apparent relationship between harvest rate and regulatory changes in the Pacific Flyway. This is unusual given our ability to document such a relationship in other mallard stocks and in other species. We note, however, that the period 2002–2007 was comprised of both stable and liberal regulations and harvest rate estimates were based solely on reward bands. Regulations were relatively restrictive during most of the earlier period and harvest rates were estimated based on standard bands using reporting rates estimated from reward banding during 1987–1988. Additionally, 1993–1995 were transition years in which full-address and toll-free bands were being introduced and information to assess their reporting rates (and their effects on reporting rates of standard bands) is limited. Thus, the two periods in which we wish to compare harvest rates are characterized not only by changes in regulations, but also in estimation methods.

Consequently, we lack a sound empirical basis for predicting harvest rates of western mallards associated with current regulatory alternatives in the Pacific Flyway. In 2009, we began using Bayesian statistical methods for improving regulation-specific predictions of harvest rates (see Appendix F). The methodology is analogous to that currently in use for mid-continent and eastern mallards except that the marginal effect of framework date extensions in moderate and liberal alternatives is inestimable because there are no data prior to implementation of extensions. In 2008, we specified prior regulation-specific harvest rates of 0.01, 0.06, 0.09, and 0.11 with associated standard deviations of 0.003, 0.02, 0.03, and 0.03 for the closed, restrictive, moderate, and liberal alternatives, respectively. The harvest rates for the liberal alternative were based on empirical estimates realized under the current liberal alternative during 2002–2007 and determined from adult-male mallards banded with reward bands and standard bands adjusted for band reporting rates in California and Oregon. Harvest rates for the moderate and restrictive alternatives were based on the proportional (0.85 and 0.51) difference in harvest rates expected for mid-continent mallards under the respective alternatives. And finally, harvest rate for the closed alternative was based on what we might realize with a closed season in the U.S.(including Alaska) and a very restrictive season in Canada, similar to that for mid-continent mallards. A relatively large standard deviation (CV = 0.3) was chosen to reflect greater uncertainty about the means than that for mid-continent mallards (CV = 0.2). Current predictions of harvest rates of adult-male western mallards associated with each regulatory alternative are provided in Table 2.

7 OPTIMAL REGULATORY STRATEGIES

Using stochastic dynamic programming (Lubow 1995, Johnson and Williams 1999), we calculated the optimal regulatory strategy for the Mississippi and Central Flyways based on: (1) the 2014 regulatory alternatives, including the closed-season constraint; (2) current population models and associated weights for mid-continent mallards; and (3) the dual objectives of maximizing long-term cumulative harvest and achieving a population goal of 8.5 million mid-continent mallards. The resulting regulatory strategy (Table 3) is similar to that used last year. Note that prescriptions for closed seasons in this strategy represent resource conditions that are insufficient to support one of the current regulatory alternatives, given current harvest-management objectives and constraints. However, closed seasons under all of these conditions are not necessarily required for long-term resource protection, and simply reflect the NAWMP population goal and the nature of the current regulatory alternatives. Assuming that regulatory choices adhered to this strategy (and that current model

weights accurately reflect population dynamics), breeding-population size would be expected to average 7.27 million (SD = 1.97 million). Based on an estimated population size of 11.04 million mid-continent mallards and 4.63 million ponds in Prairie Canada, the optimal choice for the Mississippi and Central Flyways in 2014 is the liberal regulatory alternative.

Table 3 – Optimal regulatory strategy[a] for the Mississippi and Central Flyways for the 2014 hunting season. This strategy is based on current regulatory alternatives (including the closed-season constraint), mid-continent mallard models and weights, and the dual objectives of maximizing long-term cumulative harvest and achieving a population goal of 8.5 million mallards. The shaded cell indicates the regulatory prescription for 2014.

	Ponds[c]									
BPOP[b]	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
≤4.5	C	C	C	C	C	C	C	C	C	C
4.75–6.25	R	R	R	R	R	R	R	R	R	R
6.5	R	R	R	R	R	R	R	R	R	M
6.75	R	R	R	R	R	R	R	M	M	L
7	R	R	R	R	R	M	M	M	L	L
7.25	R	R	R	M	M	M	L	L	L	L
7.5	R	R	M	M	L	L	L	L	L	L
7.75	M	M	M	L	L	L	L	L	L	L
≥8.0	L	L	L	L	L	L	L	L	L	L

[a] C = closed season, R = restrictive, M = moderate, L = liberal.

[b] Mallard breeding population size (in millions) in the WBPHS (strata 13–18, 20–50, 75–77) and Michigan, Minnesota, and Wisconsin.

[c] Ponds (in millions) in Prairie Canada in May.

We calculated the optimal regulatory strategy for the Atlantic Flyway based on: (1) the 2012 regulatory alternatives; (2) the eastern mallard population models and 2012 model weights; and (3) an objective to maximize long-term cumulative harvest. The resulting strategy suggests liberal regulations for all population sizes of record, and is characterized by a lack of intermediate regulations (Table 4). We simulated the use of this regulatory strategy to determine expected performance characteristics. Assuming that harvest management adhered to this strategy (and that 2012 model weights accurately reflect population dynamics), breeding-population size would be expected to average 1.02 million (SD = 0.31 million). Based on an estimated breeding population size of 0.86 million mallards, the optimal choice for the Atlantic Flyway in 2014 is the liberal regulatory alternative.

We calculated the optimal regulatory strategy for the Pacific Flyway based on: (1) the 2014 regulatory alternatives, (2) current (1990–2013) population models and parameter estimates, and (3) an objective to

Table 4 – Optimal regulatory strategy[a] for the Atlantic Flyway for the 2014 hunting season. This strategy is based on current regulatory alternatives, eastern mallard models and 2012 model weights, and an objective to maximize long-term cumulative harvest. The shaded cell indicates the regulatory prescription for 2014.

Mallards[b]	Regulation
≤0.275	C
≥0.300	L

[a] C = closed season, L = liberal.

[b] Estimated number of mallards (in millions) in eastern Canada (WBPHS strata 51–54, 56) and the northeastern U.S. (AFBWS).

maximize long-term cumulative harvest subject to a constraint intended to prevent extreme changes in regulations associated with relatively small changes in population sizes (Table 5). We simulated the use of this regulatory strategy to determine expected performance characteristics. Assuming that harvest management adhered to this strategy (and that current model parameters accurately reflect population dynamics), breeding-population size would be expected to average 0.96 million (SD = 0.24 million) in Alaska and 0.44 million (SD = 0.03 million) in California-Oregon. Based on an estimated breeding population size of 0.50 million mallards in Alaska and 0.32 million in California-Oregon, the optimal choice for the Pacific Flyway in 2014 is the liberal regulatory alternative (see Table 5).

Table 5 – Optimal regulatory strategy[a] for the Pacific Flyway for the 2014 hunting season. This strategy is based on the 2014 regulatory alternatives, current (1990–2013) western mallard population models and parameter estimates, and an objective to maximize long-term cumulative harvest subject to a constraint intended to prevent extreme changes in regulations associated with relatively small changes in population sizes. The shaded cell indicates the regulatory prescription for 2014.

	Alaska BPOP[b]										
CA–OR BPOP[b]	0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	≥0.5
0	C	C	M	L	L	L	L	L	L	L	L
0.05	C	C	C	R	R	R	M	M	L	L	L
0.10	C	R	R	R	M	L	L	L	L	L	L
0.15	R	R	M	M	L	L	L	L	L	L	L
0.20	M	R	M	L	L	L	L	L	L	L	L
0.25	L	R	L	L	L	L	L	L	L	L	L
0.30	L	R	L	L	L	L	L	L	L	L	L
0.35	L	R	L	L	L	L	L	L	L	L	L
0.40	L	M	L	L	L	L	L	L	L	L	L
0.45	L	M	L	L	L	L	L	L	L	L	L
0.50	L	M	L	L	L	L	L	L	L	L	L
≥0.55	L	M	L	L	L	L	L	L	L	L	L

[a] C = closed season, R = restrictive, M = moderate, L = liberal.

[b] Estimated number of mallards (in millions) for Alaska (WBPHS strata 1–12) and in California-Oregon.

8 APPLICATION OF AHM CONCEPTS TO OTHER STOCKS

The USFWS is working to apply the principles and tools of AHM to improve decision-making for several other stocks of waterfowl. Below, we provide the 2014 AHM updates that are currently informing American black duck, northern pintail, and scaup harvest management decisions.

8.1 American Black Duck

Federal, state, and provincial agencies in the U.S. and Canada agreed that an international harvest strategy for black ducks is needed because the resource is valued by both countries and both countries have the ability to influence the resource through harvest. The partners also agreed a harvest strategy should be developed with an AHM approach based on the integrated breeding-ground survey data (Zimmerman et al. 2012, U.S. Fish and Wildlife Service 2013) and a formal approach to determining appropriate harvest levels with a fair allocation of the harvest between countries (Conroy 2010).

The overall goals of the Black Duck International Harvest strategy include:

(1) maintain a black duck population that meets legal mandates and provides consumptive and non-consumptive use commensurate with habitat carrying capacity;

(2) maintain societal values associated with the hunting tradition; and

(3) maintain equitable access to the black duck resource in Canada and the U.S.

The objectives of the harvest strategy are to achieve 98% of the long-term cumulative harvest and to share the allocated harvest (i.e., parity) equitably between countries. Historically, the realized allocation of harvest between Canada and the U.S. has ranged from 40% to 60% in either country. Recognizing the historical allocation and acknowledging incomplete control over harvest, parity is achieved through a constraint which discounts combinations of country-specific harvest rates that are expected to result in allocation of harvest that is >50% in one country. The constraint applies a mild penalty on country-specific harvest options that result in one country receiving >50% but <60% of the harvest allocation and a stronger discount on combinations resulting in one country receiving >60% of the harvest allocation (Figure 7). The goals and objectives of the black duck AHM framework were developed through a formal consultation process with representatives from the Canadian Wildlife Service, U.S. Fish and Wildlife Service, Atlantic Flyway Council and Mississippi Flyway Council.

Country-specific harvest opportunities were determined from a set of expected harvest rate distributions defined as regulatory packages. Initially, Canada developed 4 regulatory packages (liberal, moderate, restrictive and closed) and the U.S. developed 3 (moderate, restrictive, closed), with the Canadian moderate and U.S. restrictive packages defined as 1990–2010 harvest levels (Figure 8). Due to the lack of changes in black duck hunting regulations in either country since 1984 specific regulatory frameworks are not currently available for restrictive or liberal packages in Canada or the a moderate package in the U.S. Therefore, the Canadian restrictive package is designed to achieve a 30% reduction in mean harvest rate over the 1990-2010 mean harvest rate. Similarly, the liberal and moderate packages in Canada and U.S., respectively, are designed to

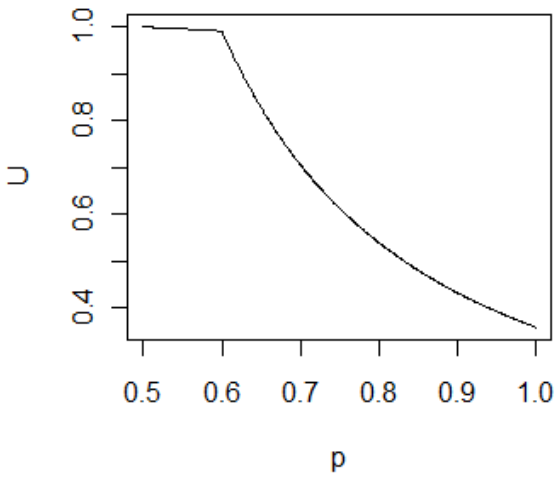


Figure 7 – Functional form of the harvest parity constraint designed to allocate allowable black duck harvest equally between the U.S. and Canada. Where p is the proportion of harvest allocated to one country, and U is the utility of a specific combination of country-specific harvest options in achieving the objective of black duck adaptive harvest management.

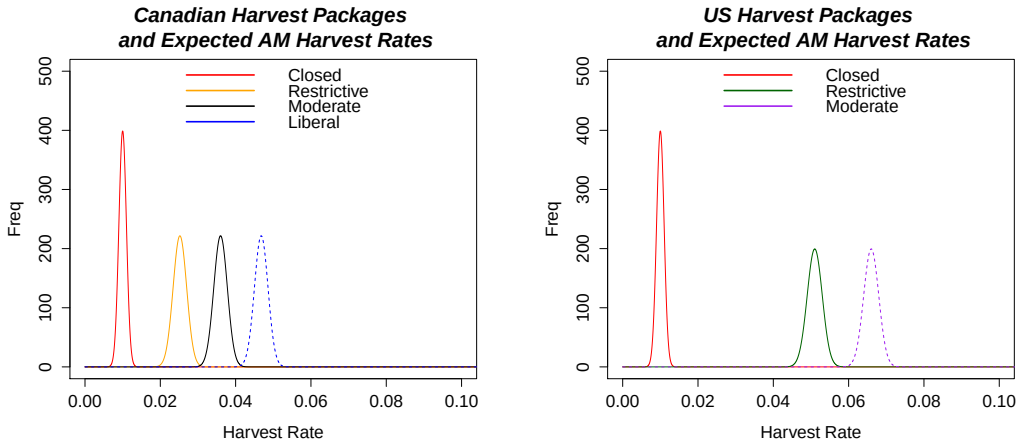


Figure 8 – Predictive harvest rate distributions for adult male black ducks expected under the application of the 2014 regulatory alternatives in Canada and the U.S.

achieve a 30% increase in mean harvest rate over the 1990–2010 mean harvest rate. The closed package would require either country to prohibit black duck harvest. Canada and the U.S. will determine, independently, appropriate regulations designed to achieve their prescribed harvest targets as identified under the regulatory packages. Regulations will vary independently between countries based on the status of the population and optimal strategy as determined through the AHM protocol.

The AHM model is based on spring breeding-ground abundance as estimated by the integrated Eastern Waterfowl Survey from the core survey area. The core survey area is comprised of USFWS survey strata 51, 52, 63, 64, 66, 67, 68, 70, 71, and 72. The American black duck population measure is based on "indicated pairs", defined as 1 individual observed equals 1 indicated pair whereas a group of 2 is assumed to represent 1.5 indicated pairs. Fall age ratios are estimated using harvest age ratios derived from the USFWS and CWS parts collection surveys, adjusted for differential vulnerability. Age- and sex-specific harvest rates are based on direct recoveries of black ducks banded in Canada, 1961–2006, adjusted by country- and band inscription-specific reporting rates. Direct and indirect band recoveries of adult and juvenile male and female black ducks banded in Canada, 1961–2006, were used to estimate age- and sex-specific annual survival rates.

The black duck AHM framework is based on two hypotheses regarding black duck population ecology. The first hypothesis states that black duck population growth is limited by competition with mallards during the breeding season. The second hypothesis states that black duck population growth is limited by harvest because hunting mortality is additive to natural mortality. The current AHM framework incorporates each of these hypotheses into a single parametric (i.e., regression) model. Estimates of each parameter (i.e., mallard competition and additive hunting mortality) are updated over time to provide additional evidence about each hypothesis.

Optimal country-specific regulatory strategies for the 2014 hunting season were calculated using: (1) the black duck harvest objective (98% of long-term cumulative harvest); (2) 2014 country specific regulatory alternatives (Figure 8); (3) current parameter estimates for mallard competition and additive mortality; and (4) 2013 estimates of 0.62 million breeding black ducks and 0.50 million breeding mallards in the core survey area. The optimal regulatory choices are the moderate package in Canada and restrictive package in the U.S (Table 6).

8.2 Northern Pintails

In 2010, the Flyway Councils and the USFWS established an adaptive framework to inform northern pintail harvest management decisions. The current protocol is based on: (1) an explicit harvest management ob-

Table 6 – Black duck optimal regulatory strategies[a] for Canada and the United States for the 2014 hunting season. This strategy is based on current regulatory alternatives, black duck model, and the objective of achieving 98% long-term cumulative harvest and to share the allocated harvest (i.e., parity) equitably between countries. The shaded cell indicates the regulatory prescription for each country in 2014.

Canada	MALL[b]										
ABDU[b]	0	100	200	30	400	500	600	700	800	900	1000
0	C	C	C	C	C	C	C	C	C	C	C
100	C	C	C	C	C	C	C	C	C	C	C
200	C	C	C	C	C	C	C	C	C	C	C
300	M	M	M	C	C	C	C	C	C	C	C
400	L	M	M	M	M	M	M	M	M	M	M
500	L	L	L	M	M	M	M	M	M	M	M
600	L	L	L	L	L	M	M	M	M	M	M
700	L	L	L	L	L	L	L	L	L	L	L
800	L	L	L	L	L	L	L	L	L	L	L
900	L	L	L	L	L	L	L	L	L	L	L
1000	L	L	L	L	L	L	L	L	L	L	L
United States	MALL										
ABDU	0	100	200	300	400	500	600	700	800	900	1000
0	C	C	C	C	C	C	C	C	C	C	C
100	C	C	C	C	C	C	C	C	C	C	C
200	C	C	C	C	C	C	C	C	C	C	C
300	R	R	R	C	C	C	C	C	C	C	C
400	R	R	R	R	R	R	R	R	R	R	R
500	M	M	R	R	R	R	R	R	R	R	R
600	M	M	M	R	R	R	R	R	R	R	R
700	M	M	M	M	M	R	R	R	R	R	R
800	M	M	M	M	M	M	M	M	R	R	M
900	M	M	M	M	M	M	M	M	M	M	M
1000	M	M	M	M	M	M	M	M	M	M	M

[a] C = closed season, R = restrictive, M = moderate, L = liberal.

[b] Mallard and black duck breeding population sizes (in thousands).

jective; (2) regulatory alternatives that do not admit partial seasons or 3-bird daily bag limits; (3) a formal optimization process using stochastic dynamic programming (Lubow 1995, Johnson and Williams 1999); (4) harvest allocation on a national rather than Flyway-by-Flyway basis, with no explicit attempt to achieve a particular allocation of harvest among Flyways; and (5) current system models. Details describing the historical development of the technical and policy elements of the northern pintail adaptive management framework can be found in the northern pintail harvest strategy document (U.S. Fish and Wildlife Service 2010).

The harvest-management objective for the northern pintail population is to maximize long-term cumulative harvest, which inherently requires perpetuation of a viable population. This objective is specified under a constraint that provides for an open hunting season when the observed breeding population is above 1.75 million birds (based on the lowest observed breeding population size since 1985 of 1.79 million birds in 2002). The

single objective and constraint, in conjunction with the regulatory alternatives were determined after an intensive consultation process with the waterfowl management community. The resulting management objective serves to integrate and balance multiple competing objectives for pintail harvest management, including minimizing closed seasons, eliminating partial seasons (shorter pintail season within the general duck season), maximizing seasons with liberal season length and greater than 1-bird daily bag limit, and minimizing large changes in regulations.

The adaptive management protocol considers a range of regulatory alternatives for pintail harvest management that includes a closed season, 1-bird daily bag limit, or 2-bird daily bag limit. The maximum pintail season length depends on the general duck season framework (characterized as liberal, moderate, or restrictive and varying by Flyway) specified by mallard AHM. An optimal pintail regulation is calculated under the assumption of a liberal mallard season length in all Flyways. However, if the season length of the general duck season determined by mallard AHM is less than liberal in any of the Flyways, then an appropriate pintail daily bag limit would be substituted for that Flyway. Thus, a shorter season length dictated by mallard AHM would result in an equivalent season length for pintails, but with increased bag limit if the expected harvest remained within allowable limits.

Regulatory substitution rules have been developed for the Central and Mississippi Flyways, where the general duck season length is driven by the mid-continent mallard AHM protocol (Table 7). These substitutions were determined by finding a pintail daily bag limit whose expected harvest was less than or equal to that called for under the national recommendation. Thus, if the national pintail harvest strategy called for a liberal 2-bird bag limit, but the mid-continent mallard season length was moderate, the recommended pintail regulation for the Central and Mississippi Flyways would be moderate in length with a 3-bird bag limit. Because season lengths more restrictive than liberal are expected infrequently in the Atlantic and Pacific Flyways under current eastern and western mallard AHM strategies, substitution rules have not yet been developed for these Flyways. If shorter season lengths were called for in the Pacific or Atlantic Flyway, then similar rules would be specified for these flyways and used to identify the appropriate substitution. In all cases, a substitution produces a lower expected harvest than the harvest allowed under the pintail strategy.

Table 7 – Substitution rules in the Central and Mississippi Flyways for joint implementation of northern pintail and mallard harvest strategies. The mid-continent mallard AHM strategy stipulates the maximum season length for pintails in the Central and Mississippi Flyways. The substitutions are used when the mid-continent mallard season length is less than liberal. For example, if the pintail strategy calls for a liberal season length with a 2-bird bag, but the mid-continent mallard strategy calls for a restrictive season length, the recommended pintail regulation for the Central and Mississippi Flyways would be restrictive in length with a 3-bird bag limit.

Pintail	Mid-continent mallard AHM season length			
Regulation	Closed	Restrictive	Moderate	Liberal
Closed	Closed	Closed	Closed	Closed
Liberal 1	Closed	Restrictive 3	Moderate 3	Liberal 1
Liberal 2	Closed	Restrictive 3	Moderate 3	Liberal 2

The current AHM protocol for pintails considers two population models. Each model represents an alternative hypothesis about the effect of harvest on population dynamics: one in which harvest is additive to natural mortality, and another in which harvest is compensatory to natural mortality. The compensatory model assumes that the mechanism for compensation is density-dependent post-harvest (winter) survival. The models differ only in how they incorporate the winter survival rate. In the additive model, winter survival rate is a constant, whereas winter survival is density-dependent in the compensatory model. A complete description of the model set used to predict pintail population change can be found in Appendix G. Model weights for the pintail model set have been updated annually since 2007 by comparing model predictions with observed survey results. As of 2014, model weights favor the hypothesis that harvest mortality is additive (58%).

Northern pintail optimal regulatory strategies for the 2014 hunting season were calculated using: (1) pintail

harvest-management objectives; (2) the 2014 regulatory alternatives; and (3) current population models and model weights. Based on this year's survey results of 3.22 million birds observed at a mean latitude of 53.9 degrees, the optimal regulatory choice for all four flyways is the liberal regulatory alternative with a 2-bird bag (Table 8).

Table 8 – Northern pintail optimal regulatory strategy[a] for all 4 Flyways for the 2014 hunting season. This strategy is based on current regulatory alternatives, northern pintail models and weights, and the objective of maximizing long-term cumulative harvest constrained to provide for an open hunting season when the observed breeding population is above 1.75 million birds. The shaded cell indicates the regulatory prescription for 2014.

	Mean latitude[c]										
BPOP[b]	52.0	52.5	53.0	53.5	54.0	54.5	55.0	55.5	56.0	56.5	57.0
≤ 1.6	C	C	C	C	C	C	C	C	C	C	C
1.8	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
2.0	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
2.2	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
2.4	L2	L2	L2	L2	L2	L1	L1	L2	L2	L2	L2
≥ 2.6	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2	L2

[a] C = closed season, L1 = liberal season with 1-bird bag, L2 = liberal season with 2-bird bag.

[b] Observed northern pintail breeding population size (in millions) from the WBPHS (strata 1–50, 75–77).

[c] Mean latitude (in degrees) is the average latitude of the WBPHS strata weighted by population size.

8.3 Scaup

The USFWS implemented an AHM decision-making framework to inform scaup harvest regulations in 2008 (Boomer and Johnson 2007). Initial scaup regulatory alternatives associated with restrictive, moderate, and liberal packages were developed based on a simulation of an optimal policy derived under an objective to achieve 95% of the long-term cumulative harvest (Boomer et al. 2007). This objective resulted in a strategy less sensitive to small changes in population size compared to a strategy derived under an objective to achieve 100% of long-term cumulative harvest and allowed for some harvest opportunity at relatively low population sizes. The USFWS worked with the Flyways to specify Flyway-specific regulatory alternatives to achieve the allowable harvest thresholds corresponding to each package. At this time, the USFWS also agreed to consider "hybrid season" options that would be available to all Flyways for the restrictive and moderate packages. Hybrid seasons allow daily bag limits to vary for certain continuous portions of the scaup season length. In 2008, restrictive, moderate, and liberal scaup regulatory alternatives were defined and implemented in all four Flyways. Subsequent feedback from the Flyways led the USFWS to further clarify criteria associated with the establishment of "hybrid seasons" and to allow additional modifications of the alternatives for each Flyway resulting in updated regulatory alternatives that were adopted in 2009. Because of the considerable uncertainty involved with predicting scaup harvest, the USFWS and the Flyways agreed to keep these packages in place for at least 3 years. In 2013, the moderate packages for the Mississippi and Central Flyways were modified to include a 3 bird bag (Table 9).

The scaup harvest strategy prescribes optimal harvest levels rather than regulatory packages. The predicted harvest levels associated with the scaup regulatory alternatives adopted for each Flyway were based on relatively crude predictions from harvest models developed in Boomer et al. (2007) or alternative harvest models proposed by the Flyways. In addition, the current scaup regulatory packages were developed under the assumption of a liberal AHM framework. We have not yet determined how changes in the overall AHM frameworks will affect the scaup decision-making framework. As we gain experience with scaup regulatory alternatives, we will evaluate the harvest predictions corresponding to the Flyway-specific regulatory alterna-

Table 9 – Scaup regulatory alternatives[a] corresponding to the restrictive, moderate, and liberal packages.

Package	Atlantic	Mississippi	Central	Pacific
Restrictive	20(2)/40(1)^H	45(2)/15(1)^H	39(2)/35(1)^H	86(2)
Moderate	60(2)	60(3)	74(3)	86(3)
Liberal	60(4)	60(4)	74(6)	107(7)

[a] Season length in days (bag limit); these alternatives assume an overall liberal AHM framework as determined by the status of mallards.

[H] Multiple day and bag limit combinations refer to hybrid seasons which allow for different bag limits over a continuous season length.

tives with the ultimate goal being to use regulatory packages, as opposed to harvest, as the control variable in deriving future scaup harvest policies.

The lack of scaup demographic information over a sufficient time frame and at a continental scale precludes the use of a traditional balance equation to represent scaup population and harvest dynamics. As a result, we used a discrete-time, stochastic, logistic-growth population model to represent changes in scaup abundance, while explicitly accounting for scaling issues associated with the monitoring data. Details describing the modeling and assessment framework that has been developed for scaup can be found in Appendix H and in Boomer and Johnson (2007).

For 2014, we updated the scaup assessment based on the current model formulation and data extending from 1974 through 2013. As in past analyses, the state space formulation and Bayesian analysis framework provided reasonable fits to the observed breeding population and total harvest estimates with realistic measures of variation. The posterior mean estimate of the intrinsic rate of increase (r) is 0.14 while the posterior mean estimate of the carrying capacity (K) is 8.27 million birds. The posterior mean estimate of the scaling parameter (q) is 0.64, ranging between 0.57 and 0.72 with 95% probability.

We calculated an optimal harvest policy for scaup based on: (1) a control variable of total harvest (U.S.and Canada combined), (2) current population model and updated parameter estimates, and (3) an objective to achieve 95% of the long-term cumulative harvest. We simulated the use of this regulatory strategy to determine expected performance characteristics. Assuming that harvest management adhered to this strategy (and that current model parameters accurately reflect population dynamics), breeding-population size would be expected to average 4.65 million (SD = 0.77 million). With an estimated breeding population size of 4.61 million scaup, the optimal harvest level for scaup is 0.40 million (Table 10). Based on the harvest thresholds specified in Boomer et al. (2007), this year's optimal harvest corresponds to the moderate regulatory alternative.

9 EMERGING ISSUES IN AHM

Learning occurs passively with current AHM protocols as annual comparisons of model predictions to observations from monitoring programs are used to update model weights and relative beliefs about system responses to management (Johnson et al. 2002*b*) or as model parameters are updated based on an assessment of the most recent monitoring data (Boomer and Johnson 2007, Johnson et al. 2007). However, learning can also occur as decision-making frameworks are evaluated to determine if objectives are being achieved, have changed, or if other aspects of the decision problem are adequately being addressed. Often the feedback resulting from this process results in a form of "double-loop" learning (Lee 1993) that offers the opportunity to adapt decision-making frameworks in response to a shifting decision context, novel or emerging management alternatives, or a need to revise assumptions and models that may perform poorly or need to account for

Table 10 – Optimal scaup harvest levels (observed scale in millions) and corresponding breeding population sizes (in millions) for the 2014 hunting season. This strategy is based on the current scaup population model, and an objective to maximize 95% of long-term cumulative harvest. The shaded cell indicates the optimal harvest level for 2014 which corresponds to the moderate regulatory alternative.

BPOP	Optimal Harvest
0.0–1.8	0
2.0–2.2	0.05
2.4–2.6	0.1
2.8–3.0	0.15
3.2–3.4	0.2
3.6–3.8	0.25
4	0.3
4.2	0.35
4.4–4.6	0.4
4.8	0.45
5.0–5.2	0.5
5.4	0.55

new information. Adaptive management depends on this iterative process to ensure that decision-making protocols remain relevant in evolving biological and social systems.

The HMWG has begun the extensive assessment work required to evaluate the harvest management implications associated with changes in the timing of regulatory decisions associated with the Preferred Alternative specified in the Final 2013 Supplemental Environmental Impact Statement (SEIS) on the Issuance of Annual Regulations Permitting the Hunting of Migratory Birds (U.S. Department of the Interior 2013). In addition, the HMWG has begun discussing the technical challenges involved with dealing with large-scale habitat and environmental change on the decision-making frameworks used to inform waterfowl harvest management. We anticipate that large-scale system change will exacerbate most forms of uncertainty that affect waterfowl AHM, but we believe that the elements of the current AHM framework provide the necessary structure for coping with these changing systems (Nichols et al. 2011).

In response to these large-scale issues, the HMWG has been focusing efforts on the evolving needs of AHM and the role of the working group in planning for and executing the double-loop phase of AHM. At its most recent meeting, the HMWG prioritized the technical work for the upcoming 2014–2015 regulations cycle, focusing on the SEIS assessments and revisions to mallard AHM frameworks (Appendix B).

LITERATURE CITED

Anderson, D. R., and K. P. Burnham. 1976. Population ecology of the mallard. VI. The effect of exploitation on survival. U.S. Fish and Wildlife Service Resource Publication. 128. 66pp.

Blohm, R. J. 1989. Introduction to harvest – understanding surveys and season setting. Proceedings of the International Waterfowl Symposium 6:118–133.

Blohm, R. J., R. E. Reynolds, J. P. Bladen, J. D. Nichols, J. E. Hines, K. P. Pollock, and R. T. Eberhardt. 1987. Mallard mortality rates on key breeding and wintering areas. Transactions of the North American Wildilfe and Resources Conference 52:246–263.

Boomer, G. S., and F. A. Johnson. 2007. A proposed assessment and decision-making framework to inform scaup harvest management. Unpublished Report. U.S. Fish and Wildlife Service, Laurel, MD. 26pp. URL http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BySpecies/SCAUP2007Report.pdf.

Boomer, G. S., F. A. Johnson, M. D. Koneff, T. A. Sanders, and R. E. Trost. 2007. A process to determine scaup regulatory alternatives. Unpublished Scoping Document. U.S. Fish and Wildlife Service, Laurel, MD. 20pp. URL http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BySpecies/scaup_regs_scoping_draftVI.pdf.

Boomer, G. S., G. S. Zimmerman, P. R. Garrettson, M. D. Koneff, T. A. Sanders, K. D. Magruder, and J. A. Royle. 2013. Band reporting probabilities for mallards recovered in the United States and Canada. Journal of Wildlife Management 77:1059–1066.

Brooks, S. P., and A. Gelman. 1998. Alternative methods for monitoring convergence of iterative simulations. Journal of Computational and Graphical Statistics 7:434–455.

Burnham, K. P., G. C. White, and D. R. Anderson. 1984. Estimating the effect of hunting on annual survival rates of adult mallards. Journal of Wildlife Management 48:350–361.

Conroy, M. J. 2010. Technical support for adaptive harvest management for American black ducks. Unpublished Final Report. Cooperative Fish and Wildlife Research Unit, U.S. Geological Survey, Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA.

Henny, C. J., and K. P. Burnham. 1976. A reward band study of mallards to estimate reporting rates. Journal of Wildlife Management 40:1–14.

Heusmann, H. W., and J. R. Sauer. 2000. The northeastern states' waterfowl breeding population survey. Wildlife Society Bulletin 28:355–364.

Hodges, J. L., J. G. King, B. Conant, and H. A. Hanson. 1996. Aerial surveys of waterbirds in Alaska 1975–94: population trends and observer variability. National Biological Service, U.S. Department of the Interior Information and Technology Report 4, Washington, D.C.

Johnson, F. A. 2003. Population dynamics of ducks other than mallards in mid-continent North America. Draft. U.S. Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C. 15pp.

Johnson, F. A., G. S. Boomer, and T. A. Sanders. 2007. A proposed protocol for the adaptive harvest management of mallards breeding in Western North America. Unpublished Report. U.S. Fish and Wildlife Service, Laurel, MD. 33pp.

Johnson, F. A., J. A. Dubovsky, M. C. Runge, and D. R. Eggeman. 2002*a*. A revised protocol for the adaptive harvest management of eastern mallards. U.S. Fish and Wildlife Service, U.S. Department of the Interior Technical report, Washington, D.C. URL http://www.fws.gov/migratorybirds/NewReportsPublications/AHM/Year2002/emal-ahm-2002.pdf.

Johnson, F. A., W. L. Kendall, and J. A. Dubovsky. 2002*b*. Conditions and limitations on learning in the adaptive management of mallard harvests. Wildlife Society Bulletin 30:176–185.

Johnson, F. A., C. T. Moore, W. L. Kendall, J. A. Dubovsky, D. F. Caithamer, J. Kelley, J. R., and B. K. Williams. 1997. Uncertainty and the management of mallard harvests. Journal of Wildlife Management 61:202–216.

Johnson, F. A., and B. K. Williams. 1999. Protocol and practice in the adaptive management of waterfowl harvests. Conservation Ecology 3:8. URL http://www.consecol.org/vol3/iss1/art8.

Johnson, F. A., B. K. Williams, J. D. Nichols, J. E. Hines, W. L. Kendall, G. W. Smith, and D. F. Caithamer. 1993. Developing an adaptive management strategy for harvesting waterfowl in North America. Transactions of the North American Wildlife and Natural Resources Conference 58:565–583.

Johnson, F. A., B. K. Williams, and P. R. Schmidt. 1996. Adaptive decision-making in waterfowl harvest and habitat management. Proceedings of the International Waterfowl Symposium 7:26–33.

Lee, K. N. 1993. Compass and Gyroscope: Integrating Science and Politics for the Environment. Island Press, Washington, D.C.

Lubow, B. C. 1995. SDP: Generalized software for solving stochastic dynamic optimization problems. Wildlife Society Bulletin 23:738–742.

Meyer, R., and R. B. Millar. 1999. BUGS in Bayesian stock assessments. Canadian Journal of Fisheries and Aquatic Sciences 56:10078–1086.

Millar, R. B., and R. Meyer. 2000. Non-linear state space modeling of fisheries biomass dynamics by using Metropolis-Hastings within Gibbs sampling. Applied Statistics 49:327–342.

Nichols, J. D., F. A. Johnson, and B. K. Williams. 1995*a*. Managing North American waterfowl in the face of uncertainty. Annual Review of Ecology and Systematics 26:177–199.

Nichols, J. D., M. D. Koneff, P. J. Heglund, M. G. Knutson, M. E. Seamans, J. E. Lyons, J. M. Morton, M. T. Jones, G. S. Boomer, and B. K. Williams. 2011. Climate change, uncertainty, and natural resource management. Journal of Wildlife Management 75:6–18.

Nichols, J. D., R. E. Reynolds, R. J. Blohm, R. E. Trost, J. E. Hines, and J. P. Bladen. 1995*b*. Geographic variation in band reporting rates for mallards based on reward banding. Journal of Wildlife Management 59:697–708.

Runge, M. C. 2007. Northern pintail harvest strategy: development of a compensatory model. Unpublished Report. U.S. Geological Survey, Patuxent Wildlife Research Center, Laurel, MD.

Runge, M. C., and G. S. Boomer. 2005. Population dynamics and harvest management of the continental northern pintail population. Unpublished Report. U.S. Geological Survey, Patuxent Wildlife Research Center, Laurel, MD. 42pp. URL http://www.fws.gov/migratorybirds/NewReportsPublications/AHM/Year2005/NOPI%202005%20Report%202.pdf.

Runge, M. C., F. A. Johnson, J. A. Dubovsky, W. L. Kendall, J. Lawrence, and J. Gammonley. 2002. A revised protocol for the adaptive harvest management of mid-continent mallards. U.S. Fish and Wildlife Service, U.S. Department of the Interior Technical report, Washington, D.C. URL http://www.fws.gov/migratorybirds/NewReportsPublications/AHM/Year2002/MCMrevise2002.pdf.

Schaefer, M. B. 1954. Some aspects of the dynamics of populations important to the management of commercial marine fisheries. Bulletin of the Inter-American Tropical Tuna Commission 1:25–56.

Smith, G. W. 1995. A critical review of the aerial and ground surveys of breeding waterfowl in North America. National Biological Service, U.S. Department of the Interior Biological Science Report 5, Washington, D.C.

Spiegelhalter, D. J., A. Thomas, N. Best, and D. Lunn. 2003. WinBUGS 1.4 User manual. MRC Biostatistics Unit, Institues of Public Health, Cambridge, UK.

U.S. Department of the Interior. 2013. Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Hunting of Migratory Birds. U.S. Fish and Wildlife Service, Washington, D.C. 418pp. URL https://www.federalregister.gov/articles/2013/05/31/2013-12443/final-supplemental-environmental-impact-statement-on-the-issuance-of-annual-regulations-permitting.

U.S. Fish and Wildlife Service. 2000. Adaptive harvest management: 2000 duck hunting season. U.S. Department of Interior, Washington, D.C. 43pp. URL http://www.fws.gov/migratorybirds/NewReportsPublications/AHM/Year2000/ahm2000.pdf.

U.S. Fish and Wildlife Service. 2001. Framework-date extensions for duck hunting in the United States: projected impacts & coping with uncertainty. U.S. Department of Interior, Washington, D.C. 8pp. URL http://www.fws.gov/migratorybirds/NewReportsPublications/AHM/Year2001/fwassess.PDF.

U.S. Fish and Wildlife Service. 2002. Adaptive harvest management: 2002 duck hunting season. U.S. Department of Interior, Washington, D.C. 34pp. URL http://www.fws.gov/migratorybirds/NewReportsPublications/AHM/Year2002/2002-AHM-report.pdf.

U.S. Fish and Wildlife Service. 2010. Northern Pintail Harvest Strategy. U.S. Department of Interior, Washington, D.C. 20pp. URL http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BySpecies/Nopi%20Harvest%20Strategy%202010%20Final.pdf.

U.S. Fish and Wildlife Service. 2011. Adaptive harvest management: 2011 duck hunting season. U.S. Department of Interior, Washington, D.C. 59pp. URL http://www.fws.gov/migratorybirds/NewReportsPublications/AHM/Year2011/ahmreport2011.pdf.

U.S. Fish and Wildlife Service. 2012. Adaptive harvest management: 2012 duck hunting season. U.S. Department of Interior, Washington, D.C. 58pp. URL http://www.fws.gov/migratorybirds/NewReportsPublications/AHM/Year2011/ahmreport2012.pdf.

U.S. Fish and Wildlife Service. 2013. Waterfowl population status, 2013. U.S. Department of Interior, Washington, D.C. URL http://www.fws.gov/migratorybirds/NewReportsPublications/PopulationStatus/Waterfowl/StatusReport2013_final.pdf.

Walters, C. 1986. Adaptive Management of Renewable Resources. Macmillian, New York.

Williams, B. K., and F. A. Johnson. 1995. Adaptive management and the regulation of waterfowl harvests. Wildlife Society Bulletin 23:430–436.

Williams, B. K., F. A. Johnson, and K. Wilkins. 1996. Uncertainty and the adaptive management of waterfowl harvests. Journal of Wildlife Management 60:223–232.

Zimmerman, G. S., J. R. Sauer, W. A. Link, and M. Otto. 2012. Composite analysis of black duck breeding population surveys in eastern North America. Journal of Wildlife Management 76:1165–1176.

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Appendix B 2015 Harvest Management Working Group Priorities

Priority rankings and project leads identified for the technical work proposed at the 2013 Harvest Management Working Group meeting and amended during the 2014 early regulations meetings.

Highest Priorities (Urgent and Important)

- SEIS
  - Evaluation and development of adjustments to harvest strategies based on changes in timing of regulatory decisions in association with the preferred SEIS alternative
  - Development of strategies and methods for communicating the implications of the SEIS to the harvest management community and general public (*HMWG, HMWG Communications Team, Flyway Councils, and FWS*)
- Mallard AHM Revisions (Double-looping)
  - Multi-stock management (*Atlantic Flyway, PHAB, HMWG*)
  - Mid-continent (*Mississippi and Central Flyways, PHAB, others...*)
  - Western (*Pacific Flyway, PHAB, others...*)
- Assess implications of NAWMP objectives for waterfowl management (*HDWG, Flyway Councils, FWS, NAWMP Interim Integration Committee, others...*)

Long-range Priorities (Non-urgent, but Very Important)

- Time dependent optimal solutions to address system change (*Scott Boomer, Fred Johnson, Mike Runge*)
- Developing methods to communicate with constituents (*Dave Case, PHAB, HMWG Communications Team*)
- Northern pintail AHM Revision (Double-looping) (*Pacific Flyway, PHAB, others...*)

Additional Priorities

- Sea duck harvest potential assessment (*Seaduck Joint Venture, HMWG*)
- Two-tier licensing system evaluation (*Central Flyway, HMWG*)

Appendix C Mid-continent Mallard Models

In 1995, we developed population models to predict changes in mid-continent mallards based on the traditional survey area which includes individuals from Alaska (Johnson et al. 1997). In 1997, we added mallards from the Great Lakes region (Michigan, Minnesota, and Wisconsin) to the mid-continent mallard stock, assuming their population dynamics were equivalent. In 2002, we made extensive revisions to the set of alternative models describing the population dynamics of mid-continent mallards (Runge et al. 2002, U.S. Fish and Wildlife Service 2002). In 2008, we redefined the population of mid-continent mallards (Table 1) to account for the removal of Alaskan birds (WBPHS strata 1–12) that are now considered to be in the western mallard stock and have subsequently rescaled the model set accordingly.

Mid-continent Mallard Breeding Population Estimates

Table C.1 – Estimates (N) and associated standard errors (SE) of mid-continent mallards (in millions) observed in the WBPHS (strata 13–18, 20–50, and 75–77) and the Great Lakes region (Michigan, Minnesota, and Wisconsin) from 1992 to 2014.

	WBPHS area		Great Lakes region		Total	
Year	N	SE	N	SE	N	SE
1992	5.6304	0.2379	0.9964	0.1178	6.6267	0.2654
1993	5.4253	0.2068	0.9176	0.0827	6.3429	0.2227
1994	6.6292	0.2803	1.1304	0.1153	7.7596	0.3031
1995	7.7452	0.2793	1.0857	0.1323	8.8309	0.3090
1996	7.4193	0.2593	1.0074	0.0991	8.4267	0.2776
1997	9.3554	0.3041	1.0777	0.1140	10.4332	0.3248
1998	8.8041	0.2940	1.0783	0.1172	9.8825	0.3165
1999	10.0926	0.3374	1.0309	0.1282	11.1236	0.3610
2000	8.6999	0.2855	1.1993	0.1221	9.8992	0.3105
2001	7.1857	0.2204	0.8282	0.0718	8.0139	0.2318
2002	6.8364	0.2412	1.0684	0.0883	7.9047	0.2569
2003	7.1062	0.2589	0.8407	0.0647	7.9470	0.2668
2004	6.6142	0.2746	0.9465	0.0915	7.5607	0.2895
2005	6.0521	0.2754	0.8138	0.0677	6.8660	0.2836
2006	6.7607	0.2187	0.6249	0.0577	7.3856	0.2262
2007	7.7258	0.2805	0.7904	0.0752	8.5162	0.2904
2008	7.1914	0.2525	0.6865	0.0550	7.8779	0.2584
2009	8.0094	0.2442	0.6958	0.0625	8.7052	0.2521
2010	7.8246	0.2799	0.7793	0.0714	8.6039	0.2889
2011	8.7668	0.2650	0.7298	0.0720	9.4965	0.2746
2012	10.0959	0.3199	0.8612	0.1769	10.9571	0.3655
2013	10.0335	0.3586	0.7628	0.0744	10.7963	0.3662
2014	10.3989	0.3429	0.6459	0.0681	11.0448	0.3496

Model Structure

Collectively, the models express uncertainty (or disagreement) about whether harvest is an additive or compensatory form of mortality (Burnham et al. 1984), and whether the reproductive process is weakly or strongly density-dependent (i.e., the degree to which reproductive rates decline with increasing population size).

All population models for mid-continent mallards share a common "balance equation" to predict changes in breeding-population size as a function of annual survival and reproductive rates:

$$N_{t+1} = N_t \left(mS_{t,AM} + (1-m)(S_{t,AF} + R_t(S_{t,JF} + S_{t,JM}\phi_F^{sum}/\phi_M^{sum}))\right)$$

where:

N=breeding population size,

m = proportion of males in the breeding population,

S_{AM}, S_{AF}, S_{JF}, and S_{JM} = survival rates of adult males, adult females, young females, and young males, respectively,

R = reproductive rate, defined as the fall age ratio of females,

$\phi_F^{sum}/\phi_M^{sum}$= the ratio of female ($F$) to male ($M$) summer survival, and t = year.

We assumed that m and $\phi_F^{sum}/\phi_M^{sum}$ are fixed and known. We also assumed, based in part on information provided by Blohm et al. (1987), the ratio of female to male summer survival was equivalent to the ratio of annual survival rates in the absence of harvest. Based on this assumption, we estimated $\phi_F^{sum}/\phi_M^{sum} = 0.897$. To estimate m we expressed the balance equation in matrix form:

$$\begin{bmatrix} N_{t+1,AM} \\ N_{t+1,AF} \end{bmatrix} = \begin{bmatrix} S_{AM} & RS_{JM}\phi_F^{sum}/\phi_M^{sum} \\ 0 & S_{AF} + RS_{JF} \end{bmatrix} \begin{bmatrix} N_{t,AM} \\ N_{t,AF} \end{bmatrix}$$

and substituted the constant ratio of summer survival and means of estimated survival and reproductive rates. The right eigenvector of the transition matrix is the stable sex structure that the breeding population eventually would attain with these constant demographic rates. This eigenvector yielded an estimate of $m = 0.5246$.

Using estimates of annual survival and reproductive rates, the balance equation for mid-continent mallards over-predicted observed population sizes by 11.0% on average. The source of the bias is unknown, so we modified the balance equation to eliminate the bias by adjusting both survival and reproductive rates:

$$N_{t+1} = \gamma_S N_t \left(mS_{t,am} + (1-m)\left(S_{t,AF} + \gamma_R R_t \left(S_{t,JF} + S_{t,JM}\phi_F^{sum}/\phi_M^{sum}\right)\right)\right)$$

where γ denotes the bias-correction factors for survival (S), and reproduction (R). We used a least squares approach to estimate $\gamma_S = 0.9407$ and $\gamma_R = 0.8647$.

Survival Process

We considered two alternative hypotheses for the relationship between annual survival and harvest rates. For both models, we assumed that survival in the absence of harvest was the same for adults and young of the same sex. In the model where harvest mortality is additive to natural mortality:

$$S_{t,sex,age} = S^A_{0,sex}(1 - K_{t,sex,age})$$

and in the model where changes in natural mortality compensate for harvest losses (up to some threshold):

$$S_{t,sex,age} = \begin{cases} s^C_{0,sex} & if\ K_{t,sex,age} \leq 1 - s^C_{0,sex} \\ 1 - K_{t,sex,age} & if\ K_{t,sex,age} > 1 - s^C_{0,sex} \end{cases}$$

where s_0 = survival in the absence of harvest under the additive (A) or compensatory (C) model, and K = harvest rate adjusted for crippling loss (20%, Anderson and Burnham 1976). We averaged estimates of s_0 across banding reference areas by weighting by breeding-population size. For the additive model, $s_0 = 0.7896$ and 0.6886 for males and females, respectively. For the compensatory model, $s_0 = 0.6467$ and 0.5965 for males and females, respectively. These estimates may seem counterintuitive because survival in the absence of harvest should be the same for both models. However, estimating a common (but still sex-specific) s_0 for both models leads to alternative models that do not fit available band-recovery data equally well. More importantly, it suggests that the greatest uncertainty about survival rates is when harvest rate is within the realm of experience. By allowing s_0 to differ between additive and compensatory models, we acknowledge that the greatest uncertainty about survival rate is its value in the absence of harvest (i.e., where we have no experience).

Reproductive Process

Annual reproductive rates were estimated from age ratios in the harvest of females, corrected using a constant estimate of differential vulnerability. Predictor variables were the number of ponds in May in Prairie Canada (P, in millions) and the size of the breeding population (N, in millions). We estimated the best-fitting linear model, and then calculated the 80% confidence ellipsoid for all model parameters. We chose the two points on this ellipsoid with the largest and smallest values for the effect of breeding-population size, and generated a weakly density-dependent model:

$$R_t = 0.7166 + 0.1083P_t - 0.0373N_t$$

and a strongly density-dependent model:

$$R_t = 1.1390 + 0.1376P_t - 0.1131N_t$$

Predicted recruitment was then rescaled to reflect the current definition of mid-continent mallards which now excludes birds from Alaska but includes mallards observed in the Great Lakes region.

Pond Dynamics

We modeled annual variation in Canadian pond numbers as a first-order autoregressive process. The estimated model was:

$$P_{t+1} = 2.2127 + 0.3420P_t + \varepsilon_t$$

where ponds are in millions and ε_t is normally distributed with mean = 0 and variance = 1.2567.

Variance of Prediction Errors

Using the balance equation and sub-models described above, predictions of breeding-population size in year *t+1* depend only on specification of population size, pond numbers, and harvest rate in year *t*. For the period in which comparisons were possible, we compared these predictions with observed population sizes.

We estimated the prediction-error variance by setting:

$$
\begin{aligned}
e_t &= \ln\left(N_t^{obs}\right) - \ln\left(N_t^{pre}\right) \\
e_t &\sim N\left(0, \sigma^2\right) \\
\hat{\sigma^2} &= \textstyle\sum_t \left[\ln\left(N_t^{obs}\right) - \ln\left(N_t^{pre}\right)\right]^2 / (n-1)
\end{aligned}
$$

where N^{obs} and N^{pre} are observed and predicted population sizes (in millions), respectively, and n = the number of years being compared. We were concerned about a variance estimate that was too small, either by chance or because the number of years in which comparisons were possible was small. Therefore, we calculated the upper 80% confidence limit for σ^2 based on a Chi-squared distribution for each combination of the alternative survival and reproductive sub-models, and then averaged them. The final estimate of σ^2 was 0.0280, equivalent to a coefficient of variation of about 16.85%.

Model Implications

The population model with additive hunting mortality and weakly density-dependent recruitment (SaRw) leads to the most conservative harvest strategy, whereas the model with compensatory hunting mortality and strongly density-dependent recruitment (ScRs) leads to the most liberal strategy. The other two models (SaRs and ScRw) lead to strategies that are intermediate between these extremes. Under the models with compensatory hunting mortality (ScRs and ScRw), the optimal strategy is to have a liberal regulation regardless of population size or number of ponds because at harvest rates achieved under the liberal alternative, harvest has no effect on population size. Under the strongly density-dependent model (ScRs), the density dependence regulates the population and keeps it within narrow bounds. Under the weakly density dependent model (ScRw), the density-dependence does not exert as strong a regulatory effect, and the population size fluctuates more.

Model Weights

Model weights are calculated as Bayesian probabilities, reflecting the relative ability of the individual alternative models to predict observed changes in population size. The Bayesian probability for each model is a function of the models previous (or prior) weight and the likelihood of the observed population size under that model. We used Bayes' theorem to calculate model weights from a comparison of predicted and observed population sizes for the years 1996–2014, starting with equal model weights in 1995.

Appendix D Eastern Mallard Models

Eastern mallard population dynamics are represented by 4 alternative models that combine two mortality (additive versus compensatory) and two reproductive (strong or weak density dependent) hypotheses. Each balance equation also includes a bias-correction term applied to the reproductive sub-models.

Eastern Mallard Breeding Population Estimates

Table D.1 – Estimates (N) and associated standard errors (SE) of eastern mallards (in millions) observed in the northeastern U.S. (AFBWS) and southern Ontario and Quebec (WBPHS strata 51–54 and 56) from 1990 to 2014.

	AFBWS		WBPHS		Total	
Year	N	SE	N	SE	N	SE
1990	0.6651	0.0783	0.1907	0.0472	0.8558	0.0914
1991	0.7792	0.0883	0.1528	0.0337	0.9320	0.0945
1992	0.5622	0.0479	0.3203	0.0530	0.8825	0.0715
1993	0.6866	0.0499	0.2921	0.0482	0.9786	0.0694
1994	0.8563	0.0628	0.2195	0.0282	1.0758	0.0688
1995	0.8641	0.0704	0.1844	0.0400	1.0486	0.0810
1996	0.8486	0.0611	0.2831	0.0557	1.1317	0.0826
1997	0.7952	0.0496	0.2121	0.0396	1.0073	0.0634
1998	0.7752	0.0497	0.2638	0.0672	1.0390	0.0836
1999	0.8800	0.0602	0.2125	0.0369	1.0924	0.0706
2000	0.7626	0.0487	0.1323	0.0264	0.8948	0.0554
2001	0.8094	0.0516	0.2002	0.0356	1.0097	0.0627
2002	0.8335	0.0562	0.1915	0.0319	1.0250	0.0647
2003	0.7319	0.0470	0.3083	0.0554	1.0402	0.0726
2004	0.8066	0.0517	0.3015	0.0533	1.1081	0.0743
2005	0.7536	0.0536	0.2934	0.0531	1.0470	0.0755
2006	0.7214	0.0476	0.1740	0.0284	0.8954	0.0555
2007	0.6876	0.0467	0.2193	0.0336	0.9069	0.0576
2008	0.6191	0.0407	0.1960	0.0300	0.8151	0.0505
2009	0.6668	0.0457	0.2411	0.0434	0.9078	0.0630
2010	0.6517	0.0491	0.1100	0.0205	0.7617	0.0532
2011	0.5861	0.0416	0.1599	0.0343	0.7460	0.0539
2012	0.6126	0.0458	0.2251	0.0399	0.8376	0.0608
2013	0.6042	0.0428	NA[a]	NA	NA	NA
2014	0.6346	0.0489	0.2208	0.0366	0.8554	0.0611

[a] Estimates for southern Ontario and Quebec (WBPHS strata 51–54 and 56) were not available in 2013.

Model Structure

As with mid-continent mallards, all population models for eastern mallards share a common balance equation to predict changes in breeding-population size as a function of annual survival and reproductive rates:

$$N_{t+1} = N_t \left((pS_t^{am}) + \left((1-p)\, S_t^{af} \right) + \left(p\, (A_t^m/d)\, S_t^{ym} \right) + \left(p\, (A_t^m/d)\, \psi S_t^{yf} \right) \right)$$

where:

N = breeding-population size,

p = proportion of males in the breeding population,

S^{am}, S^{af}, S^{ym}, and S^{yf} = survival rates of adult males, adult females, young males, and young females, respectively,

A^m = ratio of young males to adult males in the harvest,

d = ratio of young male to adult male direct recovery rates,

ψ = the ratio of male to female summer survival, and t = year.

In this balance equation, we assume that p, d, and ψ are fixed and known. The parameter ψ is necessary to account for the difference in anniversary date between the breeding-population survey (May) and the survival and reproductive rate estimates (August). This model also assumes that the sex ratio of fledged young is 1:1; hence A^m/d appears twice in the balance equation. We estimated $d = 1.043$ as the median ratio of young:adult male band-recovery rates in those states from which wing receipts were obtained. We estimated $\psi = 1.216$ by regressing through the origin estimates of male survival against female survival in the absence of harvest, assuming that differences in natural mortality between males and females occur principally in summer. To estimate p, we used a population projection matrix of the form:

$$\begin{bmatrix} M_{t+1} \\ F_{t+1} \end{bmatrix} = \begin{bmatrix} S^{am} + (A^m/d)\, S^{ym} & 0 \\ (A^m/d)\, \psi S^{yf} & S^{af} \end{bmatrix} \begin{bmatrix} M_t \\ F_t \end{bmatrix}$$

where M and F are the relative number of males and females in the breeding populations, respectively. To parameterize the projection matrix we used average annual survival rate and age ratio estimates, and the estimates of d and ψ provided above. The right eigenvector of the projection matrix is the stable proportion of males and females the breeding population eventually would attain in the face of constant demographic rates. This eigenvector yielded an estimate of $p = 0.544$.

During the 2002 eastern mallard model set revision, bias-correction terms for the eastern mallard balance equation assumed that any bias resided solely in survival rates:

$$N_{t+1} = N_t \omega \left(pS_t^{am} + \left((1-p)\, S_t^{af} \right) + \left(p\, (A_t^m/d)\, S_t^{ym} \right) + \left(p\, (A_t^m/d)\, \psi S_t^{yf} \right) \right)$$

(where ω is the bias-correction factor for survival rates), or solely in reproductive rates:

$$N_{t+1} = N_t \left(pS_t^{am} + \left((1-p)\, S_t^{af} \right) + \left(p\alpha\, (A_t^m/d)\, S_t^{ym} \right) + \left(p\alpha\, (A_t^m/d)\, \psi S_t^{yf} \right) \right)$$

(where α is the bias-correction factor for reproductive rates). These analyses resulted in least squares estimates of $\omega = 0.836$ and $\alpha = 0.701$, suggesting a positive bias in survival or reproductive rates. The 2011

updates of eastern mallard model weights indicated strong support for models that account for bias in eastern mallard demographic parameters; models without bias-corrections for survival or recruitment accumulated weights of approximately zero (U.S. Fish and Wildlife Service 2011). To simplify the updated model set, we eliminated the no-bias and survival bias models. Although, the predictions from the recruitment and survival bias-corrected sub models did not differ substantially, models that included bias in recruitment had slightly higher weights. Consequently, we retained the bias-correction term for recruitment in the eastern mallard model set.

Survival Process

During the eastern mallard model assessment, it was noted that observed survival rates of eastern mallards varied from year to year, but did not display an obvious trend, while harvest rates have generally declined since 2002 (U.S. Fish and Wildlife Service 2011). Given the uncertainty in predicting eastern mallard survival rates from an additive harvest mortality model, we chose to include an alternative survival model that represents compensatory harvest mortality. For both models, we assumed that survival in the absence of harvest was the same for adults and young of the same sex. In the model where harvest mortality is additive to natural mortality:

$$S_{t,sex,age} = S^{A}_{0,sex}(1 - K_{t,sex,age})$$

and in the model where changes in natural mortality compensate for harvest losses (up to some threshold):

$$S_{t,sex,age} = \begin{cases} s^{C}_{0,sex} & if\ K_{t,sex,age} \leq 1 - s^{C}_{0,sex} \\ 1 - K_{t,sex,age} & if\ K_{t,sex,age} > 1 - s^{C}_{0,sex} \end{cases}$$

where s_0 = survival in the absence of harvest under the additive (A) or compensatory (C) model, and K = harvest rate adjusted for crippling loss (20%, Anderson and Burnham 1976).

Because we did not have current estimates to parameterize the compensatory relationship between kill rates and annual survival for eastern mallards, we chose to use the mid-continent mallard compensatory survival parameters scaled to observed eastern mallard survival estimates. Mid-continent mallard additive survival parameters are approximately 7.5% higher than male and 14% higher than female eastern mallard estimates. To make the mid-continent compensatory parameters comparable to eastern mallards, we scaled the mid- continent mallard compensatory survival parameters by the same amount. Therefore, the compensatory model parameters ($s^{C}_{0,sex}$) for midcontinent mallards were scaled from 0.6467 to 0.5985 for males and from 0.5965 to 0.5154 for females for use in the eastern mallard model set. We used the same parameter values for the additive harvest mortality model ($s^{A}_{0,sex} = 0.7307$ for males and 0.5950 for females)that were estimated for the 2002 revision.

Reproductive Process

As with survival, annual reproductive rates must be predicted in advance of setting regulations. We relied on the apparent relationship between breeding-population size and reproductive rates:

$$R_t = ae^{bN_t}$$

where R_t is the reproductive rate (i.e., A^{m}_{t}/d), N_t is breeding-population size in millions, and a and b are model parameters. The least-squares parameter estimates were $a = 2.508$ and $b = -0.875$. Because of both the importance and uncertainty of the relationship between population size and reproduction, we specified two alternative models in which the slope (b) was fixed at the least-squares estimate $\pm$ one standard error, and in which the intercepts (a) were subsequently re-estimated. This provided alternative hypotheses of strongly density-dependent ($a = 4.154$, $b = -1.377$) and weakly density-dependent reproduction ($a = 1.518$, $b = -0.373$).

Variance of Prediction Errors

Using the balance equations and sub-models provided above, predictions of breeding-population size in year *t+1* depend only on the specification of a regulatory alternative and on an estimate of population size in year *t*. We were interested in how well these predictions corresponded with observed population sizes. In making these comparisons, we were primarily concerned with how well the bias-corrected balance equations and reproductive and survival sub-models performed. Rather than use regulations as model inputs, we used estimates of harvest rates for the period in which reliable estimates of harvest rates were available (2002–2011).

We estimated the prediction-error variance by setting:

$$
\begin{aligned}
& e_t = \ln\left(N_t^{obs}\right) - \ln\left(N_t^{pre}\right) \\
& \text{then assuming} \quad e_t \sim N\left(0, \sigma^2\right) \\
& \text{and estimating} \quad \hat{\sigma}^2 = \textstyle\sum_t \left[\ln\left(N_t^{obs}\right) - \ln\left(N_t^{pre}\right)\right]^2 / (n-1)
\end{aligned}
$$

where N^{obs} and N^{pre} are observed and predicted population sizes (in millions), respectively, and $n = 9$. We were concerned about a variance estimate that was too small, either by chance or because the number of years in which comparisons were possible was small. Therefore, we calculated the upper 80% confidence limit for σ^2 based on a Chi-squared distribution for each combination of the alternative survival and reproductive sub-models, and then averaged them. The final estimate of σ^2 was 0.0483, equivalent to a coefficient of variation of about 22%.

Model Implications

The population model with additive hunting mortality and weakly density-dependent recruitment (SaRw) leads to the most conservative harvest strategy, whereas the model with compensatory hunting mortality and strongly density-dependent recruitment (ScRs) leads to the most liberal strategy. The other two models (SaRs and ScRw) lead to strategies that are intermediate between these extremes. Under the models with compensatory hunting mortality (ScRs and ScRw), the optimal strategy is to have a liberal regulation regardless of population size because at harvest rates achieved under the liberal alternative, harvest has no effect on population size. Under the strongly density-dependent model (ScRs), the density dependence regulates the population and keeps it within narrow bounds. Under the weakly density dependent model (ScRw), density-dependence does not exert as strong a regulatory effect, and the population size fluctuates more.

Model Weights

We used Bayes' theorem to calculate model weights from a comparison of predicted and observed population sizes for the years 2003–2012. We calculated weights for the alternative models based on an assumption of equal model weights in 2002 (the last year data was used to develop most model components) and on estimates of year-specific harvest rates (Appendix F).

Appendix E Western Mallard Models

In contrast to mid-continent and eastern mallards, we did not model changes in population size for both the Alaska and California-Oregon stocks of western mallards as an explicit function of survival and reproductive rate estimates (which in turn may be functions of harvest and environmental covariates). We believed this so-called "balance-equation approach" was not viable for western mallards because of insufficient banding in Alaska to estimate survival rates, and because of the difficulty in estimating stock-specific fall age ratios from a sample of wings derived from a mix of breeding stocks.

Western Mallard Breeding Population Estimates

Table E.1 – Estimates (N) and associated standard errors (SE) of western mallards (in millions) observed in Alaska (WBPHS strata 1–12) from 1990 to 2014 and California-Oregon (state surveys) combined from 1992 to 2014.

	Alaska		California-Oregon[a]		Total	
Year	N	SE	N	SE	N	SE
1990	0.3669	0.0370	NA	NA	NA	NA
1991	0.3853	0.0363	NA	NA	NA	NA
1992	0.3457	0.0387	0.4693	0.0604	0.8150	0.0718
1993	0.2830	0.0295	0.4506	0.0509	0.7336	0.0588
1994	0.3509	0.0371	0.4281	0.0425	0.7790	0.0564
1995	0.5242	0.0680	0.4460	0.0427	0.9702	0.0803
1996	0.5220	0.0436	0.6389	0.0802	1.1609	0.0912
1997	0.5842	0.0520	0.6325	0.1043	1.2167	0.1166
1998	0.8362	0.0673	0.4788	0.0489	1.3151	0.0832
1999	0.7131	0.0696	0.6857	0.1066	1.3987	0.1273
2000	0.7703	0.0522	0.4584	0.0532	1.2287	0.0745
2001	0.7183	0.0541	0.3874	0.0450	1.1056	0.0704
2002	0.6673	0.0507	0.3698	0.0327	1.0371	0.0603
2003	0.8435	0.0668	0.4261	0.0501	1.2696	0.0835
2004	0.8111	0.0639	0.3449	0.0352	1.1560	0.0729
2005	0.7031	0.0547	0.3920	0.0474	1.0951	0.0724
2006	0.5158	0.0469	0.4805	0.0576	0.9964	0.0743
2007	0.5815	0.0551	0.4808	0.0546	1.0623	0.0775
2008	0.5324	0.0468	0.3725	0.0478	0.9049	0.0669
2009	0.5030	0.0449	0.3746	0.0639	0.8775	0.0781
2010	0.6056	0.0531	0.4347	0.0557	1.0402	0.0769
2011	0.4158	0.0388	0.3763	0.0452	0.7921	0.0596
2012	0.5056	0.0511	0.4759	0.0550	0.9814	0.0751
2013	0.3384	0.0382	0.3830	0.0527	0.7214	0.0651
2014	0.5009	0.0574	0.3239	0.0553	0.8248	0.0797

[a] Historical breeding population estimates for Oregon were updated in 2014.

Model Structure

To evaluate western mallard population dynamics, we used a discrete logistic model (Schaefer 1954), which combines reproduction and natural mortality into a single parameter r, the intrinsic rate of growth. The

model assumes density-dependent growth, which is regulated by the ratio of population size, N, to the carrying capacity of the environment, K (i.e., equilibrium population size in the absence of harvest). In the traditional formulation, harvest mortality is additive to other sources of mortality, but compensation for hunting losses can occur through subsequent increases in production. However, we parameterized the model in a way that also allows for compensation of harvest mortality between the hunting and breeding seasons. It is important to note that compensation modeled in this way is purely phenomenological, in the sense that there is no explicit ecological mechanism for compensation (e.g., density-dependent mortality after the hunting season). The basic model for both the Alaska and California-Oregon stocks has the form:

$$N_{t+1} = \left[N_t + N_t r\left(1 - \frac{N_t}{K}\right)\right](1 - \alpha_t)$$

where,

$$\alpha_t = dh_t^{AM}$$

and where t = year, h^{AM} = the harvest rate of adult males, and d = a scaling factor. The scaling factor is used to account for a combination of unobservable effects, including un-retrieved harvest (i.e., crippling loss), differential harvest mortality of cohorts other than adult males, and for the possibility that some harvest mortality may not affect subsequent breeding-population size (i.e., the compensatory mortality hypothesis).

Estimation Framework

We used Bayesian estimation methods in combination with a state-space model that accounts explicitly for both process and observation error in breeding population size. This combination of methods is becoming widely used in natural resource modeling, in part because it facilitates the fitting of non-linear models that may have non-normal errors (Meyer and Millar 1999). The Bayesian approach also provides a natural and intuitive way to portray uncertainty, allows one to incorporate prior information about model parameters, and permits the updating of parameter estimates as further information becomes available.

We first scaled N by K as recommended by Meyer and Millar (1999), and assumed that process errors were log-normally distributed with mean 0 and variance σ^2. Thus, the process model had the form:

$$\begin{aligned} P_t &= N_t/K_t \\ \log(P_t) &= \log\left(\left[P_{t-1} + P_{t-1} r\left(1 - P_{t-1}\right)\right]\left(1 - dh_{t-1}^{AM}\right)\right) + e_t \end{aligned}$$

where,

$$e_t \sim N(0, \sigma^2)$$

The observation model related the unknown population sizes ($P_t K$) to the population sizes (N_t) estimated from the breeding-population surveys in Alaska and California-Oregon. We assumed that the observation process yielded additive, normally distributed errors, which were represented by:

$$N_t = P_t K + \varepsilon_t^{BPOP},$$

where,

$$\varepsilon_t^{BPOP} \sim N(0, \sigma^2_{BPOP}).$$

permitting us to estimate the process error, which reflects the inability of the model to completely describe changes in population size. The process error reflects the combined effect of misspecification of an appropriate model form, as well as any un-modeled environmental drivers. We initially examined a number of possible environmental covariates, including the Palmer Drought Index in California and Oregon, spring temperature in Alaska, and the El Niño Southern Oscillation Index (http://www.cdc.noaa.gov/people/klaus.wolter/MEI/mei.html). While the estimated effects of these covariates on r or K were generally what one would expect, they were never of sufficient magnitude to have a meaningful effect on optimal harvest strategies. We therefore chose not to further pursue an investigation of environmental covariates, and posited that the process error was a sufficient surrogate for these un-modeled effects. Parameterization of the models also required measures of harvest rate. Beginning in 2002, harvest rates of adult males were estimated directly from the recovery of reward bands. Prior to 1993, we used direct recoveries of standard bands, corrected for band-reporting rates provided by Nichols et al. (1995*b*). We also used the band-reporting rates provided by Nichols et al. (1995*b*) for estimating harvest rates in 1994 and 1995, except that we inflated the reporting rates of full-address and toll-free bands based on an unpublished analysis by Clint Moore and Jim Nichols (Patuxent Wildlife Research Center). We were unwilling to estimate harvest rates for the years 1996–2001 because of suspected, but unknown, increases in the reporting rates of all bands. For simplicity, harvest rate estimates were treated as known values in our analysis, although future analyses might benefit from an appropriate observation model for these data.

In a Bayesian analysis, one is interested in making probabilistic statements about the model parameters (θ), conditioned on the observed data. Thus, we are interested in evaluating $P(\theta|data)$, which requires the specification of prior distributions for all model parameters and unobserved system states (θ) and the sampling distribution (likelihood) of the observed data $P(data|\theta)$. Using Bayes theorem, we can represent the posterior probability distribution of model parameters, conditioned on the data, as:

$$P(\theta|data) \propto P(\theta) \times P(data|\theta)$$

Accordingly, we specified prior distributions for model parameters *r, K, d,* and P_0, which is the initial population size relative to carrying capacity. For both stocks, we specified the following prior distributions for *r, d,* and σ^2:

$$\begin{aligned} r &\sim Lognormal(-1.0397, 0.69315) \\ d &\sim Uniform(0, 2) \\ \sigma^2 &\sim Inverse-gamma(0.001, 0.001) \end{aligned}$$

The prior distribution for r is centered at 0.35, which we believe to be a reasonable value for mallards based on life-history characteristics and estimates for other avian species. Yet the distribution also admits considerable uncertainty as to the value of r within what we believe to be realistic biological bounds. As for the harvest-rate scalar, we would expect $d \geq 1$ under the additive hypothesis and $d < 1$ under the compensatory hypothesis. As we had no data to specify an informative prior distribution, we specified a vague prior in which d could take on a wide range of values with equal probability. We used a traditional, uninformative prior distribution for σ^2. Prior distributions for K and P_0 were stock-specific and are described in the following sections.

We used the public-domain software JAGS (https://sourceforge.net/projects/mcmc-jags) to derive samples from the joint posterior distribution of model parameters via Markov-Chain Monte Carlo (MCMC) simulations. We obtained 800,000 samples from the joint posterior distribution, discarded the first 700,000, and then thinned the remainder by 50, resulting in a sample of 2,000 for each of 5 chains, or 10,000 total samples.

Alaska mallards

Data selection—Breeding population estimates of mallards in Alaska (and the Old Crow Flats in Yukon) are available since 1955 in WBPHS strata 1–12 (Smith 1995). However, a change in survey aircraft in 1977 instantaneously increased the detectability of waterfowl, and thus population estimates (Hodges et al. 1996). Moreover, there was a rapid increase in average annual temperature in Alaska at the same time, apparently tied to changes in the frequency and intensity of El Niño events (http://www.cdc.noaa.gov/people/klaus.wolter/MEI/mei.html). This confounding of changes in climate and survey methods led us to truncate the years 1955–1977 from the time series of population estimates.

Modeling of the Alaska stock also depended on the availability of harvest-rate estimates derived from band-recovery data. Unfortunately, sufficient numbers of mallards were not banded in Alaska prior to 1990. A search for covariates that would have allowed us to make harvest-rate predictions for years in which band-recovery data were not available was not fruitful, and we were thus forced to further restrict the time series to 1990 and later. Even so, harvest rate estimates were not available for the years 1996–2001 because of unknown changes in band-reporting rates. Because available estimates of harvest rate showed no apparent variation over time, we simply used the mean and standard deviation of the available estimates and generated independent samples of predictions for the missing years based on a logit transformation and an assumption of normality:

$$ln\left(\frac{h_t}{1-h_t}\right) \sim Normal(-2.4189, 0.0891) \quad \text{for } t = 1996\text{–}2001$$

Prior distributions for K and P_0—We believed that sufficient information was available to use mildly informative priors for K and P_0. In recent years the Alaska stock has contained approximately 0.8 million mallards. If harvest rates have been comparable to that necessary to achieve maximum sustained yield (MSY) under the logistic model (i.e., $r/2$), then we would expect $K \approx 1.6$ million. On the other hand, if harvest rates have been less than those associated with MSY, then we would expect $K < 1.6$ million. Because we believed it was not likely that harvest rates were $> r/2$, we believed the likely range of K to be 0.8–1.6 million. We therefore specified a prior distribution that had a mean of 1.4 million, but had a sufficiently large variance to admit a wide range of possible values:

$$K \sim Lognormal(0.13035, 0.41224)$$

Extending this line of reasoning, we specified a prior distribution that assumed the estimated population size of approximately 0.4 million at the start of the time-series (i.e., 1990) was 20–60% of K. Thus on a log scale:

$$P_o \sim Uniform(-1.6094, -0.5108)$$

Parameter estimates—The logistic model and associated posterior parameter estimates provided a reasonable fit to the observed time-series of population estimates. The posterior means of K and r were similar to their priors, although their variances were considerably smaller (Table E.2). However, the posterior distribution of d was essentially the same as its prior, reflecting the absence of information in the data necessary to reliably estimate this parameter.

California-Oregon mallards

Data selection—Breeding-population estimates of mallards in California are available starting in 1992, but not until 1994 in Oregon. Also, Oregon did not conduct a survey in 2001. To avoid truncating the time

Table E.2 – Estimates of model parameters resulting from fitting a discrete logistic model with MCMC to a time-series of estimated population sizes and harvest rates of mallards breeding in Alaska from 1992 to 2013.

Parameter	Mean	SD	2.5% CI[a]	Median	97.5% CI
K	1.088	0.314	0.652	1.022	1.841
P_0	0.357	0.097	0.210	0.346	0.563
d	1.216	0.502	0.185	1.263	1.964
r	0.280	0.122	0.082	0.268	0.547
σ^2	0.026	0.012	0.010	0.024	0.057

[a] CI = credible interval.

series, we used the admittedly weak relationship ($P = 0.04$) between California-Oregon population estimates to predict population sizes in Oregon in 1992, 1993, and 2001. The fitted linear model was:

$$N_t^{OR} = 51022 + 0.1129(N_t^{CA})$$

To derive realistic standard errors, we assumed that the predictions had the same mean coefficient of variation as the years when surveys were conducted ($n = 19$, CV = 0.086). The estimated sizes and variances of the California-Oregon stock were calculated by simply summing the state-specific estimates.

We pooled banding and recovery data for the California-Oregon stock and estimated harvest rates in the same manner as that for Alaska mallards. Although banded sample sizes were sufficient in all years, harvest rates could not be estimated for the years 1996–2001 because of unknown changes in band-reporting rates. As with Alaska, available estimates of harvest rate showed no apparent trend over time, and we simply used the mean and standard deviation of the available estimates and generated independent samples of predictions for the missing years based on a logit transformation and an assumption of normality:

$$ln\left(\frac{h_t}{1-h_t}\right) \sim Normal(-1.9519, 0.0355) \quad \text{for } t = 1996\text{–}2001$$

Prior distributions for K and P_0—Unlike the Alaska stock, the California-Oregon population has been relatively stable with a mean of 0.48 million mallards. We believed K should be in the range 0.48–0.96 million, assuming the logistic model and that harvest rates were $\leq r/2$. We therefore specified a prior distribution on K that had a mean of 0.7 million, but with a variance sufficiently large to admit a wide range of possible values:

$$K \sim Lognormal(-0.5628, 0.41224)$$

The estimated size of the California-Oregon stock was 0.48 million at the start of the time-series (i.e., 1992). We used a similar line of reasoning as that for Alaska for specifying a prior distribution P_0, positing that initial population size was 40-100% of K. Thus on a log scale:

$$P_o \sim Uniform(-0.9163, 0.0)$$

Parameter estimates—The logistic model and associated posterior parameter estimates provided a reasonable fit to the observed time series of population estimates. The posterior means of K and r were similar to their priors, although the variances were considerably smaller (Table E.3). Interestingly, the

Table E.3 – Estimates of model parameters resulting from fitting a discrete logistic model with MCMC to a time-series of estimated population sizes and harvest rates of mallards breeding in California and Oregon from 1992 to 2013.

Parameter	Mean	SD	2.5% CI[a]	Median	97.5% CI
K	0.640	0.173	0.436	0.591	1.081
P_0	0.743	0.162	0.430	0.761	0.987
d	0.663	0.436	0.046	0.583	1.693
r	0.370	0.255	0.072	0.309	1.033
σ^2	0.009	0.008	0.001	0.007	0.030

[a] CI = credible interval.

posterior mean of d was < 1, suggestive of a compensatory response to harvest; however the standard deviation of the estimate was large, with the upper 95% credibility limit > 1.

For each western mallard substock, we further summarized the simulation results for r, K, and the scaling factor d to admit parametric uncertainty with a formal correlation structure within the optimization procedure used to calculate the harvest strategy. We first defined a joint distribution for 3 discrete outcomes for each of the 3 population parameters. We used the 30 and 70 percent quantiles for each parameter as the cut points to define three bins for which to discretize 3 values of each posterior distribution. We then determined the frequency of occurrence of each of the 27 possible combinations of each parameter value falling within the 3 bins from the MCMC simulation results. These frequencies were then assigned parameter values based on the midpoint of bin ranges (15, 50, 85 percent quantiles) to specify the joint distribution of the population parameter values used in the optimization.

Appendix F Modeling Mallard Harvest Rates

Mid-continent

We modeled harvest rates of mid-continent mallards within a Bayesian hierarchical framework. We developed a set of models to predict harvest rates under each regulatory alternative as a function of the harvest rates observed under the liberal alternative, using historical information. We modeled the probability of regulation-specific harvest rates (h) based on normal distributions with the following parameterizations:

$$\begin{aligned}
&\text{Closed:} && p(h_C) \sim N(\mu_C, \nu_C^2) \\
&\text{Restrictive:} && p(h_R) \sim N(\mu_R, \nu_R^2) \\
&\text{Moderate:} && p(h_M) \sim N(\mu_M, \nu_M^2) \\
&\text{Liberal:} && p(h_L) \sim N(\mu_L, \nu_L^2)
\end{aligned}$$

For the restrictive and moderate alternatives we introduced the parameter γ to represent the relative difference between the harvest rate observed under the liberal alternative and the moderate or restrictive alternatives. Based on this parameterization, we are making use of the information that has been gained (under the liberal alternative) and are modeling harvest rates for the restrictive and moderate alternatives as a function of the mean harvest rate observed under the liberal alternative. For the harvest-rate distributions assumed under the restrictive and moderate regulatory alternatives, we specified that γ_R and γ_M are equal to the prior estimates of the predicted mean harvest rates under the restrictive and moderate alternatives divided by the prior estimates of the predicted mean harvest rates observed under the liberal alternative. Thus, these parameters act to scale the mean of the restrictive and moderate distributions in relation to the mean harvest rate observed under the liberal regulatory alternative. We also considered the marginal effect of framework-date extensions under the moderate and liberal alternatives by including the parameter δ_f.

To update the probability distributions of harvest rates realized under each regulatory alternative, we first needed to specify a prior probability distribution for each of the model parameters. These distributions represent prior beliefs regarding the relationship between each regulatory alternative and the expected harvest rates. We used a normal distribution to represent the mean and a scaled inverse-chi-square distribution to represent the variance of the normal distribution of the likelihood. For the mean (μ) of each harvest-rate distribution associated with each regulatory alternative, we use the predicted mean harvest rates provided in (U.S. Fish and Wildlife Service 2000, 13–14), assuming uniformity of regulatory prescriptions across flyways. We set prior values of each standard deviation (ν) equal to 20% of the mean (CV = 0.2) based on an analysis by Johnson et al. (1997). We then specified the following prior distributions and parameter values under each regulatory package:

Closed (in U.S. only):

$$p(\mu_C) \sim N\left(0.0088, \frac{0.0018^2}{6}\right)$$

$$p(\nu_C^2) \sim Scaled\ Inv - \chi^2(6, 0.0018^2)$$

These closed-season parameter values are based on observed harvest rates in Canada during the 1988–93 seasons, which was a period of restrictive regulations in both Canada and the United States.

For the restrictive and moderate alternatives, we specified that the standard error of the normal distribution of the scaling parameter is based on a coefficient of variation for the mean equal to 0.3. The

scale parameter of the inverse-chi-square distribution was set equal to the standard deviation of the harvest rate mean under the restrictive and moderate regulation alternatives (i.e., CV = 0.2).

Restrictive:

$$p(\gamma_R) \sim N\left(0.51, \frac{0.15^2}{6}\right)$$
$$p(\nu_R^2) \sim Scaled\,Inv-\chi^2(6, 0.0133^2)$$

Moderate:

$$p(\gamma_M) \sim N\left(0.85, \frac{0.26^2}{6}\right)$$
$$p(\nu_r^2) \sim Scaled\,Inv-\chi^2(6, 0.0223^2)$$

Liberal:

$$p(\mu_L) \sim N\left(0.1305, \frac{0.0261^2}{6}\right)$$
$$p(\nu_R^2) \sim Scaled\,Inv-\chi^2(6, 0.0261^2)$$

The prior distribution for the marginal effect of the framework-date extension was specified as:

$$p(\delta_f) \sim N\left(0.02, 0.01^2\right)$$

The prior distributions were multiplied by the likelihood functions based on the last 16 years of data under liberal regulations, and the resulting posterior distributions were evaluated with Markov Chain Monte Carlo simulation. Posterior estimates of model parameters and of annual harvest rates are provided in Table F.1.

Table F.1 – Parameter estimates for predicting mid-continent mallard harvest rates resulting from a hierarchical, Bayesian analysis of mid-continent mallard banding and recovery information from 1998 to 2013.

Parameter	Estimate	SD	Parameter	Estimate	SD
μ_C	0.0088	0.0007	h_{1998}	0.1020	0.0069
ν_C	0.0019	0.0005	h_{1999}	0.0981	0.0072
γ_R	0.5095	0.0616	h_{2000}	0.1242	0.0083
ν_R	0.0129	0.0032	h_{2001}	0.0922	0.0087
γ_M	0.8490	0.1061	h_{2002}	0.1216	0.0042
ν_M	0.0215	0.0054	h_{2003}	0.1107	0.0042
μ_L	0.1085	0.0062	h_{2004}	0.1304	0.0047
ν_L	0.0184	0.0029	h_{2005}	0.1147	0.0054
δ_f	0.0061	0.0067	h_{2006}	0.1032	0.0043
			h_{2007}	0.1134	0.0041
			h_{2008}	0.1187	0.0044
			h_{2009}	0.1015	0.0036
			h_{2010}	0.1107	0.0050
			h_{2011}	0.0967	0.0059
			h_{2012}	0.1020	0.0048
			h_{2013}	0.1031	0.0052

Eastern

We modeled harvest rates of eastern mallards using the same parameterizations as those for mid-continent mallards:

$$\begin{aligned}
&\text{Closed:} && p(h_C) \sim N(\mu_C, \nu_C^2) \\
&\text{Restrictive:} && p(h_R) \sim N(\gamma_R \mu_L, \nu_R^2) \\
&\text{Moderate:} && p(h_M) \sim N(\gamma_M \mu_L + \delta_f, \nu_M^2) \\
&\text{Liberal:} && p(h_L) \sim N(\mu_L + \delta_f, \nu_L^2)
\end{aligned}$$

We set prior values of each standard deviation (ν) equal to 30% of the mean (CV = 0.3) to account for additional variation due to changes in regulations in the other Flyways and their unpredictable effects on the harvest rates of eastern mallards. We then specified the following prior distribution and parameter values for the liberal regulatory alternative:

Closed (in US only):

$$p(\mu_C) \sim N\left(0.08, \tfrac{0.024^2}{6}\right)$$
$$p(\nu_C^2) \sim Scaled\,Inv - \chi^2(6, 0.024^2)$$

Restrictive:

$$p(\gamma_R) \sim N\left(0.76, \tfrac{0.228^2}{6}\right)$$
$$p(\nu_R^2) \sim Scaled\,Inv - \chi^2(6, 0.0404^2)$$

Moderate:

$$p(\gamma_M) \sim N\left(0.92, \tfrac{0.28^2}{6}\right)$$
$$p(\nu_R^2) \sim Scaled\,Inv - \chi^2(6, 0.0488^2)$$

Liberal:

$$p(\mu_L) \sim N\left(0.1771, \tfrac{0.0531^2}{6}\right)$$
$$p(\nu_R^2) \sim Scaled\,Inv - \chi^2(6, 0.0531^2)$$

A previous analysis suggested that the effect of the framework-date extension on eastern mallards would be of lower magnitude and more variable than on mid-continent mallards (U.S. Fish and Wildlife Service 2000). Therefore, we specified the following prior distribution for the marginal effect of the framework-date extension for eastern mallards as:

$$p(\delta_f) \sim N\left(0.01, 0.01^2\right)$$

The prior distributions were multiplied by the likelihood functions based on the last 12 years of data under liberal regulations, and the resulting posterior distributions were evaluated with Markov Chain Monte Carlo simulation. Posterior estimates of model parameters and of annual harvest rates are provided in Table F.2.

Western

We modeled harvest rates of western mallards using a similar parameterization as that used for mid-continent and eastern mallards. However, we did not explicitly model the effect of the framework date

Table F.2 – Parameter estimates for predicting eastern mallard harvest rates resulting from a hierarchical, Bayesian analysis of eastern mallard banding and recovery information from 2002 to 2013.

Parameter	Estimate	SD	Parameter	Estimate	SD
μ_C	0.0800	0.0098	h_{2002}	0.1470	0.0124
ν_C	0.0231	0.0058	h_{2003}	0.1115	0.0097
γ_R	0.7616	0.0921	h_{2004}	0.1352	0.0114
ν_R	0.0393	0.0101	h_{2005}	0.1469	0.0125
γ_M	0.9180	0.1151	h_{2006}	0.1271	0.0106
ν_M	0.0472	0.0120	h_{2007}	0.1217	0.0118
μ_L	0.1394	0.0126	h_{2008}	0.1367	0.0107
ν_L	0.0368	0.0062	h_{2009}	0.1383	0.0111
δ_f	0.0020	0.0093	h_{2010}	0.1315	0.0112
			h_{2011}	0.1119	0.0094
			h_{2012}	0.1322	0.0107
			h_{2013}	0.1479	0.0109

extension because we did not use data observed prior to when framework date extensions were available. In the western mallard parameterization, the effect of the framework date extensions are implicit in the expected mean harvest rate expected under the liberal regulatory option.

$$
\begin{aligned}
&\text{Closed:} && p(h_C) \sim N(\mu_C, \nu_C^2) \\
&\text{Restrictive:} && p(h_R) \sim N(\gamma_R \mu_L, \nu_R^2) \\
&\text{Moderate:} && p(h_M) \sim N(\gamma_M \mu_L, \nu_M^2) \\
&\text{Liberal:} && p(h_L) \sim N(\mu_L, \nu_L^2)
\end{aligned}
$$

We set prior values of each standard deviation (ν) equal to 30% of the mean (CV = 0.3) to account for additional variation due to changes in regulations in the other Flyways and their unpredictable effects on the harvest rates of western mallards. We then specified the following prior distribution and parameter values for the liberal regulatory alternative:

Closed (in US only):

$$p(\mu_C) \sim N\left(0.0088, \tfrac{0.00264^2}{6}\right)$$

$$p(\nu_C^2) \sim Scaled\,Inv-\chi^2(6, 0.00264^2)$$

Restrictive:

$$p(\gamma_R) \sim N\left(0.51, \tfrac{0.153^2}{6}\right)$$

$$p(\nu_R^2) \sim Scaled\,Inv-\chi^2(6, 0.01867^2)$$

Moderate:

$p(\gamma_M) \sim N\left(0.85, \frac{0.255^2}{6}\right)$

$p(\nu_R^2) \sim Scaled\,Inv - \chi^2(6, 0, 0.03112^2)$

Liberal:

$p(\mu_L) \sim N\left(0.1220, \frac{0.03661^2}{6}\right)$

$p(\nu_R^2) \sim Scaled\,Inv - \chi^2(6, 0.03661^2)$

The prior distributions were multiplied by the likelihood functions based on the last 6 years of data under liberal regulations, and the resulting posterior distributions were evaluated with Markov Chain Monte Carlo simulation. Posterior estimates of model parameters and of annual harvest rates are provided Table F.3.

Table F.3 – Parameter estimates for predicting western mallard harvest rates resulting from a hierarchical, Bayesian analysis of western mallard banding and recovery information from 2008 to 2013.

Parameter	Estimate	SD	Parameter	Estimate	SD
μ_C	0.0081	0.0188	h_{2008}	0.1354	0.0073
ν_C	0.0181	0.0048	h_{2009}	0.1312	0.0065
γ_R	0.5106	0.0625	h_{2010}	0.1331	0.0069
ν_R	0.0173	0.0044	h_{2011}	0.1067	0.0059
γ_M	0.8475	0.1049	h_{2012}	0.1236	0.0058
ν_M	0.0288	0.0073	h_{2013}	0.0863	0.0050
μ_L	0.1203	0.0093			
ν_L	0.0290	0.0057			

Appendix G Northern Pintail Models

The Flyway Councils have long identified the northern pintail as a high-priority species for inclusion in the AHM process. In 2010, the USFWS and Flyway Councils adopted an adaptive management framework to inform northern pintail harvest management. A detailed progress report that describes the evolution of the pintail harvest strategy is available online (http://www.fws.gov/migratorybirds/NewsPublicationsReports.html). The northern pintail adaptive harvest management protocol considers two population models that represent alternative hypotheses about the effect of harvest on population dynamics: one in which harvest is additive to natural mortality, and another in which harvest is compensatory to natural mortality. We describe the technical details of the northern pintail model set below.

Latitude Bias Correction Model

Northern pintails tend to settle on breeding territories farther north during years when the prairies are dry and farther south during wet years. When pintails settle farther north, a smaller proportion are counted during the Waterfowl Breeding Population and Habitat Survey (WBPHS strata: 1–50, 75–77), thus the population estimate is biased low in comparison to years when the birds settle farther south. This phenomenon may be a result of decreased detectability of pintails during surveys in northern latitudes compared to southern latitudes or because birds settle in regions not covered by the survey. Runge and Boomer (2005) developed an empirical relationship to correct the observed breeding population estimates for this bias. Based on this approach, the latitude-adjusted breeding population size ($cBPOP_t$) in year t, can be calculated with

$$cBPOP_t = e^{ln(oBPOP_t) + 0.741(mLAT_t - 51.68)}$$

where $oBPOP_t$ is the observed breeding population size in year t and $mLAT_t$ is the mean latitude of the observed breeding population in year t. The mean latitude of the pintail breeding population distribution is based on the geographical centroid of each stratum in the traditional survey area (WBPHS strata: 1–50, 75–77). In year t, we calculate a mean latitude ($mLAT_t$) weighted by the population estimates from each strata with

$$mLAT_t = \sum_j [Lat_j(oBPOP_{t,j}/oBPOP_t)]$$

where Lat_j is the latitude of survey stratum j.

Population Models

Two population models are considered: one in which harvest is additive to natural mortality, and another in which harvest is compensatory to natural mortality. The models differ in how they handle the winter survival rate. In the additive model, winter survival rate is a constant, whereas winter survival is density-dependent in the compensatory model.

For the additive harvest mortality model, the latitude-adjusted population size ($cBPOP$) in year $t+1$, is calculated with

$$cBPOP_{t+1} = \left(cBPOP_t s_s \left(1 + \gamma_R \hat{R}_t\right) - \frac{\hat{H}_t}{(1-c)} \right) s_w$$

where $cBPOP_t$ is the latitude-adjusted breeding population size in year t, s_s and s_w are the summer and winter survival rates, respectively, γ_R is a bias-correction constant for the age-ratio, c is the crippling loss rate, $\hat{R}_t$ is the predicted age-ratio, and $\hat{H}_t$ is the predicted continental harvest. The model uses the following constants: $s_s = 0.70$, $s_w = 0.93$, $\gamma_R = 0.8$, and $c = 0.20$.

The compensatory harvest mortality model serves as a hypothesis that stands in contrast to the additive harvest mortality model, positing a strong but realistic degree of compensation. The compensatory model assumes that the mechanism for compensation is density-dependent post-harvest (winter) survival (Runge 2007). The form is a logistic relationship between winter survival and post-harvest population size, with the relationship anchored around the historic mean values for each variable. For the compensatory model, predicted winter survival rate in year t (s_t) is calculated as

$$s_t = s_0 + (s_1 - s_0)\left[1 + e^{-(a + b(P_t - \bar{P}))}\right]^{-1},$$

where s_1 (upper asymptote) is 1.0, s_0 (lower asymptote) is 0.7, b (slope term) is -1.0, P_t is the post-harvest population size in year t (expressed in millions), $\bar{P}$ is the mean post-harvest population size (4.295 million from 1974 through 2005), and

$$a = \text{logit}\left(\frac{\bar{s} - s_0}{s_1 - s_0}\right)$$

or

$$a = \log\left(\frac{\bar{s} - s_0}{s_1 - s_0}\right) - \log\left\{1 - \left(\frac{\bar{s} - s_0}{s_1 - s_0}\right)\right\},$$

where $\bar{s}$ is 0.93 (mean winter survival rate).

Age Ratio Submodel

Recruitment ($\hat{R}$) in year t is measured by the vulnerability-adjusted, female age-ratio in the fall population and is predicted as

$$\hat{R}_t = e^{(7.6048 - 0.13183 mLAT_t - 0.09212 cBPOP_t)}$$

where $mLAT_t$ is the mean latitude of the observed breeding population in year t and $cBPOP_t$ is the latitude-adjusted breeding population in year t (expressed in millions).

Harvest Submodel

Predicted continental harvest ($\hat{H}$) in year t is calculated with

$$\hat{H}_t = H_{PF} + H_{CF} + H_{MF} + H_{AF} + H_{AKCan}$$

where H_{PF}, H_{CF}, H_{MF}, and H_{AF} are the predicted harvest in the Pacific, Central, Mississippi, and Atlantic Flyways, respectively. The expected harvest from Alaska and Canada H_{AKCan} is assumed fixed and equal to 67,000 birds. Flyway specific harvest predictions are calculated with

Table G.1 – Total pintail harvest expected from the set of regulatory alternatives specified for each Flyway under the northern pintail adaptive harvest management protocol.

Pacific Atlantic	**Central Mississippi**	**Total Harvest**
Closed	Closed	67,000
Liberal 1	Closed	278,000
Liberal 1	Restrictive 3	410,000
Liberal 1	Moderate 3	523,000
Liberal 1	Liberal 1	569,000
Liberal 2	Closed	357,000
Liberal 2	Restrictive 3	490,000
Liberal 2	Moderate 3	603,000
Liberal 2	Liberal 2	672,000

$$H_{PF} = -12051.41 + 1160.960days + 73911.49bag$$

$$H_{CF} = -95245.20 + 2946.285days + 15228.03bag + 23136.04sis$$

$$H_{MF} = -59083.66 + 3413.49days + 7911.95bag + 59510.10sis$$

$$H_{PF} = -2403.06 + 360.950days + 5494.00bag$$

where *days* is the season length, *bag* is the daily bag limit, and *sis* is an indicator variable with value equal to 0 (full season equal to length from general duck season) or 1 (restrictive season within the liberal or moderate regulatory alternative for general duck season, i.e., partial season). Each regulatory combination of bag limit and season length has an associated predicted pintail harvest (Table G.1).

Model Weights

The relative degree of confidence that we have in the additive or compensatory mortality hypothesis can be represented with model weights that are updated annually from a comparison of model specific predictions and observed population sizes. For the period 1974–2012, the subsequent year's breeding population size (on the latitude-adjusted scale) was predicted with both the additive and compensatory models, and compared to the observed breeding population size (on the latitude-adjusted scale). The mean-squared error of the predictions from the additive model (MSE_{add}) was calculated as:

$$MSE_{add} = \frac{1}{(t-1975)+1} \sum_{t=1975}^{t} \left(cBPOP_t - cBPOP_t^{add} \right)^2,$$

and the mean-squared error of the predictions from the compensatory model were calculated in a similar manner.

We calculated model weights for the additive and compensatory model as a function of their relative mean-squared errors. The model weight for the additive model (W_{add}) was determined by

$$W_{add} = \frac{\frac{1}{MSE_{add}}}{\frac{1}{MSE_{add}} + \frac{1}{MSE_{comp}}}$$

The model weight for the compensatory model was found in a corresponding manner, or by subtracting the additive model weight from 1.0. As of 2014, the compensatory model did not fit the historic data as well as the additive model; the model weights were 0.576 for the additive model and 0.424 for the compensatory model.

Equilibrium Conditions

Equilibrium analyses of the additive model suggest a carrying capacity of 7.32 million (on the latitude-adjusted scale), maximum sustained yield (MSY) of 444,000 at an equilibrium population size of 3.34 million, and harvest rate of 10.7% (Runge and Boomer 2005). The yield curve resulting from the compensatory model is significantly skewed compared to the additive model (Figure G.1). Compared to the additive model, the compensatory model results in a lower carrying capacity (4.67 million), a higher MSY (560 thousand) at a lower equilibrium population size (3.00 million), and a higher maximum harvest rate (14.8%).

The average model, based on 2014 model weights, produces a yield curve that is intermediate between the additive and compensatory models. An equilibrium analysis of the weighted model results in carrying capacity, MSY, equilibrium population size at MSY, and maximum harvest rate that are intermediate between the additive and compensatory model results (5.50 million, 491 thousand, 3.10 million, and 12.6% respectively).

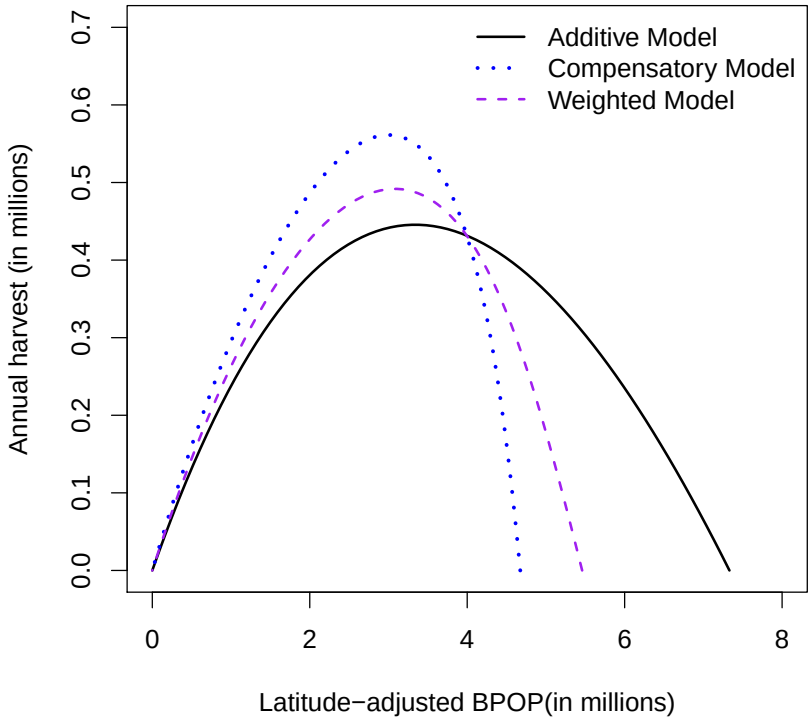


Figure G.1 – Harvest yield curves resulting from an equilibrium analysis of the northern pintail model set based on 2014 model weights.

Appendix H Scaup Model

We use a state-space formulation of scaup population and harvest dynamics within a Bayesian estimation framework (Meyer and Millar 1999, Millar and Meyer 2000). This analytical framework allows us to represent uncertainty associated with the monitoring programs (observation error) and the ability of our model formulation to predict actual changes in the system (process error).

Process Model

Given a logistic growth population model that includes harvest (Schaefer 1954), scaup population and harvest dynamics are calculated as a function of the intrinsic rate of increase (r), carrying capacity (K), and harvest (H_t). Following Meyer and Millar (1999), we scaled population sizes by K (i.e., $P_t = N_t/K$) and assumed that process errors (ϵ_t) are lognormally distributed with a mean of 0 and variance $\sigma^2_{process}$. The state dynamics can be expressed as

$$P_{1974} = P_0 e^{\varepsilon_{1974}}$$

$$P_t = \left(P_{t-1} + rP_{t-1}\left(1 - P_{t-1}\right) - H_{t-1}/K\right) e^{\varepsilon_t}, \quad t = 1975, \ldots, 2013,$$

where P_0 is the initial ratio of population size to carrying capacity. To predict total scaup harvest levels, we modeled scaup harvest rates (h_t) as a function of the pooled direct recovery rate (f_t) observed each year with

$$h_t = f_t/\lambda_t.$$

We specified reporting rate (λ_t) distributions based on estimates for mallards (*Anas platyrhynchos*) from large scale historical and existing reward banding studies (Henny and Burnham 1976, Nichols et al. 1995*b*, P. Garrettson unpublished data). We accounted for increases in reporting rate believed to be associated with changes in band type (e.g., from AVISE and new address bands to 1-800 toll free bands) by specifying year specific reporting rates according to

$$\begin{aligned} \lambda_t &\sim Normal(0.38, 0.04), \quad t = 1974, \ldots, 1996 \\ \lambda_t &\sim Normal(0.70, 0.04), \quad t = 1997, \ldots, 2013. \end{aligned}$$

We then predicted total scaup harvest (H_t) with

$$H_t = h_t \left[P_t + rP_t\left(1 - P_t\right)\right] K, \quad t = 1974, \ldots, 2013.$$

Observation Model

We compared our predictions of population and harvest numbers from our process model to the observations collected by the Waterfowl and Breeding Habitat Survey (WBPHS) and the Harvest Survey programs with the following relationships, assuming that the population and harvest observation errors were additive and normally distributed. May breeding population estimates were related to model predictions by

$$N_t^{Observed} - P_t K = \varepsilon_t^{BPOP},$$

where

$$\varepsilon_t^{BPOP} \sim N(0, \sigma^2_{t,BPOP}), \quad t = 1974, \ldots, 2013,$$

where $\sigma^2_{t,BPOP}$ is specified each year with the BPOP variance estimates from the WBPHS.

We adjusted our harvest predictions to the observed harvest data estimates with a scaling parameter (q) according to

$$H_t^{Observed} - \left(h_t \left[P_t + rP_t\left(1 - P_t\right)\right] K\right)/q = \varepsilon_t^H, \quad t = 1974, \ldots, 2013,$$

where,

$$\varepsilon_t^H \sim N(0, \sigma^2_{t,Harvest}).$$

We assumed that appropriate measures of the harvest observation error $\sigma^2_{t,Harvest}$ could be approximated by assuming a coefficient of variation for each annual harvest estimate equal to 0.15 (Paul Padding pers. comm.). The final component of the likelihood included the year specific direct recovery rates that were represented by the rate parameter (f_t) of a Binomial distribution indexed by the total number of birds banded preseason and estimated with,

$$\begin{aligned} f_t &= m_t/M_t, \\ m_t &\sim Binomial(M_t, f_t) \end{aligned}$$

where m_t is the total number of scaup banded preseason in year t and recovered during the hunting season in year t and M_t is the total number of scaup banded preseason in year t.

Bayesian Analysis

Following Meyer and Millar (1999), we developed a fully conditional joint probability model, by first proposing prior distributions for all model parameters and unobserved system states and secondly by developing a fully conditional likelihood for each sampling distribution.

Prior Distributions

For this analysis, a joint prior distribution is required because the unknown system states P are assumed to be conditionally independent (Meyer and Millar 1999). This leads to the following joint prior distribution for the model parameters and unobserved system states

$$\begin{aligned} P(r, K, q, f_t, \lambda_t, \sigma^2_{Process}, P_0, P_{1,\ldots,T}) = \\ p(r)p(K)p(q)p(f_t)p(\lambda_t)p(\sigma^2_{Process})p(P_0)p(P_1|P_0, \sigma^2_{Process}) \\ \times \prod_{t=2}^{n} p(P_t|P_{t-1}, r, K, f_{t-1}, \lambda_{t-1}, \sigma^2_{Process}) \end{aligned}$$

In general, we chose non-informative priors to represent the uncertainty we have in specifying the value of the parameters used in our assessment. However, we were required to use existing information to specify informative priors for the initial ratio of population size to carrying capacity (P_0) as well as the reporting rate values (λ_t) specified above that were used to adjust the direct recovery rate estimates to harvest rates.

We specified that the value of P_0, ranged from the population size at maximum sustained yield ($P_0 = N_{MSY}/K = (K/2)/K = 0.5$) to the carrying capacity ($P_0 = N/K = 1$), using a uniform distribution on the log scale to represent this range of values. We assumed that the exploitation experienced at this population state was somewhere on the right-hand shoulder of a sustained yield curve (i.e., between MSY and K). Given that we have very little evidence to suggest that historical scaup harvest levels were limiting scaup population growth, this seems like a reasonable prior distribution.

We used non-informative prior distributions to represent the variance and scaling terms, while the priors for the population parameters r and K were chosen to be vague but within biological bounds. These distributions were specified according to

$$\begin{aligned}
P_0 &\sim Uniform(ln(0.5), 0), \\
K &\sim Lognormal(2.17, 0.667), \\
r &\sim Uniform(0.00001, 2), \\
f_t &\sim Beta(0.5, 0.5), \\
q &\sim Uniform(0.0, 2), \\
\sigma^2_{Process} &\sim Inverse\ Gamma(0.001, 0.001).
\end{aligned}$$

Likelihood

We related the observed population, total harvest estimates, and observed direct recoveries to the model parameters and unobserved system states with the following likelihood function:

$$\begin{aligned}
&P(N_{1,\ldots,T}, H_{1,\ldots,T}, m_{1,\ldots,T} M_{1,\ldots,T} | r, K, f_t, \lambda_t, q, \sigma^2_{Process}, \sigma^2_{Harvest}, P_{1,\ldots,T}) = \\
&\quad \times \prod_{t=1}^{T} p(N_t | P_t, K, \sigma^2_{BPOP}) \times \prod_{t=1}^{T} p(H_t | P_t, r, K, q, f_t, \lambda_t, \sigma^2_{Harvest}) \\
&\quad \times \prod_{t=1}^{T} p(m_t | M_t, f_t)
\end{aligned}$$

Posterior Evaluation

Using Bayes theorem we then specified a posterior distribution for the fully conditional joint probability distribution of the parameters given the observed information according to

$$\begin{aligned}
&P(r, K, q, f_t, \lambda_t, \sigma^2_{Process}, P_0, P_{1,\ldots,T} | N_{1,\ldots,T}, H_{1,\ldots,T}, m_{1,\ldots,T}, M_{1,\ldots,T}) \propto \\
&\quad p(r)p(K)p(q)p(f_t)p(\lambda_t)p(\sigma^2_{Process})p(P_0)p(P_1 | P_0, \sigma^2_{Process}) \\
&\quad \times \prod_{t=2}^{n} p(P_t | P_{t-1}, r, K, f_{t-1}, \lambda_{t-1}, \sigma^2_{Process}) \times \prod_{t=1}^{T} p(N_t | P_t, K, \sigma^2_{BPOP}) \\
&\quad \times \prod_{t=1}^{T} p(H_t | P_t, r, K, q, f_t, \lambda_t, \sigma^2_{Harvest}) \times \prod_{t=1}^{T} p(m_t | M_t, f_t)
\end{aligned}$$

Table H.1 – Model parameter estimates resulting from a Bayesian analysis of scaup breeding population, harvest, and banding information from 1974 to 2013.

Parameter	Mean	SD	2.5% CI	Median	97.5% CI
r	0.1435	0.0552	0.0600	0.1336	0.2739
K	8.2710	1.6750	5.9599	7.8960	12.2100
σ^2	0.0078	0.0034	0.0031	0.0072	0.0163
q	0.6445	0.0391	0.5715	0.6438	0.7247

We used Markov Chain Monte Carlo (MCMC) methods to evaluate the posterior distribution using WinBUGS (Spiegelhalter et al. 2003). We randomly generated initial values and simulated 5 independent chains each with 1,000,000 iterations. We discarded the first half of the simulation and thinned each chain by 250, yielding a sample of 10,000 points. We calculated Gelman-Rubin statistics (Brooks and Gelman 1998) to monitor for lack of convergence. The state space formulation and Bayesian analysis framework provided reasonable fits to the observed breeding population and total harvest estimates with realistic measures of variation. The 2013 posterior estimates of model parameters based on data from 1974 to 2013 are provided in Table H.1.

We further summarized the simulation results for r, K, and the scaling parameter q to admit parametric uncertainty with a formal correlation structure within the optimization procedure used to calculate the harvest strategy. We first defined a joint distribution for 3 discrete outcomes for each of the 3 population parameters. We used the 30 and 70 percent quantiles for each parameter as the cut points to define three bins for which to discretize 3 values of each posterior distribution. We then determined the frequency of occurrence of each of the 27 possible combinations of each parameter value falling within the 3 bins from the MCMC simulation results. These frequencies were then assigned parameter values based on the midpoint of the bin ranges (15, 50, 85 percent quantiles) to specify the joint distribution of the population parameter values used in the optimization.

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From: Jeffrey Warren
To: Steve Kallin; Eric Cole; Cris Dippel
Subject: Yet another way to look at the world
Date: Friday, February 13, 2015 11:19:21 AM
Attachments: AMP_figures.pptx

Please compare slides 4 and 5 in the attached powerpoint and let me know which one you think is a better representation of the objectives, criteria, and actions (in boxes on slide 5) for the AMP. I created slide 5 because I was hung up on having an objective for a management action above a biological objective, i.e., we are trying to minimize feeding for the benefit of minimizing disease threat, not the other way around. I also dropped 'hunt timing' and am considering it as included in 'harvest management'. You'll also notice that I linked harvest management to population objectives through 'public support' to acknowledge that without the public hunting would simply be culling and that hunting has very strong proponents and opponents.

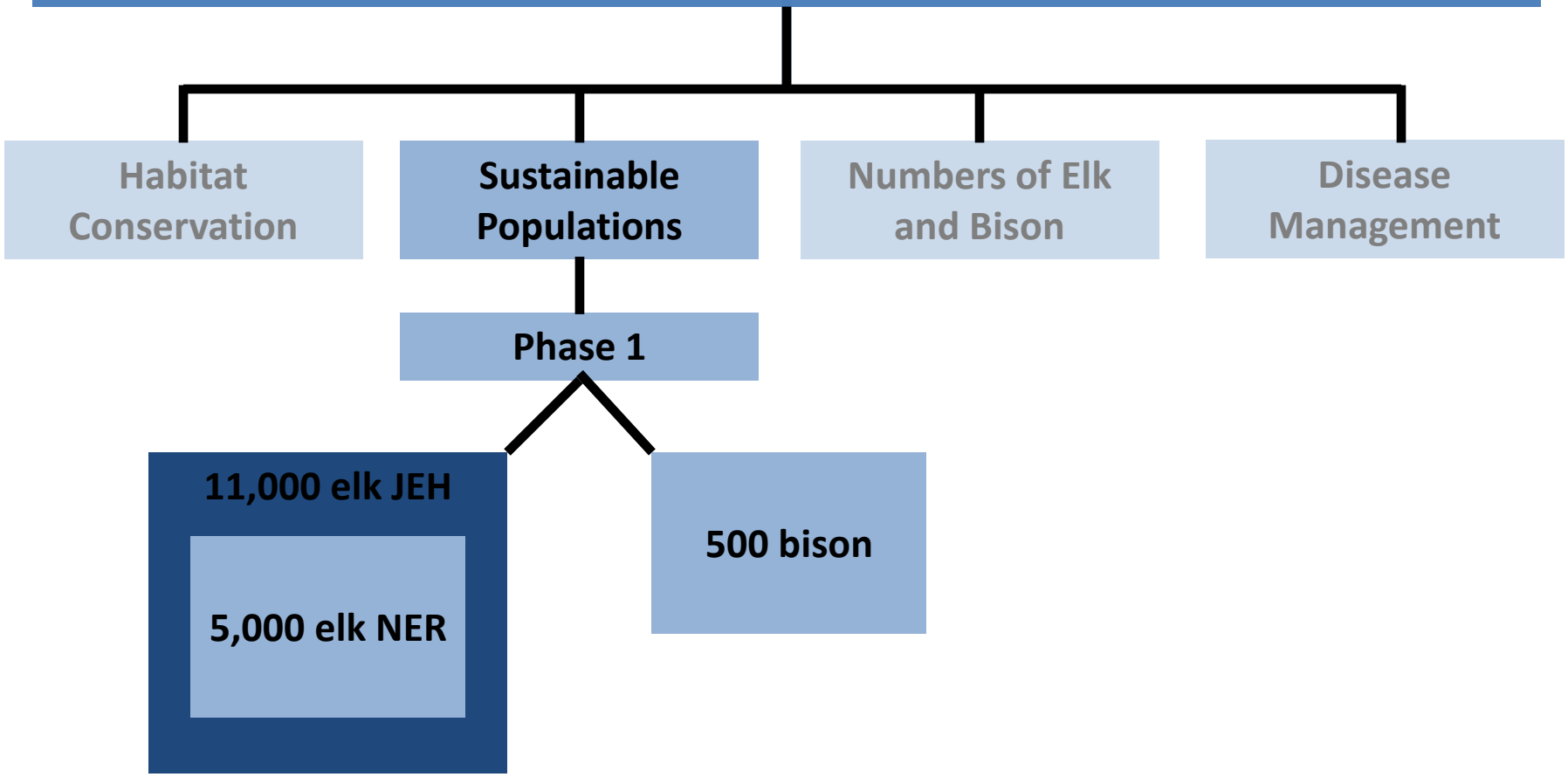
Cheers,

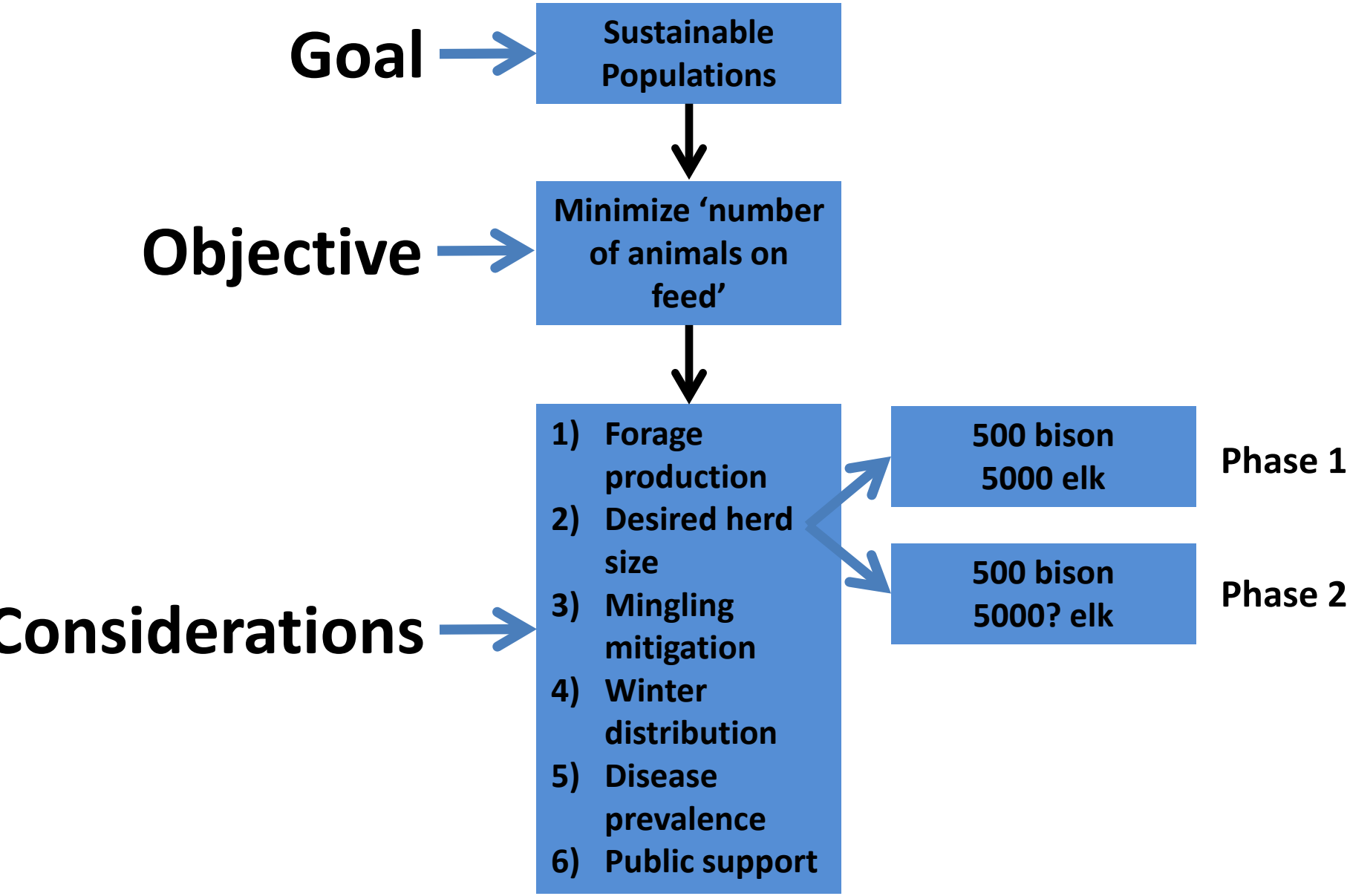
Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

‘Manage bison and elk in a manner that contributes to the state’s herd objectives yet allows for the biotic integrity and environmental health of the resources to be sustained (BEMP Desired Conditions).’



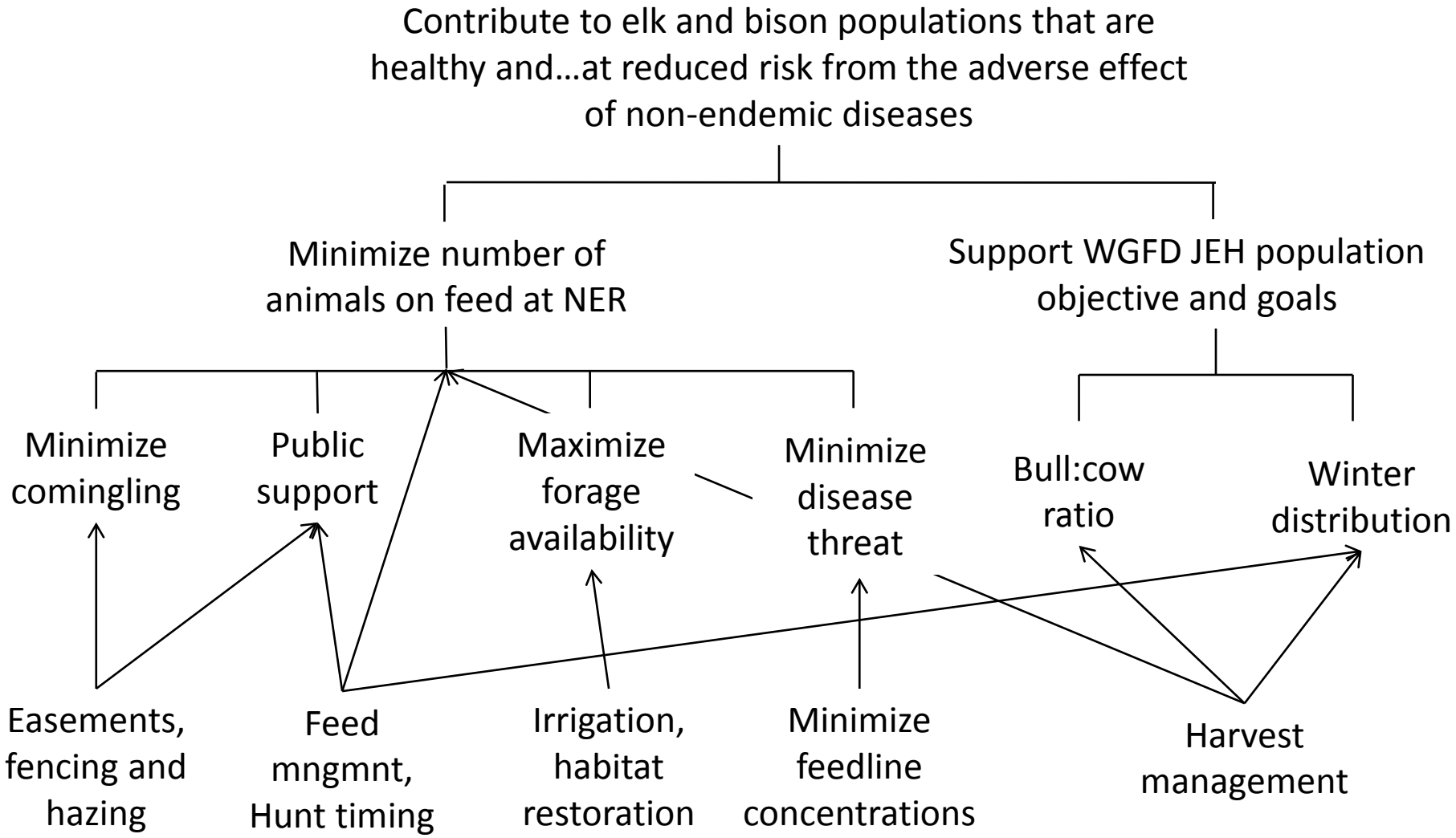

Goal
Sustainable Populations
Objective
Minimize 'number of animals on feed'
Considerations
1) Forage production
2) Desired herd size
3) Mingling mitigation
4) Winter distribution
5) Disease prevalence
6) Public support
500 bison
5000 elk
Phase 1
500 bison
5000? elk
Phase 2

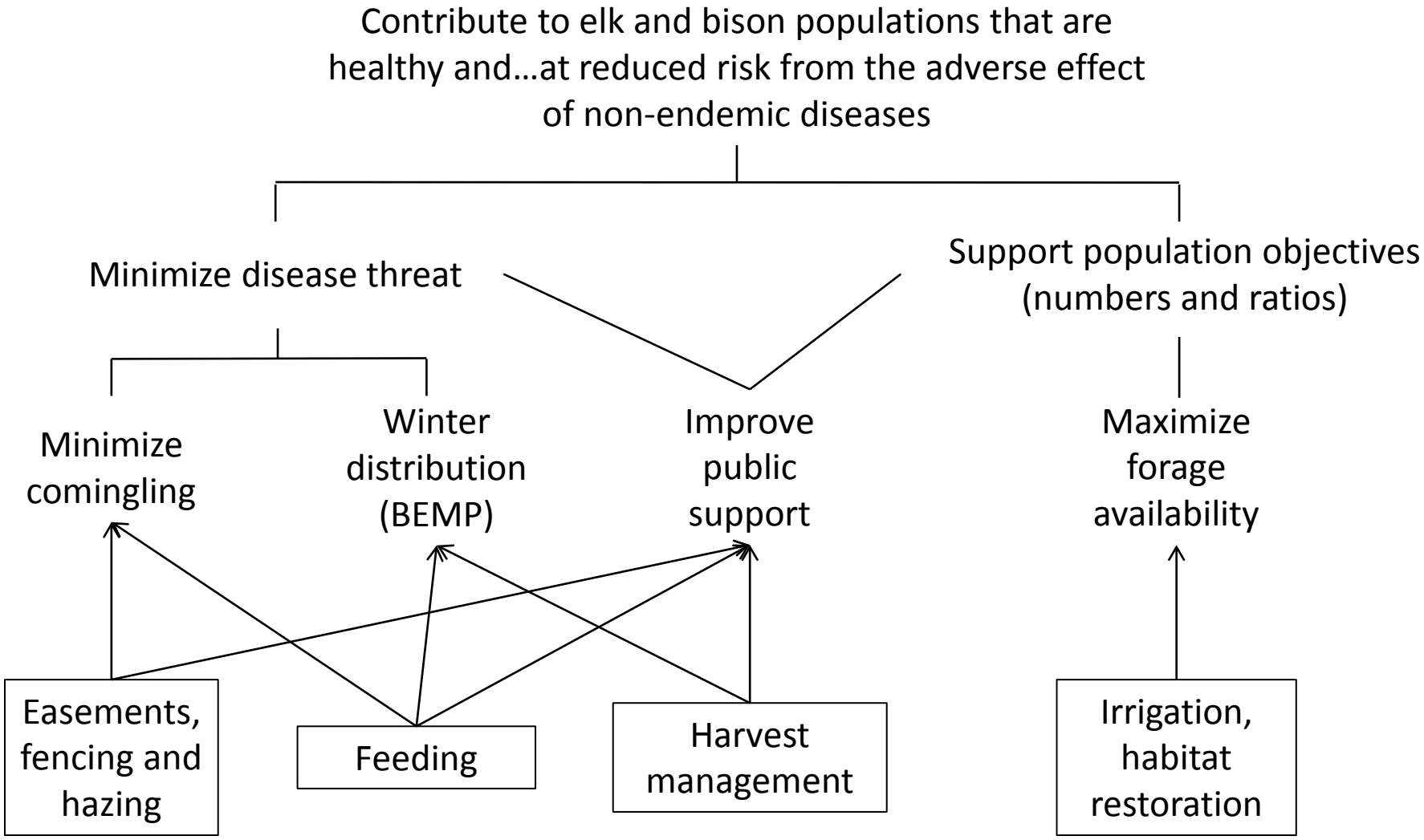
Triggers

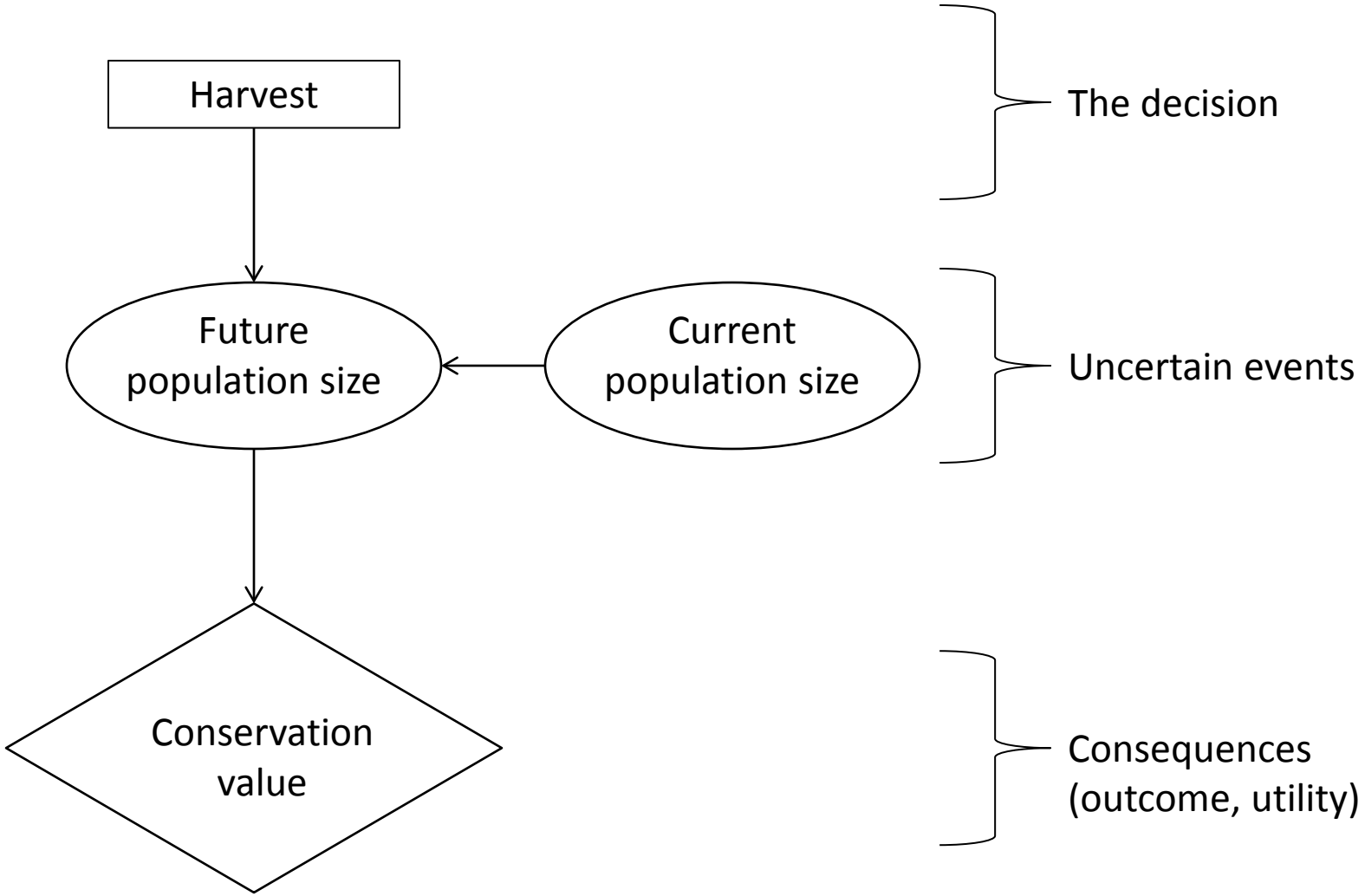
BEMP production objectives*

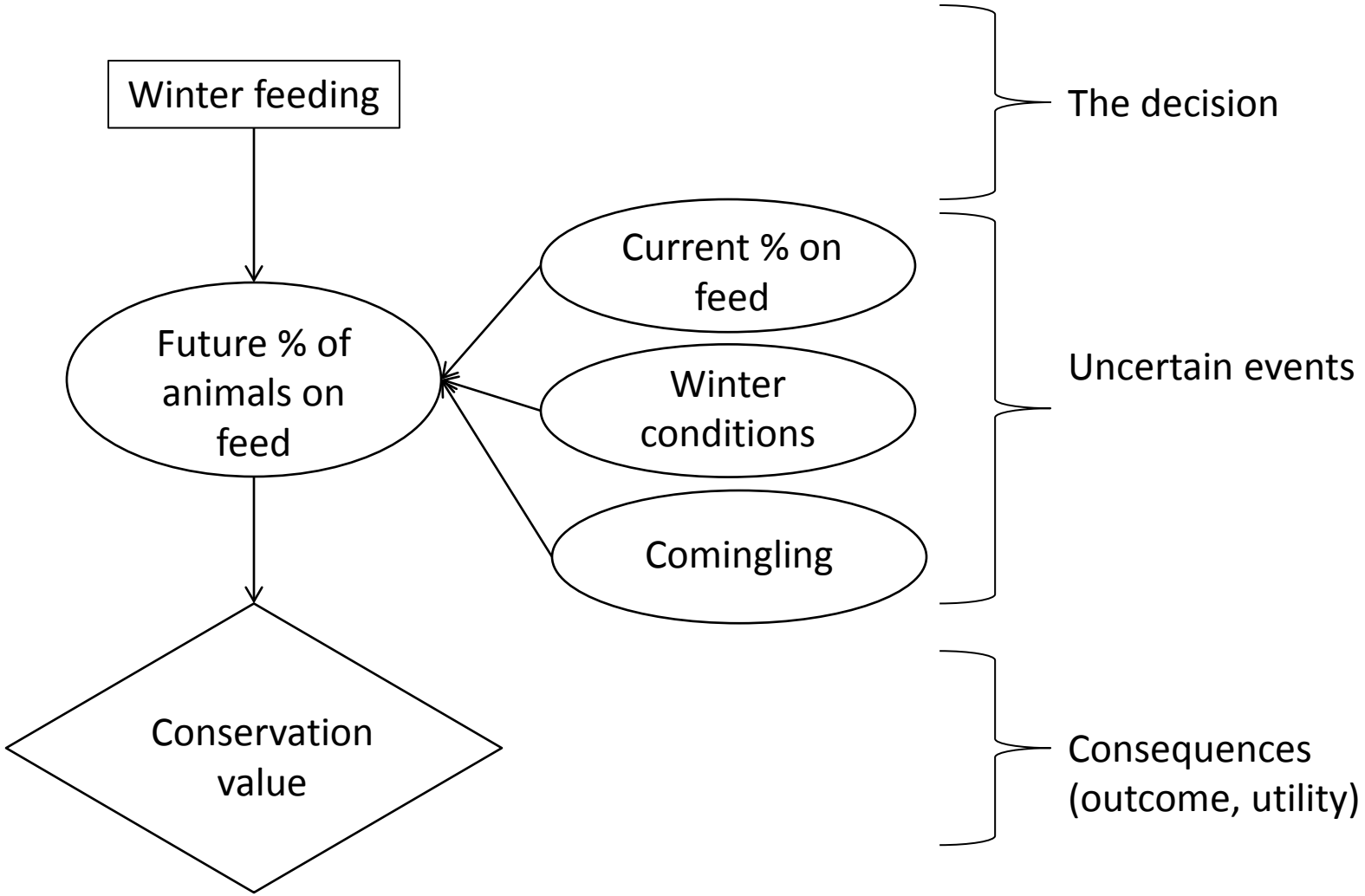
Considerations

1) **Forage production**
2) **Desired herd size**
3) **Mingling mitigation**
4) **Winter distribution**
5) **Disease prevalence**
6) **Public support**


Contribute to elk and bison populations that are healthy and…at reduced risk from the adverse effect of non-endemic diseases
Minimize number of animals on feed at NER
Support WGFD JEH population objective and goals
Minimize comingling
Public support
Maximize forage availability
Minimize disease threat
Bull:cow ratio
Winter distribution
Easements, fencing and hazing
Feed mngmnt, Hunt timing
Irrigation, habitat restoration
Minimize feedline concentrations
Harvest management


Contribute to elk and bison populations that are healthy and…at reduced risk from the adverse effect of non-endemic diseases
Minimize disease threat
Support population objectives (numbers and ratios)
Minimize comingling
Winter distribution (BEMP)
Improve public support
Maximize forage availability
Easements, fencing and hazing
Feeding
Harvest management
Irrigation, habitat restoration


Harvest
Future population size
Current population size
Conservation value
The decision
Uncertain events
Consequences (outcome, utility)


Winter feeding
Future % of animals on feed
Current % on feed
Winter conditions
Comingling
Conservation value
The decision
Uncertain events
Consequences (outcome, utility)

From: Doodle
To: Steve Kallin
Subject: Doodle: BEMP Adaptive Management Plan
Date: Tuesday, February 17, 2015 8:45:40 AM

View this poll on your dashboard

Do not forward this e-mail.*

Hi Steve Kallin,

You have created your Doodle poll

"BEMP Adaptive Management Plan"

You should keep this e-mail in case you want to edit your poll or invite more participants later on.

Administer poll **Invite participants**

* You should not forward this e-mail in order to prevent others from modifying or deleting your poll. If you do not want to use the administrative functions, you can simply ignore or delete this e-mail. Besides, old polls at Doodle are deleted automatically from time to time.

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: Link for poll "BEMP Adaptive Management Plan"
Date: Tuesday, February 17, 2015 8:45:41 AM

Hi Steve Kallin,

You have initiated a poll "BEMP Adaptive Management Plan" at Doodle.
The link to your poll is:

http://doodle.com/3vm7rbyei9s8fbfs

Share this link with all those who should cast their votes. Do not forget to cast your vote, too.

(If you did not initiate this poll, somebody must accidentally have used your e-mail address; simply ignore this e-mail, please.)

- Your Doodle Team

Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Steve Kallin
To:	Susan (Sue) Consolo-Murphy; Sarah Dewey; Dale Deiter; Kerry Murphy; Tim Fuchs; Doug Brimeyer; Jeffrey Warren; Eric Cole; Cris Dippel; Steve Kallin; Steve Cain
Subject:	Doodle Poll for next Adaptive Management Plan meeting
Date:	Tuesday, February 17, 2015 8:54:23 AM

Hi All:

Please follow the link below and reply to the Doodle Poll at your earliest convenience. I have included both morning and afternoon meetings as possibilities because of the narrow window of available days. Meeting will be again held at the NER Headquarters.

http://doodle.com/3vm7rbyei9s8fbfs

Thanks again for all your help. We look forward to moving this effort closer to the finish line.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan" Update
Date: Tuesday, February 17, 2015 8:56:06 AM



View this poll on your dashboard

Hi Steve Kallin,

"Steve Kallin" just provided information to the poll "BEMP Adaptive Management Plan."

Go to poll **Close poll**

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan" Update
Date: Tuesday, February 17, 2015 8:56:58 AM

View this poll on your dashboard

Hi Steve Kallin,

"Eric Cole" just provided information to the poll "BEMP Adaptive Management Plan."

Go to poll | Close poll

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan" Update
Date: Tuesday, February 17, 2015 9:26:45 AM

View this poll on your dashboard

Hi Steve Kallin,

"Tim Fuchs" just provided information to the poll "BEMP Adaptive Management Plan."

Go to poll | Close poll

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan" Update
Date: Tuesday, February 17, 2015 10:27:26 AM

View this poll on your dashboard

Hi Steve Kallin,

"Steve Cain" just provided information to the poll "BEMP Adaptive Management Plan."

Go to poll | Close poll

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan" Update
Date: Tuesday, February 17, 2015 10:50:42 AM

View this poll on your dashboard

Hi Steve Kallin,

"Sue Consolo-Murphy" just provided information to the poll "BEMP Adaptive Management Plan."

Go to poll **Close poll**

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Plan" Update
Date: Tuesday, February 17, 2015 4:57:03 PM

View this poll on your dashboard

Hi Steve Kallin,

"Doug Brimeyer" just provided information to the poll "BEMP Adaptive Management Plan."

Go to poll | Close poll

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Jeffrey Warren
To: Steve Kallin
Subject: RE: Doodle Poll for next Adaptive Management Plan meeting
Date: Wednesday, February 18, 2015 12:53:35 PM

Steve,

Looks like Wednesday is the day that works for everyone – are you o.k. with scheduling an afternoon meeting that day?

Cheers,

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

---

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Tuesday, February 17, 2015 8:54 AM
To: Susan (Sue) Consolo-Murphy; Sarah Dewey; Dale Deiter; Kerry Murphy; Tim Fuchs; Doug Brimeyer; Jeffrey Warren; Eric Cole; Cris Dippel; Steve Kallin; Steve Cain
Subject: Doodle Poll for next Adaptive Management Plan meeting

Hi All:

Please follow the link below and reply to the Doodle Poll at your earliest convenience. I have included both morning and afternoon meetings as possibilities because of the narrow window of available days. Meeting will be again held at the NER Headquarters.

http://doodle.com/3vm7rbyei9s8fbfs

Thanks again for all your help. We look forward to moving this effort closer to the finish line.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Cole, Eric
To: Steve Kallin; Cris Dippel
Subject: elk class count results attached
Date: Wednesday, February 18, 2015 3:09:00 PM
Attachments: 2015NER.xlsx

NER elk classification count results from 2/18/15 are attached.

With 8390 elk on feed, it appears that recent feedground estimates have been comparable to the classification count, and we are still way above the 5,000 objective for NER.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

2015 NER

	Nowlin	HQ	Flats	McBride	On Feed Total
Cow	794	1023	3206	0	5023
calf	169	306	597	1	1073
matbull	208	3	630	875	1716
spbull	101	46	425	6	578
Total	1272	1378	4858	882	8390

Off Feed near the FS access

East of Miller Butte

111
44
0
3
158

From:	Steve Kallin
To:	Steve Kallin; Sarah Dewey; Tim Fuchs; Susan (Sue) Consolo-Murphy; Dale Deiter; Cris Dippel; Kerry Murphy; Doug Brimeyer; Jeffrey Warren; Eric Cole; Steve Cain
Subject:	Next AMP MTG
Date:	Thursday, February 19, 2015 7:58:34 AM

Hi everyone:

The best time for the next AMP meeting is Wednesday, March 11 at 8:30 AM. Look forward to seeing you then at the refuge headquarters.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
P. O. Box 510
Jackson, WY 83001
Phone: (307) 201-5409
steve_kallin@fws.gov

On Feb 17, 2015, at 10:54 AM, Steve Kallin <steve_kallin@fws.gov> wrote:

> Hi All:
>
> Please follow the link below and reply to the Doodle Poll at your earliest convenience. I have included both morning and afternoon meetings as possibilities because of the narrow window of available days. Meeting will be again held at the NER Headquarters.
>
> http://doodle.com/3vm7rbyei9s8fbfs
>
> Thanks again for all your help. We look forward to moving this effort closer to the finish line.
>
> Take care,
>
> Steve Kallin
> Project Leader
> National Elk Refuge
> PO Box 510
> 675 East Broadway
> Jackson, WY 83001
> Phone: (307) 201-5409
> Fax: (307) 733-9729
> steve_kallin@fws.gov

From:	Iverson, Lori
To:	Amanda Soliday; Ann Blakley; Bryan Yetter; Claire Scolnick; Cris Dippel; Daniel Sharps; Dominick Harris; Elizabeth Schooner; Fernando Escobedo; Geneva Chong; Mike Nordell; Natalie Fath; Steve Kallin; Tim Pratt
Subject:	Fwd: NER classification count
Date:	Thursday, February 19, 2015 8:58:08 AM
Attachments:	NER feedgrounds classification_2015.xlsx

Lori Iverson
Outreach & Visitor Services
U.S. Fish & Wildlife Service
National Elk Refuge
PO Box 510 / 675 East Broadway
Jackson, WY 83001
Phone: 307.201.5433
Cell: 307.690.4375
Fax: 307.733.9729
lori_iverson@fws.gov
National Elk Refuge photo gallery
National Elk Refuge web site
Twitter: @NatlElkRefuge

---------- Forwarded message ----------
From: **Mark Gocke** <mark.gocke@wyo.gov>
Date: Wed, Feb 18, 2015 at 5:39 PM
Subject: Fwd: NER classification count
To: "environmental@jhnewsandguide.com" <environmental@jhnewsandguide.com>, Brielle Schaeffer <brielle@jhcr.org>, tyler.berg@localnews8.com, Brad Boner <photo@jhnewsandguide.com>
Cc: Alyson Courtemanch <alyson.courtemanch@wyo.gov>, "Lori_Iverson@fws.gov" <lori_iverson@fws.gov>, "Eric_Cole@fws.gov" <eric_cole@fws.gov>, "Fuchs, Tim" <tim.fuchs@wyo.gov>, Doug Brimeyer <doug.brimeyer@wyo.gov>

Hi all, I just wanted to share with you the final tally for elk on feed on the National Elk Refuge from today's count. Again, remember that the number of elk that winter on the NER usually makes up about 60% of the entire Jackson elk herd. We will be counting and classifying the other winter ranges (e.g. Gros Ventre, Buffalo Valley, Spread Creek, etc) in the coming days depending on weather. We hope to have the final figures for the entire herd by early next week. Don't hesitate to call if questions or for an interview. Thanks for coming out today.

Mark

---------- Forwarded message ----------
From: **Alyson Courtemanch** <alyson.courtemanch@wyo.gov>
Date: Wed, Feb 18, 2015 at 5:25 PM
Subject: NER classification count

To: Mark Gocke <mark.gocke@wyo.gov>, Tim Fuchs <tim.fuchs@wyo.gov>, Jonathan Stephens <jonathan.stephens@wyo.gov>, Kyle Lash <kyle.lash@wyo.gov>
Cc: Doug Brimeyer <doug.brimeyer@wyo.gov>

Attached is the final count of elk on feed on the NER (listed as 2014). I included some previous years for comparison.

Thanks for the help today,
Aly

--
Aly Courtemanch, Wildlife Biologist
Wyoming Game & Fish Department
420 North Cache
P.O. Box 67
Jackson, WY 83001
office: (307) 733-2383 x227
cell: (307) 730-2806

E-Mail to and from me, in connection with the transaction of public business, is subject to the Wyoming Public Records Act and may be disclosed to third parties.

--
Mark Gocke
Public Information Specialist
Jackson & Pinedale Regions
PO Box 67, Jackson, WY 83001
307-733-2383 x231 (O)
307-713-4200 (C)
mark.gocke@wyo.gov

E-Mail to and from me, in connection with the transaction of public business, is subject to the Wyoming Public Records Act and may be disclosed to third parties.

From:	Cole, Eric
To:	Bryan Yetter; troffe@exchange.montana.edu; Aly Courtemanch; Amanda Soliday; Arnie Dood; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Cris Dippel; Daniel Huckel; Daniel Sharps; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan Patla; Terry Roper; Tim Fuchs; Tim Pratt; Tom Reed; Ture Schoultz
Subject:	2/19/2015 National Elk Refuge Biological Update
Date:	Thursday, February 19, 2015 4:13:18 PM

2/19/2015 National Elk Refuge Biological Update

Elk Classification Count Results
WGFD and NER staff classified elk on NER feedgrounds on 2/18/15. Summary results for the elk on feed were:

Mature Bulls= 1,716
Spike Bulls= 578
Cows= 5,023
Calves=1,073
Total= 8,390

Total numbers were well above the 5 year running average of 6,807

Herd-wide classification count data from State feedgrounds in the Gros Ventre and helicopter surveys of native winter range are not yet available.

Bison Classification Count Results
WGFD, Grand Teton National Park and NER staff classified bison on NER feedgrounds on 2/19/15

Preliminary results suggest that there were 674 bison on feed. (100 mature bulls, 283 cows, 68 yearling bulls, 53 yearling cows, and 170 calves).

Most likely this represents a very high percentage of the entire Jackson Bison Herd, but helicopter survey information for bison off feed is not yet available.

Snow and Feedground Conditions
Peak snow pack depth at the NER headquarters monitoring site occurred on 1/17/15 (10.6 inches), but abnormally warm temperatures since mid-January have resulted in significant melting, and the south end of NER being completely snow free since February 13. For comparison average snow pack depth at the NER Headquarters in mid-February is 11.5 inches; I have not seen mid-winter conditions like this in my 17 years working for for the refuge.

Despite the lack of snow on southern NER, there is very little residual forage remaining in snow free areas, and elk and bison are still actively seeking supplemental feed. There are currently no plans to end supplemental feeding for the season, but NER and WGFD staff will monitor conditions and animal behavior. If current weather trends continue and additional forage opens up, an earlier than average feeding end date is very likely. For perspective the average feeding end date on NER is April 4th and the earliest end date was March 20 in 2007.

Winter Ungulate Mortality Documented
As of 2/15/15 we have documented 65 elk mortalities on NER (0.8 % of the classified NER population). This is still well below average winter mortality of 1.5%, but we anticipate additional mortality will occur before the end of the season.

2 bison (1 cow and 1 calf) and 1 pronghorn (fawn) winter deaths were also documented.

Other Ungulates Numbers
Peak pronghorn numbers observed recently were 55. The largest group has been west of Miller Butte in recent days. The highest recent bighorn sheep estimate was 65. These were all on or in the vicinity of Miller Butte

Bird Observations/Signs of Spring:
Horned larks on Poverty Flats 2/9/15
1 great blue heron in the Nowlin area 2/19/15

Large numbers of trumpeter swans are using ponds that are typically frozen solid at this time of year.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

From:	Cole, Eric
To:	Bryan Yetter; troffe@exchange.montana.edu; Aly Courtemanch; Amanda Soliday; Arnie Dood; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Cris Dippel; Daniel Huckel; Daniel Sharps; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan Patla; Terry Roper; Tim Fuchs; Tim Pratt; Tom Reed; Ture Schoultz
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Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

From:	Cole, Eric
To:	Bryan Yetter; troffe@exchange.montana.edu; Aly Courtemanch; Amanda Soliday; Arnie Dood; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Cris Dippel; Daniel Huckel; Daniel Sharps; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan Patla; Terry Roper; Tim Fuchs; Tim Pratt; Tom Reed; Ture Schoultz
Subject:	2/19/2015 National Elk Refuge Biological Update
Date:	Thursday, February 19, 2015 4:13:17 PM

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Most likely this represents a very high percentage of the entire Jackson Bison Herd, but helicopter survey information for bison off feed is not yet available.

Snow and Feedground Conditions
Peak snow pack depth at the NER headquarters monitoring site occurred on 1/17/15 (10.6 inches), but abnormally warm temperatures since mid-January have resulted in significant melting, and the south end of NER being completely snow free since February 13. For comparison average snow pack depth at the NER Headquarters in mid-February is 11.5 inches; I have not seen mid-winter conditions like this in my 17 years working for for the refuge.

Despite the lack of snow on southern NER, there is very little residual forage remaining in snow free areas, and elk and bison are still actively seeking supplemental feed. There are currently no plans to end supplemental feeding for the season, but NER and WGFD staff will monitor conditions and animal behavior. If current weather trends continue and additional forage opens up, an earlier than average feeding end date is very likely. For perspective the average feeding end date on NER is April 4th and the earliest end date was March 20 in 2007.

Winter Ungulate Mortality Documented
As of 2/15/15 we have documented 65 elk mortalities on NER (0.8 % of the classified NER population). This is still well below average winter mortality of 1.5%, but we anticipate additional mortality will occur before the end of the season.

2 bison (1 cow and 1 calf) and 1 pronghorn (fawn) winter deaths were also documented.

Other Ungulates Numbers
Peak pronghorn numbers observed recently were 55. The largest group has been west of Miller Butte in recent days. The highest recent bighorn sheep estimate was 65. These were all on or in the vicinity of Miller Butte

Bird Observations/Signs of Spring:
Horned larks on Poverty Flats 2/9/15
1 great blue heron in the Nowlin area 2/19/15

Large numbers of trumpeter swans are using ponds that are typically frozen solid at this time of year.

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From:	Cole, Eric
To:	Steve Kallin; Cris Dippel; Sarah Dewey; Susan (Sue) Consolo-Murphy
Subject:	Updated Elk Harvest Vulnerability Report in Advance of Elk Season Setting Meetings
Date:	Monday, February 23, 2015 9:44:10 PM
Attachments:	2015 Harvest Availability Report-2-20-2015.docx

Hello,

The attached "2015 harvest Availability Report" was primarily analyzed and written by Aaron Foley with assistance from me. Aaron was a USGS post doc that we have been collaborating with since 2012. Recommendations in the report are Aaron's and do not necessarily represent my views. The primary purpose of the report is to use elk GPS collar data to quantify the relative amount of time that elk spend in hunt areas by summer segment, and to estimate the actual number of cow elk that are available for harvest by hunt area and summer segment.

I provided Sarah with an earlier version of the attached report last week, but be advised that there have been some minor changes since that time, and the attached report is the version that should be used. In the new version Table 1 has been modified to include an OTHER category to account for elk that were collared on NER and that summered in the BTNF in areas other than Teton Wilderness (TW). Although we did not analyze vulnerability to harvest for the OTHER category, inclusion of OTHER does affect our estimate of the number of cow elk in the remaining summer segments, and therefore our estimates of the number of cow elk vulnerable to harvest by hunt area and summer segment.

In recent years the WGFD strategy has been to minimize harvest of the Yellowstone National Park (YNP) and TW summer segments and focus harvest on what they term the Snake River Core. Snake River Core are generally elk that summer in Grand Teton National Park and private lands south of the park (summer segment categories GTNP and SGTNP in our analysis). I, Aaron, Sarah, Doug Brimeyer and others have a JWM paper currently in review that supports the contention that long distance migratory elk that winter on NER have declined over a 35 year period, while short distance migrants that summer between Wilson and Moose have increased dramatically. Therefore, WGFD concerns about the YNP and TW segments are valid. However, it is the Refuge's contention that we will need to tolerate some increased harvest of YNP and TW elk to facilitate increased harvest of GTNP and SGTNP summer segments. With elk numbers over 8,300 for a second year in a row, clearly we are not meeting our objective of 5,000 elk on NER and as a result we are not reducing our reliance on supplemental feed.

Based on the vulnerability analysis our biggest opportunities to increase harvest of GTNP and SGTNP elk are in Hunt area 77 (the Refuge), and perhaps in HA 75 in GTNP. Opportunities to increase harvest of GTNP and SGTNP elk in HA 80 elk are limited unless the subunit south of Twin Creek is extended after the December 1 winter range closure date, and this could be politically difficult. See more detailed notes about my recommendations for each hunt area below:

HA 77 season currently closes around December 14 (week 18 in figure on page 10). I recommend extending the NER season by at least 1 week until 12/21 (week 19 in figure on page 10). Proportional use by GTNP and SGTNP of HA 77 is very high during this time period. Although proportional use by YNP elk is also very high, the actual number of YNP cow elk exposed to harvest in week 19 would be low compared to the large number of GTNP and SGTNP cow elk. (1800 GTNP elk, 1800 SGTNP elk and 250 YNP elk. For example

assuming equal availability if 100 additional elk were harvested in week 19 we estimate 47 would be GTNP elk, 47 would be SGTNP elk, and only 6 of these would be YNP elk and 1 or less would be TW elk. These trends appear consistent in HA 77 until the end of January, but how late that we want to extend the NER season is debatable.

HA 75 season currently closes around December 7 (week 17 in figure in page 5). Extending the season to match current NER season end of December 14 (week 18) might increase harvest of GTNP elk, but is unlikely to result in the harvest of many SGTNP elk. In week 18 we estimate 150 GTNP, 50 SGTNP, 10 YNP, and 1 or fewer TW cow elk available for harvest in HA 75. So for every 100 elk harvested in HA 75 in week 19, approximately 5 would be YNP elk and <1 would be TW. Therefore there is the potentially for a modest increase in GTNP elk with only a few Yellowstone elk vulnerable to harvest. There does not appear to be much benefit of pushing the HA 75 season to December 21 or later (week 19) because so few elk are available to harvest.

HA 80 current season structure is the entire hunt area is open until November 16 (the time period between weeks 7 and 13 portrayed by the gray shading in the figures on page 7), but the area south of Twin Creek is open until December 1 (week 16). At first glance the figure on page 7 suggests that we could increase harvest of GTNP elk by keeping the portion of HA 80 north of Twin Creek open until December 1 (week 16), but as indicated on the map on page 16, there is very little elk use of the area north of Twin Creek, and much of this is by YNP and TW elk. Any significant harvest gains for GTNP and to a lesser extent SGTNP elk would occur in the area south of Twin Creek if the season was extended beyond the Dec 1 winter range closure date, and the political feasibility of extending the winter closure beyond Dec 1 is uncertain. That being said, there is an opportunity to significantly increase harvest if the area south of Twin Creek was kept open longer than December 1 (weeks 16-19 on the page 7 figures). For example in week 18, December 13-19, we predict that there would be ~325 GTNP cow elk, 100 SGTNP cow elk, 80 YNP cow elk and 10 TW cow elk available for harvest. For example if 100 additional elk were harvested in HA 80 in week 18, 63 would be GTNP, 19 would be SGTNP, 15 would be YNP, and 2 would be TW.

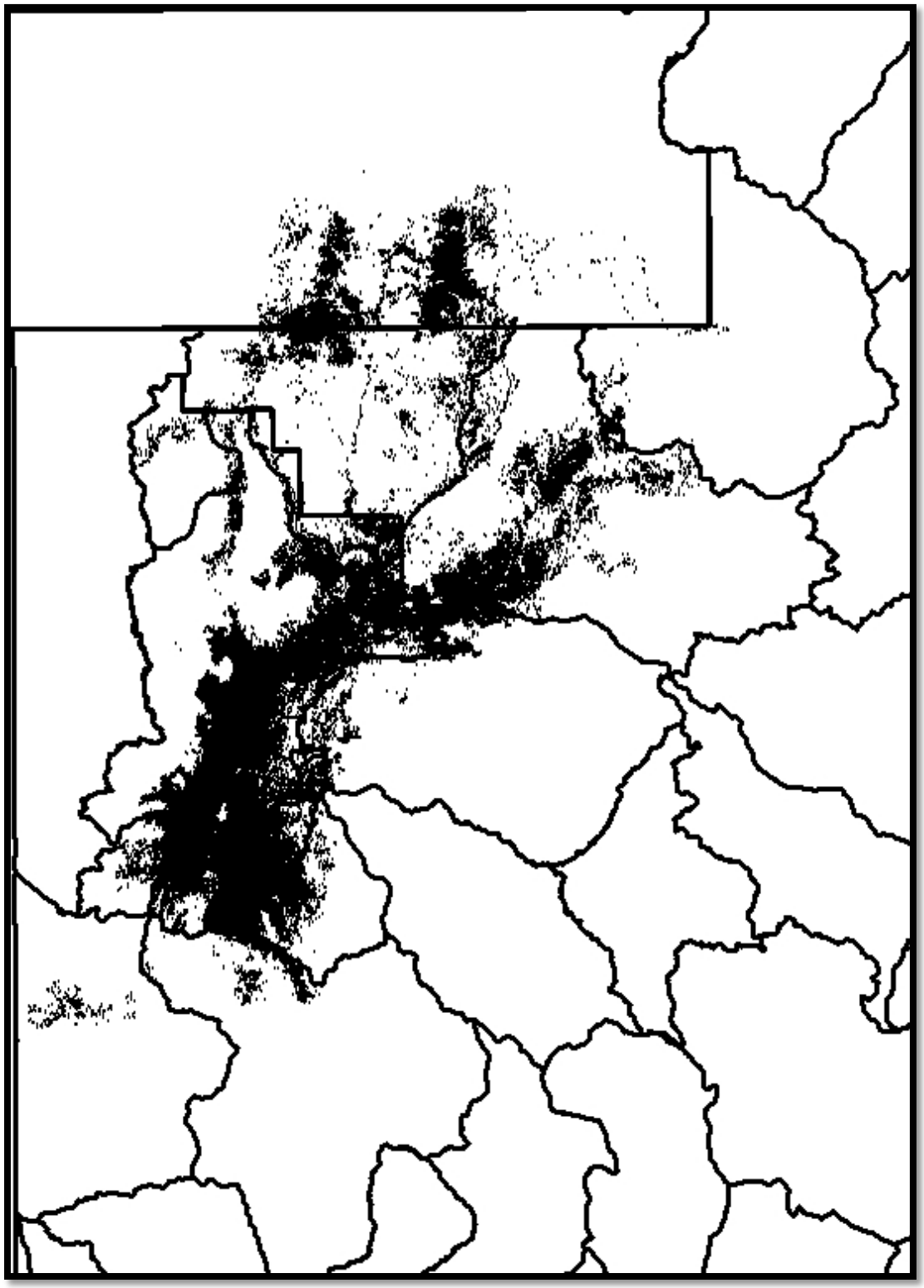
The report offers much more nuanced information and recommendations, but I think that I have hit the highlights relative to the season setting process that might best help us meet NER elk population objectives.

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307.201.5432 (Note new phone # as of June 2014)

JACKSON ELK HERD UNIT

HARVEST AVAILABILITY REPORT

2015



Produced by Aaron Foley and Eric Cole

INTRODUCTION

There are 4 primary summer segments within the Jackson Herd: Yellowstone National Park (YNP), Teton Wilderness (TW), Southern Grand Teton National Park (SGTNP), and Grand Teton National Park (GTNP). Current population size trends vary for the summer segments; YNP is decreasing while SGTNP is increasing. The remaining 2 summer segments (TW and GTNP) are currently stable. With different population size trends among summering segments, there is value in assessing differential harvest availability among the groups. Hunt Areas (HA) are locations where elk are vulnerable to harvest during the hunting season. Therefore, understanding differential vulnerability will allow managers to adjust season dates and/or modify hunt area boundaries to either increase or decrease vulnerability for certain summer segments. Such an approach has been undertaken by the Wyoming Game and Fish Department (WGFD). Two HAs have portions closed during the early part of hunt seasons with the aim of minimizing harvest of YNP and TW elk. We used an extensive dataset of elk locations acquired via GPS radio-collars to evaluate whether HA modifications are meeting desired elk management objectives and to improve our understanding of spatiotemporal tendencies for each summer segment.

We analyzed GPS collar datasets collected from 4 separate projects conducted by Pathways (PWY), National Elk Refuge (NER), Iowa State University (ISU), and Wyoming Game and Fish Department (WGFD). Before proceeding with analyses, we tested for potential fix acquisition bias due to habitat differences among HAs. Plots of percent of missing locations for each collar against proportional use of each HA did not indicate any trends. Further, we compared proportional use of HAs among the different capture sites and did not detect a capture bias. Lastly, we examined differences in day-time and night-time use of HAs; there were no differences. Thus, all data of elk that wintered on NER were combined for this analysis. To identify which summer segment each individual elk belonged to, we used centroids of locations post spring migration (7/1-9/30). There were a few instances (N = 4) when an elk was migrating after 7/1. For these individuals, we used centroids of locations after the net squared displacement plateaued (when the distance between the NER and the elk became consistent). For many years, elk hunters have considered a portion of HA84 to be part of HA80 (Fig. 1). Therefore, to be judicious in our vulnerability analyses, we modified the boundary of HA80 to include the portion of HA84. The “artificial” boundary of HA80 was appended by Doug Brimeyer and Eric Cole. The remaining HA boundaries were left intact.

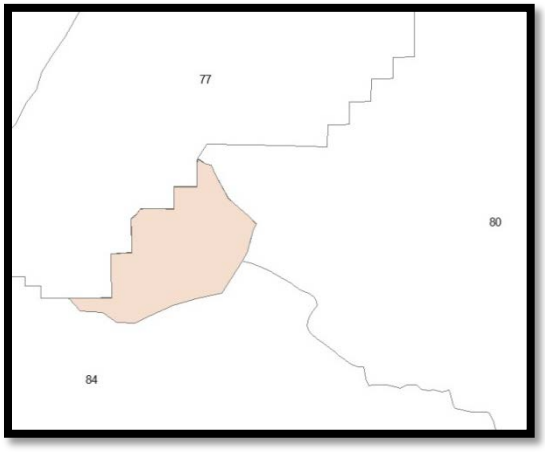


Figure 1. The tan area represents the portion of HA84 that was added to HA80 for the purpose of this analysis because elk hunters often assume the tan area is part of HA80.

GENERAL ELK USE OF HUNT AREAS

We present 2 adjacent graphs depicting HA-specific locations of elk during weekly periods of August 16 – January 31 2007-2014 regardless of whether the HA was open or closed to legal hunting (the shaded portions reflect the most recent hunting seasons). The left plots indicate proportional use of individual elk captured and collared throughout the Jackson Herd Unit (Pathways, YNP, ISU, etc.). Because proportional use do not reflect actual number of elk on a given HA, we also present **estimated** number of elk present on each HA on the right side. *This method assumes that proportion of elk captured on the NER was representative of distribution of elk summer groups wintering on NER and needs to be interpreted cautiously* (Table 1). Essentially, these 2 adjacent plots show where these elk were during the autumn-winter. Our sample size for proportional use was 104 GTNP, 57 SGTNP, 21 TW and 25 YNP elk-years. Table 2 is a reference table to interpret the x-axis.

Immediately below the 2 adjacent plots, we added the average number of elk days on a given HA **during legal season** averaged for each summer group. One day (e.g., 12/3/2009) is a location on a HA during open season by a single elk. This approach provides a different perspective of elk harvest availability by summer group.

Table 1. Number of elk-years by summer group that were captured on NER during 2007-2014. Summer ranges were classified by centroids during July-September. Elk from 'other' summer ranges were from Cache and Gros Ventre. Estimated cow elk count was the average for 2007-2014.

Summer Group	N elk-years	% Collars	Est. cow elk count
GTNP	35	45	2135
SGTNP	32	42	1992
TW	2	3	142
YNP	5	6	285
OTHER	3	4	190
SUM	**77**	**100**	**4744**

Methods:

Proportional Use - Extracted locations from Aug 16 to Jan 31. Acquired number of GPS locations per individual-year within a given HA for each week, converted to proportions where the sum of proportions for an individual equals 1 for week 1, 2, etc. Averaged these individual-year proportions and obtained standard errors (SE) which is illustrated by the vertical lines. Some averages may be low because of time spent outside of HAs (e.g., YNP and GTNP).

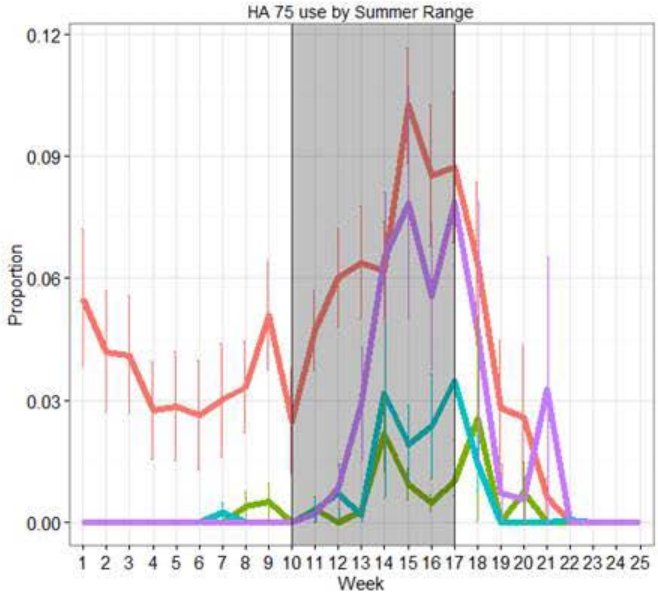
Estimated Elk Counts – Multiplied proportions of elk captured on NER by estimated number of elk within each summer group. Number of elk within each summer group was derived from proportion of elk-years and multiplied by the average number of cow elk observed on feedground from 2007-2014.

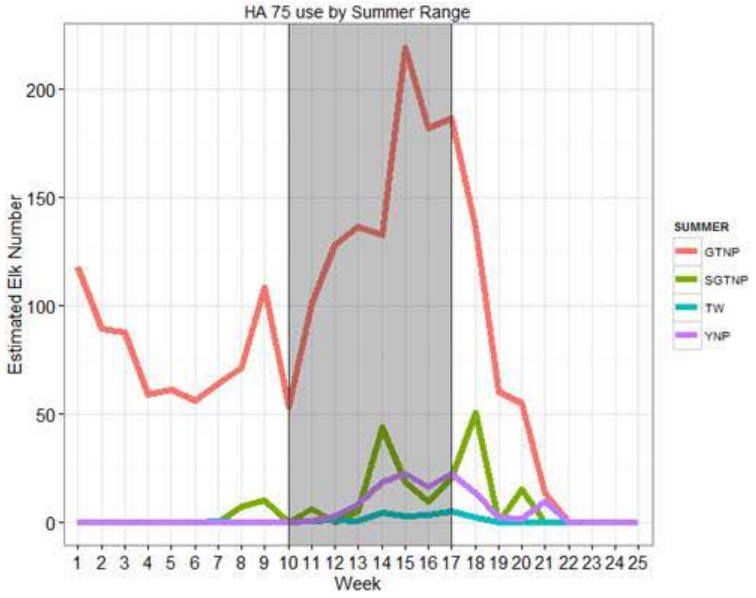
Elk Days – Subsetted master dataset to locations during legal seasons. Extracted HA-specific locations and selected unique dates (e.g., 11/24/2011) by each individual elk and then averaged the number of unique dates by summer group.

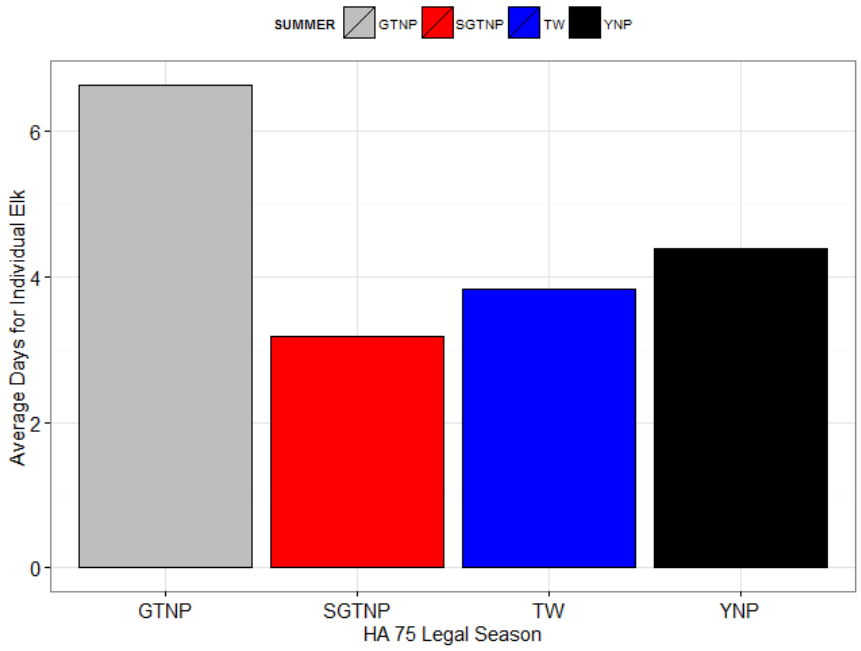
Table 2. Dates associated with each week depicted on the plots with weekly locations.

Week	Dates
1	8/16-8/22
2	8/23-8/29
3	8/30-9/5
4	9/6-9/12
5	9/13-9/19
6	9/20-9/26
7	9/27-10/3
8	10/4-10/10
9	10/11-10/17
10	10/18-10/24
11	10/25-10/31
12	11/1-11/7
13	11/8-11/14
14	11/15-11/21
15	11/22-11/28
16	11/29-12/5
17	12/6-12/12
18	12/13-12/19
19	12/20-12/26
20	12/27-1/2
21	1/3-1/9
22	1/10-1/16
23	1/17-1/23
24	1/24-1/30
25	1/31 (only 1 day)

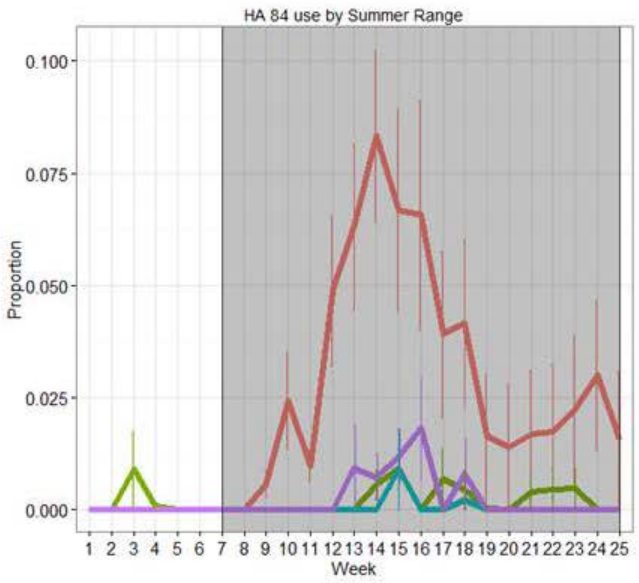
HA 75: Relatively low proportional use (<10%). Dominated by GTNP elk until approximately week 13 (early November) then elk from different summer ranges were present until approximately week 22 (early January). Strategy to protect YNP and TW may be an earlier hunting season (weeks 1-12, 8/16-11/1) which should make GTNP the only vulnerable summer segment. Even though proportional use was relatively high for TW and GTNP, GTNP elk had significantly higher estimated number of elk. This was also reflected in average number of elk days.

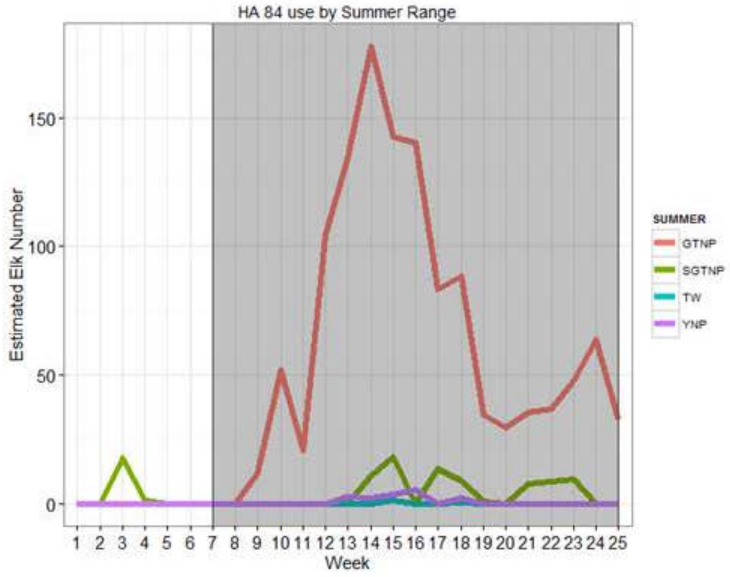


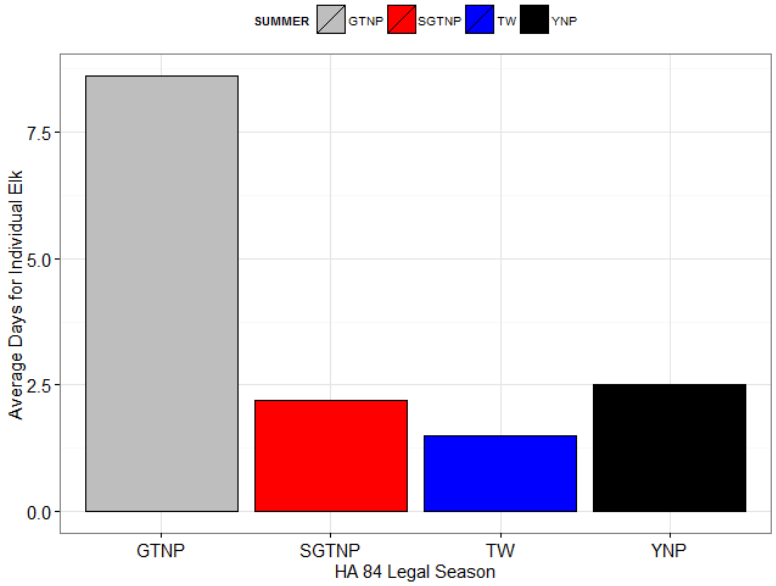




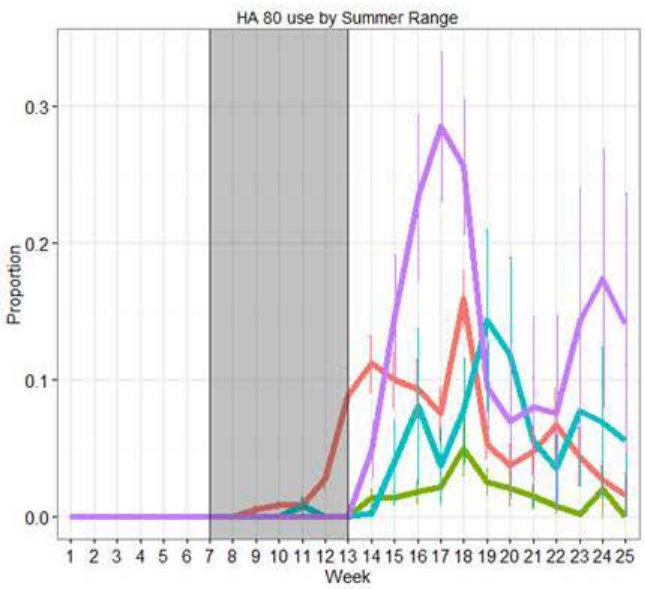
HA 84: Relatively low proportional use by elk (<1%). Low elk use during early season (Aug. and Sept.) then was occupied primarily by GTNP elk for the remainder year. All other summer ranges were present during late November. Strategy to protect TW and YNP elk may be to have earlier (9/20 – 11/1) season prior to presence of TW and YNP elk. Note: elk from other areas (e.g., state feedgrounds) are found in this HA. Estimated number of elk and average number of elk days for GTNP were profoundly higher than the remaining elk groups.

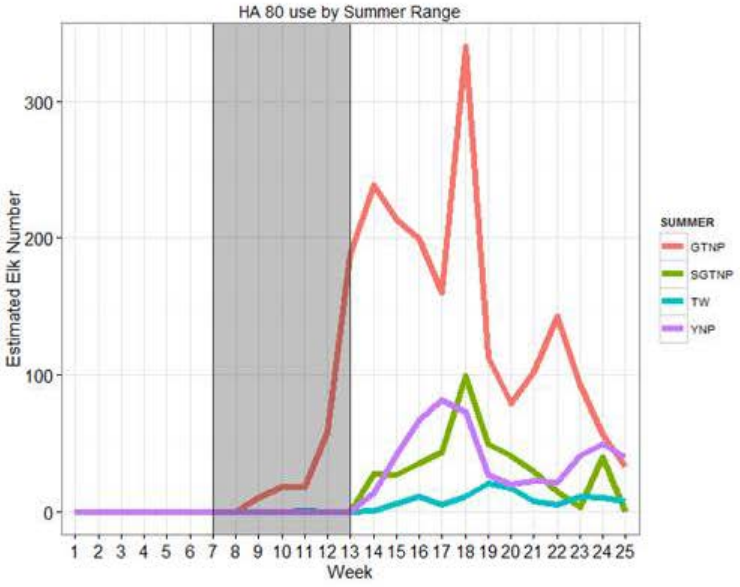


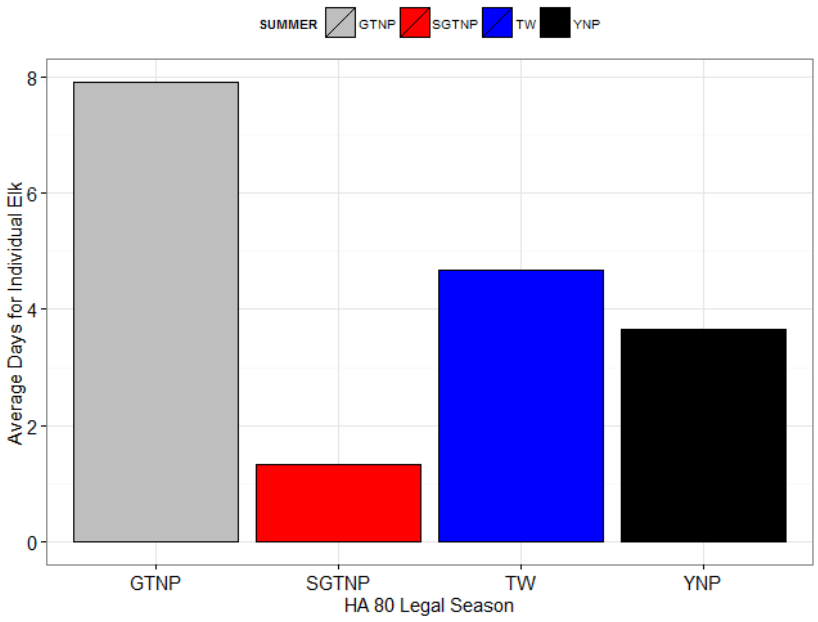




HA80: Low elk use until week 10 (mid-October). Proportional use is highest for TW but estimated elk number and average elk-days are generally biased towards GTNP. Strategy to protect TW and YNP is appropriate.

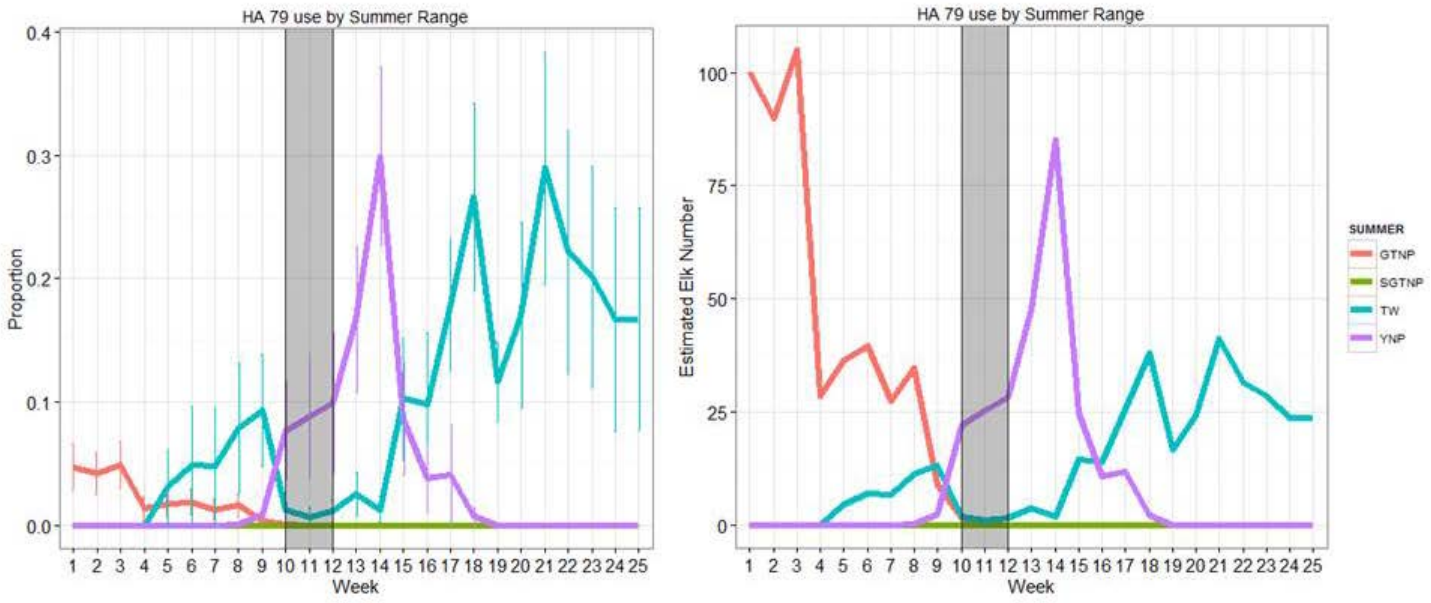


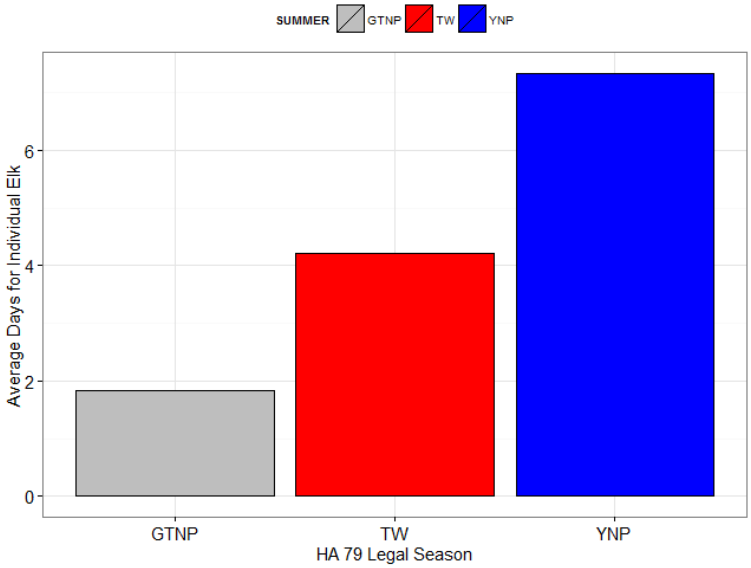




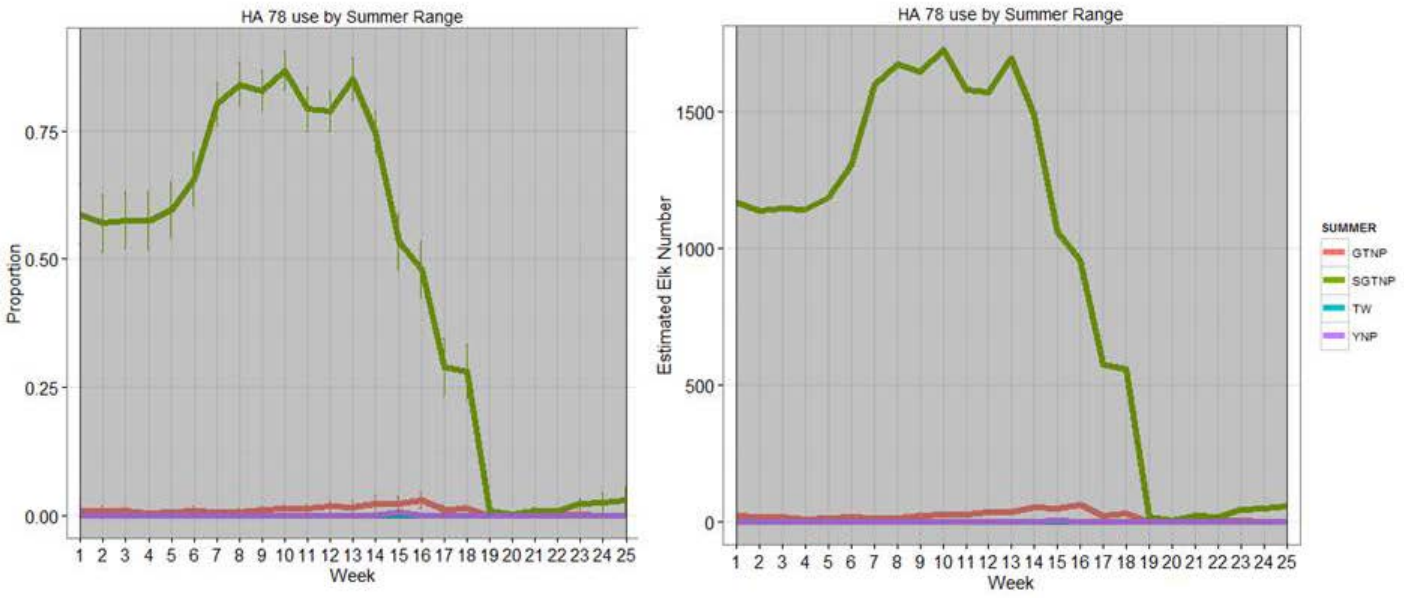
HA79: Relatively low proportional use by GTNP and SGTNP elk during early portion (August to mid-October) then an increase in both YNP and TW elk. TW elk appear to migrate through prior to YNP elk but there is high variation among individual proportions. Strategy to protect TW and YNP elk may be an earlier season when only GTNP elk are present. *Note that TW elk were present in HA 79 during late weeks rather than HA 77.*

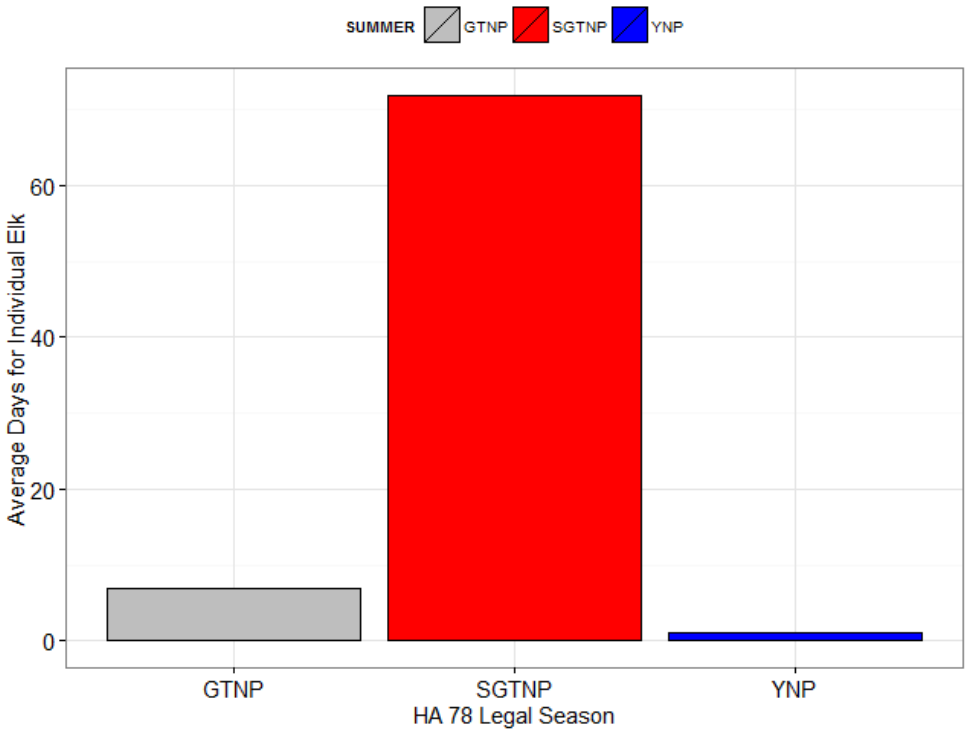
During legal season, both YNP and TW elk had the highest number of elk days. This suggests that HA79 is a critical hunt area to manage for sustainability of TW and YNP elk. Even though the hunt season is relatively brief, *it appears that harvested elk are likely to originate from YNP* because GTNP elk had left HA 79.





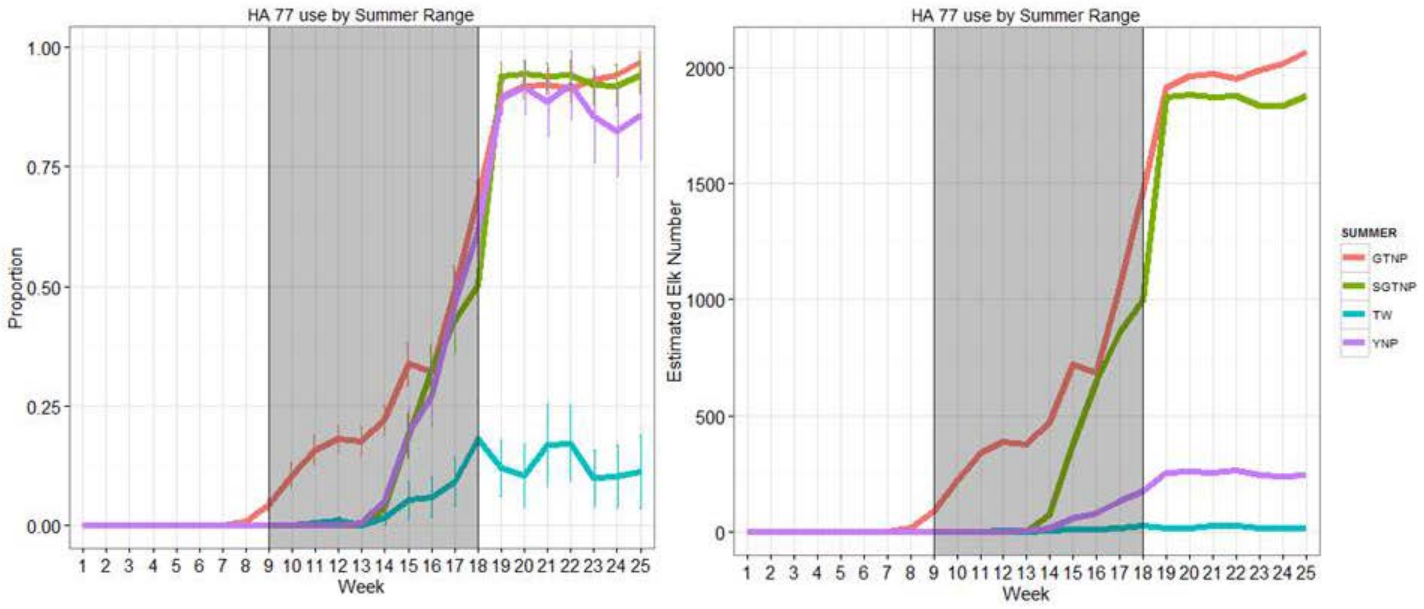
HA78: Dominated by SGTNP elk with low proportional use by GTNP elk. Strategy is currently appropriate to protect TW and YNP elk. Notice the average number of elk-days per individual was in excess of 60 days and HA 78 held most of the estimated ~2200 SGTNP elk.

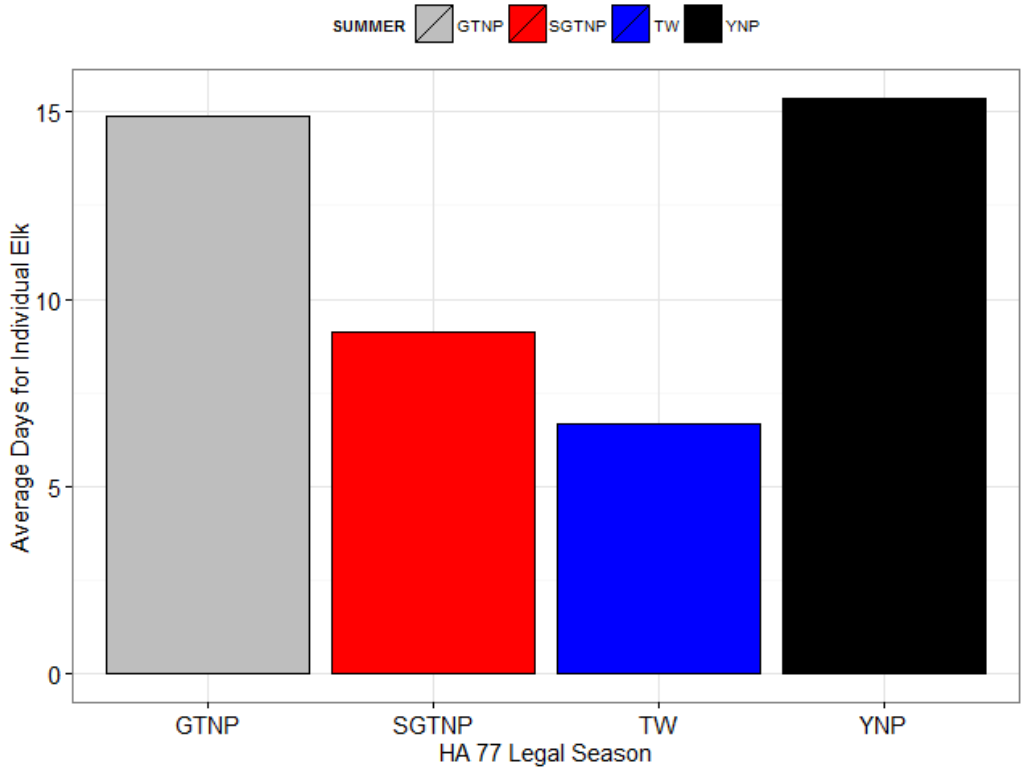




HA77: GTNP elk appear to arrive on NER prior to all other summer ranges (week 8, approximately early October) followed by identical arrival dates for YNP and SGTNP. TW had the latest arrival dates and had the least proportional use relative to other elk groups. Strategy to protect YNP and TW elk may be to close the season 1-2 weeks earlier when YNP elk start to arrive. Downside is that SGTNP and YNP arrival dates were identical which would limit opportunities to harvest SGTNP. *Note that TW elk appear to be in HA 79 during January.*

Average number of elk days during legal season was roughly equal for the GTNP and YNP elk followed by TW and SGTNP. However, number of estimated elk was mostly GTNP and SGTNP.





PROPORTIONAL USE OF HUNT AREAS DURING LEGAL HUNT SEASONS

In terms of proportional use of HAs during legal season, there were different harvest vulnerabilities among elk groups for each HA. Compared to the 2013 Report, there were several changes in proportional use. In HA 84, GTNP elk had the highest proportional use relative to other summer segments (the 2013 Report indicated a roughly equal distribution among GTNP, YNP and TW elk). In HA 75 and 77, proportional use increased for YNP elk which may be attributed to the increase in sample size (the 2013 report indicated majority users were TW and GTNP elk in HA 75). In HA 79, proportional use flip-flopped between TW and YNP. However, there are several TW and YNP elk that summer on the boundary of TW and YNP (see Figure 2 for example); therefore, if these elk were considered to be combined as "TW and YNP", proportional use would be cumulative among HAs which has implications for harvest availability relative to other summer segments.

Methods: Extracted GPS locations during HA-specific hunt dates for each individual-elk, converted to individual-elk proportional use. Grouped the proportions by summer segment and averaged. Proportions of summer ranges across all HAs add up to 1.

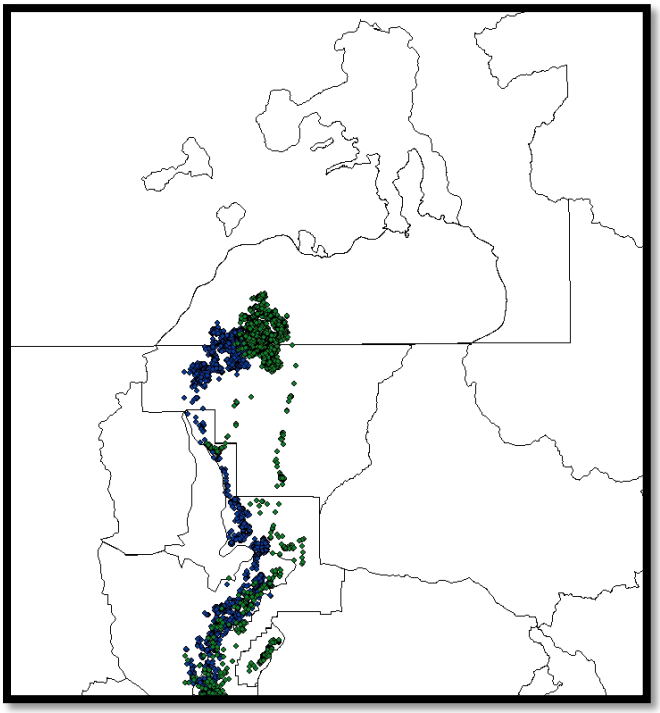
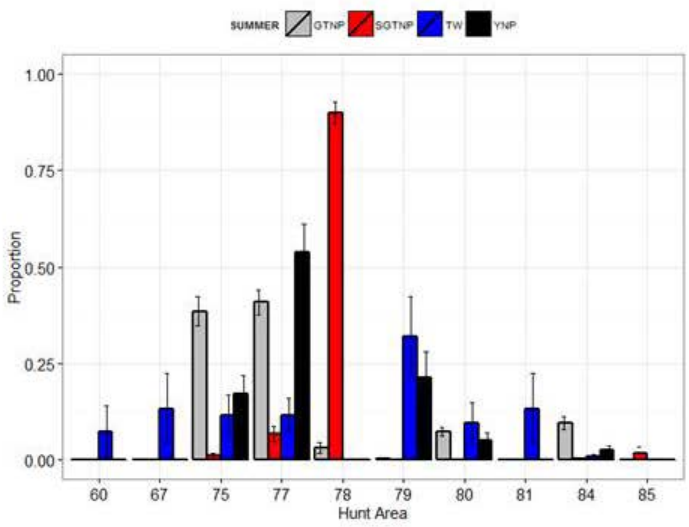
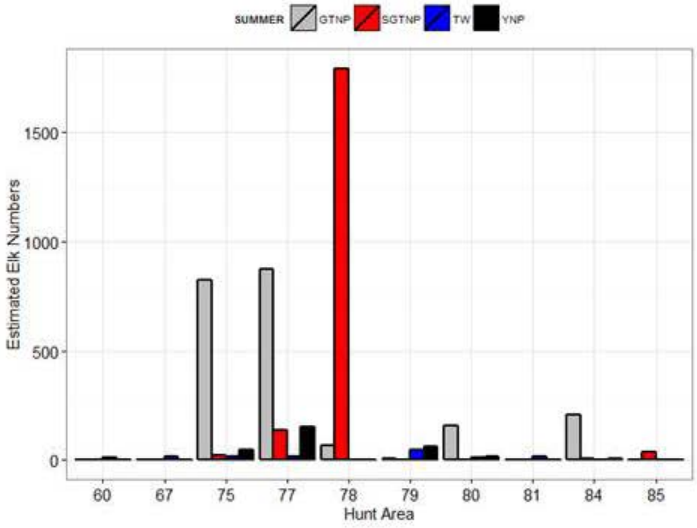


Figure 2. Example of an elk classified as TW and another elk classified as YNP based on centroid of summer home ranges. Their summer ranges significantly overlapped.

Proportionally and numerically, GTNP was most available for harvest in 75 and 77. SGTNP was most available in 78. YNP was proportionally most available in 77 but not numerically. TW availability was dispersed among several HAs but may be most vulnerable in HA 79.





SPATIAL DISTRIBUTION OF SUMMER GROUPS DURING LEGAL SEASONS

Figure 3 illustrates locations of elk that was eligible to be harvested. There was no apparent spatial segregation in any of the HAs with the exception of HA 77 and the subunits of HA 75 and HA 80.

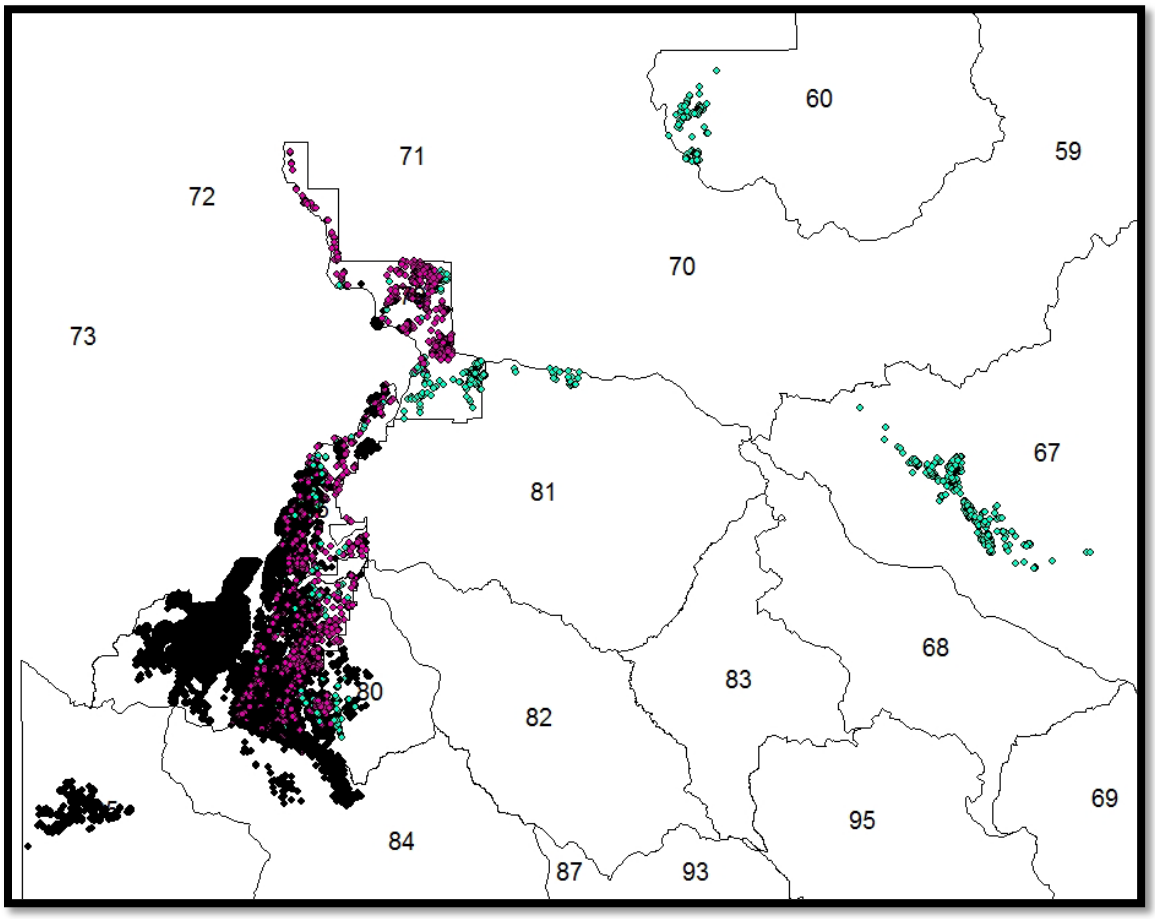


Figure 3. Locations of elk that was eligible for harvest during 2007-2014. Black = SGTNP and GTNP, Teal = TW, and Red = YNP.

Note that in Figure 4, TW and YNP (teal and red) open-season locations increases as one moves north or east in the legal hunting area outside of Antelope Flats of HA 75 (green polygon). Potential strategy to protect TW and YNP elk would be to limit harvest to the southwestern portion of the subunit within HA 75.

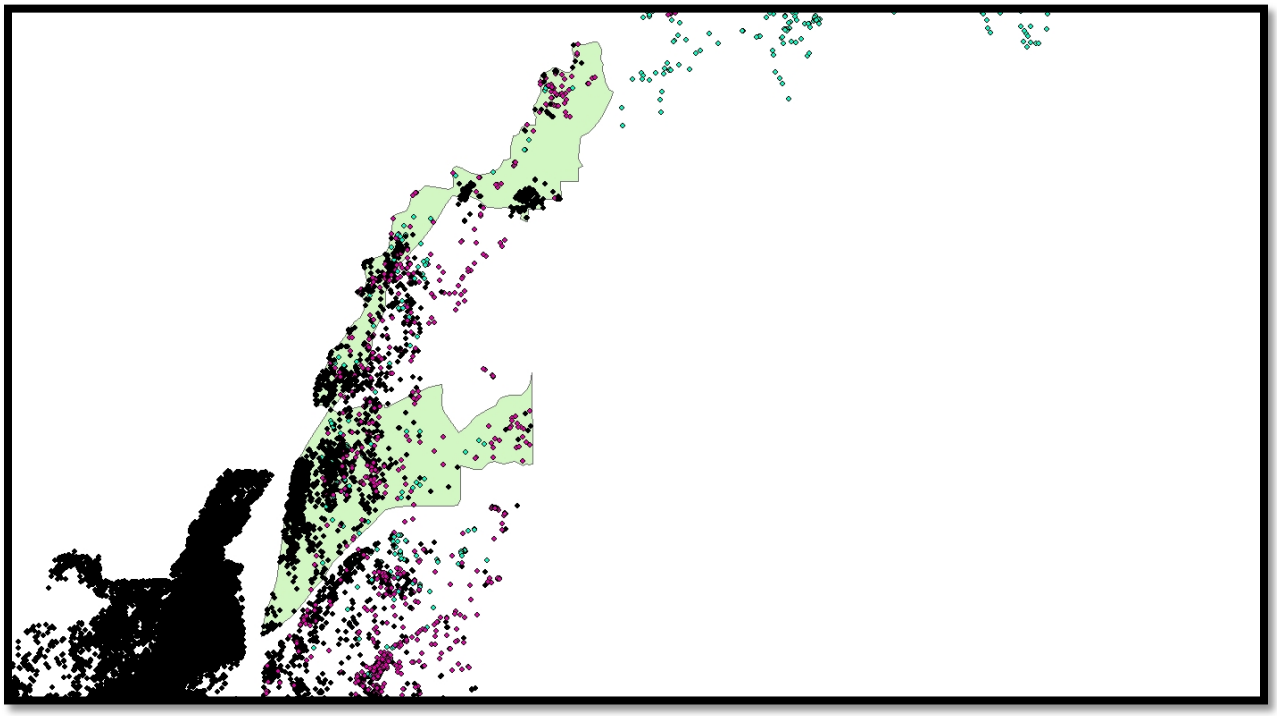


Figure 4. Locations of elk available for harvest during 2007-2014 outside of Antelope Flats of HA 75. Black locations represent GTNP and SGTNP whereas teal (TW) and red (YNP) indicate long-distance migrants.

In HA 77 (bold boundary), TW and YNP were proportionally more likely to be found in the northern portion of the NER (Fig. 5) relative to the other summer range elk whereas SGTNP and GTNP were numerically more likely to be present.

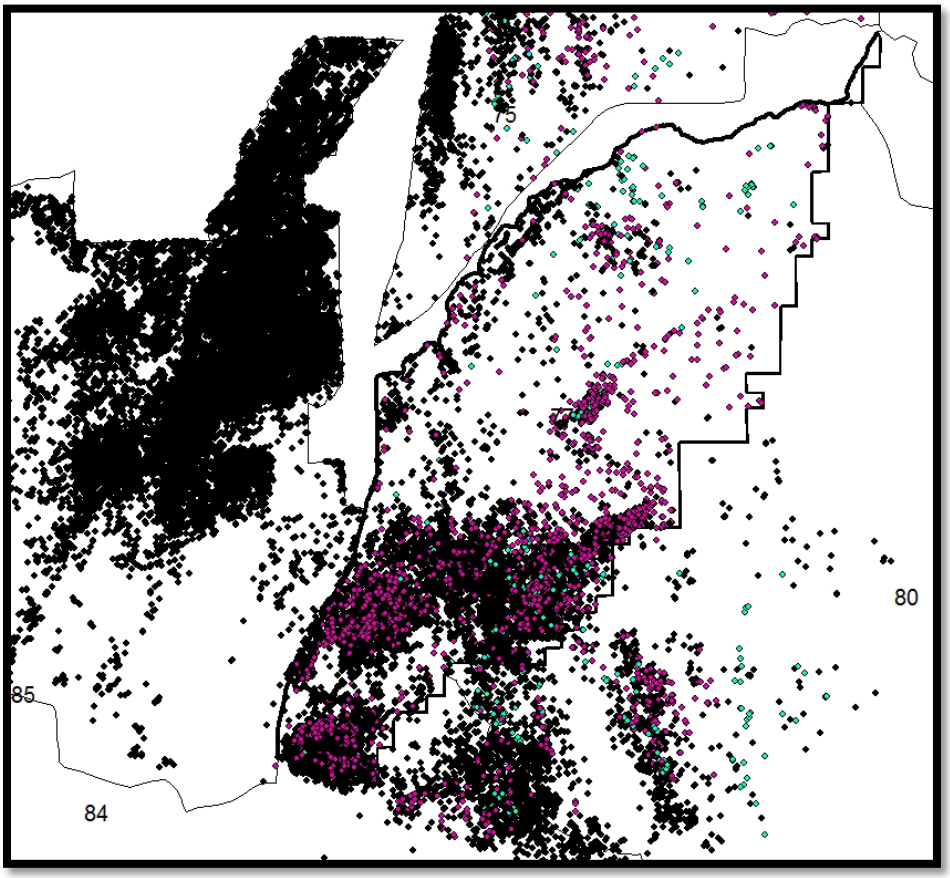
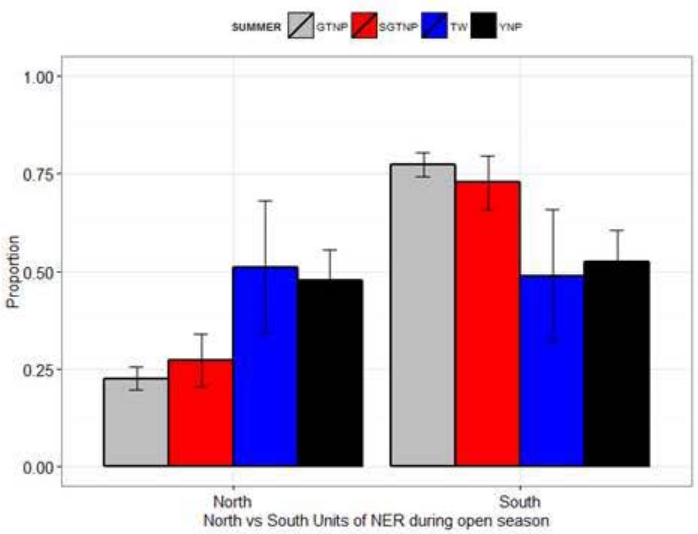
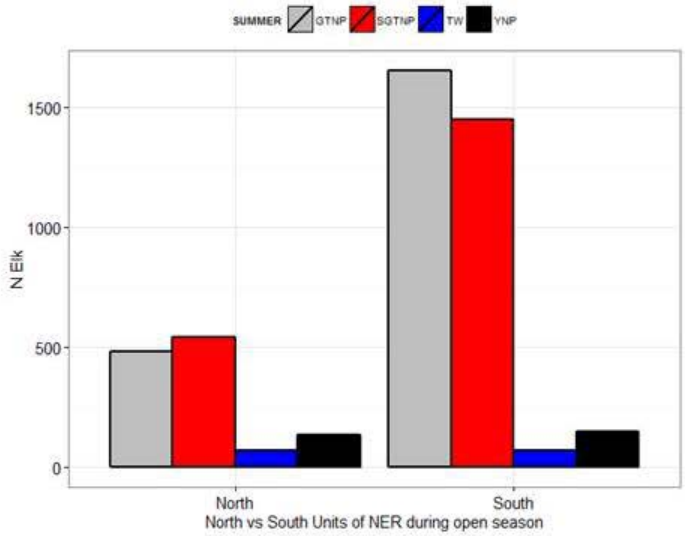


Figure 5. Locations of elk available for harvest during 2007-2014 within HA 77 (NER). Teal = TW, red = YNP, and black = SGTNP/GTNP.





In HA 80, specifically south of Twin Creek, there appears to be two areas where elk are found during open hunt dates (Fig. 6). The eastern portion appears to have more TW and YNP elk than SGTNP and GTNP which could improve fine-scale management opportunities by modifying the boundary.

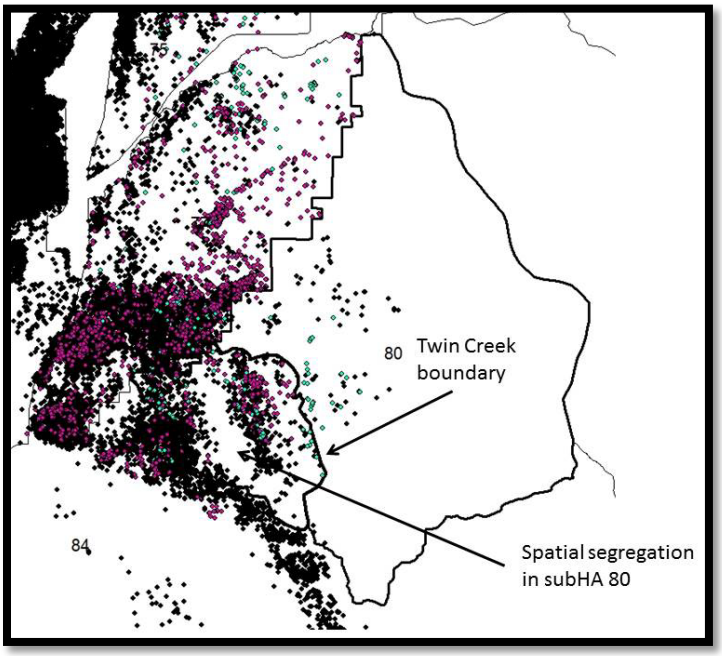
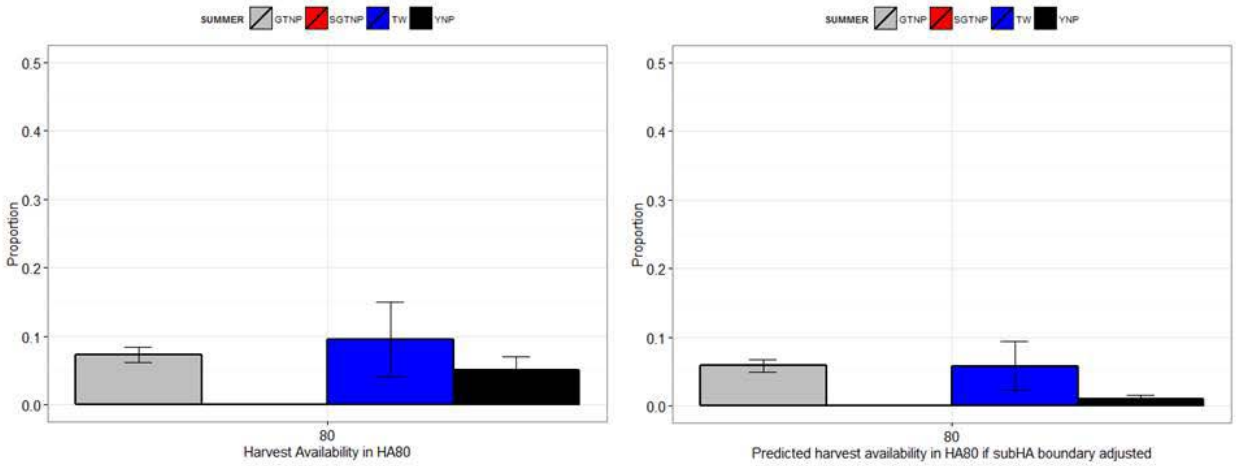
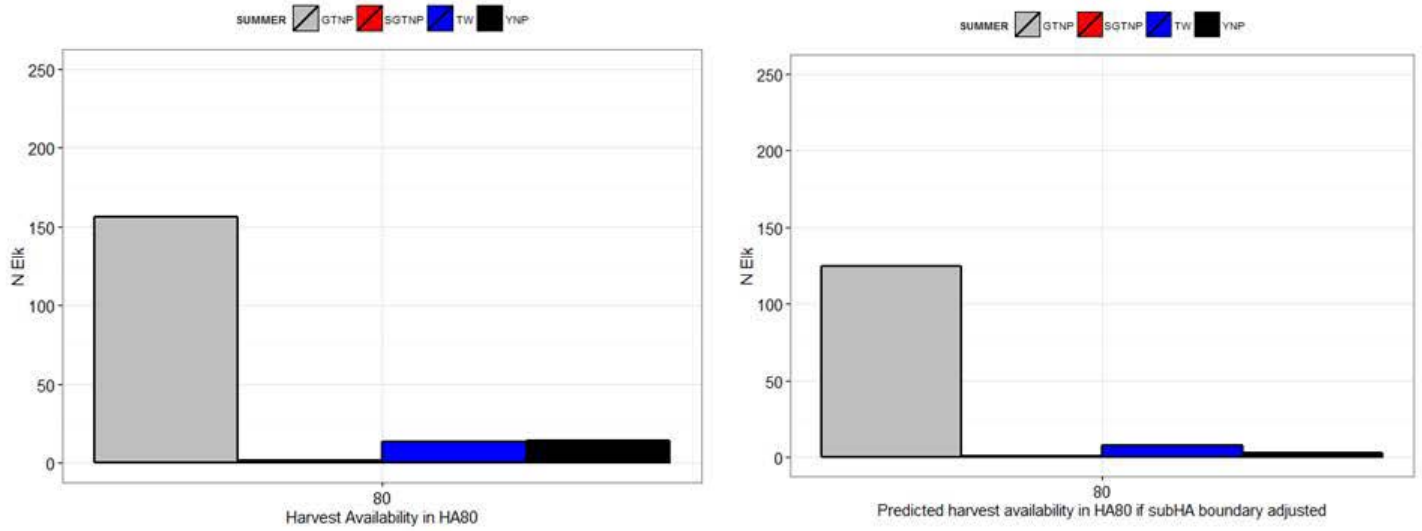


Figure 6. Locations of elk available for harvest during 2007-2014 within HA 80. Teal = TW, red = YNP, and black = SGTNP/GTNP.

If the northern portion of the current Twin Creek subunit of HA 80 was moved south to the valley, predicted harvest availability proportionally and numerically would decrease for the YNP segment, but not the TW segment. However the estimated number of elk was relatively low. This particular predicted use analysis assumed that the first 2 subareas (south of Flat Creek and south of Twin Creek) did not exist. In other words, the predicted use assumed the modified boundary was in place from 2007-2014 with the same HA and subHA season dates.





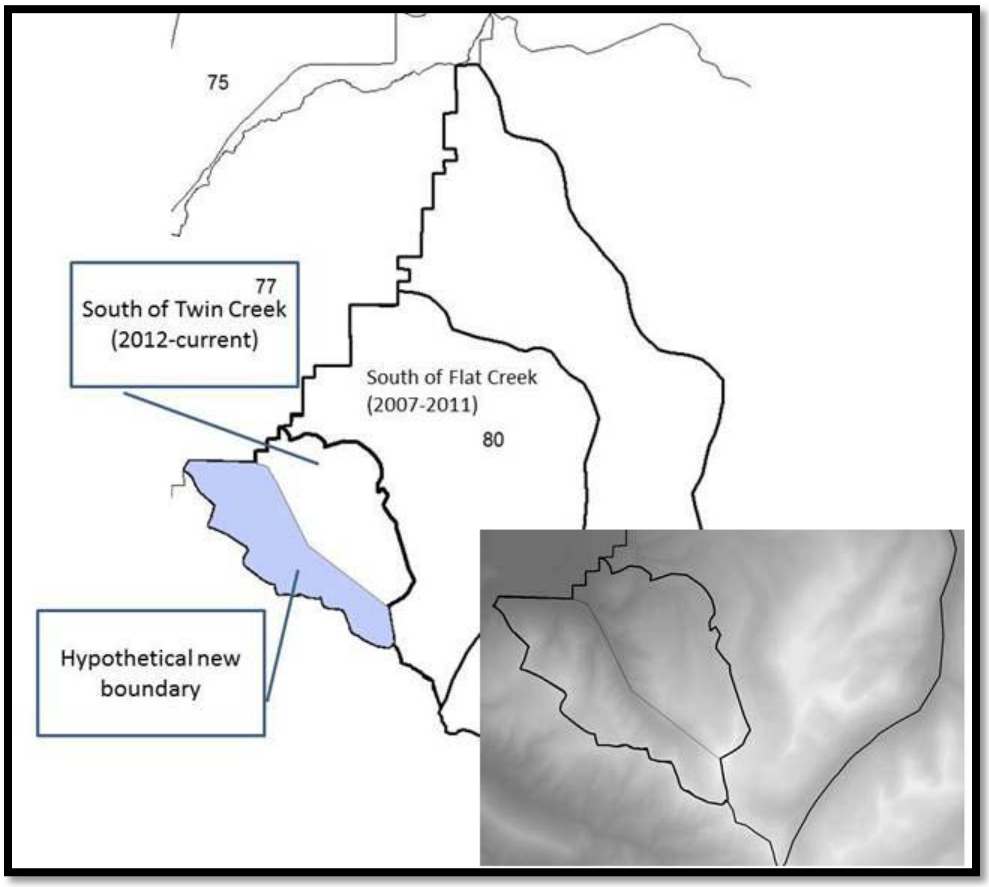
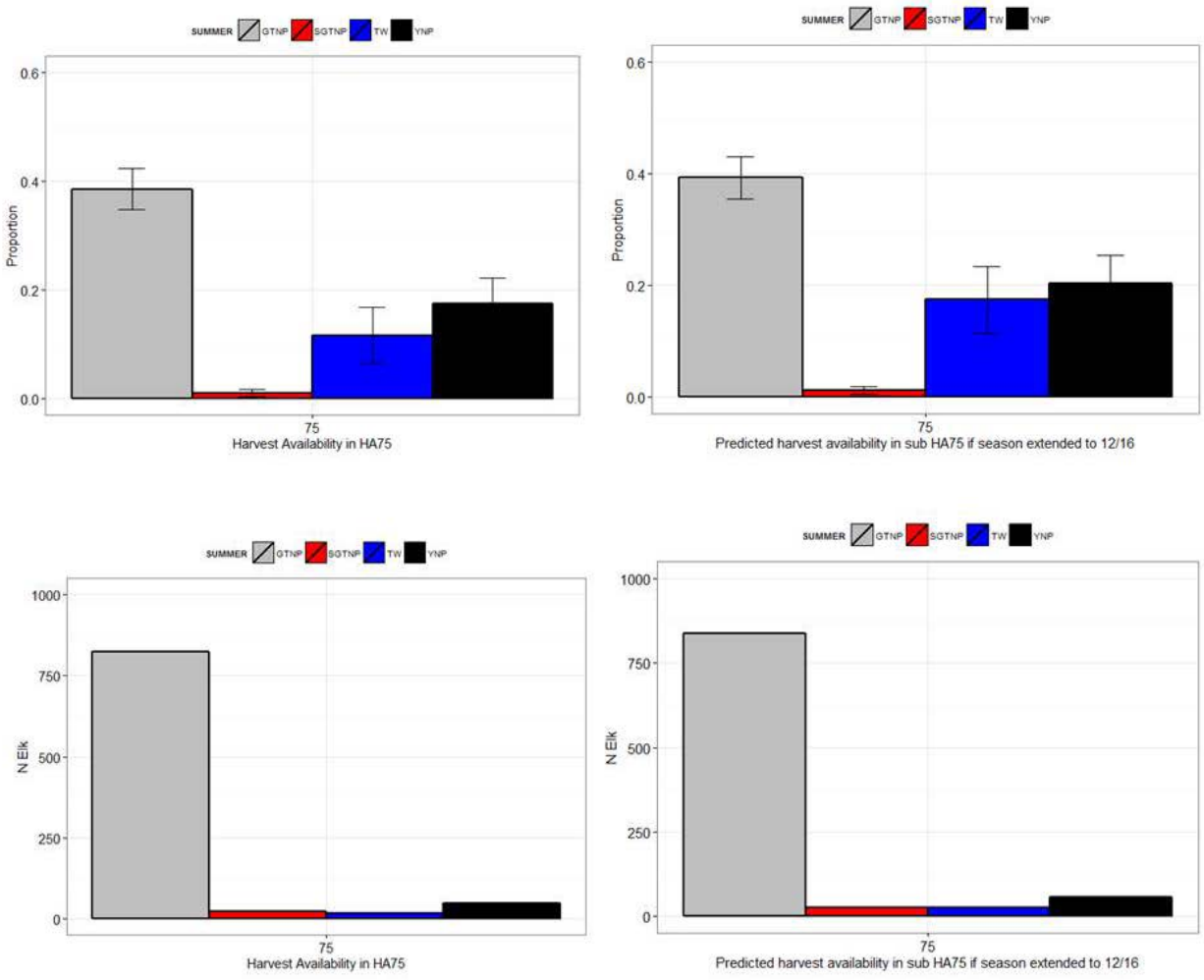


Figure 7. Illustration of HA 80 and subunits. The hypothetical boundary is in a valley between two elevated areas that run NW to SE. As elevation increases, the color becomes whiter.

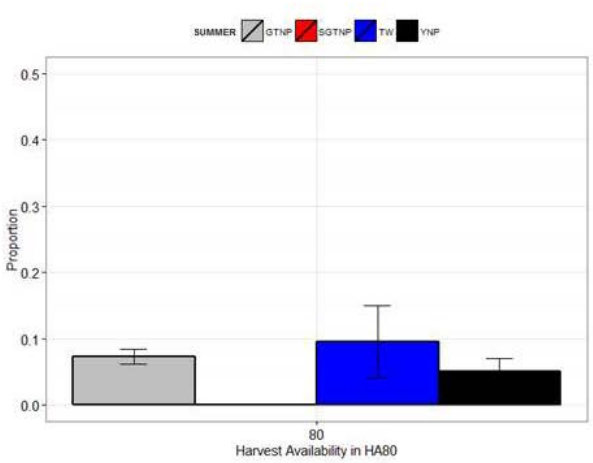
PREDICTED HUNT AREA USE IF HUNT SEASONS EXTENDED

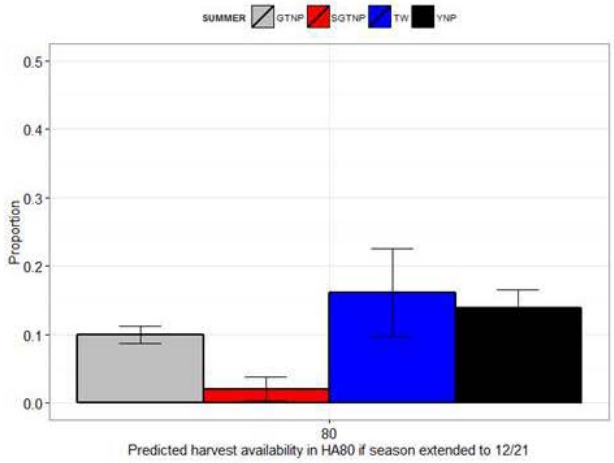
Extending the hunting seasons in HA 75 and 80 has been considered. We predicted harvest availability by appending vulnerable elk locations during existing hunt seasons with elk locations within legal areas during the proposed extended hunt dates. Specifically, for HA 75, elk locations outside of Antelope Flats (legal area) during the proposed extended season dates were considered to be vulnerable to harvest. Likewise, for HA 80, locations south of Twin Creek (legal area) during proposed extended season dates were considered to be vulnerable.

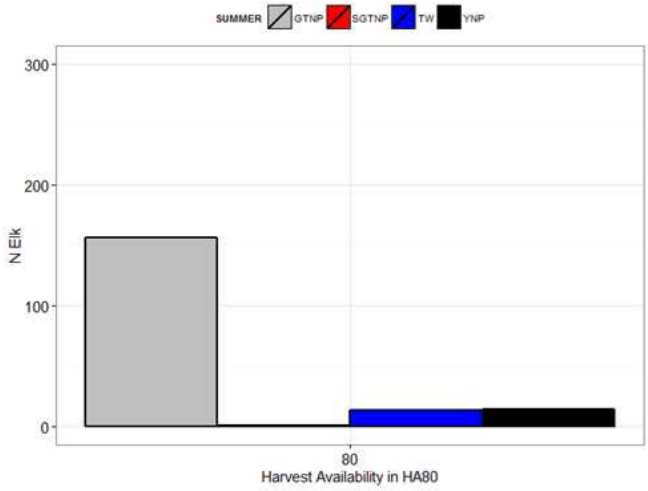
Extending the hunt season outside of Antelope Flats in HA 75 from ~12/7 to 12/16 indicates a slight increase in proportional use by TW elk. However, in terms of estimated number of elk, there does not appear to be an increase in harvest availability for YNP and TW elk.

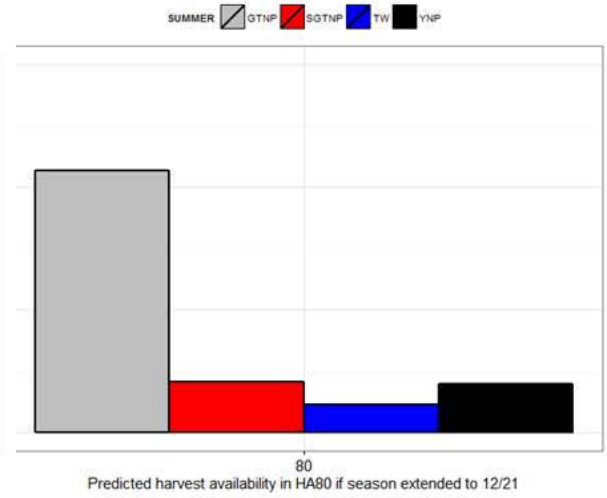


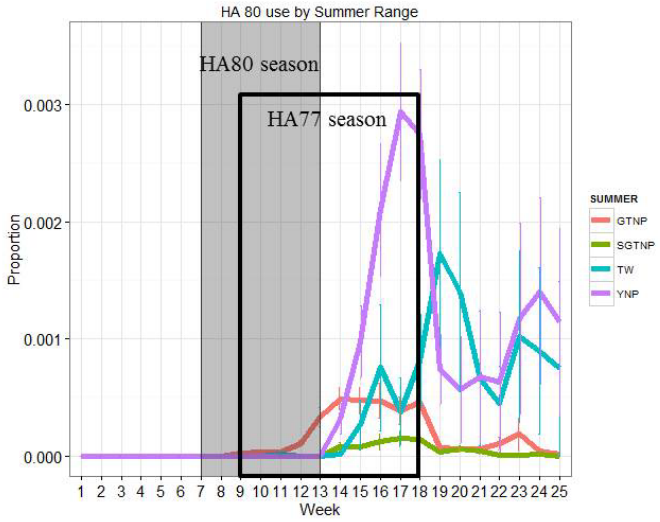
Extending the hunting season south of Twin Creek in HA 80 from 12/1 to 12/21 would increase harvest vulnerability of TW and YNP elk both proportionally and numerically. **This is counter to the findings from the 2013 Report which predicted harvest availability until 12/15.** It appears that TW and YNP elk may be using HA 80 after the current hunting season closes in HA 80 (12/1) and at the same time, potentially avoiding hunting activities in HA 77 (NER, open until 12/14). This reasoning is attributed to the decrease in HA80 use after HA 77 season closed.



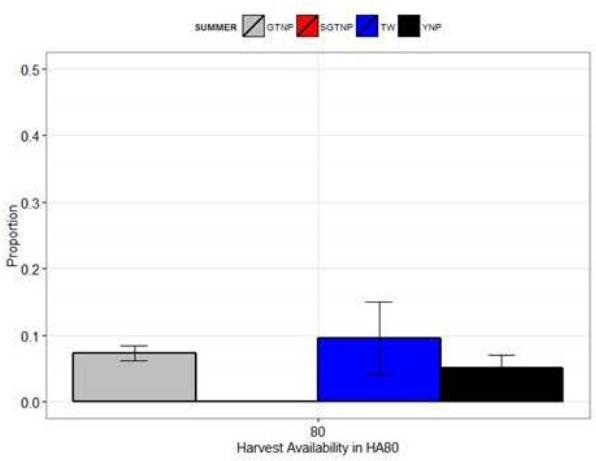


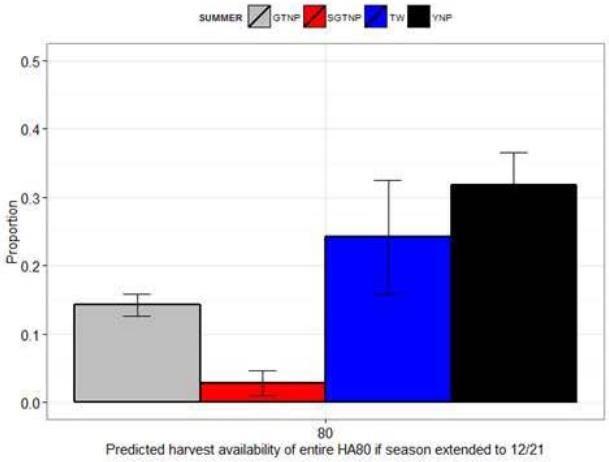


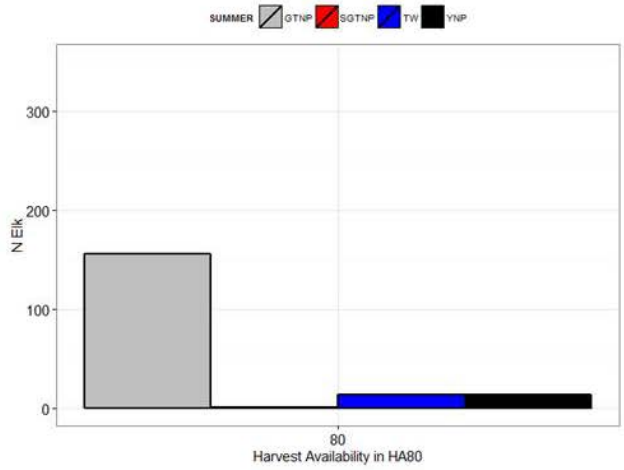


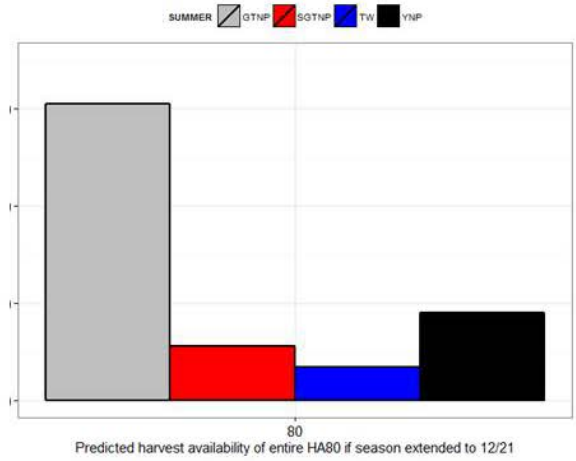


Similarly, if the hunting season in the **entire** HA80 was extended to 12/21, *harvest vulnerability would increase for all summer groups, especially TW and YNP elk*. Elk may be occupying HA 80 until hunting activities cease in HA 77 (open until 12/14).









COMPARISON OF DIFFERENT SUBSETS

There is concern that elk behavior may have changed over the years. There is also concern that summer range assignment of TW and YNP is somewhat arbitrary due to several elk summering on the boundary between YNP and TW (Figure 2). Therefore we compared the entire dataset (2007-2014) with a subset of years (2009-2014) and the same subset (’09 -’14) with TW and YNP classified as a single elk group (TWYNP). All Y-axes are identical among groups. For calculating the estimated number of elk during ’09-’14, we used the distribution of elk collars during the same years. There was not much of a difference in distribution among summer groups between ’07-’14 and ’09-’14 (Table 3).

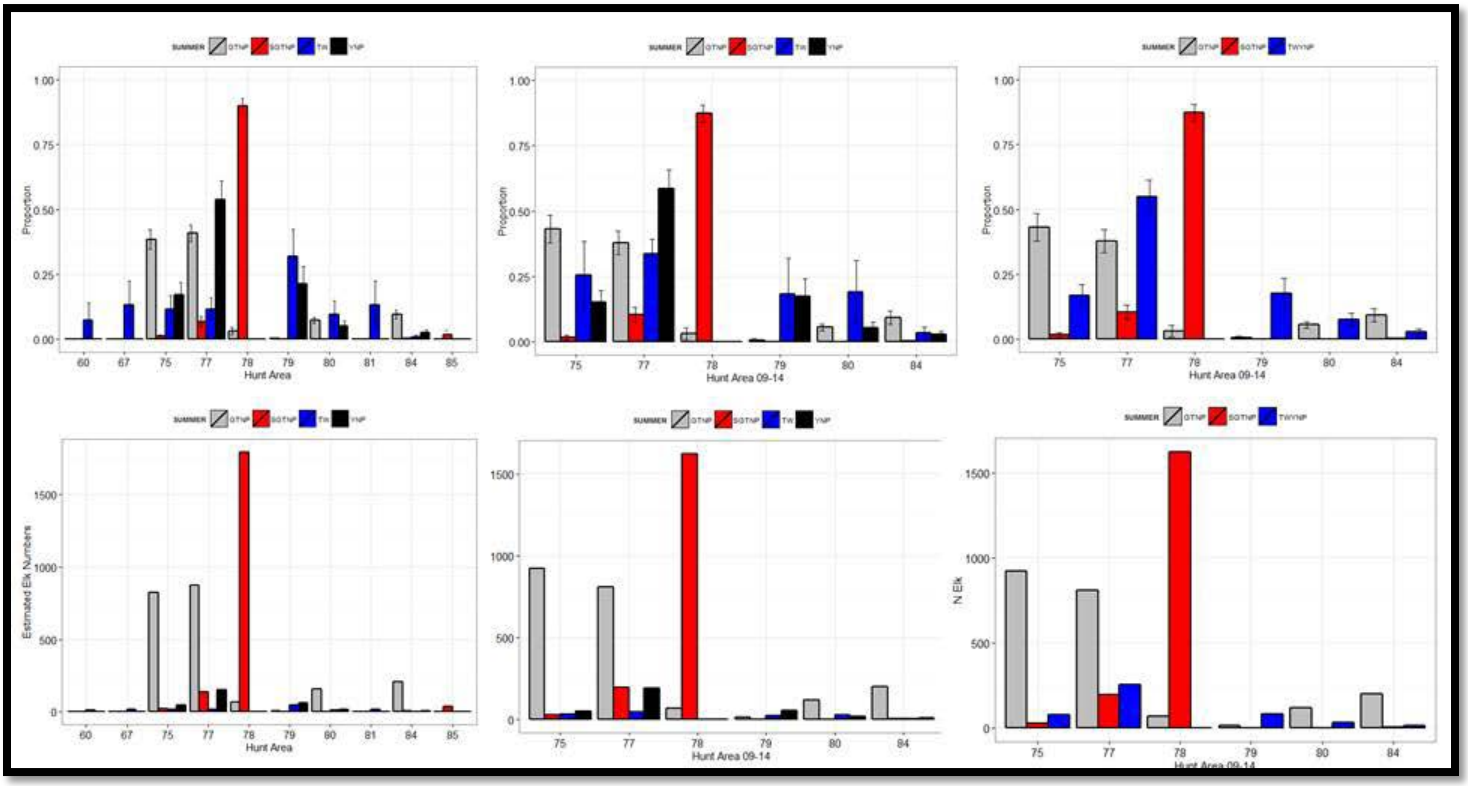
Table 3. Number of elk-years (and percent) for each summer group during 2007-2014 and 2009-2014.

Years	GTNP	SGTNP	TW	YNP	OTHER	TOTAL	Est. Cow Elk Count
2007-2014	35 (45%)	32 (42%)	2 (3%)	5 (6%)	3 (4%)	77	4744
2009-2014	32 (46%)	28 (40%)	2 (3%)	5 (7%)	3 (4%)	70	4654

We used identical methods of the aforementioned analyses and present in order, the original plots (2007-2014), followed by the subset of years (2009-2014), and lastly of TWYNP elk during 2009-2014. The top rows are proportional use and the bottom rows are estimated number of elk.

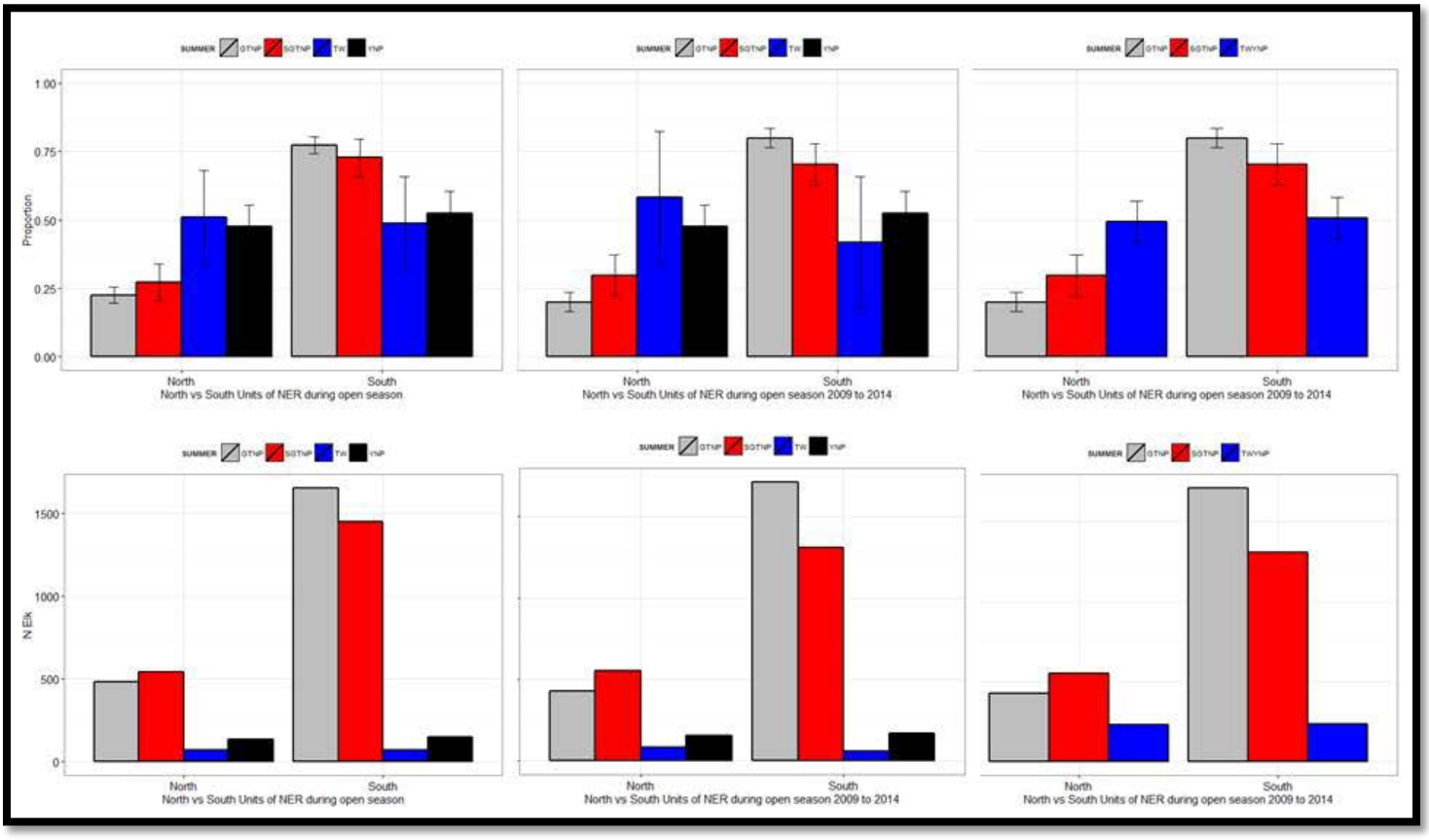
USE HUNT AREAS DURING LEGAL HUNT SEASONS

There were no dramatic changes among the plots. The low-use HAs (60, 67, and 81) are not displayed because of the exclusion of ISU elk (pre-2009).



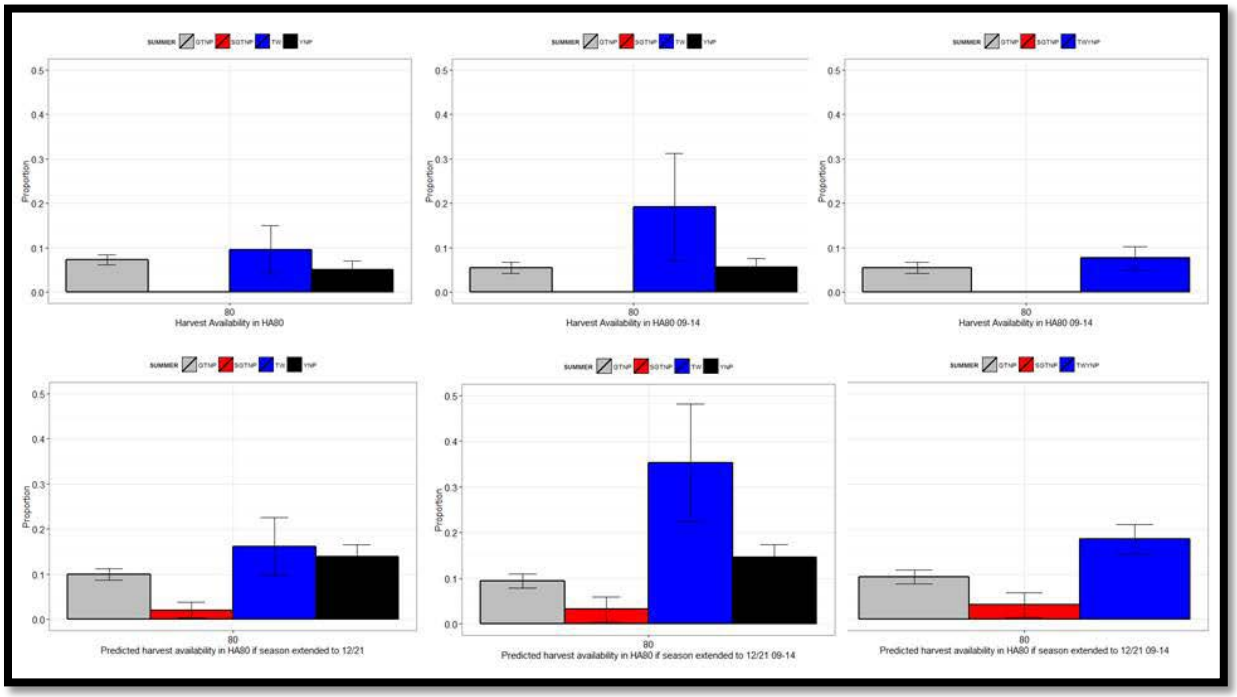
PROPORTIONAL USE OF NER UNITS DURING OPEN SEASON

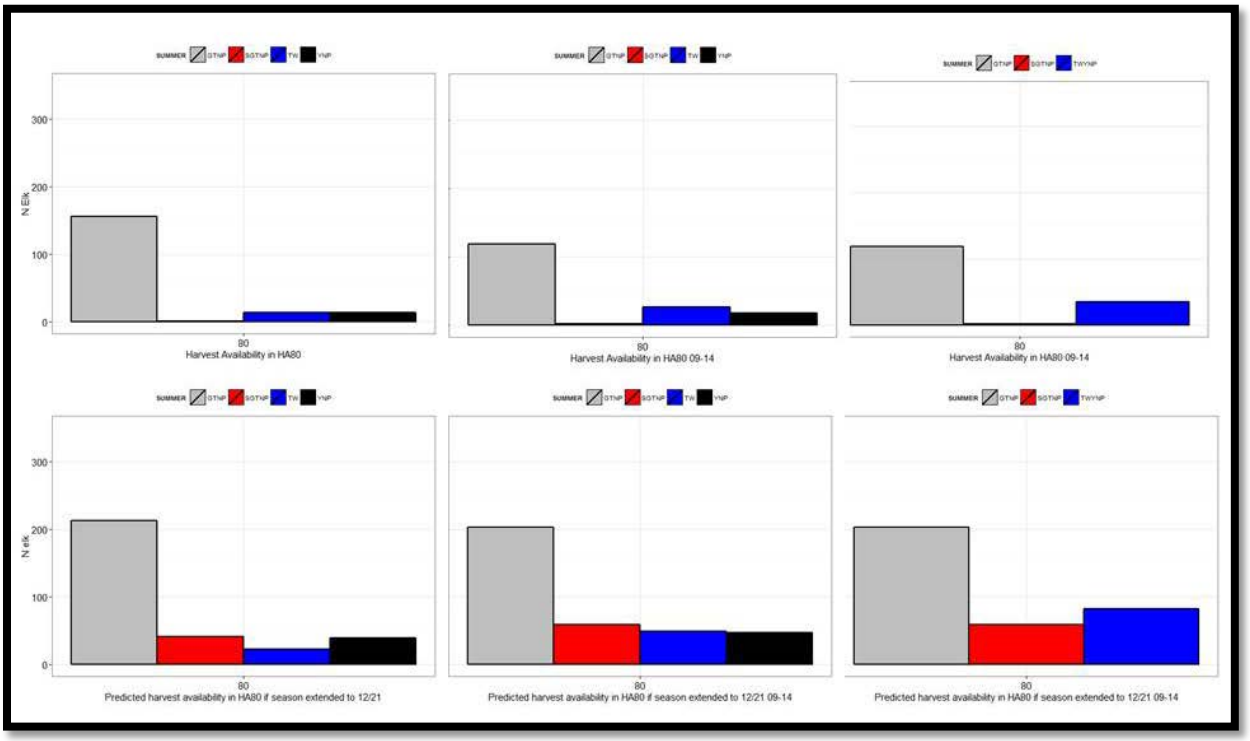
The trend of TW and YNP elk having the highest proportional use of the north unit was consistent. However, SGTNP and GTNP had higher estimated elk numbers in both NER units.



PREDICTED HARVEST AVAILABILITY IF HA80 SEASON EXTENDED

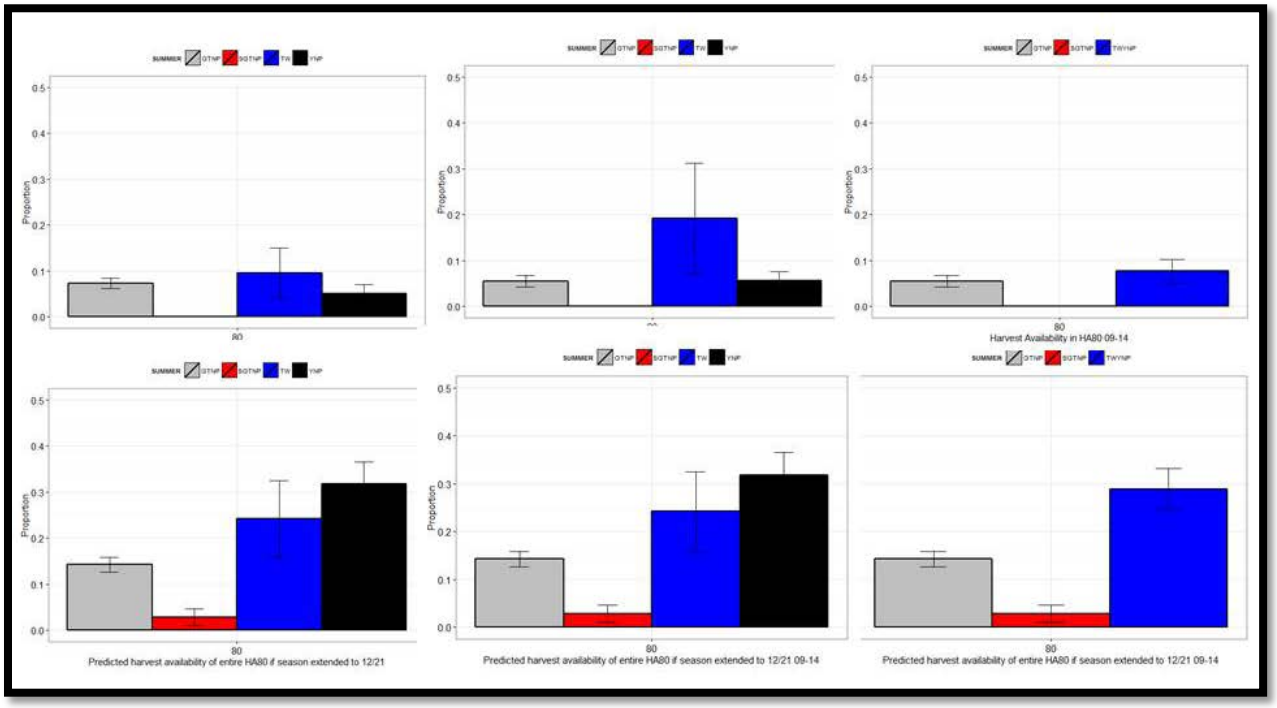
The top figure indicates proportional use whereas the bottom figure indicates estimated elk numbers. The first rows in both figures indicate actual harvest availability during open season. The bottom rows of both figures represent predicted harvest availability if the season was extended to 12/21. The predicted data includes combined locations during existing hunt dates and proposed extended season. *The general trend is that if hunting season was extended, harvest vulnerability would increase, both proportionally and numerically, for TW and YNP elk.*

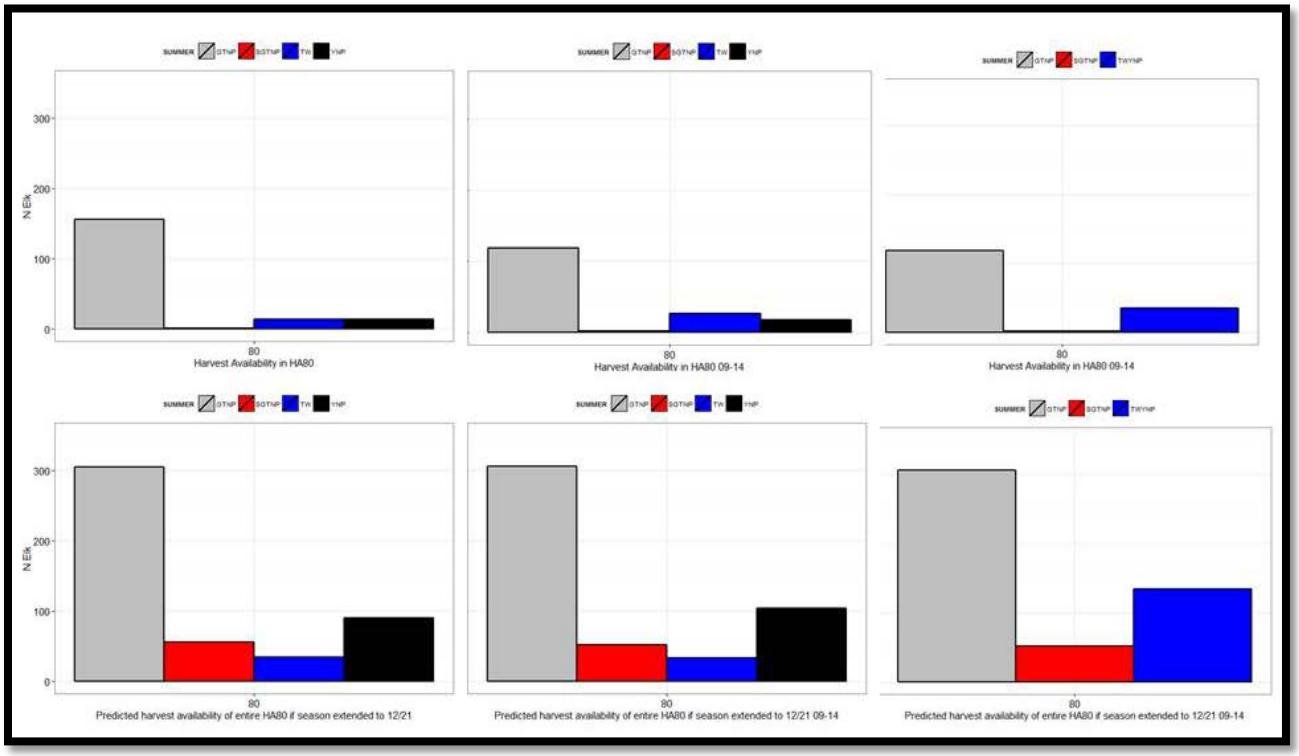




PREDICTED HARVEST AVAILABILITY IN ENTIRE HA80 IF SEASON EXTENDED

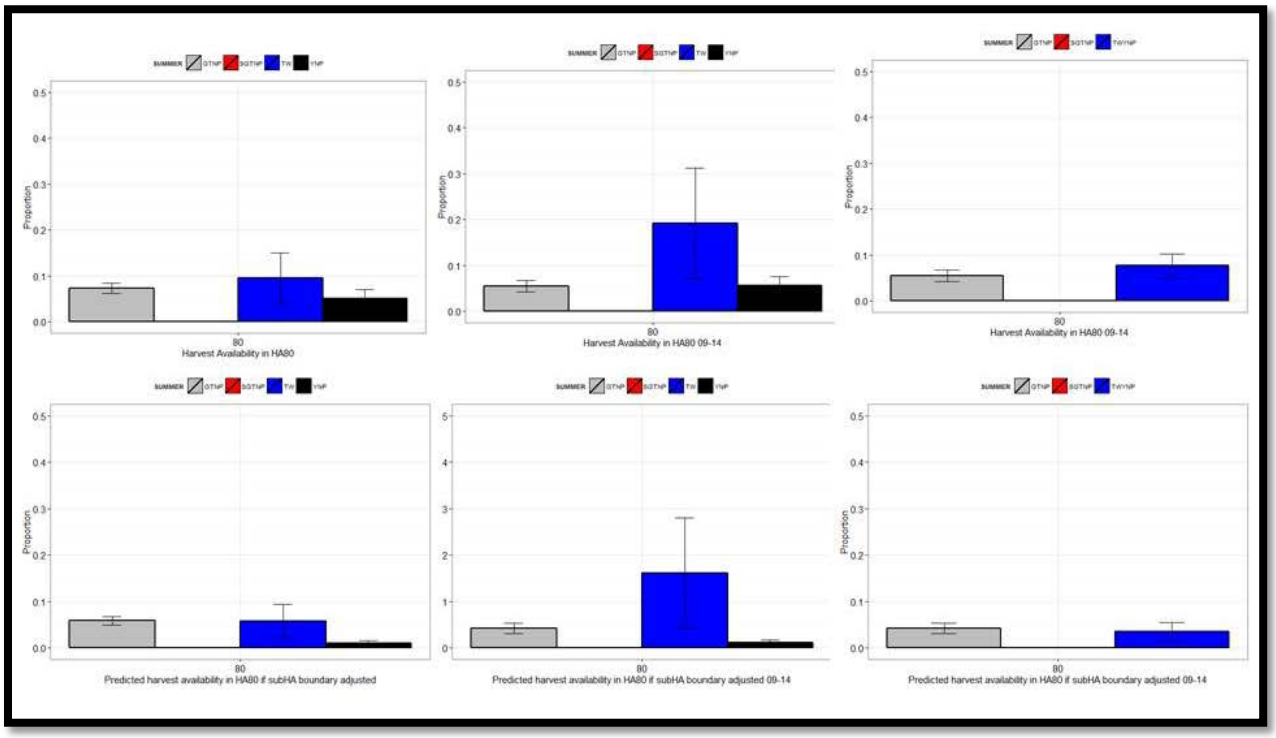
All predictions, proportionally and numerically, *suggest an increase in harvest availability for the TW-YNP elk.* Extending the season in the entire HA80 is not recommended.





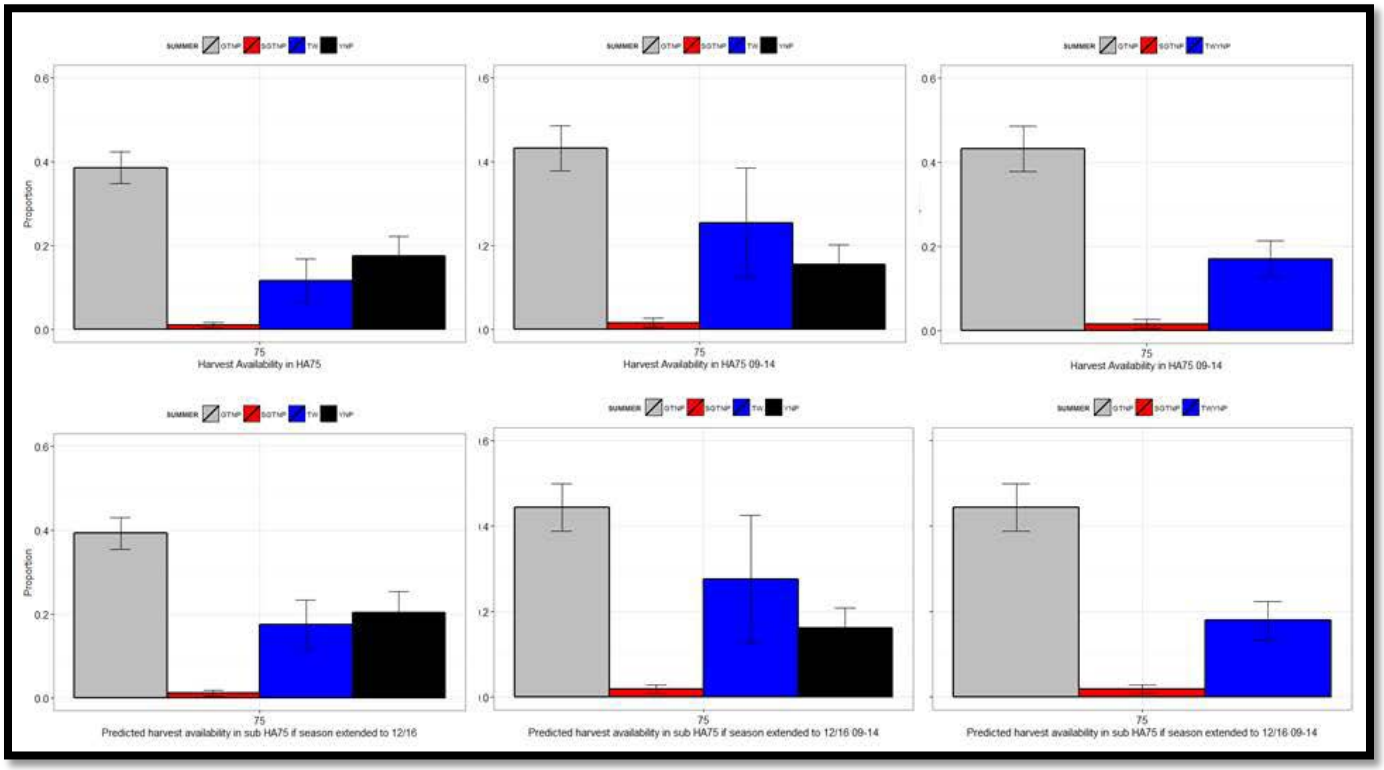
PREDICTED HARVEST AVAILABILITY IF HA80 BOUNDARY ADJUSTED

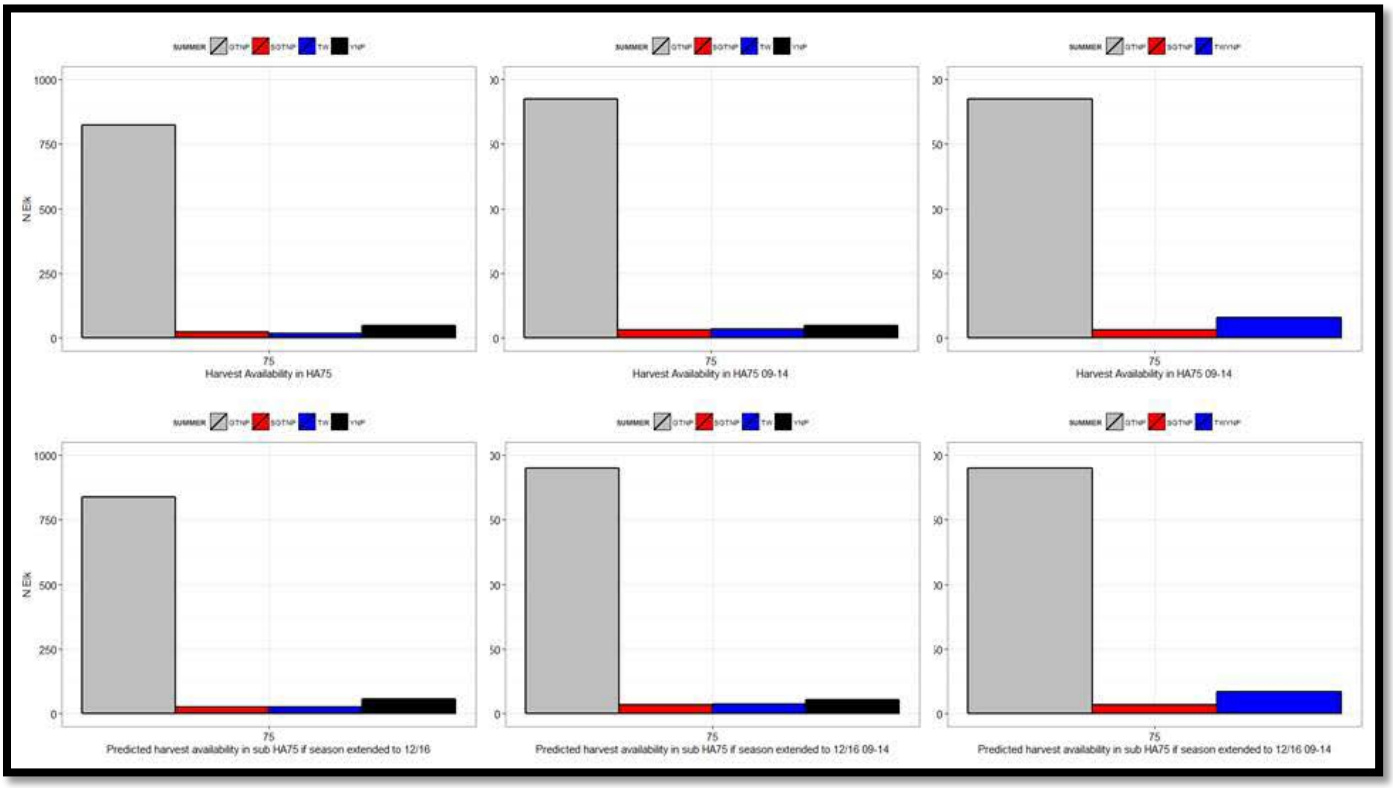
It appears that if the subHA boundary of HA80 was adjusted, harvest availability would decrease for TWYNP elk, particularly the YNP elk. Estimated number of elk not shown due to very low use.



PREDICTED HARVEST AVAILABILITY IF HA75 SEASON EXTENDED

If the HA75 season wax extended to 12/16, there does not appear to be any significant changes in proportional availability for any summer group. Similarly, the number of estimated elk is not predicted to increase.





From:	Consolo-Murphy, Susan (Sue)
To:	Cole, Eric
Cc:	Steve Kallin; Cris Dippel; Sarah Dewey
Subject:	Re: Updated Elk Harvest Vulnerability Report in Advance of Elk Season Setting Meetings
Date:	Tuesday, February 24, 2015 10:59:45 AM

Thanks, folks,

As we discussed on our phone call this morning, these are key points I took away: 1) NER would support our consideration of extending the season for elk reduction in the park to about Dec. 14 or even Dec. 21. We will consult the chief ranger and his staff to see if this is operationally sustainable. We agree that this could increase the number of elk taken and reduce the 'refuge' effect that may occur when hunting is still permitted on the refuge but park lands north of the Gros Ventre River are closed.

2) We also talked about the number and type of permits that we might recommend be issued for Grand Teton NP in the fall of 2015; in recent years the type 6 (cow/calf) permits have all sold; but not all type 4 (antlerless, full price) permits have. The latter are popular with hunters who like to use area 79. Sarah awaits results of the state's elk classification survey this week before we can recommend numbers, but we are open to the potential for increasing permits, especially type 6, although data indicates that hunter success is weather-dependent. And, we believe that NER and GTNP 'share' many hunters who move back and forth between the jurisdictions depending on where they are having success in the season. Steve indicated that he'd support our consideration of that as well.

3) Regarding supplemental feeding on NER, Steve said they believe they see the greatest potential benefit in delaying the start date. I encouraged continued work on adaptive management to consider future changes not only in feeding dates, but timing patterns and amounts of feed, which could influence elk behavior as well as numbers. We also talked about potential climate-influenced changes; Eric said that data clearly indicates that a smaller percentage of elk are arriving on the NER by December 1, compared to the percentage documented by Bruce Smith. This supports that later season start and end dates are needed to achieve elk population reduction, and might suggest other management options related to future protection of winter range.

Sue

Sue Consolo-Murphy
Chief, Science & Resource Management
Grand Teton NP & the John D. Rockefeller, Jr. Memorial Parkway

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Moose, WY 83012
(307) 739-3481 (w)
(307) 690-8005 (c)
Sue_Consolo-murphy@nps.gov

On Mon, Feb 23, 2015 at 9:44 PM, Cole, Eric <eric_cole@fws.gov> wrote:

> Hello,
>
> The attached "2015 harvest Availability Report" was primarily analyzed and written by Aaron Foley with assistance from me. Aaron was a USGS post doc that we have been collaborating with since 2012. Recommendations in the report are Aaron's and do not necessarily represent my views. The primary purpose of the report is to use elk GPS collar data to quantify the relative amount of time that elk spend in hunt areas by summer segment, and to estimate the actual number of cow elk that are available for harvest by hunt area and summer segment.
>
> I provided Sarah with an earlier version of the attached report last week, but be advised that there have been some minor changes since that time, and the attached report is the version that should be used. In the new version Table 1 has been modified to include an OTHER category to account for elk that were collared on NER and that summered in the BTNF in areas other than Teton Wilderness (TW). Although we did not analyze vulnerability to harvest for the OTHER category, inclusion of OTHER does affect our estimate of the number of cow elk in the remaining summer segments, and therefore our estimates of the number of cow elk vulnerable to harvest by hunt area and summer segment.
>
> In recent years the WGFD strategy has been to minimize harvest of the Yellowstone National Park (YNP) and TW summer segments and focus harvest on what they term the Snake River Core. Snake River Core are generally elk that summer in Grand Teton National Park and private lands south of the park (summer segment categories GTNP and SGTNP in our analysis). I, Aaron, Sarah, Doug Brimeyer and others have a JWM paper currently in review that supports the contention that long distance migratory elk that winter on NER have declined over a 35 year period, while short distance migrants that summer between Wilson and Moose have increased dramatically. Therefore, WGFD concerns about the YNP and TW segments are valid. However, it is the Refuge's contention that we will need to tolerate some increased harvest of YNP and TW elk to facilitate increased harvest of GTNP and SGTNP summer segments. With elk numbers over 8,300 for a second year in a row, clearly we are not meeting our objective of 5,000 elk on NER and as a result we are not reducing our reliance on supplemental feed.
>
> Based on the vulnerability analysis our biggest opportunities to increase harvest of GTNP and SGTNP elk are in Hunt area 77 (the Refuge), and perhaps in HA 75 in GTNP. Opportunities to increase harvest of GTNP and SGTNP elk in HA 80 elk are limited unless the subunit south of Twin Creek is extended after the December 1 winter range closure date, and this could be politically difficult. See more detailed notes about my recommendations for each hunt area below:
>
> HA 77 season currently closes around December 14 (week 18 in figure on page 10). I recommend extending the NER season by at least 1 week until 12/21 (week 19 in figure on

page 10). Proportional use by GTNP and SGTNP of HA 77 is very high during this time period. Although proportional use by YNP elk is also very high, the actual number of YNP cow elk exposed to harvest in week 19 would be low compared to the large number of GTNP and SGTNP cow elk. (1800 GTNP elk, 1800 SGTNP elk and 250 YNP elk. For example assuming equal availability if 100 additional elk were harvested in week 19 we estimate 47 would be GTNP elk, 47 would be SGTNP elk, and only 6 of these would be YNP elk and 1 or less would be TW elk. These trends appear consistent in HA 77 until the end of January, but how late that we want to extend the NER season is debatable.

HA 75 season currently closes around December 7 (week 17 in figure in page 5). Extending the season to match current NER season end of December 14 (week 18) might increase harvest of GTNP elk, but is unlikely to result in the harvest of many SGTNP elk. In week 18 we estimate 150 GTNP, 50 SGTNP, 10 YNP, and 1 or fewer TW cow elk available for harvest in HA 75. So for every 100 elk harvested in HA 75 in week 19, approximately 5 would be YNP elk and <1 would be TW. Therefore there is the potentially for a modest increase in GTNP elk with only a few Yellowstone elk vulnerable to harvest. There does not appear to be much benefit of pushing the HA 75 season to December 21 or later (week 19) because so few elk are available to harvest.

HA 80 current season structure is the entire hunt area is open until November 16 (the time period between weeks 7 and 13 portrayed by the gray shading in the figures on page 7), but the area south of Twin Creek is open until December 1 (week 16). At first glance the figure on page 7 suggests that we could increase harvest of GTNP elk by keeping the portion of HA 80 north of Twin Creek open until December 1 (week 16), but as indicated on the map on page 16, there is very little elk use of the area north of Twin Creek, and much of this is by YNP and TW elk. Any significant harvest gains for GTNP and to a lesser extent SGTNP elk would occur in the area south of Twin Creek if the season was extended beyond the Dec 1 winter range closure date, and the political feasibility of extending the winter closure beyond Dec 1 is uncertain. That being said, there is an opportunity to significantly increase harvest if the area south of Twin Creek was kept open longer than December 1 (weeks 16-19 on the page 7 figures). For example in week 18, December 13-19, we predict that there would be ~325 GTNP cow elk, 100 SGTNP cow elk, 80 YNP cow elk and 10 TW cow elk available for harvest. For example if 100 additional elk were harvested in HA 80 in week 18, 63 would be GTNP, 19 would be SGTNP, 15 would be YNP, and 2 would be TW.

The report offers much more nuanced information and recommendations, but I think that I have hit the highlights relative to the season setting process that might best help us meet NER elk population objectives.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

From: Consolo-Murphy, Susan (Sue)
To: Steve Kallin; Eric Cole; Sarah Dewey
Cc: Michael Nash
Subject: season setting
Date: Tuesday, February 24, 2015 11:40:45 AM

I received word back from Chief Ranger Nash; while our LE staff appreciate that we might achieve a little more elk reduction from extending the season later into December, it becomes a staffing challenge so this year, at least, they recommend we not go past Dec. 14

Sue Consolo-Murphy
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(307) 690-8005 (c)
Sue_Consolo-murphy@nps.gov

From: Cole, Eric
To: Jeffrey Warren
Cc: Steve Kallin; Cris Dippel
Subject: Re: FW: WILDLIFE HEALTH:Chronic Wasting Disease (CWD) Request for Proposals
Date: Wednesday, February 25, 2015 3:16:14 PM

We will certainly apply for CWD funding to support our ongoing monitoring efforts for CWD with WGFD, but beyond this I have not considered how these funds might be applied to AMP monitoring.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

On Wed, Feb 25, 2015 at 1:04 PM, Jeffrey Warren <jeffrey_warren@fws.gov> wrote:

> Eric,
>
> Are you considering applying for additional CWD funds this year? Just wondering how this funding source could potentially be used to benefit AMP monitoring.
>
> Cheers,
>
> Jeff Warren
>
> 406 276-3536 ext. 106
>
> *"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy."*
> Richard Feynman
>
> *"A great many people think they are thinking when they are merely rearranging their prejudices."*
> William James
>
> ---

From: Lee Jones [mailto:lee_c_jones@fws.gov]
Sent: Wednesday, February 25, 2015 12:59 PM
To: Biologists FW6 RW
Cc: Leaders FW6 RW Project
Subject: Fwd: WILDLIFE HEALTH:Chronic Wasting Disease (CWD) Request for Proposals

Please don't hesitate to contact me with any questions. Thanks!

Lee C. Jones

USFWS-Wildlife Health Office

10 E. Babcock, Rm 105

Bozeman, MT 59715

Office: 406-587-2169

Cell: 406-600-8405

Fax: 406-587-9098

lee_c_jones@fws.gov

Begin forwarded message:

> **From:** "Gibbs, Samantha" <samantha_gibbs@fws.gov>
> **Date:** February 25, 2015 at 10:03:28 AM MST
> **To:** Bill Thompson <Bill_Thompson@fws.gov>, Diane Granfors <Diane_Granfors@fws.gov>, Jana Newman <jana_newman@fws.gov>, Kevin Kilbride <kevin_kilbride@fws.gov>, "Knutson, Melinda" <melinda_knutson@fws.gov>, Kris Metzger <kris_metzger@fws.gov>, "Laing, Karen" <karen_laing@fws.gov>, Laurel Barnhill <laurel_barnhill@fws.gov>, Steve Kettler <steve_kettler@fws.gov>, Bridgette Flanders-Wanner <bridgette_flanders-wanner@fws.gov>, Chuck Hunter <chuck_hunter@fws.gov>, Grant Harris <grant_harris@fws.gov>, Jan Taylor <jan_taylor@fws.gov>, Patricia Heglund <patricia_heglund@fws.gov>, Ryan Mollnow <ryan_mollnow@fws.gov>, Elizabeth Souheaver <elizabeth_souheaver@fws.gov>, Anne Sittauer <anne_sittauer@fws.gov>, Barbara Boyle <barbara_boyle@fws.gov>, Barry Stieglitz <barry_stieglitz@fws.gov>, Bernie Petersen <bernie_petersen@fws.gov>, Curtis McCasland <curtis_mccasland@fws.gov>, Graham Taylor <graham_taylor@fws.gov>, Holly Gaboriault <holly_t_gaboriault@fws.gov>, Jim Leach <jim_leach@fws.gov>, Kelly McDowell <kelly_mcdowell@fws.gov>, Mike Blenden <mike_blenden@fws.gov>, Ricky Ingram <ricky_ingram@fws.gov>, Sabrina Chandler

<sabrina_chandler@fws.gov>, Thomas Harvey <thomas_harvey@fws.gov>, Timothy Yager <timothy_yager@fws.gov>, Tracey McDonnell <tracey_mcdonnell@fws.gov>, Lee Jones <lee_c_jones@fws.gov>, Mark Chase <mark_chase@fws.gov>, Jennifer Ballard <jennifer_ballard@fws.gov>
Subject: WILDLIFE HEALTH:Chronic Wasting Disease (CWD) Request for Proposals

Hi all,

Please find attached this year's request for proposals for Chronic Wasting Disease surveillance work on refuges. Please distribute to all refuges in your region that might like to submit a proposal.

Criteria used to evaluate proposals are the same as last year and include: a) the strength of partnership with a State wildlife agency or Tribe; b) the risk CWD may pose to cervid resources in the geographic area of the proposed work; c) research and/or management applications of the proposed project; and d) scientific integrity of the proposal.

Proposals are due no later than April 15, 2015.

Please contact Lee Jones or me if you have any questions or concerns.

Kind regards,

Sam

--

Samantha E. J. Gibbs, DVM PhD

Wildlife Veterinarian

Natural Resource Program Center

National Wildlife Refuge System

U.S. Fish and Wildlife Service

Patuxent Research Refuge

12302 Beech Forest Road, Laurel, MD 20708

571-216-5776

samantha_gibbs@fws.gov

From:	Cole, Eric
To:	Steve Kallin; Cris Dippel
Subject:	Fwd: Elk classification summary
Date:	Wednesday, February 25, 2015 3:17:40 PM
Attachments:	2014 Jackson Elk Herd Classification.docx

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

---------- Forwarded message ----------
From: **Alyson Courtemanch** <alyson.courtemanch@wyo.gov>
Date: Wed, Feb 25, 2015 at 2:36 PM
Subject: Elk classification summary
To: "Sarah_Dewey@nps.gov" <Sarah_Dewey@nps.gov>, "eric_Cole@fws.gov" <Eric_Cole@fws.gov>, Doug Brimeyer <doug.brimeyer@wyo.gov>, Jonathan Stephens <jonathan.stephens@wyo.gov>

Hi everyone,

Attached you'll find a quick summary of this year's Jackson Elk Herd classification. I'll be sharing this info at tomorrow's meeting, but wanted to give you the chance to see it beforehand.

Please don't share externally because the numbers are still draft.

Let me know if you have any questions,

Aly

--
Aly Courtemanch, Wildlife Biologist
Wyoming Game & Fish Department
420 North Cache
P.O. Box 67
Jackson, WY 83001
office: (307) 733-2383 x227
cell: (307) 730-2806

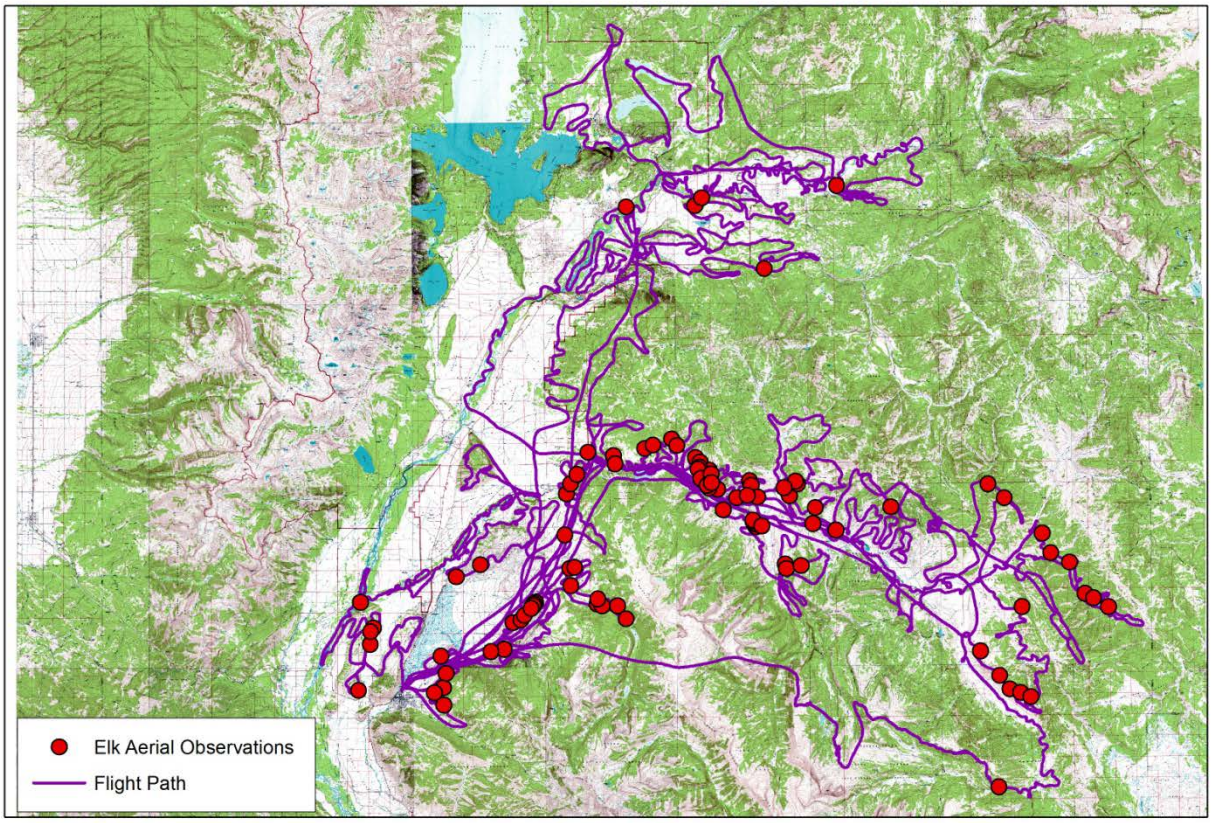
E-Mail to and from me, in connection with the transaction of public business, is subject to the Wyoming Public Records Act and may be disclosed to third parties.

2014 Jackson Elk Herd Classification Summary

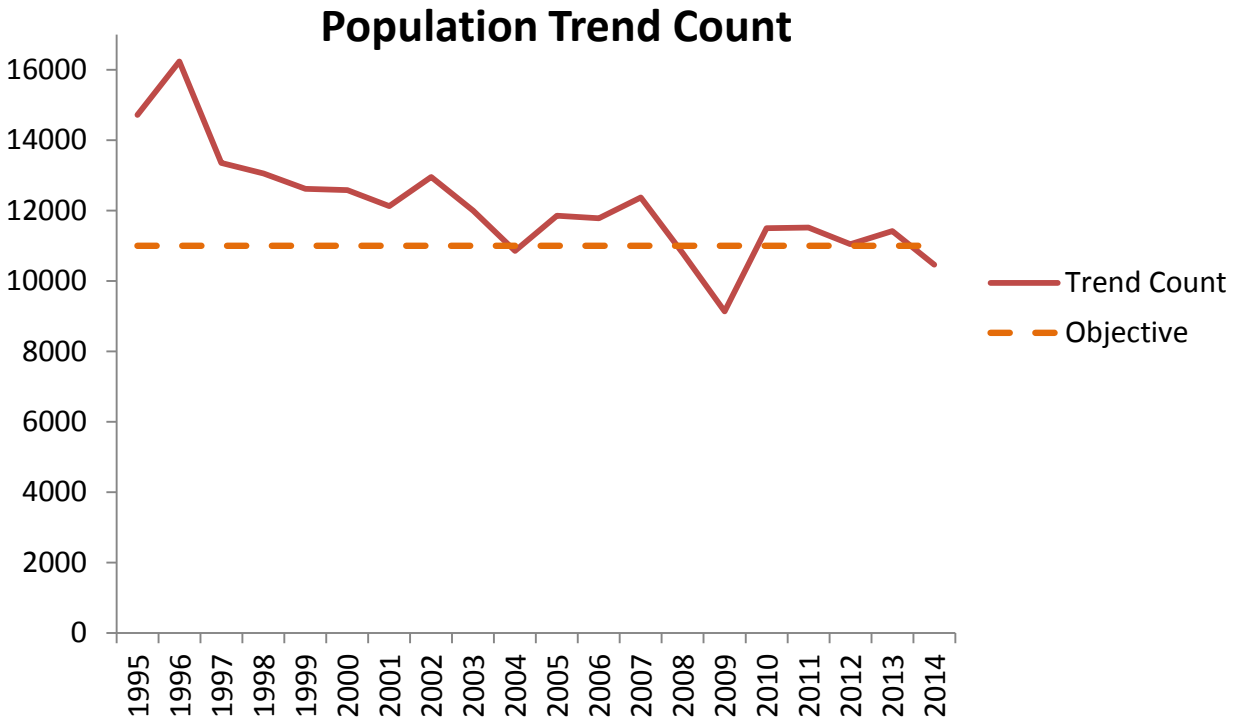
for WGFD/GTNP/NER season setting discussion

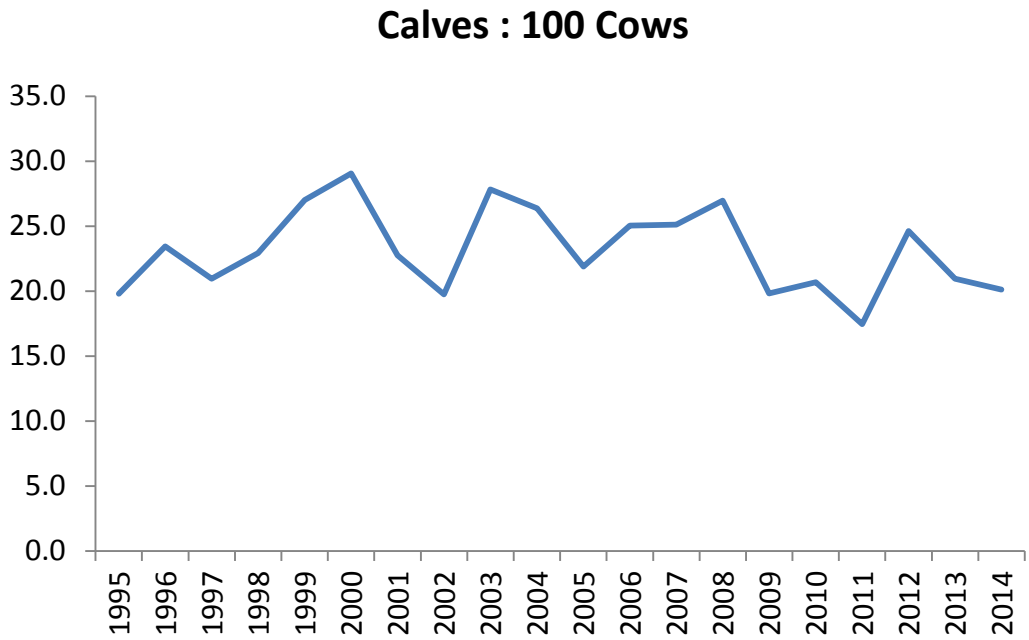
Jackson Elk Herd overall classifications and ratios for last 6 years

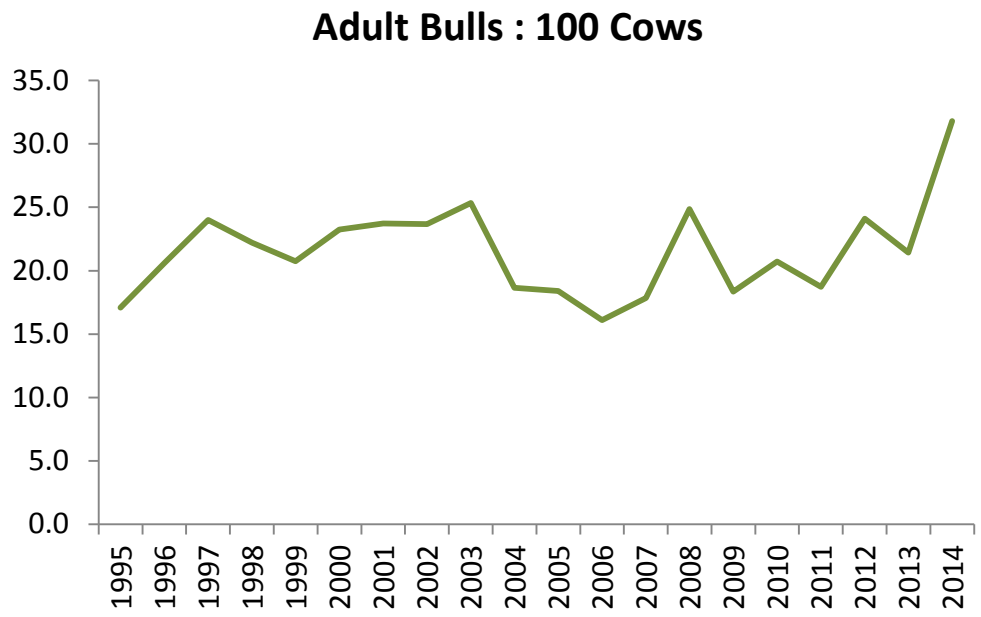
	Cows	Calves	M. Bulls	Spikes	Unclass	Trend Count	Calf:Cow	M. bull:Cow	Spike:Cow
2009	5512	1093	1012	409	1110	9136	19.8	18.4	7.4
2010	7669	1586	1589	659		11503	20.7	20.7	8.6
2011	8116	1417	1519	467		11519	17.5	18.7	5.8
2012	7027	1730	1693	601		11051	24.6	24.1	8.6
2013	7560	1585	1619	659		11423	21.0	21.4	8.7
2014	**6367**	**1281**	**2025**	**672**	**120**	**10465**	**20.1**	**31.8**	**10.6**

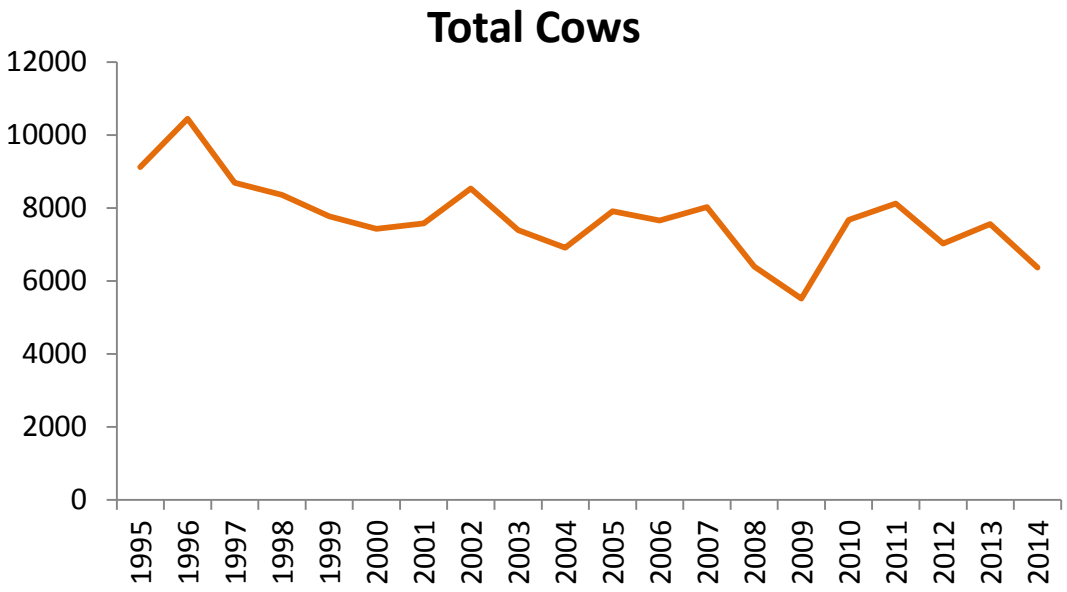


Map of helicopter flight path and elk observations from 2014 survey.


Population Trend Count
16000
14000
12000
10000
8000
6000
4000
2000
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
Trend Count
Objective


Calves : 100 Cows
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014


Adult Bulls : 100 Cows
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014


Total Cows
12000
10000
8000
6000
4000
2000
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

Jackson Elk Herd counts by management area

Winter Range	Goal	2012 Survey	2013 Survey	2014 Survey
National Elk Refuge	5,000	6,285	8,296	8,390
Upper Gros Ventre	3,500	2,982	2,326	1,162
Other winter ranges	2,500	1,445	801	913
TOTAL	11,000	11,051	11,423	10,465

2014 Jackson Elk Classifications by Hunt Area

Hunt Area	Cow	Calf	Mbull	Spike	Total			
70	9	3	0	0	12			
75	42	12	1	1	56			
77 on feed	5023	1073	1716	578	8390			
77 on native range	16	3	23	0	42			
78	0	6	17	4	27			
79	0	0	29	0	29			
80	109	48	98	24	279			
81 Spread Creek	0	0	2	0	2			
81 Gros Ventre	144	32	65	17	378			
82	93	11	4	4	112			
83	3	1	41	7	52			
GTNP other areas	33	17	4	1	55			
GV on feed	895	75	25	36	1031	**Calf:Cow**	**Mbull:Cow**	**Spike:Cow**
Herd Unit Total	**6367**	**1281**	**2025**	**672**	**10465**	20.1	31.8	10.6

Management Area	Cow	Calf	Mbull	Spike	Total	Calf:Cow	Mbull:Cow	Spike:Cow
NER on feed	5023	1073	1716	578	8390	21.4	34.2	11.5
NER native range	16	3	23		42	18.8	143.8	
80	109	48	98	24	279	44.0	89.9	22.0
Buffalo Valley	9	3	35	0	167	33.3	388.9	0.0
Upper Gros Ventre	927	82	109	46	1164	8.8	11.8	5.0
Lower Gros Ventre	241	54	26	19	340	22.4	10.8	7.9
78	0	6	17	4	27			
75	42	12	1	1	56	28.6	2.4	2.4
Herd Unit Total	6367	1281	2025	672	10465	20.1	31.8	10.6

						% off feed
On Feed	5918	1148	1741	614	9541	
On Native Range	449	133	284	58	924	8.8
Total	6367	1281	2025	672	10465	

2013 Jackson Elk Classifications by Hunt Area

Hunt Area	Cow	Calf	Mbull	Sbull	Total			
70	154	56	2	10	222			
75	0	0	10	9	19			
77 on feed	5442	1094	1318	442	8296			
77 on native range	193	53	56	33	335			
78	0	0	0	0	0			
79	0	0	9	0	9			
80	60	9	72	24	165			
81 Spread Creek	0	0	0	0	0			
81 Gros Ventre	14	34	56	22	126			
82	187	46	5	21	259			
83	22	46	73	16	157			
GV on feed	1488	247	18	82	1835	**Calf:Cow**	**Mbull:Cow**	**Spike:Cow**
Herd Unit Total	**7560**	**1585**	**1619**	**659**	**11423**	21.0	21.4	8.7

Management Area	Cow	Calf	Mbull	Sbull	Total	Calf:Cow	Mbull:Cow	Spike:Cow
NER on feed	5442	1094	1318	442	8296	20.1	24.2	8.1
NER native range	193	53	56	33	335	27.5	29.0	17.1
80	60	9	72	24	165	15.0	120.0	40.0
Buffalo Valley	154	56	11	10	231	36.4	7.1	6.5
Upper Gros Ventre	1691	365	143	127	2326	21.6	8.5	7.5
Lower Gros Ventre	20	8	9	14	51	40.0	45.0	70.0
78	0	0	0	0	0			
75	0	0	10	9	19			
Herd Unit Total	7560	1585	1619	659	11423	21.0	21.4	8.7

						% off feed
On Feed	6930	1341	1336	524	10131	
On Native Range	630	244	283	135	1292	11.3
Total	7560	1585	1619	659	11423	

From: Jeffrey Warren
To: Eric Cole
Cc: Steve Kallin; Cris Dippel
Subject: RE: FW: WILDLIFE HEALTH:Chronic Wasting Disease (CWD) Request for Proposals
Date: Wednesday, February 25, 2015 3:20:13 PM

We should consider how your ongoing monitoring will/can inform elk distribution and how that can link into AMP models.

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

From: Cole, Eric [mailto:eric_cole@fws.gov]
Sent: Wednesday, February 25, 2015 3:16 PM
To: Jeffrey Warren
Cc: Steve Kallin; Cris Dippel
Subject: Re: FW: WILDLIFE HEALTH:Chronic Wasting Disease (CWD) Request for Proposals

We will certainly apply for CWD funding to support our ongoing monitoring efforts for CWD with WGFD, but beyond this I have not considered how these funds might be applied to AMP monitoring.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

On Wed, Feb 25, 2015 at 1:04 PM, Jeffrey Warren <jeffrey_warren@fws.gov> wrote:
Eric,

Are you considering applying for additional CWD funds this year? Just wondering how this funding source could potentially be used to benefit AMP monitoring.

Cheers,

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices."
William James

From: Lee Jones [mailto:lee_c_jones@fws.gov]
Sent: Wednesday, February 25, 2015 12:59 PM
To: Biologists FW6 RW
Cc: Leaders FW6 RW Project
Subject: Fwd: WILDLIFE HEALTH:Chronic Wasting Disease (CWD) Request for Proposals

Please don't hesitate to contact me with any questions. Thanks!

Lee C. Jones
USFWS-Wildlife Health Office
10 E. Babcock, Rm 105
Bozeman, MT 59715
Office: 406-587-2169
Cell: 406-600-8405
Fax: 406-587-9098
lee_c_jones@fws.gov

Begin forwarded message:

> **From:** "Gibbs, Samantha" <samantha_gibbs@fws.gov>
> **Date:** February 25, 2015 at 10:03:28 AM MST
> **To:** Bill Thompson <Bill_Thompson@fws.gov>, Diane Granfors <Diane_Granfors@fws.gov>, Jana Newman <jana_newman@fws.gov>, Kevin Kilbride <kevin_kilbride@fws.gov>, "Knutson, Melinda" <melinda_knutson@fws.gov>, Kris Metzger <kris_metzger@fws.gov>, "Laing, Karen" <karen_laing@fws.gov>, Laurel Barnhill <laurel_barnhill@fws.gov>, Steve Kettler <steve_kettler@fws.gov>, Bridgette Flanders-Wanner <bridgette_flanders-wanner@fws.gov>, Chuck Hunter <chuck_hunter@fws.gov>, Grant Harris <grant_harris@fws.gov>, Jan Taylor <jan_taylor@fws.gov>, Patricia Heglund <patricia_heglund@fws.gov>, Ryan Mollnow <ryan_mollnow@fws.gov>, Elizabeth Souheaver <elizabeth_souheaver@fws.gov>, Anne Sittauer <anne_sittauer@fws.gov>, Barbara Boyle <barbara_boyle@fws.gov>, Barry Stieglitz <barry_stieglitz@fws.gov>, Bernie Petersen <bernie_petersen@fws.gov>, Curtis McCasland <curtis_mccasland@fws.gov>, Graham Taylor <graham_taylor@fws.gov>, Holly Gaboriault <holly_t_gaboriault@fws.gov>, Jim Leach <jim_leach@fws.gov>, Kelly McDowell <kelly_mcdowell@fws.gov>, Mike Blenden <mike_blenden@fws.gov>, Ricky Ingram <ricky_ingram@fws.gov>, Sabrina Chandler <sabrina_chandler@fws.gov>, Thomas Harvey <thomas_harvey@fws.gov>, Timothy Yager <timothy_yager@fws.gov>, Tracey McDonnell <tracey_mcdonnell@fws.gov>, Lee Jones <lee_c_jones@fws.gov>, Mark Chase <mark_chase@fws.gov>, Jennifer Ballard <jennifer_ballard@fws.gov>
> **Subject: WILDLIFE HEALTH:Chronic Wasting Disease (CWD) Request for Proposals**

Hi all,

Please find attached this year's request for proposals for Chronic Wasting Disease surveillance work on refuges. Please distribute to all refuges in your region that might like to submit a proposal.

Criteria used to evaluate proposals are the same as last year and include: a) the strength of partnership with a State wildlife agency or Tribe; b) the risk CWD may pose to cervid resources in the geographic area of the proposed work; c) research and/or management applications of the proposed project; and d) scientific integrity of the proposal.

Proposals are due no later than April 15, 2015.

Please contact Lee Jones or me if you have any questions or concerns.
Kind regards,
Sam

--
Samantha E. J. Gibbs, DVM PhD
Wildlife Veterinarian
Natural Resource Program Center
National Wildlife Refuge System
U.S. Fish and Wildlife Service
Patuxent Research Refuge
12302 Beech Forest Road, Laurel, MD 20708
571-216-5776
samantha_gibbs@fws.gov

From:	Steve Kallin
To:	Sarah Dewey
Subject:	RE: GTNP 2015 proposed ERP seasons/structure
Date:	Thursday, February 26, 2015 3:10:53 PM

Thank you,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Dewey, Sarah [mailto:sarah_dewey@nps.gov]
Sent: Thursday, February 26, 2015 2:46 PM
To: Steve Kallin; Eric Cole
Cc: Susan (Sue) Consolo-Murphy
Subject: GTNP 2015 proposed ERP seasons/structure

Steve and Eric,

Just wanted to keep you posted on what was agreed to at the meeting - HA 75 season extends from October 24 through December 13, 2015. Antelope Flats closes on November 30. There will be a total of 650 permits issued in HA 75; 150 Type 4 (also valid in HA 79 from October 24 - November 1) and 500 Type 6.

Sarah

--
Sarah Dewey, Wildlife Biologist
Grand Teton National Park
Science and Resource Management
P.O. Box 170
Moose, WY 83012
(307) 739-3488

From: Steve Kallin
To: Lori Iverson
Subject: FW: AMP invoice #1
Date: Wednesday, March 04, 2015 2:48:10 PM

Lori:

Please process this invoice through the GTA. Steve is working with us to complete the Adaptive Management Plan and his extensive experience and knowledge of the issues, combined with his biological expertise will significantly contribute to the planning and development of the experiment/research to change elk behavior and achieve the objectives in the Bison and Elk Management Plan.

Thank you,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Steve Cain [mailto:stevecain001@gmail.com]
Sent: Wednesday, March 04, 2015 10:43 AM
To: Steve Kallin
Subject: AMP invoice #1

Hi Steve,

Below is the first invoice for the AMP work. Please submit to GTA if this meets your approval. If you need anything else or would like me to communicate directly with the GTA just let me know. Thanks.

****

March 4, 2015

To: Steve Kallin, Manager, National Elk Refuge

From: Steve Cain

Subject: Adaptive Management Plan, 1st invoice

Date	Type of Work	Hours	Cumulative Hours
2/11/2015	AMP Meeting - NER	3.8	3.8
2/12/2015	AMP coordination with Steve and Jeff	4	7.8
2/13/2015	Editing and review	4	11.8
2/17/2015	Editing and review, organizing, formatting	4	15.8
2/18/2015	document editing, formatting, and development.	4	19.8
2/19/2015	document editing, formatting, and development.	2	21.8
2/20/2015	email to Steve and document review	1	22.8
3/2/2015	Introduction and planning history	2.2	25.0

25 hours @ $80/hour = $2,000

From:	Jeffrey Warren
To:	Eric Cole
Cc:	Steve Kallin
Subject:	Next week
Date:	Thursday, March 05, 2015 12:09:12 PM

Eric,

I was wondering if you would be available next week Wednesday afternoon and all day Thursday to work on the AMP models? I just spoke with Steve and we're going to postpone the meeting until we can get the plan more formalized, including having sections on the models of system dynamics and monitoring drafted. I'd like us to be able to get to a point next week where you can continue to move forward with those sections while I'm preoccupied with two workshops I am hosting this spring. I'll have that behind me by mid-April, and will have the last two weeks of April to dedicate to working with you to get a draft ready for the group's review by May 1st.

Thanks,

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

From: Jeffrey Warren
To: Steve Kallin
Subject: Plan
Date: Thursday, March 05, 2015 12:15:33 PM

Steve,

A few items to consider (one a repeat from a moment ago) – approaching WGFD with the offer to collaborate on developing a database (or modifying an existing one) for tracking of wildlife-human conflicts in the area. We can request assistance from I&M for this, i.e., request dedicated time from one of the data managers in the region.

We can also request the DBR planning branch to handle the plan formatting, assuming that may free up more of Steve C.'s time for tasks more suited to his skill set. This is outside of our need to get a general format and flow to the document as discussed, which I believe is what Steve is doing now.

(Red Rock Creek is accessible via vehicle from the west, but still mostly frozen.)
Cheers,

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

From: Cole, Eric
To: Jeffrey Warren; Steve Kallin
Subject: Re: Next week
Date: Thursday, March 05, 2015 2:14:04 PM

Hi Jeff,

I am currently available Wednesday afternoon and all day Thursday for the most part. I say for the most part because Thursday I will need about 1.5 hours around lunch to attend to some personal business.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

On Thu, Mar 5, 2015 at 12:09 PM, Jeffrey Warren <jeffrey_warren@fws.gov> wrote:

> Eric,
>
> I was wondering if you would be available next week Wednesday afternoon and all day Thursday to work on the AMP models? I just spoke with Steve and we're going to postpone the meeting until we can get the plan more formalized, including having sections on the models of system dynamics and monitoring drafted. I'd like us to be able to get to a point next week where you can continue to move forward with those sections while I'm preoccupied with two workshops I am hosting this spring. I'll have that behind me by mid-April, and will have the last two weeks of April to dedicate to working with you to get a draft ready for the group's review by May 1st.
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> Thanks,
>
> Jeff Warren
>
> 406 276-3536 ext. 106
>
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> Richard Feynman

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To: Jeffrey Warren; Steve Kallin
Subject: Re: Next week
Date: Thursday, March 05, 2015 2:14:04 PM

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Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

On Thu, Mar 5, 2015 at 12:09 PM, Jeffrey Warren <jeffrey_warren@fws.gov> wrote:

> Eric,
>
> I was wondering if you would be available next week Wednesday afternoon and all day Thursday to work on the AMP models? I just spoke with Steve and we're going to postpone the meeting until we can get the plan more formalized, including having sections on the models of system dynamics and monitoring drafted. I'd like us to be able to get to a point next week where you can continue to move forward with those sections while I'm preoccupied with two workshops I am hosting this spring. I'll have that behind me by mid-April, and will have the last two weeks of April to dedicate to working with you to get a draft ready for the group's review by May 1st.
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> Jeff Warren
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>
> *"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy."*
> Richard Feynman

> *“A great many people think they are thinking when they are merely rearranging their prejudices.”* William James

From: Steve Kallin
To: Michael Nordell
Subject: FW: Next week
Date: Thursday, March 05, 2015 3:38:15 PM

Please reserve the Old Bunkhouse for Jeff Warren for next Wed, Thurs and Friday evenings.

Thank you,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Thursday, March 05, 2015 2:21 PM
To: Eric Cole; Steve Kallin
Subject: RE: Next week

Sounds great, thanks for the update. I'll head down (family in tow) Wednesday and stay through Friday night so you and I can work Wednesday and Thursday on models and perhaps Steve and I can get together Friday afternoon to work through the new draft with revised format from Steve C. We'll continue moving east to Nebraska Saturday morning.

If the offer still stands, we will stay in the old bunkhouse. The opportunity to be that close to such a large concentration of elk trumps a hotel every time! If that won't work please let me know and I'll make other arrangements.

Cheers,

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

From: Cole, Eric [mailto:eric_cole@fws.gov]
Sent: Thursday, March 05, 2015 2:14 PM
To: Jeffrey Warren; Steve Kallin
Subject: Re: Next week

Hi Jeff,

I am currently available Wednesday afternoon and all day Thursday for the most part. I say for the most part because Thursday I will need about 1.5 hours around lunch to attend to some personal business.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

On Thu, Mar 5, 2015 at 12:09 PM, Jeffrey Warren <jeffrey_warren@fws.gov> wrote:
Eric,

I was wondering if you would be available next week Wednesday afternoon and all day Thursday to work on the AMP models? I just spoke with Steve and we're going to postpone the meeting until we can get the plan more formalized, including having sections on the models of system dynamics and monitoring drafted. I'd like us to be able to get to a point next week where you can continue to move forward with those sections while I'm preoccupied with two workshops I am hosting this spring. I'll have that behind me by mid-April, and will have the last two weeks of April to dedicate to working with you to get a draft ready for the group's review by May 1st.

Thanks,

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

From: Doodle
To: Steve Kallin
Subject: Doodle: AMP Meeting
Date: Thursday, March 05, 2015 4:00:31 PM

View this poll on your dashboard

Do not forward this e-mail.*

Hi Steve Kallin,

You have created your Doodle poll

"AMP Meeting"

You should keep this e-mail in case you want to edit your poll or invite more participants later on.

Administer poll **Invite participants**

* You should not forward this e-mail in order to prevent others from modifying or deleting your poll. If you do not want to use the administrative functions, you can simply ignore or delete this e-mail. Besides, old polls at Doodle are deleted automatically from time to time.

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Doodle
To:	Steve Kallin
Subject:	Doodle: Link for poll "AMP Meeting"
Date:	Thursday, March 05, 2015 4:00:16 PM

Hi Steve Kallin,

You have initiated a poll "AMP Meeting" at Doodle. The link to your poll is:

http://doodle.com/2w9dw9rbyze9k7xr

Share this link with all those who should cast their votes. Do not forget to cast your vote, too.

(If you did not initiate this poll, somebody must accidentally have used your e-mail address; simply ignore this e-mail, please.)

- Your Doodle Team

Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Steve Kallin
To:	Doug Brimeyer; Tim Fuchs; sue_consolo-murphy@nps.gov; Sarah Dewey; Kerry Murphy; Dale Deiter; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Kallin; Steve Cain
Cc:	Mike Blenden
Subject:	AMP Meeting CANCELLED (3/11/2015); Doodle poll for next AMP Meeting
Date:	Thursday, March 05, 2015 4:46:07 PM

Hello Everyone:

I spoke with Jeff Warren today. We have not made enough progress on the AMP since our last meeting to warrant a meeting next Wednesday, March 11. So, to be considerate of everyone's time, we are cancelling that meeting.

Jeff, Steve Cain and the NER staff will continue to work on those components of the AMP that we discussed at the last meeting. We will send you an updated draft by May 1 for your review. Please spend some time reviewing this draft before the next meeting (see Doodle Poll link below). We would like to identify any final changes/additions and complete a final draft by early June.

Please complete the new Doodle Poll at your earliest convenience (http://doodle.com/2w9dw9rbyze9k7xr).

Thanks again for all of your help!

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From:	Steve Kallin
To:	Doug Brimeyer; Tim Fuchs; sue_consolo-murphy@nps.gov; Sarah Dewey; Kerry Murphy; Dale Deiter; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Kallin; Steve Cain
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From:	Steve Kallin
To:	Doug Brimeyer; Tim Fuchs; sue_consolo-murphy@nps.gov; Sarah Dewey; Kerry Murphy; Dale Deiter; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Kallin; Steve Cain
Cc:	Mike Blenden
Subject:	AMP Meeting CANCELLED (3/11/2015); Doodle poll for next AMP Meeting
Date:	Thursday, March 05, 2015 4:46:04 PM

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steve_kallin@fws.gov

From: Doodle
To: Steve Kallin
Subject: Doodle: "AMP Meeting" Update
Date: Thursday, March 05, 2015 4:47:35 PM

View this poll on your dashboard

Hi Steve Kallin,

"Steve Kallin" just provided information to the poll "AMP Meeting."

Go to poll **Close poll**

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "AMP Meeting" Update
Date: Thursday, March 05, 2015 5:02:17 PM



View this poll on your dashboard

Hi Steve Kallin,

"Sue Consolo-Murphy" just provided information to the poll "AMP Meeting."

Go to poll **Close poll**

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "AMP Meeting" Update
Date: Thursday, March 05, 2015 5:07:28 PM

View this poll on your dashboard

Hi Steve Kallin,

"Sue Consolo-Murphy" has changed information in your poll "AMP Meeting."

Go to poll

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "AMP Meeting" Update
Date: Friday, March 06, 2015 11:52:22 AM

View this poll on your dashboard

Hi Steve Kallin,

"Eric Cole" just provided information to the poll "AMP Meeting."

Go to poll **Close poll**

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Clark, Stephen
To: Will Meeks
Subject: Fwd: joint RD briefing NER
Date: Monday, March 23, 2015 9:49:55 AM

I know you had asked about this...Didn't want to bug you on AL---just an update.
---------- Forwarded message ----------
From: **Blenden, Mike** <mike_blenden@fws.gov>
Date: Mon, Mar 23, 2015 at 9:47 AM
Subject: joint RD briefing NER
To: Stephen Clark <stephen_clark@fws.gov>

Steve,

I just verified with Kristine that she has tentatively arranged a briefing with with Noreen and her NPS counterpart (Sue ?) to discuss the Comprehensive Conservation Plan at the National Elk Refuge on March 30 at the NPS office on Alameda.

Steve Kallin, the manager of the elk refuge, had been trying to do the same but was hoping to hold it at the refuge.

Kristine will get back to me as soon as she hears back from Noreen concerning who should she would like to participate in the briefing.

I hope to have more information today.

Mike

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

--
Stephen Clark
U.S. Fish and Wildlife Service
Mountain Prairie Region
Acting Deputy Assistant Regional Director
National Wildlife Refuge System and
Partners for Fish and Wildlife Program
303-236-4304 (w)
504-214-2398 (c)

From: Will Meeks
To: Clark, Stephen
Subject: Re: joint RD briefing NER
Date: Monday, March 23, 2015 1:00:52 PM

Thanks. We need an agenda. Share it with Matt And Noreen in advance. Also then with NPS RD. I think others will attend (me, you, Blenden), but confirm. We need to talk about the Supplementsl Feeding/Adaptive Planning.

A little work needs to be done in advance.

Will Meeks
U.S. Fish and Wildlife Service
Mountain Prairie Region
Assistant Regional Director
National Wildlife Refuge System and
Partners for Fish and Wildlife Program
303-236-4303 (w)
720-541-0310 (c)

On Mar 23, 2015, at 10:49 AM, Clark, Stephen <stephen_clark@fws.gov> wrote:

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> ---------- Forwarded message ----------
> From: **Blenden, Mike** <mike_blenden@fws.gov>
> Date: Mon, Mar 23, 2015 at 9:47 AM
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> To: Stephen Clark <stephen_clark@fws.gov>
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> Michael Blenden

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U.S. Fish and Wildlife Service
Mountain Prairie Region
Acting Deputy Assistant Regional Director
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From:	Clark, Stephen
To:	Will Meeks
Subject:	Fwd: NPS/FWS RD briefing National Elk Refuge
Date:	Wednesday, March 25, 2015 10:57:23 AM
Attachments:	Jointbriefingagenda.docx

FYI on the agenda for the briefing next week.

---------- Forwarded message ----------
From: **Blenden, Mike** <mike_blenden@fws.gov>
Date: Wed, Mar 25, 2015 at 10:56 AM
Subject: NPS/FWS RD briefing National Elk Refuge
To: Matt Hogan <matt_hogan@fws.gov>
Cc: Stephen Clark <stephen_clark@fws.gov>

Matt,

Attached is a draft agenda for the briefing scheduled next Monday with Noreen and the NPS regional director concerning elk management issues at National Elk Refuge and Grand Teton National Park.

Please let me know if the agenda heads us in the right direction or you have suggestions.

Thanks,

Mike

--
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Agenda

Briefing with Regional Directors

National Park Service and U.S. Fish and Wildlife Service

Elk/Bison Management

March 30, 2015

Briefing Objective – Ensure common understanding of each agency's approach to elk and bison management and status of current efforts.

Introductions

Background

- History of Bison and Elk Management Plan (NER Manager and GRTE NP Superintendent)
- Current Elk/Bison herd status and trends – Manager/Superintendent

Key Topics for discussion

- Landscape-scale Conservation/Habitat Connectivity – Manager/Superintendent
- Predator hunting – Manager
- Bear Spray – Manager/Superintendent
- Lead Free Ammunition – Manager/Superintendent
- Highway 89 Pathway – Manager
- Adaptive Management Plan status and direction – Manager/Superintendent
- Refuge hunt program/Reduction hunt on GRTE – Manager/Superintendent
- Comprehensive Conservation Plan status and direction- Manager
- Position of the State of Wyoming – Manager/Superintendent
- Status of lawsuit – Superintendent

Questions and Discussion with NPS/FWS Leadership

Recommendations and next steps

Adjourn

From:	Clark, Stephen
To:	Will Meeks
Subject:	Fwd: NPS/FWS RD briefing National Elk Refuge
Date:	Wednesday, March 25, 2015 10:57:23 AM
Attachments:	Jointbriefingagenda.docx

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- Position of the State of Wyoming – Manager/Superintendent
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Questions and Discussion with NPS/FWS Leadership

Recommendations and next steps

Adjourn

From:	Blenden, Mike
To:	Keenan Adams; Bernie Petersen; Barbara Boyle; Will Meeks; Heather Johnson
Subject:	Fwd: NER CWD Model
Date:	Wednesday, March 25, 2015 2:12:31 PM
Attachments:	NER CWD Model 3-20-2015.docx

I need some technical help. There was a time I could have easily explained this equation and given Steve some help but those skills see to be a little rusty. I've pretty much got it except for the factor in the 6th column, 4th row. Can you explain that to me?

---------- Forwarded message ----------
From: **Steve Kallin** <steve_kallin@fws.gov>
Date: Fri, Mar 20, 2015 at 2:25 PM
Subject: NER CWD Model
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>

Mike:

The NER is working with Tom Hobbs from Colorado State University to develop a CWD model for the NER to help us answer some elk management questions. Please review the attached and provide comments, corrections or changes.

Thank you!

Steve Kallin

Project Leader

National Elk Refuge

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Process model

$$\begin{pmatrix} n_1 \\ n_2 \\ n_3 \\ n_4 \\ n_5 \\ n_6 \\ n_7 \\ n_8 \end{pmatrix}_t = \begin{pmatrix} 0 & 0 & s_{(2,J)} f_n \left(1-\phi_{(t)}\right) & 0 & 0 & s_{(2,J)} f_c (1-v)\left(1-\phi_{(t)}\right) & s_{(2,J)} f_p \left((1-\psi)\left(1-\phi_{(t)}\right)+ \psi(1-v)\left(1-\phi_{(t)}\right)\right) & 0 \\ s_{(1,J)}(1-m)\left(1-\phi_{(t)}\right) & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & s_{(2,J)}\left(1-\phi_{(t)}\right) & s_{(2,J)}\left(1-\phi_{(t)}\right) & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & s_{(2,J)} f_n \phi_{(t)} & 0 & 0 & s_{(2,J)} f_c \left(v+\phi_{(t)}-v\phi_{(t)}\right) & s_{(2,J)} \psi f_p \left(v+\phi_{(t)}-v\phi_{(t)}\right)+ (1-\psi)\phi_{(t)} & 0 \\ s_{(1,J)}\phi_{(t)}(1-m) & 0 & 0 & s_{(1)}(1-m) & 0 & 0 & 0 & 0 \\ 0 & s_{(2,J)}\phi_{(t)} & s_{(2,J)}\phi_{(t)} & 0 & s_{(2,J)} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & s_{(2,J)} & s_{(2,J)} & 0 \\ s_{(1)} m & 0 & 0 & s_{(1,J)} m & 0 & 0 & 0 & s_{(3,J)} \end{pmatrix} \begin{pmatrix} n_1 \\ n_2 \\ n_3 \\ n_4 \\ n_5 \\ n_6 \\ n_7 \\ n_8 \end{pmatrix}_{t-1}$$

$$\mathbf{n}_t = \mathbf{A}\mathbf{n}_{t-1}$$

Hobbs et al., Ecological Monographs, in press.

From:	Blenden, Mike
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Subject:	Fwd: NER CWD Model
Date:	Wednesday, March 25, 2015 2:12:31 PM
Attachments:	NER CWD Model 3-20-2015.docx

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Thank you!

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Hobbs et al., Ecological Monographs, in press.

From:	Bernie Petersen
To:	Mike Blenden; Keenan Adams; Barbara Boyle; Will Meeks; Heather Johnson
Subject:	RE: NER CWD Model
Date:	Wednesday, March 25, 2015 2:48:42 PM

Clearly you just don't get it.

Bernard J. Petersen
Refuge Supervisor North & South Dakota
National Wildlife Refuge System
U.S. Fish & Wildlife Service
Lakewood, CO 80228
303-236-4310
720-708-8026 Cell
GOOD JUDGMENT COMES FROM EXPERIENCE AND A LOT OF THAT COMES FROM BAD JUDGEMENT!!!

From: Blenden, Mike [mailto:mike_blenden@fws.gov]
Sent: Wednesday, March 25, 2015 2:12 PM
To: Keenan Adams; Bernie Petersen; Barbara Boyle; Will Meeks; Heather Johnson
Subject: Fwd: NER CWD Model

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GOOD JUDGMENT COMES FROM EXPERIENCE AND A LOT OF THAT COMES FROM BAD JUDGEMENT!!!

From: Blenden, Mike [mailto:mike_blenden@fws.gov]
Sent: Wednesday, March 25, 2015 2:12 PM
To: Keenan Adams; Bernie Petersen; Barbara Boyle; Will Meeks; Heather Johnson
Subject: Fwd: NER CWD Model

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To: Mike Blenden <mike_blenden@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>

Mike:

The NER is working with Tom Hobbs from Colorado State University to develop a CWD model for the NER to help us answer some elk management questions. Please review the attached and provide comments, corrections or changes.

Thank you!

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

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John F. Kennedy

From: Adams, Keenan
To: Bernie Petersen
Cc: Mike Blenden; Barbara Boyle; Will Meeks; Heather Johnson
Subject: Re: NER CWD Model
Date: Wednesday, March 25, 2015 2:49:30 PM

---

the answer is 6

On Wed, Mar 25, 2015 at 2:48 PM, Bernie Petersen <bernie_petersen@fws.gov> wrote:

> Clearly you just don't get it.
>
> Bernard J. Petersen
>
> Refuge Supervisor North & South Dakota
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To:	Keenan Adams
Cc:	Mike Blenden; Barbara Boyle; Will Meeks; Heather Johnson
Subject:	RE: NER CWD Model
Date:	Wednesday, March 25, 2015 2:53:45 PM

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From: Clark, Stephen
To: Will Meeks
Cc: Mike Blenden
Subject: Fwd: joint RD briefing NER
Date: Wednesday, March 25, 2015 3:24:59 PM

Will,
I know you had asked about this...Looks like the joint briefing that was scheduled for Monday has now been postponed. Mike has been in contact with Kristine. See email below. I assume that after the RD and the NPS speak on Monday---a briefing date may be set.
Thanks,

---------- Forwarded message ----------
From: **Blenden, Mike** <mike_blenden@fws.gov>
Date: Wed, Mar 25, 2015 at 3:16 PM
Subject: Re: joint RD briefing NER
To: "Clark, Stephen" <stephen_clark@fws.gov>

Stephen,

I just spoke to Kristine. Noreen and the NPS RD are just planning to have a telephone call on Monday to get to know one another, pre-joint briefing about the National Elk Refuge. I told Kristine I was preparing for the joint briefing like it was going to happen on Monday because I didn't know. She requested I provide her any information provided to NPS. To my knowledge that only consists of the draft agenda. I'll check with Steve Kallin tomorrow and see if he has provided them any additional information. If so, I'll forward that to Kristine too. Matt Hogan already has the draft agenda.

On Mon, Mar 23, 2015 at 1:23 PM, Clark, Stephen <stephen_clark@fws.gov> wrote:

> Mike,
> Please let me know when you hear back from Kristine. Will is requesting an Agenda, and a list of who will be in attendance.
> Thanks,
> ---------- Forwarded message ----------
> From: **Will Meeks** <will_meeks@fws.gov>
> Date: Mon, Mar 23, 2015 at 1:00 PM
> Subject: Re: joint RD briefing NER
> To: "Clark, Stephen" <stephen_clark@fws.gov>
>
> Thanks. We need an agenda. Share it with Matt And Noreen in advance. Also then with NPS RD. I think others will attend (me, you, Blenden), but confirm. We need to talk about the Supplementsl Feeding/Adaptive Planning.
>
> A little work needs to be done in advance.
>
> Will Meeks
> U.S. Fish and Wildlife Service
> Mountain Prairie Region

Assistant Regional Director
National Wildlife Refuge System and
Partners for Fish and Wildlife Program
303-236-4303 (w)
720-541-0310 (c)

On Mar 23, 2015, at 10:49 AM, Clark, Stephen <stephen_clark@fws.gov> wrote:

> I know you had asked about this...Didn't want to bug you on AL---just an update.
>
> ---------- Forwarded message ----------
> From: **Blenden, Mike** <mike_blenden@fws.gov>
> Date: Mon, Mar 23, 2015 at 9:47 AM
> Subject: joint RD briefing NER
> To: Stephen Clark <stephen_clark@fws.gov>
>
> Steve,
>
> I just verified with Kristine that she has tentatively arranged a briefing with with Noreen and her NPS counterpart (Sue ?) to discuss the Comprehensive Conservation Plan at the National Elk Refuge on March 30 at the NPS office on Alameda.
>
> Steve Kallin, the manager of the elk refuge, had been trying to do the same but was hoping to hold it at the refuge.
>
> Kristine will get back to me as soon as she hears back from Noreen concerning who should she would like to participate in the briefing.
>
> I hope to have more information today.
>
> Mike
>
> --
> Michael Blenden
> Refuge Supervisor - Montana, Wyoming and Utah
> 134 Union Boulevard
> Lakewood, CO 80228
> 303-236-4306
>
> *Too often we...enjoy the comfort of opinion without the discomfort of thought.*
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> --
> Stephen Clark

U.S. Fish and Wildlife Service
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303-236-4304 (w)
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504-214-2398 (c)

From: Jones, Lee
To: Cole, Eric
Cc: Steve Kallin; Cris Dippel; Jeffrey Warren; Lori Iverson; Aly Courtemanch
Subject: Re: still hoping for information
Date: Saturday, March 28, 2015 3:15:16 PM

Thanks for keeping me in the loop Eric and I'll forward to and discuss with Sam, as well. I'd also like to discuss the status of the AMP and also the status of the NER Intense Health study with you next week via phone, if possible. Thanks! Lee

Lee C. Jones
USFWS-Wildlife Health Office
10 E. Babcock, Rm 105
Bozeman, MT 59715
Office: 406.587.2169
Cell: 406.600.8405
Fax: 406.587.9098
lee_c_jones@fws.gov

On Thu, Mar 26, 2015 at 9:18 AM, Cole, Eric <eric_cole@fws.gov> wrote:

> Hi Lee,
>
> I am forwarding this inquiry and response by WGFD regarding NER and WGFD feeding strategies because I anticipate additional questions about elk health and nutrition. As background, Lorna Miller and some others in the area appear to be pro-feeding from an animal welfare perspective. Based on past interactions they appear to be operating under the assumption that NER feeds elk (and bison) to maximize their fat reserves and minimize stress to the animals, when in practice NER feeds to support WGFD population objectives and minimize conflict on surrounding private lands. I anticipate that these sort of questions will get more intense as we implement the AMP over the next few years and attempt to reduce our reliance on supplemental feeding. These sort of questions point to the need for intensive public outreach to educate the public about wild ungulate population dynamics, typical elk winter mortality rates in unfed populations, and the prevalence of density dependent diseases associated with feeding operations.
>
> Take care,
>
> **Eric Cole**
> Refuge Biologist
> U.S. Fish & Wildlife Service, National Elk Refuge
> Jackson, WY
> 307.201.5432 (Note new phone # as of June 2014)
>
> ---------- Forwarded message ----------
> From: **Alyson Courtemanch** <alyson.courtemanch@wyo.gov>
> Date: Wed, Mar 25, 2015 at 10:30 PM
> Subject: Re: still hoping for information
> To: lorna miller <lornamiller@live.com>
> Cc: Doug Brimeyer <doug.brimeyer@wyo.gov>

Hi Lorna,

Again, apologies for taking so long to put this together for you. Please find my answers to your questions attached. If you'd like more specific information about the National Elk Refuge, I suggest you contact Eric Cole (eric_cole@fws.gov). Please let me know if you have additional questions. Also, we are holding a public meeting tomorrow from 6-8 pm at the Antler Inn to discuss hunt season proposals and herd classifications.

I'm glad that you enjoyed the potluck and David Quammen's talk last night. Thanks for coming and supporting it!

Aly

On Wed, Mar 25, 2015 at 4:01 PM, lorna miller <lornamiller@live.com> wrote:

> Thanks Aly, I know you are swamped so I really appreciate it.
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> That was a very interesting talk last night. Thanks for organizing it.
> And I was VERY, VERY glad to hear that the Foundation is moving ahead with the ramps for the Levee! Great work.
> Lorna
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> Date: Wed, 25 Mar 2015 15:36:32 -0600
> Subject: Re: still hoping for information
> From: alyson.courtemanch@wyo.gov
> To: doug.brimeyer@wyo.gov
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> I know you are both really busy and I hate to be such a nuisance. If it is available online somewhere, I'm happy to look for it myself if you point me in the right direction.
> thanks
> Lorna

--
Doug Brimeyer
Jackson/Pinedale Wildlife Management Coordinator
Wyoming Game and Fish Department
doug.brimeyer@wyo.gov
307-733-2321 ext. 230

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--
Aly Courtemanch, Wildlife Biologist
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P.O. Box 67
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office: (307) 733-2383 x227
cell: (307) 730-2806

E-Mail to and from me, in connection with the transaction of public business, is subject to the Wyoming Public Records Act and may be disclosed to third parties.

From: Will Meeks
To: Mike Blenden; Stephen Clark
Subject: NER briefing
Date: Monday, March 30, 2015 5:35:39 AM

Mike and Stephen,

Thanks for sending me the briefing materials for the joint briefing. I just have a couple clarifying questions - are we ready, where are we meeting, and it's a 10 am, right?

Catching up. Thanks.

Will Meeks
U.S. Fish and Wildlife Service
Mountain Prairie Region
Assistant Regional Director
National Wildlife Refuge System and
Partners for Fish and Wildlife Program
303-236-4303 (w)
720-541-0310 (c)

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To: Mike Blenden; Stephen Clark
Subject: NER briefing
Date: Monday, March 30, 2015 5:35:39 AM

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U.S. Fish and Wildlife Service
Mountain Prairie Region
Assistant Regional Director
National Wildlife Refuge System and
Partners for Fish and Wildlife Program
303-236-4303 (w)
720-541-0310 (c)

From: Steve Cain
To: Steve Kallin
Subject: Re: AMP Meeting CANCELLED (3/11/2015); Doodle poll for next AMP Meeting
Date: Monday, March 30, 2015 9:44:02 AM

Hi Steve,

I responded to the Doodle Poll that none of the options you presented during the week of May 18 will work for me (I will be out of town that week), so just wanted to remind you of this. The week after that is OK.

I was out of town for 10 days then came home sick last Tuesday, now mostly better and clear-headed, so starting in on the plan again, just FYI. Hope all is well on your end.

Steve

On Thu, Mar 5, 2015 at 4:46 PM, Steve Kallin <steve_kallin@fws.gov> wrote:

> Hello Everyone:
>
> I spoke with Jeff Warren today. We have not made enough progress on the AMP since our last meeting to warrant a meeting next Wednesday, March 11. So, to be considerate of everyone's time, we are cancelling that meeting.
>
> Jeff, Steve Cain and the NER staff will continue to work on those components of the AMP that we discussed at the last meeting. We will send you an updated draft by May 1 for your review. Please spend some time reviewing this draft before the next meeting (see Doodle Poll link below). We would like to identify any final changes/additions and complete a final draft by early June.
>
> Please complete the new Doodle Poll at your earliest convenience (http://doodle.com/2w9dw9rbyze9k7xr).
>
> Thanks again for all of your help!
>
> Steve Kallin
>
> Project Leader
>
> National Elk Refuge
>
> PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

From: Doodle
To: Steve Kallin
Subject: Doodle: BEMP Adaptive Management Planning Meeting
Date: Tuesday, March 31, 2015 8:14:31 AM

View this poll on your dashboard

Do not forward this e-mail.*

Hi Steve Kallin,

You have created your Doodle poll

"BEMP Adaptive Management Planning Meeting"

You should keep this e-mail in case you want to edit your poll or invite more participants later on.

Administer poll **Invite participants**

* You should not forward this e-mail in order to prevent others from modifying or deleting your poll. If you do not want to use the administrative functions, you can simply ignore or delete this e-mail. Besides, old polls at Doodle are deleted automatically from time to time.

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: Link for poll "BEMP Adaptive Management Planning Meeting"
Date: Tuesday, March 31, 2015 8:14:30 AM

Hi Steve Kallin,

You have initiated a poll "BEMP Adaptive Management Planning Meeting" at Doodle. The link to your poll is:

http://doodle.com/3ty3c6mgu2heckd7

Share this link with all those who should cast their votes. Do not forget to cast your vote, too.

(If you did not initiate this poll, somebody must accidentally have used your e-mail address; simply ignore this e-mail, please.)

- Your Doodle Team

Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Steve Kallin
To:	Dale Deiter; Kerry Murphy; Tim Fuchs; Doug Brimeyer; sue_consolo-murphy@nps.gov; Sarah Dewey; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Cain; Steve Kallin
Subject:	AMP Doodle Poll Cancelled for week of May 18; NEW Doodle Poll for May 26-June 5
Date:	Tuesday, March 31, 2015 8:22:38 AM

Hi All:

It appears the week of May 18 will not work for an AMP meeting. Those who have not yet responded to the Doodle poll for that week, please disregard.

A link for a new Doodle Poll for May 26 through June 5 is below. Please complete this new poll at your earliest convenience.

http://doodle.com/3ty3c6mgu2heckd7

We still hope to send out a rough draft of the AMP for your review by the first of May.

Thanks again for your help!

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

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From:	Steve Kallin
To:	Dale Deiter; Kerry Murphy; Tim Fuchs; Doug Brimeyer; sue_consolo-murphy@nps.gov; Sarah Dewey; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Cain; Steve Kallin
Subject:	AMP Doodle Poll Cancelled for week of May 18; NEW Doodle Poll for May 26-June 5
Date:	Tuesday, March 31, 2015 8:22:33 AM

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Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Planning Meeting" Update
Date: Tuesday, March 31, 2015 8:48:06 AM

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Hi Steve Kallin,

"Eric Cole" just provided information to the poll "BEMP Adaptive Management Planning Meeting."

Go to poll **Close poll**

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Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Planning Meeting" Update
Date: Tuesday, March 31, 2015 9:02:08 AM

View this poll on your dashboard

Hi Steve Kallin,

"Steve Cain" just provided information to the poll "BEMP Adaptive Management Planning Meeting."

Go to poll | Close poll

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Planning Meeting" Update
Date: Tuesday, March 31, 2015 9:51:21 AM

View this poll on your dashboard

Hi Steve Kallin,

"Sue CM" just provided information to the poll "BEMP Adaptive Management Planning Meeting."

Go to poll **Close poll**

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Cole, Eric
To:	Bryan Yetter; Tony Hough; Amanda Soliday; Chris Clapp; Cris Dippel; Daniel Sharps; Dave Dunlap; Fernando Escobedo; Steve Koob; Steve Kallin; Lori Iverson; Doug Brimeyer; Aly Courtemanch; Tim Fuchs; Timothy Pratt
Subject:	2015 NER Feeding Review
Date:	Tuesday, March 31, 2015 10:46:10 AM
Attachments:	2015 Feeding Review.pdf

The attached file summarizes how the decision to initiate feeding on NER in 2015 was made, and provides details about the 2015 feeding season. I know that many of you receive questions from the public about NER feeding issues, and this document should help you respond should the need arise.

If you have any questions please feel free to ask.

Thanks,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

2015 Feeding Review
3/30/2015
Eric Cole, Refuge Biologist

Feeding Initiation:

Based on current criteria, initiation of supplemental feeding is dependent on the amount of forage that is available to elk. NER and WGFD biologists evaluate the amount of forage available on southern portions of the National Elk Refuge at key index sites to determine if supplemental feeding is necessary. Key index sites are not a random representation of available forage on NER, but instead represent areas where elk consume forage first, which are generally areas with plants of the highest palatability and nutritional quality for elk. Examples of plant communities represented by key index sites include sub-irrigated bluegrass, sub-irrigated sedge, and agronomic grasslands that received either late growing season irrigation or in some years late August-early September precipitation. When average available forage declines or is projected to decline below 300 lbs. per acre at key index sites, biologists usually recommend that supplemental feeding should be initiated. The 300 lbs. per acre threshold for available forage at key index sites is used because past observations suggest that elk begin leaving the refuge for private land when available forage declines below this level, even if higher quantities of lower quality forage are available in other areas on NER. Preventing elk commingling with livestock and other damage by elk and bison to surrounding private land are current goals of the Bison and Elk Management Plan (2007), and therefore current high priority goals of the NER supplemental feeding program. However these goals may be subject to change after implementation of the Adaptive Management Plan to Reduce Reliance on Supplemental Feeding (in draft).

Available forage is influenced by the following factors:

1.) Forage Production the previous growing season:
Estimated 2014 refuge-wide herbaceous forage production was 16,517 tons. Estimated total refuge-wide forage production, which includes herbaceous and woody plants, was 20,195 tons. Both herbaceous and total forage production were 16% above 1998-2014 averages. In general NER forage sampling methods are best suited to evaluate annual differences in herbaceous rather than woody vegetation on the refuge, and therefore herbaceous measurements provide a useful index of the amount of forage that will be available for ungulates during the winter. For comparison record low refuge-wide herbaceous forage production occurred in the drought year of 2003 (6,710 tons) and record high herbaceous forage production occurred in the wet years of 1998 and 2004 (19,647 and 19,597 tons respectively).

NER staff irrigated 3,860 acres using the K-line irrigation system. Estimated herbaceous production in the irrigated area was 3,436 tons. Predicted herbaceous forage production in the irrigated area would have been 1,993 tons in the complete absence of irrigation, which suggests that the NER irrigation program produced 1,444 tons of additional forage in 2014 (approximately 750 additional lbs. per acre). This represents a 10% increase in refuge-wide production and a 15% increase in production in the high elk and bison use area on the southern portion of NER.

Relatively high forage production on NER was attributed to average total precipitation during the growing season (May through August) plus irrigation effects. Although precipitation in August and September was well above average, this precipitation occurred too late in the growing season to

significantly increase forage quantity. However, late season precipitation did produce significant basal green up of grass plants, which increased the nutritional quality of the forage and increased the areas considered key index sites during feeding initiation evaluations.

2.)Forage consumption rates determined by the number of elk and bison using the south end of the Refuge during the fall and early winter period:
As has been typical since the initiation of the south unit elk hunt in 2007, elk and bison numbers were very low in October 2014, but cold stormy conditions in mid-November resulted in 500-3,000 elk using the south end of NER in late November (Figure 1) and 150-500 bison consistently using the refuge throughout December. These were the highest elk and bison numbers in the late fall-early winter period since 2010, resulting in higher forage consumption rates than usual for this time of year. During January 2015 there were additional increases in elk and bison numbers, and the cumulative effect on available forage reserves and feeding initiation date was significant.

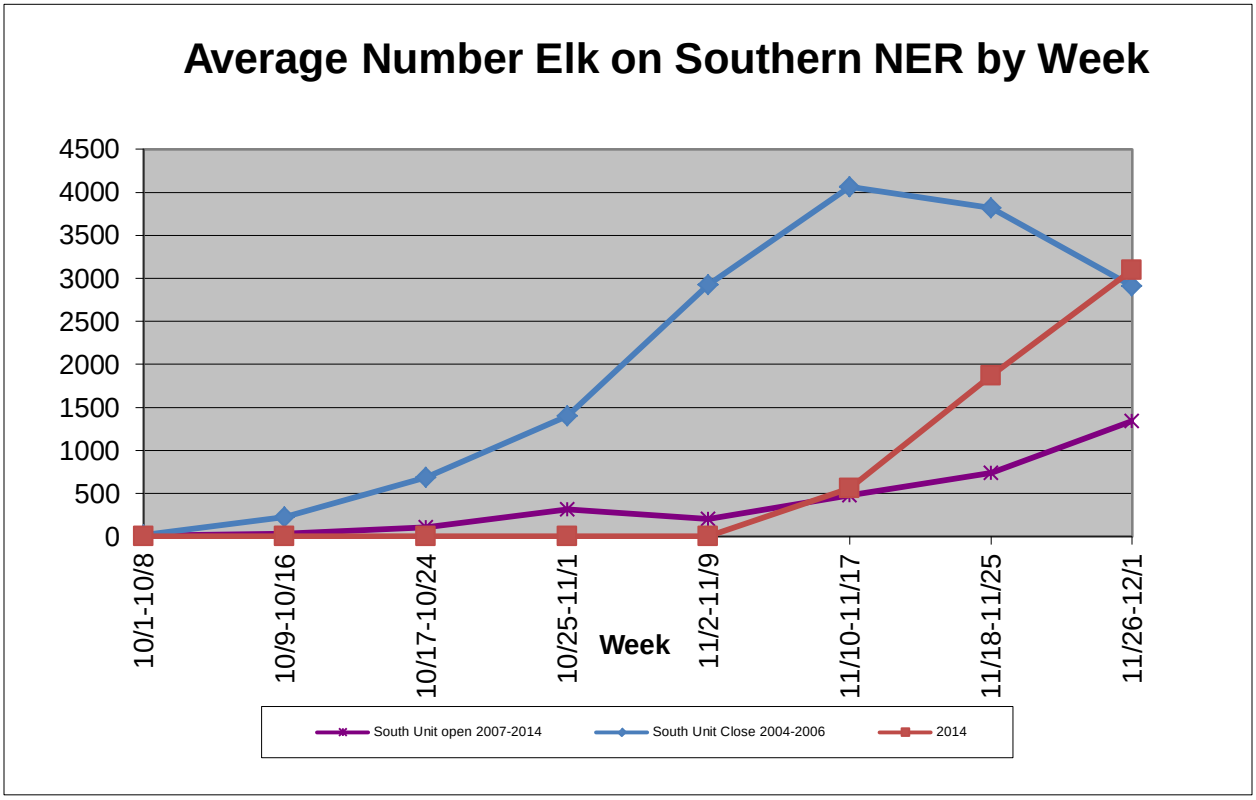


Figure 1. Average number of elk counted in the southern NER survey area by week during 3 time periods: 2004-2006 when the south elk hunting unit was closed to hunting, 2007-2014 when the south unit was open to hunting, and 2014.

3.)Snow Conditions:
Refuge personnel have consistently monitored daily snow-pack depths at NER headquarters since 2008 (Figure 2). Significant November and December snowfall resulted in average to above average snow depth on southern NER from January 1, 2015 to January 17, 2015. Unprecedented melting occurred beginning January 18, 2015 and southern NER was almost completely snow free by February 13. However, supplemental feeding had already begun on January 19, 2015 (see feeding initiation recommendation below), and despite snow free conditions by mid-February there was almost no residual forage in snow free areas on NER, and dense snow adjacent to the refuge made forage

inaccessible in these areas. Therefore supplemental feeding continued on NER until March 21, 2015 when additional areas became snow free and significant grass green up was observed on southern NER.

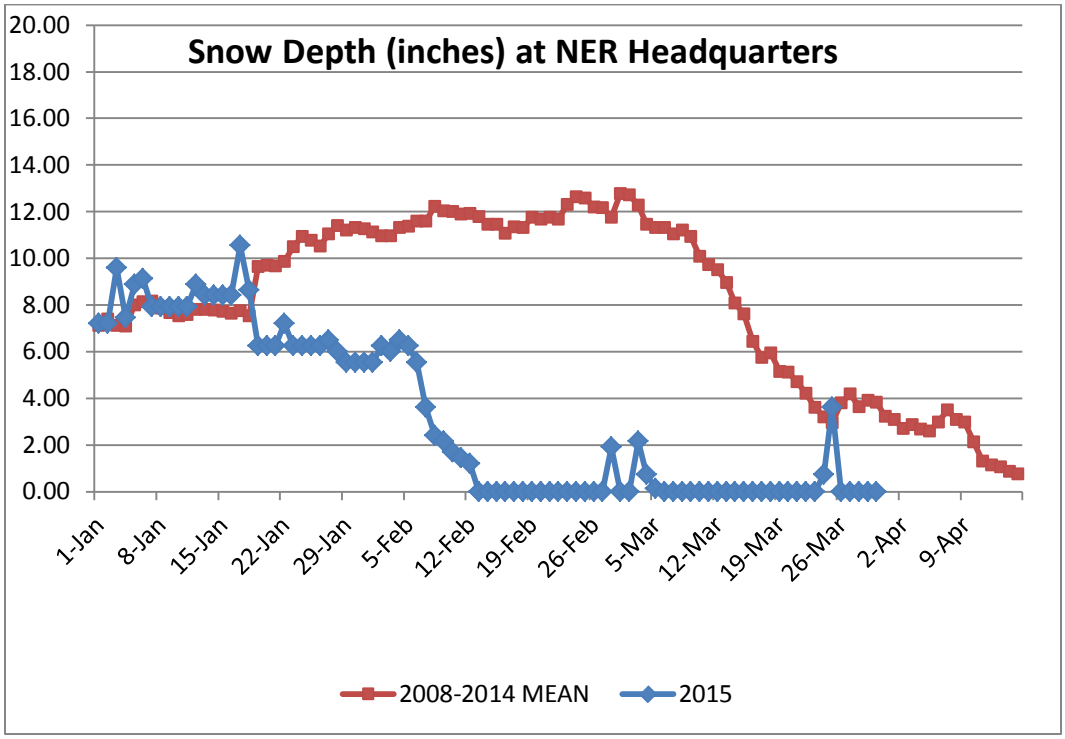


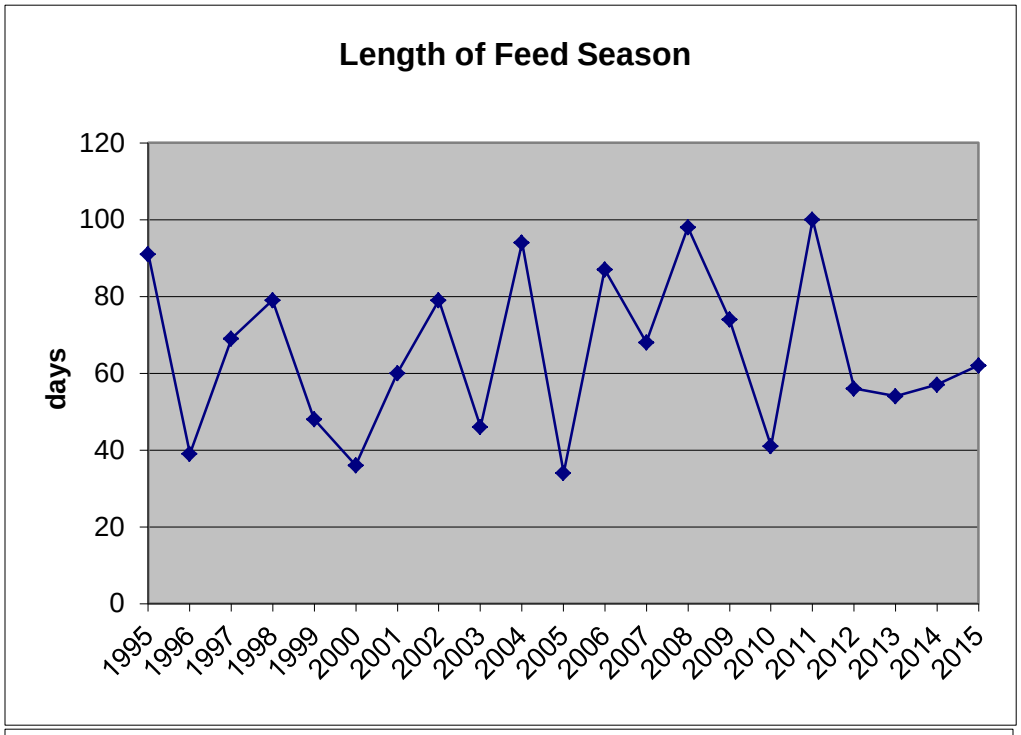
Figure 2. Mean daily snow pack depth at NER headquarters 2008-2014 compared to snow pack depth at NER headquarters in 2015.

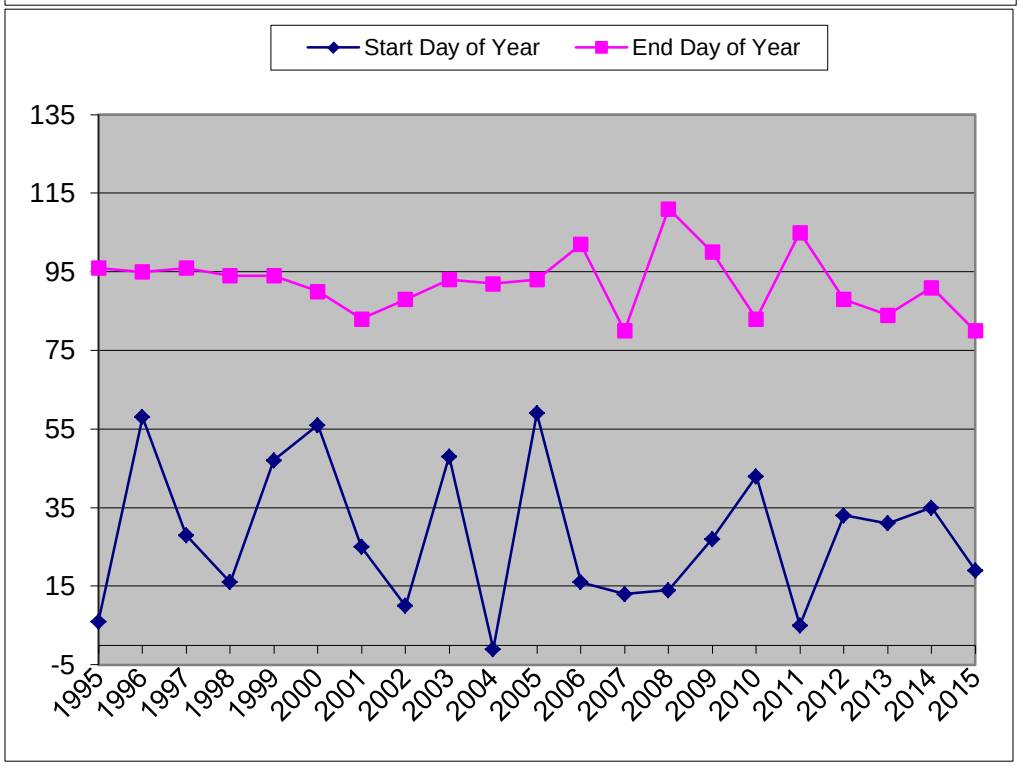
Refuge biologist Eric Cole and WGFD biologist Aly Courtemanch monitored snow and forage conditions on NER on 12/22/14, 1/6/15, and 1/12/15. Average available forage was 1,467 lbs. per acre at key index sites on 12/22/14, but by 1/12/15 average available forage had declined to 422 lbs. per acre at key index sites. Most of the decline in available forage was associated with forage consumption associated with high elk and bison numbers during the late fall and early winter period and to a lesser extent with dense snow associated with thawing/freezing conditions. Based on current criteria designed to prevent elk and bison from leaving the refuge for surrounding private land, Cole and Courtemanch predicted that available forage would soon decline below 300 lbs. per acre at key index sites, and Eric Cole recommended that supplemental feeding begin by January 16. Refuge manager Steve Kallin and WGFD manager Tim Fuchs decided to delay feeding initiation until January 19. Although 3 days later than the date recommended by biologists, the start date was still 4 days earlier than the 10-year average start date.

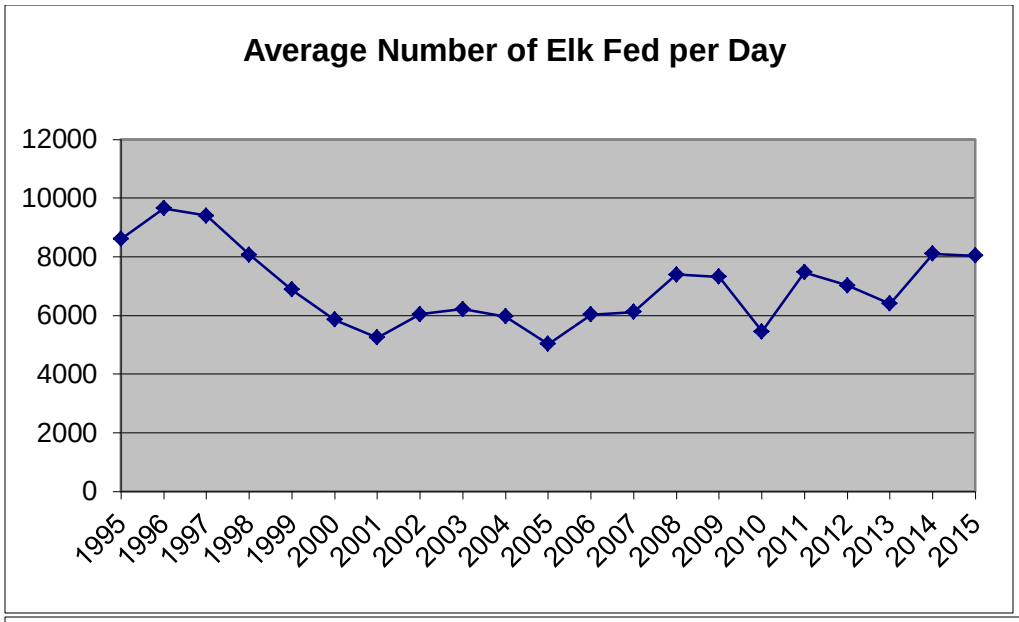
Operations:

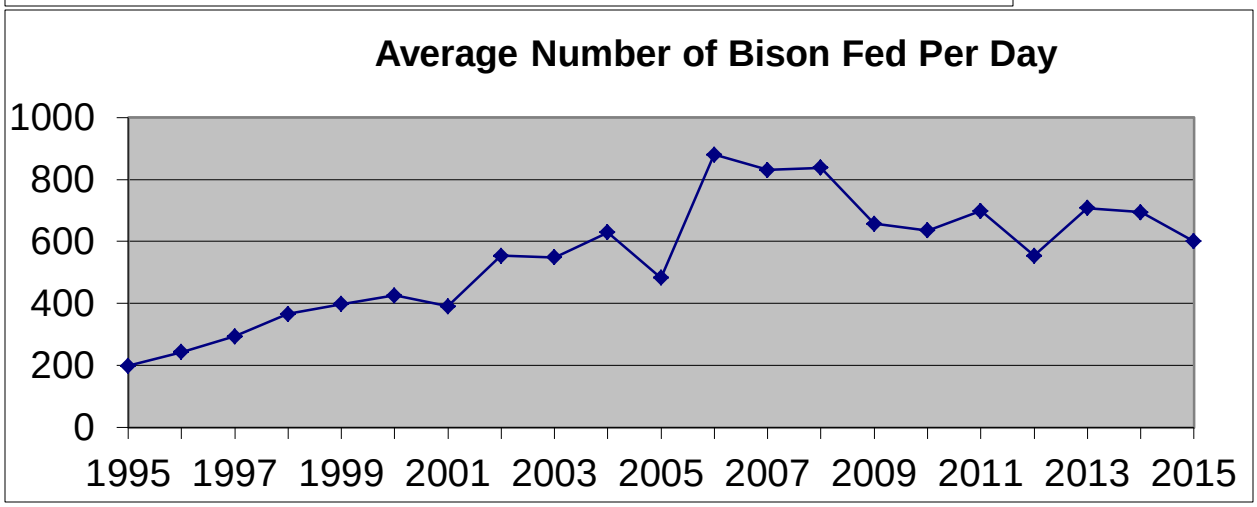
Although supplemental feeding began earlier than average, in general 2015 was an easy feeding year operationally due to unprecedented melting beginning in late January and snow free conditions in most feeding areas from mid-February until the end of the season. The last day of feeding for the year was March 21, 2 weeks earlier than average and tied for the earliest end date on record accounting for leap years. The net effect of an earlier than average start and end dates was a feed season that was 1 week shorter than the 10-year average. In general 8,035 average daily elk on feed was well above average,

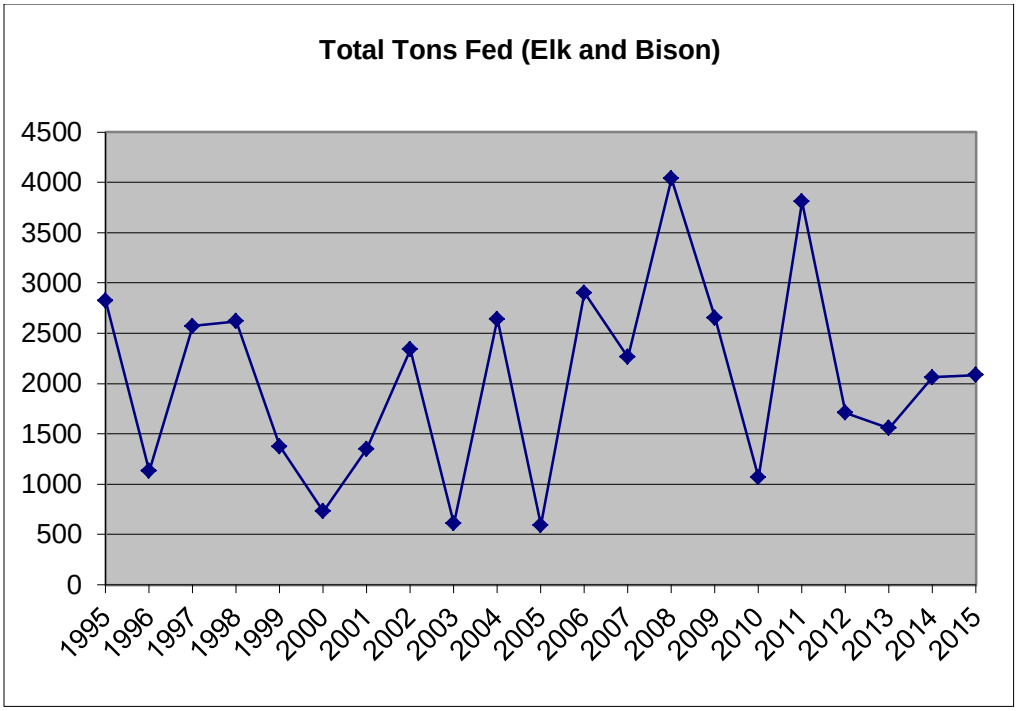
the 600 average daily bison on feed was below average, and the 2,086 tons fed was below the 10-year average. The following figures summarize 2015 feed season statistics relative to previous years:






Average Number of Elk Fed per Day
12000
10000
8000
6000
4000
2000
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015


Average Number of Bison Fed Per Day
1000
800
600
400
200
0
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015



Elk and Bison Feedground Distribution**:**

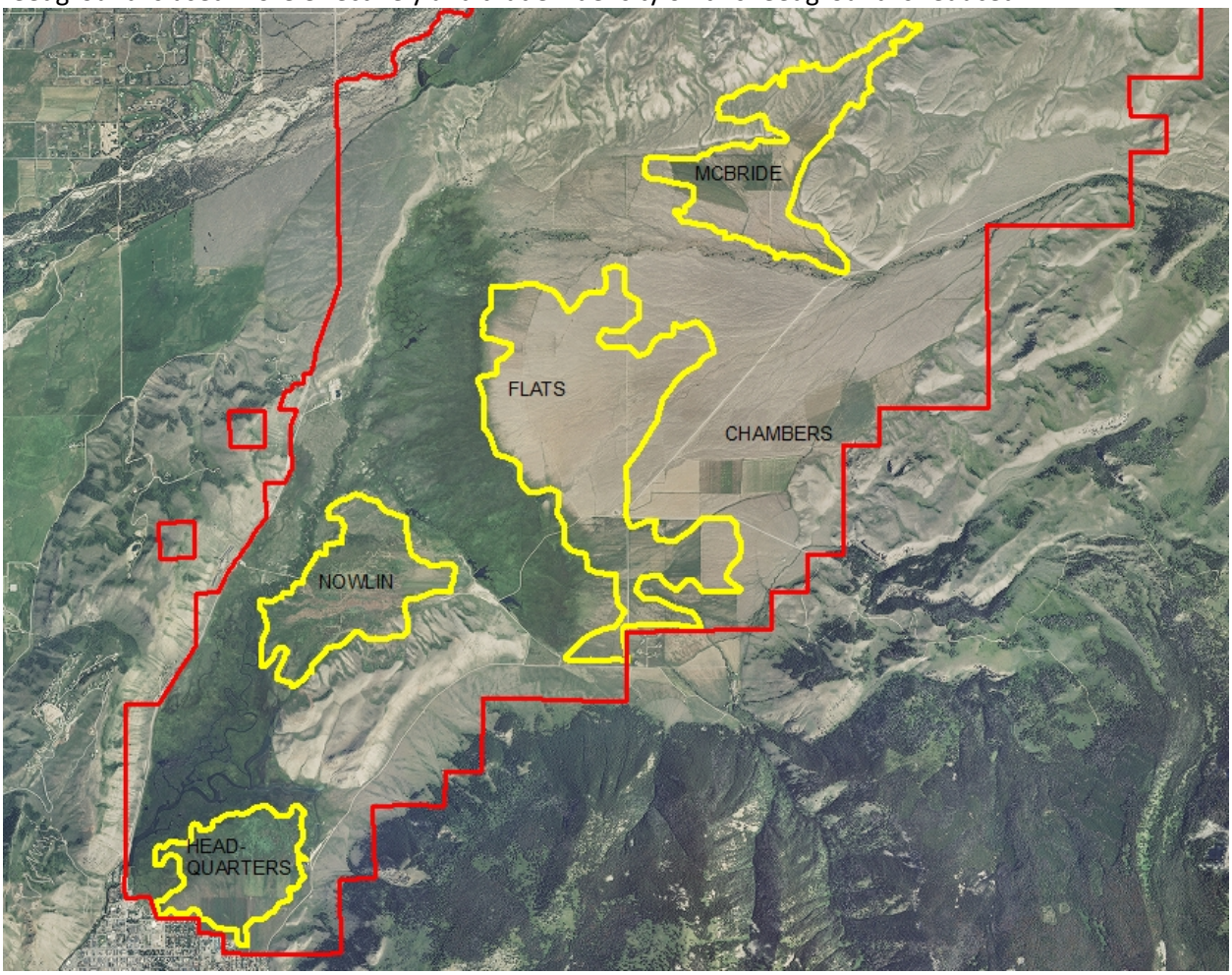
With peak numbers of around 8,400 the average number of elk on each feeding area was also high. Our objectives are to feed 500-1,000 elk at Headquarters and 1,000-1,500 elk at Nowlin because these feedgrounds have the smallest feedground area, and our goal is to minimize elk density at each feedground to reduce disease transmission. However, because of overall high elk numbers the average number of elk at Headquarters and Nowlin was higher than desired resulting in very high elk densities (Table 1). It will be difficult to reduce elk density on refuge feedgrounds until overall elk densities are reduced to the 5,000 objective or lower.

Table 1. Average number of elk, average number of bison, feedground area (acres) derived from feed equipment GPS, and estimated elk density on each feedground.

FEEDGROUND	Ave. # Elk on Feed per Day	Ave. # Bison on Feedground per day	2015 Feedground Area (Acres)	Elk Density on Feedground (per square mile)
Headquarters	1,171	0	389	1,926
Nowlin	1,768	0	536	2,111
Flats	4,105	0	1,437	1,828
McBride	991	600	652	973
COMBINED	8,035	600	3,044	1,698

We fed most bison on the McBride feedground each day according to plan, but as a consequence the Flats and Nowlin feeders often had to wait at least an hour for the McBride feed equipment to lure bison from the Chambers area to McBride before beginning their feeding operations each day. Approximately 1,200 acres of the Flats feedground in the Chambers management unit was not utilized due to the relatively short feed season, avoidance of agronomic fields during melting conditions to

prevent soil damage, and logistics associated with luring bison from Chambers to McBride each morning (Map 1). In future years we should develop strategies to ensure that the Chambers portion of the Flats feedground is used more effectively and that elk density on this feedground is reduced.



Map 1. National Elk Refuge feedgrounds. Refuge boundary shown in red and 2015 feedground area shown in yellow. Feedground area was mapped based daily GPS track log data from each feed rig.

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Planning Meeting" Update
Date: Wednesday, April 01, 2015 9:30:41 AM

View this poll on your dashboard

Hi Steve Kallin,

"Sarah Dewey" just provided information to the poll "BEMP Adaptive Management Planning Meeting."

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Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Planning Meeting" Update
Date: Wednesday, April 01, 2015 1:03:10 PM

View this poll on your dashboard

Hi Steve Kallin,

"Jeff" just provided information to the poll "BEMP Adaptive Management Planning Meeting."

Go to poll | Close poll

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Cole, Eric
To: Bryan Yetter; troffe@exchange.montana.edu; Aly Courtemanch; Amanda Soliday; Arnie Dood; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Cris Dippel; Daniel Huckel; Daniel Sharps; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan Patla; Terry Roper; Tim Fuchs; Tim Pratt; Tom Reed; Ture Schoultz
Subject: April 2, 2015 National Elk Refuge Biological Update
Date: Thursday, April 02, 2015 4:03:12 PM

April 2, 2015 National Elk Refuge Biological Update

2015 Supplemental Feeding Season

The last day of supplemental feeding for the season was March 21, 2015, This date was tied for the earliest feeding end date on record, and was associated with unusually warm temperatures beginning in mid January, melting associated with above average temperatures, and persistent snow-free conditions on the south end of NER since mid-February. Overall feed season length was 62 days, approximately 1 week shorter than the 10-year average. The average number of elk fed per day was 8,035, well above the 6,900 ten year average. Approximately 75% of the Jackson Elk Herd used NER feedgrounds in 2015, which was consistent with an increasing trend that has occurred since 2000. The cause of the increasing proportion of the Jackson Elk Herd using NER feedgrounds over time is unclear, but I will conduct some modeling to identify factors that might explain the distributional shift of elk over time. Possible factors include annual changes in snow accumulation, forage production, and wolf abundance from 2000 to 2015.

Elk Winter Mortality

To date we have documented 114 total winter elk mortalities on the Refuge (1.4% of the classified population. Of the 114 dead elk, 72 were calves (6.7% of the classified calf population). Although this has been described as a "mass die-off" by some members of the public, this is a serious misrepresentation of the facts. For perspective NER staff have documented winter elk mortality on the refuge using consistent methods since 1982, and from 1982-2014 average total winter elk mortality was 1.5% (SD 0.95), and average winter calf mortality was 3.4% (SD 3.9). Although we will continue to document elk mortality on NER through April, we do not anticipate a large increase above the numbers detected to date. Total mortality will likely be 1.5 to 2.0% (slightly above average), and calf mortality will likely be about 8% (higher than average but within the range of historic variability observed on NER). Both total and calf winter mortality rates on NER in 2015 are well below those reported on native winter range for elk. Higher than average calf mortality on NER in 2015 was largely due to systemic infection associated with foot rot, a bacterial infection linked to icy and muddy conditions, manure contamination, and dense elk congregations. 38% of the calf mortalities documented to date showed evidence of foot rot.

Current Elk and Bison Numbers on the Refuge

Since the cessation of supplemental feeding on 3/21/15, the number of elk and bison counted on southern NER has declined. The number of elk observed south of the Gros Ventre Hills was 7,063 on 3/31/15 and 4,860 on 3/31/15. The number of bison was 523 on 3/26 and 213 on 3/31. I anticipate that elk and bison numbers on southern NER will continue to decline as melting and green up continues north of the refuge and animals move north to take advantage

of additional forage in these areas.

Happy Spring,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

From: Will Meeks
To: Mike Blenden
Subject: NER
Date: Friday, April 03, 2015 6:04:08 AM

We need to finalize the agenda for that scheduled meet. Thanks.

Will Meeks
U.S. Fish and Wildlife Service
Mountain Prairie Region
Assistant Regional Director
National Wildlife Refuge System and
Partners for Fish and Wildlife Program
303-236-4303 (w)
720-541-0310 (c)

From: Will Meeks
To: Mike Blenden
Subject: NER
Date: Friday, April 03, 2015 6:04:08 AM

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Will Meeks
U.S. Fish and Wildlife Service
Mountain Prairie Region
Assistant Regional Director
National Wildlife Refuge System and
Partners for Fish and Wildlife Program
303-236-4303 (w)
720-541-0310 (c)

From: Blenden, Mike
To: Will Meeks
Subject: Re: NER
Date: Friday, April 03, 2015 1:46:03 PM

Kallin is coordinating with park superintendent on this. We hope they will review next week and give us comments so we can finalize the week of April 13.

On Fri, Apr 3, 2015 at 6:04 AM, Will Meeks <will_meeks@fws.gov> wrote:

> We need to finalize the agenda for that scheduled meet. Thanks.
>
> Will Meeks
> U.S. Fish and Wildlife Service
> Mountain Prairie Region
> Assistant Regional Director
> National Wildlife Refuge System and
> Partners for Fish and Wildlife Program
> 303-236-4303 (w)
> 720-541-0310 (c)

--

Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

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John F. Kennedy

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To: Will Meeks
Subject: Re: NER
Date: Friday, April 03, 2015 1:46:03 PM

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> 720-541-0310 (c)

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From: Jeffrey Warren
To: Eric Cole; Steve Kallin; Cris Dippel; Steve Cain
Subject: Invasives
Date: Wednesday, April 08, 2015 10:08:57 AM
Attachments: AMP_figures.pptx

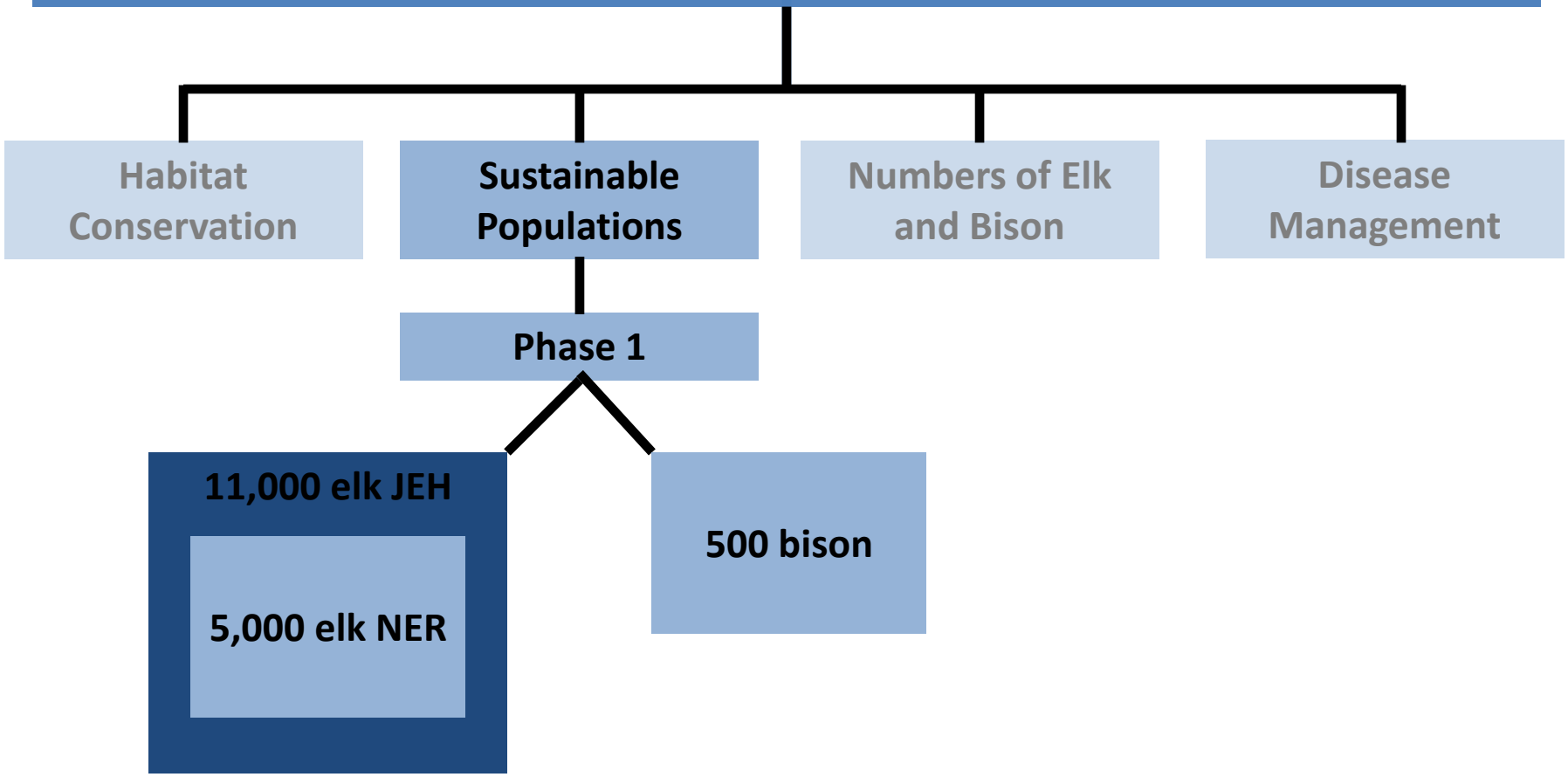
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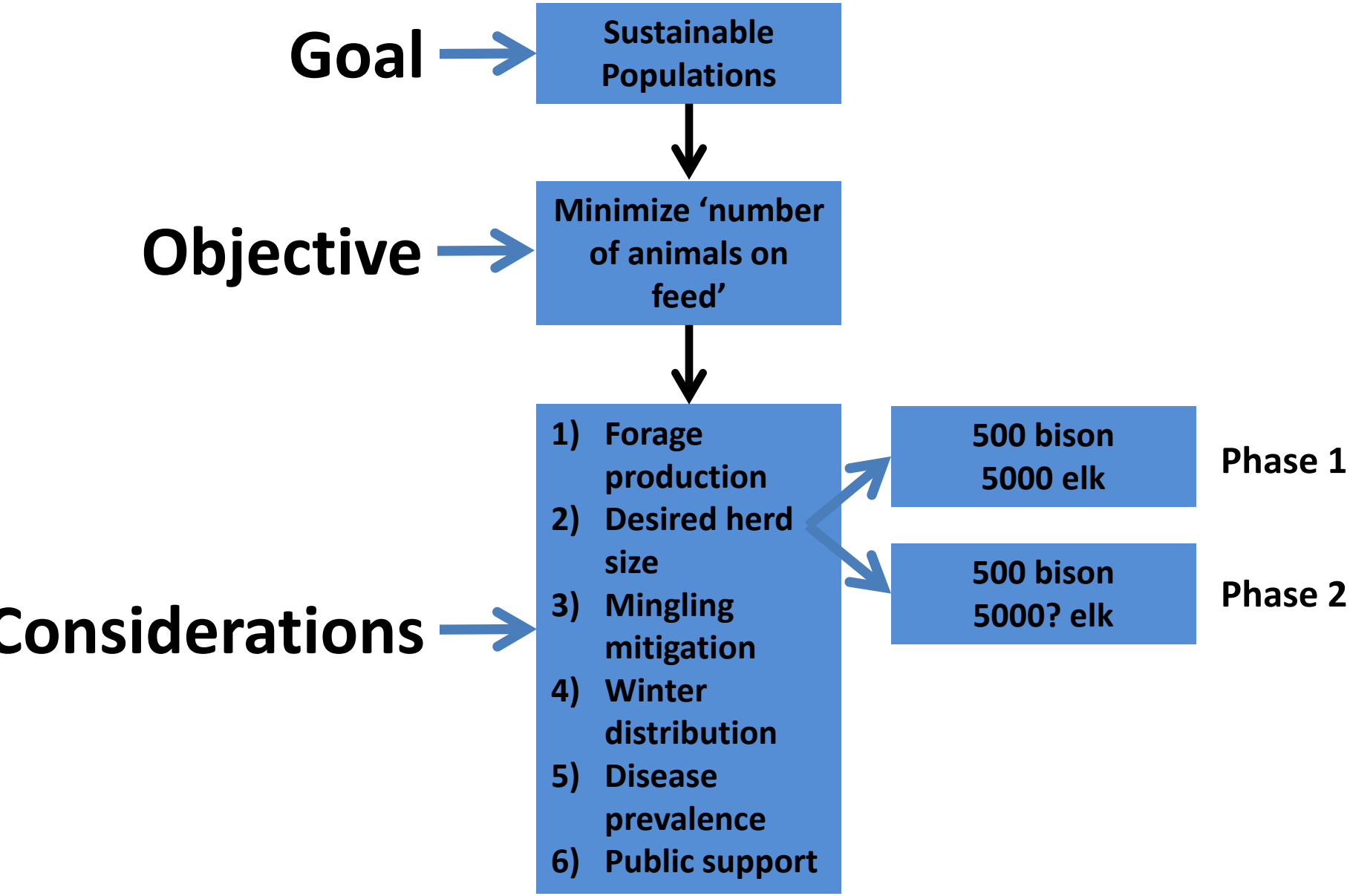
Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

‘Manage bison and elk in a manner that contributes to the state’s herd objectives yet allows for the biotic integrity and environmental health of the resources to be sustained (BEMP Desired Conditions).’



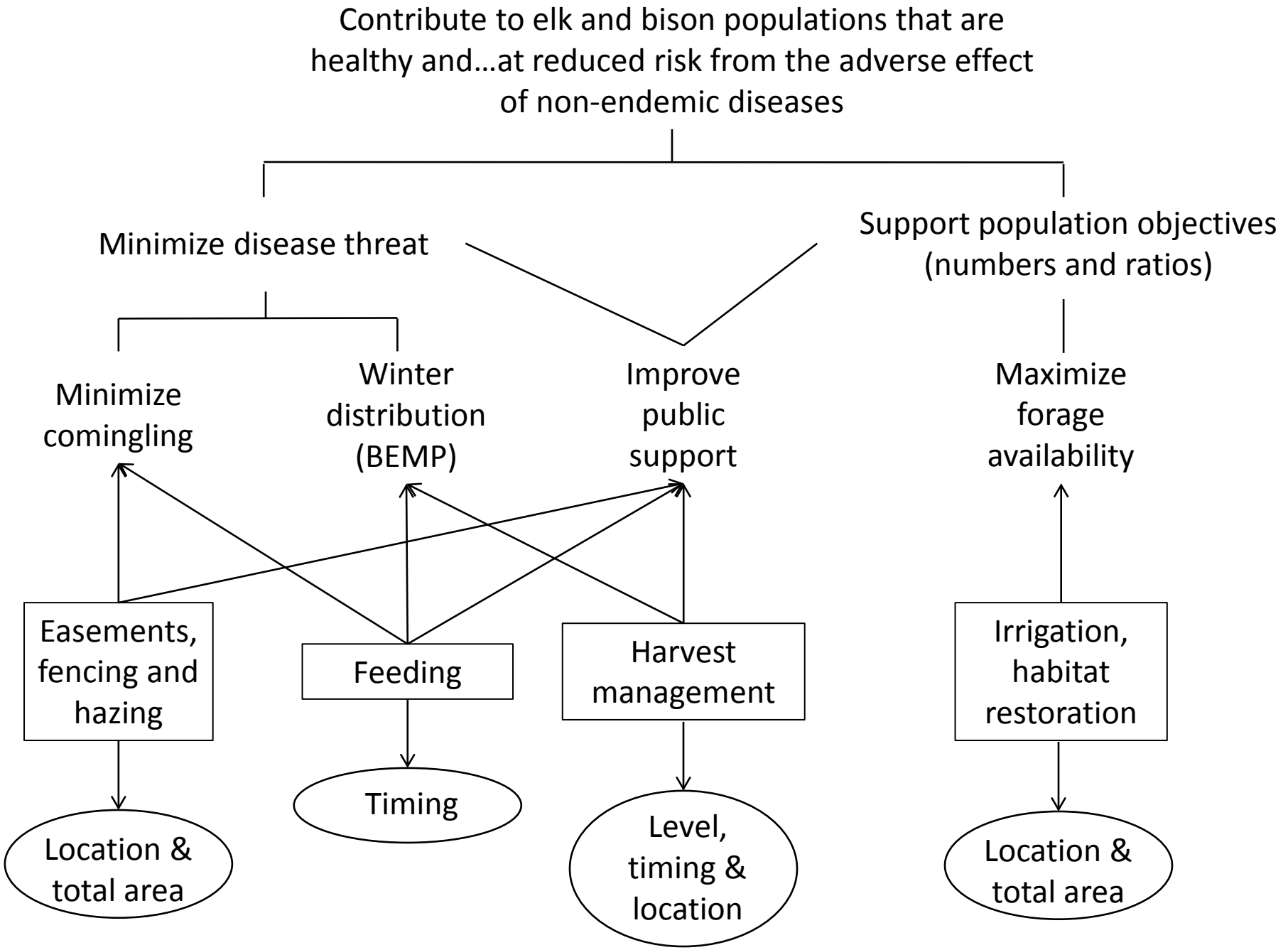

Goal
Sustainable Populations
Objective
Minimize 'number of animals on feed'
Considerations
1) Forage production
2) Desired herd size
3) Mingling mitigation
4) Winter distribution
5) Disease prevalence
6) Public support
500 bison
5000 elk
Phase 1
500 bison
5000? elk
Phase 2

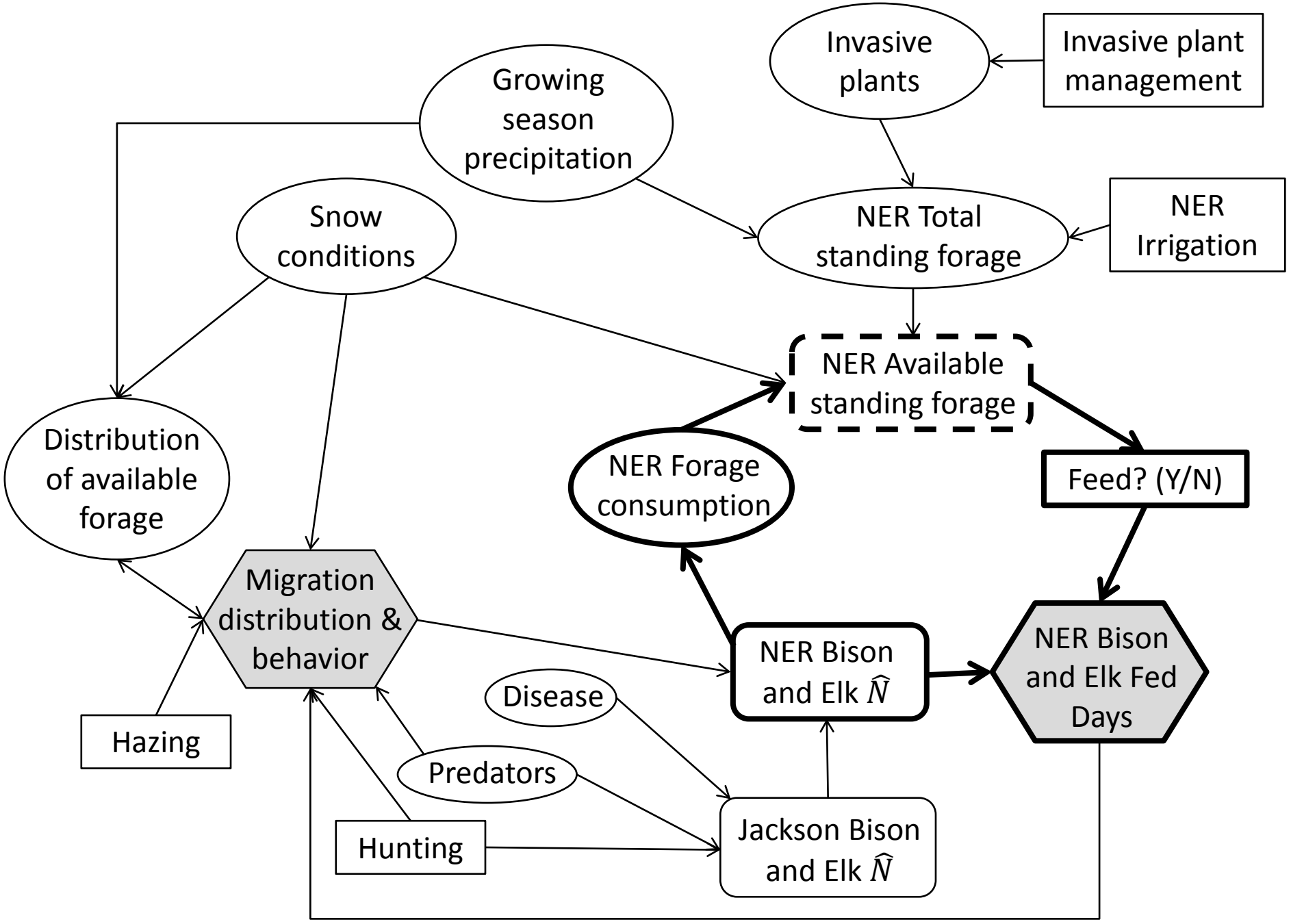
Triggers

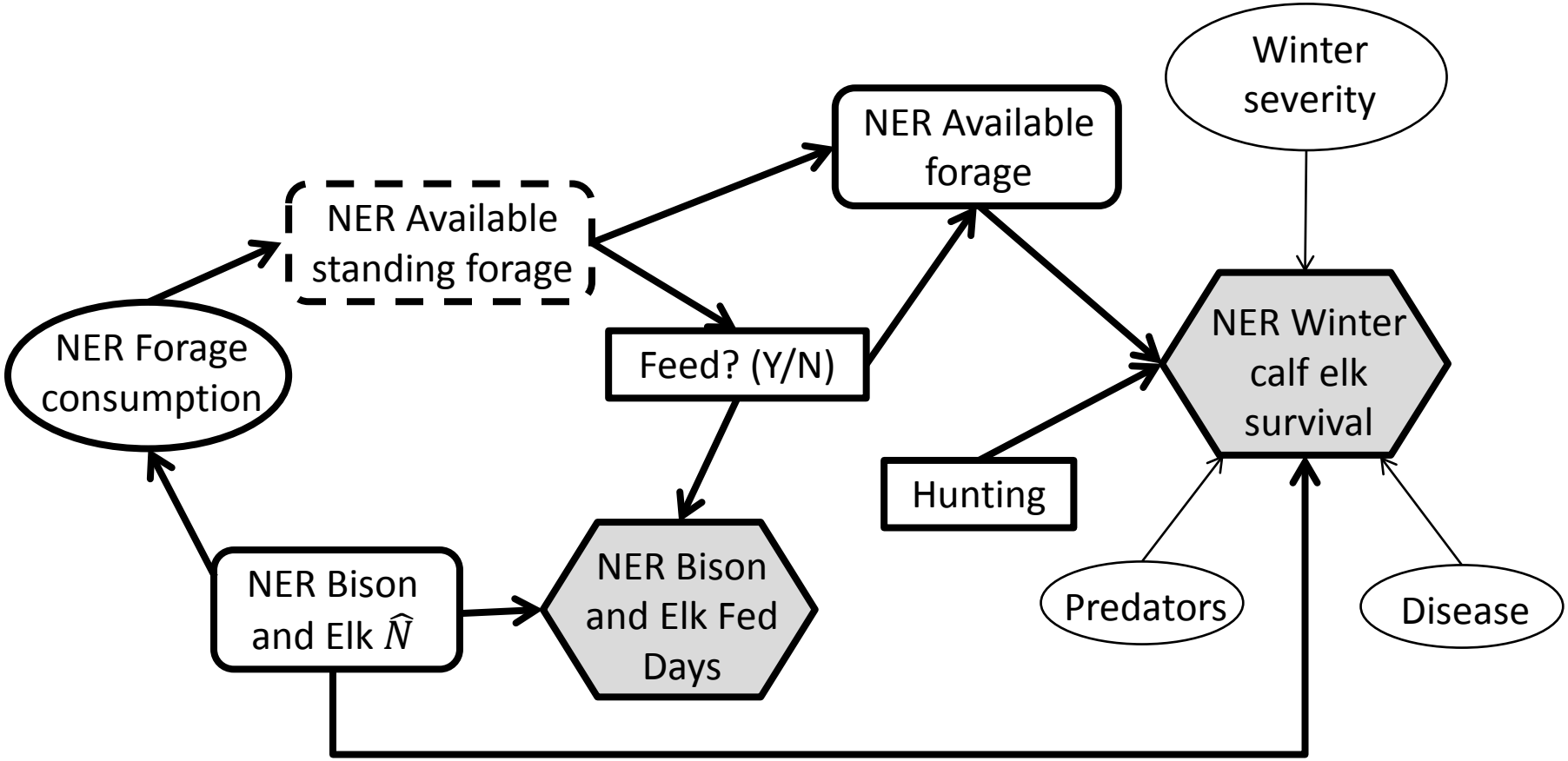
BEMP production objectives*

Considerations

1) **Forage production**
2) **Desired herd size**
3) **Mingling mitigation**
4) **Winter distribution**
5) **Disease prevalence**
6) **Public support**


Contribute to elk and bison populations that are healthy and…at reduced risk from the adverse effect of non-endemic diseases
Minimize disease threat
Support population objectives (numbers and ratios)
Minimize comingling
Winter distribution (BEMP)
Improve public support
Maximize forage availability
Easements, fencing and hazing
Feeding
Harvest management
Irrigation, habitat restoration
Location & total area
Timing
Level, timing & location
Location & total area


Invasive plants
Invasive plant management
Growing season precipitation
Snow conditions
NER Total standing forage
NER Irrigation
NER Available standing forage
Distribution of available forage
NER Forage consumption
Feed? (Y/N)
Migration distribution & behavior
NER Bison and Elk $\widehat{N}$
NER Bison and Elk Fed Days
Disease
Hazing
Predators
Hunting
Jackson Bison and Elk $\widehat{N}$


Winter severity
NER Available forage
NER Available standing forage
NER Forage consumption
Feed? (Y/N)
NER Winter calf elk survival
Hunting
NER Bison and Elk $\widehat{N}$
NER Bison and Elk Fed Days
Predators
Disease

From: Will Meeks
To: Keenan Adams; Steve Kallin; Mike Blenden; Toni Griffin
Cc: Jeffrey Warren
Subject: RE: NPS/FWS NER Briefing
Date: Thursday, April 09, 2015 11:42:50 AM

Thanks Keenan. The only thing I'll add is if the previous agenda (not lead ammo/bear spray – that's an internal NWR discussion that's yet to be finalized) had a high profile thing that Steve wants on the agenda, we can add it. As we prepare the final agenda, let's take a moment to consider if we've missed anything. Thanks.

Will Meeks
U.S. Fish and Wildlife Service, Region 6
ARD-NWRS and PFW
303-236-4303 (w)
720-541-0310 (c)

From: Adams, Keenan [mailto:keenan_adams@fws.gov]
Sent: Thursday, April 09, 2015 11:15 AM
To: Steve Kallin; Mike Blenden; Toni Griffin
Cc: Jeffrey Warren; Will Meeks
Subject: NPS/FWS NER Briefing

All,

We received more direction for Noreen and Will's joint briefing with the NPS. The "Day light" is in reference to the Adaptive Management Plan and the NPS litigation. **Not** about lead ammunition and bear spray.

I talked with Jeff (Steve, please feel free to chime in) regarding the Adaptive Mgmt Plan and the key points are:

-The team set aside last two weeks of April to finalize the models and provide a "rough draft." The team consist of 2 State, 2 FS, 2 NPS, and NWRS Staff.
-The core team will meet in late May early June to finalize the draft.
-Draft will then go to the RO for an internal review (*need to decide how we allow respecting partners can internally comment)
-There is general consensus among the core group. As of now, all entities are "on-board." The NPS and NWR has been mostly "hand-in-hand."
-The NPS's lead biologist retired in February and he was contracted by the NWR to assist with the plan development.
-The NPS has mentioned the current grizzly bear litigation in the discussions, but the issue has not been elevated or has redirected any of the management plan.
-The elk culling inside the Park is important for the NWR to meet the objective
-The Spring-gulch subdivision (State of WY jurisdiction) has a high population that will impact the NWR to meet the objective

Steve,

Do you have any further information about the NPS litigation and the potential impacts for

how the NPS views this management plan?

Regards,

--
Keenan Adams
Chief, Division of Biological Resources
National Wildlife Refuge System
Mountain-Prairie Region
Lakewood, CO
303-236-8102 (Office)

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To: Keenan Adams
Subject: RE: NER Brief
Date: Thursday, April 09, 2015 11:45:35 AM

Not following

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U.S. Fish and Wildlife Service, Region 6
ARD-NWRS and PFW
303-236-4303 (w)
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From: Adams, Keenan [mailto:keenan_adams@fws.gov]
Sent: Thursday, April 09, 2015 10:06 AM
To: Will Meeks
Subject: NER Brief

Given our conversation, is it appropriate to brief Noreen about the NER CCP following her meeting with NPS in May? Steve will be in town and we can kill two birds with one stone.

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From:	Cole, Eric
To:	Jeffrey Warren
Cc:	Steve Kallin; Cris Dippel; Steve Cain
Subject:	Re: Invasives
Date:	Thursday, April 09, 2015 11:55:38 AM

Hi Jeff,

Adding invasive species to slide 5 makes sense. I also recommend adding "timing" to the Location and total area" oval that influences the Irrigation, habitat restoration rectangle in slide 4. For example early to mid season irrigation tends to increase forage production, but late season irrigation results in green up, which increases forage quality.

Thanks,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

On Wed, Apr 8, 2015 at 10:08 AM, Jeffrey Warren <jeffrey_warren@fws.gov> wrote:

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Date: Thursday, April 09, 2015 12:05:27 PM

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Sent: Thursday, April 09, 2015 12:03 PM
To: Will Meeks
Subject: Re: NER Brief

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From: Steve Cain
To: Jeffrey Warren; Steve Kallin
Cc: Eric Cole
Subject: Re: Next steps for models
Date: Friday, April 10, 2015 7:51:48 AM

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I need more time to think through modeling calf survival, but am still leaning toward the approach we've outlined in the current draft of the plan (i.e., a non-linear saturating function that has maximum survival at high levels of 'available forage' with a shoulder representing the point where survival begins a fast decline with declining available forage). To do this we would have to estimate 'available forage' as the sum of available standing forage and supplemental feed on a per capita basis. You already have estimates of available standing forage we can use – can you pull together the amount of feed provided on an annual basis and calf survival? That would allow us to explore the relationship between the per capita ration (total feed/EFD for each year) and calf survival. A simple graph with survival on the y axis and per capita ration on the x axis would be very helpful.

Second, finalizing the conceptual models and drafting a narrative.

I've attached the figures we drafted this week with a few changes on the calf survival figure that Tim proposed. Take a look and make changes as necessary. I'd also recommend getting a few volunteers (what's that? Oh, great, Cris just volunteered) to sit down and have you describe the figure to them (like we did with Steve). It will make it clearer in your mind and likely help us identify missing factors/relationships. Check in with Tim, too, and get his thoughts on the components of calf survival he recommended adding. That will also help you begin a draft narrative for the figures (you can add to the existing text on the influence diagrams in the draft plan I've attached).

I think we'll need to have the above completed and summarized by April 20th so we can turn our focus to the calf survival model and completing the draft in order for us to have a draft for group review by May 1st. As you work through this and run into issues give me a call or send me an email and I'll try to respond as quickly as possible (my work cell is 406.548.8487).

Here is a link to the book I mentioned you should consider purchasing - http://www.wiley.com/WileyCDA/WileyTitle/productCd-0470671742.html ; while you're getting Steve to buy you books, I consider this one a must have - http://press.princeton.edu/titles/5987.html

Cheers,

Jeff Warren

406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

From: Steve Cain
To: Jeffrey Warren; Cole, Eric
Subject: bison and elk range map
Date: Friday, April 10, 2015 8:02:49 AM

Hey guys,

Two questions: 1) was the elk range map in Jeff's draft material created in Arc GIS? and 2) Does the NER have Arc GIS on a computer that I could use sometime? If the answer to both is yes and I could get the original project file, I could come to the NER sometime and add the bison range and finish this graphic for us. Alternatively, one of you could add the bison range shapefile that Sarah provided to the existing map. Let me know how you'd like to proceed.

Thanks.....Steve

From: Steve Cain
To: Jeffrey Warren; Cole, Eric
Subject: bison and elk range map
Date: Friday, April 10, 2015 8:02:49 AM

Hey guys,

Two questions: 1) was the elk range map in Jeff's draft material created in Arc GIS? and 2) Does the NER have Arc GIS on a computer that I could use sometime? If the answer to both is yes and I could get the original project file, I could come to the NER sometime and add the bison range and finish this graphic for us. Alternatively, one of you could add the bison range shapefile that Sarah provided to the existing map. Let me know how you'd like to proceed.

Thanks.....Steve

From:	Jeffrey Warren
To:	Eric Cole
Cc:	Steve Kallin; Cris Dippel; Steve Cain
Subject:	RE: Invasives
Date:	Sunday, April 12, 2015 7:25:21 AM

Sounds good – if you want to update the current file to include timing in the figure and then send me a new copy that would be great.

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

From: Cole, Eric [mailto:eric_cole@fws.gov]
Sent: Thursday, April 09, 2015 11:56 AM
To: Jeffrey Warren
Cc: Steve Kallin; Cris Dippel; Steve Cain
Subject: Re: Invasives

Hi Jeff,

Adding invasive species to slide 5 makes sense. I also recommend adding "timing" to the Location and total area" oval that influences the Irrigation, habitat restoration rectangle in slide 4. For example early to mid season irrigation tends to increase forage production, but late season irrigation results in green up, which increases forage quality.

Thanks,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

On Wed, Apr 8, 2015 at 10:08 AM, Jeffrey Warren <jeffrey_warren@fws.gov> wrote:
I added invasive plants and invasive plant management to the conceptual ecological model/influence diagram we put together a few weeks ago (slide 5 on the attached).

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy."
Richard Feynman

“A great many people think they are thinking when they are merely rearranging their prejudices.” William James

From: Steve Kallin
To: Jeffrey Warren
Cc: Cris Dippel; Eric Cole
Subject: FW: damage payments wildlife Wyoming
Date: Wednesday, April 15, 2015 11:33:15 AM
Attachments: FinalDCFY13.pdf

Jeff:

Attached is a bit of information concerning the WGFD process of paying for wildlife damage and their tally of conflicts. You were interested in having a "wildlife conflicts" database developed prior to the implementation of the AMP. The attached provides a bit of info about what they are already doing.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Huijser, Marcel [mailto:mhuijser@coe.montana.edu]
Sent: Monday, March 16, 2015 1:17 PM
To: Steve Kallin
Subject: damage payments wildlife Wyoming

From: Doug Brimeyer [mailto:doug.brimeyer@wyo.gov]
Sent: Friday, March 13, 2015 9:23 AM
To: Huijser, Marcel
Subject: Re: question for report National Elk Refuge

Marcel
The figures I mentioned earlier were for the entire state. I am attaching the latest damage claim summary for your review. The document breaks down the costs by species and region in the state. It may be useful to pull out the figures for damage in the Jackson Region. Please take a look at the attachment and let me know if you have any other questions.

On Thu, Mar 12, 2015 at 4:57 PM, Huijser, Marcel <mhuijser@coe.montana.edu> wrote:

> Hello Doug,
>
> The National Elk Refuge is almost done reviewing the report on the highway and the refuge. I interviewed you last summer for this report.
> A quick question: the $700,000 mentioned below for the entire state of Wyoming, correct? Not just for Jackson Hole area, correct?

> “Even with the ongoing hazing and supplementary feeding programs in the area, Wyoming Game & Fish Department spends about $700,000 per year to compensate private landowners for crop damage (Pers. Comm. Doug Brimeyer , Wyoming Game & Fish Department).”
>
> Note: I hope that NER will allow me to send the draft report to you and other interviewees sometime in April for final check/corrections.
>
> Thanks again for your help, Marcel

--
Doug Brimeyer
Jackson/Pinedale Wildlife Management Coordinator
Wyoming Game and Fish Department
doug.brimeyer@wyo.gov
307-733-2321 ext. 230

E-Mail to and from me, in connection with the transaction
of public business, is subject to the Wyoming Public Records
Act and may be disclosed to third parties.

Wyoming Game and Fish Department



WILDLIFE DAMAGE CLAIM REPORT

FISCAL YEAR 2013 WITH 10-YEAR SUMMARY

WILDLIFE DIVISION

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PREFACE

Common law in America, which has been continually reinforced in the United States courts, holds that the people of the state own the wildlife. No individual holds absolute property right to wildlife regardless of the status of the land on which the animal is found. Since wildlife belongs to everyone, the courts contend that everyone must share in its keep. As a result, courts have ruled the states are immune from liability for damage caused by wild animals, unless the state assumes that responsibility. Wyoming has assumed limited liability through legislation for some species of wildlife and under specific circumstances(see W.S. § 23-1-901 on page 38).

Wyoming Statute W.S. § 23-2-101(e) was passed by the legislature in an effort to provide a funding source for the payment of big or trophy game animal and game bird damage claims. That source of money is generated from a nonresident application fee of $14 and a resident application fee of $5 for any limited quota big or trophy game license issued through a drawing or for a wild bison license. The statute provides for 25% of the fees collected from license applications to be set aside to establish and maintain a fund of $500,000 to compensate landowners or lessees for property damaged by big or trophy game animals and game birds.

Wildlife damage management is a major component of the Wyoming Game and Fish Department's (WGFD) Wildlife Management Program. Considerable efforts are made to prevent damage including hazing, use of zon guns, providing materials for stackyard fences, relocating trophy game animals, increasing harvest, depredation seasons and, as a last resort, "kill" permits.

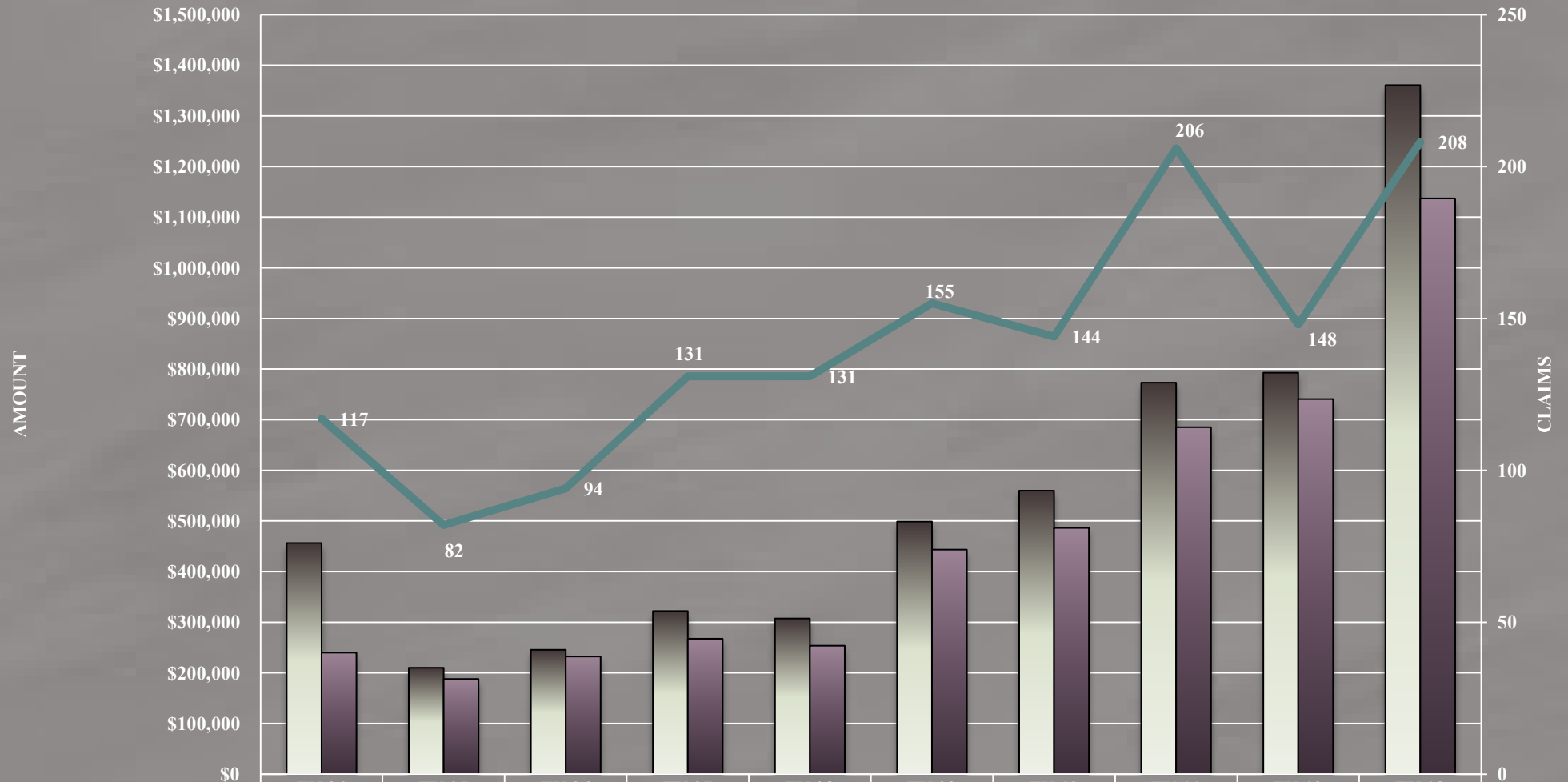
A landowner may submit a verified claim requesting compensation for damage. Claimants must meet all statutory and regulatory requirements in notifying WGFD personnel and filing the claim. WGFD personnel investigate the claim and verify the claimed damage using guidelines established by the WGFD in *The Handbook of Wildlife Depredation Techniques*. Claimants who do not wish to accept the WGFD's offer of payment may appeal the claim to the Wyoming Game and Fish Commission. If the claimant wishes to appeal the decision of the Commission, the claim may be appealed to an arbitration board and proceed on to District Court (see the Damage Claim procedure flow chart on pages 46).

Figures in this summary represent information obtained from verified claims of damage occurring in the depicted fiscal years. These figures will vary from information in the WGFD's Annual Report because program and personnel costs are combined in the Annual Report and payments of claims in the Annual Report only reflect actual payments made in that fiscal year. The Wildlife Damage Claim Summary is an effort to reflect the damage claim amounts and the amounts paid on claims which includes both claim amounts and amounts paid as if they occurred in the same fiscal year.

10-YEAR SUMMARY OF DAMAGE CLAIM ACTIONS

FISCAL YEAR	# OF CLAIMS	% OF CLAIMS PAID	% PAID IN FULL	% PAID PARTIALLY	% DENIED 15 DAY NOTICE	% DENIED 60 DAY FILING	% DISALLOWED (for other reasons covered by statute)	% APPEALED TO COMMISSION	% APPEALED TO ARBITRATION
04	117	95%	77%	18%	1%	3%	1%	5%	1%
05	82	100%	74%	26%	0%	0%	0%	2%	0%
06	94	97%	80%	17%	1%	1%	1%	1%	0%
07	131	97%	75%	22%	0%	2%	2%	1%	1%
08	131	95%	81%	13%	0%	4%	1%	1%	0%
09	155	97%	75%	22%	1%	2%	<1%	1%	1%
10	144	100%	82%	18%	0%	0%	0%	3%	1%
11	206	99%	84%	15%	<1%	0%	0%	1%	<1%
12	148	98%	82%	16%	0%	1%	1%	<1%	0%
13	208	99%	78%	20%	0%	0%	<2%	<1%	0%

10-YEAR DAMAGE CLAIM PAYMENT SUMMARY

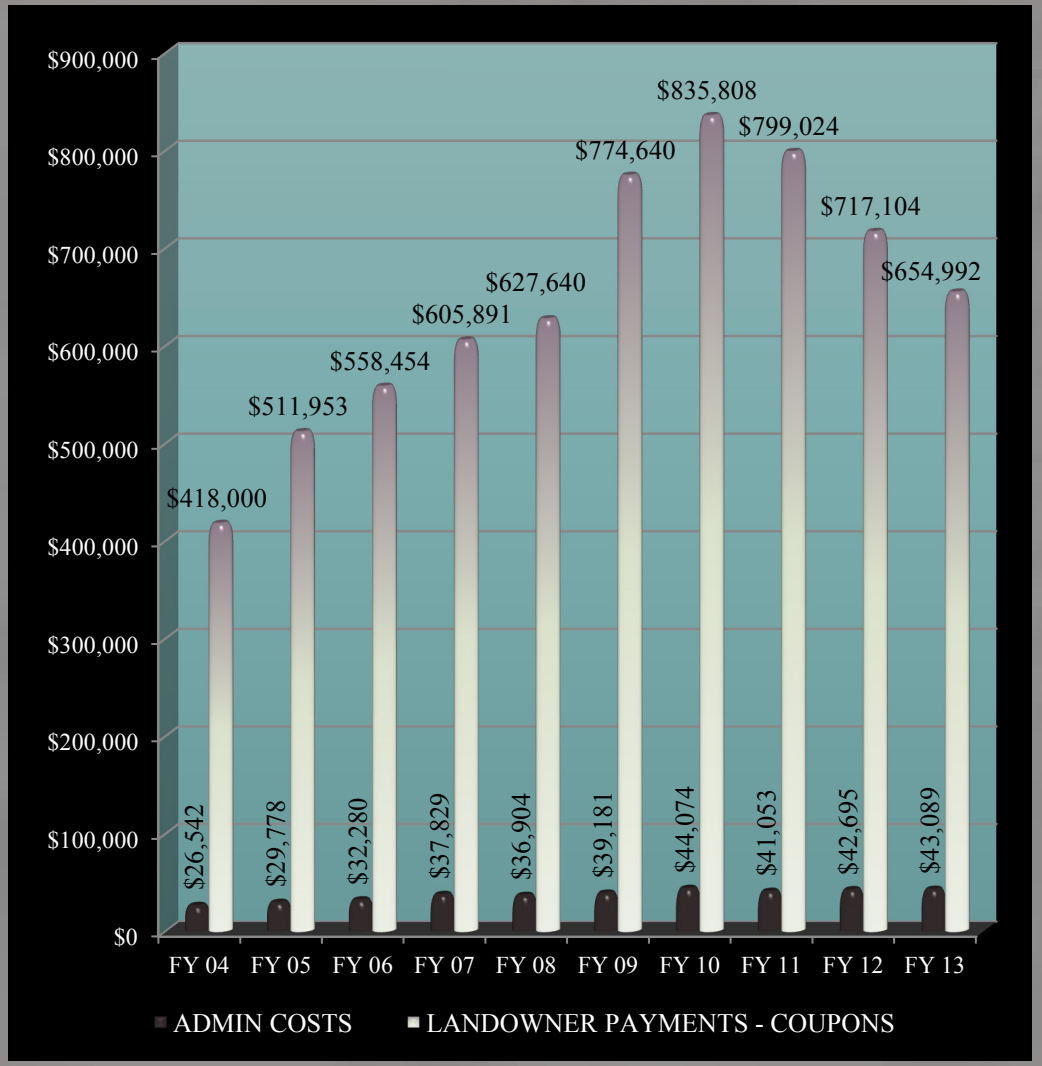


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMOUNT CLAIMED	456,406	210,189	245,653	322,153	307,504	498,914	559,876	773,154	792,950	1,360,735
AMOUNT PAID **	240,055	188,087	232,460	267,525	253,734	443,450	486,306	685,143	740,712	1,137,085
#CLAIMS	117	82	94	131	131	155	144	206	148	208

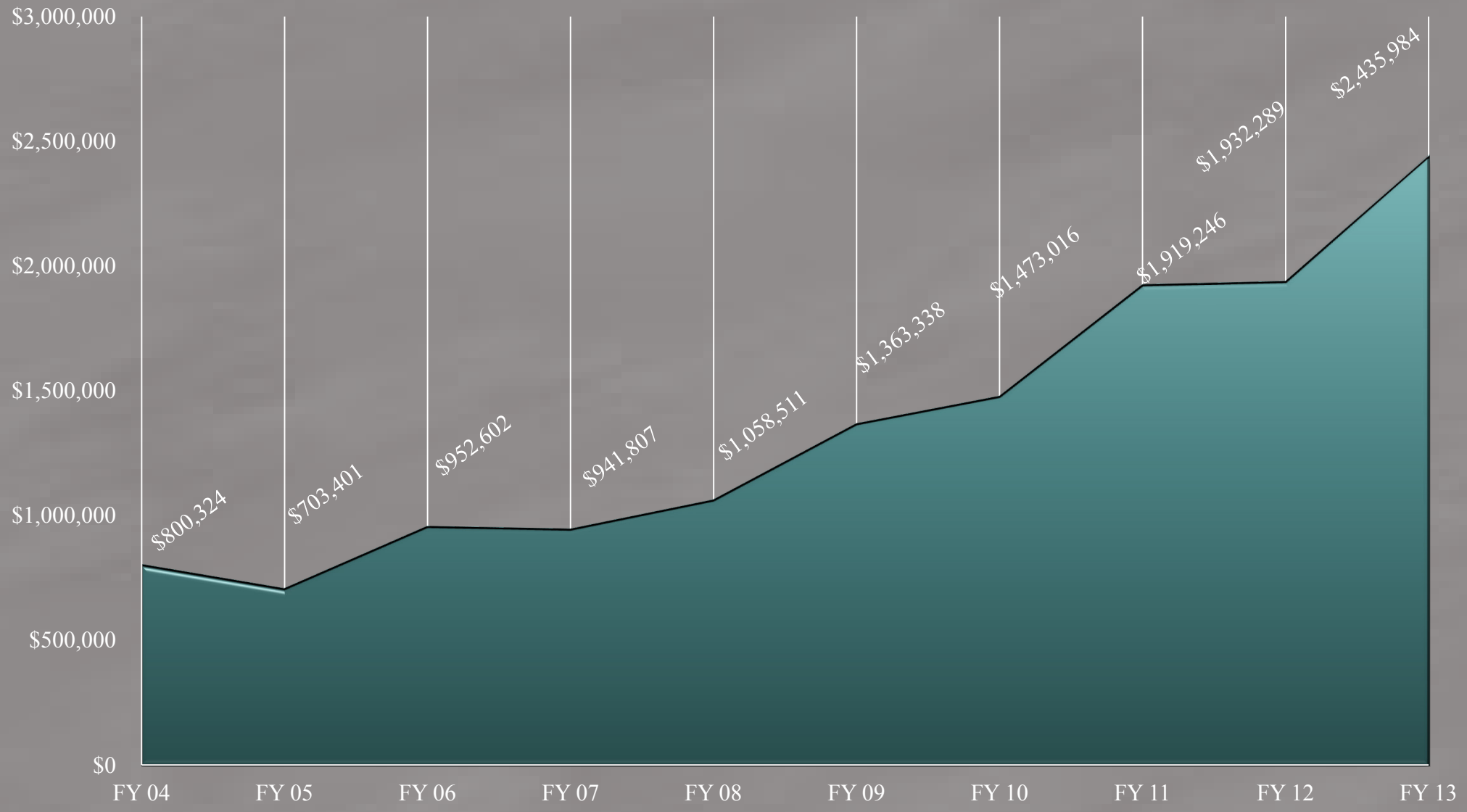
** Amount paid reflects the total dollar amount paid for claims filed in each fiscal year. In some cases, actual payment was made in FY 13 for claims filed in the previous fiscal year. For this reason, these figures may differ with figures in the Department's Annual Report.

10-YEAR SUMMARY OF PREVENTION, HANDLING AND ADMINISTRATION COSTS

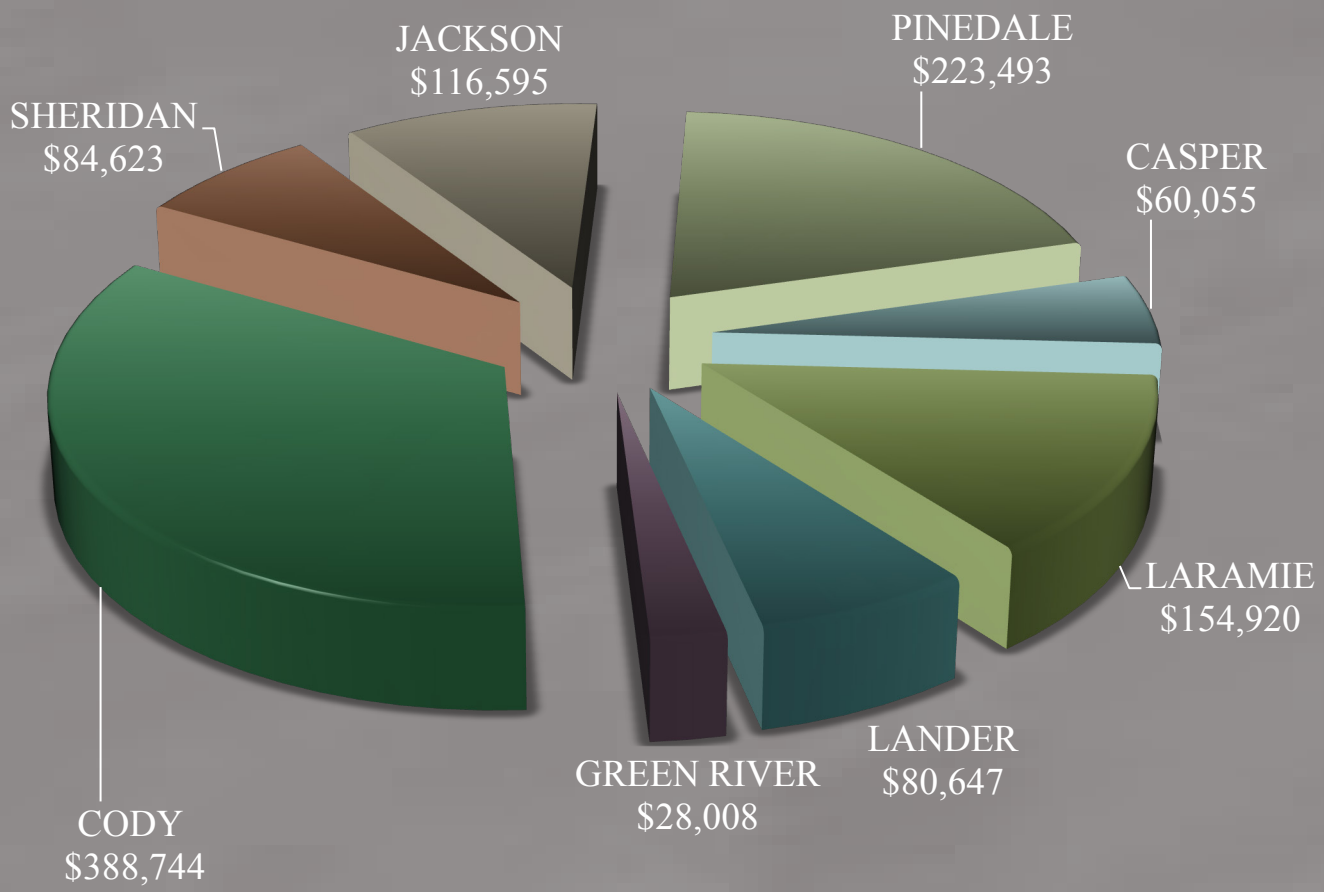




10-YEAR SUMMARY TOTAL DAMAGE PROGRAM COSTS



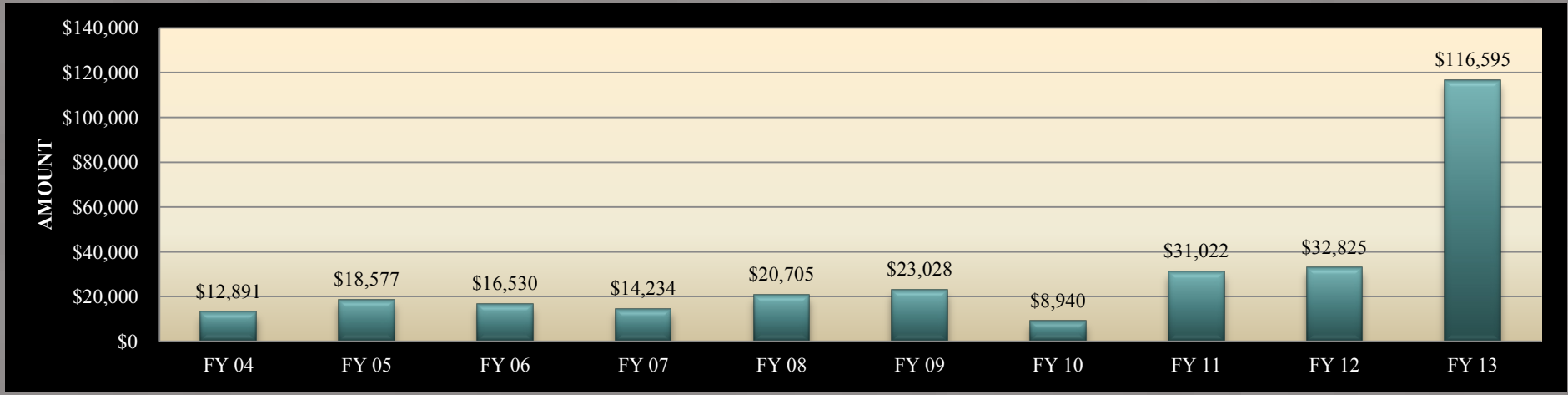
FY 13 AMOUNT, PERCENTAGE AND NUMBER OF CLAIMS PAID BY REGION

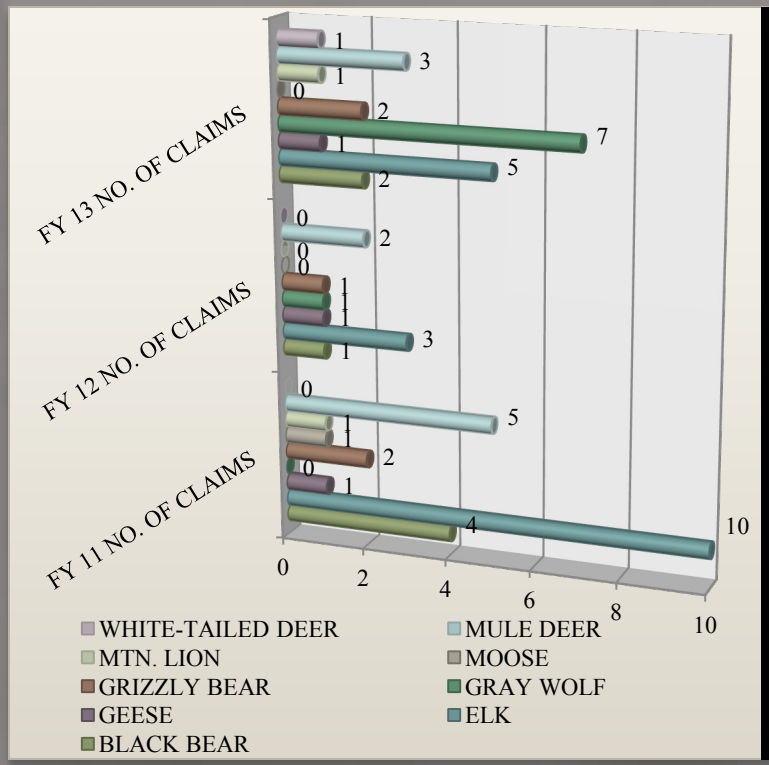


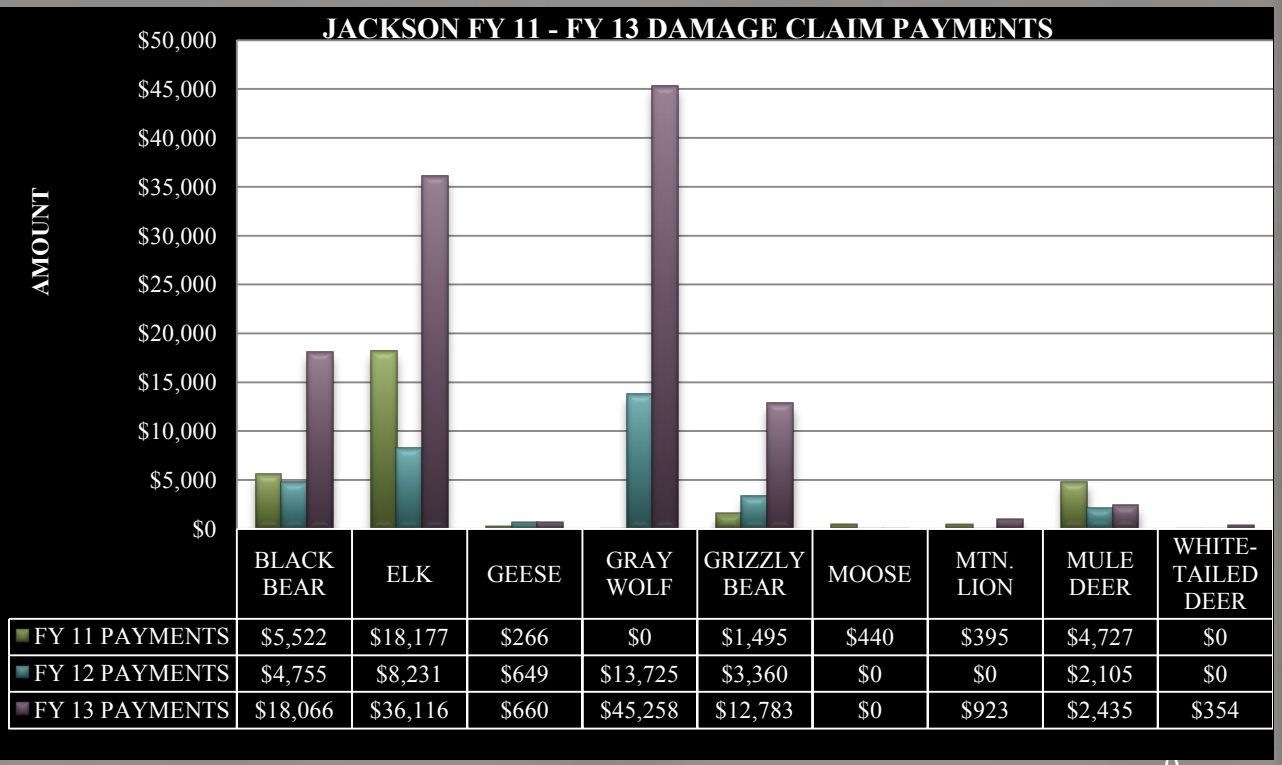
REGION	AMOUNT PAID	PERCENTAGE	NUMBER OF CLAIMS
JACKSON	$116,595	10%	14
CODY	$388,744	34%	76
SHERIDAN	$84,623	7%	21
GREEN RIVER	$28,008*	3%	13
LARAMIE	$154,920	14%	24
LANDER	$80,647	7%	12
CASPER	$60,055	5%	21
PINEDALE	$223,493	20%	27
TOTAL FY 13 DAMAGE AMOUNT PAID	**$1,137,085**		**208**

* This amount paid figure includes a Department approved payment for $765.00 that, as of this report date, is pending action from the claimant.

JACKSON REGION

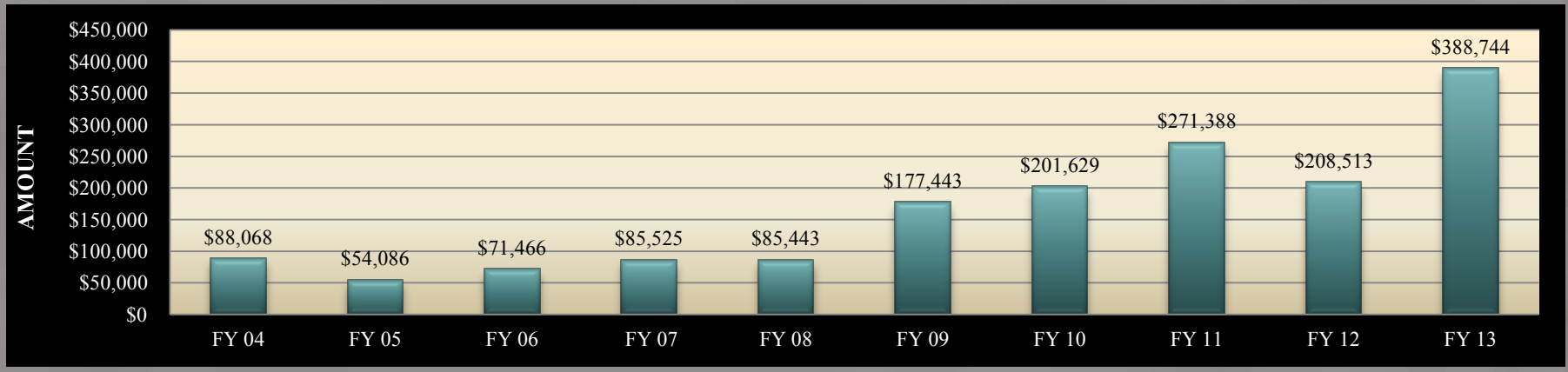


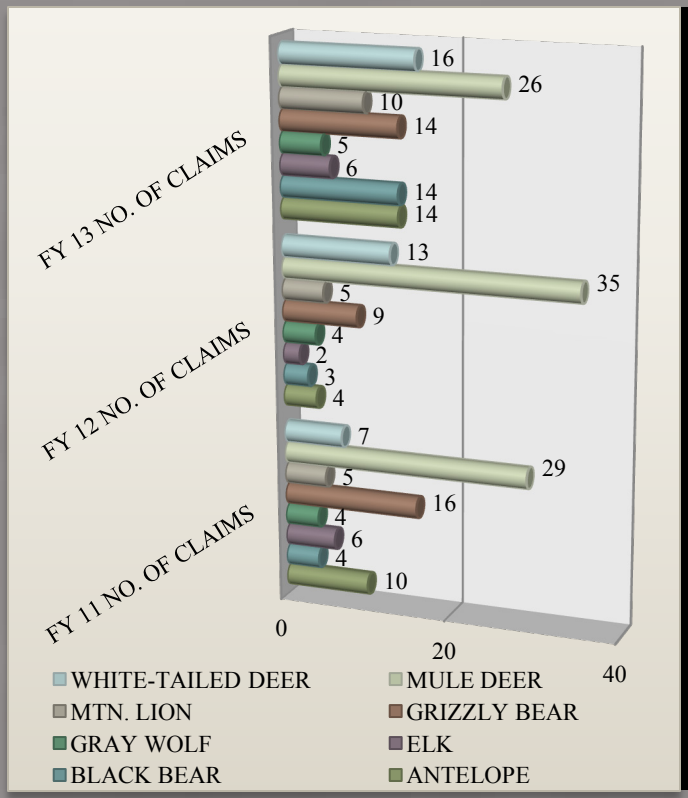


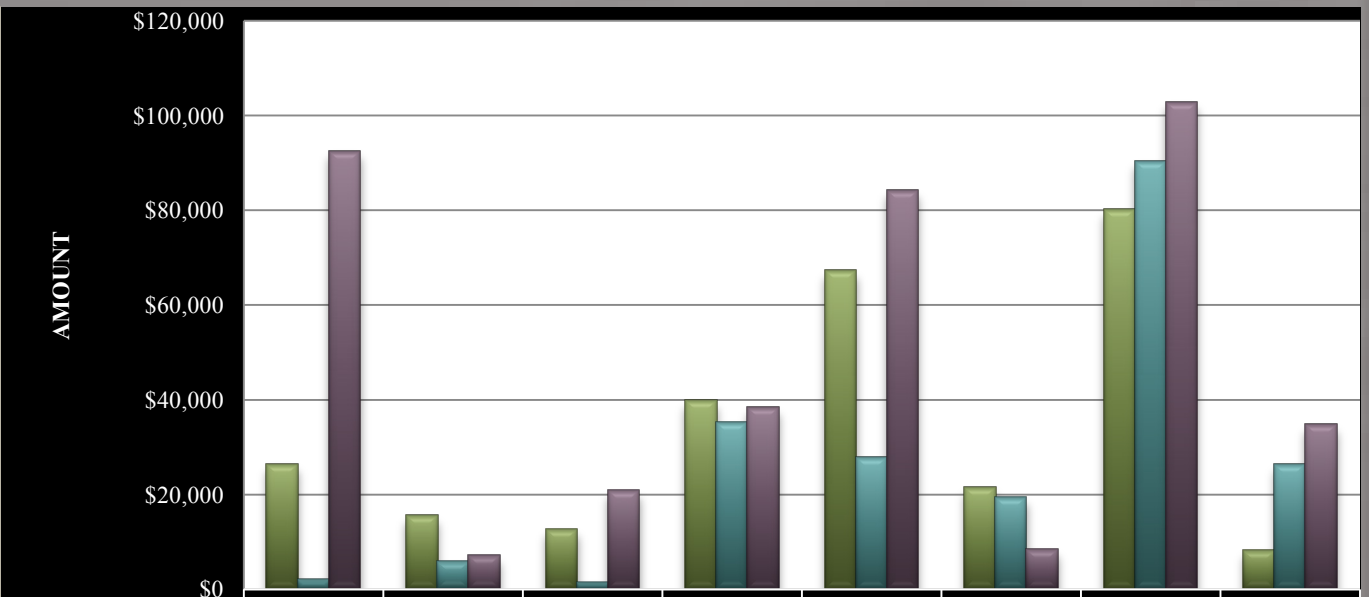


	BLACK BEAR	ELK	GEESE	GRAY WOLF	GRIZZLY BEAR	MOOSE	MTN. LION	MULE DEER	WHITE-TAILED DEER
FY 11 PAYMENTS	$5,522	$18,177	$266	$0	$1,495	$440	$395	$4,727	$0
FY 12 PAYMENTS	$4,755	$8,231	$649	$13,725	$3,360	$0	$0	$2,105	$0
FY 13 PAYMENTS	$18,066	$36,116	$660	$45,258	$12,783	$0	$923	$2,435	$354

CODY REGION

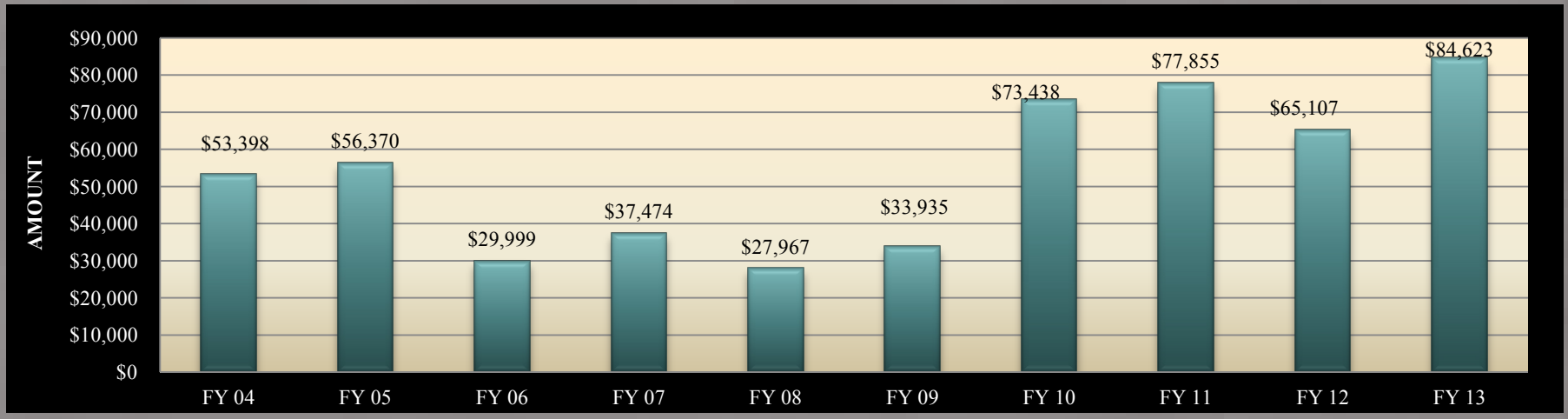


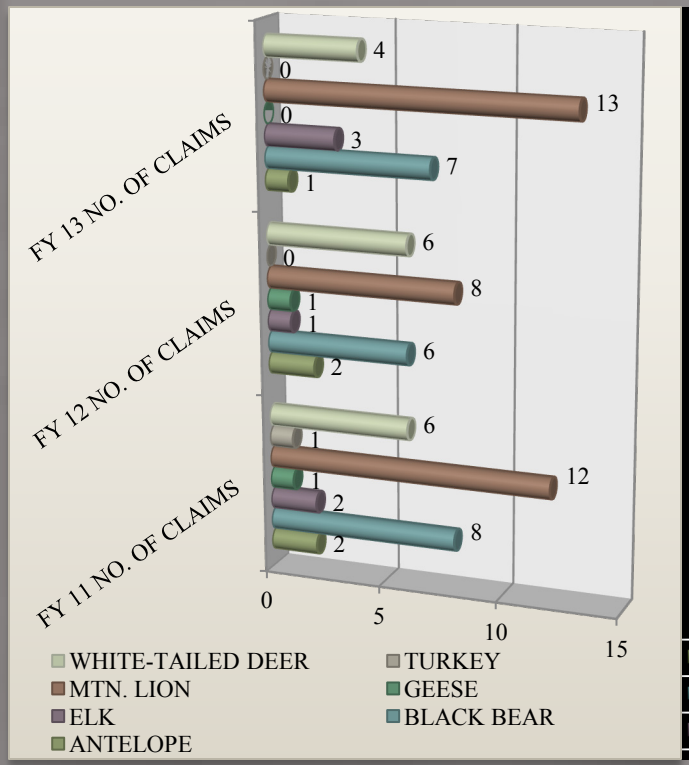


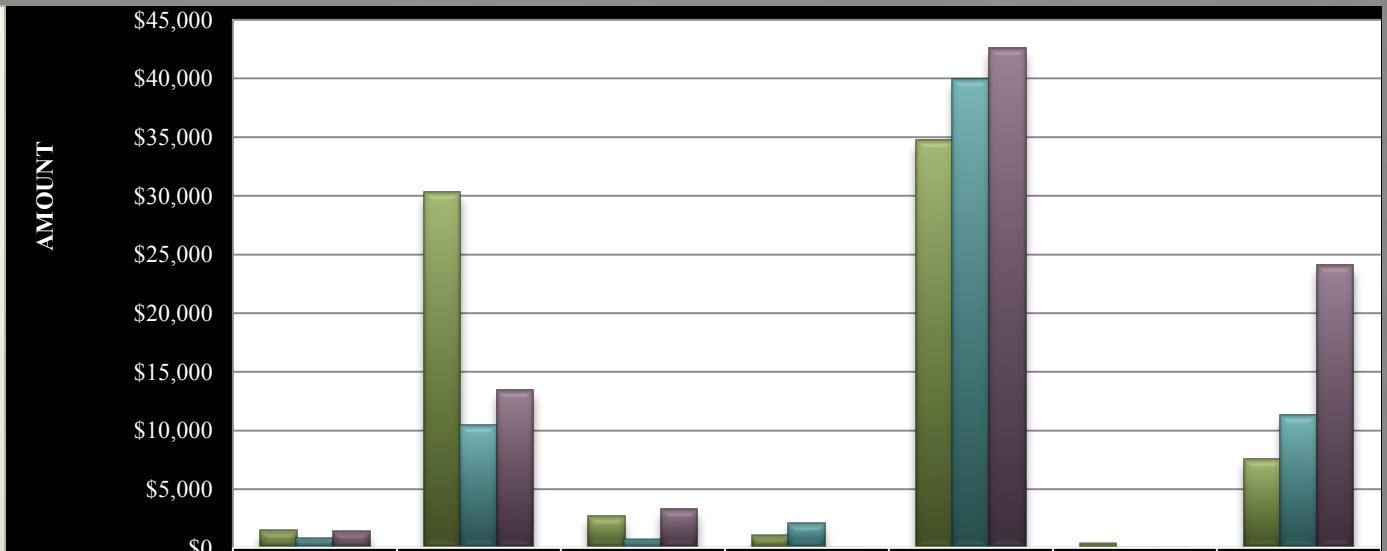


	ANTELOPE	BLACK BEAR	ELK	GRAY WOLF	GRIZZLY BEAR	MTN. LION	MULE DEER	WHITE-TAILED DEER
FY 11 PAYMENTS	$26,357	$15,553	$12,716	$39,781	$67,179	$21,505	$80,096	$8,201
FY 12 PAYMENTS	$2,147	$5,821	$1,436	$35,168	$27,853	$19,446	$90,300	$26,342
FY 13 PAYMENTS	$92,388	$7,086	$20,733	$38,420	$84,122	$8,433	$102,823	$34,739

SHERIDAN REGION

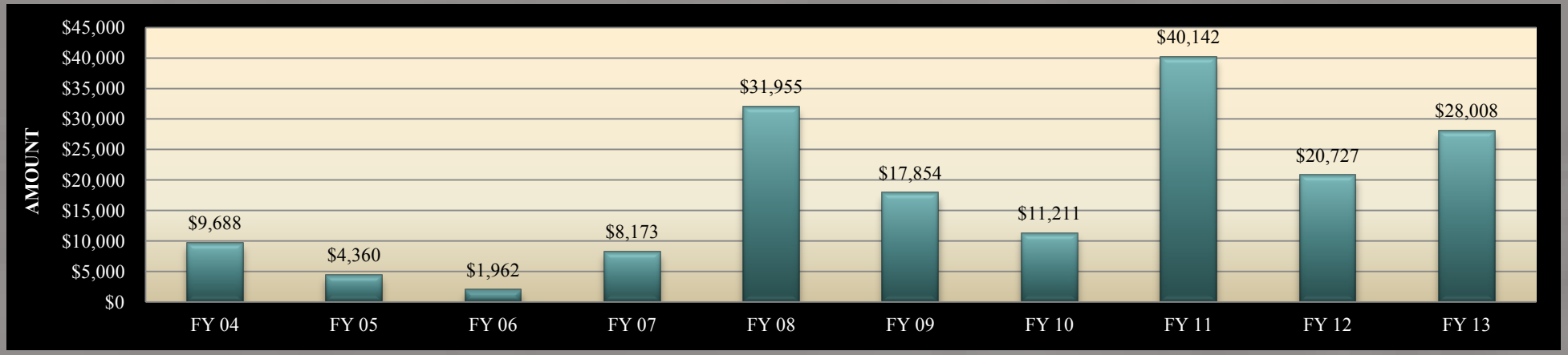


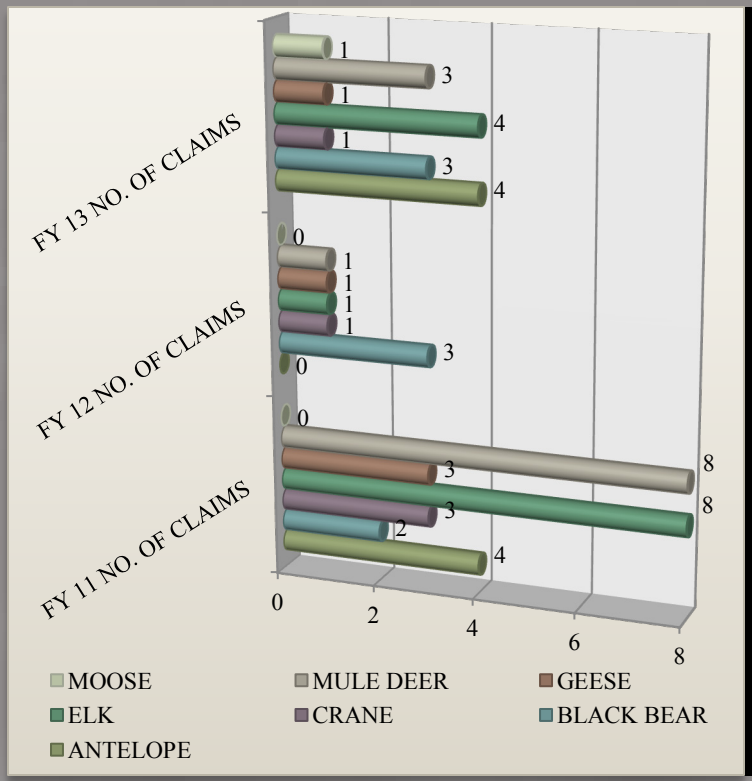


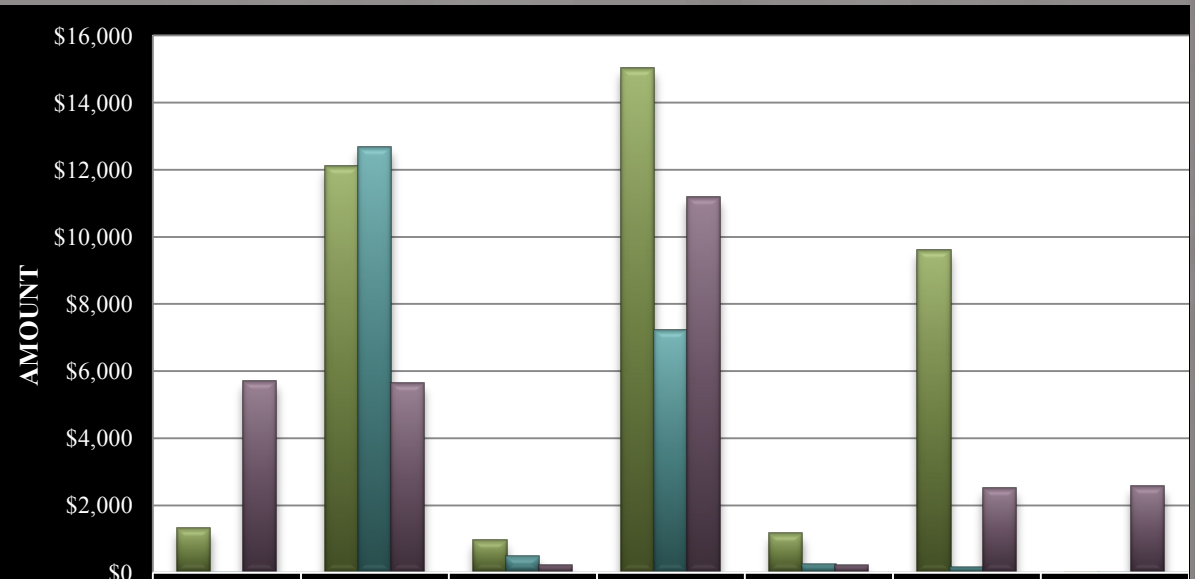


	ANTELOPE	BLACK BEAR	ELK	GEESE	MTN. LION	TURKEY	WHITE-TAILED DEER
FY 11 PAYMENTS	$1,419	$30,263	$2,650	$984	$34,690	$340	$7,509
FY 12 PAYMENTS	$805	$10,387	$656	$2,074	$39,901	$0	$11,284
FY 13 PAYMENTS	$1,400	$13,416	$3,274	$0	$42,511	$0	$24,022

GREEN RIVER REGION

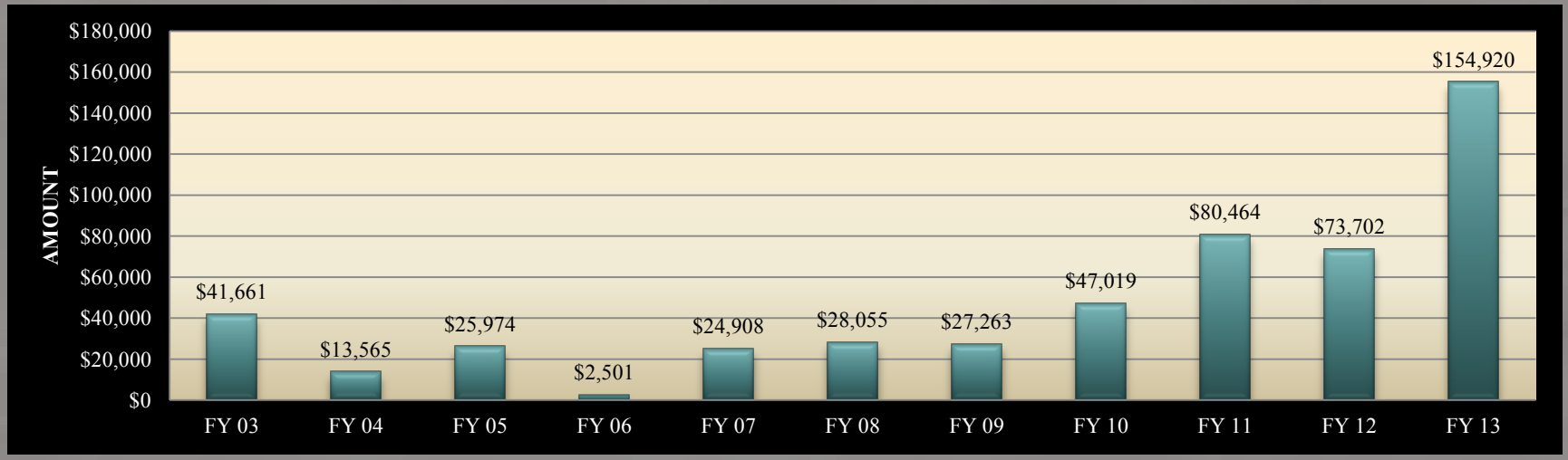


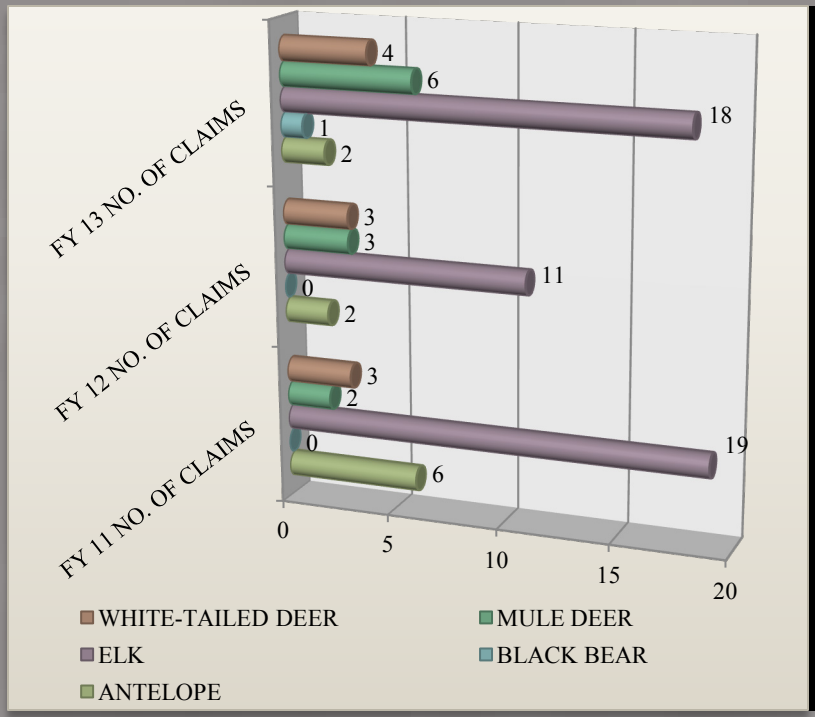


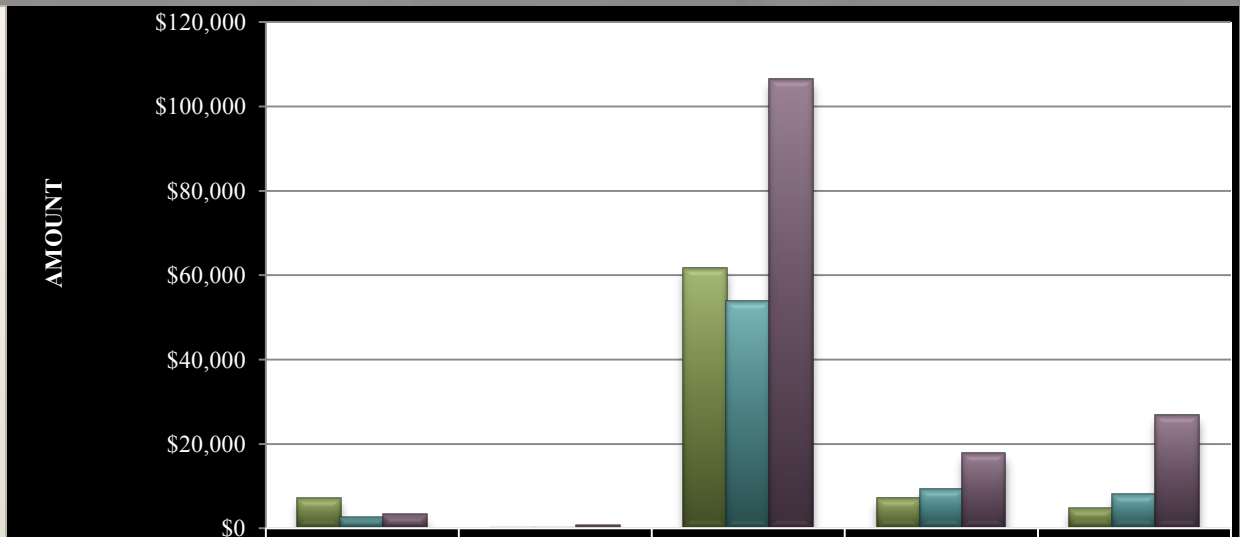


	ANTELOPE	BLACK BEAR	CRANE	ELK	GEESE	MULE DEER	MOOSE
FY11 PAYMENTS	$1,307	$12,105	$964	$15,018	$1,149	$9,599	$0
FY12 PAYMENTS	$0	$12,660	$479	$7,200	$239	$149	$0
FY 13 PAYMENTS	$5,696	$5,629	$215	$11,169	$211	$2,518	$2,570

LARAMIE REGION

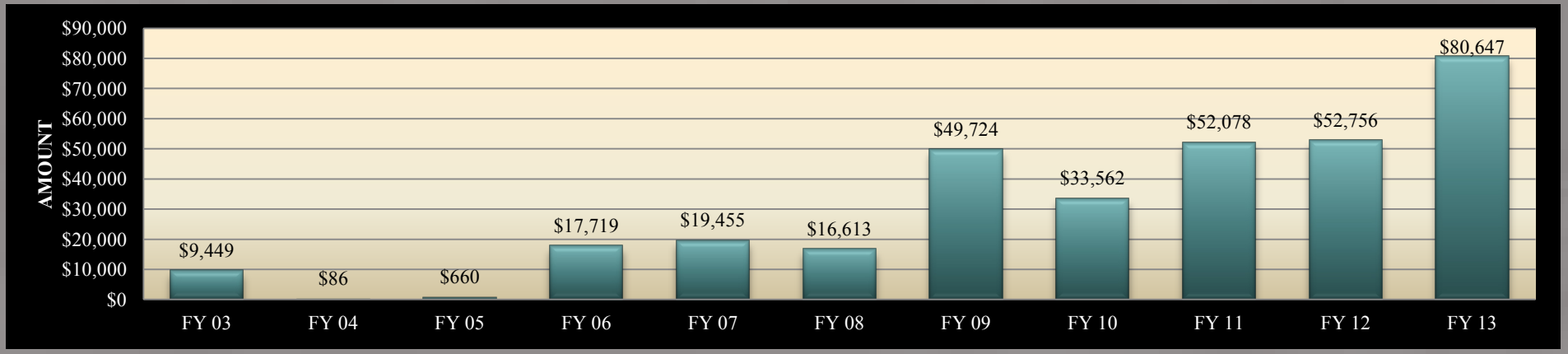


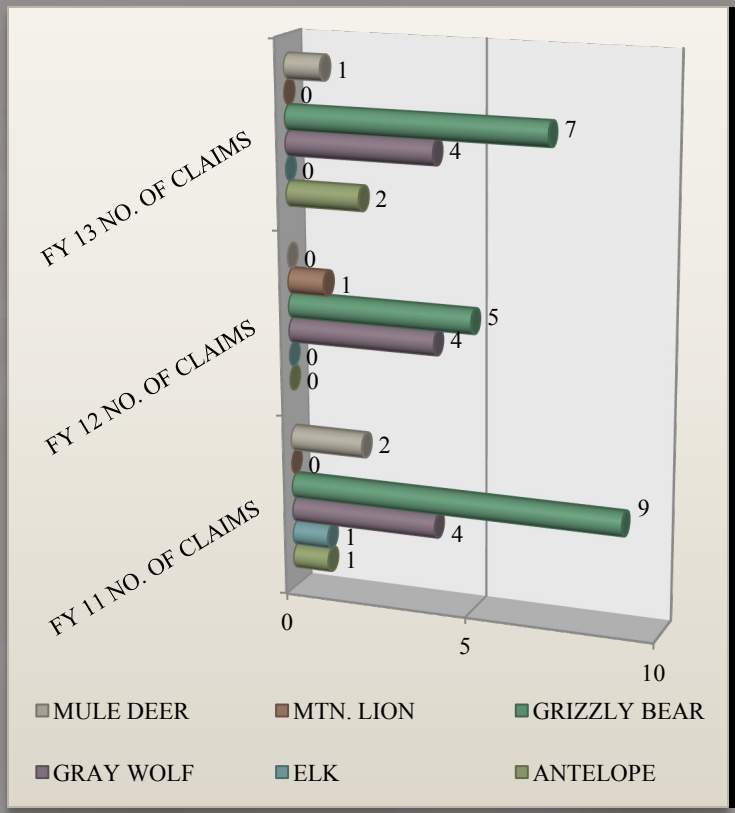


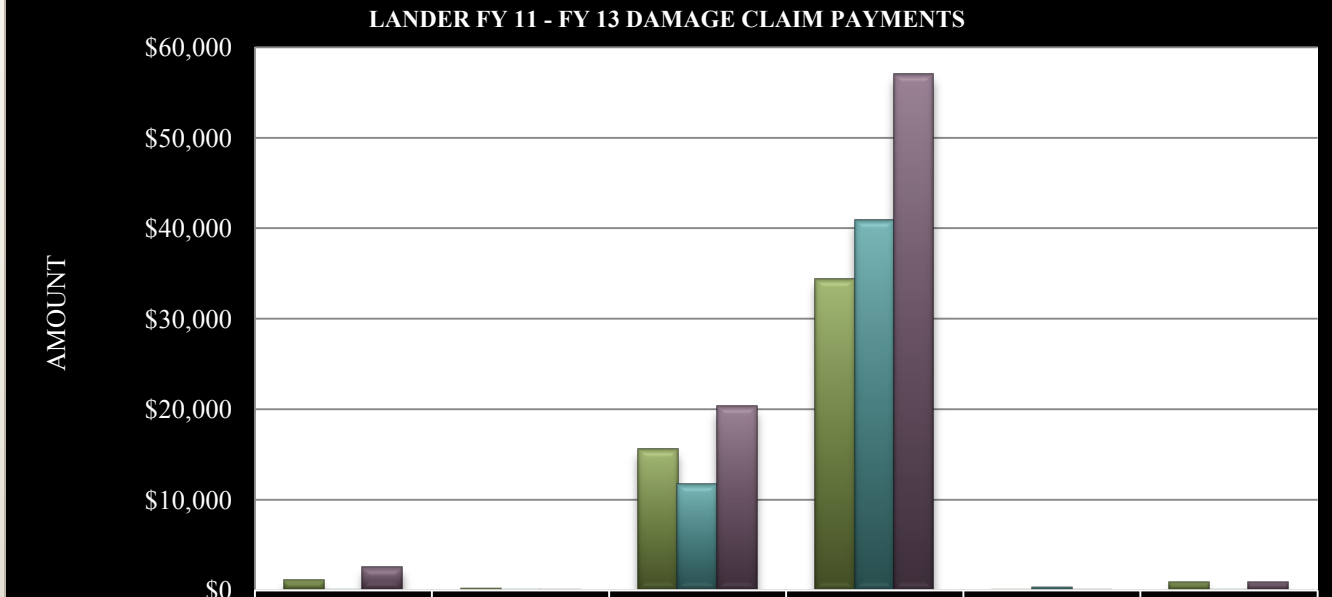


	ANTELOPE	BLACK BEAR	ELK	MULE DEER	WHITE-TAILED DEER
FY 11 PAYMENTS	$7,087	$0	$61,552	$7,198	$4,627
FY 12 PAYMENTS	$2,554	$0	$53,824	$9,311	$8,013
FY 13 PAYMENTS	$3,205	$765	$106,376	$17,689	$26,885

LANDER REGION

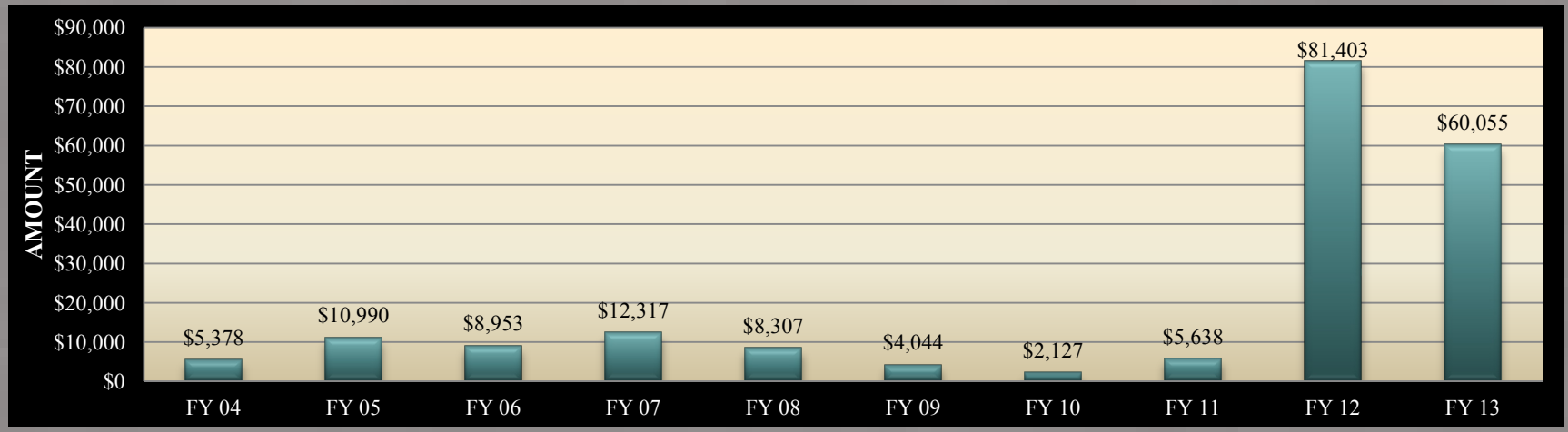


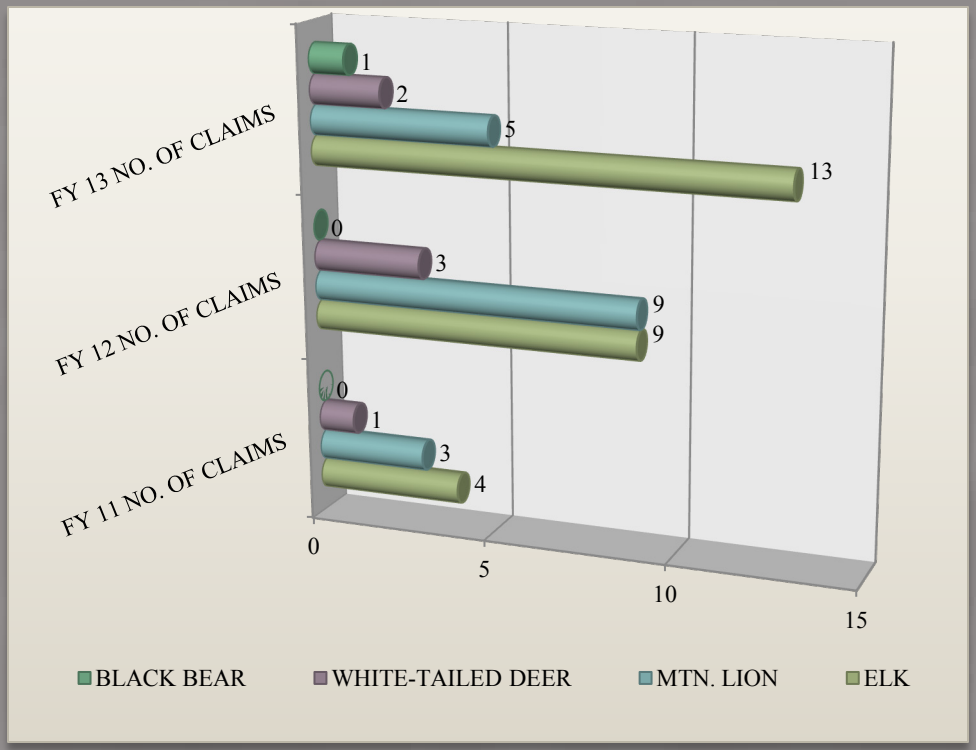


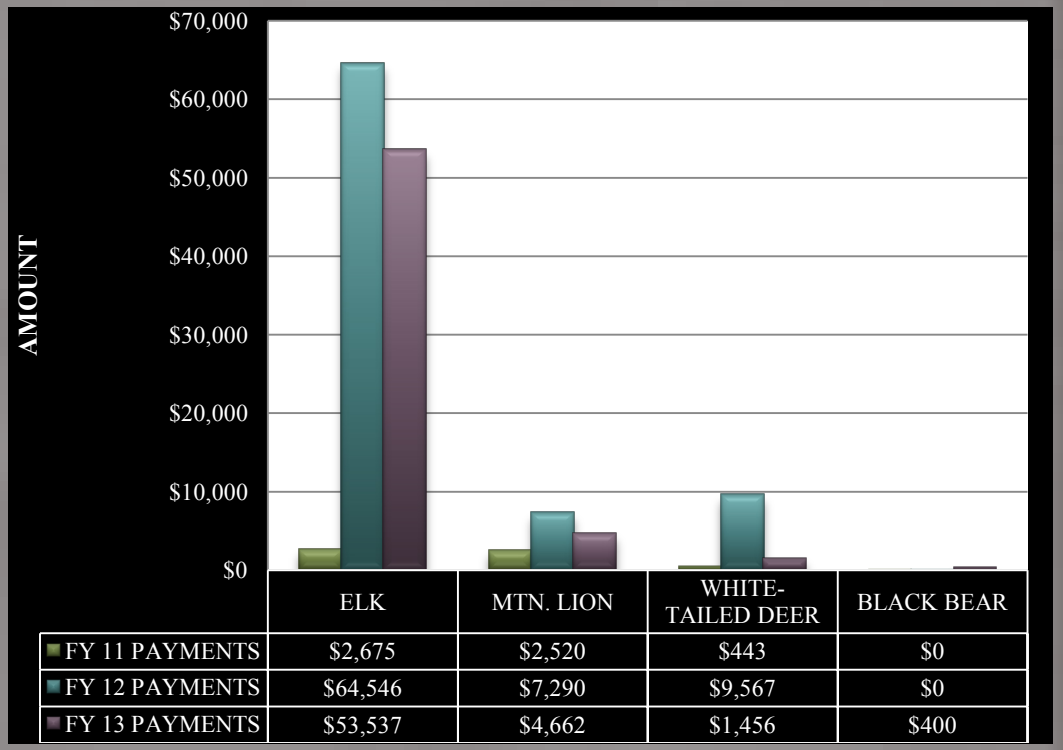


	ANTELOPE	ELK	GRAY WOLF	GRIZZLY BEAR	MTN. LION	MULE DEER
FY 11 PAYMENTS	$1,138	$150	$15,545	$34,377	$0	$868
FY 12 PAYMENTS	$0	$0	$11,636	$40,850	$270	$0
FY 13 PAYMENTS	$2,513	$0	$20,245	$56,998	$0	$891

CASPER REGION

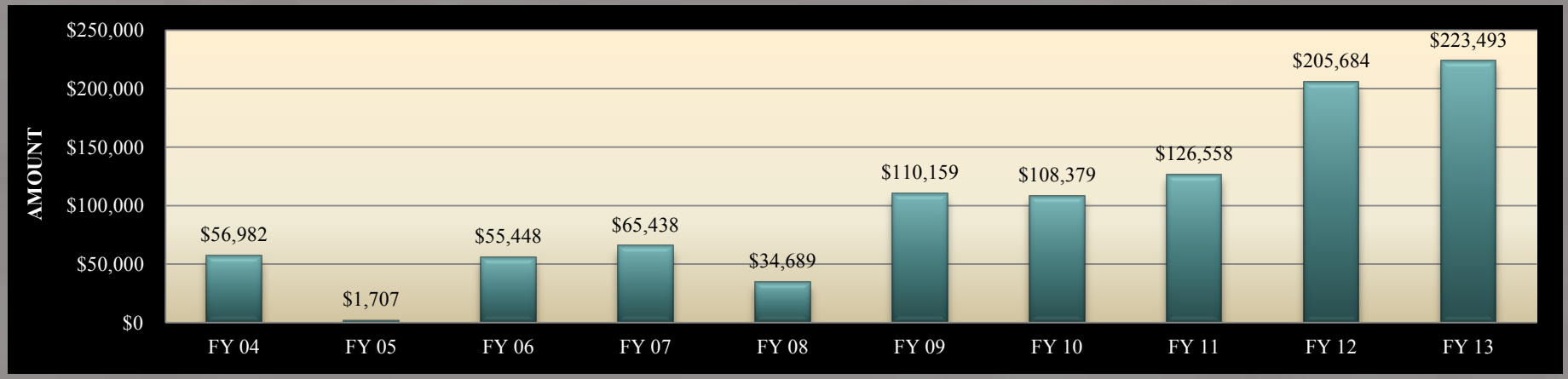


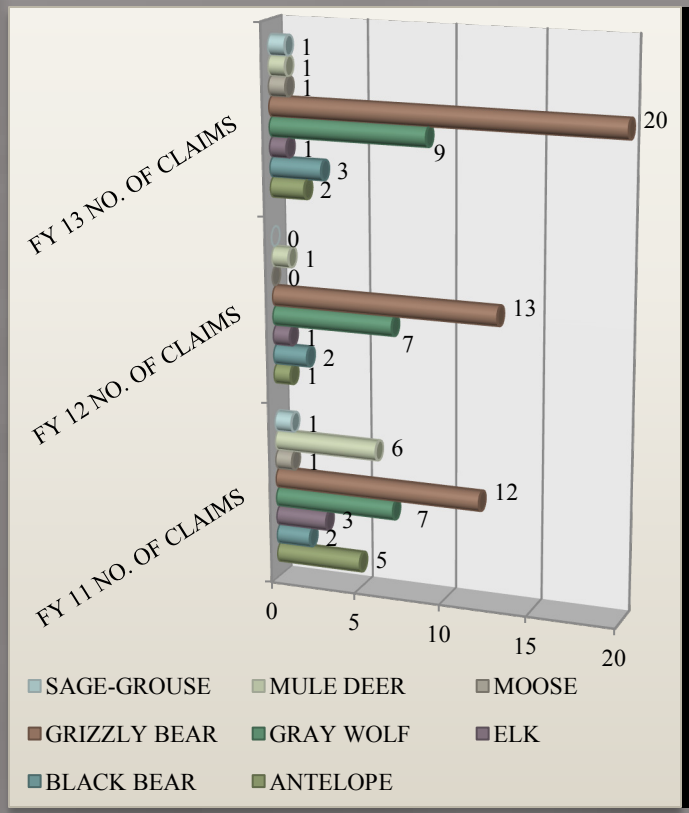


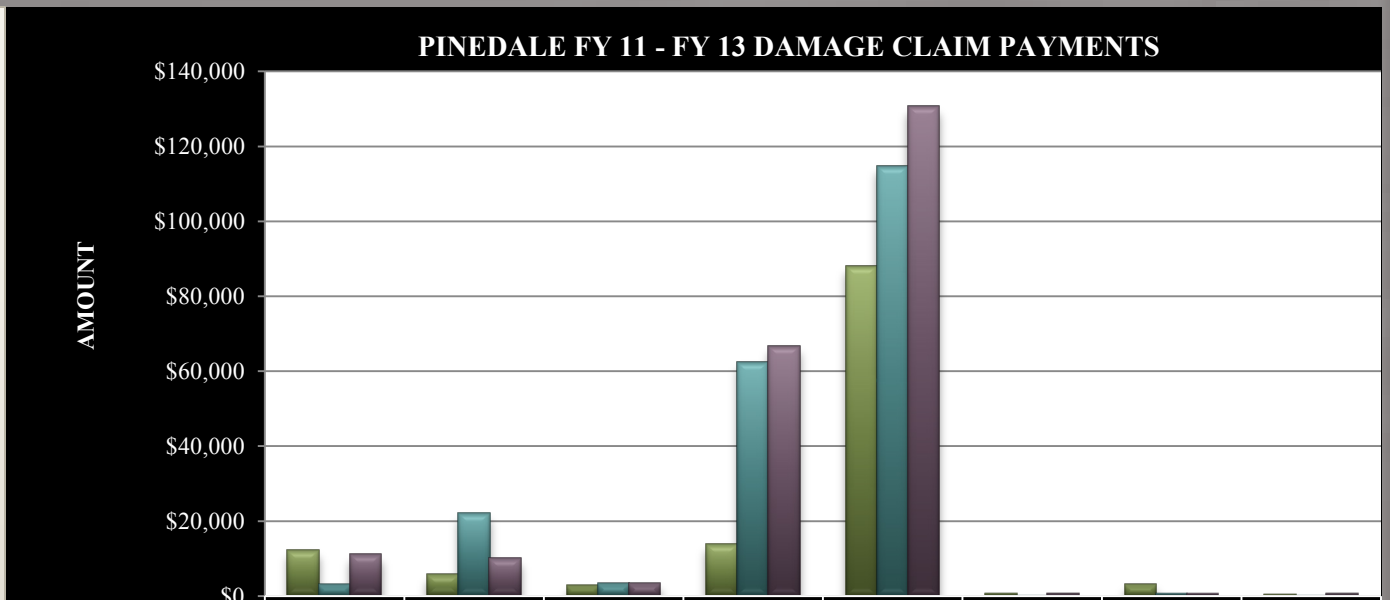


	ELK	MTN. LION	WHITE-TAILED DEER	BLACK BEAR
FY 11 PAYMENTS	$2,675	$2,520	$443	$0
FY 12 PAYMENTS	$64,546	$7,290	$9,567	$0
FY 13 PAYMENTS	$53,537	$4,662	$1,456	$400

PINEDALE REGION

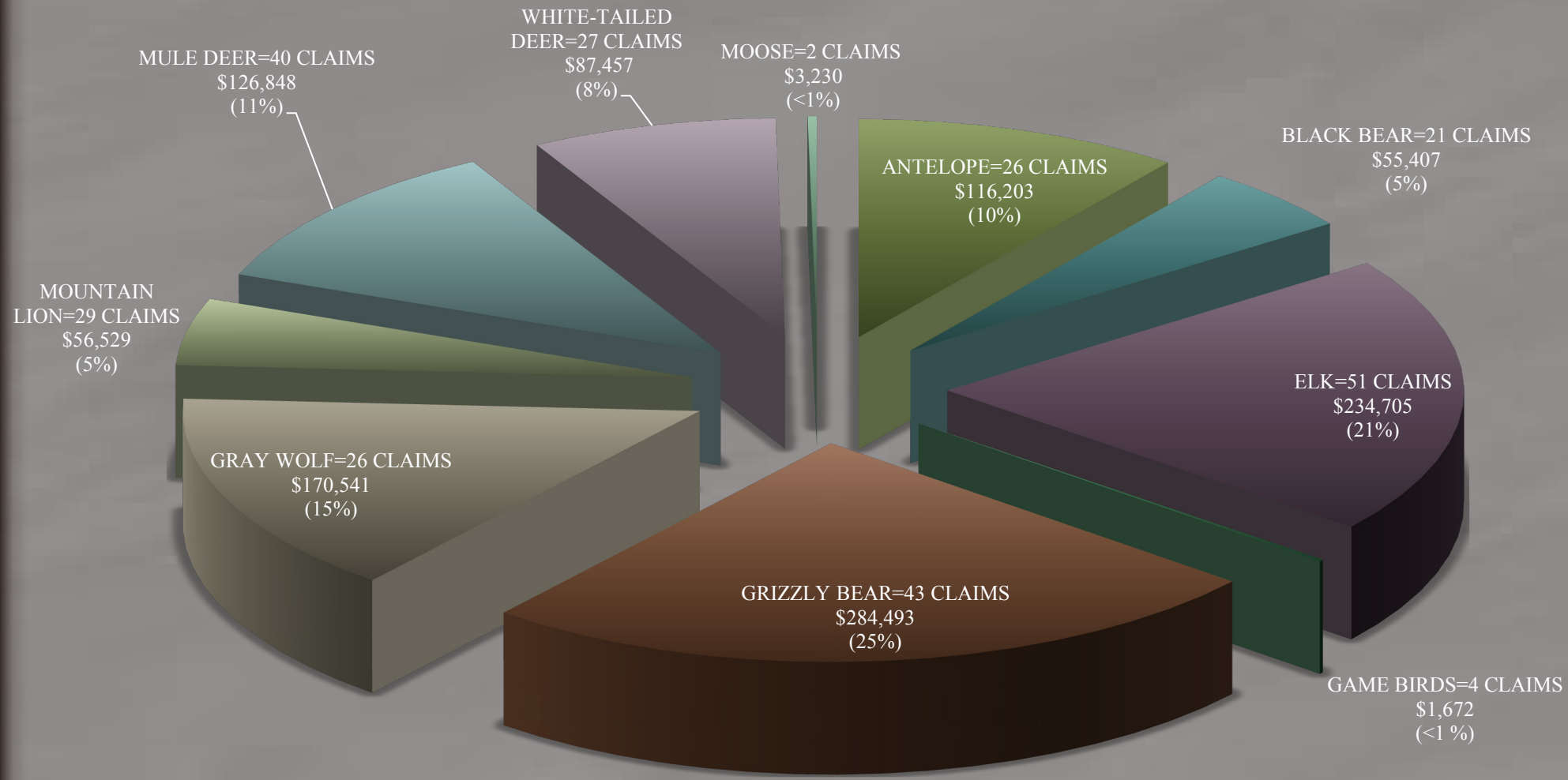






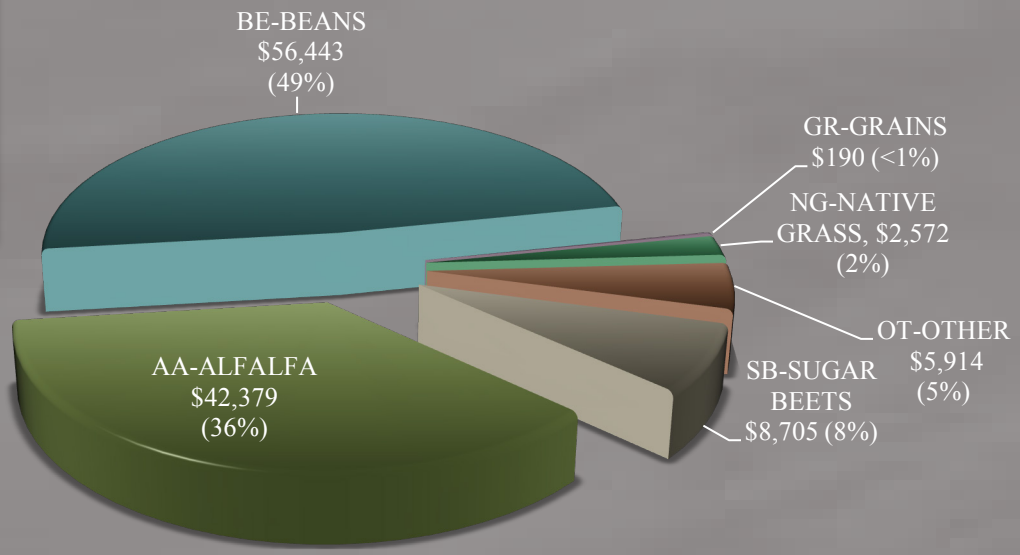
	ANTELOPE	BLACK BEAR	ELK	GRAY WOLF	GRIZZLY BEAR	MOOSE	MULE DEER	SAGE-GROUSE
FY 11 PAYMENTS	$12,130	$5,654	$2,731	$13,895	$88,081	$530	$3,153	$384
FY 12 PAYMENTS	$2,927	$21,978	$3,295	$62,434	$114,576	$0	$474	$0
FY 13 PAYMENTS	$11,002	$10,045	$3,500	$66,617	$130,591	$660	$492	$586

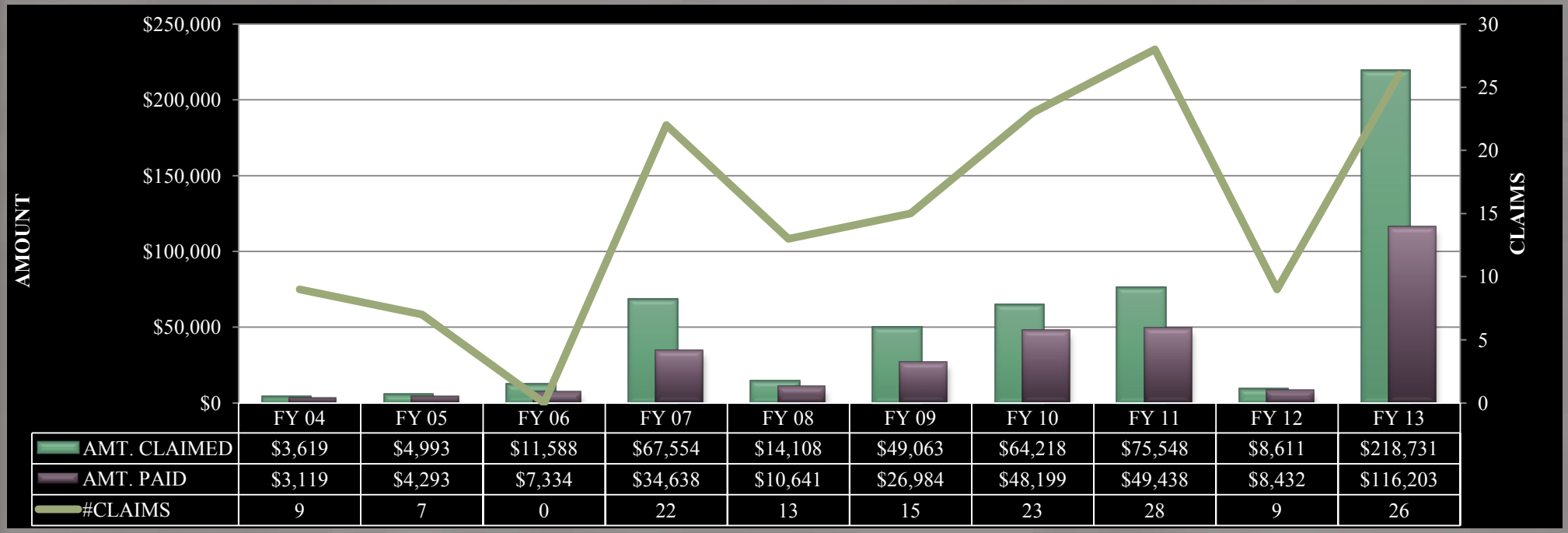
FY 13 AMOUNT AND PERCENTAGE OF CLAIMS PAID PER SPECIES



ANTELOPE

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

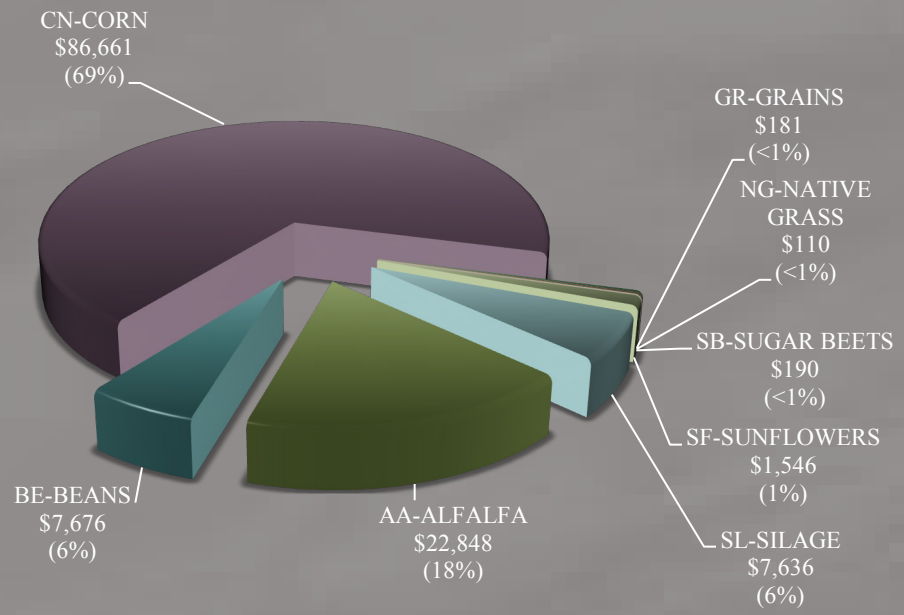


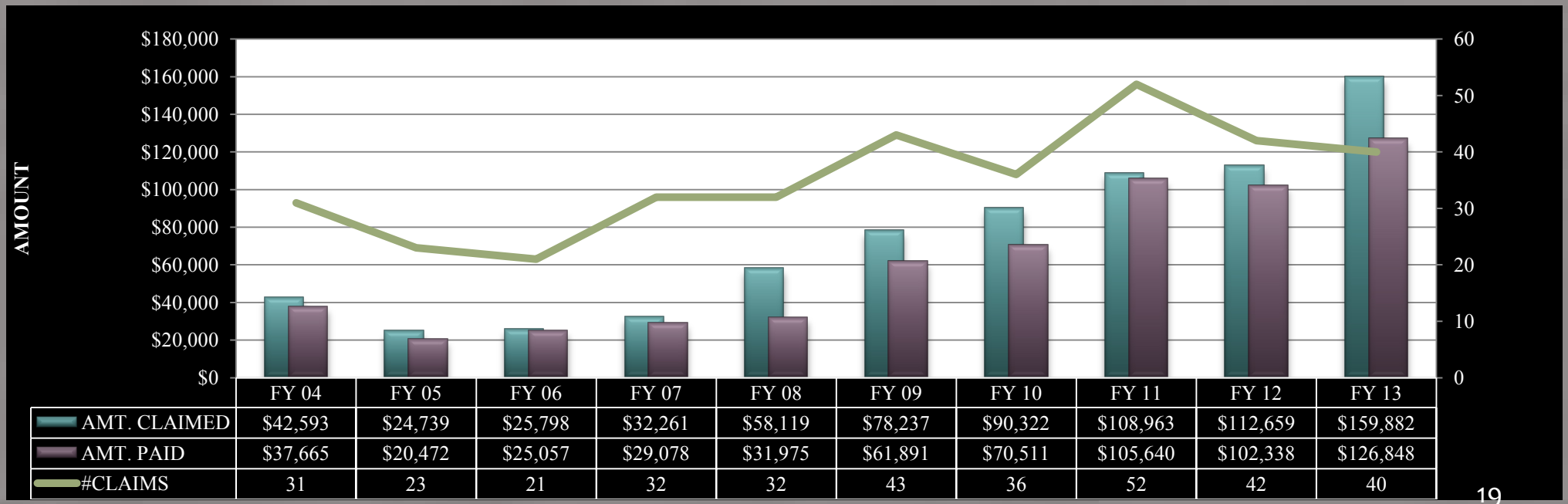


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$3,619	$4,993	$11,588	$67,554	$14,108	$49,063	$64,218	$75,548	$8,611	$218,731
AMT. PAID	$3,119	$4,293	$7,334	$34,638	$10,641	$26,984	$48,199	$49,438	$8,432	$116,203
#CLAIMS	9	7	0	22	13	15	23	28	9	26

MULE DEER

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

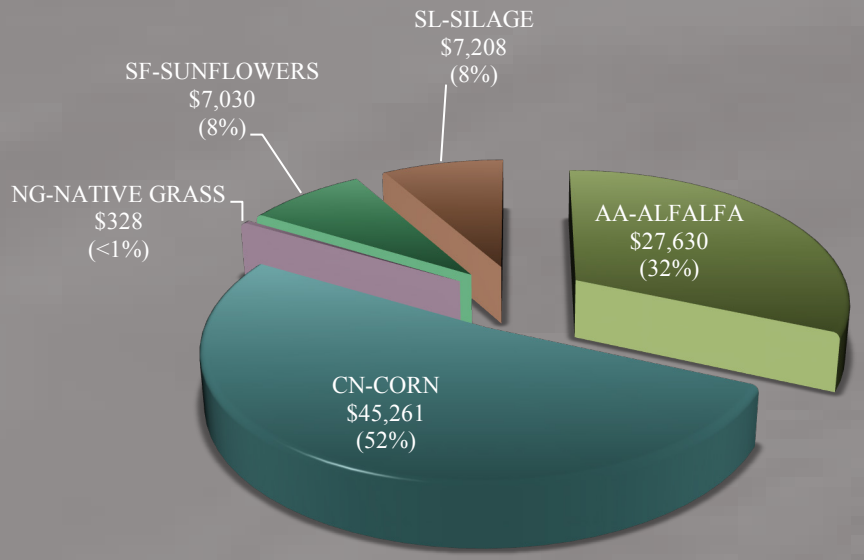


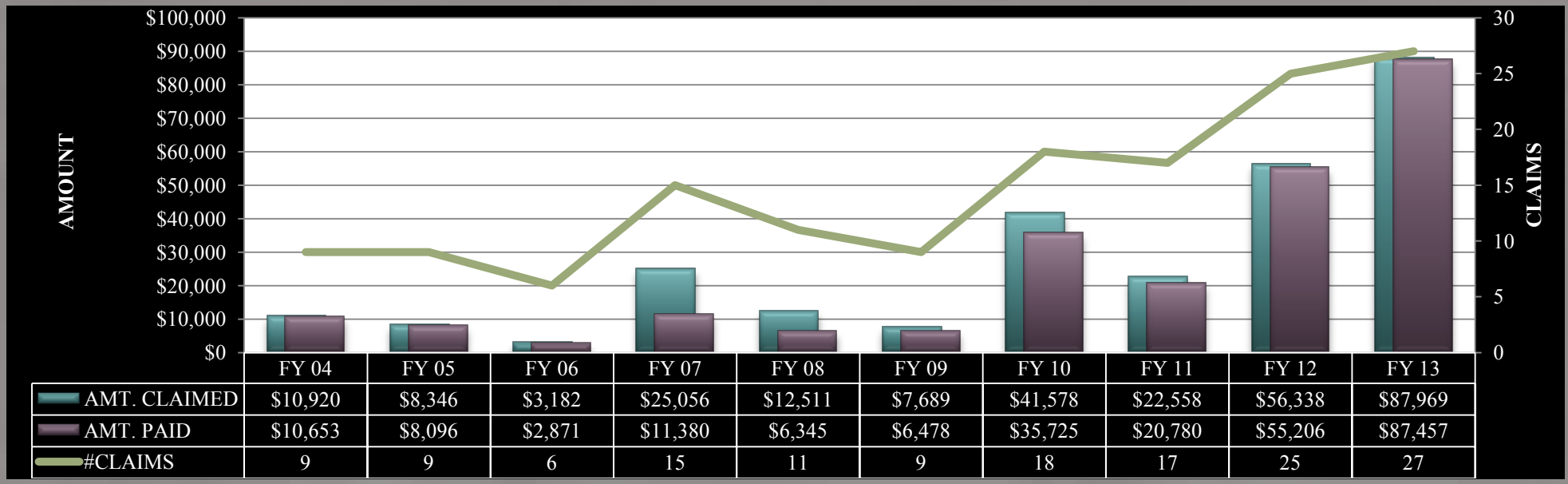


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$42,593	$24,739	$25,798	$32,261	$58,119	$78,237	$90,322	$108,963	$112,659	$159,882
AMT. PAID	$37,665	$20,472	$25,057	$29,078	$31,975	$61,891	$70,511	$105,640	$102,338	$126,848
#CLAIMS	31	23	21	32	32	43	36	52	42	40

WHITE-TAILED DEER

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

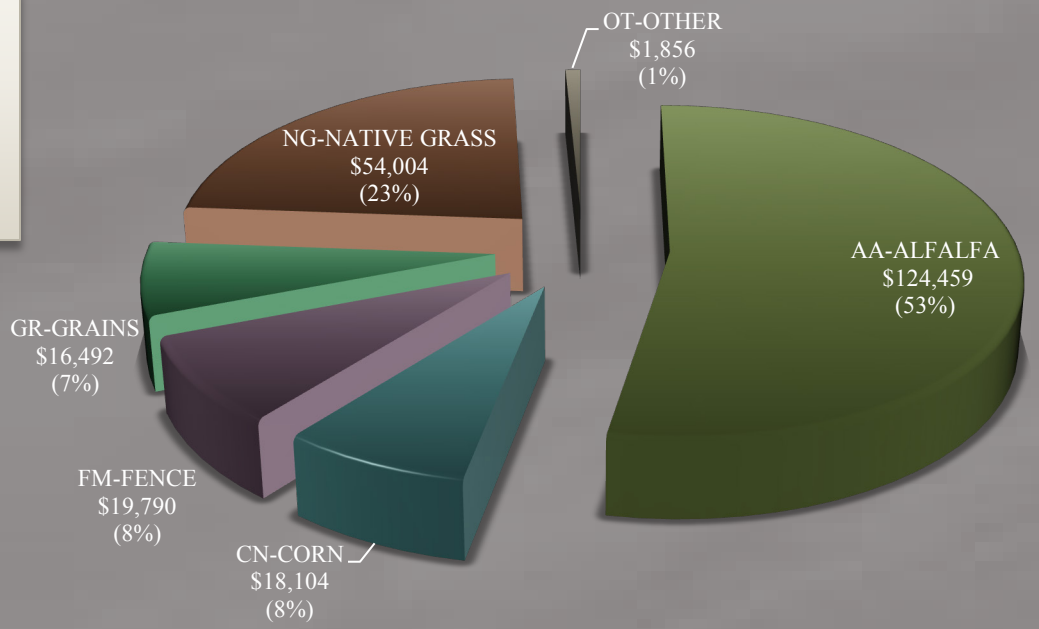


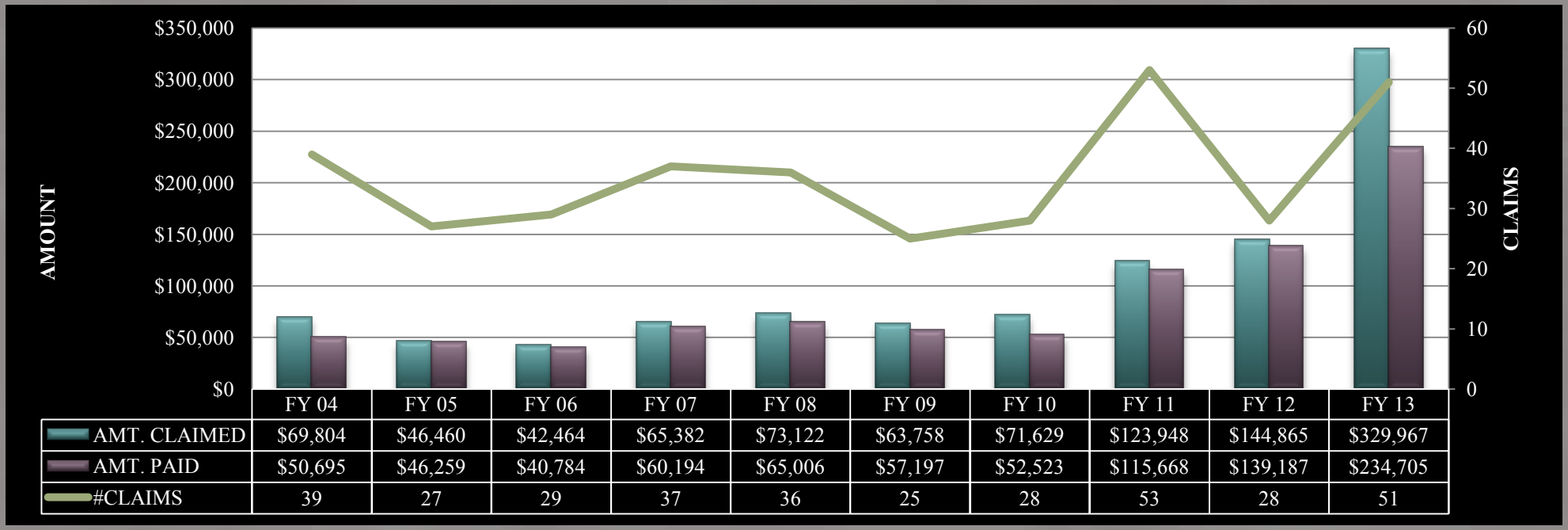


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$10,920	$8,346	$3,182	$25,056	$12,511	$7,689	$41,578	$22,558	$56,338	$87,969
AMT. PAID	$10,653	$8,096	$2,871	$11,380	$6,345	$6,478	$35,725	$20,780	$55,206	$87,457
#CLAIMS	9	9	6	15	11	9	18	17	25	27

ELK

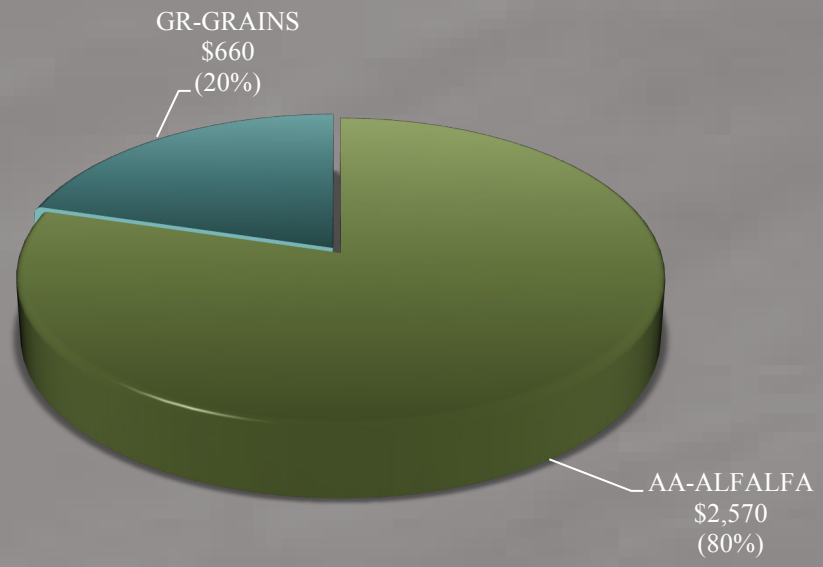
- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY





	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$69,804	$46,460	$42,464	$65,382	$73,122	$63,758	$71,629	$123,948	$144,865	$329,967
AMT. PAID	$50,695	$46,259	$40,784	$60,194	$65,006	$57,197	$52,523	$115,668	$139,187	$234,705
#CLAIMS	39	27	29	37	36	25	28	53	28	51

MOOSE
- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

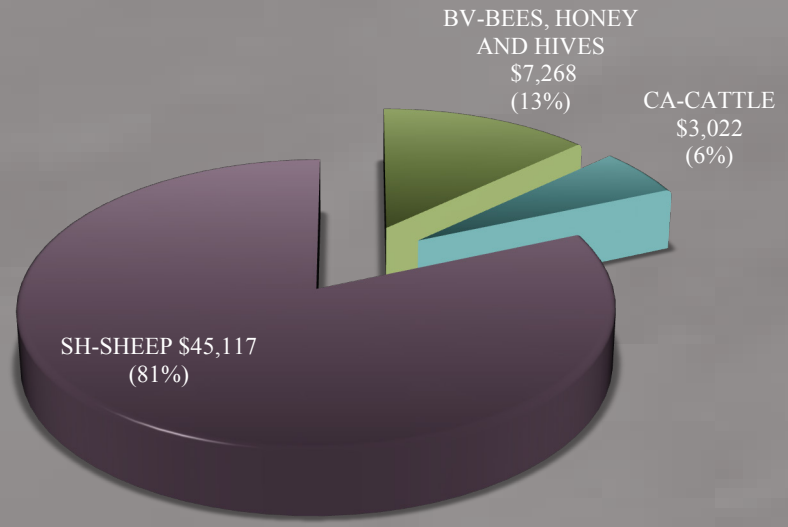


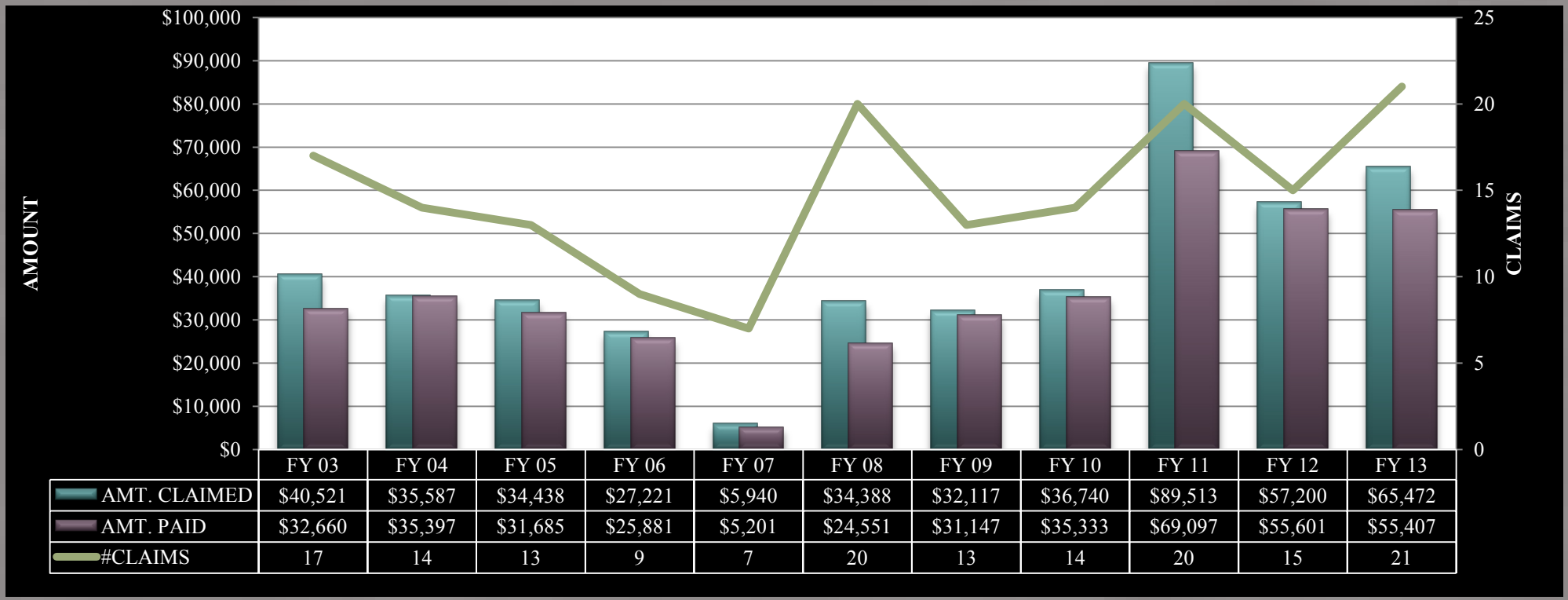


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$1,543	$85	$144	$0	$0	$0	$60	$970	$0	$3,230
AMT. PAID	$1,443	$64	$144	$0	$0	$0	$60	$970	$0	$3,230
#CLAIMS	6	1	1	0	0	0	1	2	0	2

BLACK BEAR

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

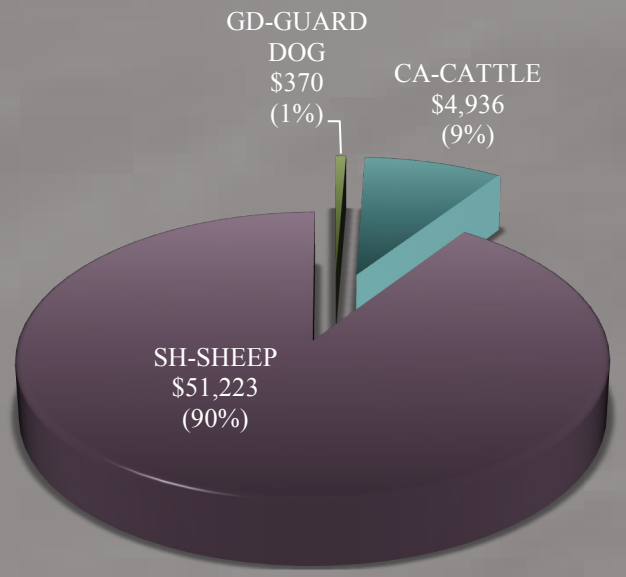


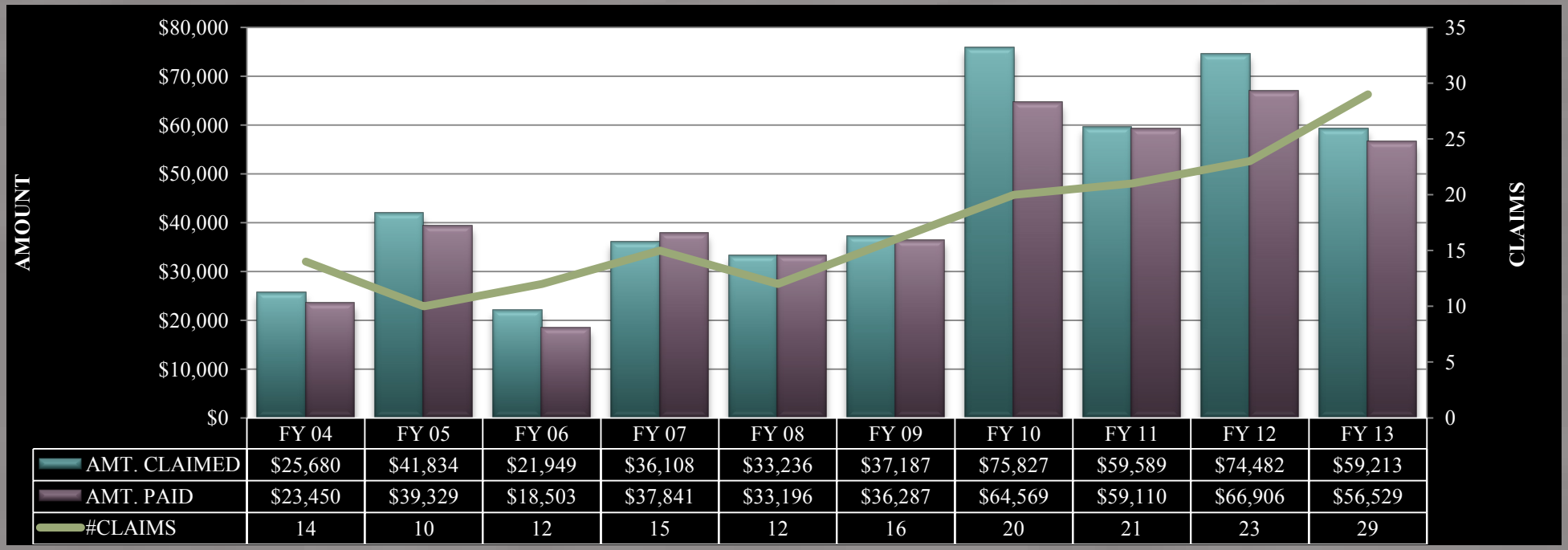


	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$40,521	$35,587	$34,438	$27,221	$5,940	$34,388	$32,117	$36,740	$89,513	$57,200	$65,472
AMT. PAID	$32,660	$35,397	$31,685	$25,881	$5,201	$24,551	$31,147	$35,333	$69,097	$55,601	$55,407
#CLAIMS	17	14	13	9	7	20	13	14	20	15	21

MOUNTAIN LION

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

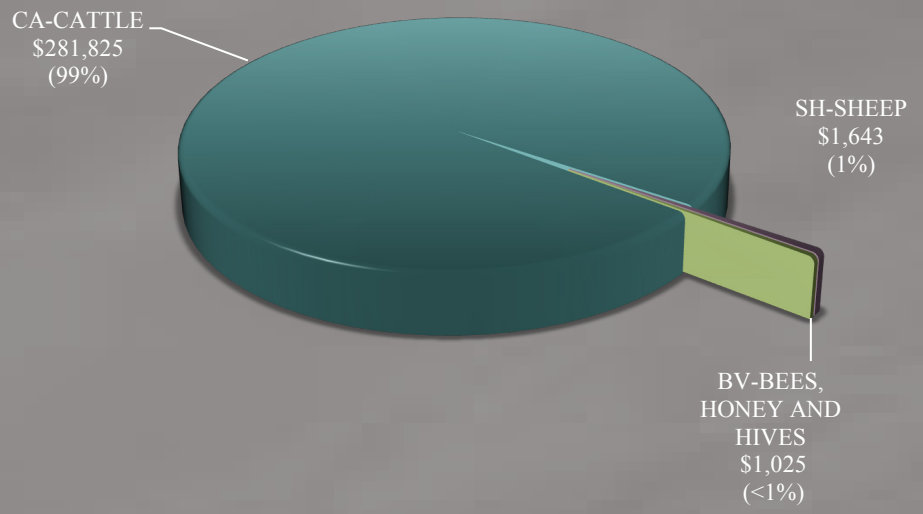


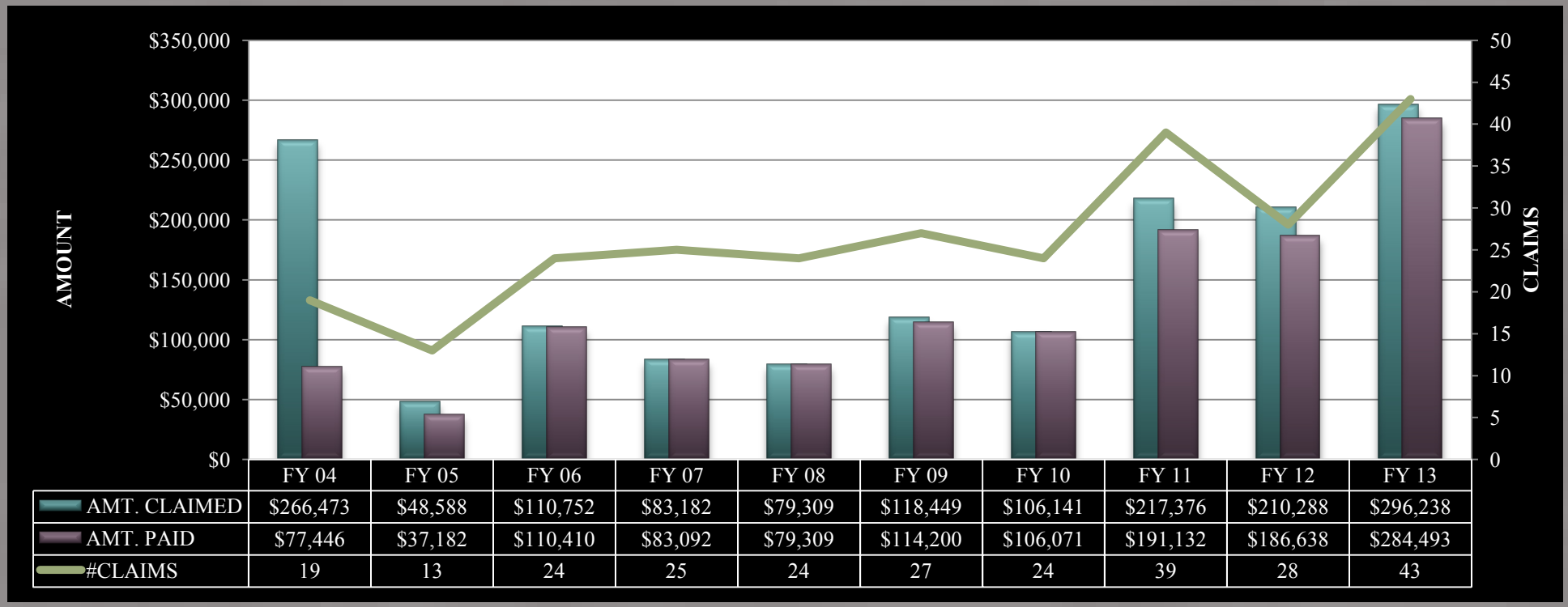


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$25,680	$41,834	$21,949	$36,108	$33,236	$37,187	$75,827	$59,589	$74,482	$59,213
AMT. PAID	$23,450	$39,329	$18,503	$37,841	$33,196	$36,287	$64,569	$59,110	$66,906	$56,529
#CLAIMS	14	10	12	15	12	16	20	21	23	29

GRIZZLY BEAR

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

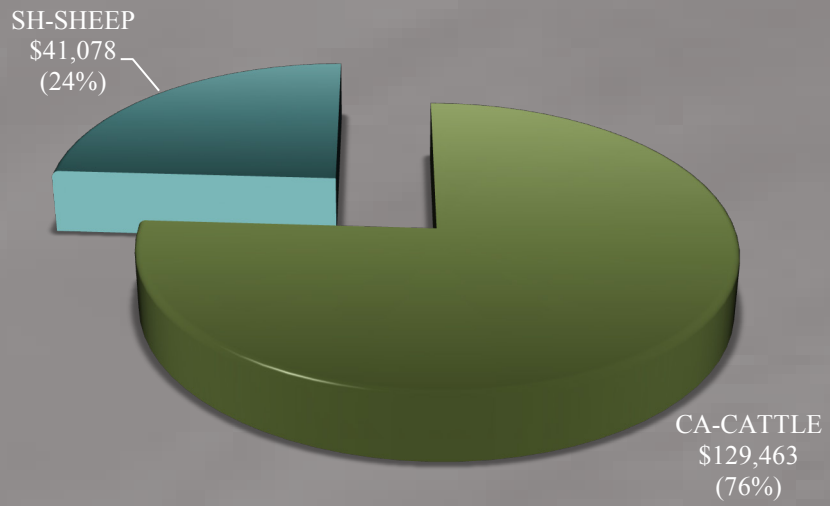


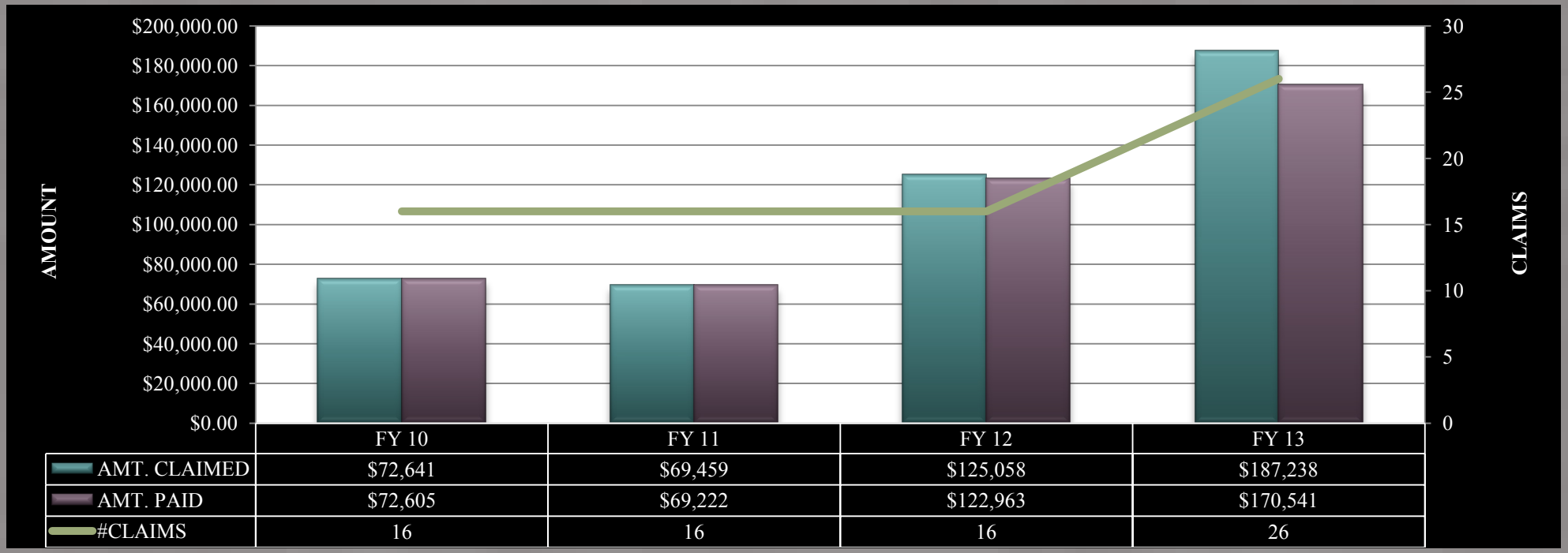


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$266,473	$48,588	$110,752	$83,182	$79,309	$118,449	$106,141	$217,376	$210,288	$296,238
AMT. PAID	$77,446	$37,182	$110,410	$83,092	$79,309	$114,200	$106,071	$191,132	$186,638	$284,493
#CLAIMS	19	13	24	25	24	27	24	39	28	43

GRAY WOLF

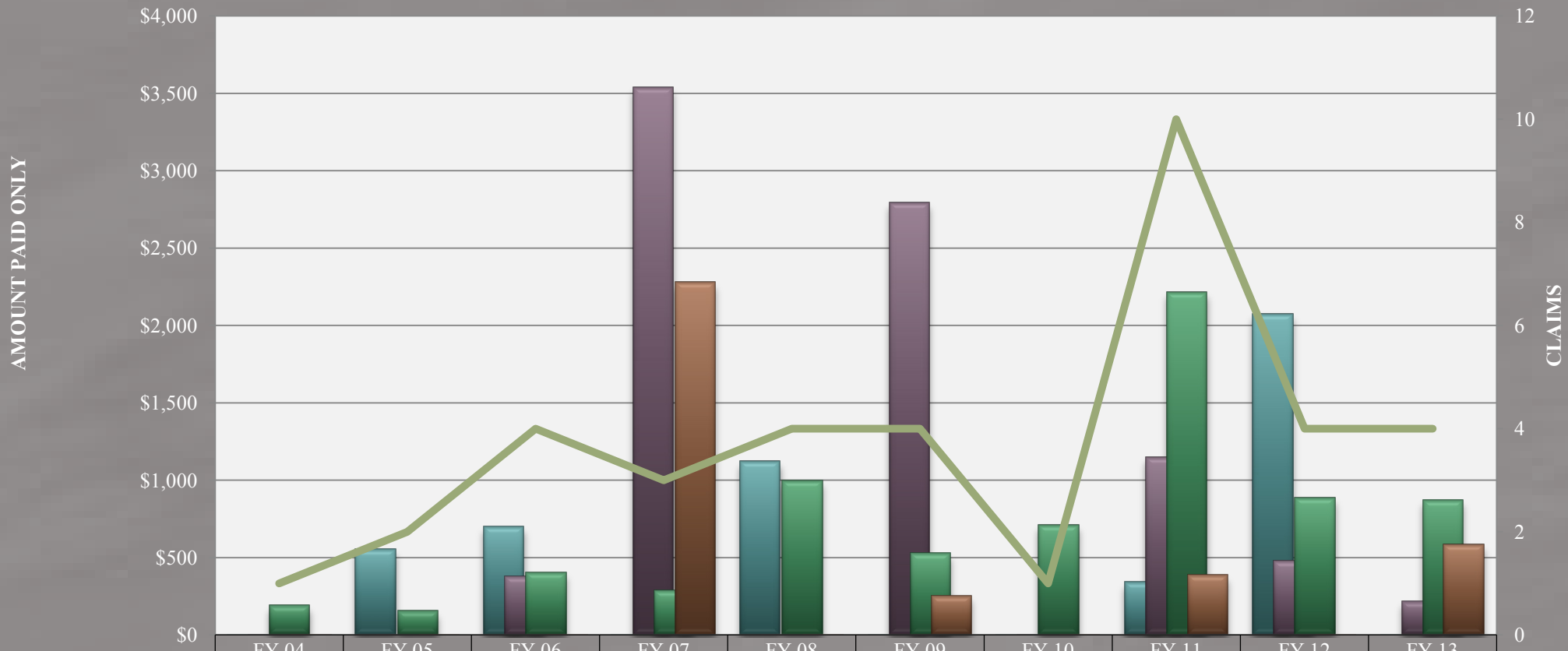
- 4-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY





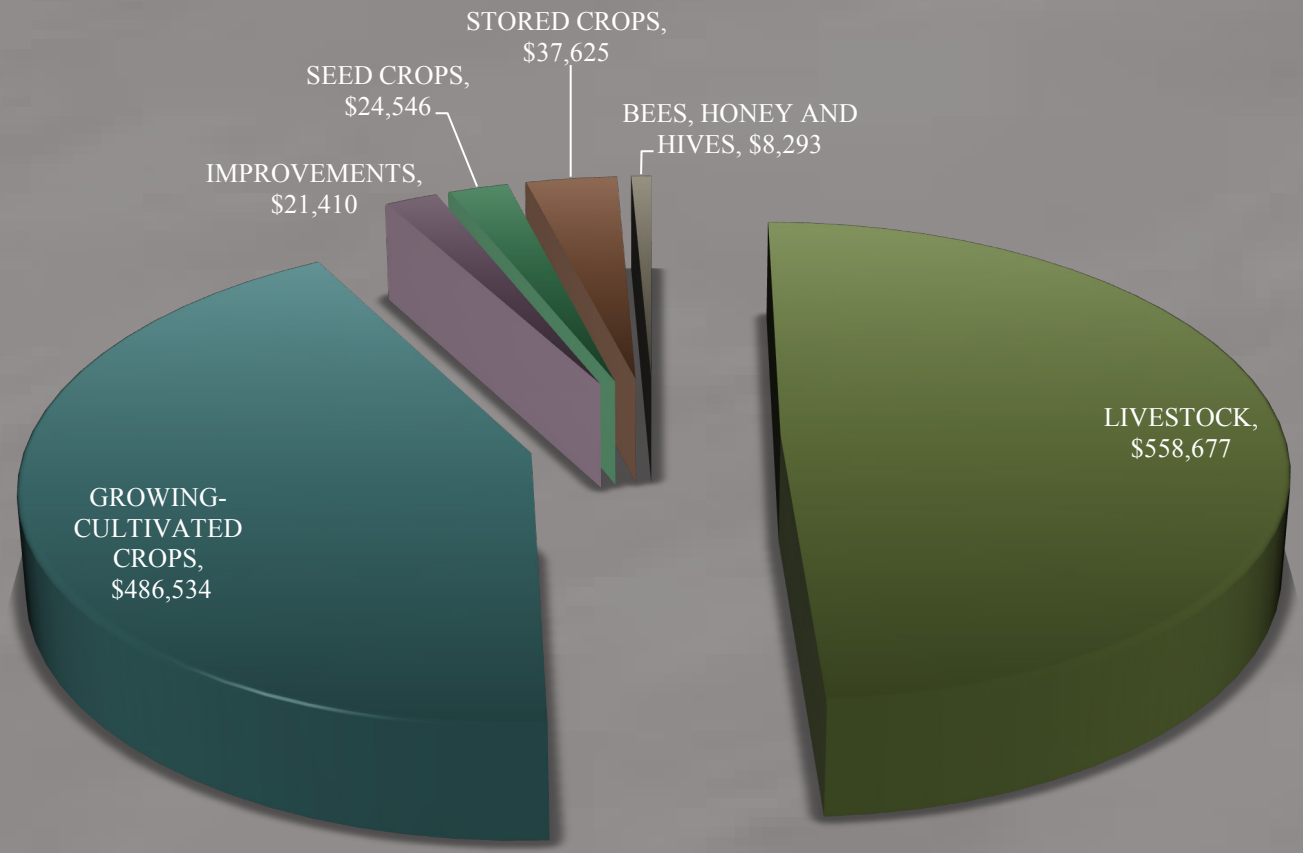
	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$72,641	$69,459	$125,058	$187,238
AMT. PAID	$72,605	$69,222	$122,963	$170,541
#CLAIMS	16	16	16	26

GAME BIRDS
•10-YEAR DAMAGE SUMMARY



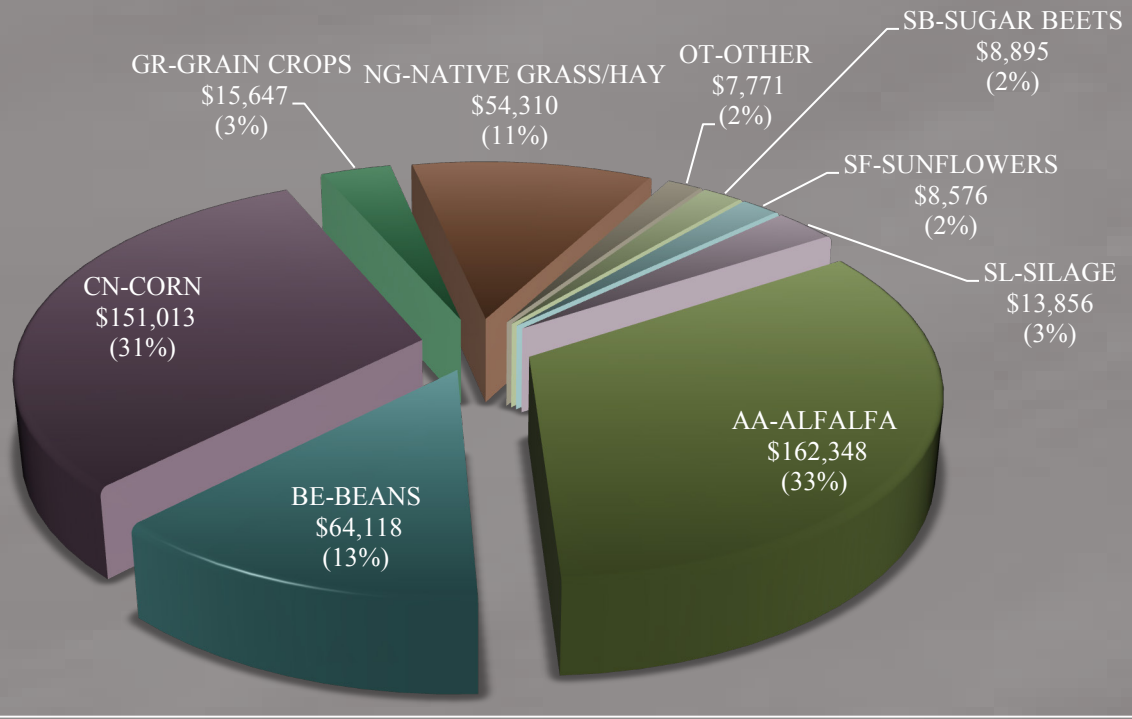
	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
TURKEYS	$0	$553	$698	$0	$1,118	$0	$0	$340	$2,074	$0
CRANES	$0	$0	$375	$3,539	$0	$2,795	$0	$1,149	$479	$215
GEESE	$187	$153	$404	$285	$995	$525	$711	$2,214	$888	$871
SAGE-GROUSE	$0	$0	$0	$2,277	$0	$254	$0	$384	$0	$586
# CLAIMS	1	2	4	3	4	4	1	10	4	4

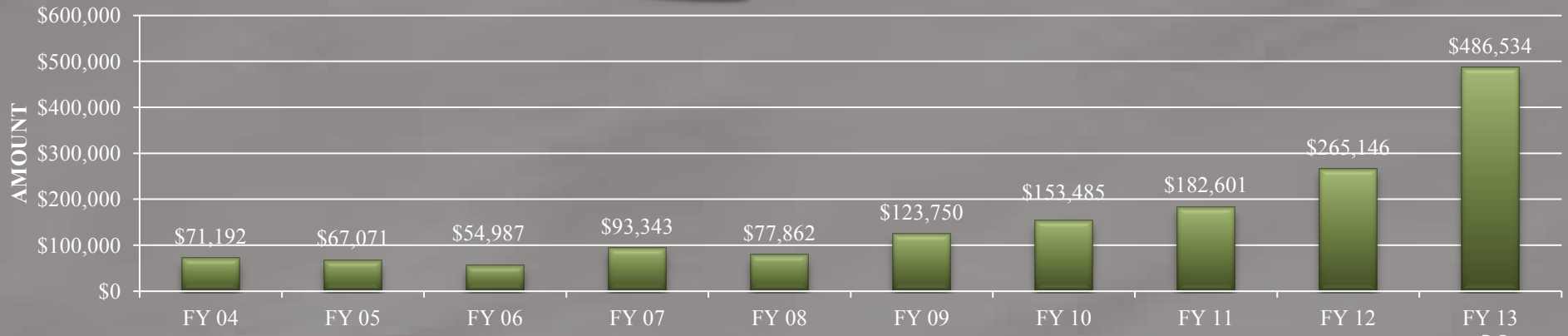
FY 13 AMOUNT AND PERCENTAGE OF CLAIMS PAID BY CATEGORY



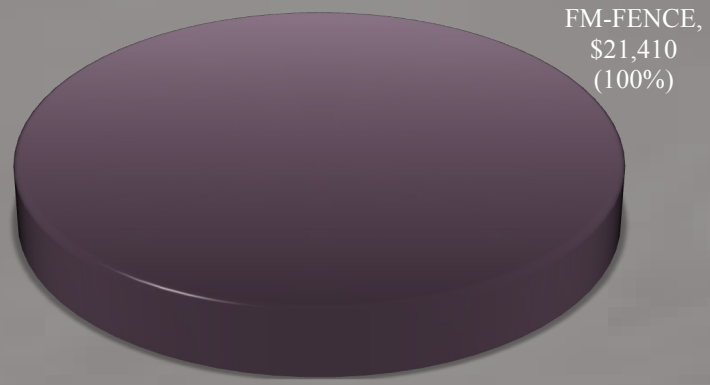
CATEGORY	AMOUNT PAID	PERCENTAGE
GROWING-CULTIVATED CROPS	$486,534	43%
IMPROVEMENTS	$21,410	2%
SEED CROPS	$24,546	2%
STORED CROPS	$37,625	3%
BEES, HONEY AND HIVES	$8,293	1%
LIVESTOCK	$558,677	49%
TOTAL FY 13 DAMAGE AMOUNT PAID	**$1,137,085**	

FY 13 GROWING-CULTIVATED CROPS &10-YEAR DAMAGE SUMMARY



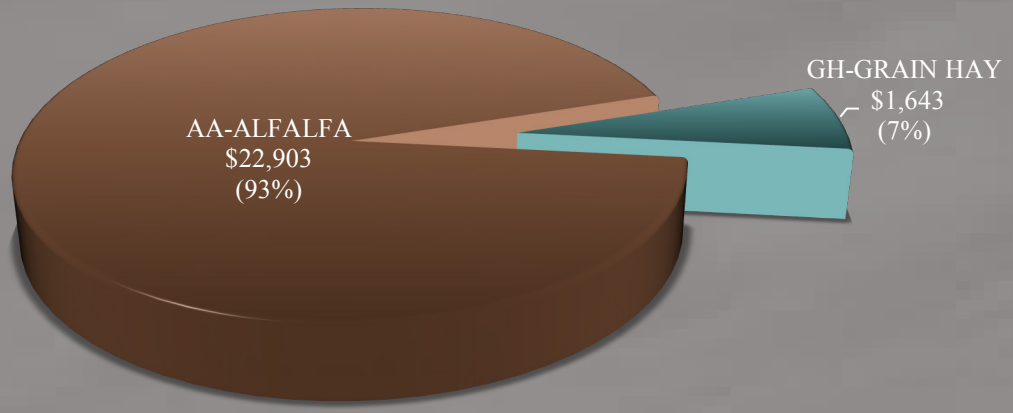


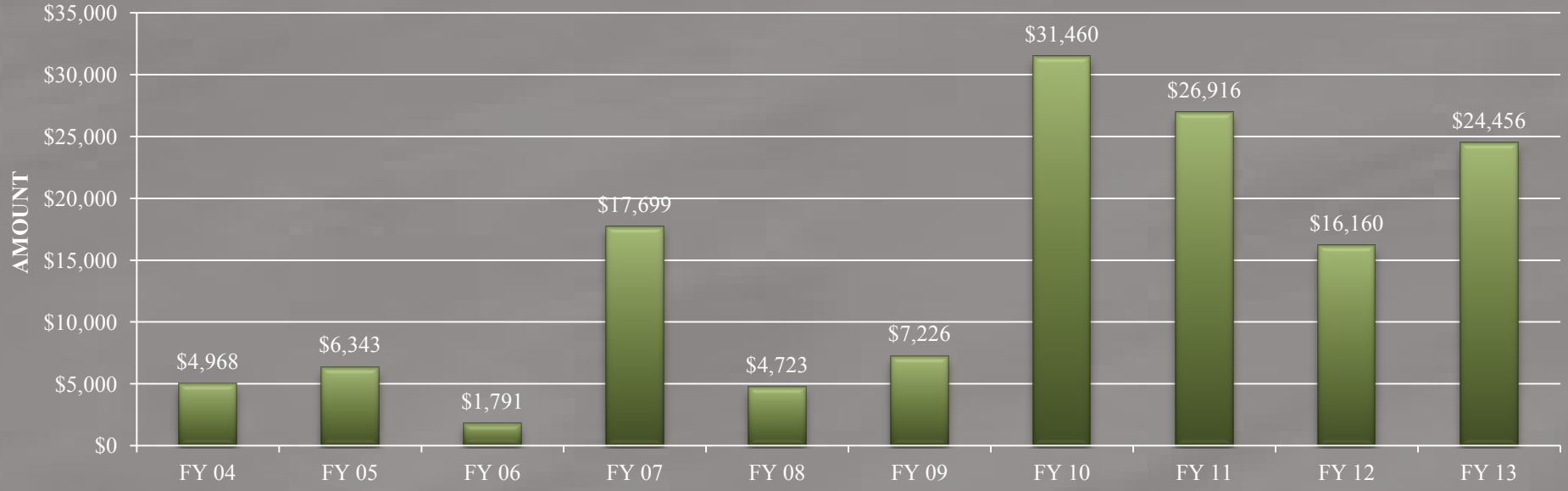
FY 13 IMPROVEMENTS &10-YEAR DAMAGE SUMMARY



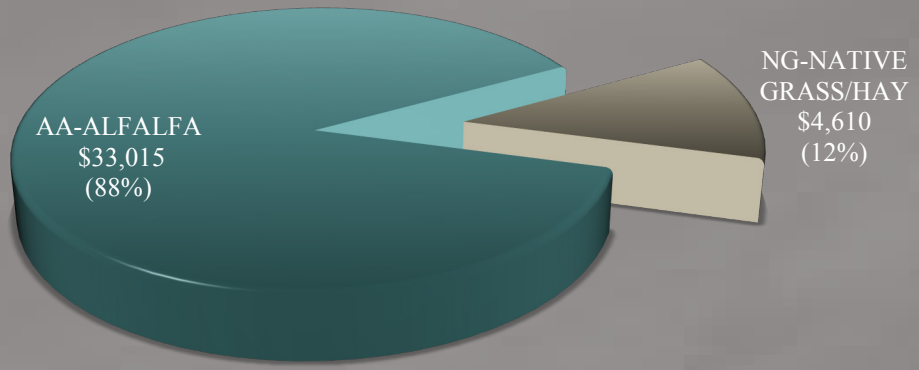


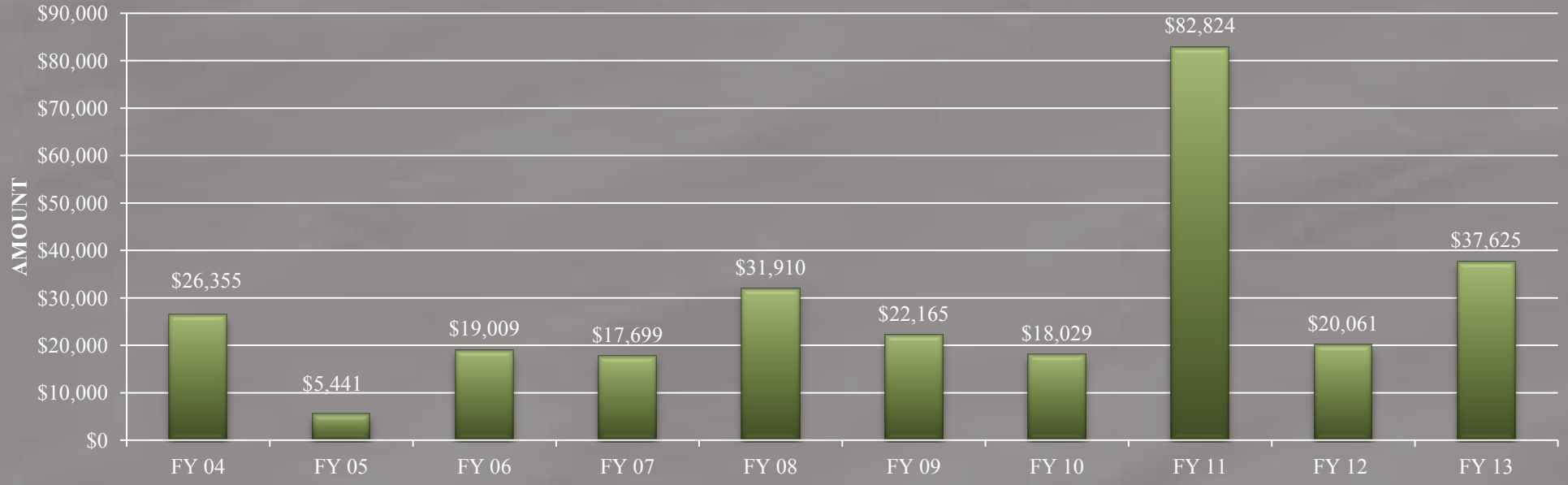
FY 13 SEED CROPS &10-YEAR DAMAGE SUMMARY



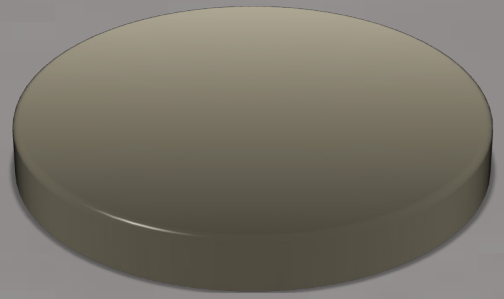


FY 13 STORED CROPS &10-YEAR DAMAGE SUMMARY

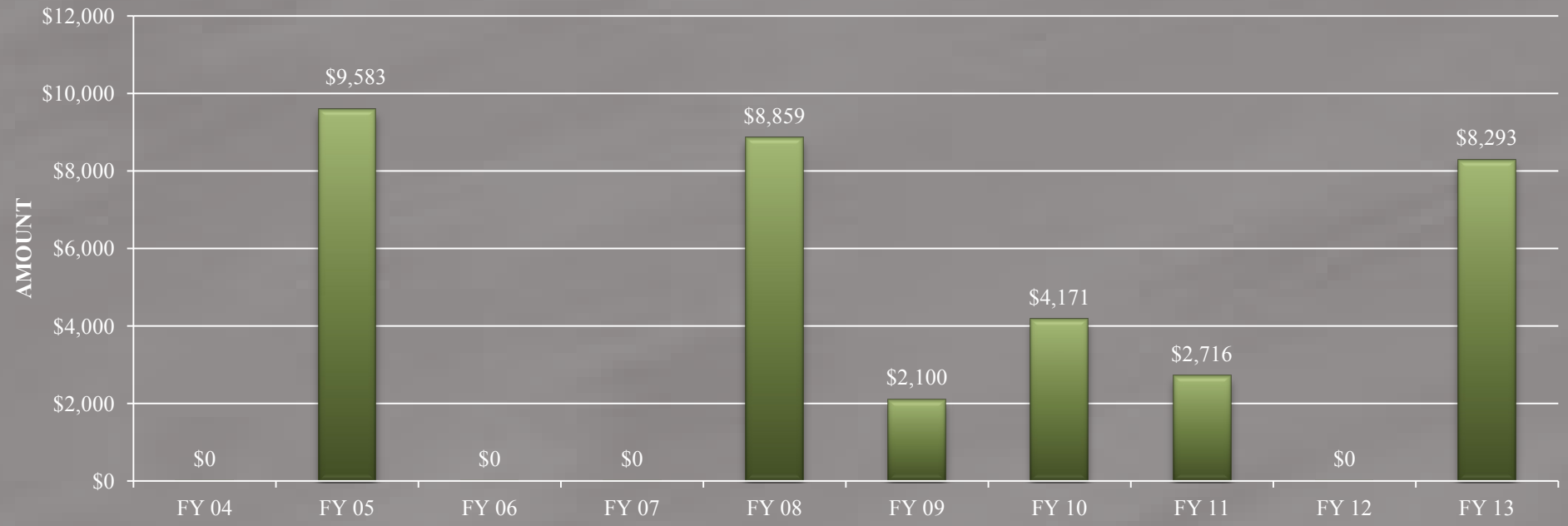




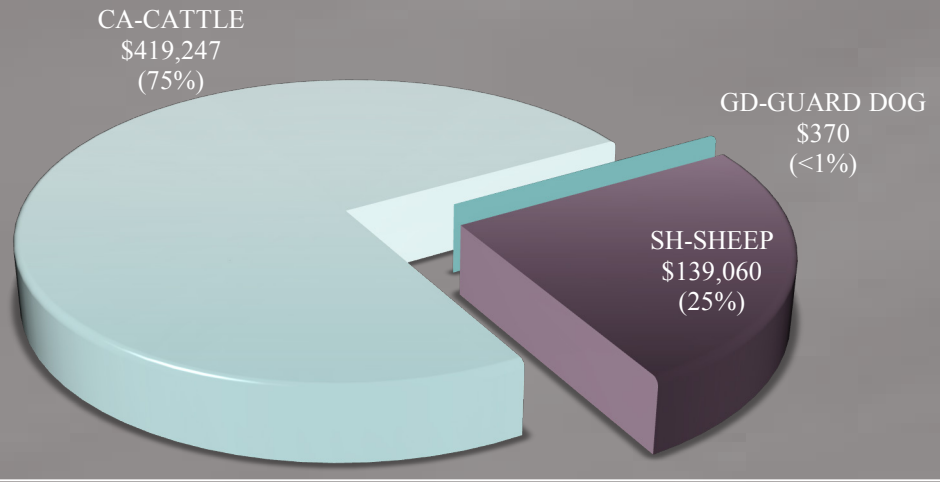
FY 13 BEES, HONEY AND HIVES &10-YEAR DAMAGE SUMMARY



BV-BEES, HONEY AND HIVES $8,293 (100%)



FY 13 LIVESTOCK &10-YEAR DAMAGE SUMMARY





FY 13 DAMAGE PAYMENTS BY SPECIES HERD UNIT

SPECIES	HERD UNIT/MGMT AREA	HERD CODE	AMOUNT PAID
ANTELOPE	COPPER MOUNTAIN	A203	$77,542.02
	FIFTEENMILE	A204	$5,981.25
	CARTER MOUNTAIN	A205	$8,864.50
	CARTER LEASE	A419	$1,472.22
	CRAZY WOMAN	A318	$1,400.00
	SUBLETTE	A401	$11,001.55
	UINTA-CEDAR MOUNTAIN	A411	$4,224.00
	DWYER	A524	$3,204.65
	BEAVER RIM	A632	$437.50
	PROJECT	A635	$2,075.00
		TOTAL PAID	**$116,202.69**
BLACK BEAR	GREY RIVER	BB102	$24,032.46
	ABSAROKA	BB201	$6,502.69
	BIGHORNS	BB301	$13,998.99
	SIERRA MADRE	BB401	$1,824.38
	UINTA	BB402	$860.00
	WIND RIVER	BB601	$7,023.08
	OUTSIDE MGMT AREA	NA	$1,165.00
		TOTAL PAID	**$55,406.60**
ELK	JACKSON	E102	$260.00
	FALL CREEK	E103	$35,856.08
	UPPER GREEN RIVER	E107	$3,500.00
	MEDICINE LODGE	E211	$1,857.30
	BLACK HILLS	E740	$15,335.50
	GOOSEBERRY	E214	$15,169.84
	CODY	E216	$3,474.62
	NORTH BIGHORN	E321	$2,177.82
	RAWHIDE	E730	$8,921.83
	SOUTH BIGHORN	E322	$1,096.00
	CLARK'S FORK	E217	$231.00
	UINTA	E423	$1,885.00
	SIERRA MADRE	E425	$3,976.80
	STEAMBOAT	E426	$5,307.50
	IRON MOUNTAIN	E531	$34,264.45
	SNOWY RANGE	E533	$17,536.09
	LAR. PEAK/MUDDY MTN	E741	$83,854.99
		TOTAL PAID	**$234,704.82**
MOOSE	SUBLETTE	MO105	$660.00
	LINCOLN	MO423	$2,570.00
		TOTAL PAID	**$3,230.00**

SPECIES	HERD UNIT/MGMT AREA	HERD CODE	AMOUNT PAID
MOUNTAIN LION	WEST	L101	$922.50
	NORTH-CENTRAL	L301	$45,701.16
	NORTHEAST	L701	$9,905.48
		TOTAL PAID	**$56,529.14**
MULE DEER	SUBLETTE	MD104	$4,404.20
	WYOMING RANGE	MD131	$886.14
	PAINTROCK	MD207	$11,362.70
	GREYBULL RIVER	MD210	$19,670.89
	SHOSHONE RIVER	MD211	$23,225.36
	SOUTHWEST BIGHORN	MD208	$4,137.09
	UPPER SHOSHONE	MD215	$3,300.00
	CLARK'S FORK	MD216	$21,818.89
	NORTH BIGHORN	MD321	$19,308.25
	UINTA	MD432	$154.00
	GOSHEN RIM	MD534	$17,166.69
	LARAMIE MTNS.	MD537	$522.00
	PROJECT	MD643	$892.00
		TOTAL PAID	**$126,848.21**
WHITE-TAILED DEER	BIGHORN BASIN	WT201	$34,738.65
	POWDER RIVER	WT303	$24,022.40
	SOUTHEAST WYOMING	WT504	$26,885.43
	CENTRAL	WT707	$1,160.00
	BLACK HILLS	WT706	$295.95
	NON HERD UNIT	WT999	$355.00
		TOTAL PAID	**$87,457.43**
GRAY WOLF	CLARK'S FORK	HUNT AREA 1	$16,575.30
	SUNLIGHT	HUNT AREA 2	$8,326.92
	GREYBULL	HUNT AREA 4	$13,517.96
	WIND RIVER	HUNT AREA 5	$17,842.56
	PACIFIC CREEK	HUNT AREA 6	$876.00
	TARGHEE	HUNT AREA 7	$309.75
	FISH CREEK	HUNT AREA 8	$1,904.00
	CRYSTAL CREEK	HUNT AREA 9	$1,400.00
	RIM	HUNT AREA 10	$2,402.55
	GREEN RIVER	HUNT AREA 11	$66,617.32
	ALPINE	HUNT AREA 12	$40,768.69
		TOTAL PAID	**$170,541.05**
GAME BIRDS	STATEWIDE	**TOTAL PAID**	**$1,671.24**
GRIZZLY BEAR	CRANDALL/SUNLIGHT	BMU6	$9,730.35
	SOUTH ABSAROKA	BMU16	$9,975.00
	CLARK'S FORK	BMU23	$17,872.47
	MEETEETSE	BMU24	$56,519.08
	WIND RIVER	BMU25	$10,059.19
	GROS VENTRE	BMU26	$63,705.75
	BACON CREEK	BMU32	$28,999.62
	BONDURANT	BMU33	$11,408.99
	WHISKEY	BMU34	$41,985.65
	UPPER GREEN	BMU35	$28,300.86
	OUTSIDE MGMT AREA	BMU999	$5,936.51
		TOTAL PAID	**$284,493.47**

KEY TO CATEGORIES AND TYPE OF DAMAGE

TYPES OF LIVESTOCK
CA-CATTLE
SH-SHEEP
HR-HORSE
GT-GOAT
SW-SWINE
LL-LLAMA
GD-GUARD DOG
OT-OTHER

TYPES OF STORED CROPS
AA-ALFALFA
CN-CORN
HL-HAYLAGE
WT- WHEAT
GR-GRAIN
GH-GRAIN HAY
NG-GRASS/NATIVE HAY
SL-SILAGE
OT-OTHER

TYPES OF EXTRAORDINARY DAMAGE TO GRASS
NG-GRASS/NATIVE HAY
OT-OTHER

TYPES OF IMPROVEMENTS
FM-FENCE
OR-ORNAMENTAL

TYPES OF GROWING-CULTIVATED CROPS
AA-ALFALFA
BE-BEANS
CN-CORN
GN-GARDEN
GR-GRAIN
NG-GRASS/NATIVE HAY
NS-COMMERCIAL NURSERY
SF-SUNFLOWER
SB-SUGAR BEETS
SL-SILAGE
WT-WHEAT
OT-OTHER

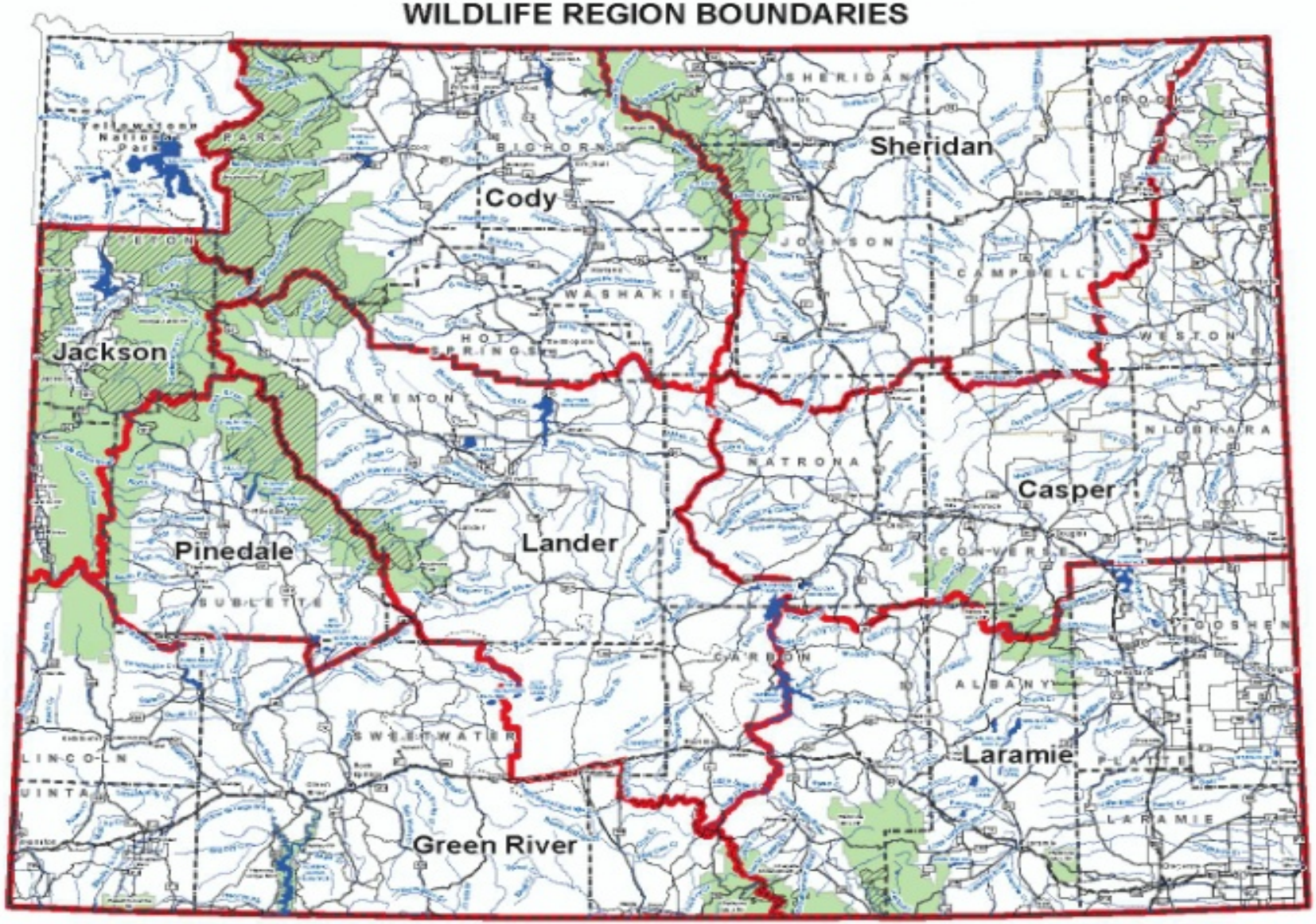
TYPES OF BEES, HONEY or HIVES
BV-BEES, HONEY, HIVES
OT-OTHER

TYPES OF SEED CROPS
AA-ALFALFA
CN-CORN
GH-GRAIN HAY
OT-OTHER

SPECIES	PROGRAM CODE
ANTELOPE	BC
ELK	BD
BIGHORN SHEEP	BE
MOOSE	BF
MOUNTAIN GOAT	BG
MOUNTAIN LION	BJ
BLACK BEAR	BK
GRIZZLY BEAR	BL
MULE DEER	BM
WHITE-TAILED DEER	BN
GRAY WOLF	BW
PHEASANT	CC
TURKEYS	CF
SAGE-GROUSE	CT
GEESE	DB
DUCKS	DC
CRANES	DF

CATEGORY OF DAMAGE
LIVESTOCK
STORED CROPS
GROWING-CULTIVATED CROPS
BEES, HONEY OR HIVES
EXTRAORDINARY DAMAGE TO GRASS
SEED CROPS
IMPROVEMENTS

WYOMING GAME AND FISH DEPARTMENT
WILDLIFE REGION BOUNDARIES



Version Date: 3 September 2013

WYOMING STATUTE W.S. §23-1-901 GOVERNING DAMAGE CLAIMS

W.S. §23-1-901. Owner of damaged property to report damage; claims for damages; time for filing; determination; appeal; arbitration.

(a) Any landowner, lessee or agent whose property is being damaged by any of the big or trophy game animals or game birds of this state shall, not later than fifteen (15) days after the damage is discovered by the owner of the property or the representative of the owner, report the damage to the nearest game warden, damage control warden, supervisor or commission member.

(b) Any landowner, lessee or agent claiming damages from the state for injury or destruction of property by big or trophy game animals or game birds of this state shall present a verified claim for the damages to the Wyoming game and fish department not later than sixty (60) days after the damage or last item of damage is discovered. The claim shall specify the damage and amount claimed. As used in this subsection, "verified claim" means a claim, which the claimant has signed and sworn to be accurate before a person authorized to administer oaths.

(c) The department shall consider the claims based upon a description of the livestock or bees damaged or killed by a trophy game animal, the damaged land, growing cultivated crops, stored crops including honey and hives, seed crops, improvements and extraordinary damage to grass. The commission is authorized to establish by rule, methods, factors and formulas to be used for determining the amount to compensate any landowner, lessee or agent for livestock damaged as a result of, missing as a result of, or killed by trophy game animals. Claims shall be investigated by the department and rejected or allowed within ninety (90) days after submission, and paid in the amount determined to be due. In the event the department fails to act within ninety (90) days, the claim, including interest based on local bank preferred rates, shall be deemed to have been allowed. No award shall be allowed to any landowner who has not permitted hunting on his property during authorized hunting seasons. Any person failing to comply with any provision of this section is barred from making any claim against the department for damages. Any claimant aggrieved by the decision of the department may appeal to the commission within thirty (30) days after receipt of the decision of the department as provided by rules of practice and procedure promulgated by the commission. The commission shall review the department decision at its next meeting following receipt of notice of request for review. The commission shall review the investigative report of the department, and it may approve, modify or reverse the decision of the department.

(d) Within ninety (90) days after receiving notice of the decision of the commission, the claimant may in writing to the department call for arbitration. Within fifteen (15) days after the department receives the call for arbitration, the claimant and the department shall each appoint a disinterested arbitrator who is an elector residing in the county where the damage occurred and notify each other of the appointment. Within twenty (20) days after their appointment, the two (2) arbitrators shall appoint a third arbitrator possessing the same qualifications. If the third arbitrator is not appointed within the time prescribed, the judge of the district court of the county or the court commissioner in the absence of the judge shall appoint the third arbitrator upon the application of either arbitrator.

(e) At least twenty (20) days before the hearing, the board of arbitrators shall provide the claimant and department notice of the time and place in the county when and where the parties will be heard and the claim investigated and decided by the board. A written copy of the decision shall be promptly served upon each party. Within ten (10) days after receipt of the decision, either party may apply to the board for modification of the decision under W.S. 1-36-111. Either party may apply to the district court for vacation of a decision under W.S. 1-36-114(a) or correction or modification of a decision under W.S. 1-36-115 within thirty (30) days after receipt of the decision or within twenty (20) days after action by the board on an application for modification under W.S. 1-36-111.

(f) If no applications under subsection (e) of this section are made after receipt of the decision, the commission shall promptly pay the amount, if any, including interest based on local bank preferred rates, awarded by the board. Within thirty (30) days after the award is final, the board's reasonable service and expense charges shall be paid by:

(i) The claimant if the award is no greater than the amount originally authorized by the commission;

(ii) Otherwise, the commission.

(g) For purposes of this section, “trophy game animals” shall include gray wolves located in the area described in W.S. 23-1-101(a)(xii)(B)(II) regardless of the date on which the damage occurs.

WYOMING GAME AND FISH COMMISSION
CHAPTER 28 REGULATION GOVERNING BIG OR TROPHY GAME ANIMAL OR GAME BIRD DAMAGE CLAIMS

Section 1. Authority. This regulation is promulgated by authority of W.S. §23-1-101, §23-1-102, §23-1-302, §23-1-304 and §23-1-901.

Section 2. Definitions. Definitions shall be as set forth in Title 23, Wyoming Statutes, Commission regulations, and the Commission also adopts the following definitions:

(a) "Authorized hunting seasons" means any hunting season during the twelve (12) month period immediately preceding the date when the claimant filed the verified claim with the Office of the Department that is established by Commission regulation, including Depredation Prevention Hunting Seasons and kill permits, for the harvest of the species of big game animals, trophy game animals, or game birds for which the verified claim was filed.

(b) "Award" means compensation for damage offered to a claimant by the Department.

(c) "Board" means a board of arbitrators.

(d) "Claimant" means any landowner, lessee or agent whose livestock, bees, hives or honey have been damaged or killed by a trophy game animal; or, whose land, growing cultivated crops, stored crops, seed crops, or improvements have been damaged by big game animals or game birds; or, whose grass has been extraordinarily damaged by big game animals or game birds.

(e) "Commercial garden" means a business that grows fruits or vegetables for commercial sale.

(f) "Commercial nursery" means a business that grows or stores trees, shrubs or plants solely for commercial sale and that is required under W.S. § 39-15-106 to be licensed with the Wyoming Department of Revenue to collect and remit sales and use tax.

(g) "Commercial orchard" means a business that grows trees for fruit or nut production for commercial sale.

(h) "Confirmed by the Department or its representative" means the Department or its representative conducted an inspection or investigation of the damage and determined the damage was more likely than not caused by a big or trophy game animal or game bird.

(i) "Consequential damages" means damage, loss, or injury that does not flow directly and immediately from the act of the big game animal, trophy game animal or game bird, but only from some of the consequences or results of such act. Consequential damages include, but are not necessarily limited to, future or anticipated production (except as otherwise provided in this regulation for young of the year livestock), sentimental value, and labor or equipment costs to remove damaged property.

(j) "Damage" means actual damage to land, growing cultivated crops, stored crops, seed crops or improvements that is caused by big game animals or game birds, and sworn by the claimant on the verified claim to have occurred; or, extraordinary damage to grass that is caused by big game animals or game birds and sworn by the claimant on the verified claim to have occurred; and, actual damage to livestock or bees including honey and hives, that is caused by trophy game animals and sworn by the claimant on the verified claim to have occurred. Damage shall not include damage to other real or personal property including, but not necessarily limited to: other vegetation or animals; motor vehicles; structures; damages caused by animals other than big game animals, trophy game animals or game birds; diseases; lost profits; consequential damages; or, any other damages whatsoever that are not specified in this regulation.

(k) "Disinterested arbitrator" means an elector residing in the county where the damage occurred, who is capable of making a reasoned and unbiased decision based on evidence presented to the Board by the claimant and the Department.

(l) "Extraordinary damage to grass" means the loss or harm as proven by the landowner, lessee, or agent that significantly exceeds the usual, customary or average use of non-cultivated grass plants of the Family Graminae.

(m) “Growing cultivated crops” means crops or other vegetation that are grown on privately owned or leased land and harvested or utilized annually for commercial sale or to feed livestock, or for human consumption. “Growing cultivated crops” can include grasses and legumes maturing for harvest, small grains, row crops and vegetables, plants grown in commercial nurseries, commercial orchards, commercial gardens, and native hay meadows that are managed for hay or livestock forage. If the crop is not harvested or utilized annually, it is not a growing cultivated crop unless it requires more than one (1) year to become established and ready for harvest. “Growing cultivated crops” do not include rangelands managed for livestock forage, or products of nurseries, orchards, and gardens that are not intended for commercial sale.

(n) “Hearing” means a procedurally correct arbitration hearing as described in Section 8 of this Regulation that shall be conducted in such manner as to afford the claimant and the Department the opportunity to present, examine, and cross-examine all witnesses and other forms of evidence presented to the Board.

(o) “Hives” means an artificial structure designed and constructed specifically for housing bees.

(p) “Improvements” means a valuable addition made to real estate to increase the productivity or value of land, including fences and man made structures erected or windbreaks or shelterbelts planted on privately owned or leased land to enhance or improve crop or livestock production or grazing management or as a protection for livestock. Improvements shall not include windbreaks or shelterbelts, if they are not planted solely to enhance or improve crop production or grazing management or as a protection for livestock.

(q) “Investigated by the Department” means an inspection determined by the Department to be a reasonable assessment of the damage caused by big or trophy game animals or game birds.

(r) “Kill permit” means a permit authorized by a Game and Fish Commissioner and the Chief Game Warden granting authority to take big game animals, trophy game animals or game birds that are causing substantial damage to property.

(s) “Land” means soil on privately owned or leased land.

(t) “Lessee” means a person who leases fee title land or State land for agricultural purposes.

(u) “More likely than not” means evidence reasonably tending to support the conclusion. Evidence that is competent, relevant, and material, and which to a rational and impartial mind naturally leads, or involuntarily leads to conclusion for which there is valid, just and reasonable substantiation.

(v) “Office of the Department” means the Wyoming Game and Fish Department, 5400 Bishop Blvd., Cheyenne, Wyoming 82006-0001 or the Wyoming Game and Fish Department, 3030 Energy Lane, Casper, Wyoming 82604.

(w) “Permitted hunting during authorized hunting seasons” means permitted hunting as described in Section 4 of this regulation.

(x) “Promptly served upon each party” means within ten (10) days following the arbitration hearing, the Board shall serve a written copy of its decision to the Office of the Department and the claimant.

(y) “Property” means livestock or bees, land, growing cultivated crops, stored crops including honey and hives, seed crops, improvements or grass that has been extraordinarily damaged.

(z) “Reasonable expense charges” means compensation given to an arbitrator while performing duties as an arbitrator that is the same compensation rate afforded to State employees by State statute for per diem and vehicular mileage; and, actual expenses incurred by the arbitrator and documented by receipt including, but not necessarily limited to, telephone calls, paper supplies, and mail service.

(aa) “Reasonable service charges” means reimbursement in the amount of one hundred ($100) dollars per day for performing duties as an arbitrator.

(bb) “Seed crops” means any crop intentionally planted, managed, and grown in accordance with accepted agricultural practices on privately owned or leased land for the production of seed for future propagation and that is harvested annually by manual or mechanical means. If the crop is not harvested annually, it shall not be classified as a seed crop unless the crop normally requires an establishment period of longer than one (1) year to be harvested or unless the crop is alfalfa seed or crested wheat grass seed.

(cc) “Stored crops” means crops that have been harvested and saved or stored for future use in accordance with accepted agricultural practices.

(dd) “Supervisor” means Regional Wildlife Supervisor.

(ee) “Trophy game animals” means black bear, gray wolf, grizzly bear or mountain lion or gray wolf in accordance with W.S. §23-1-901(g).

(ff) “Value of livestock” means the monetary value of individual livestock on the date the verified claim was filed with the Office of the Department based upon the fair market value on that date for like livestock at a rate substantiated by a livestock sales barn or other credible written valuation of the livestock provided by the claimant. However, the monetary value of young of the year livestock on the date the verified claim was filed with the Office of the Department shall be based upon the fair market value on that date for like livestock at the weaning weight substantiated by a livestock sales barn or other credible written valuation of the livestock provided by the claimant.

(gg) “Verified claim” means a Trophy Game Animal Damage Claim Affidavit or a Big Game Animal or Game Bird Damage Claim Affidavit that has been signed by the claimant and sworn to be accurate before a person authorized to administer oaths, that has been filed with the Office of the Department and contains all information required in Section 9 of this regulation.

Section 3. Damage to Livestock by Trophy Game Animals. Except as specified in subsection (a) of this section, the Department shall only offer payment for damage to individual livestock confirmed by the Department or its representative as having been injured or killed by a trophy game animal.

(a) In geographic areas determined by the Department to have terrain, topography, and vegetative characteristics that influence the ability of the claimant and Department to find missing calves and sheep that are believed to have been damaged as a result of a trophy game animal, the Department shall utilize the methods, factors and formulas in this subsection to determine the amount to compensate any landowner, lessee or agent for calves and sheep missing as a result of damage caused by a trophy game animal.

(i) Any claimant whose verified claim is for missing sheep or calves believed to have been damaged as a result of a trophy game animal, shall include on his verified claim the total known death loss, including missing animals, for the sheep or calves for the grazing season together with the number of such losses known to be due to causes other than damage by a trophy game animal.

(ii) Notwithstanding the use of the formulas in this section, the Department shall not offer compensation for more than the total known death loss less the number of such losses known to be due to causes other than damage by a black bear, grizzly bear, mountain lion, or gray wolf in those areas where gray wolves are designated as trophy game animals in accordance with Commission regulation. In order to utilize any formula, the Department or its representative must have confirmed the claimant had at least one (1) calf or one (1) sheep injured or killed by a trophy game animal.

(A) Calves and sheep in areas occupied by grizzly bears. To determine the amount of compensation due to a claimant for calves and sheep believed to be missing as a result of being damaged by a black bear, grizzly bear, or mountain lion in areas occupied by grizzly bears, the Department shall utilize the following formula:

(I) Number of individual calves or sheep confirmed by the Department or its representative killed by a black bear, grizzly bear, or mountain lion multiplied by three and one-half (3.5) multiplied by the value of livestock equals the amount of compensation.

(II) Sheep in areas not occupied by grizzly bears. To determine the amount of compensation due to a claimant for sheep believed to be missing as a result of being damaged by a black bear or mountain lion in areas not occupied by grizzly bears, the Department shall utilize the following formula:

(III) Number of individual sheep confirmed by the Department or its representative killed by a black bear or mountain lion multiplied by three (3) multiplied by the value of livestock equals the amount of compensation.

(iii) Sheep in areas set forth by Commission regulation where gray wolves are designated as trophy game animals. To determine the amount of compensation due to a claimant for sheep believed to be missing as a result of being damaged by gray wolves, in areas occupied by wolves, the Department shall utilize the following formula:

(A) Number of individual sheep confirmed by the Department or its representative killed by a gray wolf multiplied by seven (7) multiplied by the value of livestock equals the amount of compensation.

(iv) Calves in areas set forth by Commission regulation where gray wolves are designated as trophy game animals. To determine the amount of compensation due to the claimant for calves believed to be missing as a result of being damaged by gray wolves, in area occupied by gray wolves, the Department shall utilize the following formula:

(A) Number of individual calves confirmed by the Department or its representative killed by gray wolves multiplied by seven (7) multiplied by the value of livestock equals the amount of compensation.

(b) Veterinary costs for the treatment of individual livestock that have been injured by a trophy game animal shall be considered up to a maximum amount that is not to exceed the value of the livestock injured, only in cases where a licensed veterinarian believes the individual livestock in question had a reasonable chance to survive and return to a productive state. If the individual livestock died as a result of an injury inflicted by a trophy game animal, even though the livestock received veterinary care, payment shall only be made up to a maximum of the value of the livestock.

Section 4. Permitted Hunting During Authorized Hunting Seasons.

(a) A landowner shall not be eligible to receive an award for damage caused by big game animals, trophy game animals, or game birds unless the landowner has permitted hunting during authorized hunting seasons for the species for which the verified claim has been filed on his privately owned or leased land and adjoining Federal or State land within the herd unit in which the damage occurred in accordance with this section. For an award to be allowed, the landowner shall permit hunting during authorized hunting seasons delineated in subsection (i)(A) if the species of big game animals, trophy game animals, or game birds for which the verified claim was filed were present on the landowner's privately owned or leased land and adjoining Federal or State land during authorized hunting seasons delineated in subsection (i)(A). If the species of big game animals, trophy game animals, or game birds for which the verified claim has been filed were not present on the landowner's privately owned or leased land and adjoining Federal or State land during the authorized hunting seasons as delineated in subsection (i)(A), for an award to be allowed the landowner shall permit hunting during authorized hunting seasons delineated in (i)(B) and (i)(C) if requested by the Department. The landowner shall permit hunting during authorized hunting seasons delineated in (i)(B) and (i)(C) without access fees to hunters or the Department.

(i) Authorized hunting seasons include:

(A) Hunting seasons as established by Wyoming Game and Fish Commission rule and regulation;

(B) Depredation prevention hunting seasons as approved by a District Wyoming Game and Fish Commissioner and the Chief Game Warden; or,

(C) Lethal taking of wildlife through a kill permit as approved by a District Wyoming Game and Fish Commissioner and the Chief Game Warden.

(b) The Department shall determine if the landowner permitted hunting during authorized hunting seasons for the species of big game animals, trophy game animals, or game birds for which the verified claim has been filed. For an award to be allowed, the Department shall have to determine the landowner allowed sufficient numbers of hunters to access his privately owned or leased land and adjoining Federal or State land to harvest more than the number of big game animals, trophy game animals or game birds recruited in the preceding twelve (12) months into the segment of the population responsible for doing damage. The landowner shall contact the game warden to whom he reported the damage to determine how many big game animals, trophy game animals, or game birds meets the requirement of more than the number of big game animals, trophy game animals or game birds recruited in the preceding twelve (12) months into the segment of the population responsible for doing damage. An award may be allowed if the Department determines a reduction in big game animals, trophy game animals or game birds affects the Department's ability to sustain the population at the objective the Commission has established for the herd unit.

Section 5. Notification of Damage and Filing of Damage Claims.

(a) Any claimant who has incurred damage as defined in Section 2 of this Regulation shall report the damage to the nearest game warden, supervisor, or Commission member within fifteen (15) consecutive days following the date damage was discovered. If the claimant intends to take actions that prevent the damage being investigated by the Department, such as harvest of damaged crops or removal of damaged livestock, the claimant shall notify the nearest game warden, supervisor, or Commission member as soon as reasonably possible after discovery of the damage so the damage can be investigated by the Department prior to removal, harvest, modification, or destruction of the damaged property; however, in no case shall the claimant take actions that preclude the damage being investigated by the Department. If the claimant denies or precludes the damage being investigated by the Department, the Department shall deny the verified claim.

(b) The claimant shall present a verified claim in accordance with Section 9 of this regulation to the Office of the Department within sixty (60) consecutive days following the date the last item of damage was discovered.

(i) For verified claims of damage to individual livestock by a trophy game animal, the sixty-day (60) period shall commence from the last date the livestock were present on the grazing allotment or geographic location where the damage occurred;

(ii) For verified claims of damage to bees, honey, and hives by a trophy game animal, the sixty (60) day period shall commence from the last date damage occurred or from the last date the bees, honey, or hives were present on the location where the damage occurred, whichever date occurs first; and,

(iii) For verified claims of damage to land, growing cultivated crops, seed crops, stored crops, improvements, or extraordinary damage to grass by big game animals or game birds, the sixty (60) day period shall commence from the last date the growing cultivated crop or seed crop was harvested or the land, stored crops, or improvements were damaged or the extraordinary damage to grass occurred.

(c) If a claimant chooses to appeal the Department's decision regarding a verified claim to the Commission, the claimant shall file a written appeal that is received by the Office of the Department within thirty (30) consecutive days from the date the claimant received the Department's notification of its decision on the verified claim.

(d) The claimant shall have no right of appeal to the Commission of the Department's denial of the claim if based upon the information provided by the claimant in the verified claim, the claimant failed to comply with subsection (a) or (b) of this section. The claimant shall have no right of appeal to the Commission of the Department's decision on a verified claim if the claimant failed to comply with subsection (c) of this section.

Section 6. Investigation and Payment of Verified Claims.

(a) When investigating damage claims, the Department shall utilize the standard of "more likely than not" in determining whether or not the damage was the result of big or trophy game animals or game birds.

(b) The Department shall consider damage that was discovered by the claimant and reported to the nearest game warden, supervisor or Commission member within fifteen (15) consecutive days after the date the damage was discovered. Any damage that was reported more than fifteen (15) consecutive days after the date it was discovered by the claimant shall not be considered by the Department as damage under this regulation.

(c) The Department shall investigate the verified claim and either reject the claim or provide for full or partial payment to the claimant within ninety (90) consecutive days following the date the Office of the Department received the verified claim.

Section 7. Reasons for Denial of a Verified Claim.

(a) The Department shall deny the verified claim for any of the reasons specified in this subsection.

(i) The claimant did not report the damage to the nearest game warden, supervisor or Commission member within fifteen (15) consecutive days after the date the damage was discovered. Any damage that was reported more than fifteen (15) consecutive days after the date it was discovered by the claimant shall not be considered by the Department as damage under this regulation.

(ii) The damage was caused by animals or wildlife other than big game animals, trophy game animals or game birds.

(iii) The big or trophy game animals or game birds causing damage were on the landowner's privately owned or leased land and adjoining Federal or State land during authorized hunting seasons as specified in Section 4(a)(i)(A), and the landowner did not permit hunting in accordance with Section 4(a) of this regulation.

(iv) The big or trophy game animals or game birds causing damage were not on the landowner's privately owned or leased land and adjoining Federal or State land during authorized hunting seasons as specified in Section 4(a)(i)(A), and the landowner would not agree to the Department's implementation of a depredation prevention hunting season as specified in Section 4(a)(i)(B) or insisted on charging an access fee to hunters to participate in a depredation prevention hunting season as specified in Section 4(a).

(v) The big or trophy game animals or game birds causing damage were not on the landowner's privately owned or leased land and adjoining Federal or State land during authorized hunting seasons as specified in Section 4(a)(i)(A), and the landowner would not agree to the Department's implementation of a kill permit as specified in Section 4(a)(i)(C) or insisted on charging an access fee to the Department to implement a kill permit as specified in Section 4(a).

(vi) The verified claim was for property not defined as property in Section 2 of this regulation.

(vii) The claimant was compensated by crop or livestock insurance or a Federal subsidy program for the property damaged to the extent the claimant received compensation under that insurance or program.

(viii) The claimant did not present a verified claim complete with all required information specified in Section 9 of this regulation to the Office of the Department within sixty (60) days after the damage or last item of damage was discovered by the claimant.

(ix) The verified claim was for consequential damages.

(x) Hunting was not permitted during authorized hunting seasons on land in a platted subdivision where the damage occurred due to the actions of a municipal or county ordinance, or homeowners' association covenant prohibiting the discharge of firearms.

(xi) Due to actions of the claimant, the damage was not investigated by the Department.

(xii) The landowner prevented the Department's attempts to mitigate or alleviate the damage through such actions as moving the big or trophy game animals or game birds responsible for the damage or the claimant refused to utilize fencing materials provided by the Department to protect stored crops, including honey and hives.

Section 8. Arbitration.

(a) If the claimant wishes to appeal the Commission's decision regarding a verified claim, the claimant shall file a written call for arbitration with the Office of the Department within ninety (90) consecutive days from the date the claimant received written notice from the Office of the Department of the Commission's decision.

(b) If the claimant calls for arbitration, the claimant and the Office of the Department shall each appoint a disinterested arbitrator within fifteen (15) consecutive days from the date the Office of the Department received the written call for arbitration.

(c) When the claimant and the Office of the Department appoint arbitrators, written notification of the name, mailing address, and telephone number of arbitrators they selected shall be made by each party to the other within fifteen (15) consecutive days from the date the Office of the Department received the written call for arbitration.

(d) Within twenty (20) consecutive days after their appointment, the two (2) arbitrators shall appoint a third arbitrator. The two (2) arbitrators selected shall notify both the claimant and the Office of the Department in writing of the name, mailing address, and telephone number of the third arbitrator selected. If the third arbitrator is not appointed within this time period, the judge of the district court of the county or the court commissioner in the absence of the judge shall appoint the third arbitrator upon the application of either arbitrator.

(e) The three (3) arbitrators shall appoint a chairman who shall chair the Board and serve as secretary to carry out the correspondence of the Board.

(f) At least twenty (20) consecutive days before the hearing, the Board shall provide the claimant and the Office of the Department written notice of the time and place in the county when and where the testimony of the claimant and the Department shall be heard and the claim investigated and decided by the Board.

(g) Following the arbitration hearing, the Board shall within ten (10) days provide a written copy of its decision to the Office of the Department and the claimant.

(h) Unless otherwise specified in this section, the Uniform Arbitration Act, W.S. § 1-36-101 et seq. shall apply to the hearing.

(i) The decision of the Board shall become part of the Office of the Department's file and shall be made part of the record in the event of an appeal of the Board's decision and any appeal to district court shall be conducted in conformity with the Uniform Arbitration Act, W.S. §1-36-114(a) or W.S. §1-36-115.

Section 9. Verified Claim Requirements. The verified claim required by W.S. 23-1-901(b) shall be submitted on the form prescribed by the Department. The verified claim shall contain the following information:

(a) A description of the land on which the damage occurred, including the legal description (section, range, township), the county in which the land is located, and whether the land is privately owned, leased, or federally owned;

(b) Whether the claimant is the landowner, lessee, or agent of the landowner or lessee;

(c) A description of individual livestock, including the number, age class and sex if known, or description of bees, including honey and hives, damaged or killed by a trophy game animal;

(d) A description of the land, growing cultivated crops, stored crops, seed crops, or improvements damaged by a big game animal or game bird; or a description of the grass extraordinarily damaged by a big game animal or game bird;

(e) Competent, relevant and material evidence provided by the claimant that a big game animal, trophy game animal, or game bird caused the damage;

(f) The dates during which damage took place, to include the specific date the damage was discovered by the claimant and the specific date the damage ended;

(g) The amount and value of livestock or property damaged, including all calculations and evidence supporting the value determination;

(h) The species and number, if known, of big or trophy game animals or game birds that caused the damage;

(i) The name of the game warden, supervisor or Commission member to whom the claimant reported the damage and the specific date it was reported;

(j) Information to allow the Department to determine whether or not the landowner permitted hunting during authorized hunting seasons for the species causing damage in accordance with Section 4 of this regulation;

(k) Information as to whether or not an access fee was charged by the claimant for permitting hunting during authorized hunting seasons for the species of big game animal, trophy game animal or game bird for which the verified claim was filed; the total amount of access fee charged per hunter; and, the total number of hunters permitted to hunt during authorized hunting seasons for the species causing damage;

(l) Information by which the Office of the Department can recognize the claimant signed and swore before a person authorized to administer oaths (notarized) the verified claim to be accurate;

(m) For verified claims for calves and sheep missing as a result of damage by a trophy game animal, the total known death loss, including missing animals, for the sheep or calves for the grazing season together with the number of such losses known to be due to causes other than damage by a trophy game animal;

(n) Information to indicate if all or what portion of the property damaged was compensated for by crop or livestock insurance or a Federal subsidy program to the extent the claimant received compensation under that insurance or program; and,

(o) The claimant may submit additional supporting information, which shall be considered as part of the verified claim.

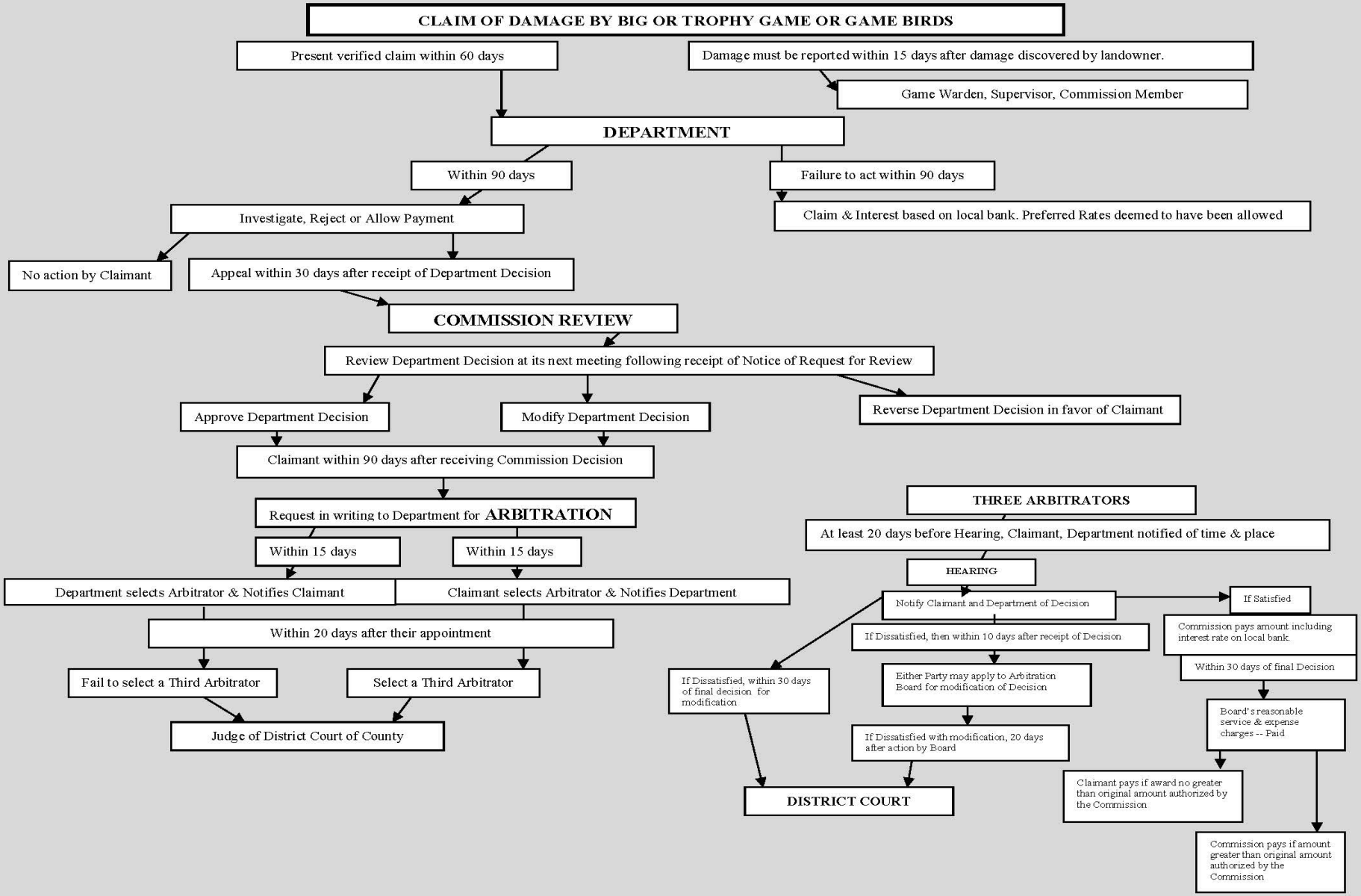
WYOMING GAME AND FISH COMMISSION

By: _____

Mike Healy, President

Dated: January 22, 2014

DAMAGE CLAIM PROCEDURE FLOW CHART



From: Steve Kallin
To: Jeffrey Warren
Cc: Cris Dippel; Eric Cole
Subject: FW: damage payments wildlife Wyoming
Date: Wednesday, April 15, 2015 11:34:22 AM
Attachments: FinalDCFY13.pdf

Jeff:

Attached is a bit of information concerning the WGFD process of paying for wildlife damage and their tally of conflicts. You were interested in having a "wildlife conflicts" database developed prior to the implementation of the AMP. The attached provides a bit of info about what they are already doing.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Huijser, Marcel [mailto:mhuijser@coe.montana.edu]
Sent: Monday, March 16, 2015 1:17 PM
To: Steve Kallin
Subject: damage payments wildlife Wyoming

From: Doug Brimeyer [mailto:doug.brimeyer@wyo.gov]
Sent: Friday, March 13, 2015 9:23 AM
To: Huijser, Marcel
Subject: Re: question for report National Elk Refuge

Marcel
The figures I mentioned earlier were for the entire state. I am attaching the latest damage claim summary for your review. The document breaks down the costs by species and region in the state. It may be useful to pull out the figures for damage in the Jackson Region. Please take a look at the attachment and let me know if you have any other questions.

On Thu, Mar 12, 2015 at 4:57 PM, Huijser, Marcel <mhuijser@coe.montana.edu> wrote:

> Hello Doug,
>
> The National Elk Refuge is almost done reviewing the report on the highway and the refuge. I interviewed you last summer for this report.
> A quick question: the $700,000 mentioned below for the entire state of Wyoming, correct? Not just for Jackson Hole area, correct?

> “Even with the ongoing hazing and supplementary feeding programs in the area, Wyoming Game & Fish Department spends about $700,000 per year to compensate private landowners for crop damage (Pers. Comm. Doug Brimeyer , Wyoming Game & Fish Department).”
>
> Note: I hope that NER will allow me to send the draft report to you and other interviewees sometime in April for final check/corrections.
>
> Thanks again for your help, Marcel

--
Doug Brimeyer
Jackson/Pinedale Wildlife Management Coordinator
Wyoming Game and Fish Department
doug.brimeyer@wyo.gov
307-733-2321 ext. 230

E-Mail to and from me, in connection with the transaction
of public business, is subject to the Wyoming Public Records
Act and may be disclosed to third parties.

Wyoming Game and Fish Department



WILDLIFE DAMAGE CLAIM REPORT

FISCAL YEAR 2013 WITH 10-YEAR SUMMARY

WILDLIFE DIVISION

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PREFACE

Common law in America, which has been continually reinforced in the United States courts, holds that the people of the state own the wildlife. No individual holds absolute property right to wildlife regardless of the status of the land on which the animal is found. Since wildlife belongs to everyone, the courts contend that everyone must share in its keep. As a result, courts have ruled the states are immune from liability for damage caused by wild animals, unless the state assumes that responsibility. Wyoming has assumed limited liability through legislation for some species of wildlife and under specific circumstances(see W.S. § 23-1-901 on page 38).

Wyoming Statute W.S. § 23-2-101(e) was passed by the legislature in an effort to provide a funding source for the payment of big or trophy game animal and game bird damage claims. That source of money is generated from a nonresident application fee of $14 and a resident application fee of $5 for any limited quota big or trophy game license issued through a drawing or for a wild bison license. The statute provides for 25% of the fees collected from license applications to be set aside to establish and maintain a fund of $500,000 to compensate landowners or lessees for property damaged by big or trophy game animals and game birds.

Wildlife damage management is a major component of the Wyoming Game and Fish Department's (WGFD) Wildlife Management Program. Considerable efforts are made to prevent damage including hazing, use of zon guns, providing materials for stackyard fences, relocating trophy game animals, increasing harvest, depredation seasons and, as a last resort, "kill" permits.

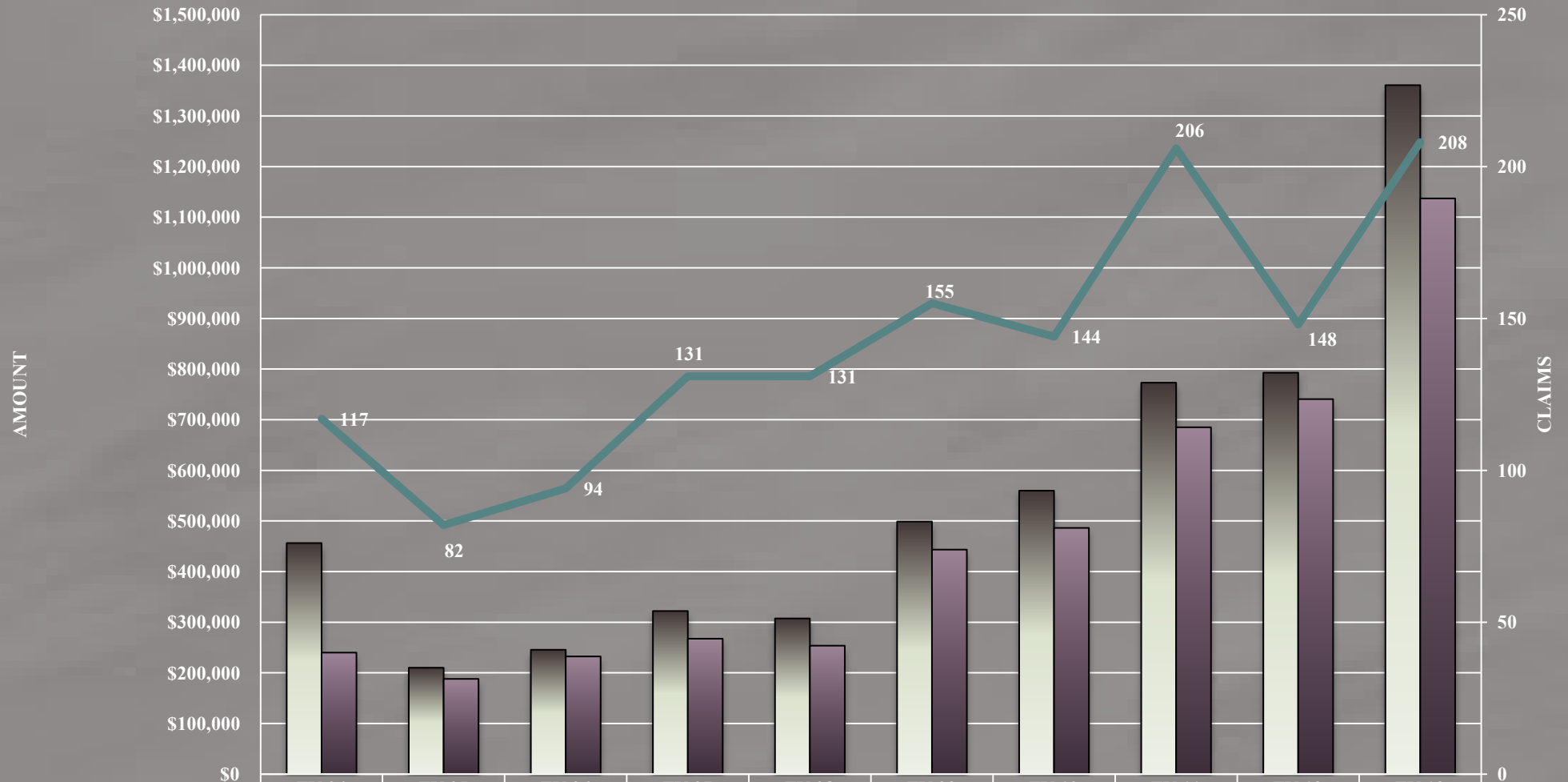
A landowner may submit a verified claim requesting compensation for damage. Claimants must meet all statutory and regulatory requirements in notifying WGFD personnel and filing the claim. WGFD personnel investigate the claim and verify the claimed damage using guidelines established by the WGFD in *The Handbook of Wildlife Depredation Techniques*. Claimants who do not wish to accept the WGFD's offer of payment may appeal the claim to the Wyoming Game and Fish Commission. If the claimant wishes to appeal the decision of the Commission, the claim may be appealed to an arbitration board and proceed on to District Court (see the Damage Claim procedure flow chart on pages 46).

Figures in this summary represent information obtained from verified claims of damage occurring in the depicted fiscal years. These figures will vary from information in the WGFD's Annual Report because program and personnel costs are combined in the Annual Report and payments of claims in the Annual Report only reflect actual payments made in that fiscal year. The Wildlife Damage Claim Summary is an effort to reflect the damage claim amounts and the amounts paid on claims which includes both claim amounts and amounts paid as if they occurred in the same fiscal year.

10-YEAR SUMMARY OF DAMAGE CLAIM ACTIONS

FISCAL YEAR	# OF CLAIMS	% OF CLAIMS PAID	% PAID IN FULL	% PAID PARTIALLY	% DENIED 15 DAY NOTICE	% DENIED 60 DAY FILING	% DISALLOWED (for other reasons covered by statute)	% APPEALED TO COMMISSION	% APPEALED TO ARBITRATION
04	117	95%	77%	18%	1%	3%	1%	5%	1%
05	82	100%	74%	26%	0%	0%	0%	2%	0%
06	94	97%	80%	17%	1%	1%	1%	1%	0%
07	131	97%	75%	22%	0%	2%	2%	1%	1%
08	131	95%	81%	13%	0%	4%	1%	1%	0%
09	155	97%	75%	22%	1%	2%	<1%	1%	1%
10	144	100%	82%	18%	0%	0%	0%	3%	1%
11	206	99%	84%	15%	<1%	0%	0%	1%	<1%
12	148	98%	82%	16%	0%	1%	1%	<1%	0%
13	208	99%	78%	20%	0%	0%	<2%	<1%	0%

10-YEAR DAMAGE CLAIM PAYMENT SUMMARY

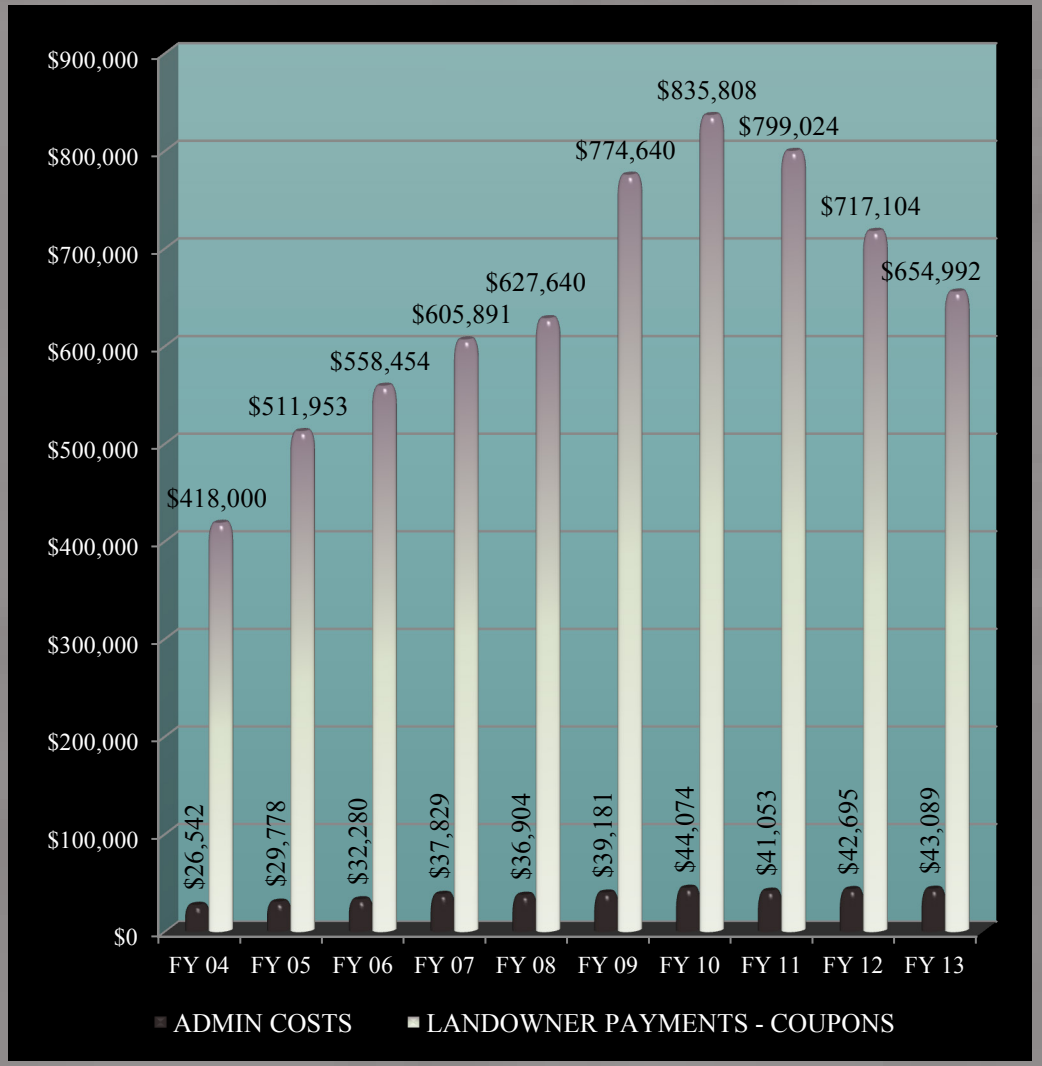


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMOUNT CLAIMED	456,406	210,189	245,653	322,153	307,504	498,914	559,876	773,154	792,950	1,360,735
AMOUNT PAID **	240,055	188,087	232,460	267,525	253,734	443,450	486,306	685,143	740,712	1,137,085
#CLAIMS	117	82	94	131	131	155	144	206	148	208

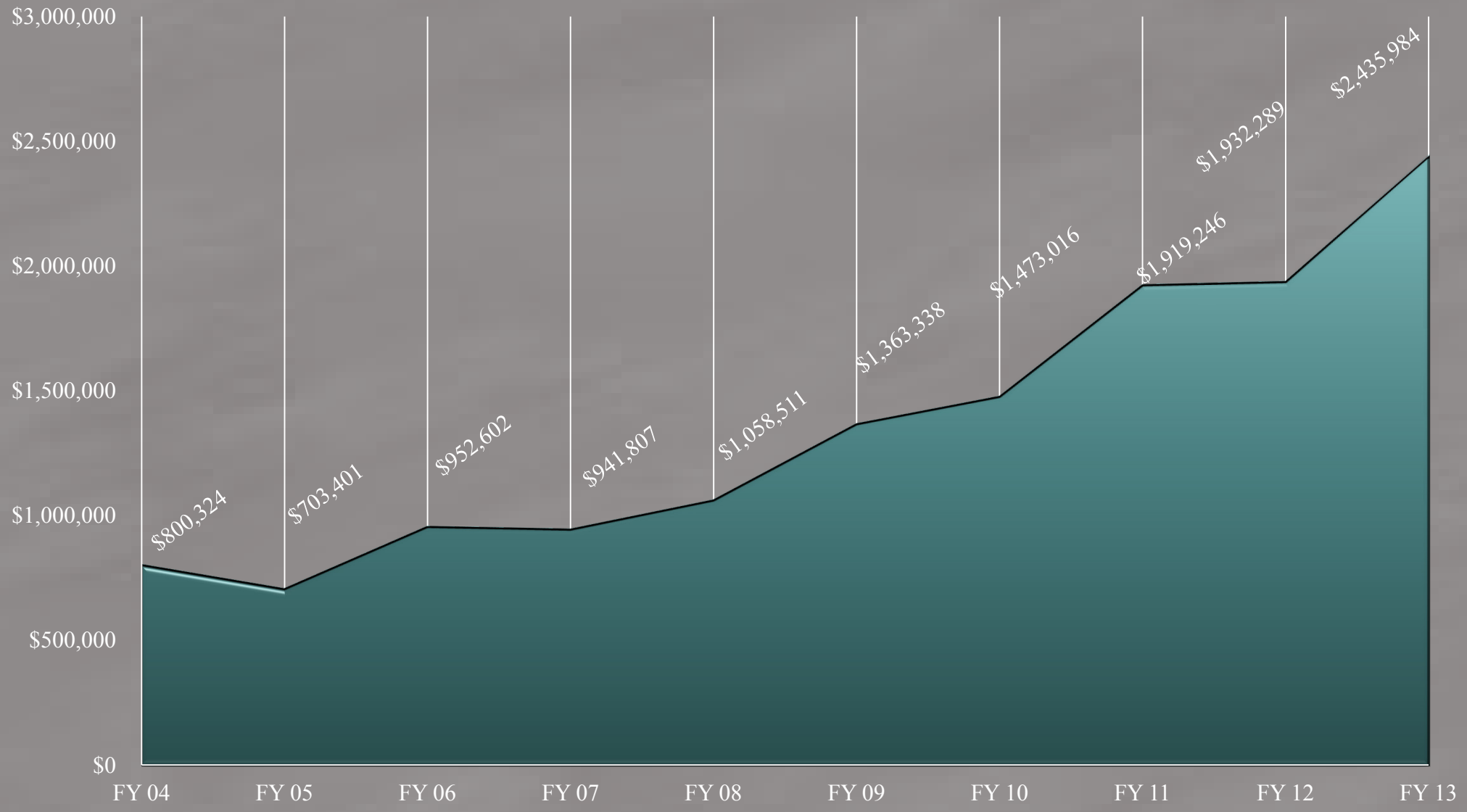
** Amount paid reflects the total dollar amount paid for claims filed in each fiscal year. In some cases, actual payment was made in FY 13 for claims filed in the previous fiscal year. For this reason, these figures may differ with figures in the Department's Annual Report.

10-YEAR SUMMARY OF PREVENTION, HANDLING AND ADMINISTRATION COSTS

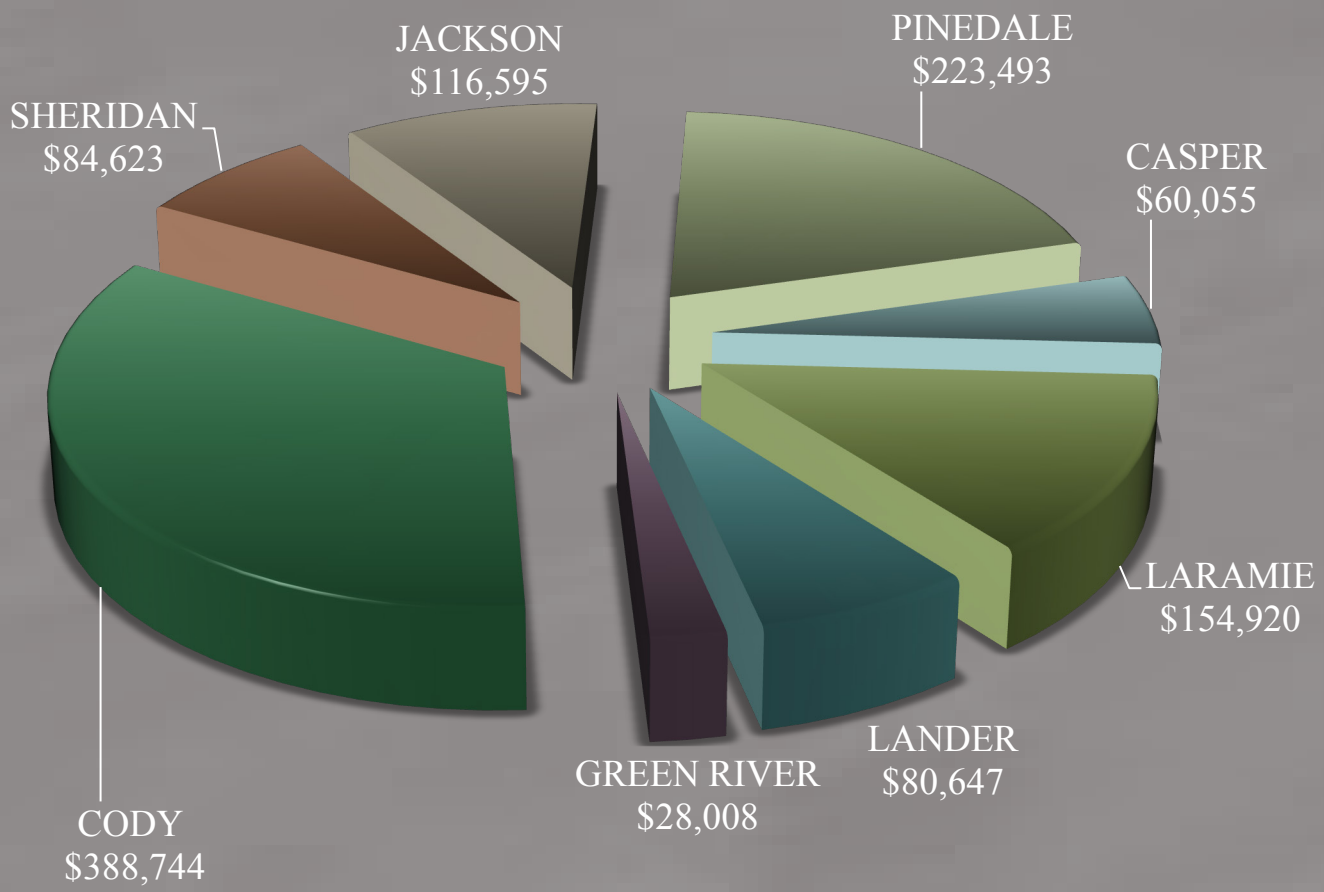




10-YEAR SUMMARY TOTAL DAMAGE PROGRAM COSTS



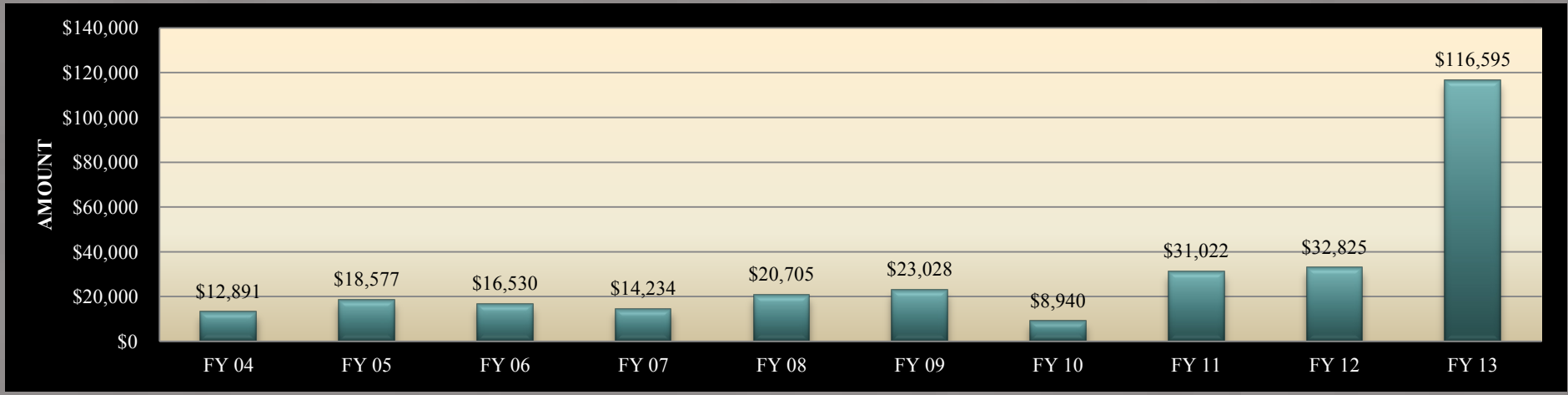
FY 13 AMOUNT, PERCENTAGE AND NUMBER OF CLAIMS PAID BY REGION

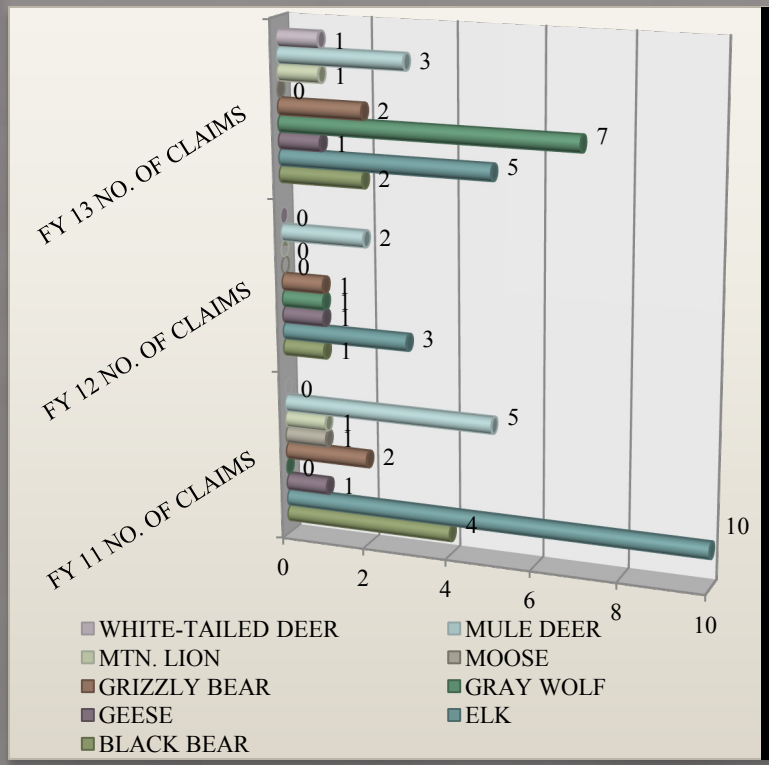


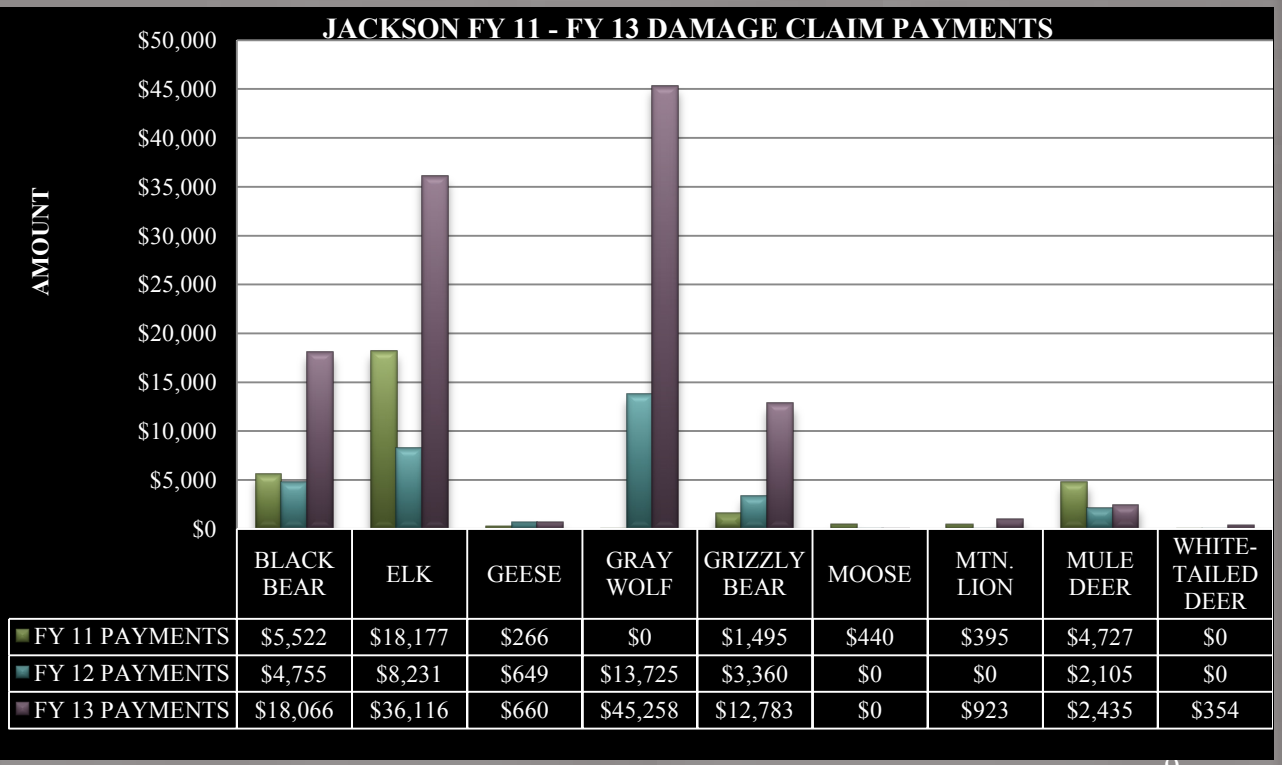
REGION	AMOUNT PAID	PERCENTAGE	NUMBER OF CLAIMS
JACKSON	$116,595	10%	14
CODY	$388,744	34%	76
SHERIDAN	$84,623	7%	21
GREEN RIVER	$28,008*	3%	13
LARAMIE	$154,920	14%	24
LANDER	$80,647	7%	12
CASPER	$60,055	5%	21
PINEDALE	$223,493	20%	27
TOTAL FY 13 DAMAGE AMOUNT PAID	**$1,137,085**		**208**

* This amount paid figure includes a Department approved payment for $765.00 that, as of this report date, is pending action from the claimant.

JACKSON REGION

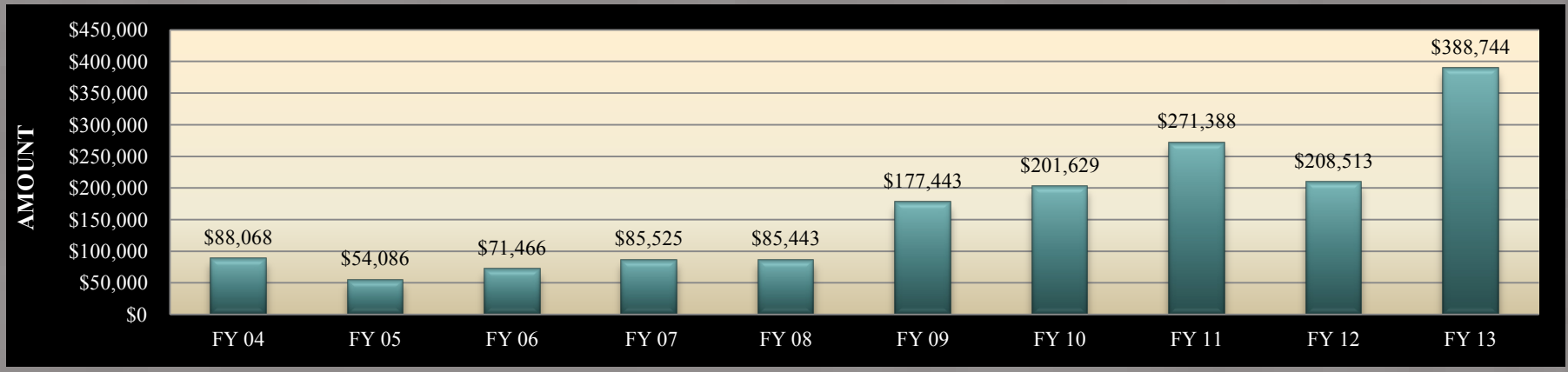


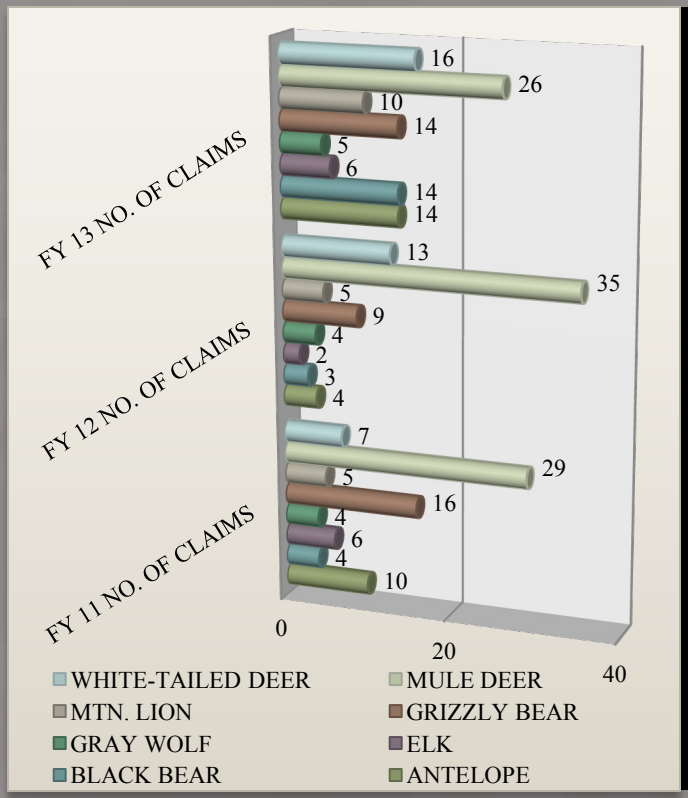


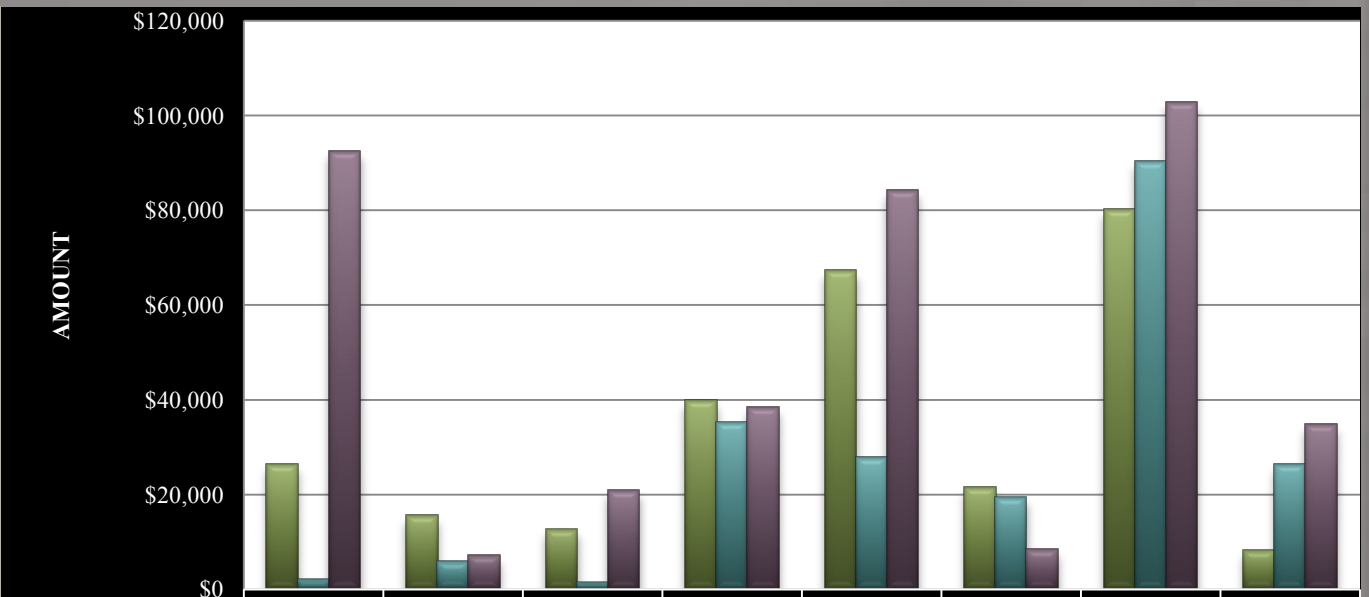


	BLACK BEAR	ELK	GEESE	GRAY WOLF	GRIZZLY BEAR	MOOSE	MTN. LION	MULE DEER	WHITE-TAILED DEER
FY 11 PAYMENTS	$5,522	$18,177	$266	$0	$1,495	$440	$395	$4,727	$0
FY 12 PAYMENTS	$4,755	$8,231	$649	$13,725	$3,360	$0	$0	$2,105	$0
FY 13 PAYMENTS	$18,066	$36,116	$660	$45,258	$12,783	$0	$923	$2,435	$354

CODY REGION

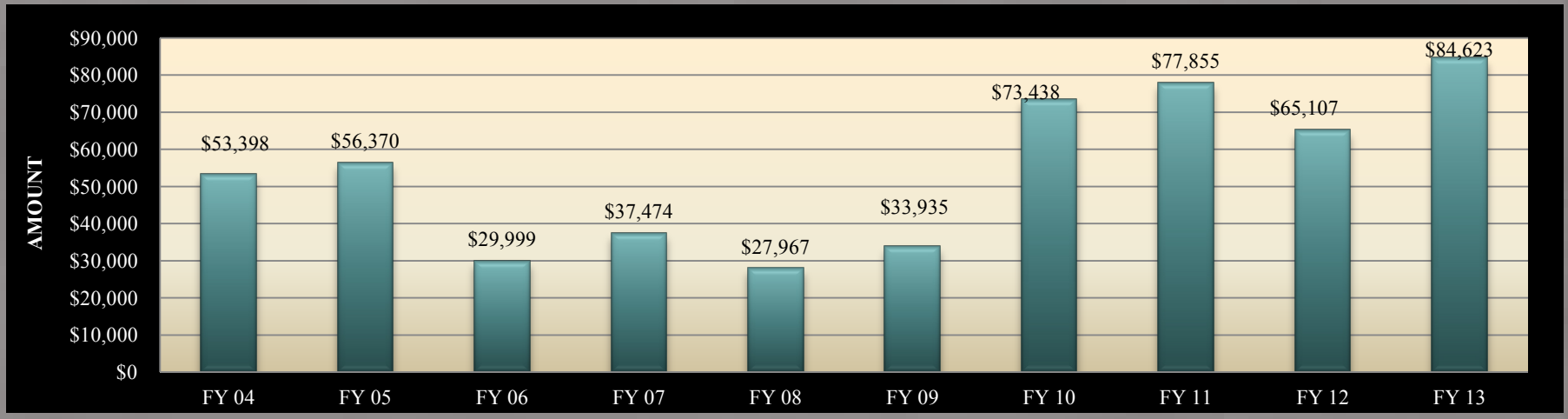


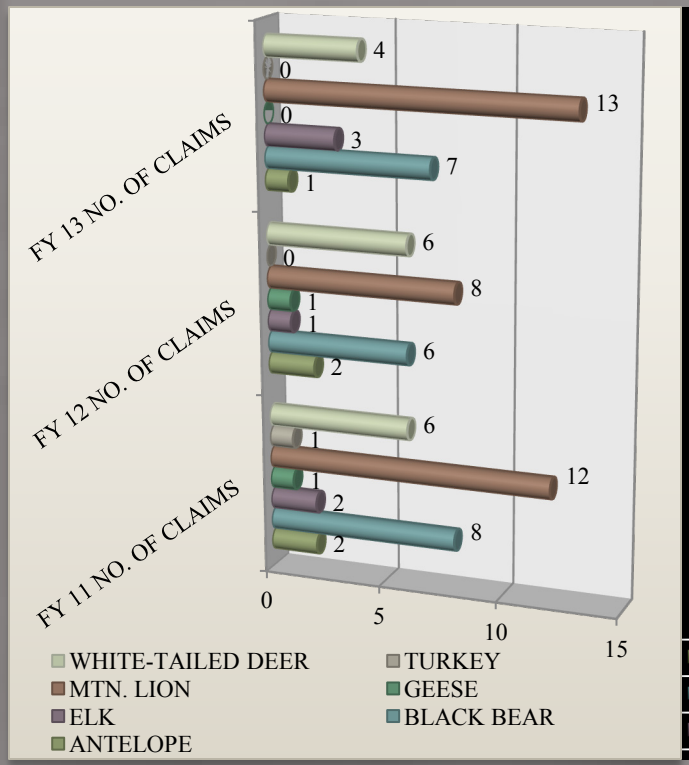


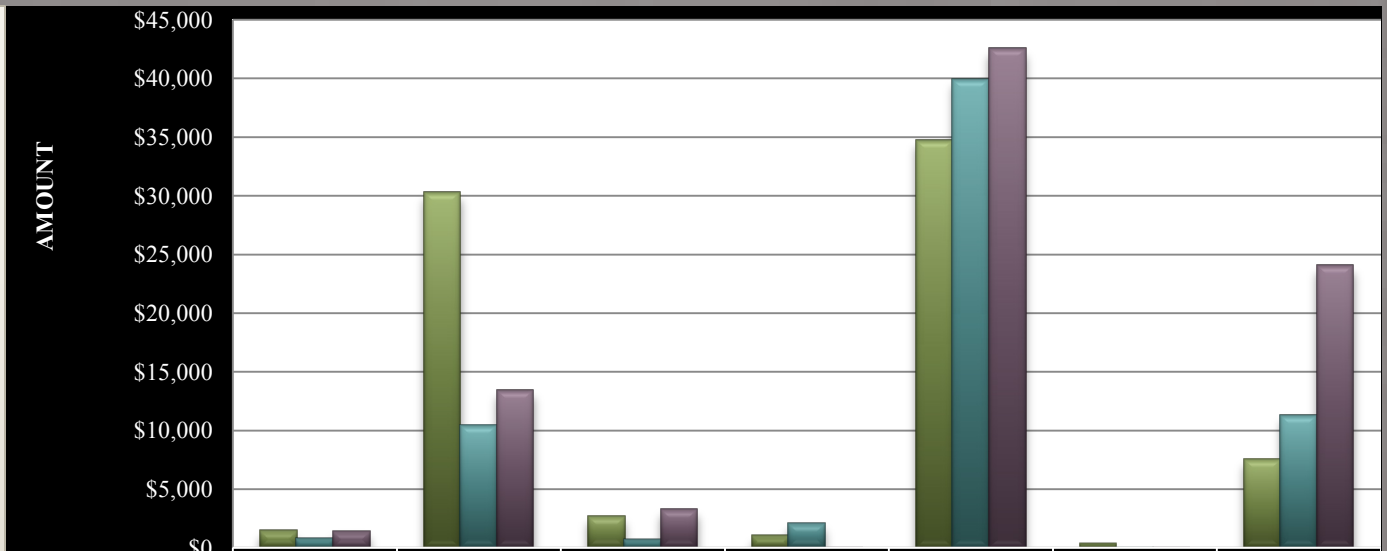


	ANTELOPE	BLACK BEAR	ELK	GRAY WOLF	GRIZZLY BEAR	MTN. LION	MULE DEER	WHITE-TAILED DEER
FY 11 PAYMENTS	$26,357	$15,553	$12,716	$39,781	$67,179	$21,505	$80,096	$8,201
FY 12 PAYMENTS	$2,147	$5,821	$1,436	$35,168	$27,853	$19,446	$90,300	$26,342
FY 13 PAYMENTS	$92,388	$7,086	$20,733	$38,420	$84,122	$8,433	$102,823	$34,739

SHERIDAN REGION

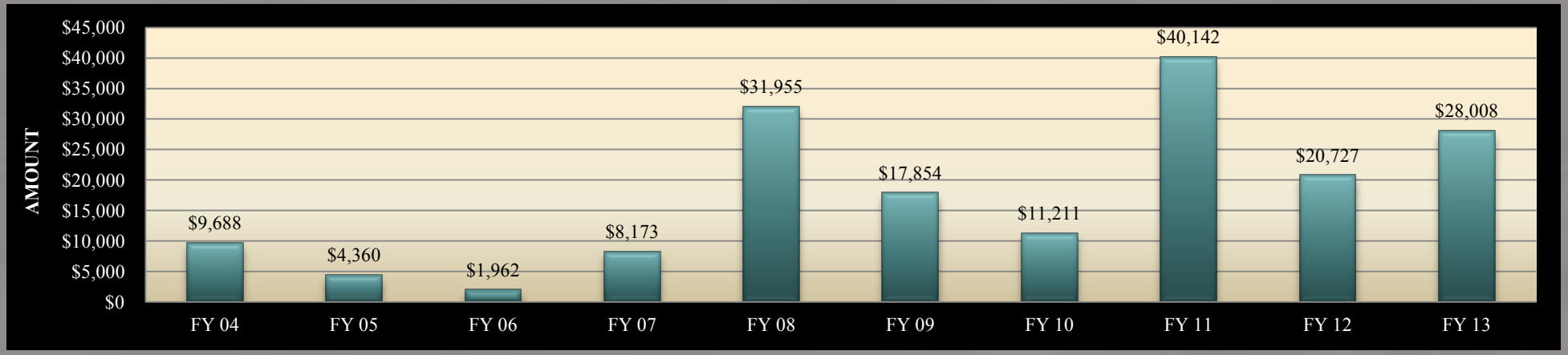


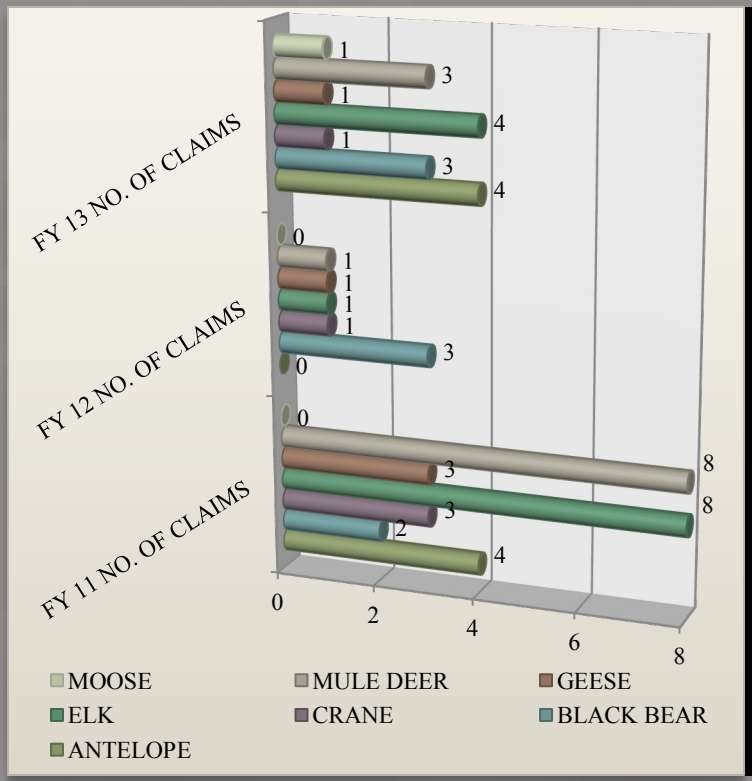


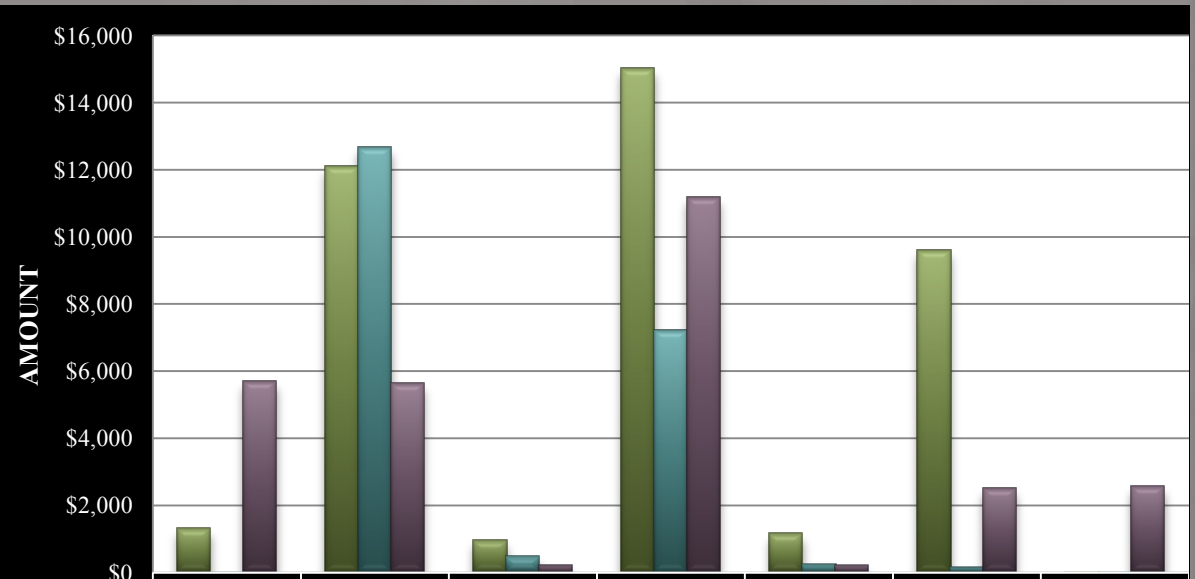


	ANTELOPE	BLACK BEAR	ELK	GEESE	MTN. LION	TURKEY	WHITE-TAILED DEER
FY 11 PAYMENTS	$1,419	$30,263	$2,650	$984	$34,690	$340	$7,509
FY 12 PAYMENTS	$805	$10,387	$656	$2,074	$39,901	$0	$11,284
FY 13 PAYMENTS	$1,400	$13,416	$3,274	$0	$42,511	$0	$24,022

GREEN RIVER REGION

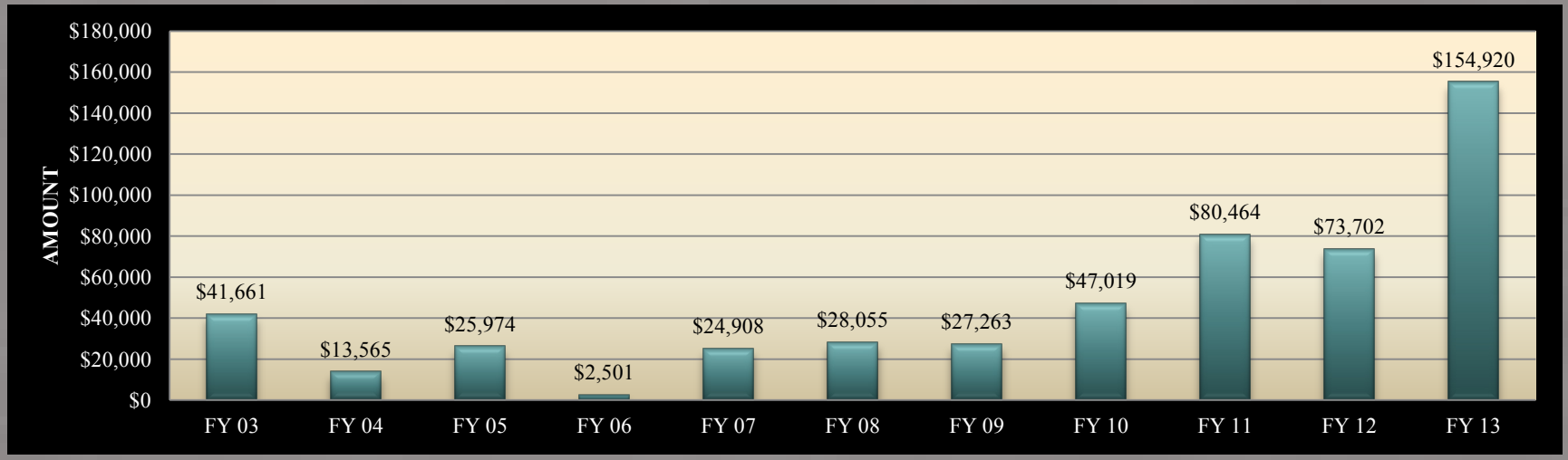


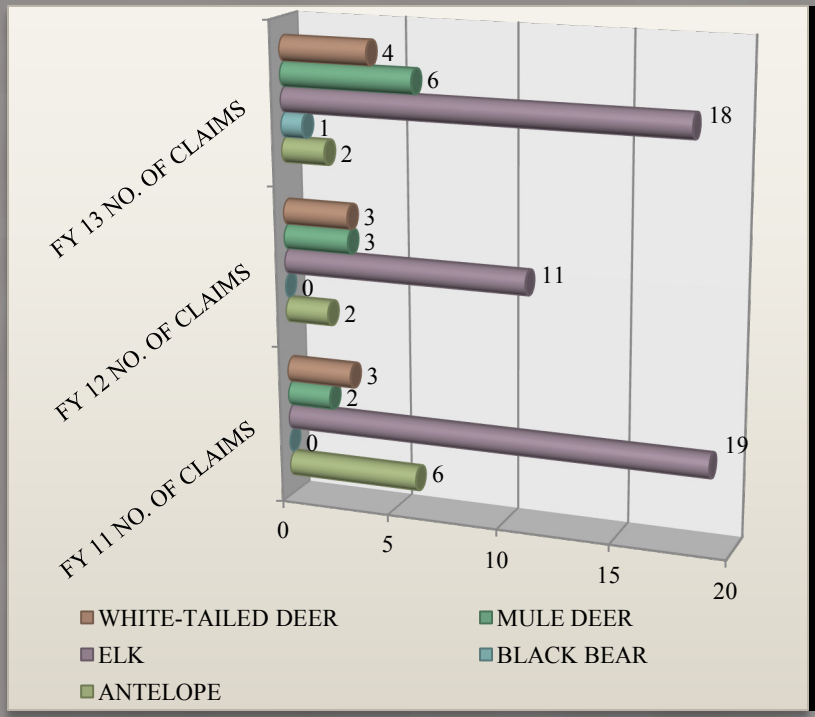


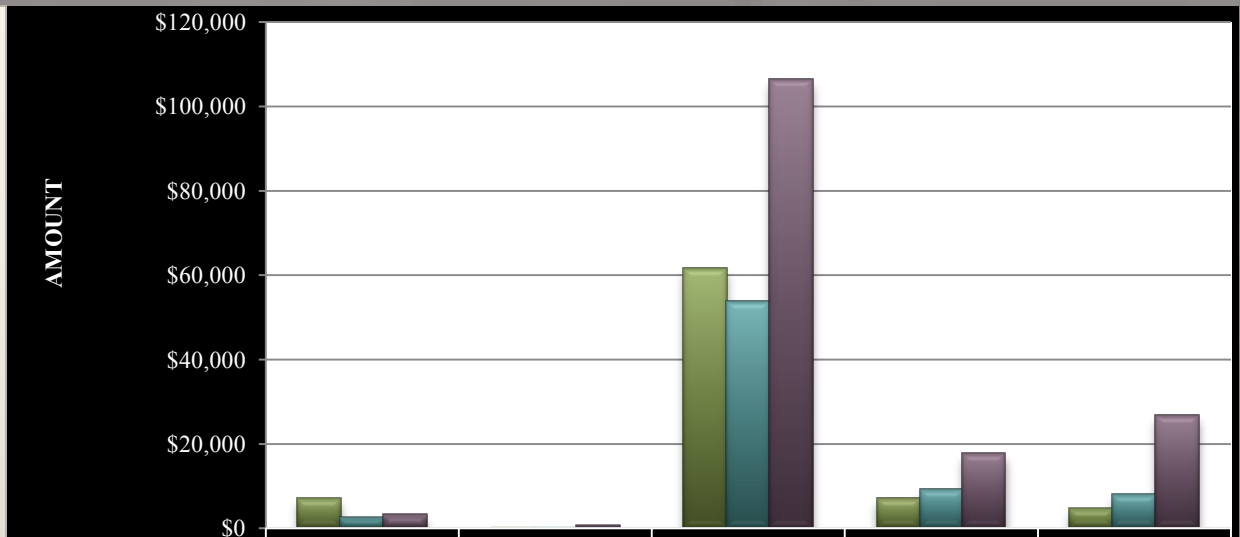


	ANTELOPE	BLACK BEAR	CRANE	ELK	GEESE	MULE DEER	MOOSE
FY11 PAYMENTS	$1,307	$12,105	$964	$15,018	$1,149	$9,599	$0
FY12 PAYMENTS	$0	$12,660	$479	$7,200	$239	$149	$0
FY 13 PAYMENTS	$5,696	$5,629	$215	$11,169	$211	$2,518	$2,570

LARAMIE REGION

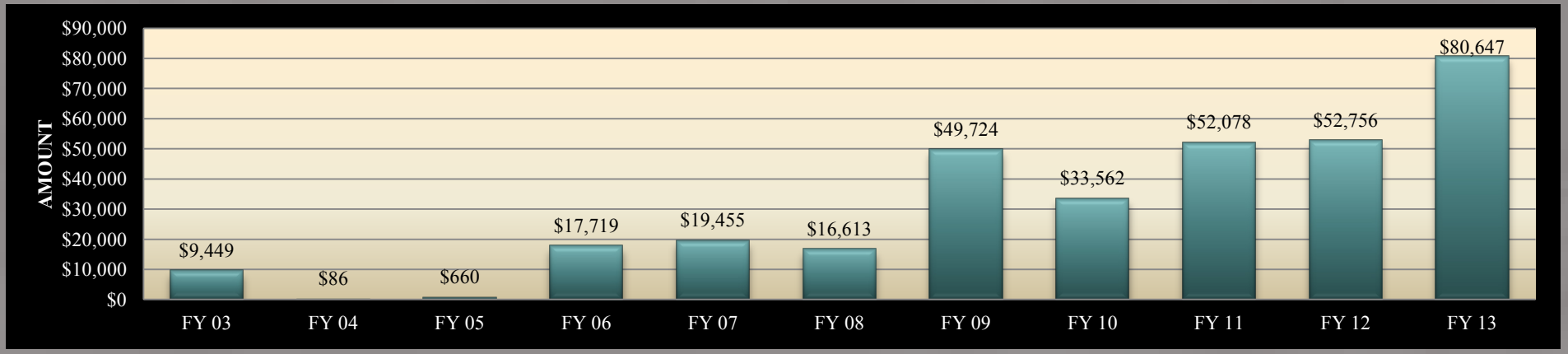


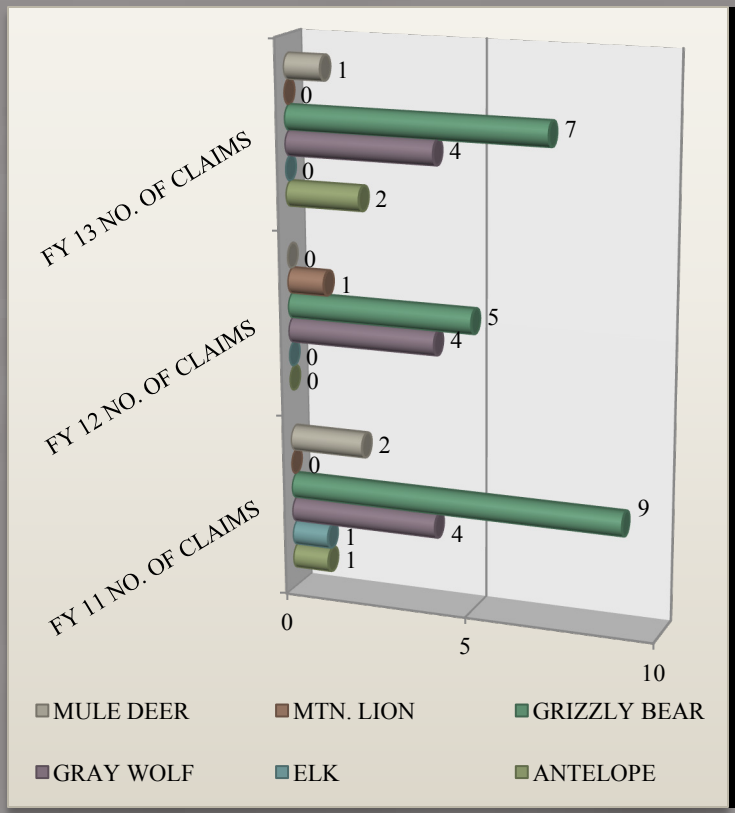


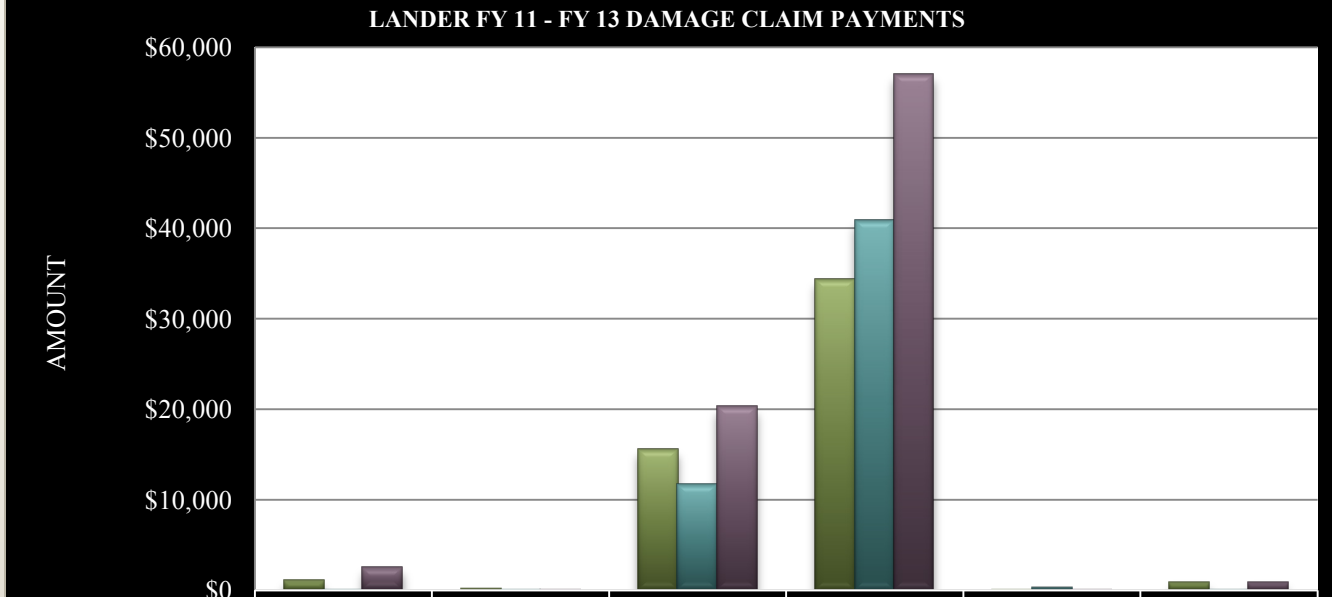


	ANTELOPE	BLACK BEAR	ELK	MULE DEER	WHITE-TAILED DEER
FY 11 PAYMENTS	$7,087	$0	$61,552	$7,198	$4,627
FY 12 PAYMENTS	$2,554	$0	$53,824	$9,311	$8,013
FY 13 PAYMENTS	$3,205	$765	$106,376	$17,689	$26,885

LANDER REGION

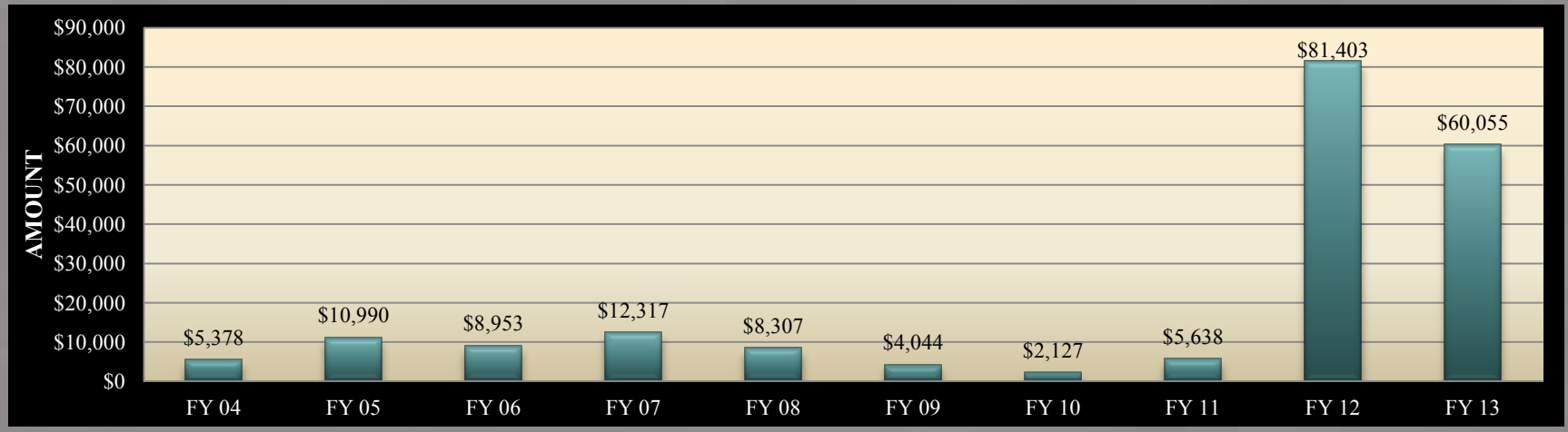


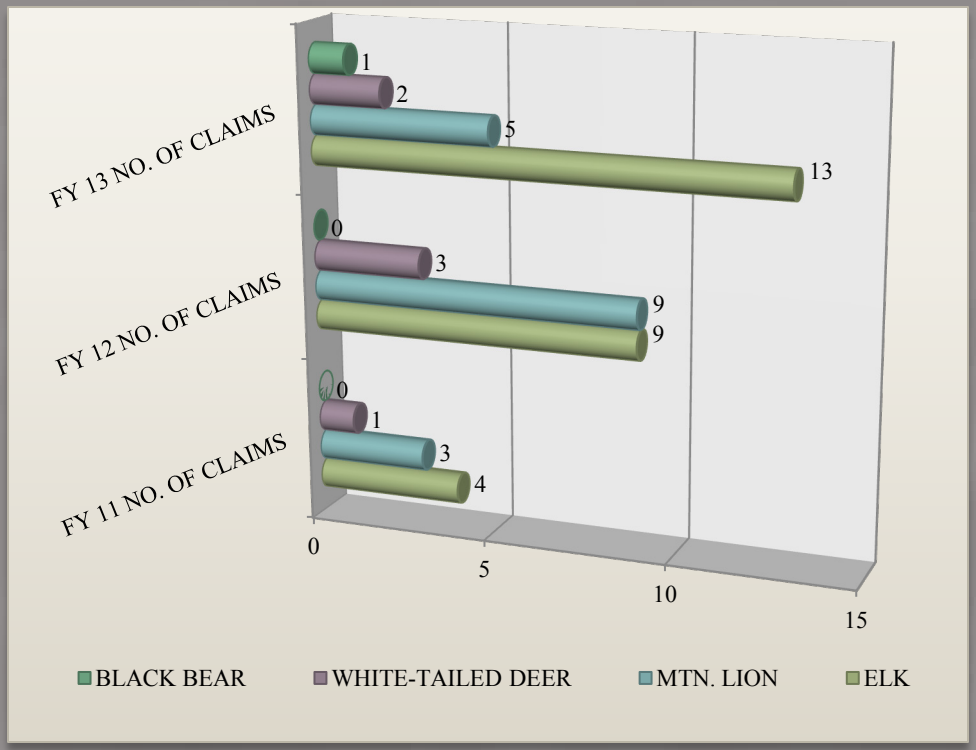


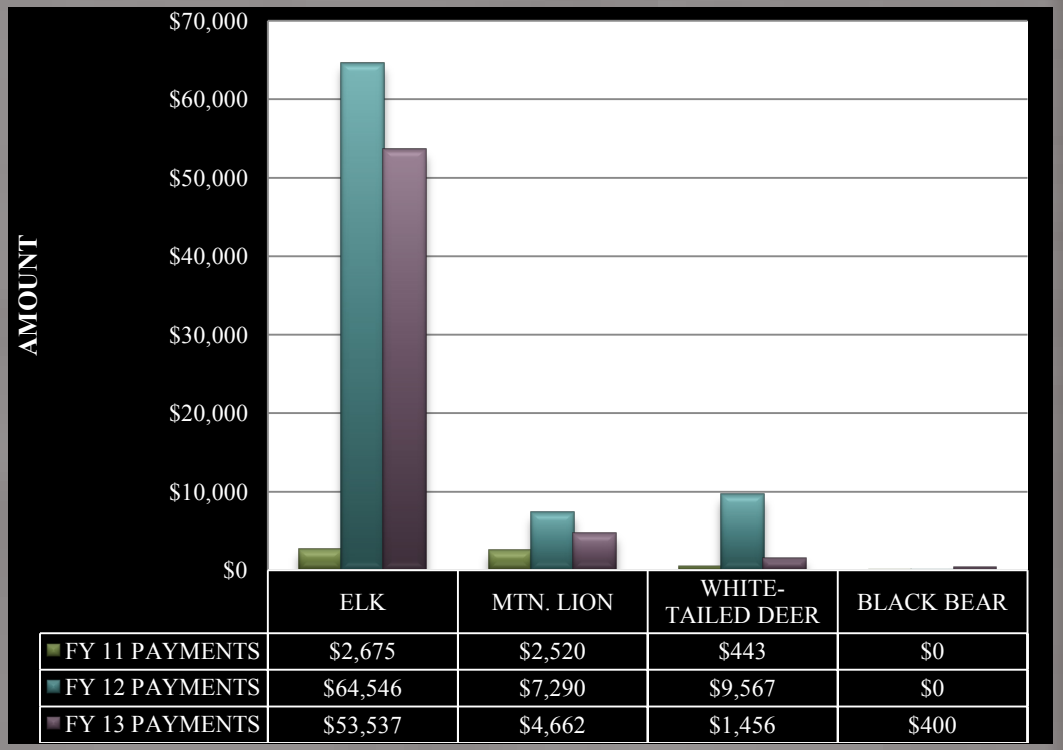


	ANTELOPE	ELK	GRAY WOLF	GRIZZLY BEAR	MTN. LION	MULE DEER
FY 11 PAYMENTS	$1,138	$150	$15,545	$34,377	$0	$868
FY 12 PAYMENTS	$0	$0	$11,636	$40,850	$270	$0
FY 13 PAYMENTS	$2,513	$0	$20,245	$56,998	$0	$891

CASPER REGION

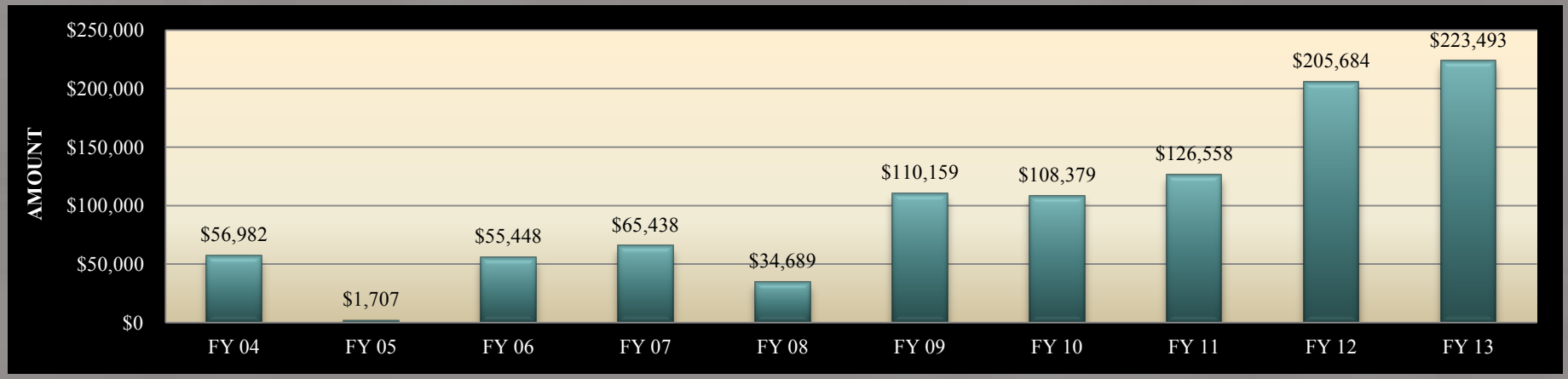


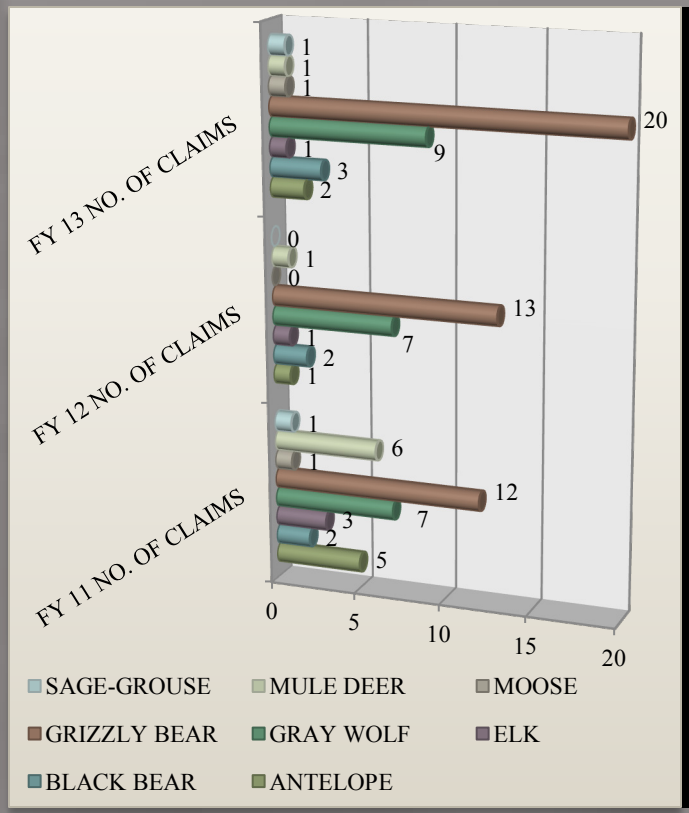


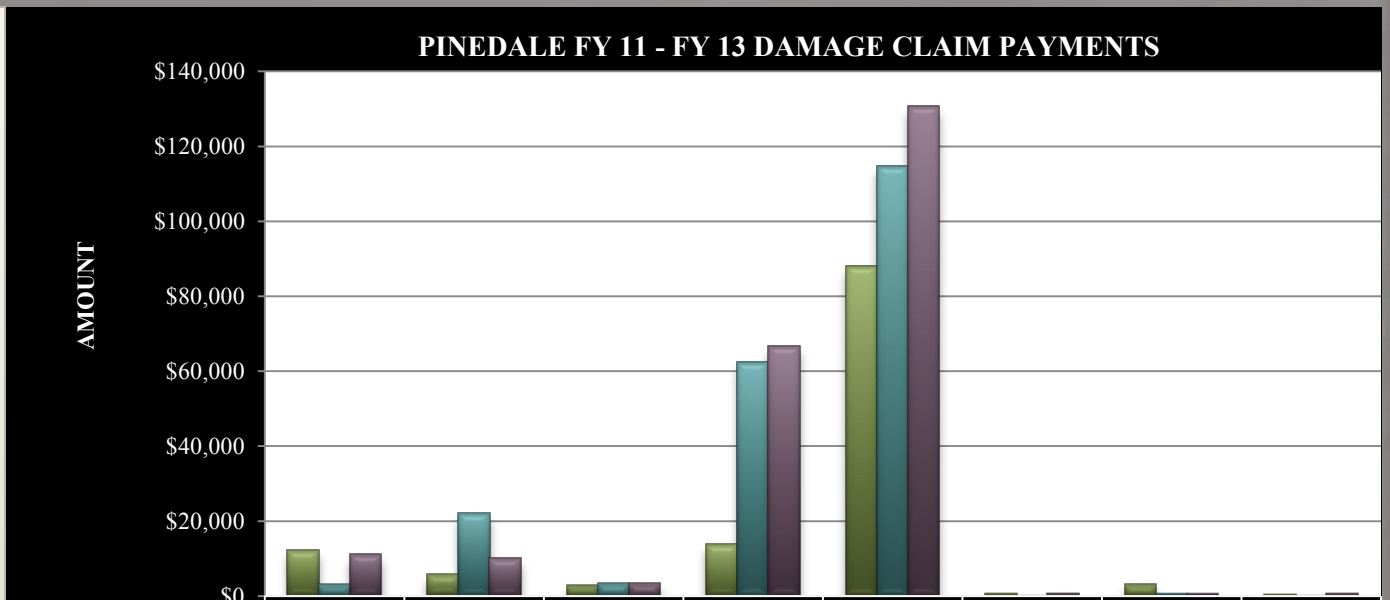


	ELK	MTN. LION	WHITE-TAILED DEER	BLACK BEAR
FY 11 PAYMENTS	$2,675	$2,520	$443	$0
FY 12 PAYMENTS	$64,546	$7,290	$9,567	$0
FY 13 PAYMENTS	$53,537	$4,662	$1,456	$400

PINEDALE REGION

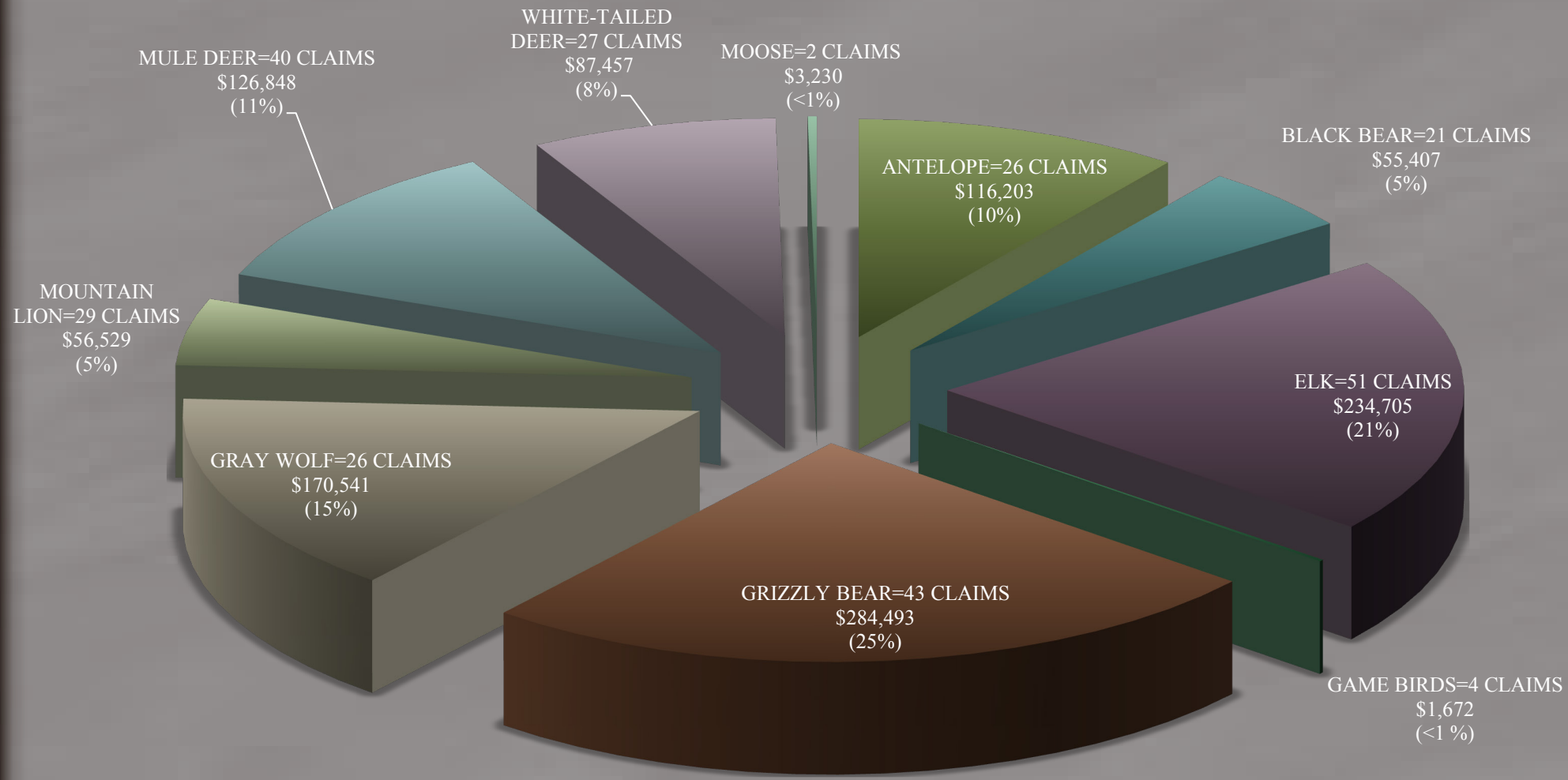






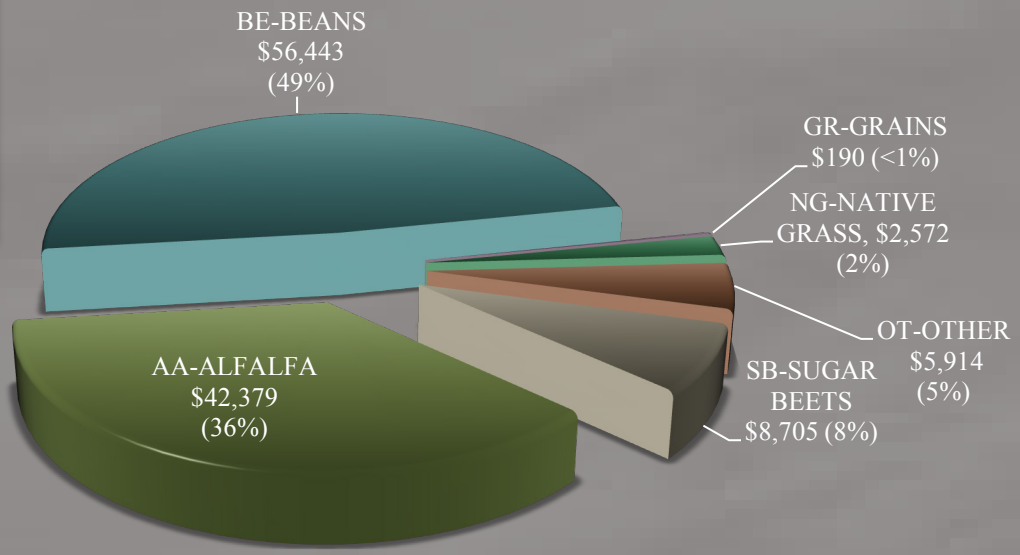
	ANTELOPE	BLACK BEAR	ELK	GRAY WOLF	GRIZZLY BEAR	MOOSE	MULE DEER	SAGE-GROUSE
FY 11 PAYMENTS	$12,130	$5,654	$2,731	$13,895	$88,081	$530	$3,153	$384
FY 12 PAYMENTS	$2,927	$21,978	$3,295	$62,434	$114,576	$0	$474	$0
FY 13 PAYMENTS	$11,002	$10,045	$3,500	$66,617	$130,591	$660	$492	$586

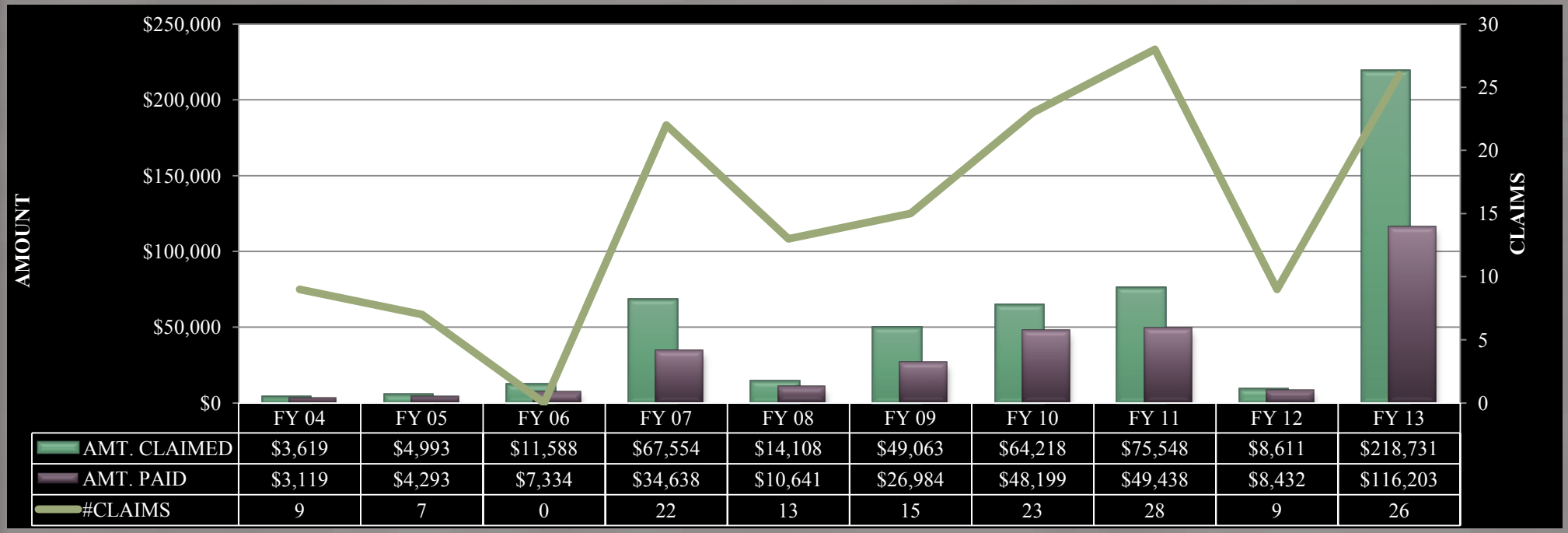
FY 13 AMOUNT AND PERCENTAGE OF CLAIMS PAID PER SPECIES



ANTELOPE

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

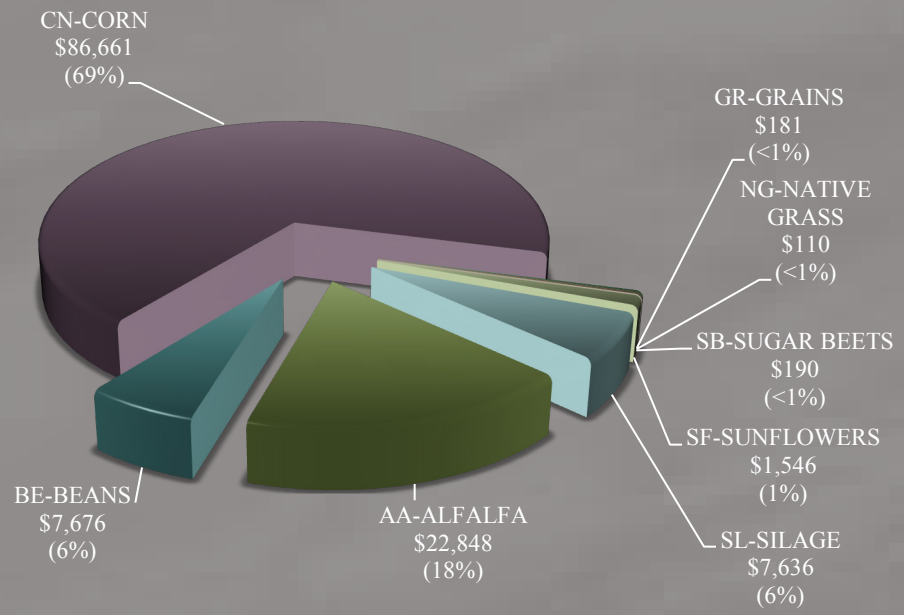


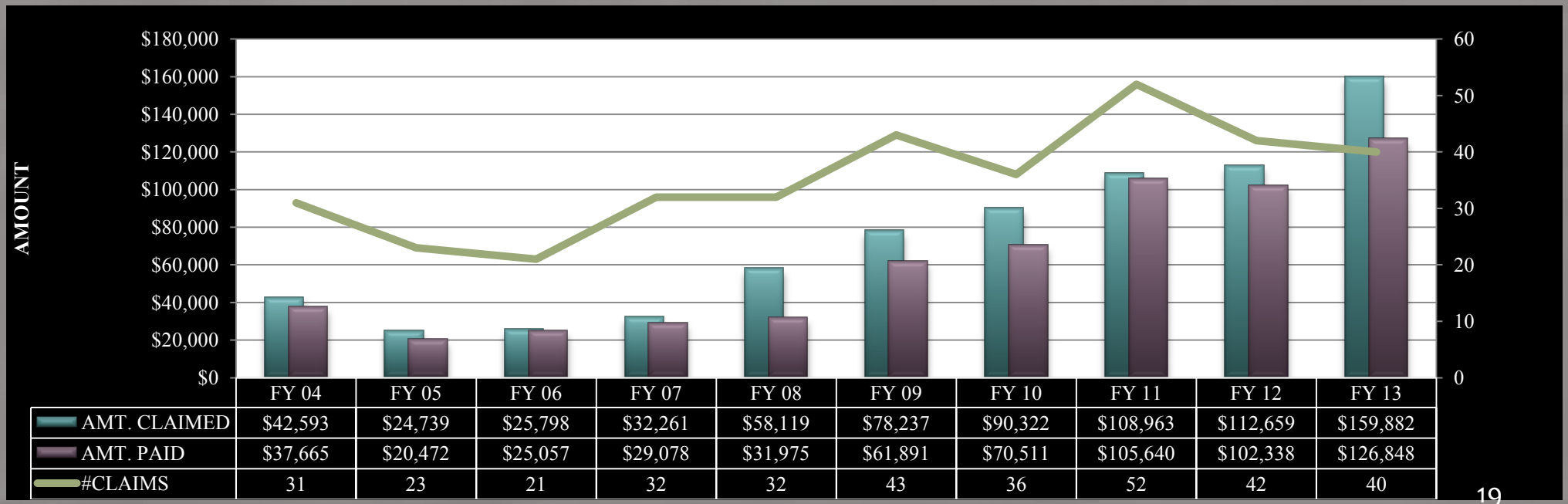


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$3,619	$4,993	$11,588	$67,554	$14,108	$49,063	$64,218	$75,548	$8,611	$218,731
AMT. PAID	$3,119	$4,293	$7,334	$34,638	$10,641	$26,984	$48,199	$49,438	$8,432	$116,203
#CLAIMS	9	7	0	22	13	15	23	28	9	26

MULE DEER

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

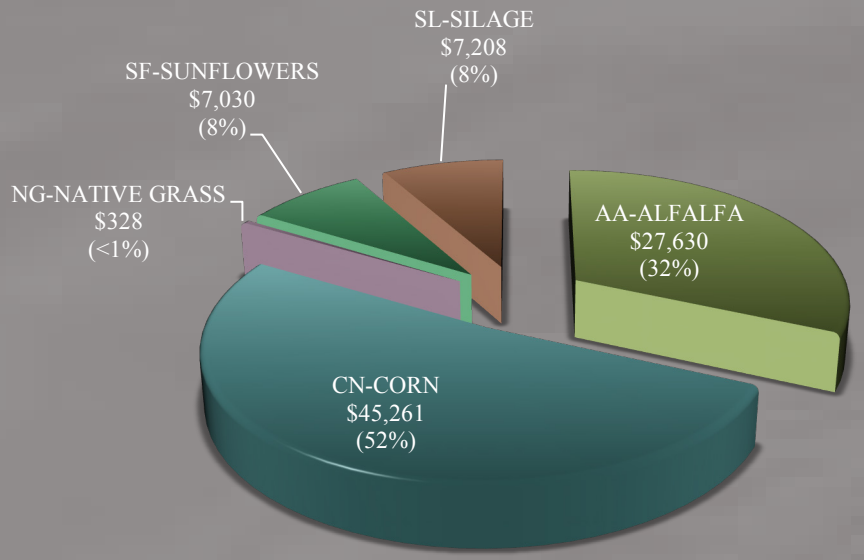


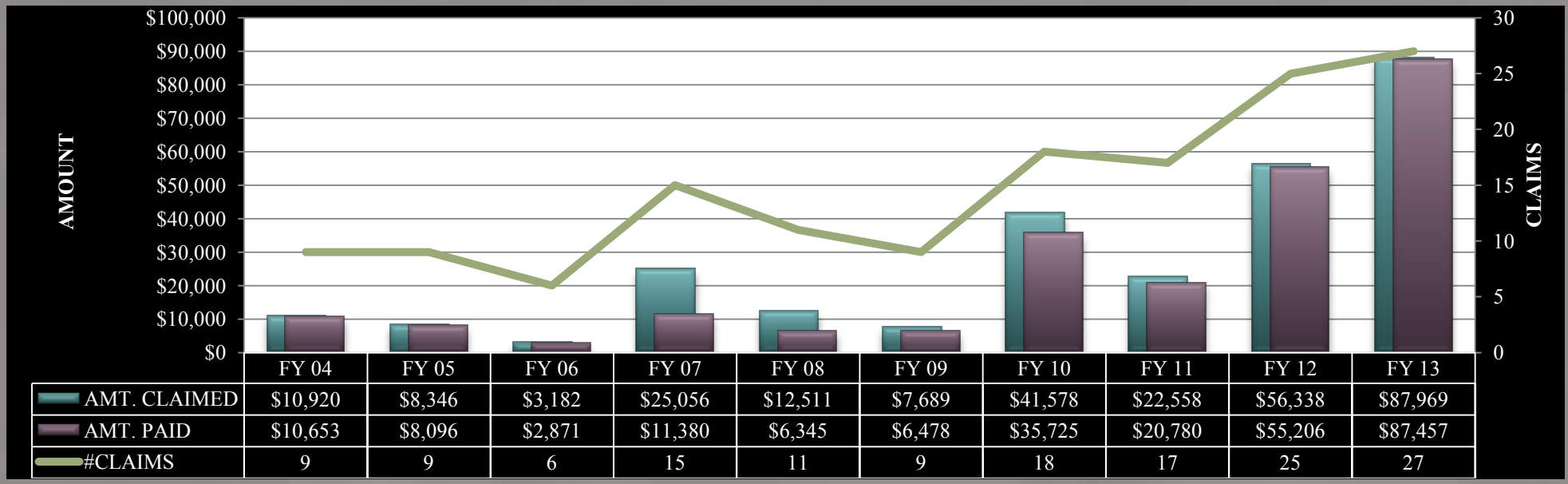


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$42,593	$24,739	$25,798	$32,261	$58,119	$78,237	$90,322	$108,963	$112,659	$159,882
AMT. PAID	$37,665	$20,472	$25,057	$29,078	$31,975	$61,891	$70,511	$105,640	$102,338	$126,848
#CLAIMS	31	23	21	32	32	43	36	52	42	40

WHITE-TAILED DEER

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

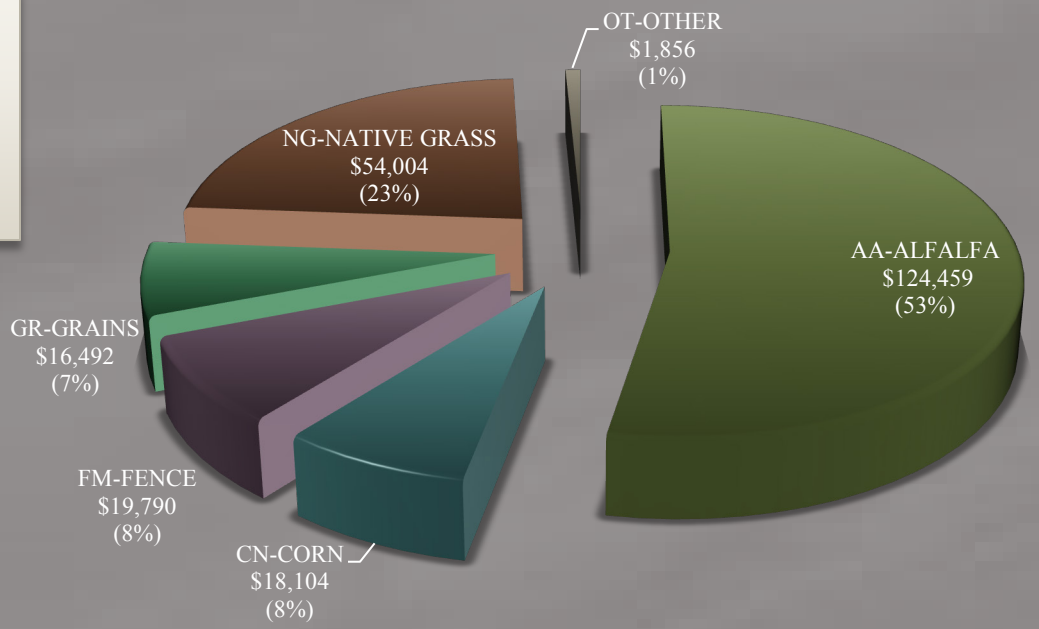


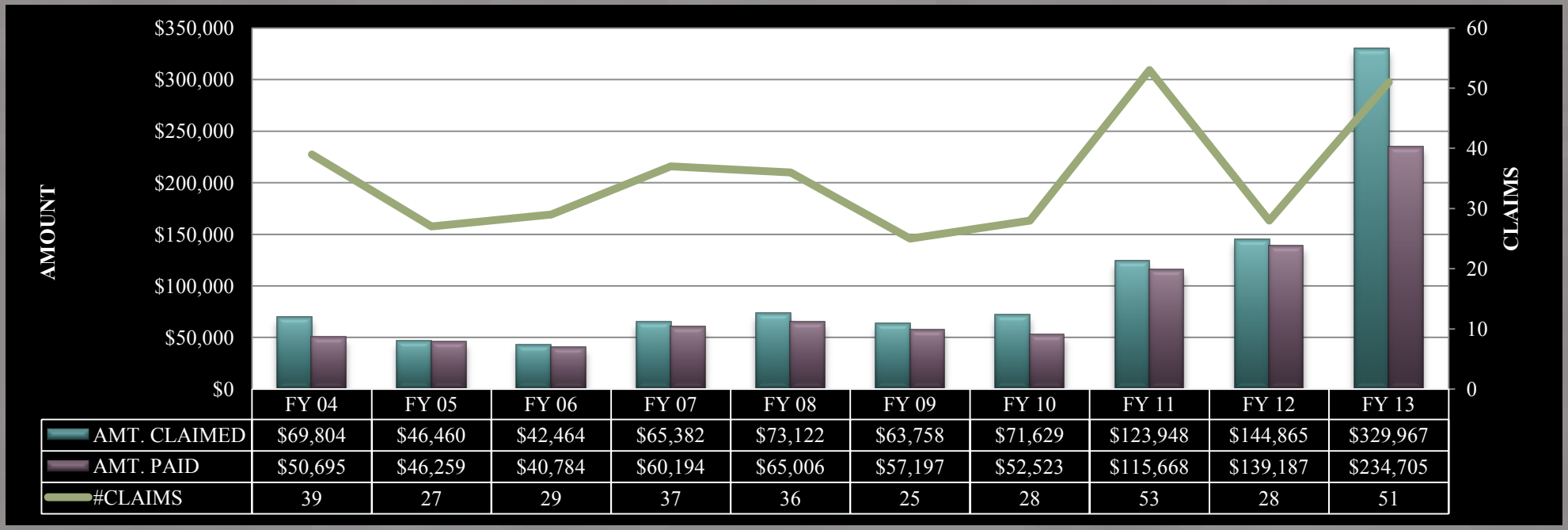


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$10,920	$8,346	$3,182	$25,056	$12,511	$7,689	$41,578	$22,558	$56,338	$87,969
AMT. PAID	$10,653	$8,096	$2,871	$11,380	$6,345	$6,478	$35,725	$20,780	$55,206	$87,457
#CLAIMS	9	9	6	15	11	9	18	17	25	27

ELK

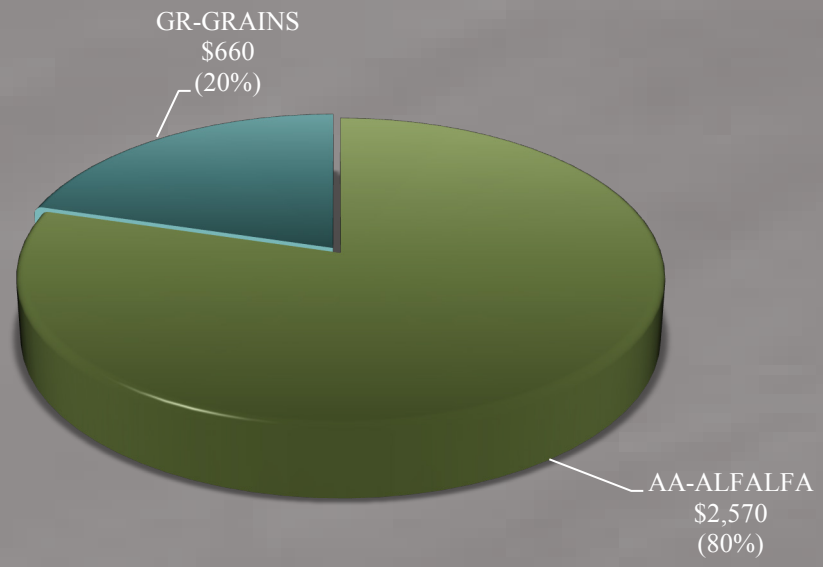
- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY





	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$69,804	$46,460	$42,464	$65,382	$73,122	$63,758	$71,629	$123,948	$144,865	$329,967
AMT. PAID	$50,695	$46,259	$40,784	$60,194	$65,006	$57,197	$52,523	$115,668	$139,187	$234,705
#CLAIMS	39	27	29	37	36	25	28	53	28	51

MOOSE
- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

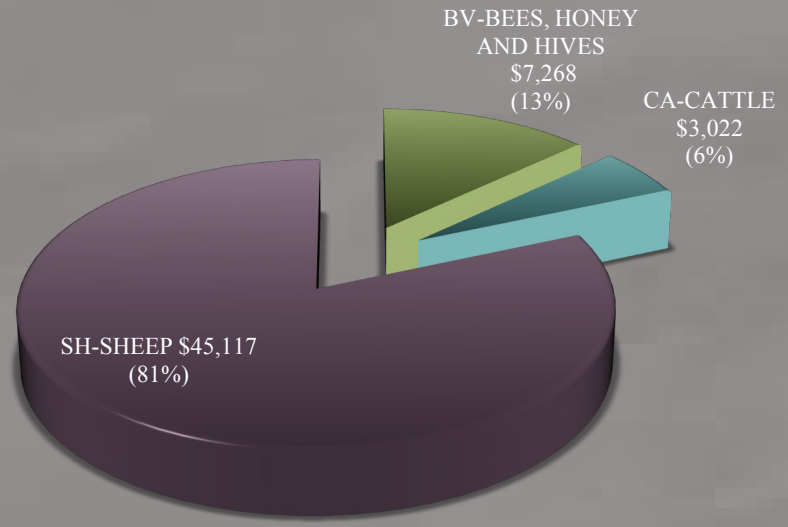


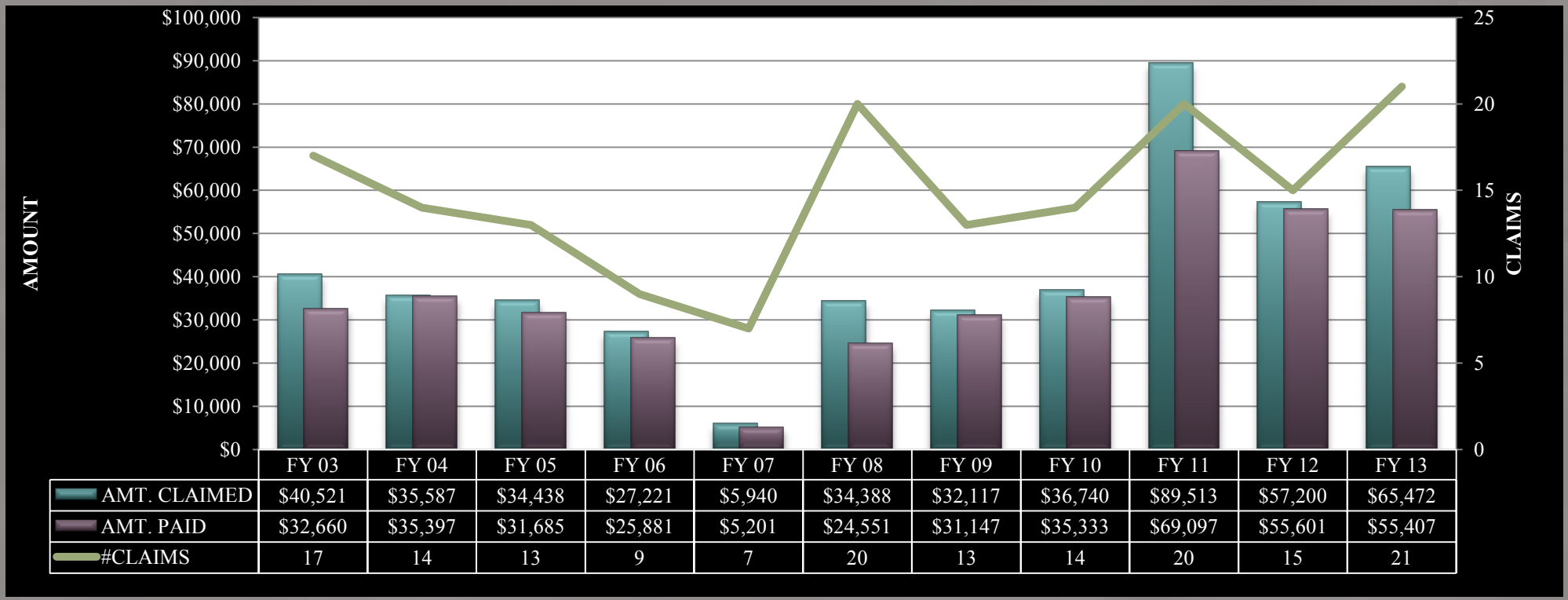


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$1,543	$85	$144	$0	$0	$0	$60	$970	$0	$3,230
AMT. PAID	$1,443	$64	$144	$0	$0	$0	$60	$970	$0	$3,230
#CLAIMS	6	1	1	0	0	0	1	2	0	2

BLACK BEAR

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

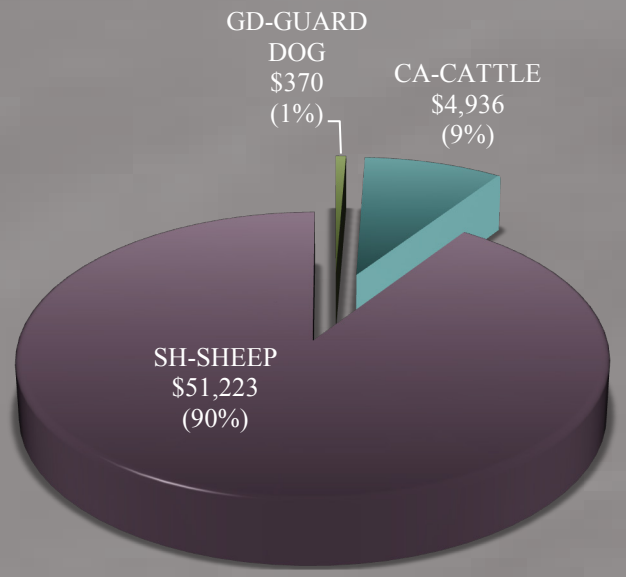


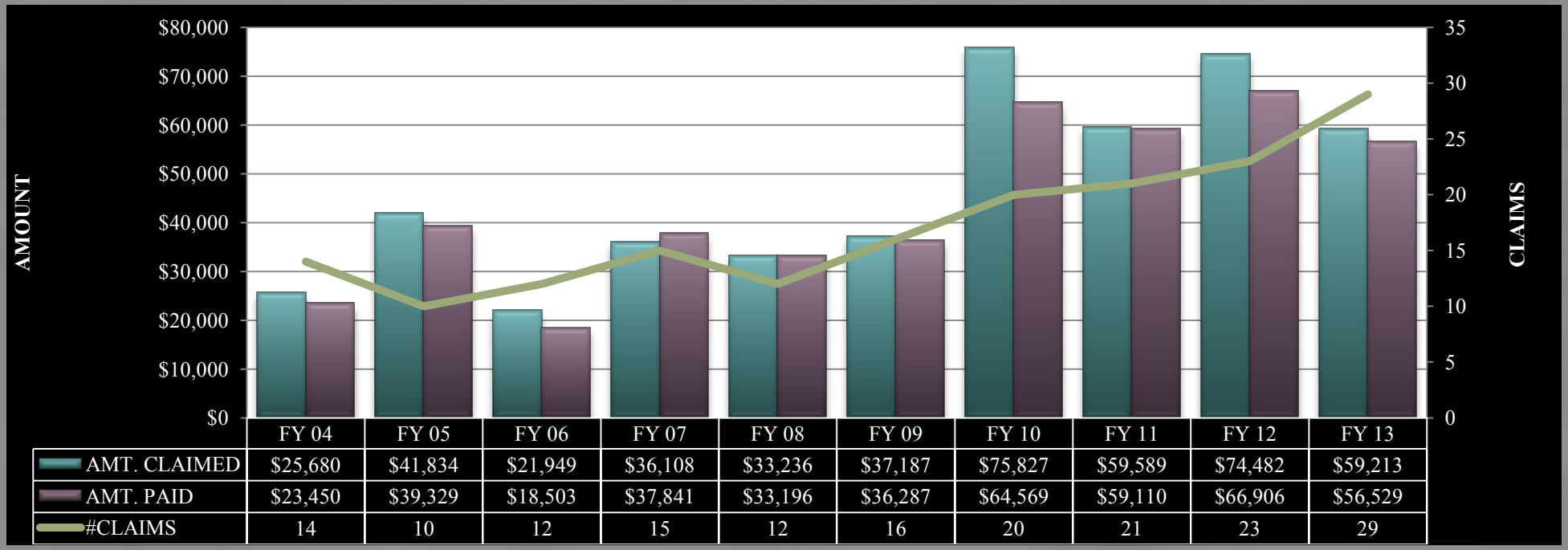


	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$40,521	$35,587	$34,438	$27,221	$5,940	$34,388	$32,117	$36,740	$89,513	$57,200	$65,472
AMT. PAID	$32,660	$35,397	$31,685	$25,881	$5,201	$24,551	$31,147	$35,333	$69,097	$55,601	$55,407
#CLAIMS	17	14	13	9	7	20	13	14	20	15	21

MOUNTAIN LION

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

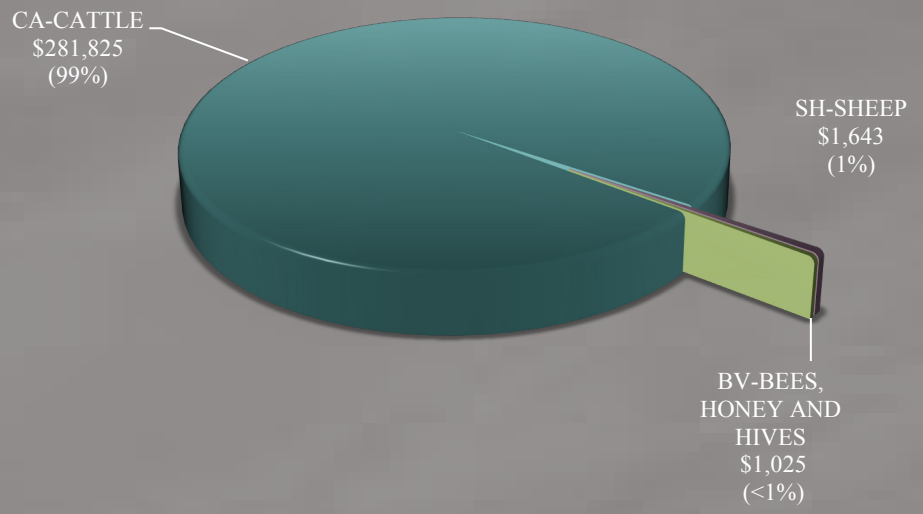


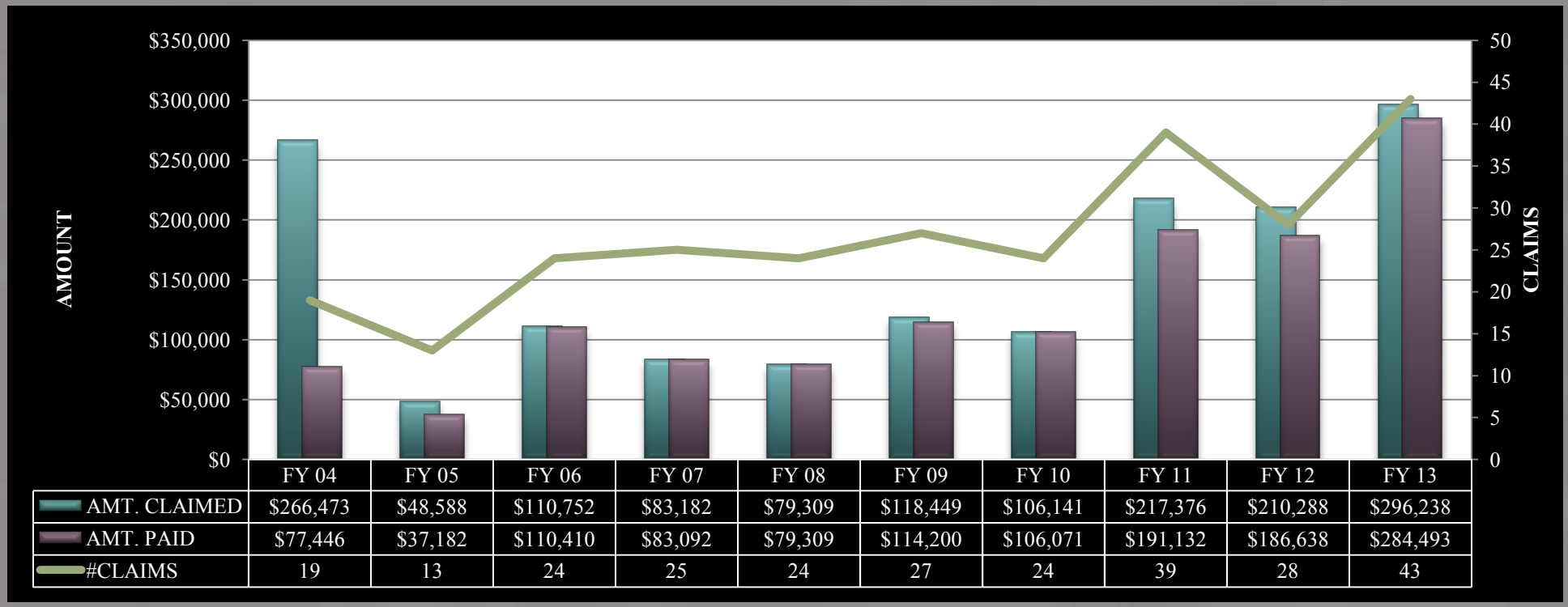


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$25,680	$41,834	$21,949	$36,108	$33,236	$37,187	$75,827	$59,589	$74,482	$59,213
AMT. PAID	$23,450	$39,329	$18,503	$37,841	$33,196	$36,287	$64,569	$59,110	$66,906	$56,529
#CLAIMS	14	10	12	15	12	16	20	21	23	29

GRIZZLY BEAR

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

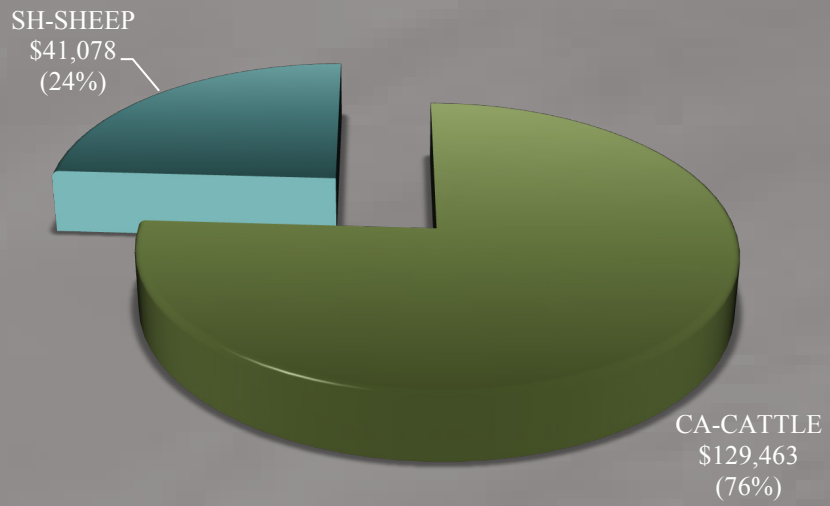


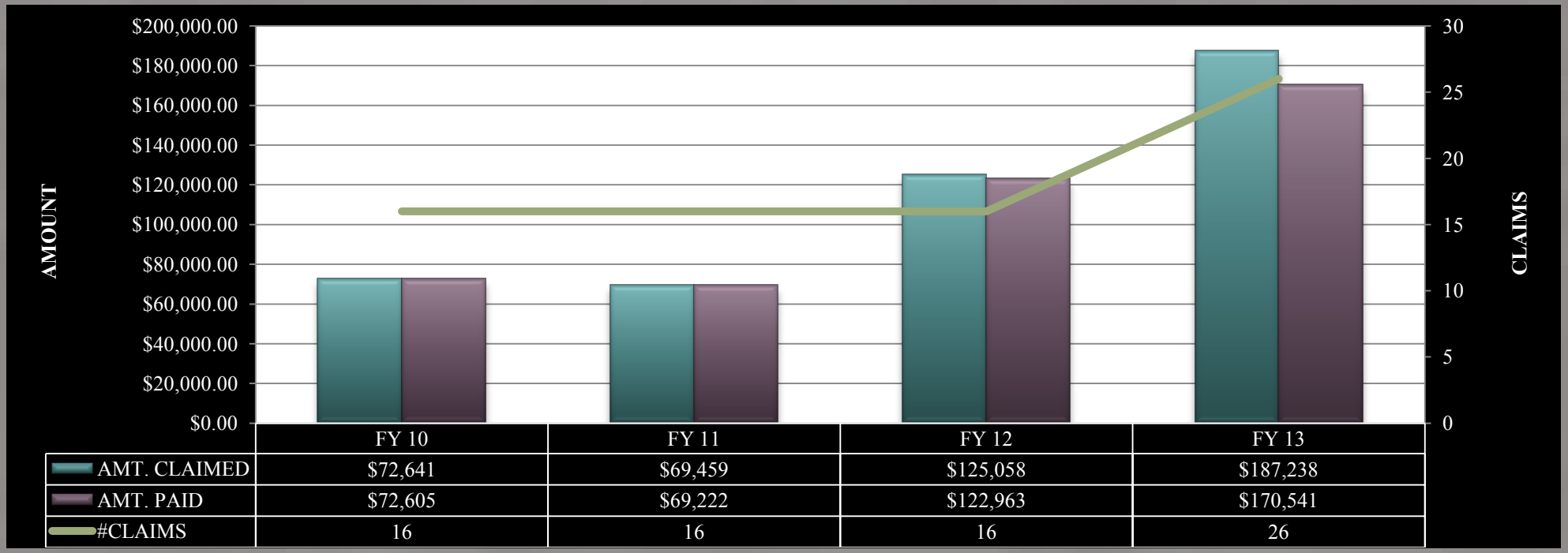


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$266,473	$48,588	$110,752	$83,182	$79,309	$118,449	$106,141	$217,376	$210,288	$296,238
AMT. PAID	$77,446	$37,182	$110,410	$83,092	$79,309	$114,200	$106,071	$191,132	$186,638	$284,493
#CLAIMS	19	13	24	25	24	27	24	39	28	43

GRAY WOLF

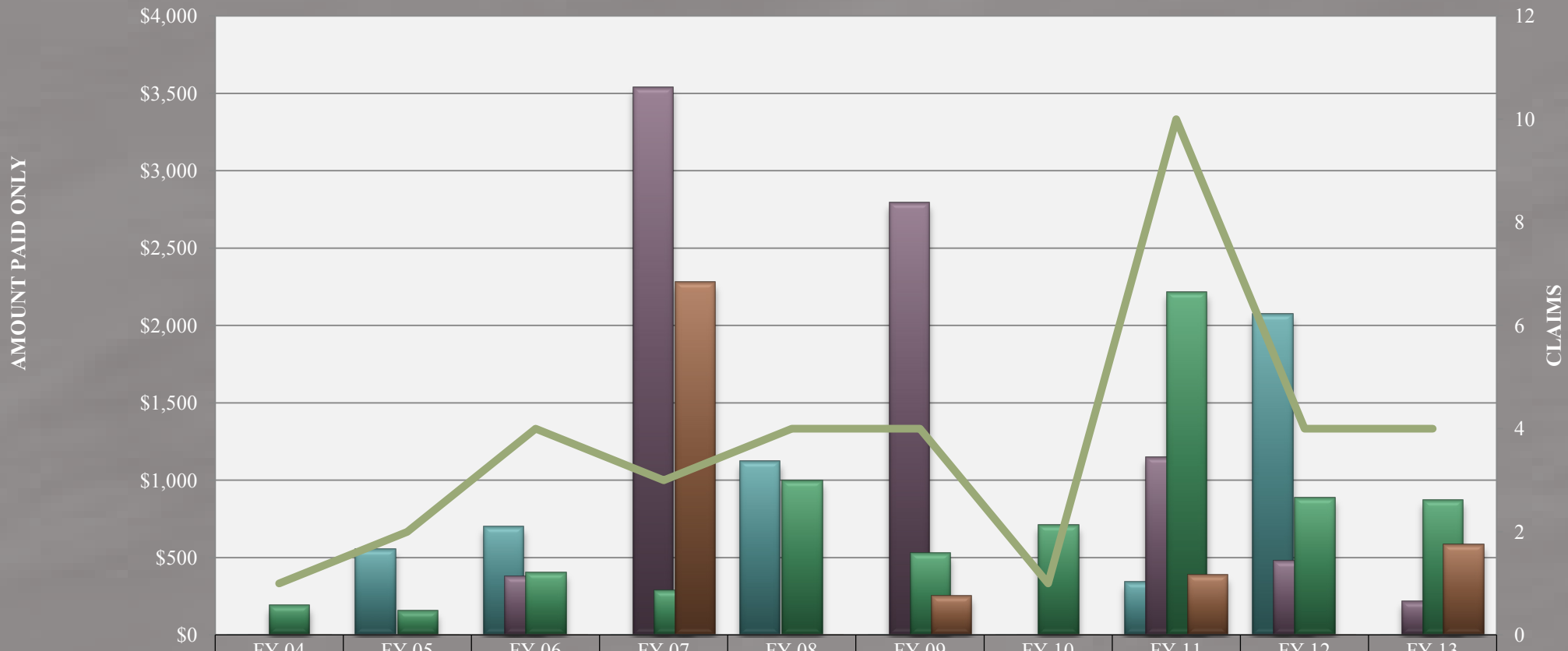
- 4-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY





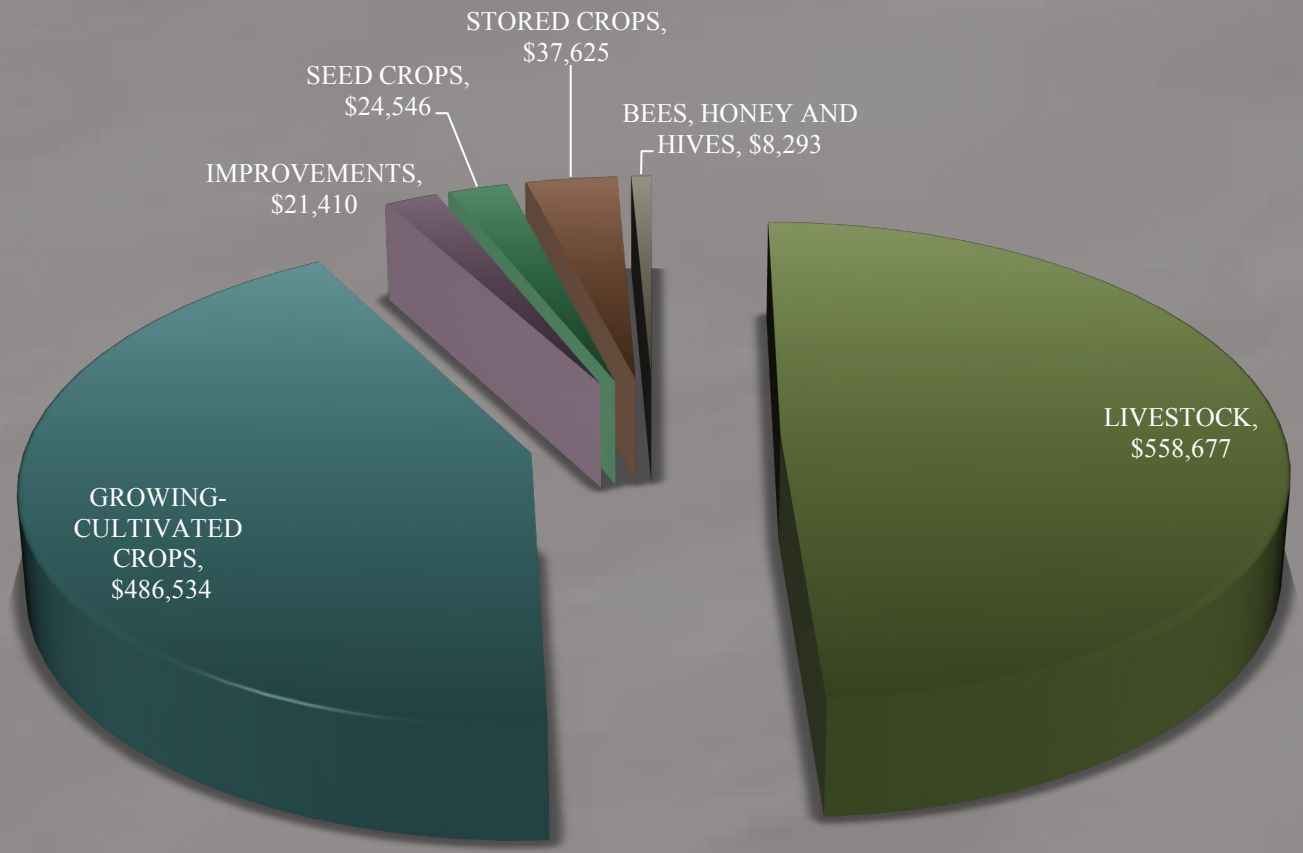
	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$72,641	$69,459	$125,058	$187,238
AMT. PAID	$72,605	$69,222	$122,963	$170,541
#CLAIMS	16	16	16	26

GAME BIRDS
•10-YEAR DAMAGE SUMMARY



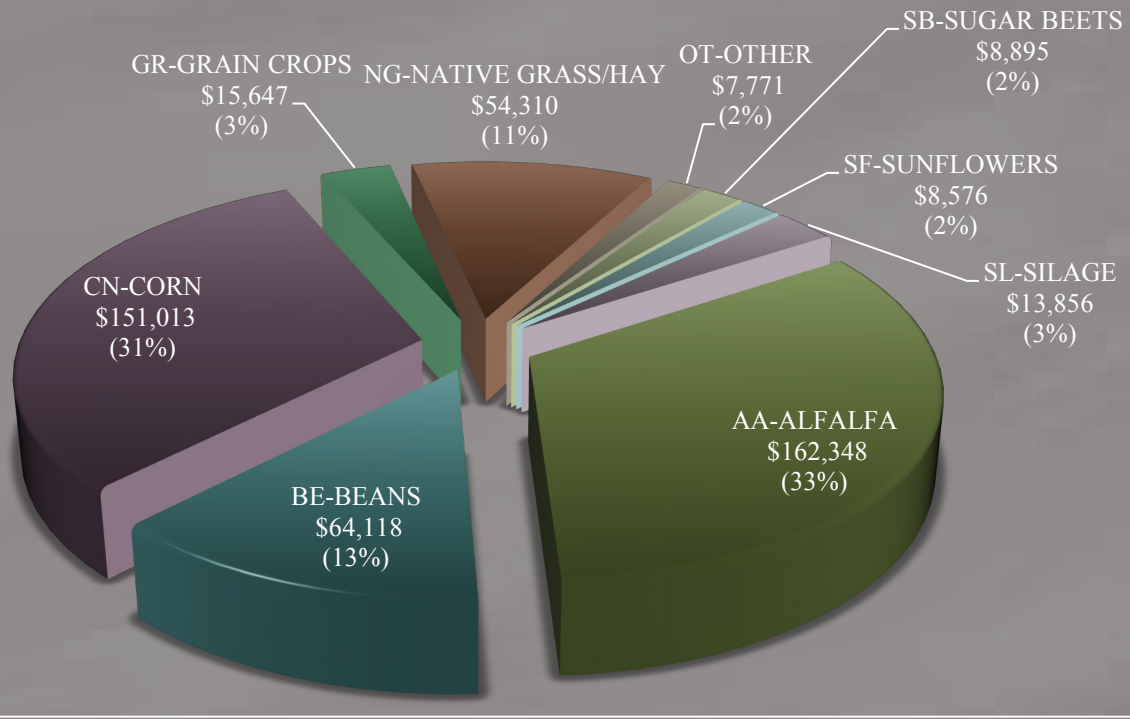
	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
TURKEYS	$0	$553	$698	$0	$1,118	$0	$0	$340	$2,074	$0
CRANES	$0	$0	$375	$3,539	$0	$2,795	$0	$1,149	$479	$215
GEESE	$187	$153	$404	$285	$995	$525	$711	$2,214	$888	$871
SAGE-GROUSE	$0	$0	$0	$2,277	$0	$254	$0	$384	$0	$586
# CLAIMS	1	2	4	3	4	4	1	10	4	4

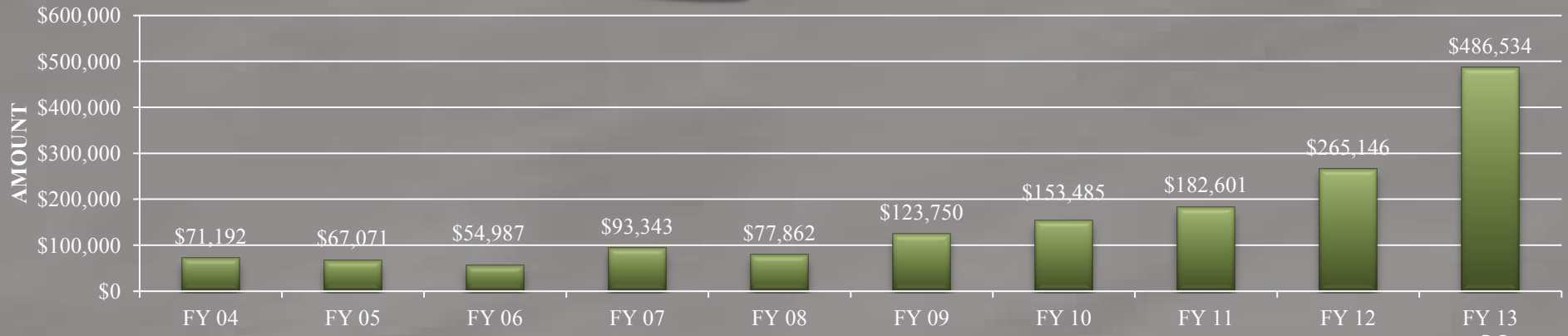
FY 13 AMOUNT AND PERCENTAGE OF CLAIMS PAID BY CATEGORY



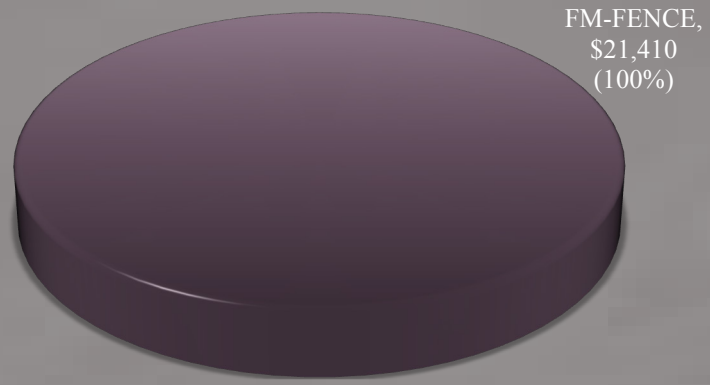
CATEGORY	AMOUNT PAID	PERCENTAGE
GROWING-CULTIVATED CROPS	$486,534	43%
IMPROVEMENTS	$21,410	2%
SEED CROPS	$24,546	2%
STORED CROPS	$37,625	3%
BEES, HONEY AND HIVES	$8,293	1%
LIVESTOCK	$558,677	49%
TOTAL FY 13 DAMAGE AMOUNT PAID	**$1,137,085**	

FY 13 GROWING-CULTIVATED CROPS &10-YEAR DAMAGE SUMMARY



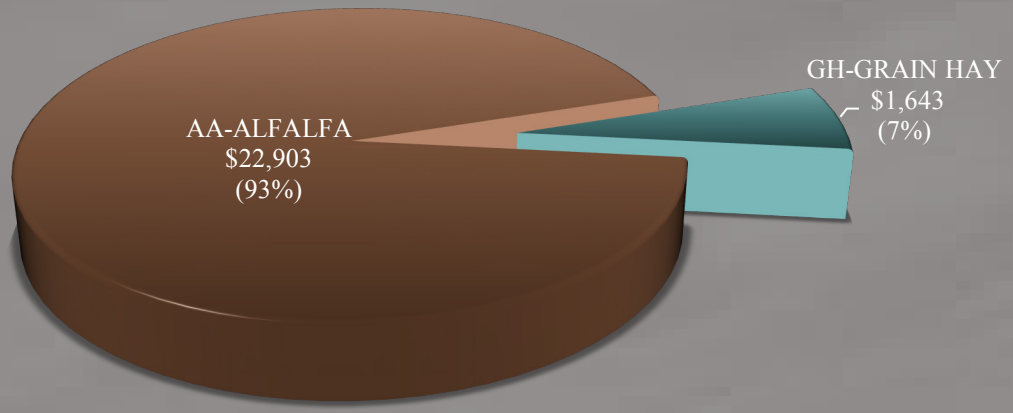


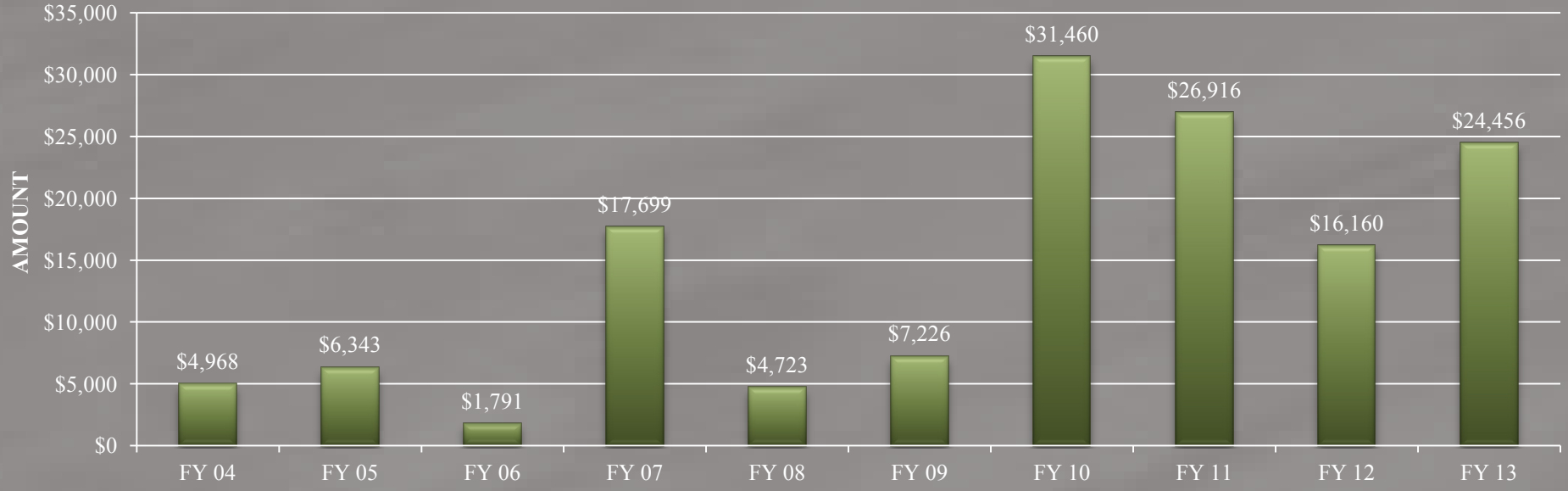
FY 13 IMPROVEMENTS &10-YEAR DAMAGE SUMMARY



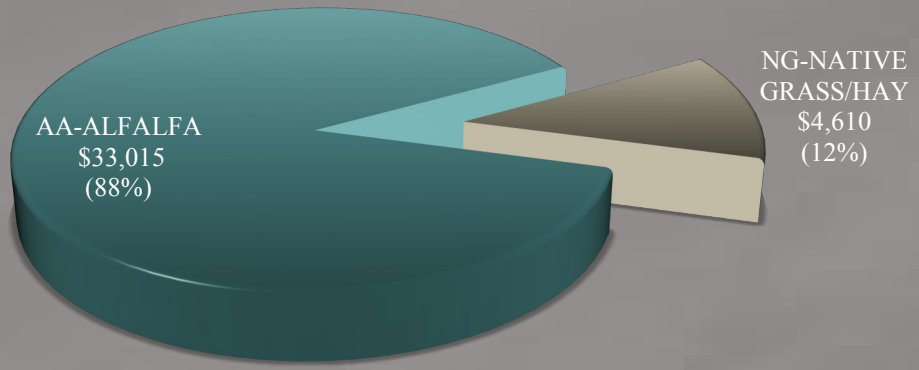


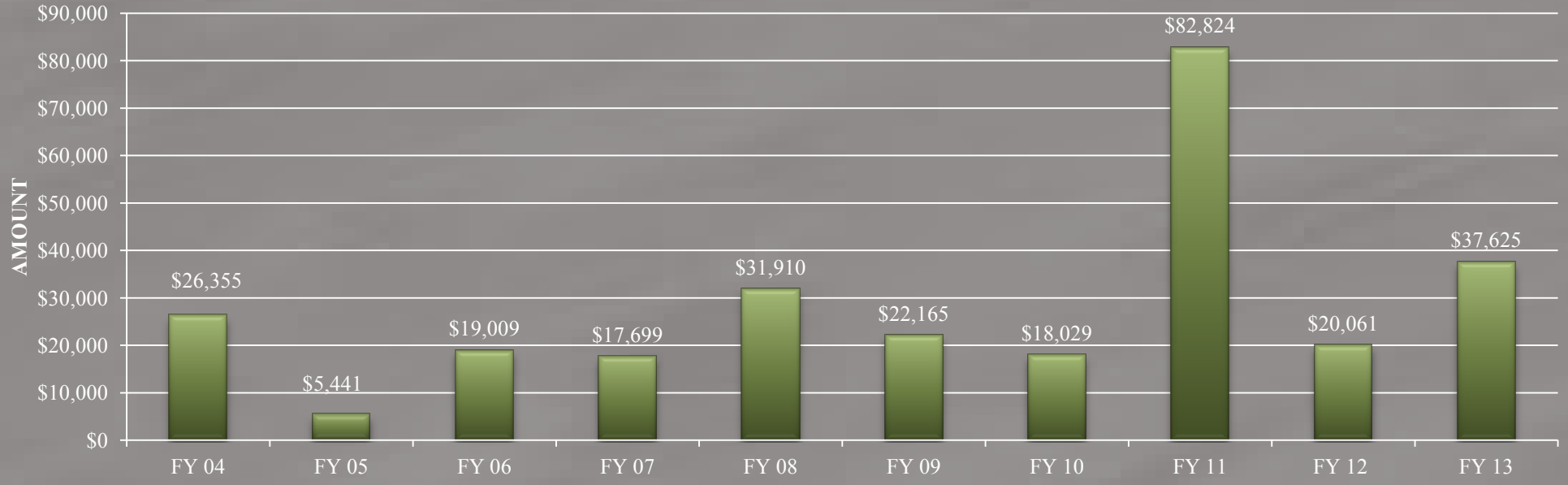
FY 13 SEED CROPS &10-YEAR DAMAGE SUMMARY



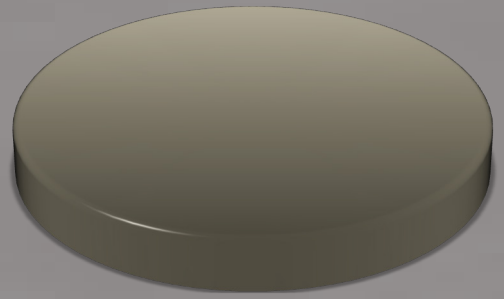


FY 13 STORED CROPS &10-YEAR DAMAGE SUMMARY

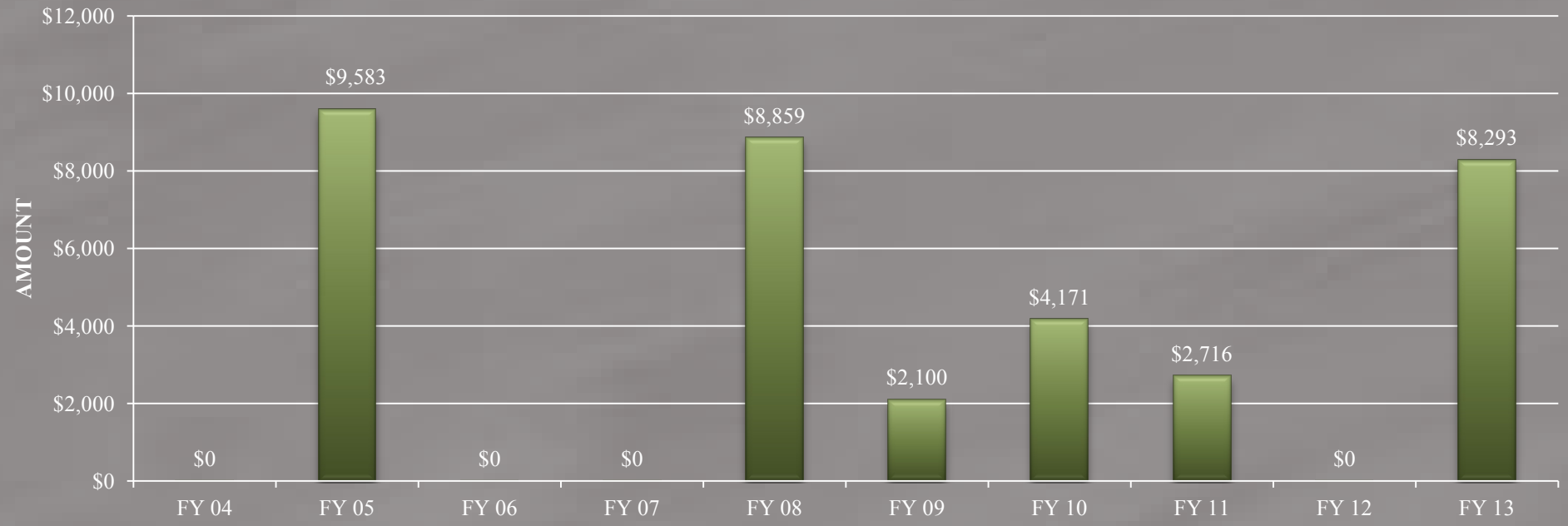




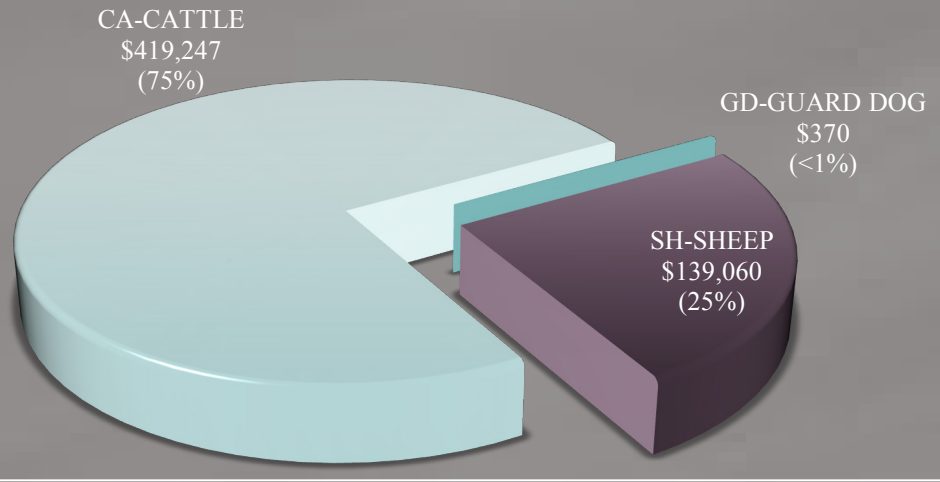
FY 13 BEES, HONEY AND HIVES &10-YEAR DAMAGE SUMMARY



BV-BEES, HONEY AND HIVES $8,293 (100%)



FY 13 LIVESTOCK &10-YEAR DAMAGE SUMMARY





FY 13 DAMAGE PAYMENTS BY SPECIES HERD UNIT

SPECIES	HERD UNIT/MGMT AREA	HERD CODE	AMOUNT PAID
ANTELOPE	COPPER MOUNTAIN	A203	$77,542.02
	FIFTEENMILE	A204	$5,981.25
	CARTER MOUNTAIN	A205	$8,864.50
	CARTER LEASE	A419	$1,472.22
	CRAZY WOMAN	A318	$1,400.00
	SUBLETTE	A401	$11,001.55
	UINTA-CEDAR MOUNTAIN	A411	$4,224.00
	DWYER	A524	$3,204.65
	BEAVER RIM	A632	$437.50
	PROJECT	A635	$2,075.00
		TOTAL PAID	**$116,202.69**
BLACK BEAR	GREY RIVER	BB102	$24,032.46
	ABSAROKA	BB201	$6,502.69
	BIGHORNS	BB301	$13,998.99
	SIERRA MADRE	BB401	$1,824.38
	UINTA	BB402	$860.00
	WIND RIVER	BB601	$7,023.08
	OUTSIDE MGMT AREA	NA	$1,165.00
		TOTAL PAID	**$55,406.60**
ELK	JACKSON	E102	$260.00
	FALL CREEK	E103	$35,856.08
	UPPER GREEN RIVER	E107	$3,500.00
	MEDICINE LODGE	E211	$1,857.30
	BLACK HILLS	E740	$15,335.50
	GOOSEBERRY	E214	$15,169.84
	CODY	E216	$3,474.62
	NORTH BIGHORN	E321	$2,177.82
	RAWHIDE	E730	$8,921.83
	SOUTH BIGHORN	E322	$1,096.00
	CLARK'S FORK	E217	$231.00
	UINTA	E423	$1,885.00
	SIERRA MADRE	E425	$3,976.80
	STEAMBOAT	E426	$5,307.50
	IRON MOUNTAIN	E531	$34,264.45
	SNOWY RANGE	E533	$17,536.09
	LAR. PEAK/MUDDY MTN	E741	$83,854.99
		TOTAL PAID	**$234,704.82**
MOOSE	SUBLETTE	MO105	$660.00
	LINCOLN	MO423	$2,570.00
		TOTAL PAID	**$3,230.00**

SPECIES	HERD UNIT/MGMT AREA	HERD CODE	AMOUNT PAID
MOUNTAIN LION	WEST	L101	$922.50
	NORTH-CENTRAL	L301	$45,701.16
	NORTHEAST	L701	$9,905.48
		TOTAL PAID	**$56,529.14**
MULE DEER	SUBLETTE	MD104	$4,404.20
	WYOMING RANGE	MD131	$886.14
	PAINTROCK	MD207	$11,362.70
	GREYBULL RIVER	MD210	$19,670.89
	SHOSHONE RIVER	MD211	$23,225.36
	SOUTHWEST BIGHORN	MD208	$4,137.09
	UPPER SHOSHONE	MD215	$3,300.00
	CLARK'S FORK	MD216	$21,818.89
	NORTH BIGHORN	MD321	$19,308.25
	UINTA	MD432	$154.00
	GOSHEN RIM	MD534	$17,166.69
	LARAMIE MTNS.	MD537	$522.00
	PROJECT	MD643	$892.00
		TOTAL PAID	**$126,848.21**
WHITE-TAILED DEER	BIGHORN BASIN	WT201	$34,738.65
	POWDER RIVER	WT303	$24,022.40
	SOUTHEAST WYOMING	WT504	$26,885.43
	CENTRAL	WT707	$1,160.00
	BLACK HILLS	WT706	$295.95
	NON HERD UNIT	WT999	$355.00
		TOTAL PAID	**$87,457.43**
GRAY WOLF	CLARK'S FORK	HUNT AREA 1	$16,575.30
	SUNLIGHT	HUNT AREA 2	$8,326.92
	GREYBULL	HUNT AREA 4	$13,517.96
	WIND RIVER	HUNT AREA 5	$17,842.56
	PACIFIC CREEK	HUNT AREA 6	$876.00
	TARGHEE	HUNT AREA 7	$309.75
	FISH CREEK	HUNT AREA 8	$1,904.00
	CRYSTAL CREEK	HUNT AREA 9	$1,400.00
	RIM	HUNT AREA 10	$2,402.55
	GREEN RIVER	HUNT AREA 11	$66,617.32
	ALPINE	HUNT AREA 12	$40,768.69
		TOTAL PAID	**$170,541.05**
GAME BIRDS	STATEWIDE	**TOTAL PAID**	**$1,671.24**
GRIZZLY BEAR	CRANDALL/SUNLIGHT	BMU6	$9,730.35
	SOUTH ABSAROKA	BMU16	$9,975.00
	CLARK'S FORK	BMU23	$17,872.47
	MEETEETSE	BMU24	$56,519.08
	WIND RIVER	BMU25	$10,059.19
	GROS VENTRE	BMU26	$63,705.75
	BACON CREEK	BMU32	$28,999.62
	BONDURANT	BMU33	$11,408.99
	WHISKEY	BMU34	$41,985.65
	UPPER GREEN	BMU35	$28,300.86
	OUTSIDE MGMT AREA	BMU999	$5,936.51
		TOTAL PAID	**$284,493.47**

KEY TO CATEGORIES AND TYPE OF DAMAGE

TYPES OF LIVESTOCK
CA-CATTLE
SH-SHEEP
HR-HORSE
GT-GOAT
SW-SWINE
LL-LLAMA
GD-GUARD DOG
OT-OTHER

TYPES OF STORED CROPS
AA-ALFALFA
CN-CORN
HL-HAYLAGE
WT- WHEAT
GR-GRAIN
GH-GRAIN HAY
NG-GRASS/NATIVE HAY
SL-SILAGE
OT-OTHER

TYPES OF EXTRAORDINARY DAMAGE TO GRASS
NG-GRASS/NATIVE HAY
OT-OTHER

TYPES OF IMPROVEMENTS
FM-FENCE
OR-ORNAMENTAL

TYPES OF GROWING-CULTIVATED CROPS
AA-ALFALFA
BE-BEANS
CN-CORN
GN-GARDEN
GR-GRAIN
NG-GRASS/NATIVE HAY
NS-COMMERCIAL NURSERY
SF-SUNFLOWER
SB-SUGAR BEETS
SL-SILAGE
WT-WHEAT
OT-OTHER

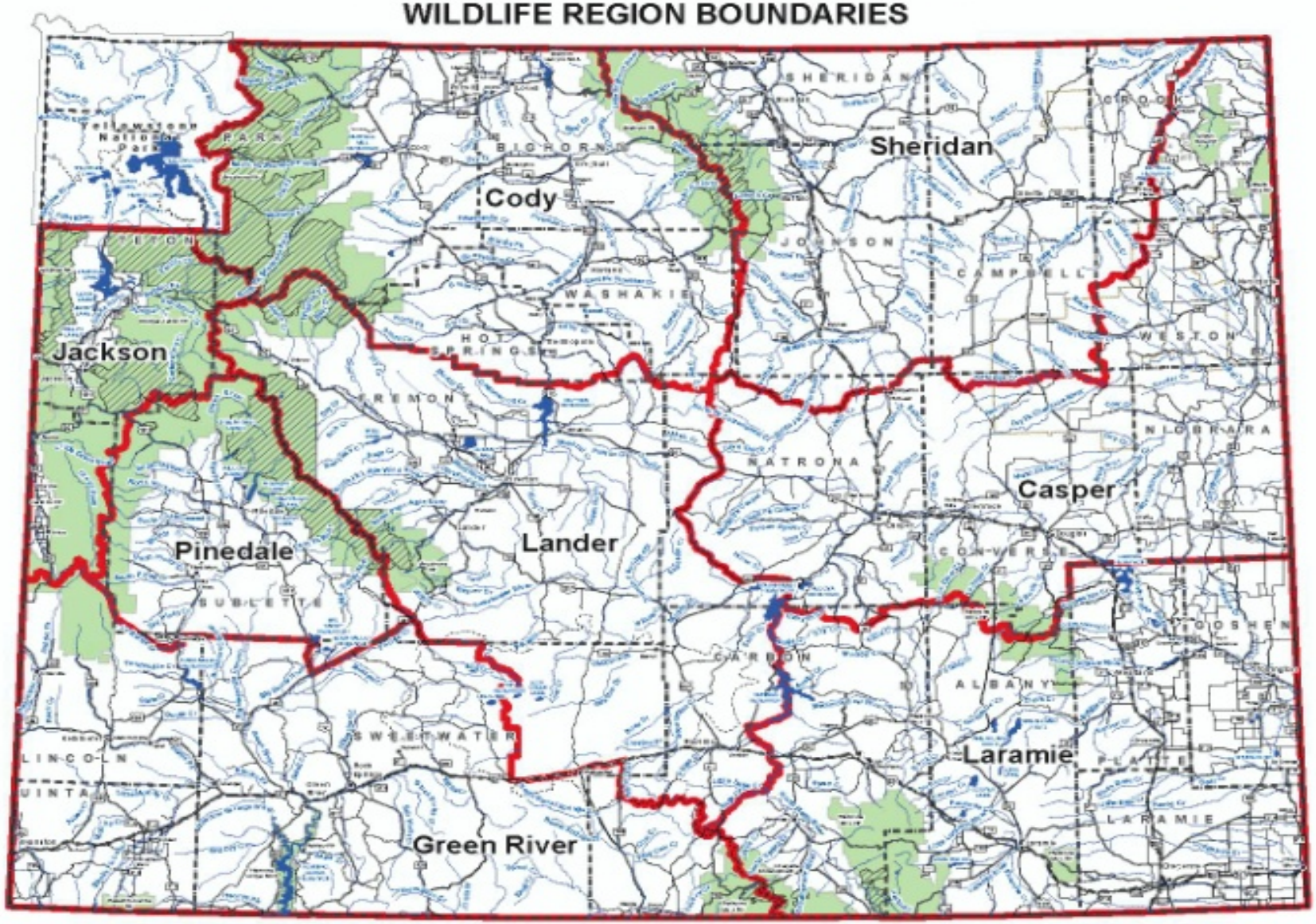
TYPES OF BEES, HONEY or HIVES
BV-BEES, HONEY, HIVES
OT-OTHER

TYPES OF SEED CROPS
AA-ALFALFA
CN-CORN
GH-GRAIN HAY
OT-OTHER

SPECIES	PROGRAM CODE
ANTELOPE	BC
ELK	BD
BIGHORN SHEEP	BE
MOOSE	BF
MOUNTAIN GOAT	BG
MOUNTAIN LION	BJ
BLACK BEAR	BK
GRIZZLY BEAR	BL
MULE DEER	BM
WHITE-TAILED DEER	BN
GRAY WOLF	BW
PHEASANT	CC
TURKEYS	CF
SAGE-GROUSE	CT
GEESE	DB
DUCKS	DC
CRANES	DF

CATEGORY OF DAMAGE
LIVESTOCK
STORED CROPS
GROWING-CULTIVATED CROPS
BEES, HONEY OR HIVES
EXTRAORDINARY DAMAGE TO GRASS
SEED CROPS
IMPROVEMENTS

WYOMING GAME AND FISH DEPARTMENT
WILDLIFE REGION BOUNDARIES



Version Date: 3 September 2013

WYOMING STATUTE W.S. §23-1-901 GOVERNING DAMAGE CLAIMS

W.S. §23-1-901. Owner of damaged property to report damage; claims for damages; time for filing; determination; appeal; arbitration.

(a) Any landowner, lessee or agent whose property is being damaged by any of the big or trophy game animals or game birds of this state shall, not later than fifteen (15) days after the damage is discovered by the owner of the property or the representative of the owner, report the damage to the nearest game warden, damage control warden, supervisor or commission member.

(b) Any landowner, lessee or agent claiming damages from the state for injury or destruction of property by big or trophy game animals or game birds of this state shall present a verified claim for the damages to the Wyoming game and fish department not later than sixty (60) days after the damage or last item of damage is discovered. The claim shall specify the damage and amount claimed. As used in this subsection, "verified claim" means a claim, which the claimant has signed and sworn to be accurate before a person authorized to administer oaths.

(c) The department shall consider the claims based upon a description of the livestock or bees damaged or killed by a trophy game animal, the damaged land, growing cultivated crops, stored crops including honey and hives, seed crops, improvements and extraordinary damage to grass. The commission is authorized to establish by rule, methods, factors and formulas to be used for determining the amount to compensate any landowner, lessee or agent for livestock damaged as a result of, missing as a result of, or killed by trophy game animals. Claims shall be investigated by the department and rejected or allowed within ninety (90) days after submission, and paid in the amount determined to be due. In the event the department fails to act within ninety (90) days, the claim, including interest based on local bank preferred rates, shall be deemed to have been allowed. No award shall be allowed to any landowner who has not permitted hunting on his property during authorized hunting seasons. Any person failing to comply with any provision of this section is barred from making any claim against the department for damages. Any claimant aggrieved by the decision of the department may appeal to the commission within thirty (30) days after receipt of the decision of the department as provided by rules of practice and procedure promulgated by the commission. The commission shall review the department decision at its next meeting following receipt of notice of request for review. The commission shall review the investigative report of the department, and it may approve, modify or reverse the decision of the department.

(d) Within ninety (90) days after receiving notice of the decision of the commission, the claimant may in writing to the department call for arbitration. Within fifteen (15) days after the department receives the call for arbitration, the claimant and the department shall each appoint a disinterested arbitrator who is an elector residing in the county where the damage occurred and notify each other of the appointment. Within twenty (20) days after their appointment, the two (2) arbitrators shall appoint a third arbitrator possessing the same qualifications. If the third arbitrator is not appointed within the time prescribed, the judge of the district court of the county or the court commissioner in the absence of the judge shall appoint the third arbitrator upon the application of either arbitrator.

(e) At least twenty (20) days before the hearing, the board of arbitrators shall provide the claimant and department notice of the time and place in the county when and where the parties will be heard and the claim investigated and decided by the board. A written copy of the decision shall be promptly served upon each party. Within ten (10) days after receipt of the decision, either party may apply to the board for modification of the decision under W.S. 1-36-111. Either party may apply to the district court for vacation of a decision under W.S. 1-36-114(a) or correction or modification of a decision under W.S. 1-36-115 within thirty (30) days after receipt of the decision or within twenty (20) days after action by the board on an application for modification under W.S. 1-36-111.

(f) If no applications under subsection (e) of this section are made after receipt of the decision, the commission shall promptly pay the amount, if any, including interest based on local bank preferred rates, awarded by the board. Within thirty (30) days after the award is final, the board's reasonable service and expense charges shall be paid by:

(i) The claimant if the award is no greater than the amount originally authorized by the commission;

(ii) Otherwise, the commission.

(g) For purposes of this section, “trophy game animals” shall include gray wolves located in the area described in W.S. 23-1-101(a)(xii)(B)(II) regardless of the date on which the damage occurs.

WYOMING GAME AND FISH COMMISSION
CHAPTER 28 REGULATION GOVERNING BIG OR TROPHY GAME ANIMAL OR GAME BIRD DAMAGE CLAIMS

Section 1. Authority. This regulation is promulgated by authority of W.S. §23-1-101, §23-1-102, §23-1-302, §23-1-304 and §23-1-901.

Section 2. Definitions. Definitions shall be as set forth in Title 23, Wyoming Statutes, Commission regulations, and the Commission also adopts the following definitions:

(a) "Authorized hunting seasons" means any hunting season during the twelve (12) month period immediately preceding the date when the claimant filed the verified claim with the Office of the Department that is established by Commission regulation, including Depredation Prevention Hunting Seasons and kill permits, for the harvest of the species of big game animals, trophy game animals, or game birds for which the verified claim was filed.

(b) "Award" means compensation for damage offered to a claimant by the Department.

(c) "Board" means a board of arbitrators.

(d) "Claimant" means any landowner, lessee or agent whose livestock, bees, hives or honey have been damaged or killed by a trophy game animal; or, whose land, growing cultivated crops, stored crops, seed crops, or improvements have been damaged by big game animals or game birds; or, whose grass has been extraordinarily damaged by big game animals or game birds.

(e) "Commercial garden" means a business that grows fruits or vegetables for commercial sale.

(f) "Commercial nursery" means a business that grows or stores trees, shrubs or plants solely for commercial sale and that is required under W.S. § 39-15-106 to be licensed with the Wyoming Department of Revenue to collect and remit sales and use tax.

(g) "Commercial orchard" means a business that grows trees for fruit or nut production for commercial sale.

(h) "Confirmed by the Department or its representative" means the Department or its representative conducted an inspection or investigation of the damage and determined the damage was more likely than not caused by a big or trophy game animal or game bird.

(i) "Consequential damages" means damage, loss, or injury that does not flow directly and immediately from the act of the big game animal, trophy game animal or game bird, but only from some of the consequences or results of such act. Consequential damages include, but are not necessarily limited to, future or anticipated production (except as otherwise provided in this regulation for young of the year livestock), sentimental value, and labor or equipment costs to remove damaged property.

(j) "Damage" means actual damage to land, growing cultivated crops, stored crops, seed crops or improvements that is caused by big game animals or game birds, and sworn by the claimant on the verified claim to have occurred; or, extraordinary damage to grass that is caused by big game animals or game birds and sworn by the claimant on the verified claim to have occurred; and, actual damage to livestock or bees including honey and hives, that is caused by trophy game animals and sworn by the claimant on the verified claim to have occurred. Damage shall not include damage to other real or personal property including, but not necessarily limited to: other vegetation or animals; motor vehicles; structures; damages caused by animals other than big game animals, trophy game animals or game birds; diseases; lost profits; consequential damages; or, any other damages whatsoever that are not specified in this regulation.

(k) "Disinterested arbitrator" means an elector residing in the county where the damage occurred, who is capable of making a reasoned and unbiased decision based on evidence presented to the Board by the claimant and the Department.

(l) "Extraordinary damage to grass" means the loss or harm as proven by the landowner, lessee, or agent that significantly exceeds the usual, customary or average use of non-cultivated grass plants of the Family Graminae.

(m) “Growing cultivated crops” means crops or other vegetation that are grown on privately owned or leased land and harvested or utilized annually for commercial sale or to feed livestock, or for human consumption. “Growing cultivated crops” can include grasses and legumes maturing for harvest, small grains, row crops and vegetables, plants grown in commercial nurseries, commercial orchards, commercial gardens, and native hay meadows that are managed for hay or livestock forage. If the crop is not harvested or utilized annually, it is not a growing cultivated crop unless it requires more than one (1) year to become established and ready for harvest. “Growing cultivated crops” do not include rangelands managed for livestock forage, or products of nurseries, orchards, and gardens that are not intended for commercial sale.

(n) “Hearing” means a procedurally correct arbitration hearing as described in Section 8 of this Regulation that shall be conducted in such manner as to afford the claimant and the Department the opportunity to present, examine, and cross-examine all witnesses and other forms of evidence presented to the Board.

(o) “Hives” means an artificial structure designed and constructed specifically for housing bees.

(p) “Improvements” means a valuable addition made to real estate to increase the productivity or value of land, including fences and man made structures erected or windbreaks or shelterbelts planted on privately owned or leased land to enhance or improve crop or livestock production or grazing management or as a protection for livestock. Improvements shall not include windbreaks or shelterbelts, if they are not planted solely to enhance or improve crop production or grazing management or as a protection for livestock.

(q) “Investigated by the Department” means an inspection determined by the Department to be a reasonable assessment of the damage caused by big or trophy game animals or game birds.

(r) “Kill permit” means a permit authorized by a Game and Fish Commissioner and the Chief Game Warden granting authority to take big game animals, trophy game animals or game birds that are causing substantial damage to property.

(s) “Land” means soil on privately owned or leased land.

(t) “Lessee” means a person who leases fee title land or State land for agricultural purposes.

(u) “More likely than not” means evidence reasonably tending to support the conclusion. Evidence that is competent, relevant, and material, and which to a rational and impartial mind naturally leads, or involuntarily leads to conclusion for which there is valid, just and reasonable substantiation.

(v) “Office of the Department” means the Wyoming Game and Fish Department, 5400 Bishop Blvd., Cheyenne, Wyoming 82006-0001 or the Wyoming Game and Fish Department, 3030 Energy Lane, Casper, Wyoming 82604.

(w) “Permitted hunting during authorized hunting seasons” means permitted hunting as described in Section 4 of this regulation.

(x) “Promptly served upon each party” means within ten (10) days following the arbitration hearing, the Board shall serve a written copy of its decision to the Office of the Department and the claimant.

(y) “Property” means livestock or bees, land, growing cultivated crops, stored crops including honey and hives, seed crops, improvements or grass that has been extraordinarily damaged.

(z) “Reasonable expense charges” means compensation given to an arbitrator while performing duties as an arbitrator that is the same compensation rate afforded to State employees by State statute for per diem and vehicular mileage; and, actual expenses incurred by the arbitrator and documented by receipt including, but not necessarily limited to, telephone calls, paper supplies, and mail service.

(aa) “Reasonable service charges” means reimbursement in the amount of one hundred ($100) dollars per day for performing duties as an arbitrator.

(bb) “Seed crops” means any crop intentionally planted, managed, and grown in accordance with accepted agricultural practices on privately owned or leased land for the production of seed for future propagation and that is harvested annually by manual or mechanical means. If the crop is not harvested annually, it shall not be classified as a seed crop unless the crop normally requires an establishment period of longer than one (1) year to be harvested or unless the crop is alfalfa seed or crested wheat grass seed.

(cc) “Stored crops” means crops that have been harvested and saved or stored for future use in accordance with accepted agricultural practices.

(dd) “Supervisor” means Regional Wildlife Supervisor.

(ee) “Trophy game animals” means black bear, gray wolf, grizzly bear or mountain lion or gray wolf in accordance with W.S. §23-1-901(g).

(ff) “Value of livestock” means the monetary value of individual livestock on the date the verified claim was filed with the Office of the Department based upon the fair market value on that date for like livestock at a rate substantiated by a livestock sales barn or other credible written valuation of the livestock provided by the claimant. However, the monetary value of young of the year livestock on the date the verified claim was filed with the Office of the Department shall be based upon the fair market value on that date for like livestock at the weaning weight substantiated by a livestock sales barn or other credible written valuation of the livestock provided by the claimant.

(gg) “Verified claim” means a Trophy Game Animal Damage Claim Affidavit or a Big Game Animal or Game Bird Damage Claim Affidavit that has been signed by the claimant and sworn to be accurate before a person authorized to administer oaths, that has been filed with the Office of the Department and contains all information required in Section 9 of this regulation.

Section 3. Damage to Livestock by Trophy Game Animals. Except as specified in subsection (a) of this section, the Department shall only offer payment for damage to individual livestock confirmed by the Department or its representative as having been injured or killed by a trophy game animal.

(a) In geographic areas determined by the Department to have terrain, topography, and vegetative characteristics that influence the ability of the claimant and Department to find missing calves and sheep that are believed to have been damaged as a result of a trophy game animal, the Department shall utilize the methods, factors and formulas in this subsection to determine the amount to compensate any landowner, lessee or agent for calves and sheep missing as a result of damage caused by a trophy game animal.

(i) Any claimant whose verified claim is for missing sheep or calves believed to have been damaged as a result of a trophy game animal, shall include on his verified claim the total known death loss, including missing animals, for the sheep or calves for the grazing season together with the number of such losses known to be due to causes other than damage by a trophy game animal.

(ii) Notwithstanding the use of the formulas in this section, the Department shall not offer compensation for more than the total known death loss less the number of such losses known to be due to causes other than damage by a black bear, grizzly bear, mountain lion, or gray wolf in those areas where gray wolves are designated as trophy game animals in accordance with Commission regulation. In order to utilize any formula, the Department or its representative must have confirmed the claimant had at least one (1) calf or one (1) sheep injured or killed by a trophy game animal.

(A) Calves and sheep in areas occupied by grizzly bears. To determine the amount of compensation due to a claimant for calves and sheep believed to be missing as a result of being damaged by a black bear, grizzly bear, or mountain lion in areas occupied by grizzly bears, the Department shall utilize the following formula:

(I) Number of individual calves or sheep confirmed by the Department or its representative killed by a black bear, grizzly bear, or mountain lion multiplied by three and one-half (3.5) multiplied by the value of livestock equals the amount of compensation.

(II) Sheep in areas not occupied by grizzly bears. To determine the amount of compensation due to a claimant for sheep believed to be missing as a result of being damaged by a black bear or mountain lion in areas not occupied by grizzly bears, the Department shall utilize the following formula:

(III) Number of individual sheep confirmed by the Department or its representative killed by a black bear or mountain lion multiplied by three (3) multiplied by the value of livestock equals the amount of compensation.

(iii) Sheep in areas set forth by Commission regulation where gray wolves are designated as trophy game animals. To determine the amount of compensation due to a claimant for sheep believed to be missing as a result of being damaged by gray wolves, in areas occupied by wolves, the Department shall utilize the following formula:

(A) Number of individual sheep confirmed by the Department or its representative killed by a gray wolf multiplied by seven (7) multiplied by the value of livestock equals the amount of compensation.

(iv) Calves in areas set forth by Commission regulation where gray wolves are designated as trophy game animals. To determine the amount of compensation due to the claimant for calves believed to be missing as a result of being damaged by gray wolves, in area occupied by gray wolves, the Department shall utilize the following formula:

(A) Number of individual calves confirmed by the Department or its representative killed by gray wolves multiplied by seven (7) multiplied by the value of livestock equals the amount of compensation.

(b) Veterinary costs for the treatment of individual livestock that have been injured by a trophy game animal shall be considered up to a maximum amount that is not to exceed the value of the livestock injured, only in cases where a licensed veterinarian believes the individual livestock in question had a reasonable chance to survive and return to a productive state. If the individual livestock died as a result of an injury inflicted by a trophy game animal, even though the livestock received veterinary care, payment shall only be made up to a maximum of the value of the livestock.

Section 4. Permitted Hunting During Authorized Hunting Seasons.

(a) A landowner shall not be eligible to receive an award for damage caused by big game animals, trophy game animals, or game birds unless the landowner has permitted hunting during authorized hunting seasons for the species for which the verified claim has been filed on his privately owned or leased land and adjoining Federal or State land within the herd unit in which the damage occurred in accordance with this section. For an award to be allowed, the landowner shall permit hunting during authorized hunting seasons delineated in subsection (i)(A) if the species of big game animals, trophy game animals, or game birds for which the verified claim was filed were present on the landowner's privately owned or leased land and adjoining Federal or State land during authorized hunting seasons delineated in subsection (i)(A). If the species of big game animals, trophy game animals, or game birds for which the verified claim has been filed were not present on the landowner's privately owned or leased land and adjoining Federal or State land during the authorized hunting seasons as delineated in subsection (i)(A), for an award to be allowed the landowner shall permit hunting during authorized hunting seasons delineated in (i)(B) and (i)(C) if requested by the Department. The landowner shall permit hunting during authorized hunting seasons delineated in (i)(B) and (i)(C) without access fees to hunters or the Department.

(i) Authorized hunting seasons include:

(A) Hunting seasons as established by Wyoming Game and Fish Commission rule and regulation;

(B) Depredation prevention hunting seasons as approved by a District Wyoming Game and Fish Commissioner and the Chief Game Warden; or,

(C) Lethal taking of wildlife through a kill permit as approved by a District Wyoming Game and Fish Commissioner and the Chief Game Warden.

(b) The Department shall determine if the landowner permitted hunting during authorized hunting seasons for the species of big game animals, trophy game animals, or game birds for which the verified claim has been filed. For an award to be allowed, the Department shall have to determine the landowner allowed sufficient numbers of hunters to access his privately owned or leased land and adjoining Federal or State land to harvest more than the number of big game animals, trophy game animals or game birds recruited in the preceding twelve (12) months into the segment of the population responsible for doing damage. The landowner shall contact the game warden to whom he reported the damage to determine how many big game animals, trophy game animals, or game birds meets the requirement of more than the number of big game animals, trophy game animals or game birds recruited in the preceding twelve (12) months into the segment of the population responsible for doing damage. An award may be allowed if the Department determines a reduction in big game animals, trophy game animals or game birds affects the Department's ability to sustain the population at the objective the Commission has established for the herd unit.

Section 5. Notification of Damage and Filing of Damage Claims.

(a) Any claimant who has incurred damage as defined in Section 2 of this Regulation shall report the damage to the nearest game warden, supervisor, or Commission member within fifteen (15) consecutive days following the date damage was discovered. If the claimant intends to take actions that prevent the damage being investigated by the Department, such as harvest of damaged crops or removal of damaged livestock, the claimant shall notify the nearest game warden, supervisor, or Commission member as soon as reasonably possible after discovery of the damage so the damage can be investigated by the Department prior to removal, harvest, modification, or destruction of the damaged property; however, in no case shall the claimant take actions that preclude the damage being investigated by the Department. If the claimant denies or precludes the damage being investigated by the Department, the Department shall deny the verified claim.

(b) The claimant shall present a verified claim in accordance with Section 9 of this regulation to the Office of the Department within sixty (60) consecutive days following the date the last item of damage was discovered.

(i) For verified claims of damage to individual livestock by a trophy game animal, the sixty-day (60) period shall commence from the last date the livestock were present on the grazing allotment or geographic location where the damage occurred;

(ii) For verified claims of damage to bees, honey, and hives by a trophy game animal, the sixty (60) day period shall commence from the last date damage occurred or from the last date the bees, honey, or hives were present on the location where the damage occurred, whichever date occurs first; and,

(iii) For verified claims of damage to land, growing cultivated crops, seed crops, stored crops, improvements, or extraordinary damage to grass by big game animals or game birds, the sixty (60) day period shall commence from the last date the growing cultivated crop or seed crop was harvested or the land, stored crops, or improvements were damaged or the extraordinary damage to grass occurred.

(c) If a claimant chooses to appeal the Department's decision regarding a verified claim to the Commission, the claimant shall file a written appeal that is received by the Office of the Department within thirty (30) consecutive days from the date the claimant received the Department's notification of its decision on the verified claim.

(d) The claimant shall have no right of appeal to the Commission of the Department's denial of the claim if based upon the information provided by the claimant in the verified claim, the claimant failed to comply with subsection (a) or (b) of this section. The claimant shall have no right of appeal to the Commission of the Department's decision on a verified claim if the claimant failed to comply with subsection (c) of this section.

Section 6. Investigation and Payment of Verified Claims.

(a) When investigating damage claims, the Department shall utilize the standard of "more likely than not" in determining whether or not the damage was the result of big or trophy game animals or game birds.

(b) The Department shall consider damage that was discovered by the claimant and reported to the nearest game warden, supervisor or Commission member within fifteen (15) consecutive days after the date the damage was discovered. Any damage that was reported more than fifteen (15) consecutive days after the date it was discovered by the claimant shall not be considered by the Department as damage under this regulation.

(c) The Department shall investigate the verified claim and either reject the claim or provide for full or partial payment to the claimant within ninety (90) consecutive days following the date the Office of the Department received the verified claim.

Section 7. Reasons for Denial of a Verified Claim.

(a) The Department shall deny the verified claim for any of the reasons specified in this subsection.

(i) The claimant did not report the damage to the nearest game warden, supervisor or Commission member within fifteen (15) consecutive days after the date the damage was discovered. Any damage that was reported more than fifteen (15) consecutive days after the date it was discovered by the claimant shall not be considered by the Department as damage under this regulation.

(ii) The damage was caused by animals or wildlife other than big game animals, trophy game animals or game birds.

(iii) The big or trophy game animals or game birds causing damage were on the landowner's privately owned or leased land and adjoining Federal or State land during authorized hunting seasons as specified in Section 4(a)(i)(A), and the landowner did not permit hunting in accordance with Section 4(a) of this regulation.

(iv) The big or trophy game animals or game birds causing damage were not on the landowner's privately owned or leased land and adjoining Federal or State land during authorized hunting seasons as specified in Section 4(a)(i)(A), and the landowner would not agree to the Department's implementation of a depredation prevention hunting season as specified in Section 4(a)(i)(B) or insisted on charging an access fee to hunters to participate in a depredation prevention hunting season as specified in Section 4(a).

(v) The big or trophy game animals or game birds causing damage were not on the landowner's privately owned or leased land and adjoining Federal or State land during authorized hunting seasons as specified in Section 4(a)(i)(A), and the landowner would not agree to the Department's implementation of a kill permit as specified in Section 4(a)(i)(C) or insisted on charging an access fee to the Department to implement a kill permit as specified in Section 4(a).

(vi) The verified claim was for property not defined as property in Section 2 of this regulation.

(vii) The claimant was compensated by crop or livestock insurance or a Federal subsidy program for the property damaged to the extent the claimant received compensation under that insurance or program.

(viii) The claimant did not present a verified claim complete with all required information specified in Section 9 of this regulation to the Office of the Department within sixty (60) days after the damage or last item of damage was discovered by the claimant.

(ix) The verified claim was for consequential damages.

(x) Hunting was not permitted during authorized hunting seasons on land in a platted subdivision where the damage occurred due to the actions of a municipal or county ordinance, or homeowners' association covenant prohibiting the discharge of firearms.

(xi) Due to actions of the claimant, the damage was not investigated by the Department.

(xii) The landowner prevented the Department's attempts to mitigate or alleviate the damage through such actions as moving the big or trophy game animals or game birds responsible for the damage or the claimant refused to utilize fencing materials provided by the Department to protect stored crops, including honey and hives.

Section 8. Arbitration.

(a) If the claimant wishes to appeal the Commission's decision regarding a verified claim, the claimant shall file a written call for arbitration with the Office of the Department within ninety (90) consecutive days from the date the claimant received written notice from the Office of the Department of the Commission's decision.

(b) If the claimant calls for arbitration, the claimant and the Office of the Department shall each appoint a disinterested arbitrator within fifteen (15) consecutive days from the date the Office of the Department received the written call for arbitration.

(c) When the claimant and the Office of the Department appoint arbitrators, written notification of the name, mailing address, and telephone number of arbitrators they selected shall be made by each party to the other within fifteen (15) consecutive days from the date the Office of the Department received the written call for arbitration.

(d) Within twenty (20) consecutive days after their appointment, the two (2) arbitrators shall appoint a third arbitrator. The two (2) arbitrators selected shall notify both the claimant and the Office of the Department in writing of the name, mailing address, and telephone number of the third arbitrator selected. If the third arbitrator is not appointed within this time period, the judge of the district court of the county or the court commissioner in the absence of the judge shall appoint the third arbitrator upon the application of either arbitrator.

(e) The three (3) arbitrators shall appoint a chairman who shall chair the Board and serve as secretary to carry out the correspondence of the Board.

(f) At least twenty (20) consecutive days before the hearing, the Board shall provide the claimant and the Office of the Department written notice of the time and place in the county when and where the testimony of the claimant and the Department shall be heard and the claim investigated and decided by the Board.

(g) Following the arbitration hearing, the Board shall within ten (10) days provide a written copy of its decision to the Office of the Department and the claimant.

(h) Unless otherwise specified in this section, the Uniform Arbitration Act, W.S. § 1-36-101 et seq. shall apply to the hearing.

(i) The decision of the Board shall become part of the Office of the Department's file and shall be made part of the record in the event of an appeal of the Board's decision and any appeal to district court shall be conducted in conformity with the Uniform Arbitration Act, W.S. §1-36-114(a) or W.S. §1-36-115.

Section 9. Verified Claim Requirements. The verified claim required by W.S. 23-1-901(b) shall be submitted on the form prescribed by the Department. The verified claim shall contain the following information:

(a) A description of the land on which the damage occurred, including the legal description (section, range, township), the county in which the land is located, and whether the land is privately owned, leased, or federally owned;

(b) Whether the claimant is the landowner, lessee, or agent of the landowner or lessee;

(c) A description of individual livestock, including the number, age class and sex if known, or description of bees, including honey and hives, damaged or killed by a trophy game animal;

(d) A description of the land, growing cultivated crops, stored crops, seed crops, or improvements damaged by a big game animal or game bird; or a description of the grass extraordinarily damaged by a big game animal or game bird;

(e) Competent, relevant and material evidence provided by the claimant that a big game animal, trophy game animal, or game bird caused the damage;

(f) The dates during which damage took place, to include the specific date the damage was discovered by the claimant and the specific date the damage ended;

(g) The amount and value of livestock or property damaged, including all calculations and evidence supporting the value determination;

(h) The species and number, if known, of big or trophy game animals or game birds that caused the damage;

(i) The name of the game warden, supervisor or Commission member to whom the claimant reported the damage and the specific date it was reported;

(j) Information to allow the Department to determine whether or not the landowner permitted hunting during authorized hunting seasons for the species causing damage in accordance with Section 4 of this regulation;

(k) Information as to whether or not an access fee was charged by the claimant for permitting hunting during authorized hunting seasons for the species of big game animal, trophy game animal or game bird for which the verified claim was filed; the total amount of access fee charged per hunter; and, the total number of hunters permitted to hunt during authorized hunting seasons for the species causing damage;

(l) Information by which the Office of the Department can recognize the claimant signed and swore before a person authorized to administer oaths (notarized) the verified claim to be accurate;

(m) For verified claims for calves and sheep missing as a result of damage by a trophy game animal, the total known death loss, including missing animals, for the sheep or calves for the grazing season together with the number of such losses known to be due to causes other than damage by a trophy game animal;

(n) Information to indicate if all or what portion of the property damaged was compensated for by crop or livestock insurance or a Federal subsidy program to the extent the claimant received compensation under that insurance or program; and,

(o) The claimant may submit additional supporting information, which shall be considered as part of the verified claim.

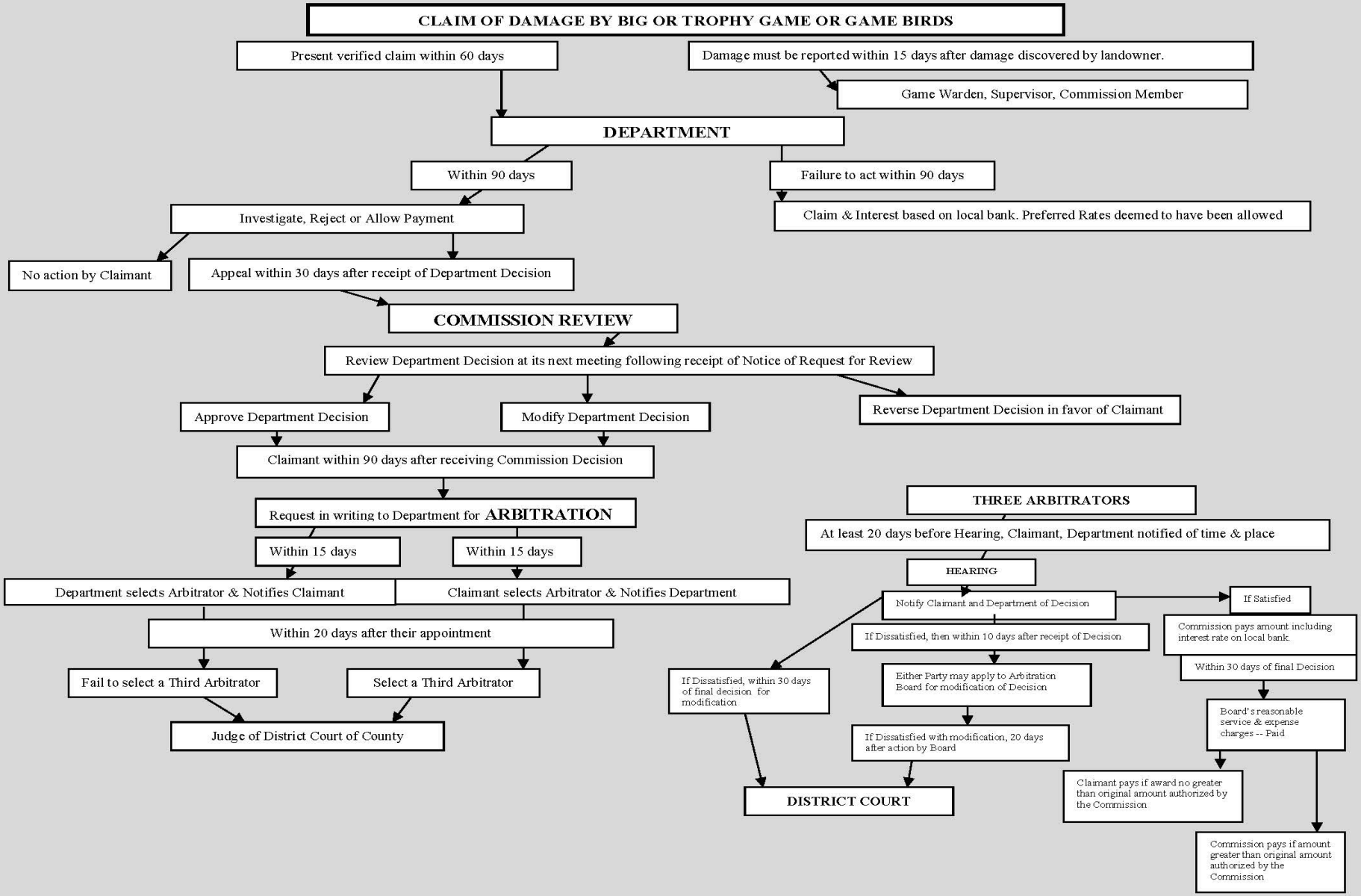
WYOMING GAME AND FISH COMMISSION

By: _____

Mike Healy, President

Dated: January 22, 2014

DAMAGE CLAIM PROCEDURE FLOW CHART



From: Steve Kallin
To: Jeffrey Warren
Cc: Cris Dippel; Eric Cole
Subject: FW: damage payments wildlife Wyoming
Date: Wednesday, April 15, 2015 11:34:22 AM
Attachments: FinalDCFY13.pdf

Jeff:

Attached is a bit of information concerning the WGFD process of paying for wildlife damage and their tally of conflicts. You were interested in having a "wildlife conflicts" database developed prior to the implementation of the AMP. The attached provides a bit of info about what they are already doing.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Huijser, Marcel [mailto:mhuijser@coe.montana.edu]
Sent: Monday, March 16, 2015 1:17 PM
To: Steve Kallin
Subject: damage payments wildlife Wyoming

From: Doug Brimeyer [mailto:doug.brimeyer@wyo.gov]
Sent: Friday, March 13, 2015 9:23 AM
To: Huijser, Marcel
Subject: Re: question for report National Elk Refuge

Marcel
The figures I mentioned earlier were for the entire state. I am attaching the latest damage claim summary for your review. The document breaks down the costs by species and region in the state. It may be useful to pull out the figures for damage in the Jackson Region. Please take a look at the attachment and let me know if you have any other questions.

On Thu, Mar 12, 2015 at 4:57 PM, Huijser, Marcel <mhuijser@coe.montana.edu> wrote:

> Hello Doug,
>
> The National Elk Refuge is almost done reviewing the report on the highway and the refuge. I interviewed you last summer for this report.
> A quick question: the $700,000 mentioned below for the entire state of Wyoming, correct? Not just for Jackson Hole area, correct?

> “Even with the ongoing hazing and supplementary feeding programs in the area, Wyoming Game & Fish Department spends about $700,000 per year to compensate private landowners for crop damage (Pers. Comm. Doug Brimeyer , Wyoming Game & Fish Department).”
>
> Note: I hope that NER will allow me to send the draft report to you and other interviewees sometime in April for final check/corrections.
>
> Thanks again for your help, Marcel

--
Doug Brimeyer
Jackson/Pinedale Wildlife Management Coordinator
Wyoming Game and Fish Department
doug.brimeyer@wyo.gov
307-733-2321 ext. 230

E-Mail to and from me, in connection with the transaction
of public business, is subject to the Wyoming Public Records
Act and may be disclosed to third parties.

Wyoming Game and Fish Department



WILDLIFE DAMAGE CLAIM REPORT

FISCAL YEAR 2013 WITH 10-YEAR SUMMARY

WILDLIFE DIVISION

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PREFACE

Common law in America, which has been continually reinforced in the United States courts, holds that the people of the state own the wildlife. No individual holds absolute property right to wildlife regardless of the status of the land on which the animal is found. Since wildlife belongs to everyone, the courts contend that everyone must share in its keep. As a result, courts have ruled the states are immune from liability for damage caused by wild animals, unless the state assumes that responsibility. Wyoming has assumed limited liability through legislation for some species of wildlife and under specific circumstances(see W.S. § 23-1-901 on page 38).

Wyoming Statute W.S. § 23-2-101(e) was passed by the legislature in an effort to provide a funding source for the payment of big or trophy game animal and game bird damage claims. That source of money is generated from a nonresident application fee of $14 and a resident application fee of $5 for any limited quota big or trophy game license issued through a drawing or for a wild bison license. The statute provides for 25% of the fees collected from license applications to be set aside to establish and maintain a fund of $500,000 to compensate landowners or lessees for property damaged by big or trophy game animals and game birds.

Wildlife damage management is a major component of the Wyoming Game and Fish Department's (WGFD) Wildlife Management Program. Considerable efforts are made to prevent damage including hazing, use of zon guns, providing materials for stackyard fences, relocating trophy game animals, increasing harvest, depredation seasons and, as a last resort, "kill" permits.

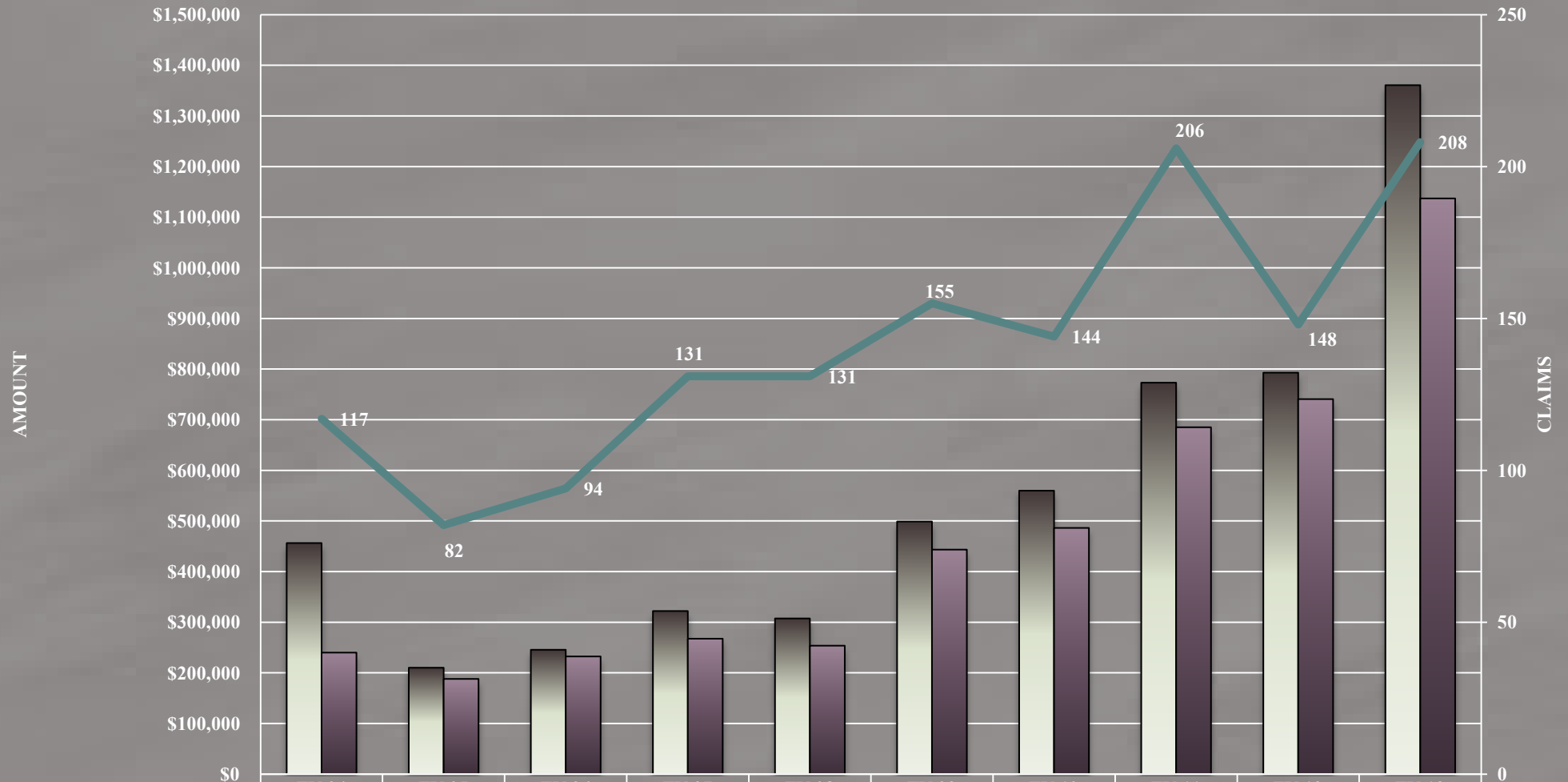
A landowner may submit a verified claim requesting compensation for damage. Claimants must meet all statutory and regulatory requirements in notifying WGFD personnel and filing the claim. WGFD personnel investigate the claim and verify the claimed damage using guidelines established by the WGFD in *The Handbook of Wildlife Depredation Techniques*. Claimants who do not wish to accept the WGFD's offer of payment may appeal the claim to the Wyoming Game and Fish Commission. If the claimant wishes to appeal the decision of the Commission, the claim may be appealed to an arbitration board and proceed on to District Court (see the Damage Claim procedure flow chart on pages 46).

Figures in this summary represent information obtained from verified claims of damage occurring in the depicted fiscal years. These figures will vary from information in the WGFD's Annual Report because program and personnel costs are combined in the Annual Report and payments of claims in the Annual Report only reflect actual payments made in that fiscal year. The Wildlife Damage Claim Summary is an effort to reflect the damage claim amounts and the amounts paid on claims which includes both claim amounts and amounts paid as if they occurred in the same fiscal year.

10-YEAR SUMMARY OF DAMAGE CLAIM ACTIONS

FISCAL YEAR	# OF CLAIMS	% OF CLAIMS PAID	% PAID IN FULL	% PAID PARTIALLY	% DENIED 15 DAY NOTICE	% DENIED 60 DAY FILING	% DISALLOWED (for other reasons covered by statute)	% APPEALED TO COMMISSION	% APPEALED TO ARBITRATION
04	117	95%	77%	18%	1%	3%	1%	5%	1%
05	82	100%	74%	26%	0%	0%	0%	2%	0%
06	94	97%	80%	17%	1%	1%	1%	1%	0%
07	131	97%	75%	22%	0%	2%	2%	1%	1%
08	131	95%	81%	13%	0%	4%	1%	1%	0%
09	155	97%	75%	22%	1%	2%	<1%	1%	1%
10	144	100%	82%	18%	0%	0%	0%	3%	1%
11	206	99%	84%	15%	<1%	0%	0%	1%	<1%
12	148	98%	82%	16%	0%	1%	1%	<1%	0%
13	208	99%	78%	20%	0%	0%	<2%	<1%	0%

10-YEAR DAMAGE CLAIM PAYMENT SUMMARY

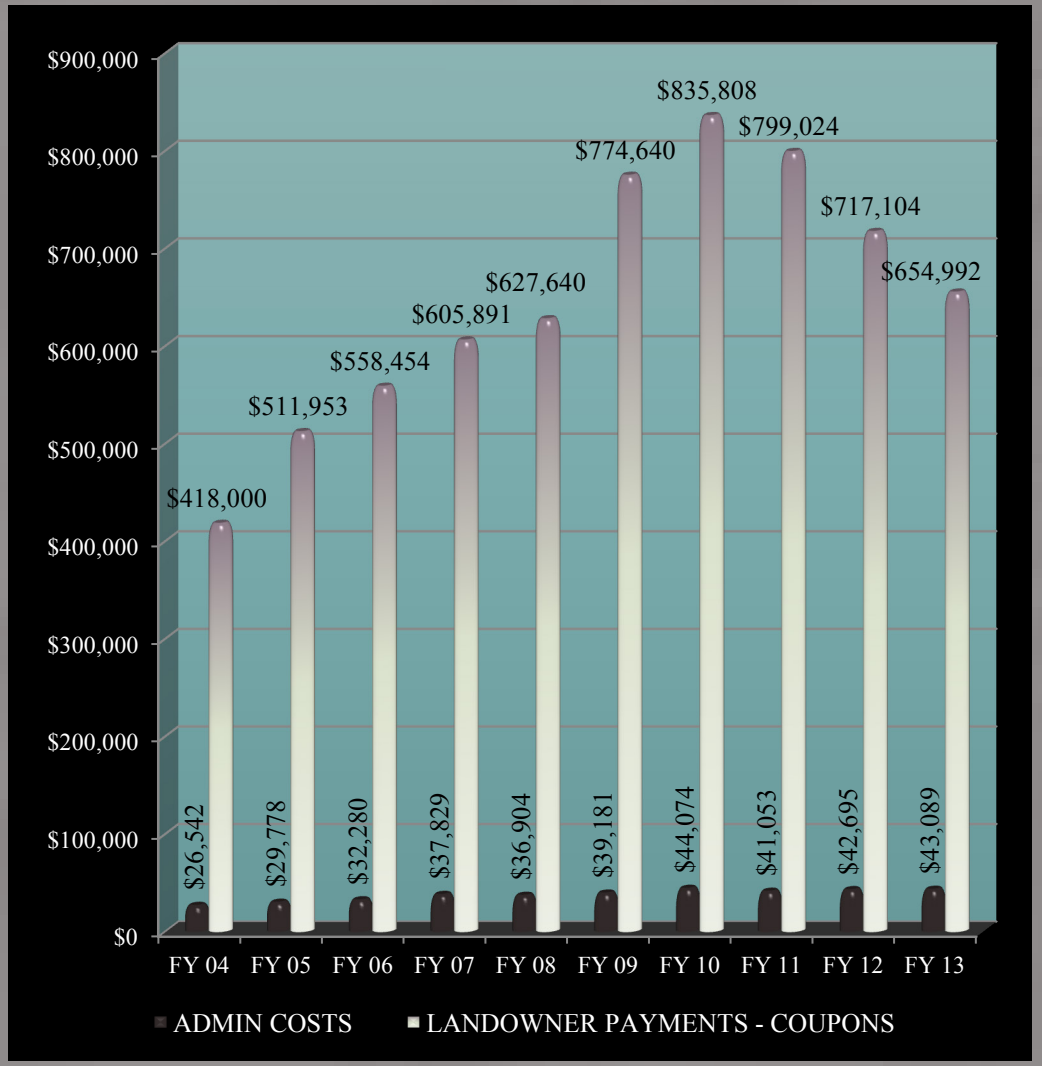


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMOUNT CLAIMED	456,406	210,189	245,653	322,153	307,504	498,914	559,876	773,154	792,950	1,360,735
AMOUNT PAID **	240,055	188,087	232,460	267,525	253,734	443,450	486,306	685,143	740,712	1,137,085
#CLAIMS	117	82	94	131	131	155	144	206	148	208

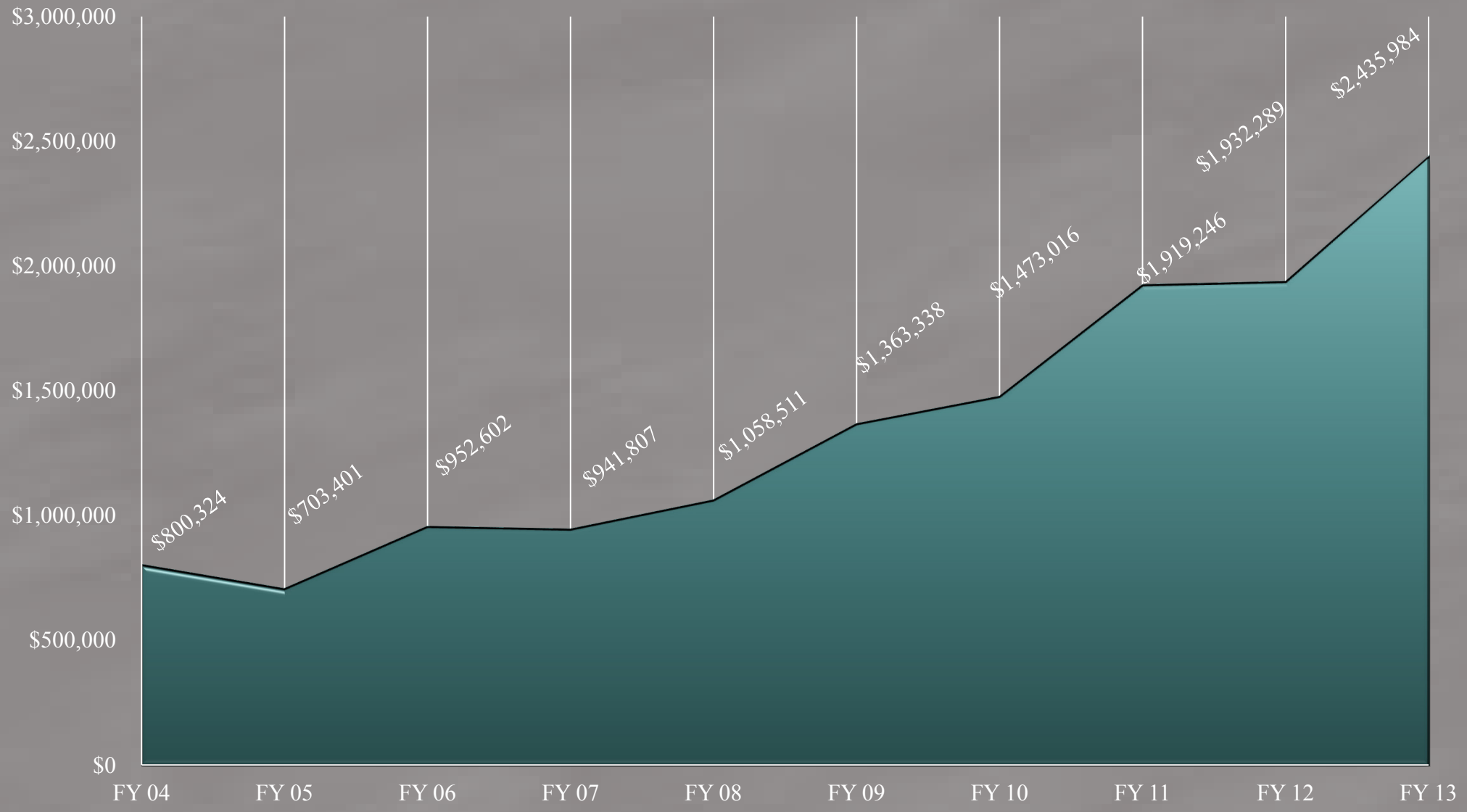
** Amount paid reflects the total dollar amount paid for claims filed in each fiscal year. In some cases, actual payment was made in FY 13 for claims filed in the previous fiscal year. For this reason, these figures may differ with figures in the Department's Annual Report.

10-YEAR SUMMARY OF PREVENTION, HANDLING AND ADMINISTRATION COSTS

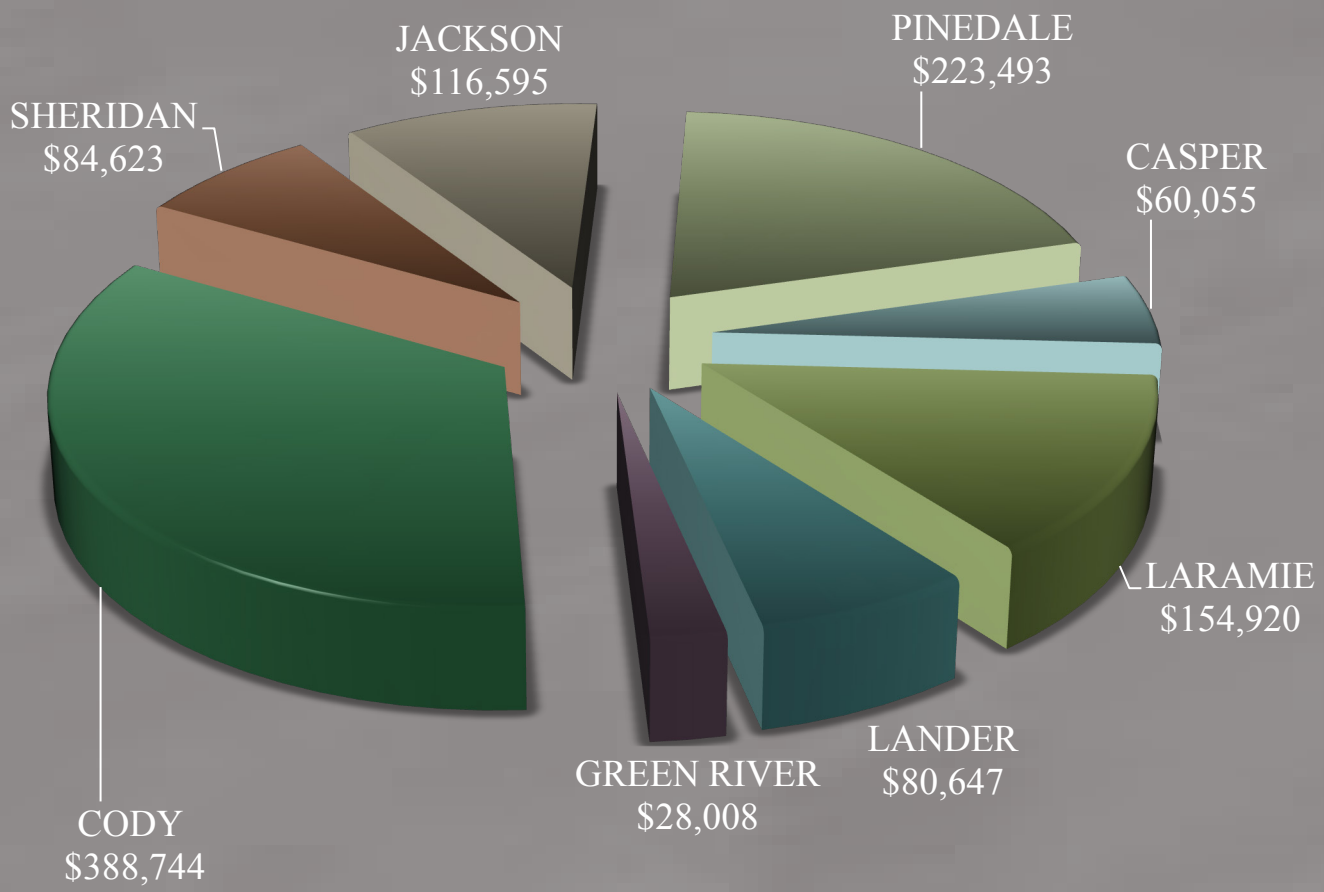




10-YEAR SUMMARY TOTAL DAMAGE PROGRAM COSTS



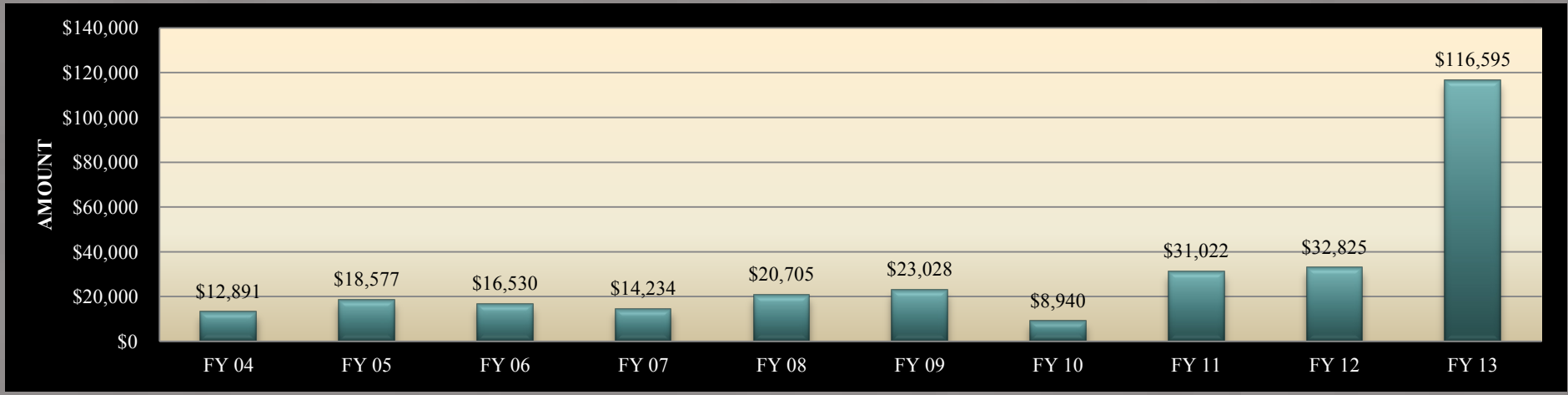
FY 13 AMOUNT, PERCENTAGE AND NUMBER OF CLAIMS PAID BY REGION

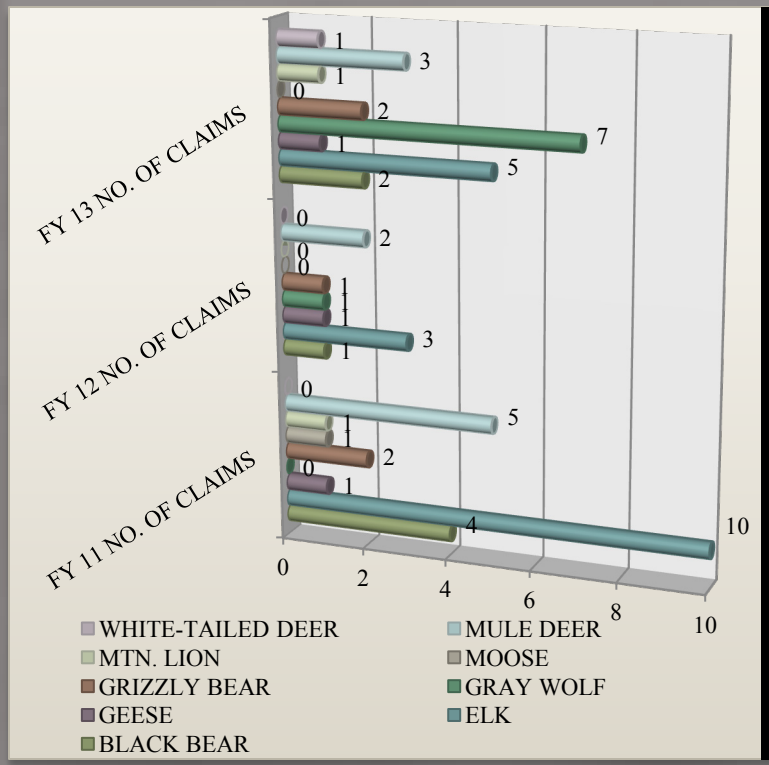


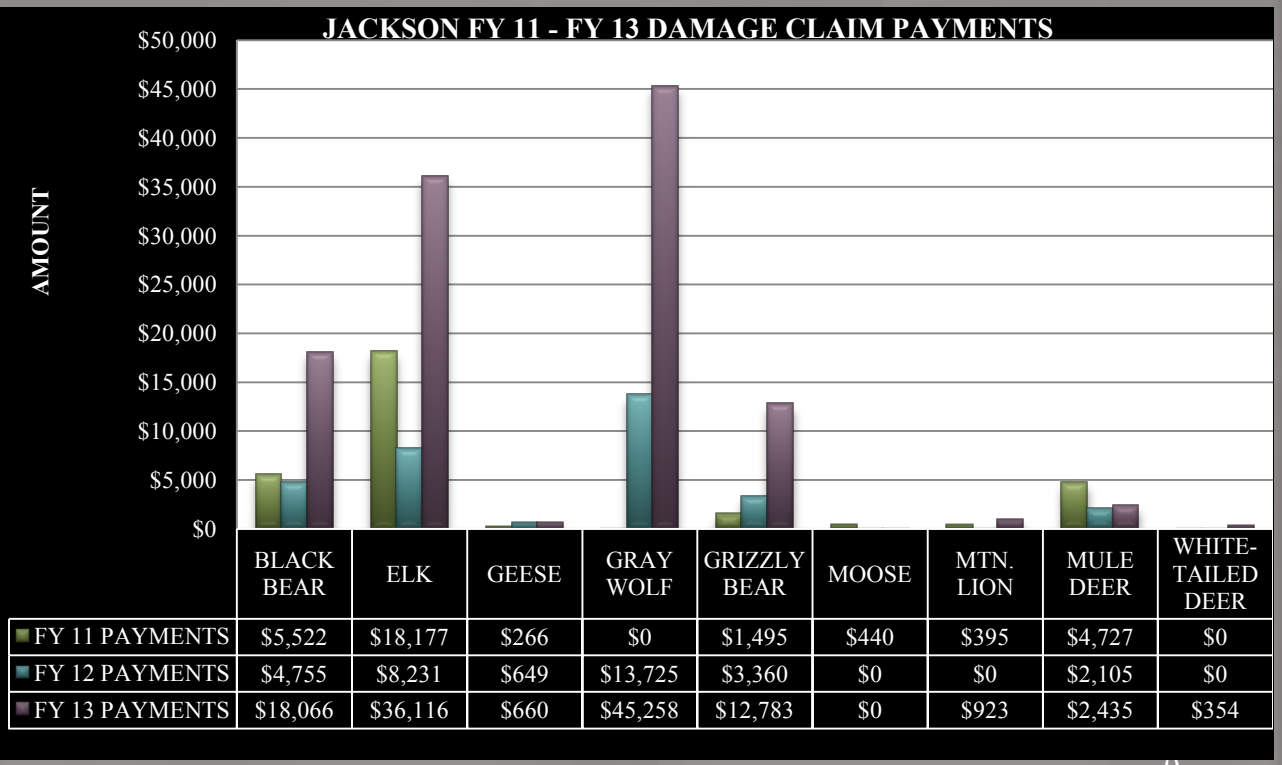
REGION	AMOUNT PAID	PERCENTAGE	NUMBER OF CLAIMS
JACKSON	$116,595	10%	14
CODY	$388,744	34%	76
SHERIDAN	$84,623	7%	21
GREEN RIVER	$28,008*	3%	13
LARAMIE	$154,920	14%	24
LANDER	$80,647	7%	12
CASPER	$60,055	5%	21
PINEDALE	$223,493	20%	27
TOTAL FY 13 DAMAGE AMOUNT PAID	**$1,137,085**		**208**

* This amount paid figure includes a Department approved payment for $765.00 that, as of this report date, is pending action from the claimant.

JACKSON REGION

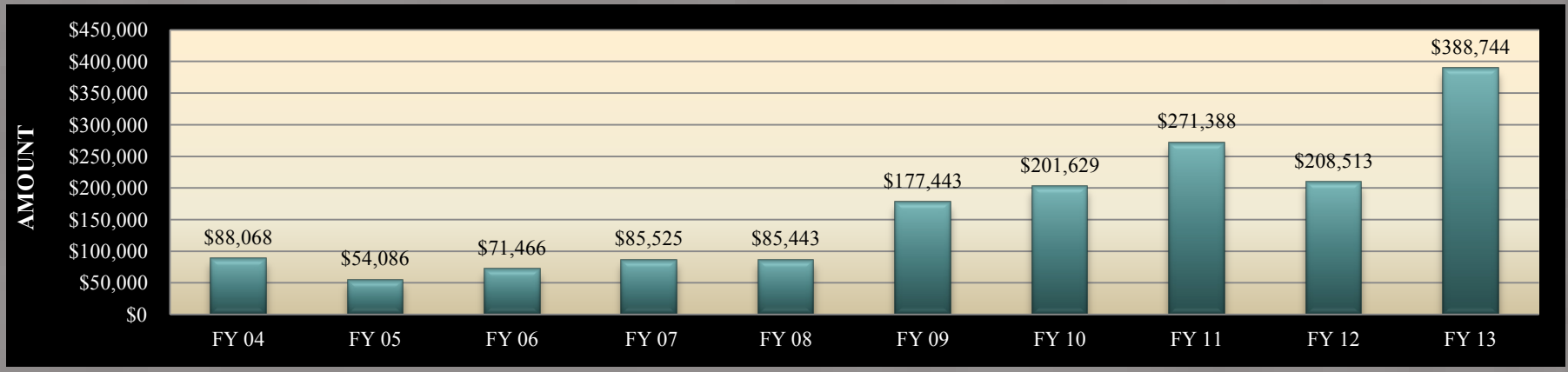


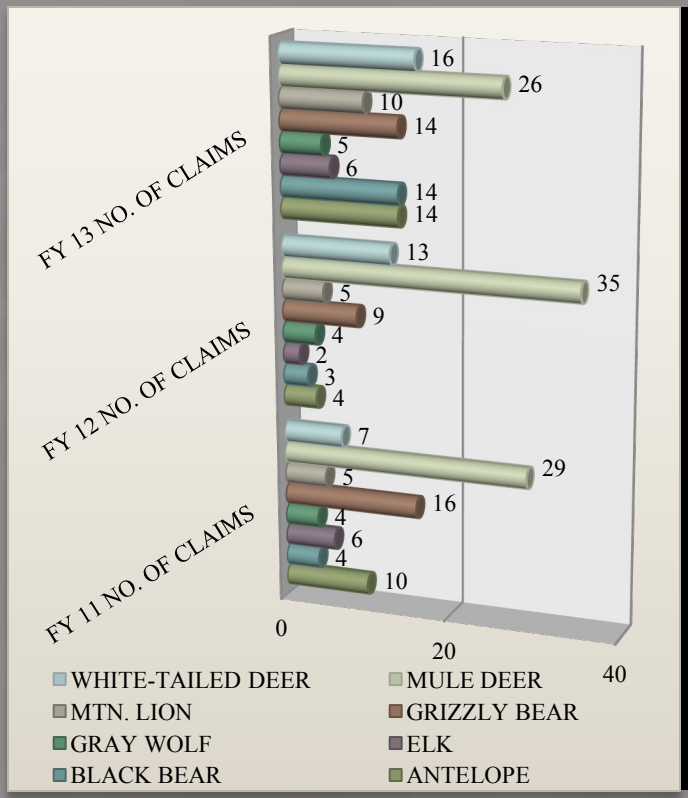


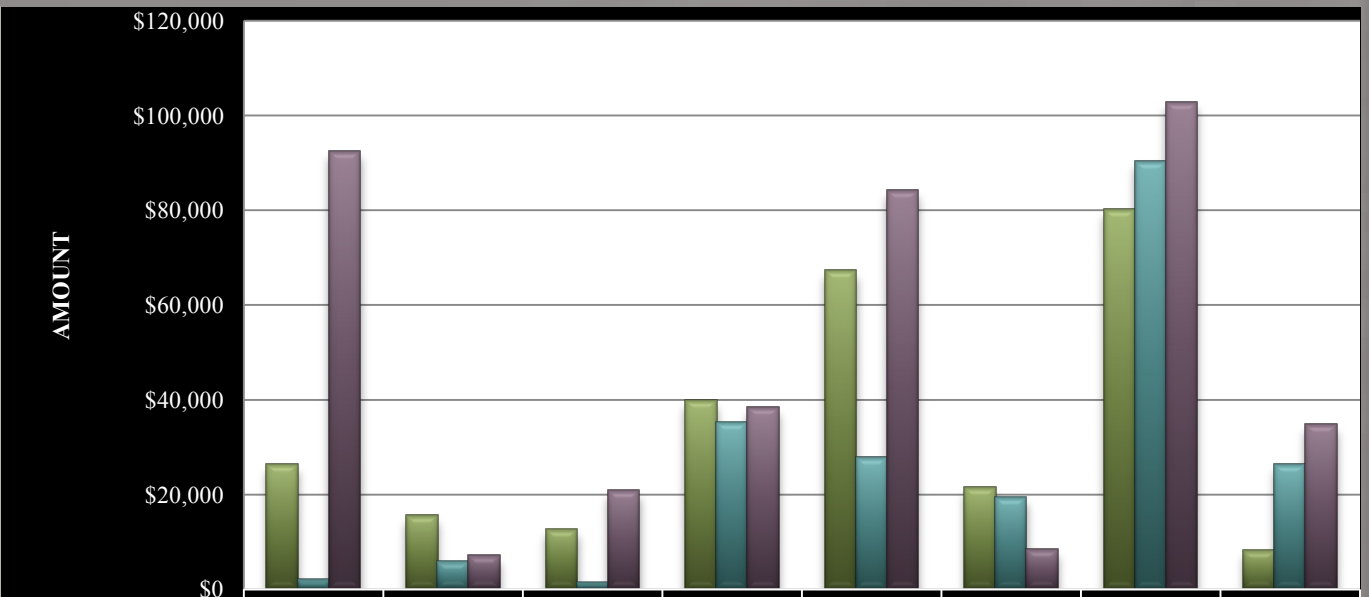


	BLACK BEAR	ELK	GEESE	GRAY WOLF	GRIZZLY BEAR	MOOSE	MTN. LION	MULE DEER	WHITE-TAILED DEER
FY 11 PAYMENTS	$5,522	$18,177	$266	$0	$1,495	$440	$395	$4,727	$0
FY 12 PAYMENTS	$4,755	$8,231	$649	$13,725	$3,360	$0	$0	$2,105	$0
FY 13 PAYMENTS	$18,066	$36,116	$660	$45,258	$12,783	$0	$923	$2,435	$354

CODY REGION

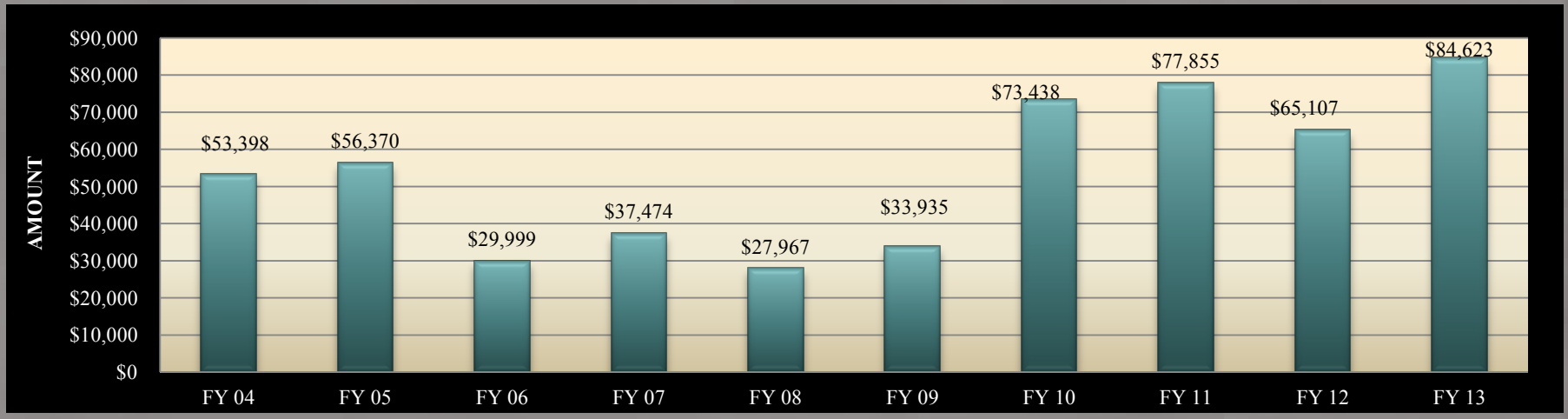


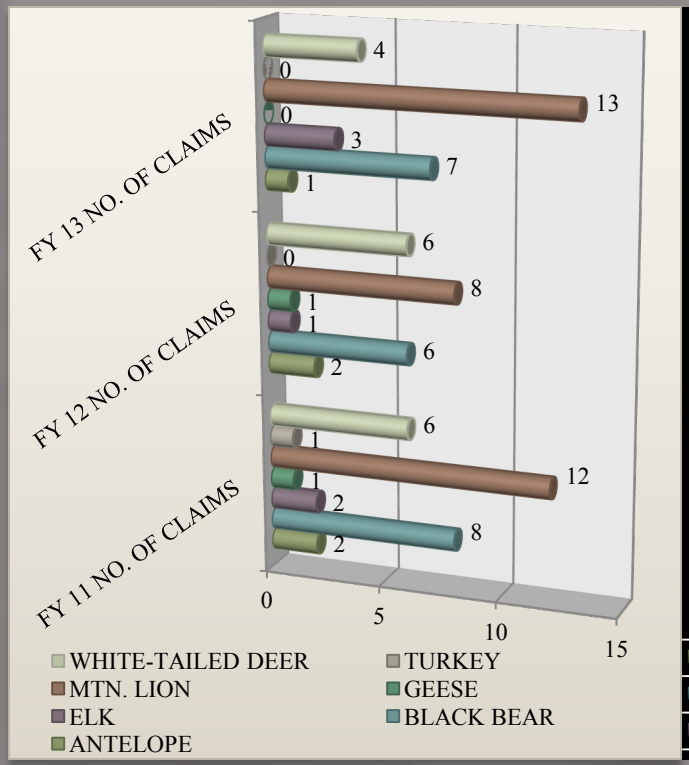


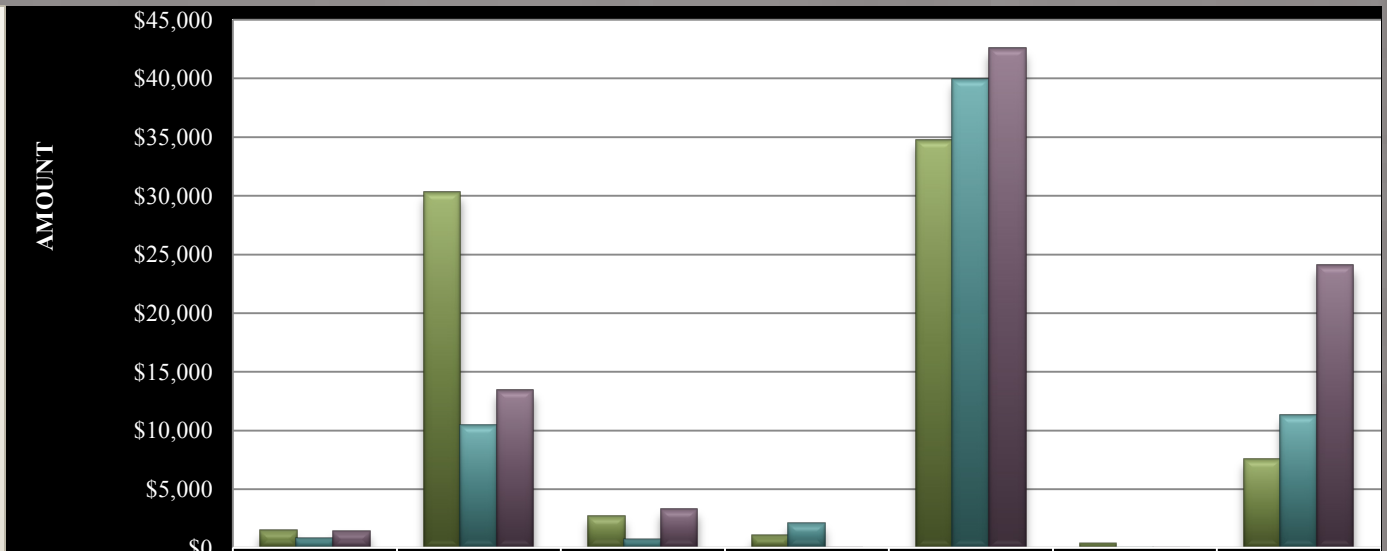


	ANTELOPE	BLACK BEAR	ELK	GRAY WOLF	GRIZZLY BEAR	MTN. LION	MULE DEER	WHITE-TAILED DEER
FY 11 PAYMENTS	$26,357	$15,553	$12,716	$39,781	$67,179	$21,505	$80,096	$8,201
FY 12 PAYMENTS	$2,147	$5,821	$1,436	$35,168	$27,853	$19,446	$90,300	$26,342
FY 13 PAYMENTS	$92,388	$7,086	$20,733	$38,420	$84,122	$8,433	$102,823	$34,739

SHERIDAN REGION

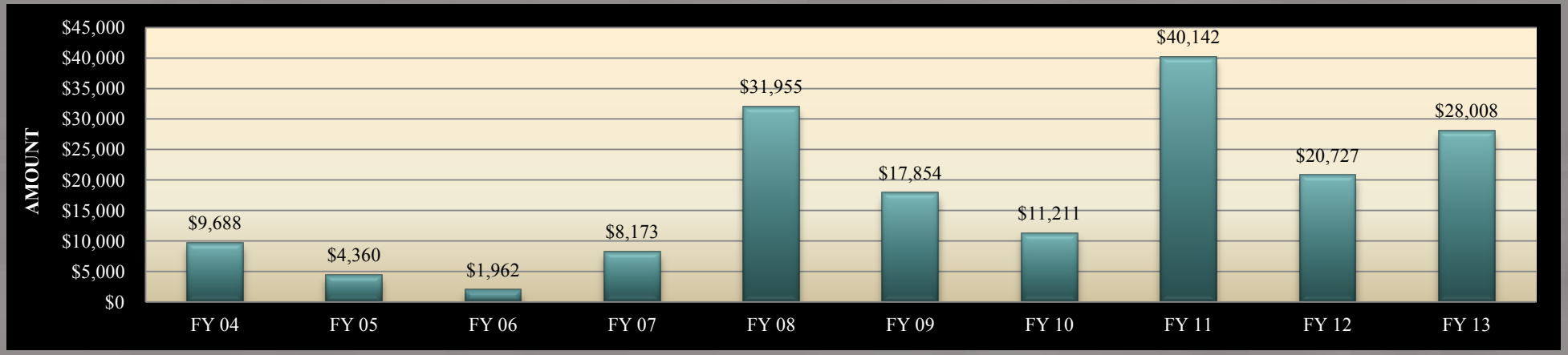


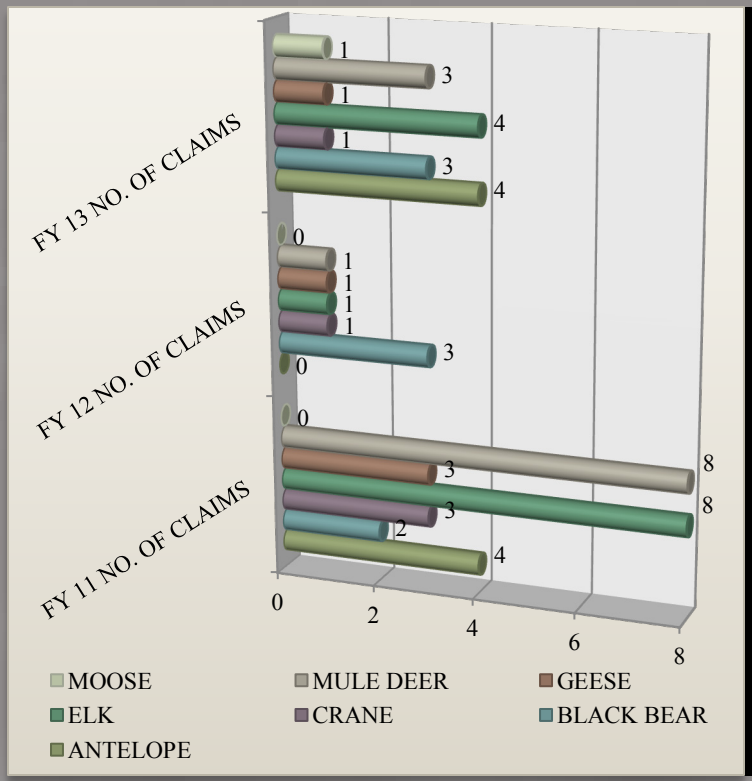


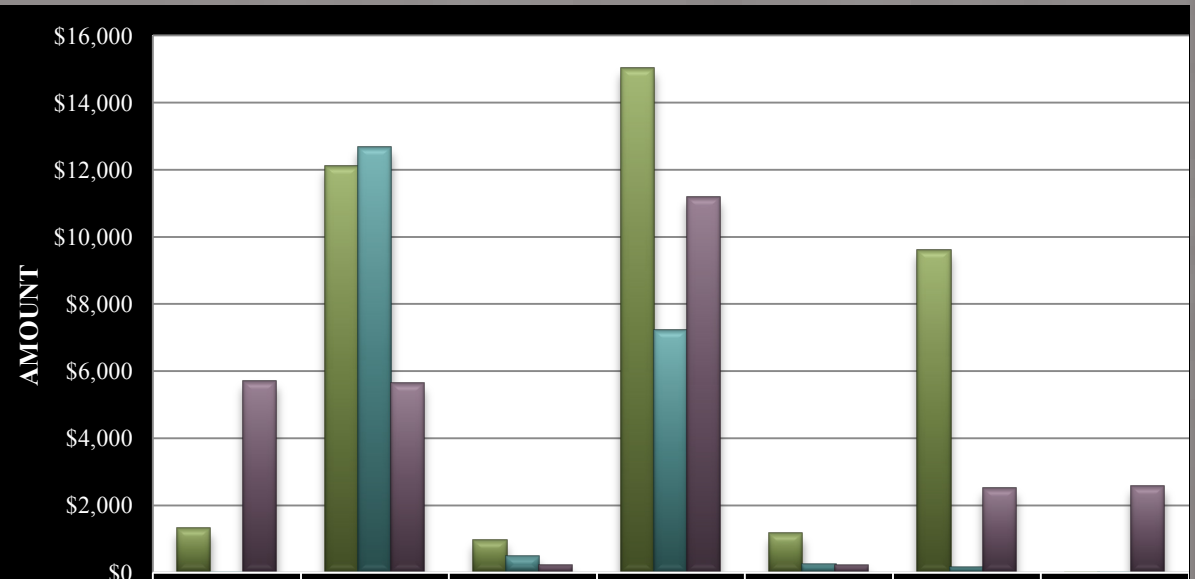


	ANTELOPE	BLACK BEAR	ELK	GEESE	MTN. LION	TURKEY	WHITE-TAILED DEER
FY 11 PAYMENTS	$1,419	$30,263	$2,650	$984	$34,690	$340	$7,509
FY 12 PAYMENTS	$805	$10,387	$656	$2,074	$39,901	$0	$11,284
FY 13 PAYMENTS	$1,400	$13,416	$3,274	$0	$42,511	$0	$24,022

GREEN RIVER REGION

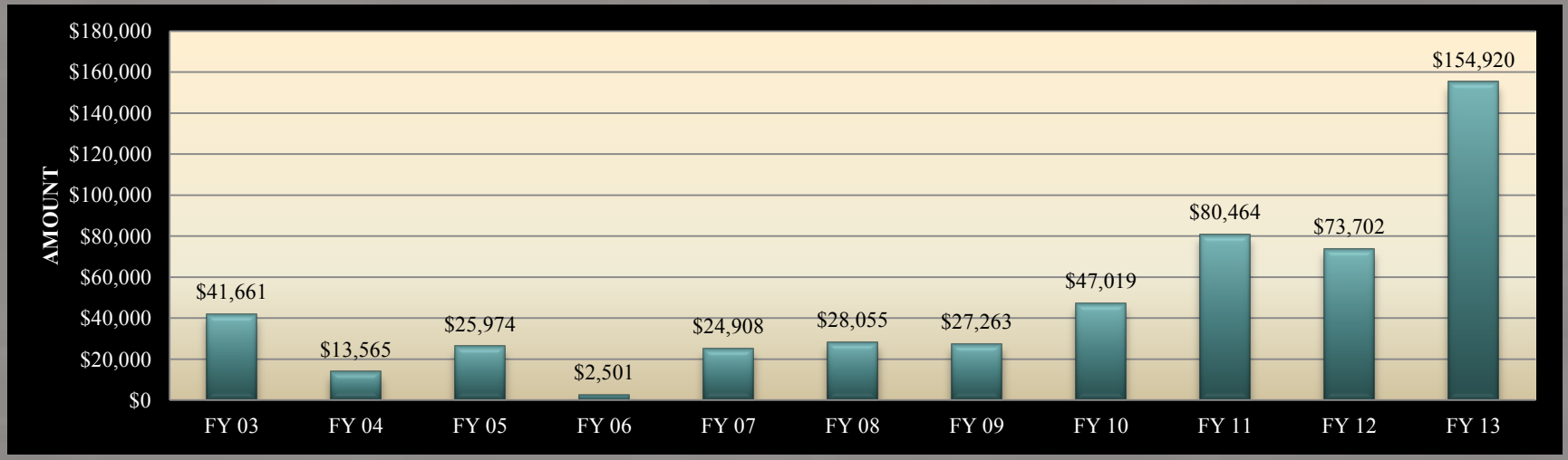


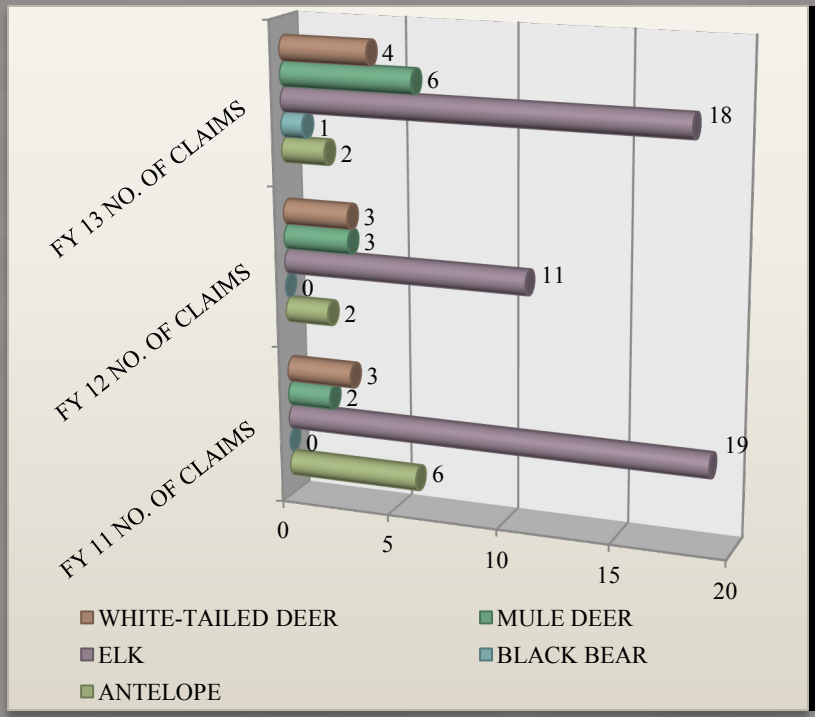


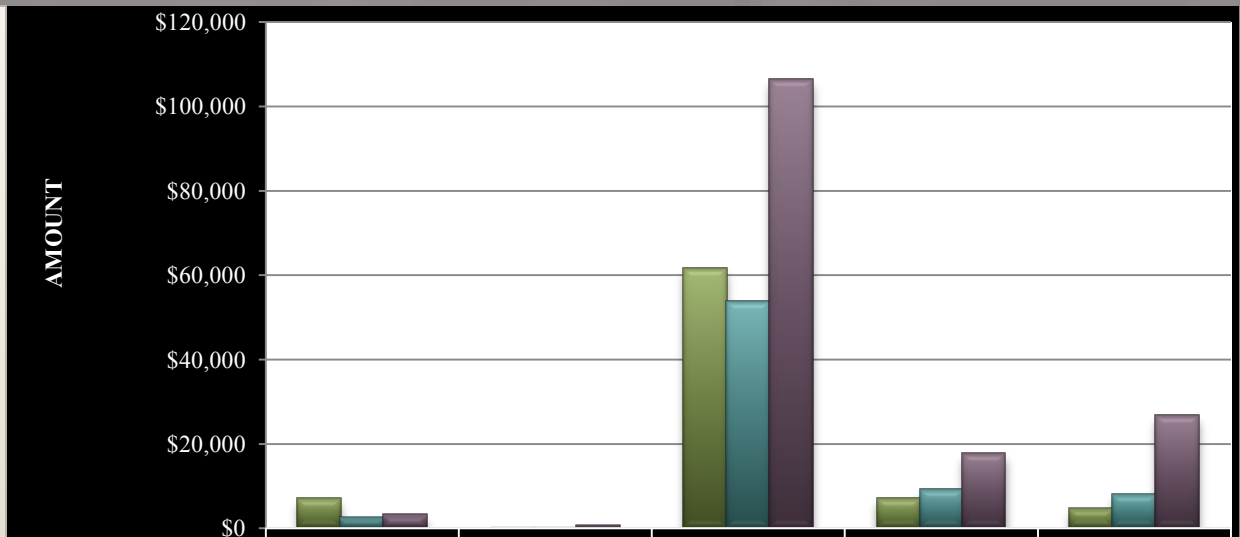


	ANTELOPE	BLACK BEAR	CRANE	ELK	GEESE	MULE DEER	MOOSE
FY11 PAYMENTS	$1,307	$12,105	$964	$15,018	$1,149	$9,599	$0
FY12 PAYMENTS	$0	$12,660	$479	$7,200	$239	$149	$0
FY 13 PAYMENTS	$5,696	$5,629	$215	$11,169	$211	$2,518	$2,570

LARAMIE REGION

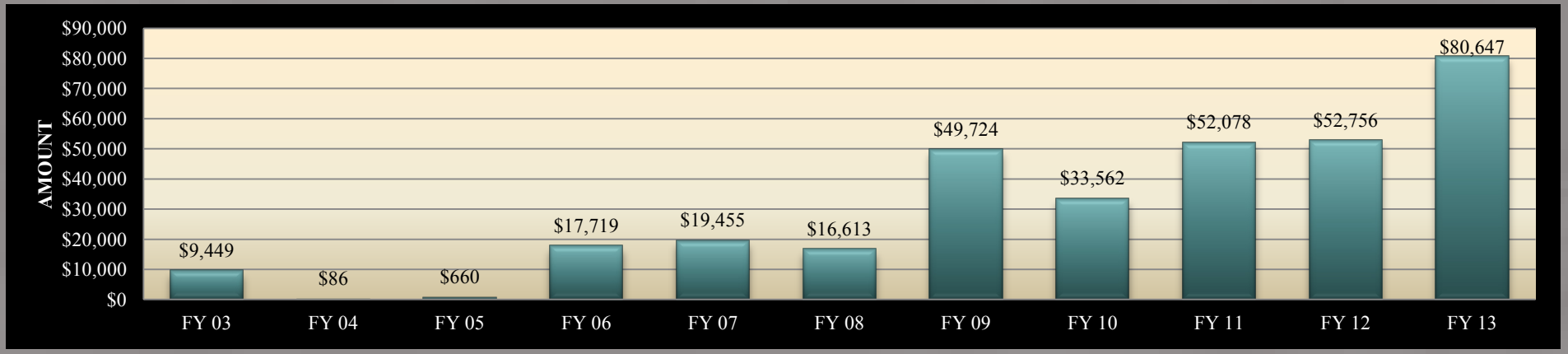


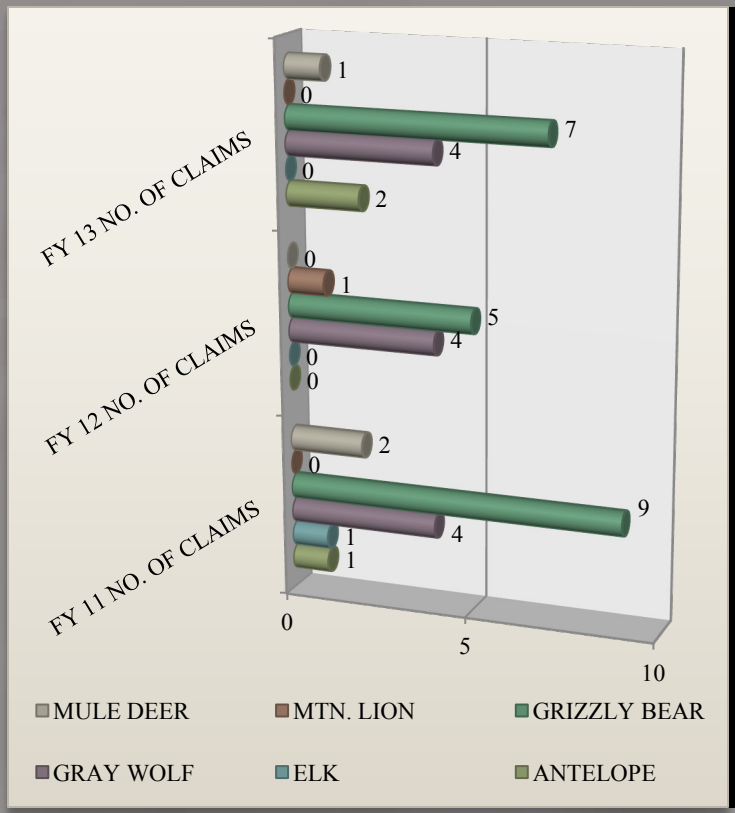


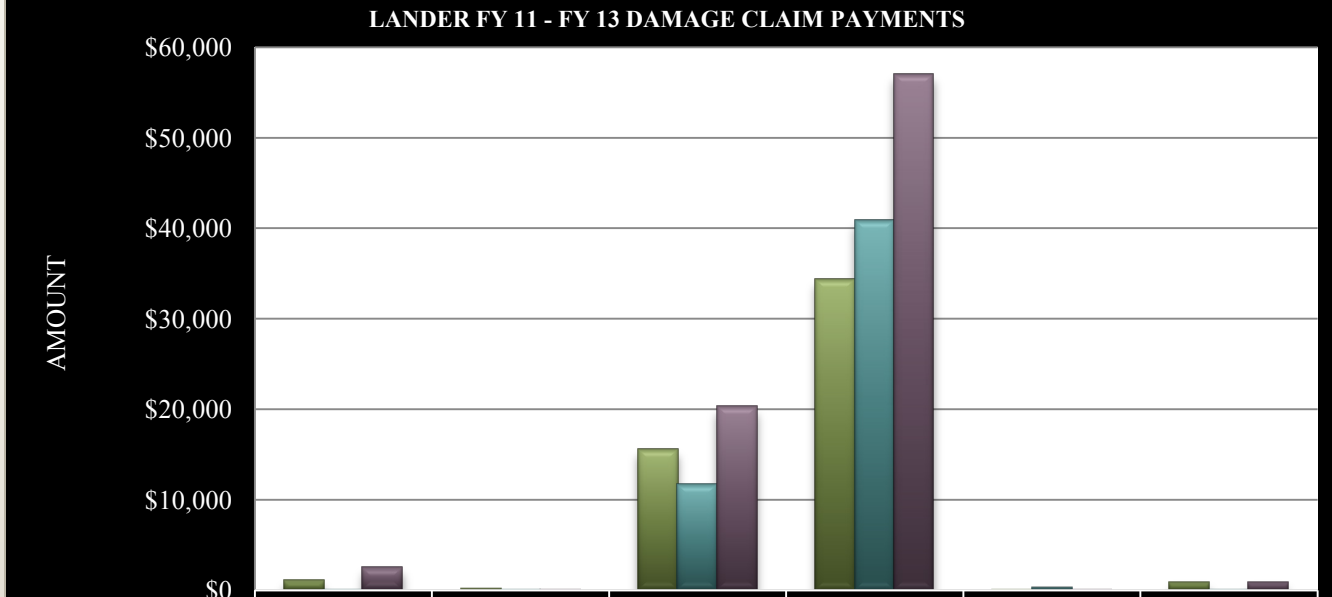


	ANTELOPE	BLACK BEAR	ELK	MULE DEER	WHITE-TAILED DEER
FY 11 PAYMENTS	$7,087	$0	$61,552	$7,198	$4,627
FY 12 PAYMENTS	$2,554	$0	$53,824	$9,311	$8,013
FY 13 PAYMENTS	$3,205	$765	$106,376	$17,689	$26,885

LANDER REGION

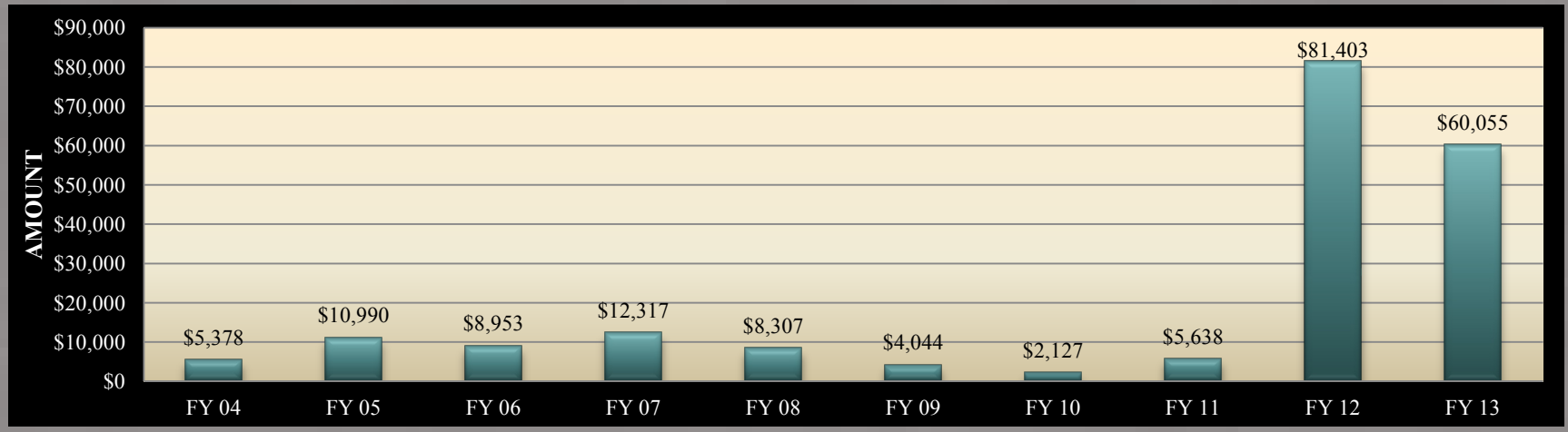


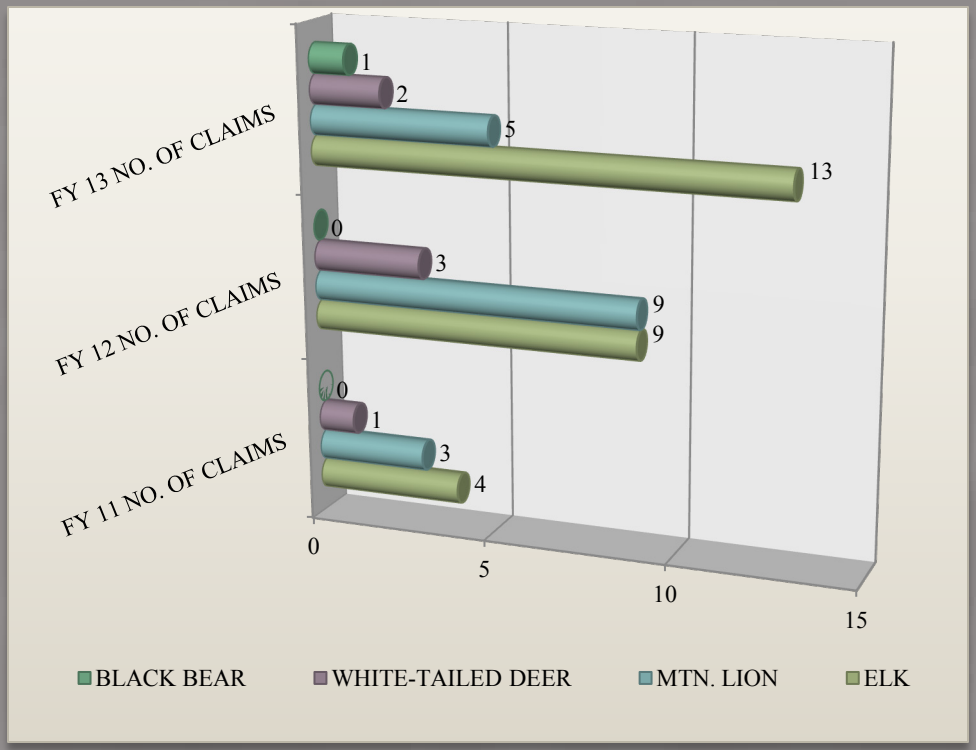


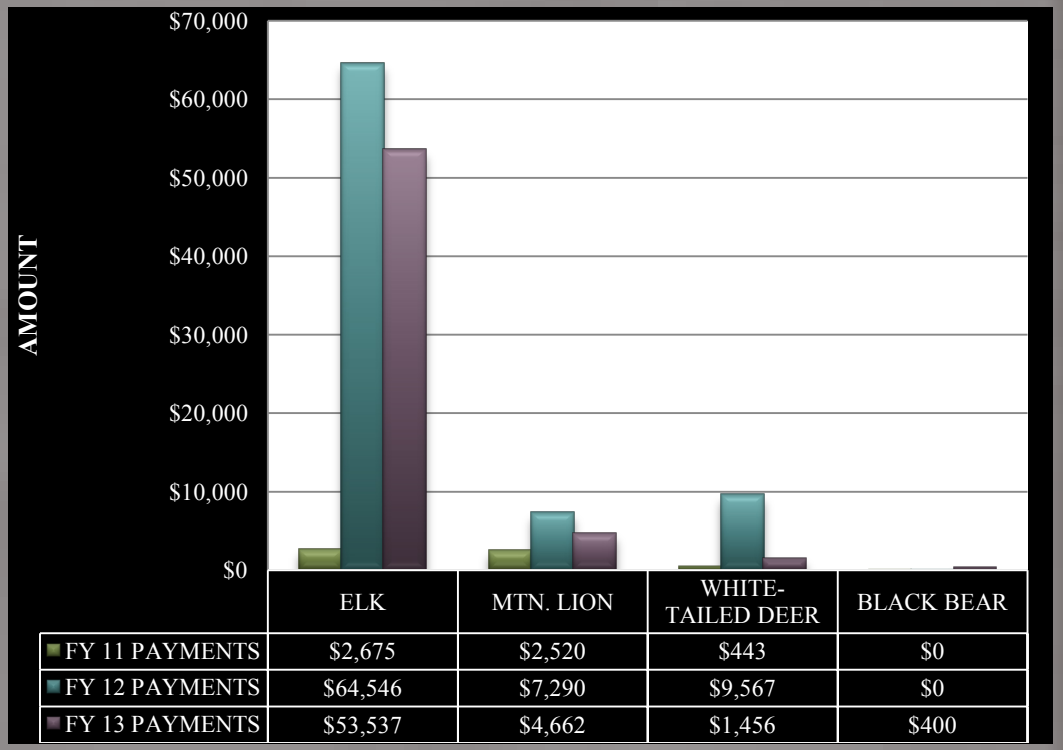


	ANTELOPE	ELK	GRAY WOLF	GRIZZLY BEAR	MTN. LION	MULE DEER
FY 11 PAYMENTS	$1,138	$150	$15,545	$34,377	$0	$868
FY 12 PAYMENTS	$0	$0	$11,636	$40,850	$270	$0
FY 13 PAYMENTS	$2,513	$0	$20,245	$56,998	$0	$891

CASPER REGION

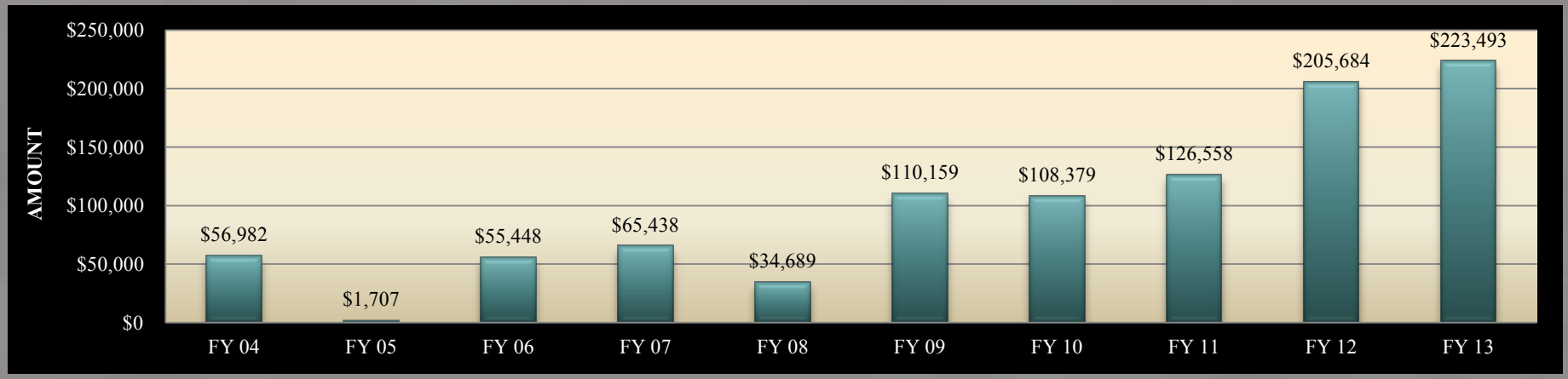


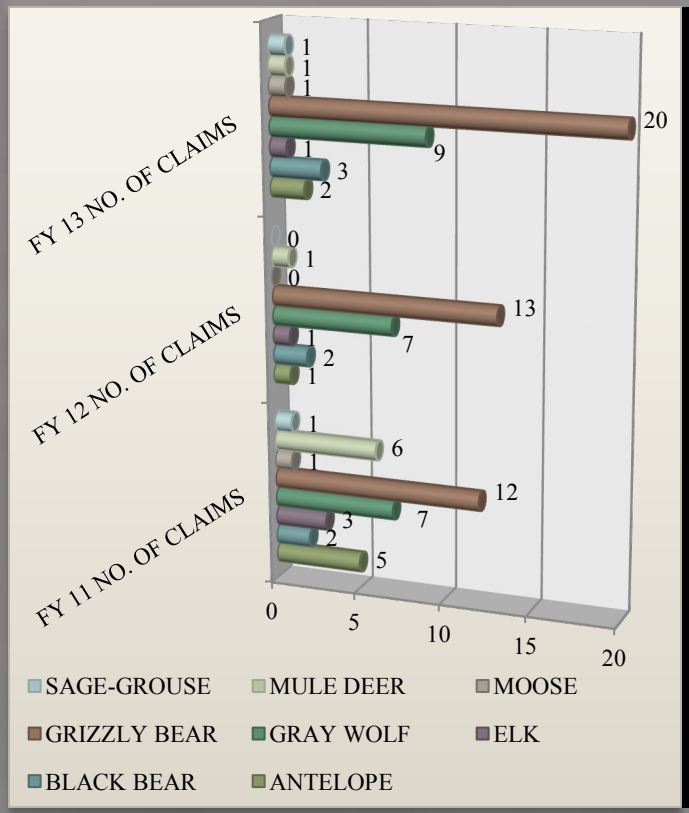


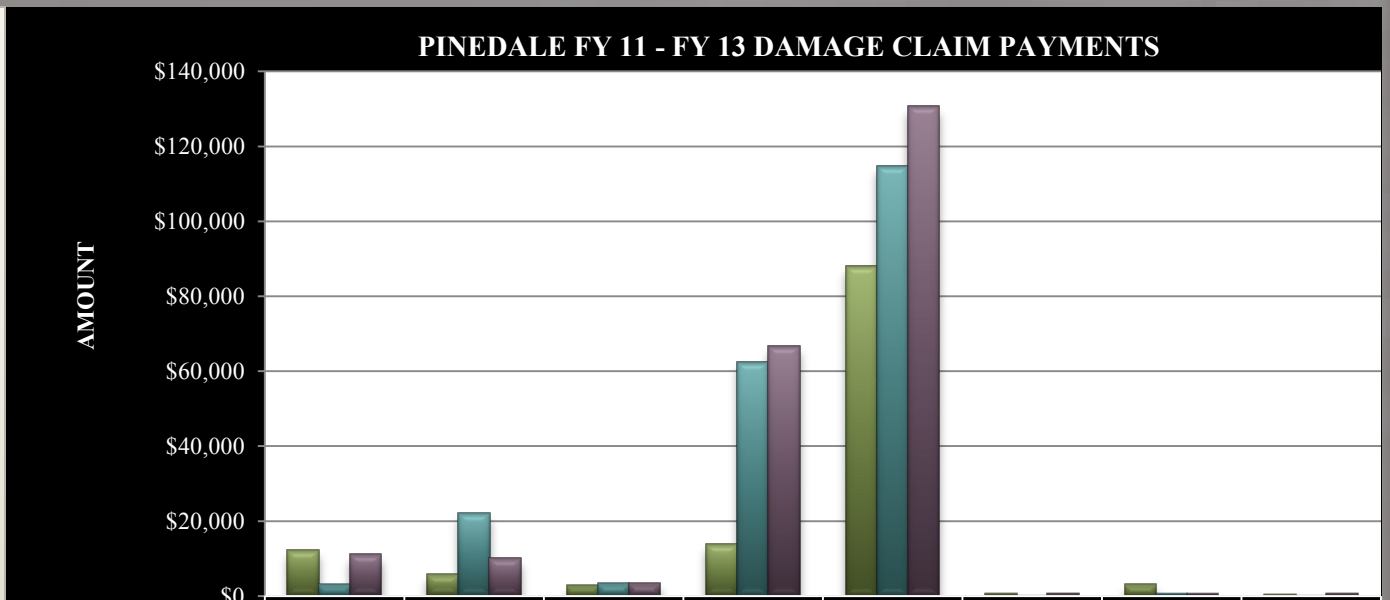


	ELK	MTN. LION	WHITE-TAILED DEER	BLACK BEAR
FY 11 PAYMENTS	$2,675	$2,520	$443	$0
FY 12 PAYMENTS	$64,546	$7,290	$9,567	$0
FY 13 PAYMENTS	$53,537	$4,662	$1,456	$400

PINEDALE REGION

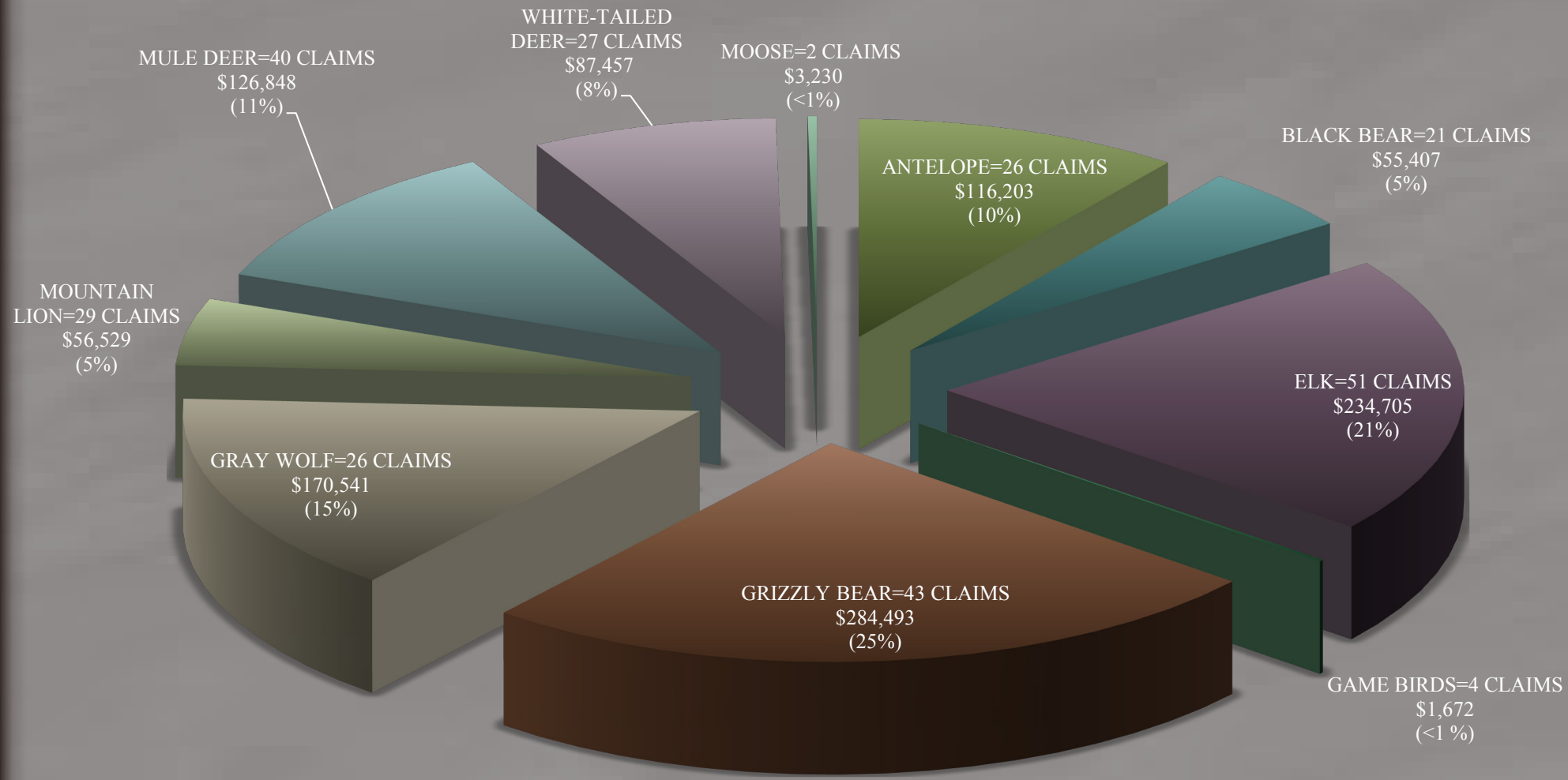






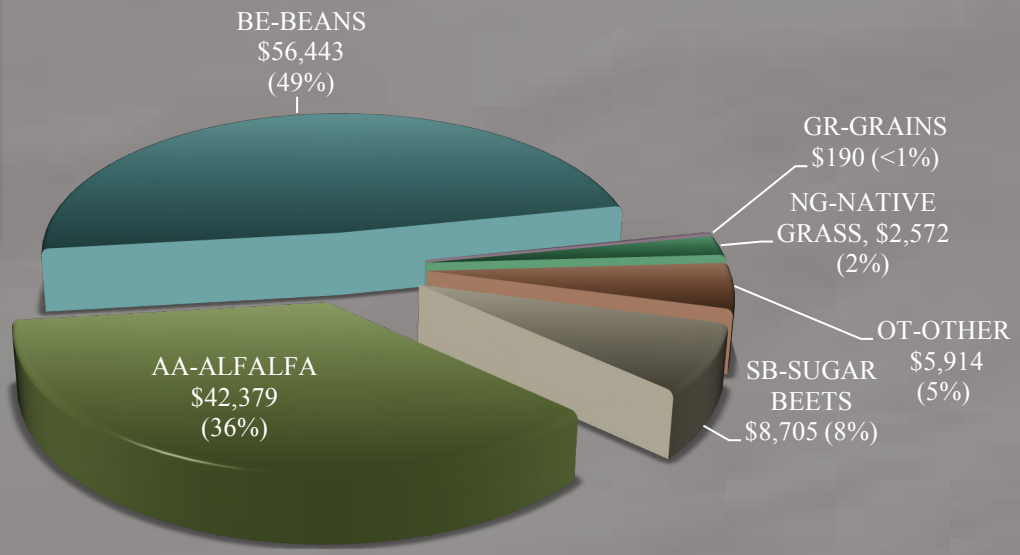
	ANTELOPE	BLACK BEAR	ELK	GRAY WOLF	GRIZZLY BEAR	MOOSE	MULE DEER	SAGE-GROUSE
FY 11 PAYMENTS	$12,130	$5,654	$2,731	$13,895	$88,081	$530	$3,153	$384
FY 12 PAYMENTS	$2,927	$21,978	$3,295	$62,434	$114,576	$0	$474	$0
FY 13 PAYMENTS	$11,002	$10,045	$3,500	$66,617	$130,591	$660	$492	$586

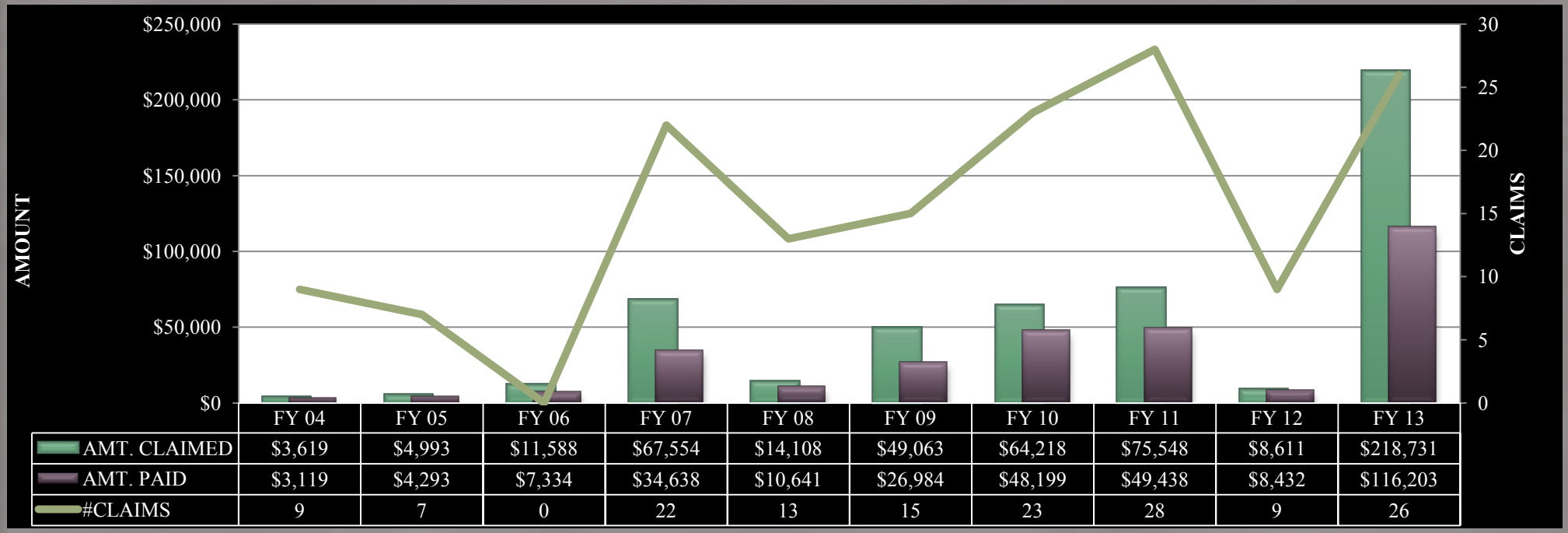
FY 13 AMOUNT AND PERCENTAGE OF CLAIMS PAID PER SPECIES



ANTELOPE

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

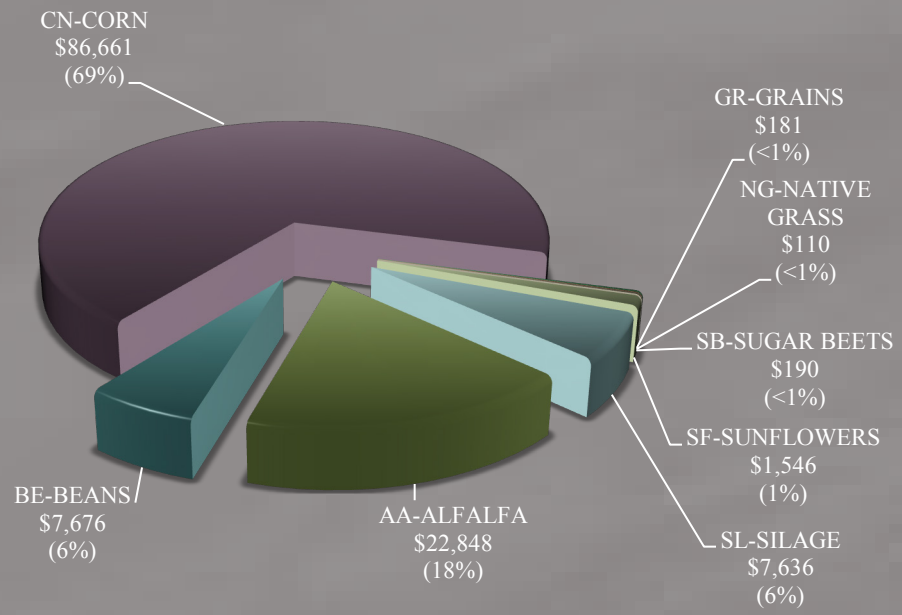


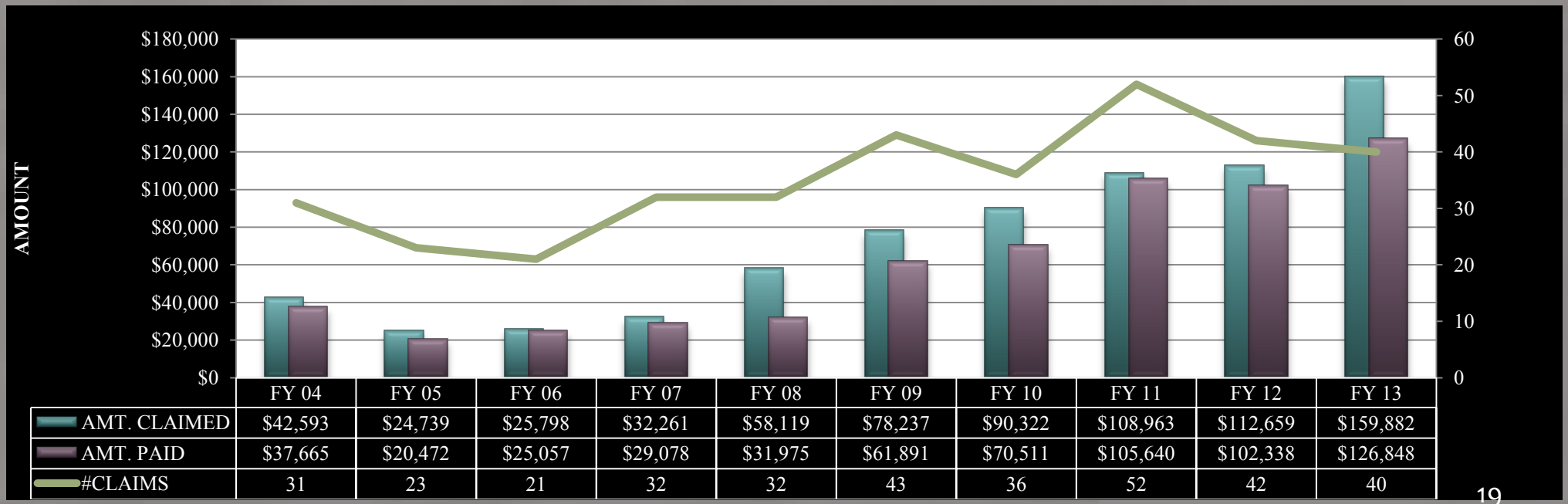


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$3,619	$4,993	$11,588	$67,554	$14,108	$49,063	$64,218	$75,548	$8,611	$218,731
AMT. PAID	$3,119	$4,293	$7,334	$34,638	$10,641	$26,984	$48,199	$49,438	$8,432	$116,203
#CLAIMS	9	7	0	22	13	15	23	28	9	26

MULE DEER

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

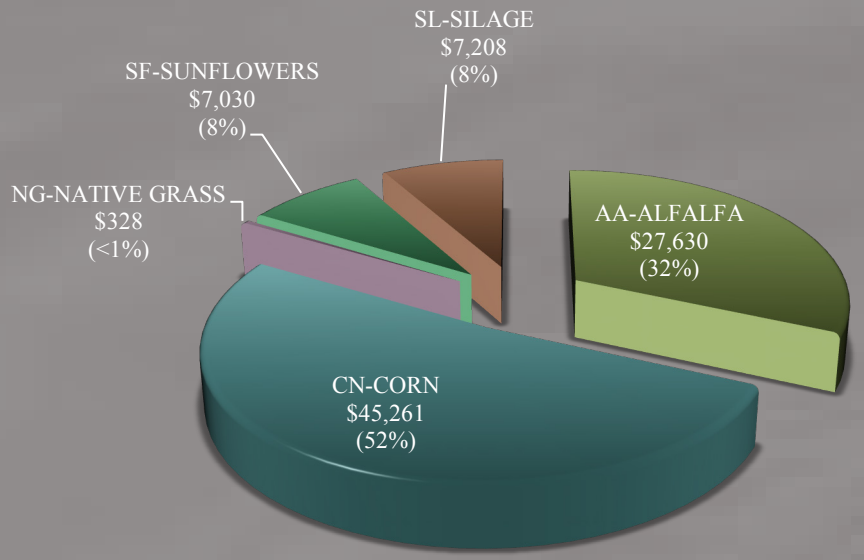


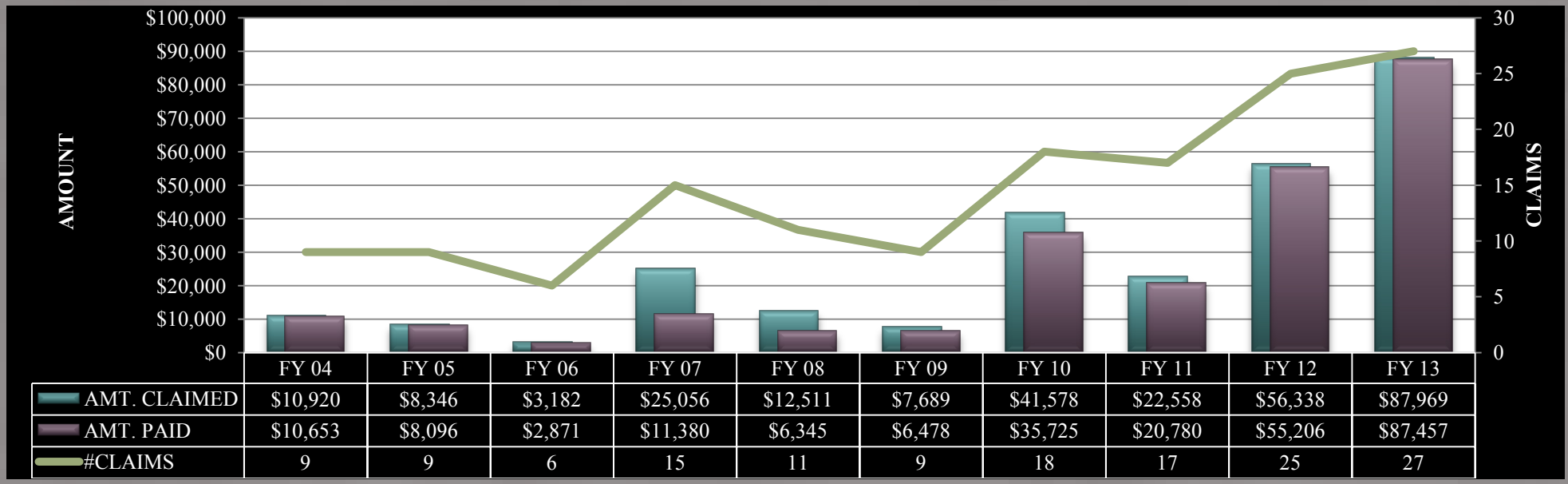


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$42,593	$24,739	$25,798	$32,261	$58,119	$78,237	$90,322	$108,963	$112,659	$159,882
AMT. PAID	$37,665	$20,472	$25,057	$29,078	$31,975	$61,891	$70,511	$105,640	$102,338	$126,848
#CLAIMS	31	23	21	32	32	43	36	52	42	40

WHITE-TAILED DEER

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

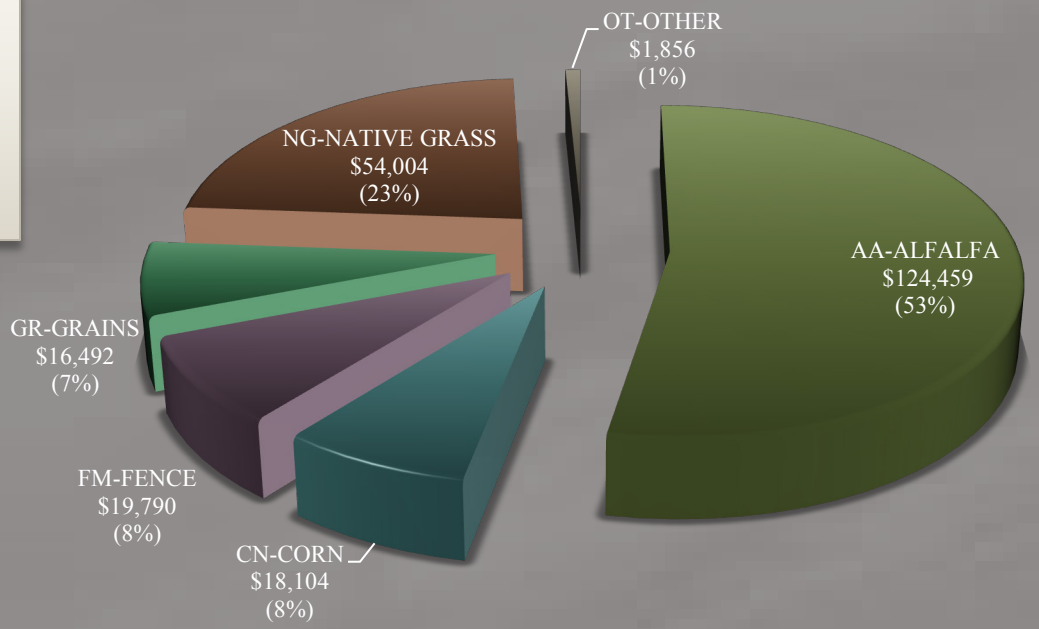


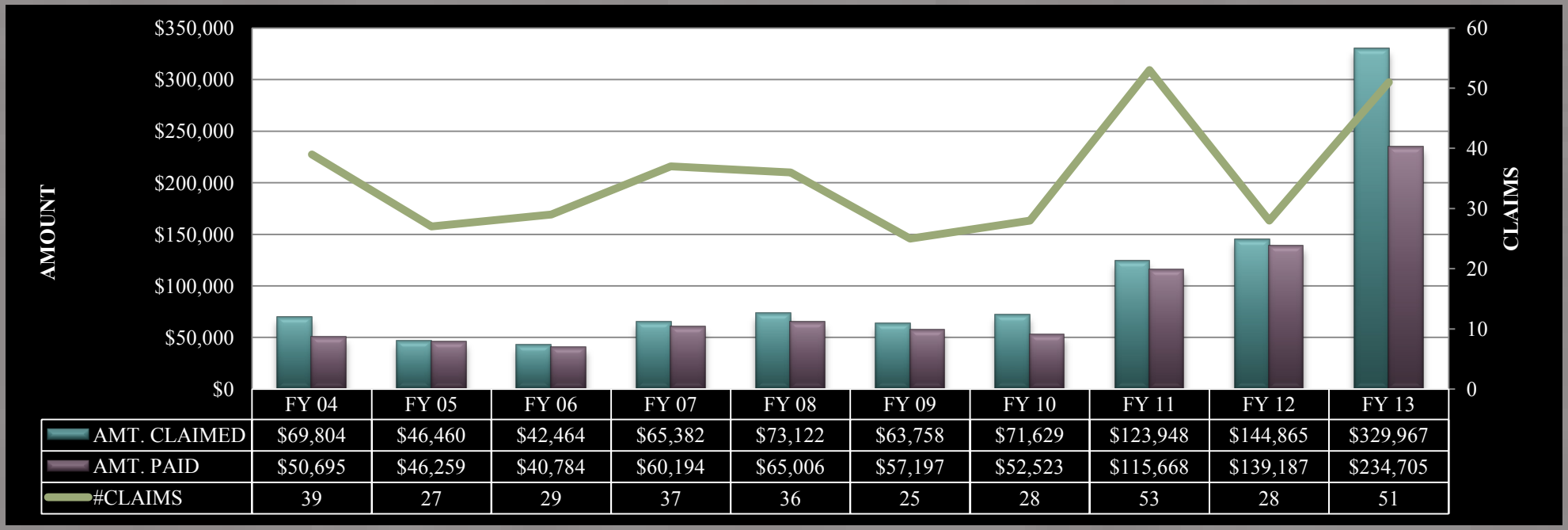


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$10,920	$8,346	$3,182	$25,056	$12,511	$7,689	$41,578	$22,558	$56,338	$87,969
AMT. PAID	$10,653	$8,096	$2,871	$11,380	$6,345	$6,478	$35,725	$20,780	$55,206	$87,457
#CLAIMS	9	9	6	15	11	9	18	17	25	27

ELK

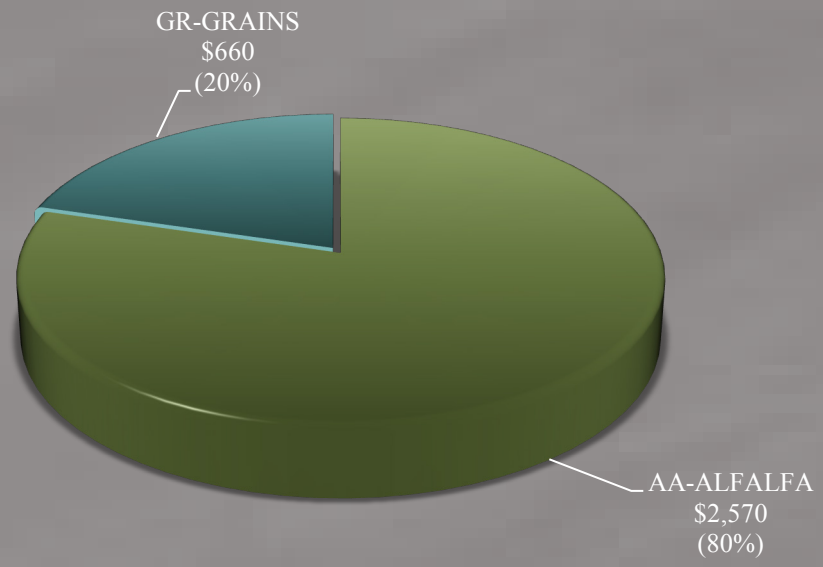
- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY





	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$69,804	$46,460	$42,464	$65,382	$73,122	$63,758	$71,629	$123,948	$144,865	$329,967
AMT. PAID	$50,695	$46,259	$40,784	$60,194	$65,006	$57,197	$52,523	$115,668	$139,187	$234,705
#CLAIMS	39	27	29	37	36	25	28	53	28	51

MOOSE
- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

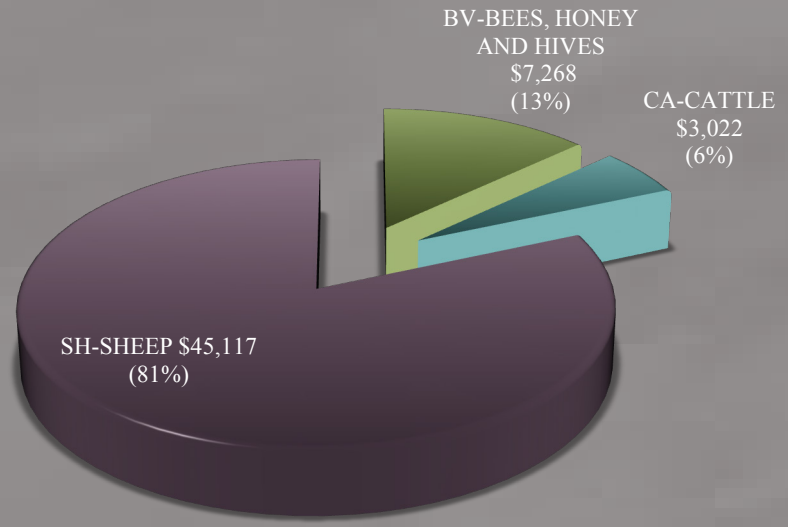


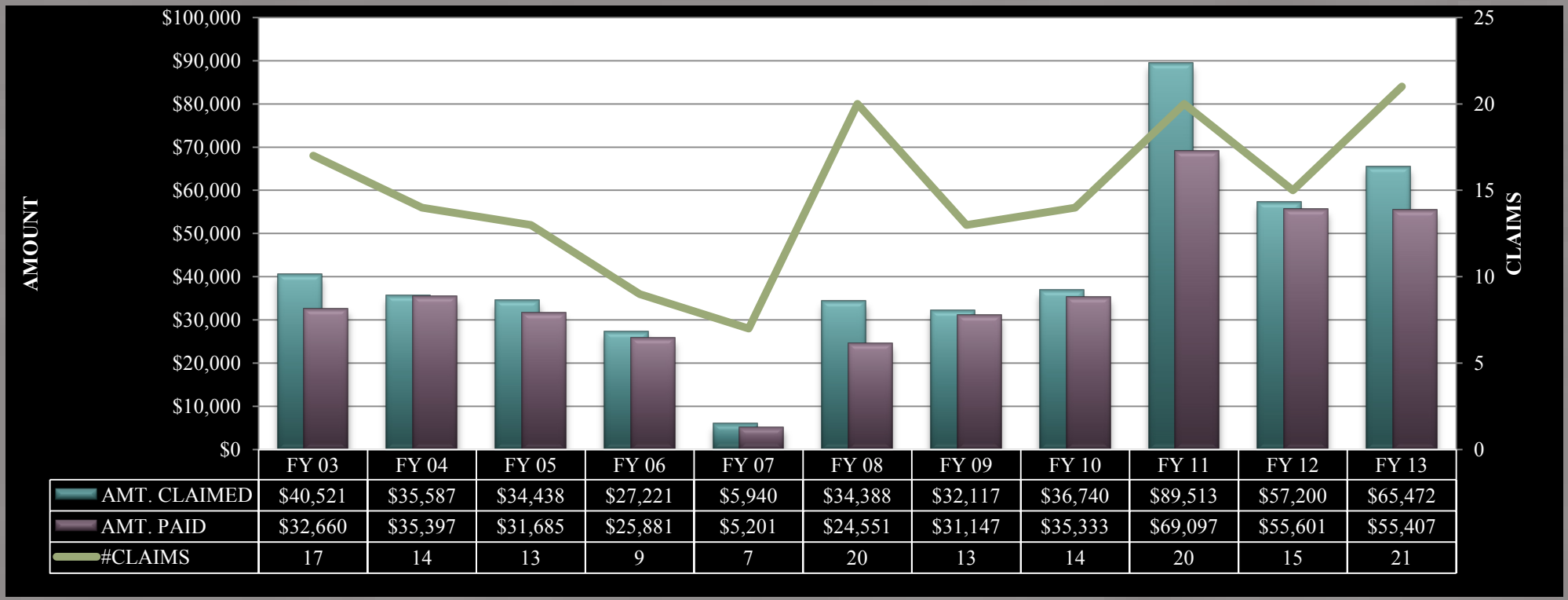


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$1,543	$85	$144	$0	$0	$0	$60	$970	$0	$3,230
AMT. PAID	$1,443	$64	$144	$0	$0	$0	$60	$970	$0	$3,230
#CLAIMS	6	1	1	0	0	0	1	2	0	2

BLACK BEAR

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

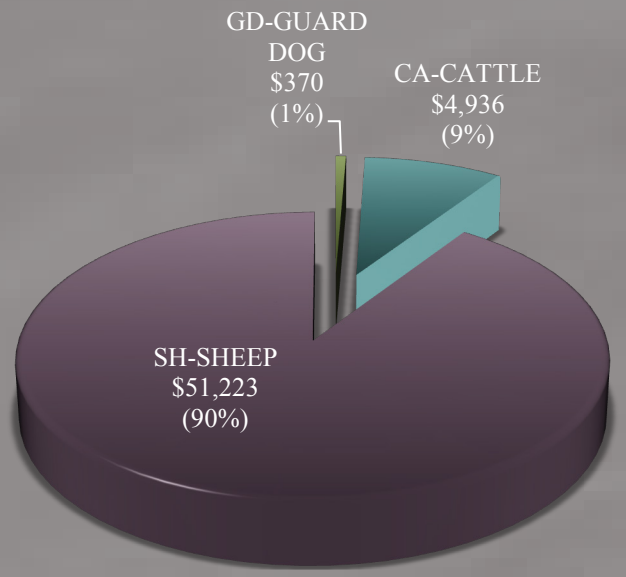


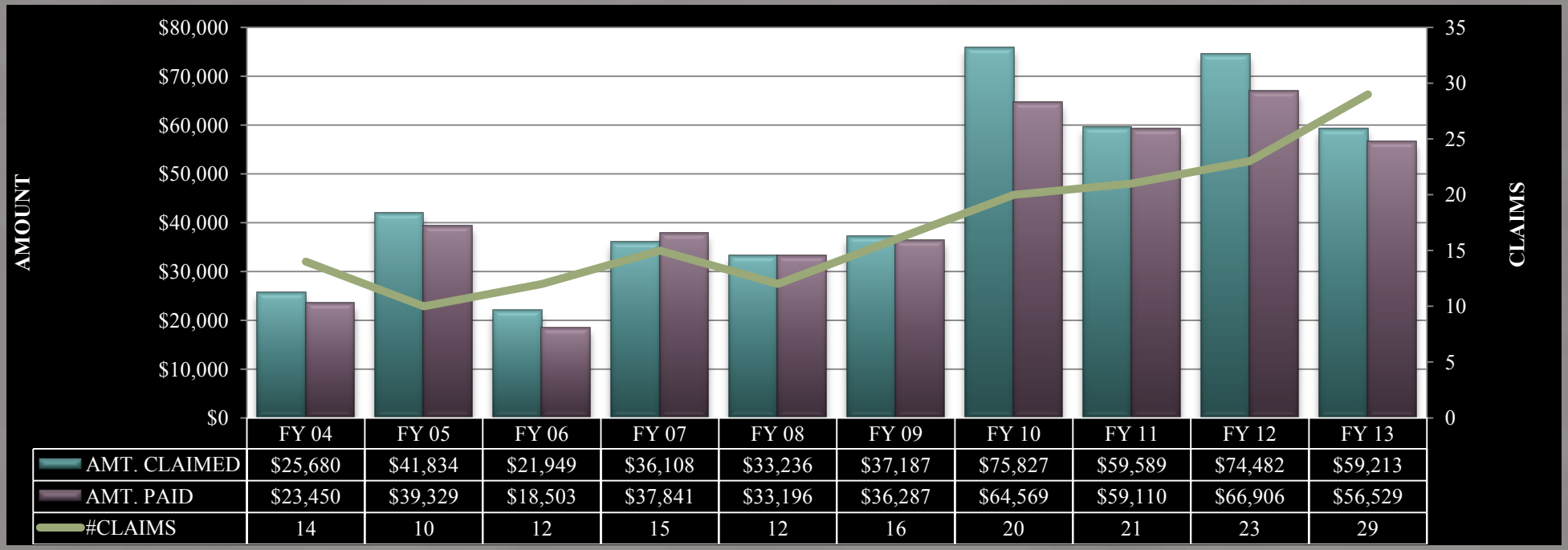


	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$40,521	$35,587	$34,438	$27,221	$5,940	$34,388	$32,117	$36,740	$89,513	$57,200	$65,472
AMT. PAID	$32,660	$35,397	$31,685	$25,881	$5,201	$24,551	$31,147	$35,333	$69,097	$55,601	$55,407
#CLAIMS	17	14	13	9	7	20	13	14	20	15	21

MOUNTAIN LION

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

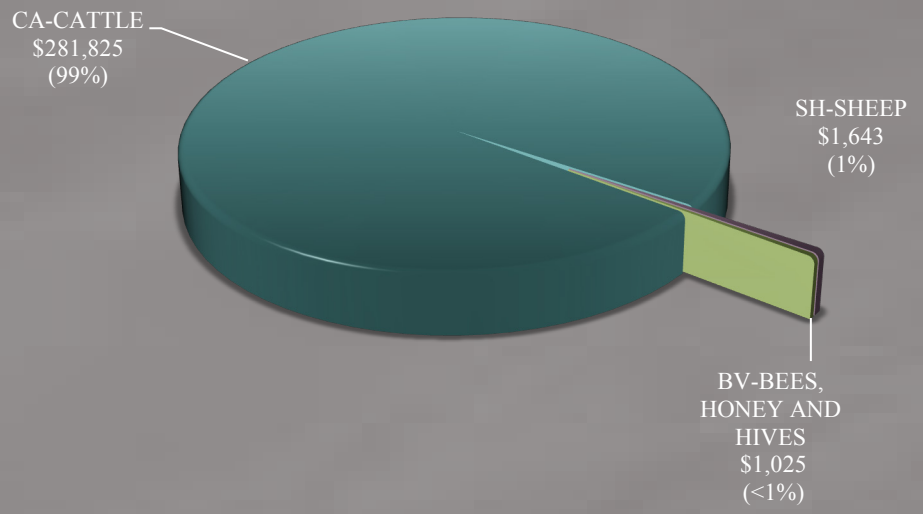


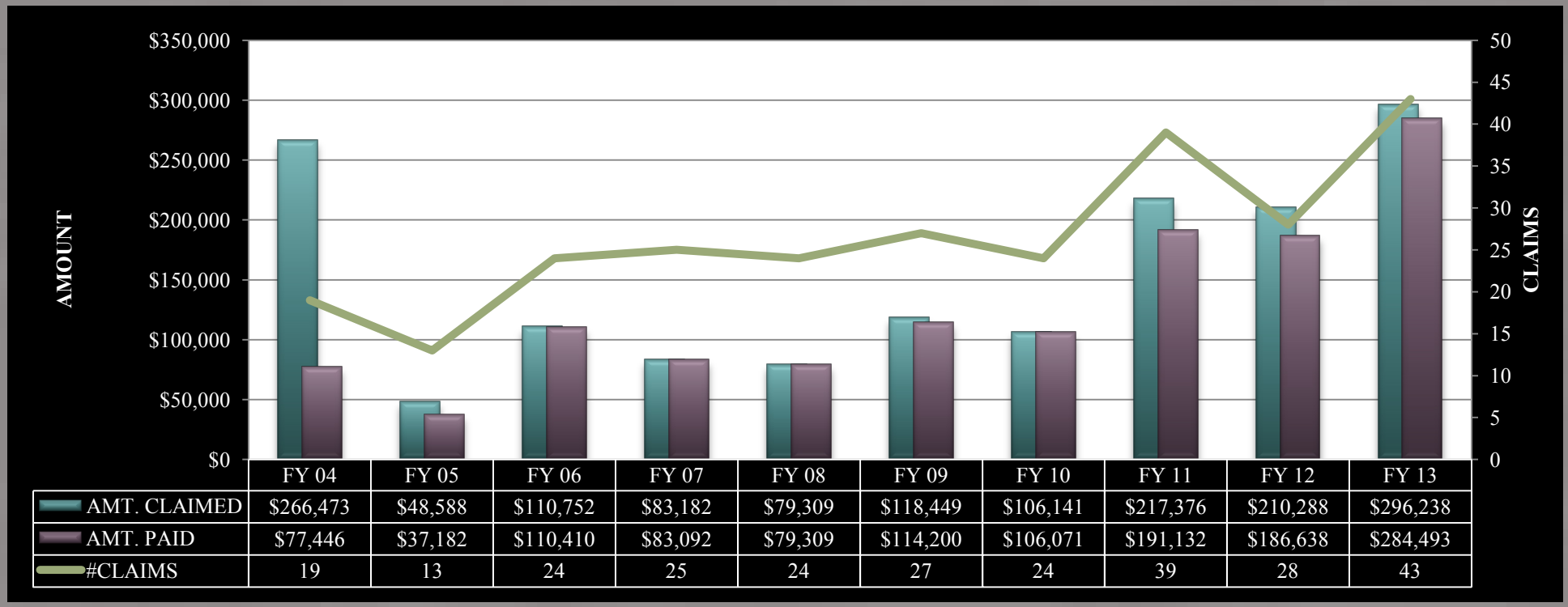


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$25,680	$41,834	$21,949	$36,108	$33,236	$37,187	$75,827	$59,589	$74,482	$59,213
AMT. PAID	$23,450	$39,329	$18,503	$37,841	$33,196	$36,287	$64,569	$59,110	$66,906	$56,529
#CLAIMS	14	10	12	15	12	16	20	21	23	29

GRIZZLY BEAR

- 10-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY

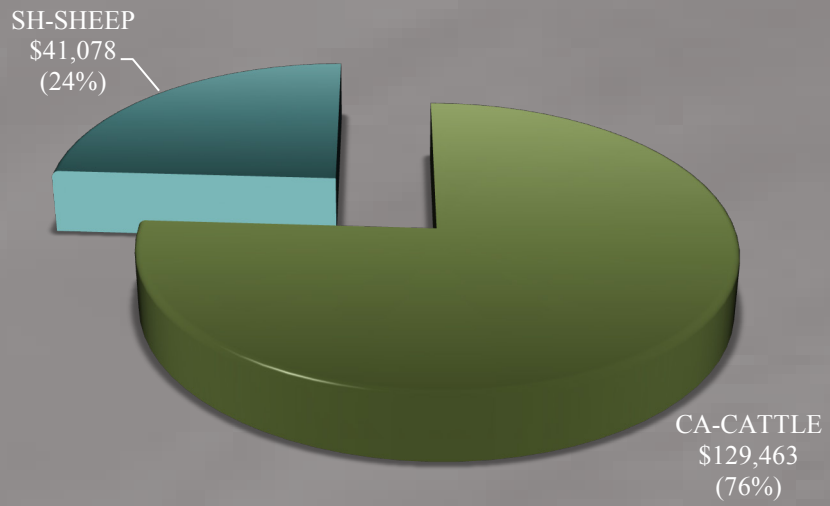


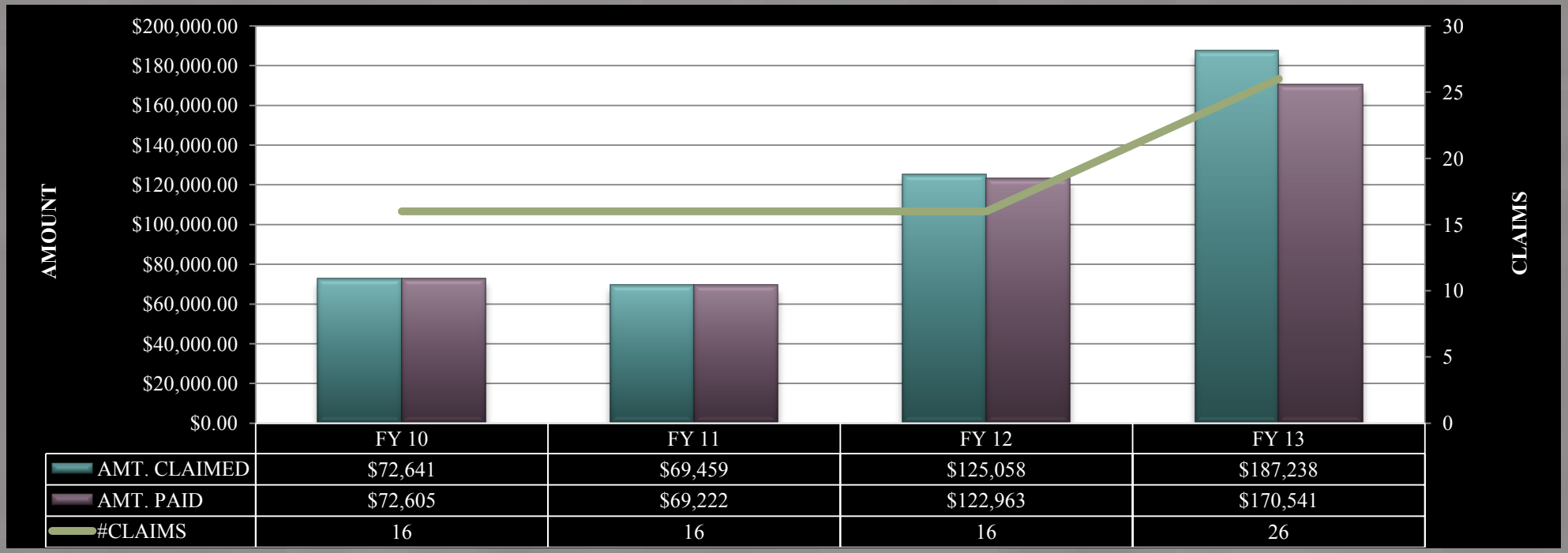


	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$266,473	$48,588	$110,752	$83,182	$79,309	$118,449	$106,141	$217,376	$210,288	$296,238
AMT. PAID	$77,446	$37,182	$110,410	$83,092	$79,309	$114,200	$106,071	$191,132	$186,638	$284,493
#CLAIMS	19	13	24	25	24	27	24	39	28	43

GRAY WOLF

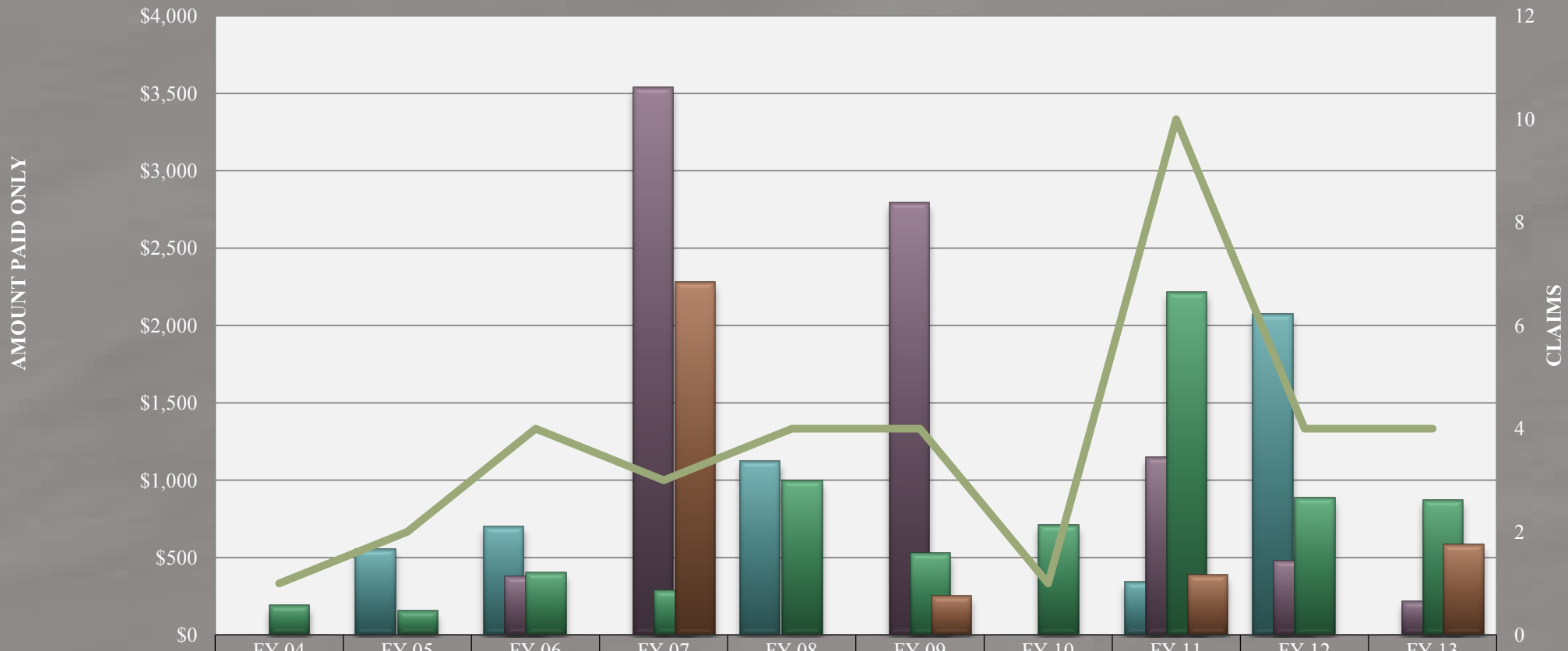
- 4-YEAR DAMAGE SUMMARY
- FY 13 PERCENTAGE OF DAMAGE BY CATEGORY





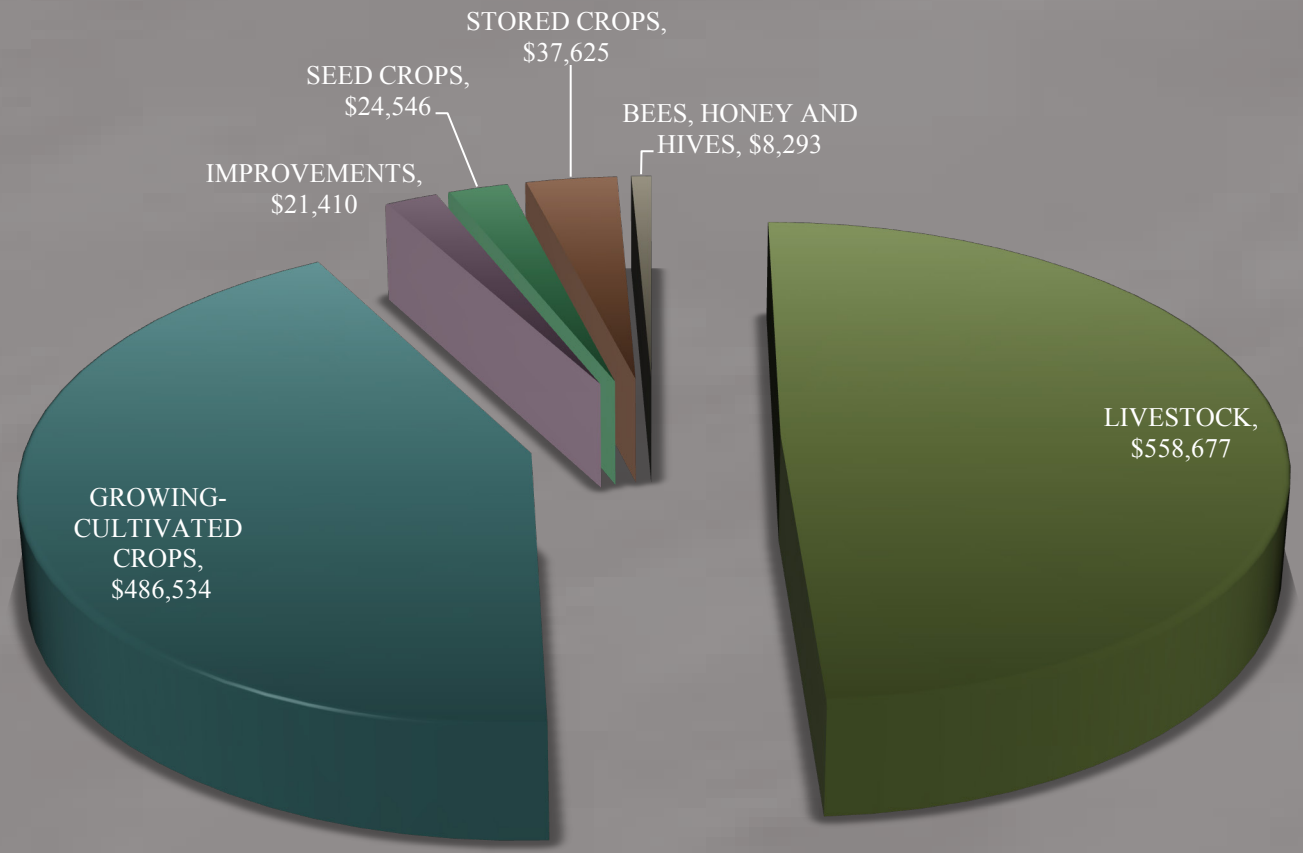
	FY 10	FY 11	FY 12	FY 13
AMT. CLAIMED	$72,641	$69,459	$125,058	$187,238
AMT. PAID	$72,605	$69,222	$122,963	$170,541
#CLAIMS	16	16	16	26

GAME BIRDS
•10-YEAR DAMAGE SUMMARY



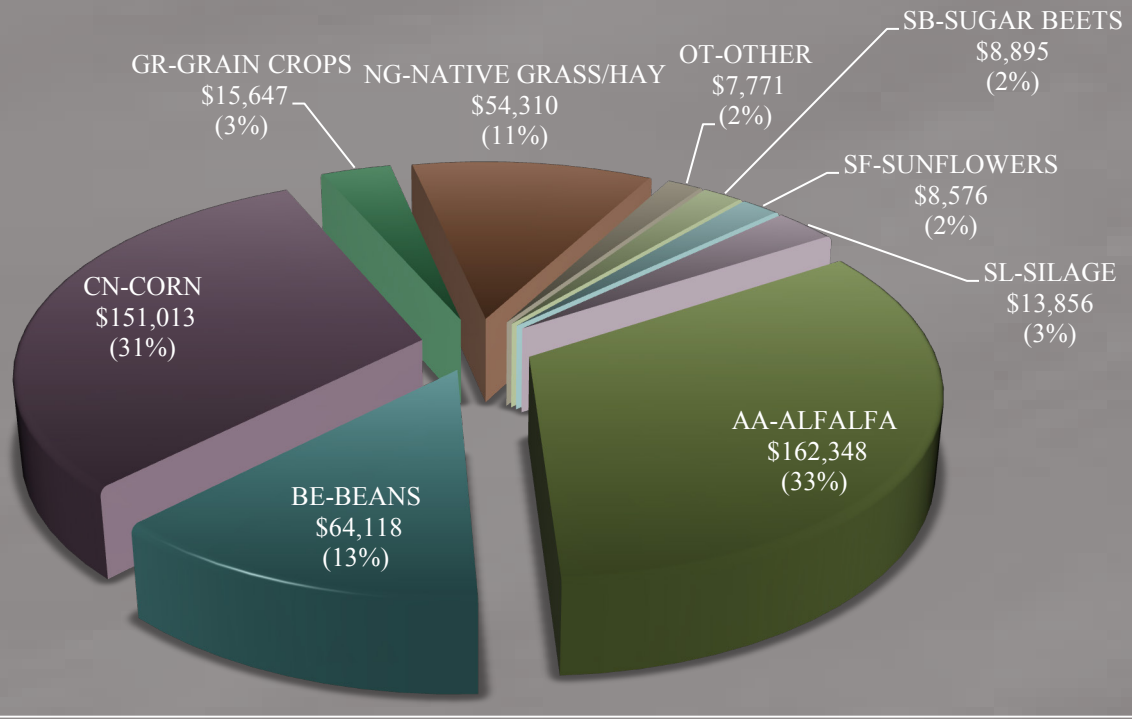
	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
TURKEYS	$0	$553	$698	$0	$1,118	$0	$0	$340	$2,074	$0
CRANES	$0	$0	$375	$3,539	$0	$2,795	$0	$1,149	$479	$215
GEESE	$187	$153	$404	$285	$995	$525	$711	$2,214	$888	$871
SAGE-GROUSE	$0	$0	$0	$2,277	$0	$254	$0	$384	$0	$586
# CLAIMS	1	2	4	3	4	4	1	10	4	4

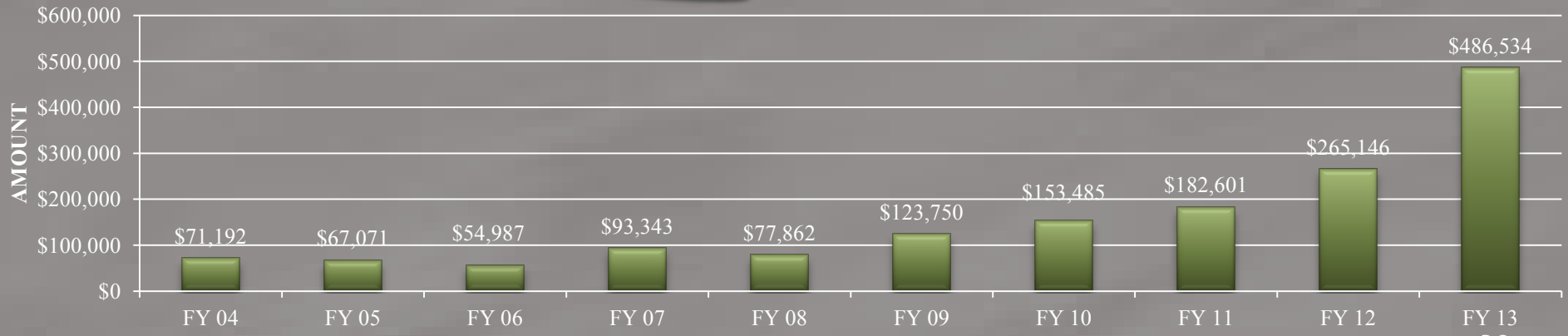
FY 13 AMOUNT AND PERCENTAGE OF CLAIMS PAID BY CATEGORY



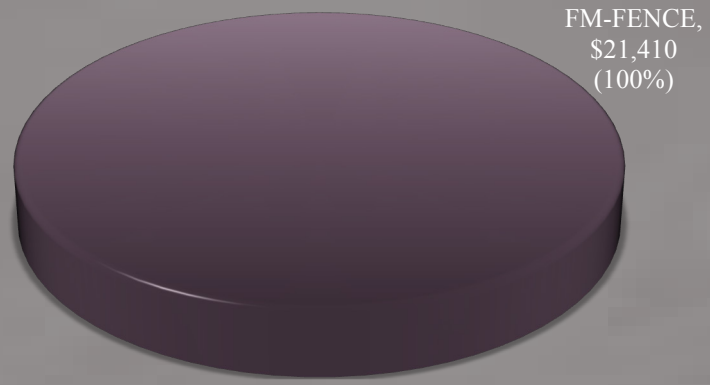
CATEGORY	AMOUNT PAID	PERCENTAGE
GROWING-CULTIVATED CROPS	$486,534	43%
IMPROVEMENTS	$21,410	2%
SEED CROPS	$24,546	2%
STORED CROPS	$37,625	3%
BEES, HONEY AND HIVES	$8,293	1%
LIVESTOCK	$558,677	49%
TOTAL FY 13 DAMAGE AMOUNT PAID	**$1,137,085**	

FY 13 GROWING-CULTIVATED CROPS &10-YEAR DAMAGE SUMMARY



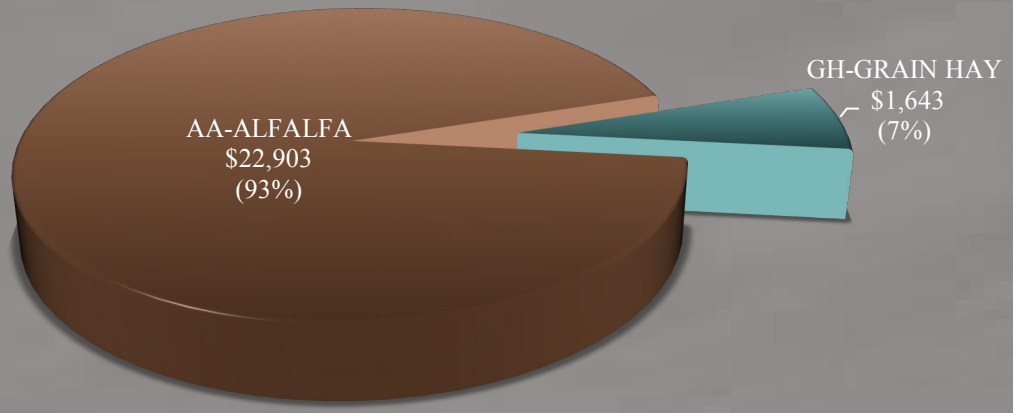


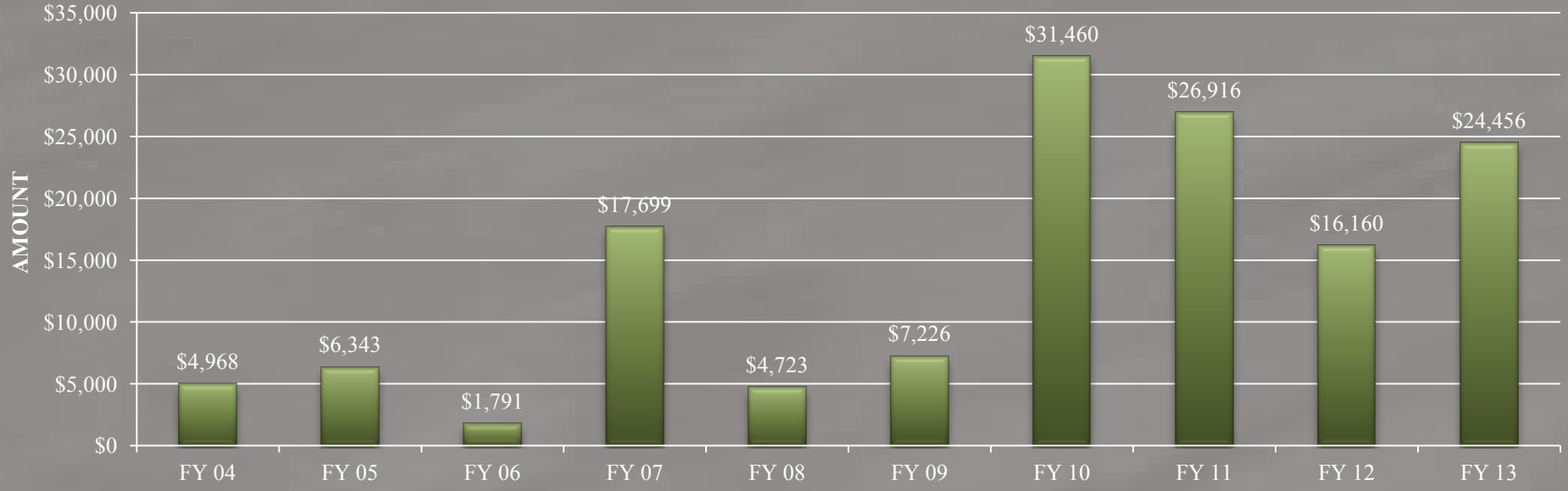
FY 13 IMPROVEMENTS &10-YEAR DAMAGE SUMMARY



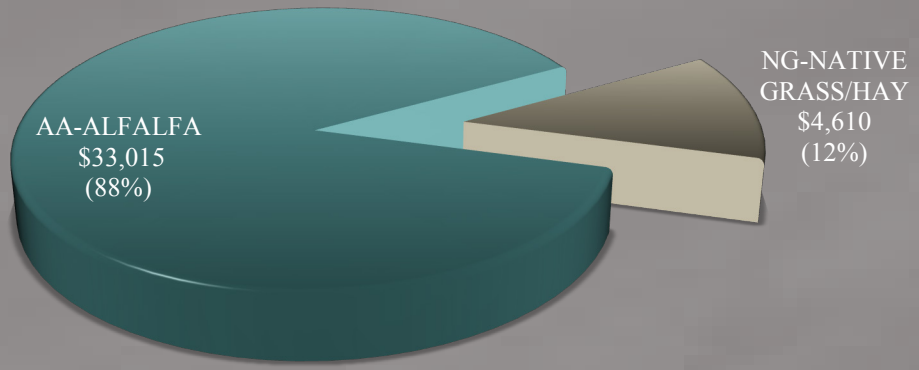


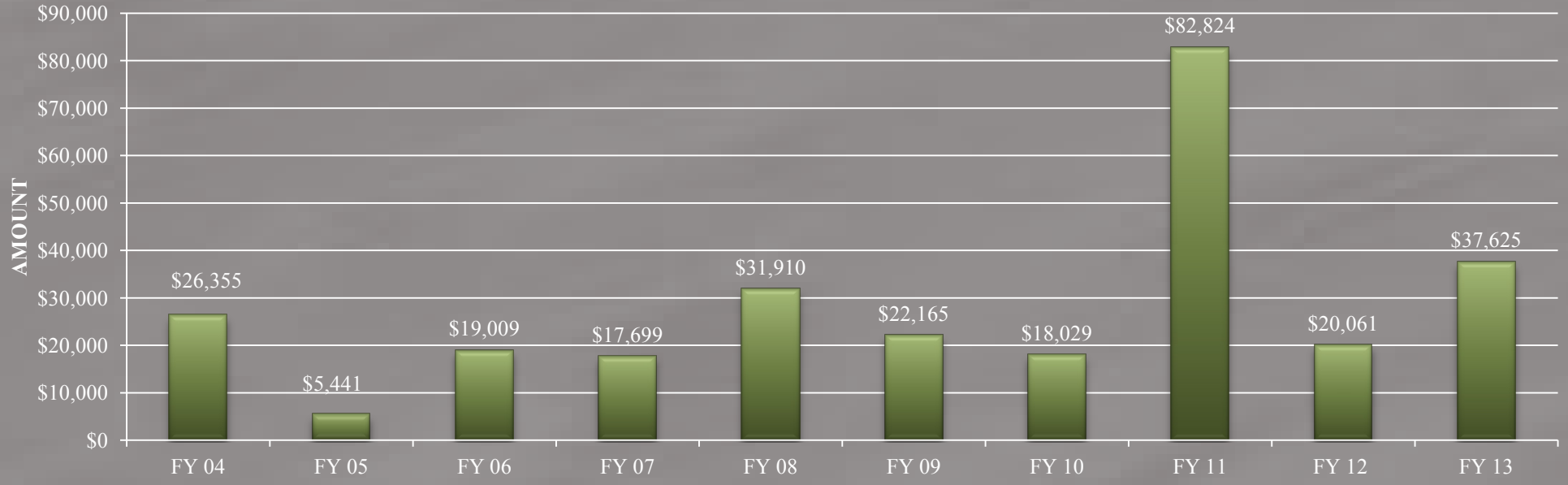
FY 13 SEED CROPS &10-YEAR DAMAGE SUMMARY



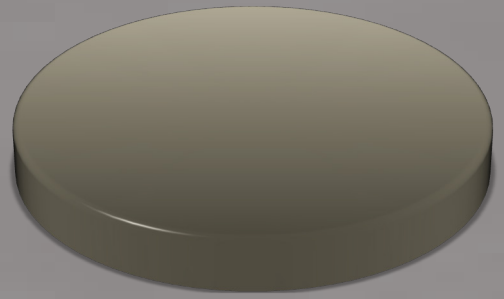


FY 13 STORED CROPS &10-YEAR DAMAGE SUMMARY

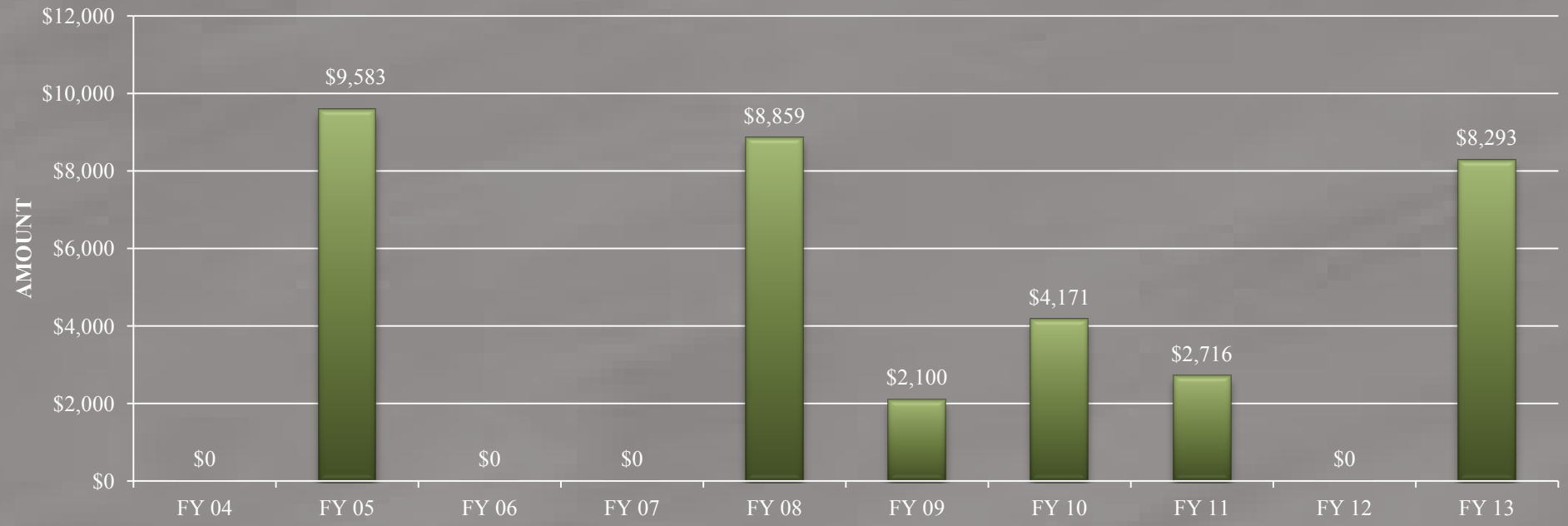




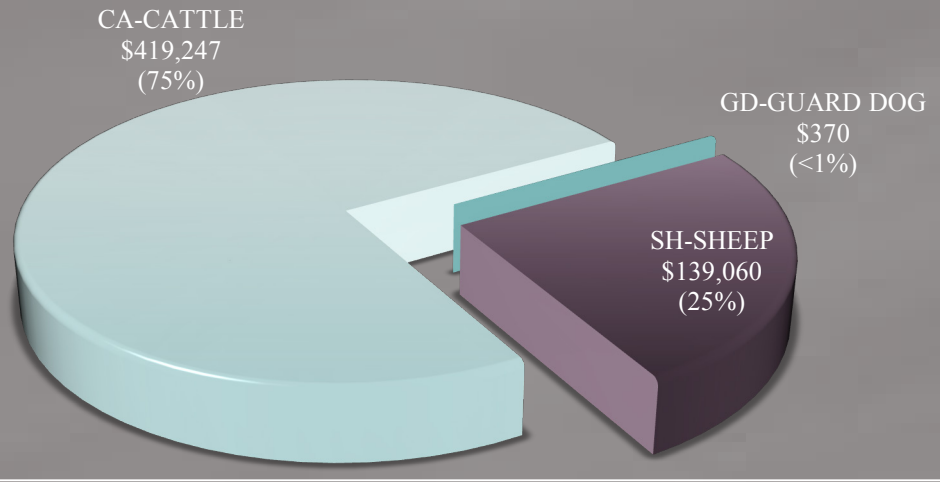
FY 13 BEES, HONEY AND HIVES &10-YEAR DAMAGE SUMMARY



BV-BEES, HONEY AND HIVES $8,293 (100%)



FY 13 LIVESTOCK &10-YEAR DAMAGE SUMMARY





FY 13 DAMAGE PAYMENTS BY SPECIES HERD UNIT

SPECIES	HERD UNIT/MGMT AREA	HERD CODE	AMOUNT PAID
ANTELOPE	COPPER MOUNTAIN	A203	$77,542.02
	FIFTEENMILE	A204	$5,981.25
	CARTER MOUNTAIN	A205	$8,864.50
	CARTER LEASE	A419	$1,472.22
	CRAZY WOMAN	A318	$1,400.00
	SUBLETTE	A401	$11,001.55
	UINTA-CEDAR MOUNTAIN	A411	$4,224.00
	DWYER	A524	$3,204.65
	BEAVER RIM	A632	$437.50
	PROJECT	A635	$2,075.00
		TOTAL PAID	**$116,202.69**
BLACK BEAR	GREY RIVER	BB102	$24,032.46
	ABSAROKA	BB201	$6,502.69
	BIGHORNS	BB301	$13,998.99
	SIERRA MADRE	BB401	$1,824.38
	UINTA	BB402	$860.00
	WIND RIVER	BB601	$7,023.08
	OUTSIDE MGMT AREA	NA	$1,165.00
		TOTAL PAID	**$55,406.60**
ELK	JACKSON	E102	$260.00
	FALL CREEK	E103	$35,856.08
	UPPER GREEN RIVER	E107	$3,500.00
	MEDICINE LODGE	E211	$1,857.30
	BLACK HILLS	E740	$15,335.50
	GOOSEBERRY	E214	$15,169.84
	CODY	E216	$3,474.62
	NORTH BIGHORN	E321	$2,177.82
	RAWHIDE	E730	$8,921.83
	SOUTH BIGHORN	E322	$1,096.00
	CLARK'S FORK	E217	$231.00
	UINTA	E423	$1,885.00
	SIERRA MADRE	E425	$3,976.80
	STEAMBOAT	E426	$5,307.50
	IRON MOUNTAIN	E531	$34,264.45
	SNOWY RANGE	E533	$17,536.09
	LAR. PEAK/MUDDY MTN	E741	$83,854.99
		TOTAL PAID	**$234,704.82**
MOOSE	SUBLETTE	MO105	$660.00
	LINCOLN	MO423	$2,570.00
		TOTAL PAID	**$3,230.00**

SPECIES	HERD UNIT/MGMT AREA	HERD CODE	AMOUNT PAID
MOUNTAIN LION	WEST	L101	$922.50
	NORTH-CENTRAL	L301	$45,701.16
	NORTHEAST	L701	$9,905.48
		TOTAL PAID	**$56,529.14**
MULE DEER	SUBLETTE	MD104	$4,404.20
	WYOMING RANGE	MD131	$886.14
	PAINTROCK	MD207	$11,362.70
	GREYBULL RIVER	MD210	$19,670.89
	SHOSHONE RIVER	MD211	$23,225.36
	SOUTHWEST BIGHORN	MD208	$4,137.09
	UPPER SHOSHONE	MD215	$3,300.00
	CLARK'S FORK	MD216	$21,818.89
	NORTH BIGHORN	MD321	$19,308.25
	UINTA	MD432	$154.00
	GOSHEN RIM	MD534	$17,166.69
	LARAMIE MTNS.	MD537	$522.00
	PROJECT	MD643	$892.00
		TOTAL PAID	**$126,848.21**
WHITE-TAILED DEER	BIGHORN BASIN	WT201	$34,738.65
	POWDER RIVER	WT303	$24,022.40
	SOUTHEAST WYOMING	WT504	$26,885.43
	CENTRAL	WT707	$1,160.00
	BLACK HILLS	WT706	$295.95
	NON HERD UNIT	WT999	$355.00
		TOTAL PAID	**$87,457.43**
GRAY WOLF	CLARK'S FORK	HUNT AREA 1	$16,575.30
	SUNLIGHT	HUNT AREA 2	$8,326.92
	GREYBULL	HUNT AREA 4	$13,517.96
	WIND RIVER	HUNT AREA 5	$17,842.56
	PACIFIC CREEK	HUNT AREA 6	$876.00
	TARGHEE	HUNT AREA 7	$309.75
	FISH CREEK	HUNT AREA 8	$1,904.00
	CRYSTAL CREEK	HUNT AREA 9	$1,400.00
	RIM	HUNT AREA 10	$2,402.55
	GREEN RIVER	HUNT AREA 11	$66,617.32
	ALPINE	HUNT AREA 12	$40,768.69
		TOTAL PAID	**$170,541.05**
GAME BIRDS	STATEWIDE	**TOTAL PAID**	**$1,671.24**
GRIZZLY BEAR	CRANDALL/SUNLIGHT	BMU6	$9,730.35
	SOUTH ABSAROKA	BMU16	$9,975.00
	CLARK'S FORK	BMU23	$17,872.47
	MEETEETSE	BMU24	$56,519.08
	WIND RIVER	BMU25	$10,059.19
	GROS VENTRE	BMU26	$63,705.75
	BACON CREEK	BMU32	$28,999.62
	BONDURANT	BMU33	$11,408.99
	WHISKEY	BMU34	$41,985.65
	UPPER GREEN	BMU35	$28,300.86
	OUTSIDE MGMT AREA	BMU999	$5,936.51
		TOTAL PAID	**$284,493.47**

KEY TO CATEGORIES AND TYPE OF DAMAGE

TYPES OF LIVESTOCK
CA-CATTLE
SH-SHEEP
HR-HORSE
GT-GOAT
SW-SWINE
LL-LLAMA
GD-GUARD DOG
OT-OTHER

TYPES OF STORED CROPS
AA-ALFALFA
CN-CORN
HL-HAYLAGE
WT- WHEAT
GR-GRAIN
GH-GRAIN HAY
NG-GRASS/NATIVE HAY
SL-SILAGE
OT-OTHER

TYPES OF EXTRAORDINARY DAMAGE TO GRASS
NG-GRASS/NATIVE HAY
OT-OTHER

TYPES OF IMPROVEMENTS
FM-FENCE
OR-ORNAMENTAL

TYPES OF GROWING-CULTIVATED CROPS
AA-ALFALFA
BE-BEANS
CN-CORN
GN-GARDEN
GR-GRAIN
NG-GRASS/NATIVE HAY
NS-COMMERCIAL NURSERY
SF-SUNFLOWER
SB-SUGAR BEETS
SL-SILAGE
WT-WHEAT
OT-OTHER

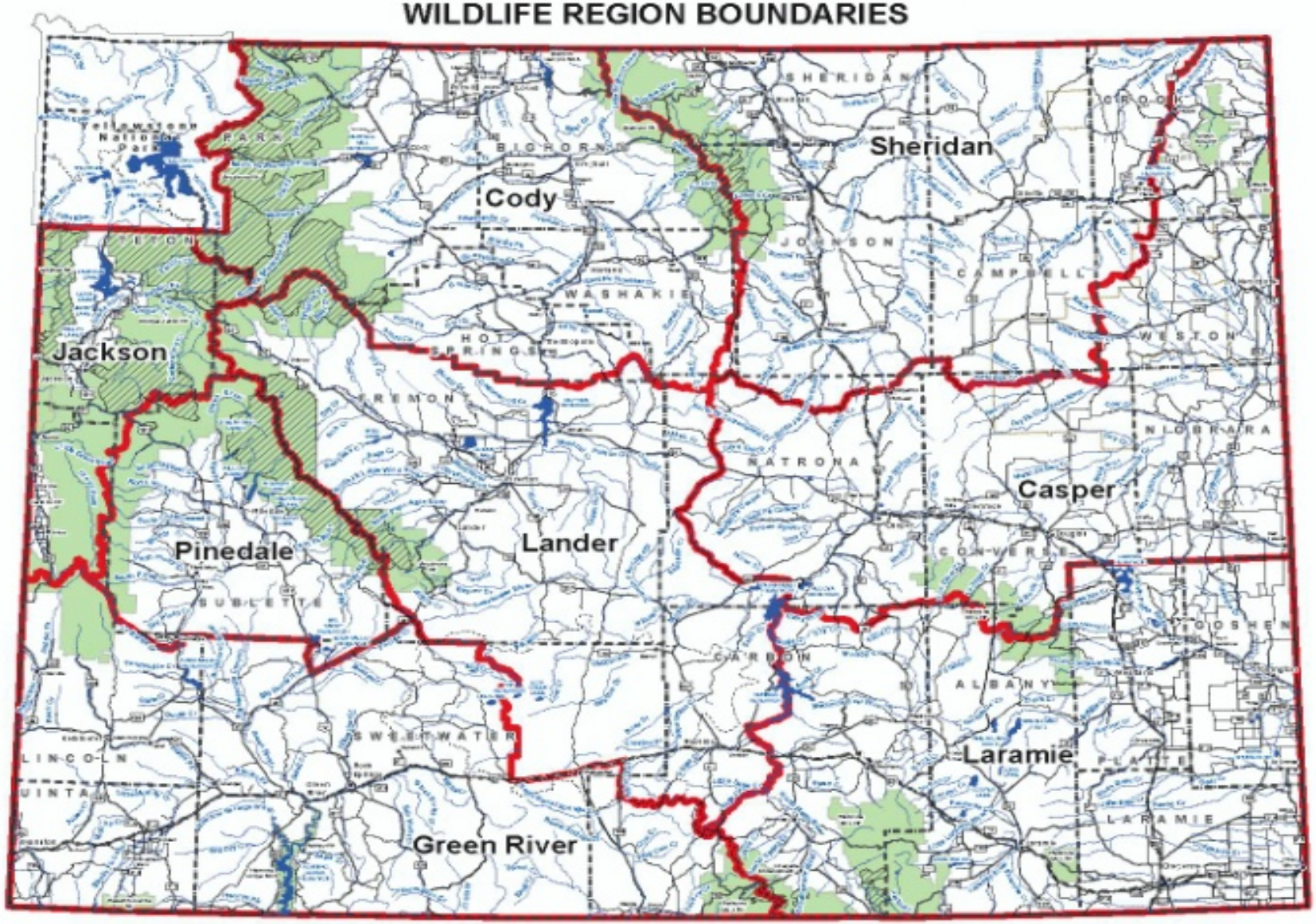
TYPES OF BEES, HONEY or HIVES
BV-BEES, HONEY, HIVES
OT-OTHER

TYPES OF SEED CROPS
AA-ALFALFA
CN-CORN
GH-GRAIN HAY
OT-OTHER

SPECIES	PROGRAM CODE
ANTELOPE	BC
ELK	BD
BIGHORN SHEEP	BE
MOOSE	BF
MOUNTAIN GOAT	BG
MOUNTAIN LION	BJ
BLACK BEAR	BK
GRIZZLY BEAR	BL
MULE DEER	BM
WHITE-TAILED DEER	BN
GRAY WOLF	BW
PHEASANT	CC
TURKEYS	CF
SAGE-GROUSE	CT
GEESE	DB
DUCKS	DC
CRANES	DF

CATEGORY OF DAMAGE
LIVESTOCK
STORED CROPS
GROWING-CULTIVATED CROPS
BEES, HONEY OR HIVES
EXTRAORDINARY DAMAGE TO GRASS
SEED CROPS
IMPROVEMENTS

WYOMING GAME AND FISH DEPARTMENT
WILDLIFE REGION BOUNDARIES



Version Date: 3 September 2013

WYOMING STATUTE W.S. §23-1-901 GOVERNING DAMAGE CLAIMS

W.S. §23-1-901. Owner of damaged property to report damage; claims for damages; time for filing; determination; appeal; arbitration.

(a) Any landowner, lessee or agent whose property is being damaged by any of the big or trophy game animals or game birds of this state shall, not later than fifteen (15) days after the damage is discovered by the owner of the property or the representative of the owner, report the damage to the nearest game warden, damage control warden, supervisor or commission member.

(b) Any landowner, lessee or agent claiming damages from the state for injury or destruction of property by big or trophy game animals or game birds of this state shall present a verified claim for the damages to the Wyoming game and fish department not later than sixty (60) days after the damage or last item of damage is discovered. The claim shall specify the damage and amount claimed. As used in this subsection, "verified claim" means a claim, which the claimant has signed and sworn to be accurate before a person authorized to administer oaths.

(c) The department shall consider the claims based upon a description of the livestock or bees damaged or killed by a trophy game animal, the damaged land, growing cultivated crops, stored crops including honey and hives, seed crops, improvements and extraordinary damage to grass. The commission is authorized to establish by rule, methods, factors and formulas to be used for determining the amount to compensate any landowner, lessee or agent for livestock damaged as a result of, missing as a result of, or killed by trophy game animals. Claims shall be investigated by the department and rejected or allowed within ninety (90) days after submission, and paid in the amount determined to be due. In the event the department fails to act within ninety (90) days, the claim, including interest based on local bank preferred rates, shall be deemed to have been allowed. No award shall be allowed to any landowner who has not permitted hunting on his property during authorized hunting seasons. Any person failing to comply with any provision of this section is barred from making any claim against the department for damages. Any claimant aggrieved by the decision of the department may appeal to the commission within thirty (30) days after receipt of the decision of the department as provided by rules of practice and procedure promulgated by the commission. The commission shall review the department decision at its next meeting following receipt of notice of request for review. The commission shall review the investigative report of the department, and it may approve, modify or reverse the decision of the department.

(d) Within ninety (90) days after receiving notice of the decision of the commission, the claimant may in writing to the department call for arbitration. Within fifteen (15) days after the department receives the call for arbitration, the claimant and the department shall each appoint a disinterested arbitrator who is an elector residing in the county where the damage occurred and notify each other of the appointment. Within twenty (20) days after their appointment, the two (2) arbitrators shall appoint a third arbitrator possessing the same qualifications. If the third arbitrator is not appointed within the time prescribed, the judge of the district court of the county or the court commissioner in the absence of the judge shall appoint the third arbitrator upon the application of either arbitrator.

(e) At least twenty (20) days before the hearing, the board of arbitrators shall provide the claimant and department notice of the time and place in the county when and where the parties will be heard and the claim investigated and decided by the board. A written copy of the decision shall be promptly served upon each party. Within ten (10) days after receipt of the decision, either party may apply to the board for modification of the decision under W.S. 1-36-111. Either party may apply to the district court for vacation of a decision under W.S. 1-36-114(a) or correction or modification of a decision under W.S. 1-36-115 within thirty (30) days after receipt of the decision or within twenty (20) days after action by the board on an application for modification under W.S. 1-36-111.

(f) If no applications under subsection (e) of this section are made after receipt of the decision, the commission shall promptly pay the amount, if any, including interest based on local bank preferred rates, awarded by the board. Within thirty (30) days after the award is final, the board's reasonable service and expense charges shall be paid by:

(i) The claimant if the award is no greater than the amount originally authorized by the commission;

(ii) Otherwise, the commission.

(g) For purposes of this section, “trophy game animals” shall include gray wolves located in the area described in W.S. 23-1-101(a)(xii)(B)(II) regardless of the date on which the damage occurs.

WYOMING GAME AND FISH COMMISSION
CHAPTER 28 REGULATION GOVERNING BIG OR TROPHY GAME ANIMAL OR GAME BIRD DAMAGE CLAIMS

Section 1. Authority. This regulation is promulgated by authority of W.S. §23-1-101, §23-1-102, §23-1-302, §23-1-304 and §23-1-901.

Section 2. Definitions. Definitions shall be as set forth in Title 23, Wyoming Statutes, Commission regulations, and the Commission also adopts the following definitions:

(a) "Authorized hunting seasons" means any hunting season during the twelve (12) month period immediately preceding the date when the claimant filed the verified claim with the Office of the Department that is established by Commission regulation, including Depredation Prevention Hunting Seasons and kill permits, for the harvest of the species of big game animals, trophy game animals, or game birds for which the verified claim was filed.

(b) "Award" means compensation for damage offered to a claimant by the Department.

(c) "Board" means a board of arbitrators.

(d) "Claimant" means any landowner, lessee or agent whose livestock, bees, hives or honey have been damaged or killed by a trophy game animal; or, whose land, growing cultivated crops, stored crops, seed crops, or improvements have been damaged by big game animals or game birds; or, whose grass has been extraordinarily damaged by big game animals or game birds.

(e) "Commercial garden" means a business that grows fruits or vegetables for commercial sale.

(f) "Commercial nursery" means a business that grows or stores trees, shrubs or plants solely for commercial sale and that is required under W.S. § 39-15-106 to be licensed with the Wyoming Department of Revenue to collect and remit sales and use tax.

(g) "Commercial orchard" means a business that grows trees for fruit or nut production for commercial sale.

(h) "Confirmed by the Department or its representative" means the Department or its representative conducted an inspection or investigation of the damage and determined the damage was more likely than not caused by a big or trophy game animal or game bird.

(i) "Consequential damages" means damage, loss, or injury that does not flow directly and immediately from the act of the big game animal, trophy game animal or game bird, but only from some of the consequences or results of such act. Consequential damages include, but are not necessarily limited to, future or anticipated production (except as otherwise provided in this regulation for young of the year livestock), sentimental value, and labor or equipment costs to remove damaged property.

(j) "Damage" means actual damage to land, growing cultivated crops, stored crops, seed crops or improvements that is caused by big game animals or game birds, and sworn by the claimant on the verified claim to have occurred; or, extraordinary damage to grass that is caused by big game animals or game birds and sworn by the claimant on the verified claim to have occurred; and, actual damage to livestock or bees including honey and hives, that is caused by trophy game animals and sworn by the claimant on the verified claim to have occurred. Damage shall not include damage to other real or personal property including, but not necessarily limited to: other vegetation or animals; motor vehicles; structures; damages caused by animals other than big game animals, trophy game animals or game birds; diseases; lost profits; consequential damages; or, any other damages whatsoever that are not specified in this regulation.

(k) "Disinterested arbitrator" means an elector residing in the county where the damage occurred, who is capable of making a reasoned and unbiased decision based on evidence presented to the Board by the claimant and the Department.

(l) "Extraordinary damage to grass" means the loss or harm as proven by the landowner, lessee, or agent that significantly exceeds the usual, customary or average use of non-cultivated grass plants of the Family Graminae.

(m) “Growing cultivated crops” means crops or other vegetation that are grown on privately owned or leased land and harvested or utilized annually for commercial sale or to feed livestock, or for human consumption. “Growing cultivated crops” can include grasses and legumes maturing for harvest, small grains, row crops and vegetables, plants grown in commercial nurseries, commercial orchards, commercial gardens, and native hay meadows that are managed for hay or livestock forage. If the crop is not harvested or utilized annually, it is not a growing cultivated crop unless it requires more than one (1) year to become established and ready for harvest. “Growing cultivated crops” do not include rangelands managed for livestock forage, or products of nurseries, orchards, and gardens that are not intended for commercial sale.

(n) “Hearing” means a procedurally correct arbitration hearing as described in Section 8 of this Regulation that shall be conducted in such manner as to afford the claimant and the Department the opportunity to present, examine, and cross-examine all witnesses and other forms of evidence presented to the Board.

(o) “Hives” means an artificial structure designed and constructed specifically for housing bees.

(p) “Improvements” means a valuable addition made to real estate to increase the productivity or value of land, including fences and man made structures erected or windbreaks or shelterbelts planted on privately owned or leased land to enhance or improve crop or livestock production or grazing management or as a protection for livestock. Improvements shall not include windbreaks or shelterbelts, if they are not planted solely to enhance or improve crop production or grazing management or as a protection for livestock.

(q) “Investigated by the Department” means an inspection determined by the Department to be a reasonable assessment of the damage caused by big or trophy game animals or game birds.

(r) “Kill permit” means a permit authorized by a Game and Fish Commissioner and the Chief Game Warden granting authority to take big game animals, trophy game animals or game birds that are causing substantial damage to property.

(s) “Land” means soil on privately owned or leased land.

(t) “Lessee” means a person who leases fee title land or State land for agricultural purposes.

(u) “More likely than not” means evidence reasonably tending to support the conclusion. Evidence that is competent, relevant, and material, and which to a rational and impartial mind naturally leads, or involuntarily leads to conclusion for which there is valid, just and reasonable substantiation.

(v) “Office of the Department” means the Wyoming Game and Fish Department, 5400 Bishop Blvd., Cheyenne, Wyoming 82006-0001 or the Wyoming Game and Fish Department, 3030 Energy Lane, Casper, Wyoming 82604.

(w) “Permitted hunting during authorized hunting seasons” means permitted hunting as described in Section 4 of this regulation.

(x) “Promptly served upon each party” means within ten (10) days following the arbitration hearing, the Board shall serve a written copy of its decision to the Office of the Department and the claimant.

(y) “Property” means livestock or bees, land, growing cultivated crops, stored crops including honey and hives, seed crops, improvements or grass that has been extraordinarily damaged.

(z) “Reasonable expense charges” means compensation given to an arbitrator while performing duties as an arbitrator that is the same compensation rate afforded to State employees by State statute for per diem and vehicular mileage; and, actual expenses incurred by the arbitrator and documented by receipt including, but not necessarily limited to, telephone calls, paper supplies, and mail service.

(aa) “Reasonable service charges” means reimbursement in the amount of one hundred ($100) dollars per day for performing duties as an arbitrator.

(bb) “Seed crops” means any crop intentionally planted, managed, and grown in accordance with accepted agricultural practices on privately owned or leased land for the production of seed for future propagation and that is harvested annually by manual or mechanical means. If the crop is not harvested annually, it shall not be classified as a seed crop unless the crop normally requires an establishment period of longer than one (1) year to be harvested or unless the crop is alfalfa seed or crested wheat grass seed.

(cc) “Stored crops” means crops that have been harvested and saved or stored for future use in accordance with accepted agricultural practices.

(dd) “Supervisor” means Regional Wildlife Supervisor.

(ee) “Trophy game animals” means black bear, gray wolf, grizzly bear or mountain lion or gray wolf in accordance with W.S. §23-1-901(g).

(ff) “Value of livestock” means the monetary value of individual livestock on the date the verified claim was filed with the Office of the Department based upon the fair market value on that date for like livestock at a rate substantiated by a livestock sales barn or other credible written valuation of the livestock provided by the claimant. However, the monetary value of young of the year livestock on the date the verified claim was filed with the Office of the Department shall be based upon the fair market value on that date for like livestock at the weaning weight substantiated by a livestock sales barn or other credible written valuation of the livestock provided by the claimant.

(gg) “Verified claim” means a Trophy Game Animal Damage Claim Affidavit or a Big Game Animal or Game Bird Damage Claim Affidavit that has been signed by the claimant and sworn to be accurate before a person authorized to administer oaths, that has been filed with the Office of the Department and contains all information required in Section 9 of this regulation.

Section 3. Damage to Livestock by Trophy Game Animals. Except as specified in subsection (a) of this section, the Department shall only offer payment for damage to individual livestock confirmed by the Department or its representative as having been injured or killed by a trophy game animal.

(a) In geographic areas determined by the Department to have terrain, topography, and vegetative characteristics that influence the ability of the claimant and Department to find missing calves and sheep that are believed to have been damaged as a result of a trophy game animal, the Department shall utilize the methods, factors and formulas in this subsection to determine the amount to compensate any landowner, lessee or agent for calves and sheep missing as a result of damage caused by a trophy game animal.

(i) Any claimant whose verified claim is for missing sheep or calves believed to have been damaged as a result of a trophy game animal, shall include on his verified claim the total known death loss, including missing animals, for the sheep or calves for the grazing season together with the number of such losses known to be due to causes other than damage by a trophy game animal.

(ii) Notwithstanding the use of the formulas in this section, the Department shall not offer compensation for more than the total known death loss less the number of such losses known to be due to causes other than damage by a black bear, grizzly bear, mountain lion, or gray wolf in those areas where gray wolves are designated as trophy game animals in accordance with Commission regulation. In order to utilize any formula, the Department or its representative must have confirmed the claimant had at least one (1) calf or one (1) sheep injured or killed by a trophy game animal.

(A) Calves and sheep in areas occupied by grizzly bears. To determine the amount of compensation due to a claimant for calves and sheep believed to be missing as a result of being damaged by a black bear, grizzly bear, or mountain lion in areas occupied by grizzly bears, the Department shall utilize the following formula:

(I) Number of individual calves or sheep confirmed by the Department or its representative killed by a black bear, grizzly bear, or mountain lion multiplied by three and one-half (3.5) multiplied by the value of livestock equals the amount of compensation.

(II) Sheep in areas not occupied by grizzly bears. To determine the amount of compensation due to a claimant for sheep believed to be missing as a result of being damaged by a black bear or mountain lion in areas not occupied by grizzly bears, the Department shall utilize the following formula:

(III) Number of individual sheep confirmed by the Department or its representative killed by a black bear or mountain lion multiplied by three (3) multiplied by the value of livestock equals the amount of compensation.

(iii) Sheep in areas set forth by Commission regulation where gray wolves are designated as trophy game animals. To determine the amount of compensation due to a claimant for sheep believed to be missing as a result of being damaged by gray wolves, in areas occupied by wolves, the Department shall utilize the following formula:

(A) Number of individual sheep confirmed by the Department or its representative killed by a gray wolf multiplied by seven (7) multiplied by the value of livestock equals the amount of compensation.

(iv) Calves in areas set forth by Commission regulation where gray wolves are designated as trophy game animals. To determine the amount of compensation due to the claimant for calves believed to be missing as a result of being damaged by gray wolves, in area occupied by gray wolves, the Department shall utilize the following formula:

(A) Number of individual calves confirmed by the Department or its representative killed by gray wolves multiplied by seven (7) multiplied by the value of livestock equals the amount of compensation.

(b) Veterinary costs for the treatment of individual livestock that have been injured by a trophy game animal shall be considered up to a maximum amount that is not to exceed the value of the livestock injured, only in cases where a licensed veterinarian believes the individual livestock in question had a reasonable chance to survive and return to a productive state. If the individual livestock died as a result of an injury inflicted by a trophy game animal, even though the livestock received veterinary care, payment shall only be made up to a maximum of the value of the livestock.

Section 4. Permitted Hunting During Authorized Hunting Seasons.

(a) A landowner shall not be eligible to receive an award for damage caused by big game animals, trophy game animals, or game birds unless the landowner has permitted hunting during authorized hunting seasons for the species for which the verified claim has been filed on his privately owned or leased land and adjoining Federal or State land within the herd unit in which the damage occurred in accordance with this section. For an award to be allowed, the landowner shall permit hunting during authorized hunting seasons delineated in subsection (i)(A) if the species of big game animals, trophy game animals, or game birds for which the verified claim was filed were present on the landowner's privately owned or leased land and adjoining Federal or State land during authorized hunting seasons delineated in subsection (i)(A). If the species of big game animals, trophy game animals, or game birds for which the verified claim has been filed were not present on the landowner's privately owned or leased land and adjoining Federal or State land during the authorized hunting seasons as delineated in subsection (i)(A), for an award to be allowed the landowner shall permit hunting during authorized hunting seasons delineated in (i)(B) and (i)(C) if requested by the Department. The landowner shall permit hunting during authorized hunting seasons delineated in (i)(B) and (i)(C) without access fees to hunters or the Department.

(i) Authorized hunting seasons include:

(A) Hunting seasons as established by Wyoming Game and Fish Commission rule and regulation;

(B) Depredation prevention hunting seasons as approved by a District Wyoming Game and Fish Commissioner and the Chief Game Warden; or,

(C) Lethal taking of wildlife through a kill permit as approved by a District Wyoming Game and Fish Commissioner and the Chief Game Warden.

(b) The Department shall determine if the landowner permitted hunting during authorized hunting seasons for the species of big game animals, trophy game animals, or game birds for which the verified claim has been filed. For an award to be allowed, the Department shall have to determine the landowner allowed sufficient numbers of hunters to access his privately owned or leased land and adjoining Federal or State land to harvest more than the number of big game animals, trophy game animals or game birds recruited in the preceding twelve (12) months into the segment of the population responsible for doing damage. The landowner shall contact the game warden to whom he reported the damage to determine how many big game animals, trophy game animals, or game birds meets the requirement of more than the number of big game animals, trophy game animals or game birds recruited in the preceding twelve (12) months into the segment of the population responsible for doing damage. An award may be allowed if the Department determines a reduction in big game animals, trophy game animals or game birds affects the Department's ability to sustain the population at the objective the Commission has established for the herd unit.

Section 5. Notification of Damage and Filing of Damage Claims.

(a) Any claimant who has incurred damage as defined in Section 2 of this Regulation shall report the damage to the nearest game warden, supervisor, or Commission member within fifteen (15) consecutive days following the date damage was discovered. If the claimant intends to take actions that prevent the damage being investigated by the Department, such as harvest of damaged crops or removal of damaged livestock, the claimant shall notify the nearest game warden, supervisor, or Commission member as soon as reasonably possible after discovery of the damage so the damage can be investigated by the Department prior to removal, harvest, modification, or destruction of the damaged property; however, in no case shall the claimant take actions that preclude the damage being investigated by the Department. If the claimant denies or precludes the damage being investigated by the Department, the Department shall deny the verified claim.

(b) The claimant shall present a verified claim in accordance with Section 9 of this regulation to the Office of the Department within sixty (60) consecutive days following the date the last item of damage was discovered.

(i) For verified claims of damage to individual livestock by a trophy game animal, the sixty-day (60) period shall commence from the last date the livestock were present on the grazing allotment or geographic location where the damage occurred;

(ii) For verified claims of damage to bees, honey, and hives by a trophy game animal, the sixty (60) day period shall commence from the last date damage occurred or from the last date the bees, honey, or hives were present on the location where the damage occurred, whichever date occurs first; and,

(iii) For verified claims of damage to land, growing cultivated crops, seed crops, stored crops, improvements, or extraordinary damage to grass by big game animals or game birds, the sixty (60) day period shall commence from the last date the growing cultivated crop or seed crop was harvested or the land, stored crops, or improvements were damaged or the extraordinary damage to grass occurred.

(c) If a claimant chooses to appeal the Department's decision regarding a verified claim to the Commission, the claimant shall file a written appeal that is received by the Office of the Department within thirty (30) consecutive days from the date the claimant received the Department's notification of its decision on the verified claim.

(d) The claimant shall have no right of appeal to the Commission of the Department's denial of the claim if based upon the information provided by the claimant in the verified claim, the claimant failed to comply with subsection (a) or (b) of this section. The claimant shall have no right of appeal to the Commission of the Department's decision on a verified claim if the claimant failed to comply with subsection (c) of this section.

Section 6. Investigation and Payment of Verified Claims.

(a) When investigating damage claims, the Department shall utilize the standard of "more likely than not" in determining whether or not the damage was the result of big or trophy game animals or game birds.

(b) The Department shall consider damage that was discovered by the claimant and reported to the nearest game warden, supervisor or Commission member within fifteen (15) consecutive days after the date the damage was discovered. Any damage that was reported more than fifteen (15) consecutive days after the date it was discovered by the claimant shall not be considered by the Department as damage under this regulation.

(c) The Department shall investigate the verified claim and either reject the claim or provide for full or partial payment to the claimant within ninety (90) consecutive days following the date the Office of the Department received the verified claim.

Section 7. Reasons for Denial of a Verified Claim.

(a) The Department shall deny the verified claim for any of the reasons specified in this subsection.

(i) The claimant did not report the damage to the nearest game warden, supervisor or Commission member within fifteen (15) consecutive days after the date the damage was discovered. Any damage that was reported more than fifteen (15) consecutive days after the date it was discovered by the claimant shall not be considered by the Department as damage under this regulation.

(ii) The damage was caused by animals or wildlife other than big game animals, trophy game animals or game birds.

(iii) The big or trophy game animals or game birds causing damage were on the landowner's privately owned or leased land and adjoining Federal or State land during authorized hunting seasons as specified in Section 4(a)(i)(A), and the landowner did not permit hunting in accordance with Section 4(a) of this regulation.

(iv) The big or trophy game animals or game birds causing damage were not on the landowner's privately owned or leased land and adjoining Federal or State land during authorized hunting seasons as specified in Section 4(a)(i)(A), and the landowner would not agree to the Department's implementation of a depredation prevention hunting season as specified in Section 4(a)(i)(B) or insisted on charging an access fee to hunters to participate in a depredation prevention hunting season as specified in Section 4(a).

(v) The big or trophy game animals or game birds causing damage were not on the landowner's privately owned or leased land and adjoining Federal or State land during authorized hunting seasons as specified in Section 4(a)(i)(A), and the landowner would not agree to the Department's implementation of a kill permit as specified in Section 4(a)(i)(C) or insisted on charging an access fee to the Department to implement a kill permit as specified in Section 4(a).

(vi) The verified claim was for property not defined as property in Section 2 of this regulation.

(vii) The claimant was compensated by crop or livestock insurance or a Federal subsidy program for the property damaged to the extent the claimant received compensation under that insurance or program.

(viii) The claimant did not present a verified claim complete with all required information specified in Section 9 of this regulation to the Office of the Department within sixty (60) days after the damage or last item of damage was discovered by the claimant.

(ix) The verified claim was for consequential damages.

(x) Hunting was not permitted during authorized hunting seasons on land in a platted subdivision where the damage occurred due to the actions of a municipal or county ordinance, or homeowners' association covenant prohibiting the discharge of firearms.

(xi) Due to actions of the claimant, the damage was not investigated by the Department.

(xii) The landowner prevented the Department's attempts to mitigate or alleviate the damage through such actions as moving the big or trophy game animals or game birds responsible for the damage or the claimant refused to utilize fencing materials provided by the Department to protect stored crops, including honey and hives.

Section 8. Arbitration.

(a) If the claimant wishes to appeal the Commission's decision regarding a verified claim, the claimant shall file a written call for arbitration with the Office of the Department within ninety (90) consecutive days from the date the claimant received written notice from the Office of the Department of the Commission's decision.

(b) If the claimant calls for arbitration, the claimant and the Office of the Department shall each appoint a disinterested arbitrator within fifteen (15) consecutive days from the date the Office of the Department received the written call for arbitration.

(c) When the claimant and the Office of the Department appoint arbitrators, written notification of the name, mailing address, and telephone number of arbitrators they selected shall be made by each party to the other within fifteen (15) consecutive days from the date the Office of the Department received the written call for arbitration.

(d) Within twenty (20) consecutive days after their appointment, the two (2) arbitrators shall appoint a third arbitrator. The two (2) arbitrators selected shall notify both the claimant and the Office of the Department in writing of the name, mailing address, and telephone number of the third arbitrator selected. If the third arbitrator is not appointed within this time period, the judge of the district court of the county or the court commissioner in the absence of the judge shall appoint the third arbitrator upon the application of either arbitrator.

(e) The three (3) arbitrators shall appoint a chairman who shall chair the Board and serve as secretary to carry out the correspondence of the Board.

(f) At least twenty (20) consecutive days before the hearing, the Board shall provide the claimant and the Office of the Department written notice of the time and place in the county when and where the testimony of the claimant and the Department shall be heard and the claim investigated and decided by the Board.

(g) Following the arbitration hearing, the Board shall within ten (10) days provide a written copy of its decision to the Office of the Department and the claimant.

(h) Unless otherwise specified in this section, the Uniform Arbitration Act, W.S. § 1-36-101 et seq. shall apply to the hearing.

(i) The decision of the Board shall become part of the Office of the Department's file and shall be made part of the record in the event of an appeal of the Board's decision and any appeal to district court shall be conducted in conformity with the Uniform Arbitration Act, W.S. §1-36-114(a) or W.S. §1-36-115.

Section 9. Verified Claim Requirements. The verified claim required by W.S. 23-1-901(b) shall be submitted on the form prescribed by the Department. The verified claim shall contain the following information:

(a) A description of the land on which the damage occurred, including the legal description (section, range, township), the county in which the land is located, and whether the land is privately owned, leased, or federally owned;

(b) Whether the claimant is the landowner, lessee, or agent of the landowner or lessee;

(c) A description of individual livestock, including the number, age class and sex if known, or description of bees, including honey and hives, damaged or killed by a trophy game animal;

(d) A description of the land, growing cultivated crops, stored crops, seed crops, or improvements damaged by a big game animal or game bird; or a description of the grass extraordinarily damaged by a big game animal or game bird;

(e) Competent, relevant and material evidence provided by the claimant that a big game animal, trophy game animal, or game bird caused the damage;

(f) The dates during which damage took place, to include the specific date the damage was discovered by the claimant and the specific date the damage ended;

(g) The amount and value of livestock or property damaged, including all calculations and evidence supporting the value determination;

(h) The species and number, if known, of big or trophy game animals or game birds that caused the damage;

(i) The name of the game warden, supervisor or Commission member to whom the claimant reported the damage and the specific date it was reported;

(j) Information to allow the Department to determine whether or not the landowner permitted hunting during authorized hunting seasons for the species causing damage in accordance with Section 4 of this regulation;

(k) Information as to whether or not an access fee was charged by the claimant for permitting hunting during authorized hunting seasons for the species of big game animal, trophy game animal or game bird for which the verified claim was filed; the total amount of access fee charged per hunter; and, the total number of hunters permitted to hunt during authorized hunting seasons for the species causing damage;

(l) Information by which the Office of the Department can recognize the claimant signed and swore before a person authorized to administer oaths (notarized) the verified claim to be accurate;

(m) For verified claims for calves and sheep missing as a result of damage by a trophy game animal, the total known death loss, including missing animals, for the sheep or calves for the grazing season together with the number of such losses known to be due to causes other than damage by a trophy game animal;

(n) Information to indicate if all or what portion of the property damaged was compensated for by crop or livestock insurance or a Federal subsidy program to the extent the claimant received compensation under that insurance or program; and,

(o) The claimant may submit additional supporting information, which shall be considered as part of the verified claim.

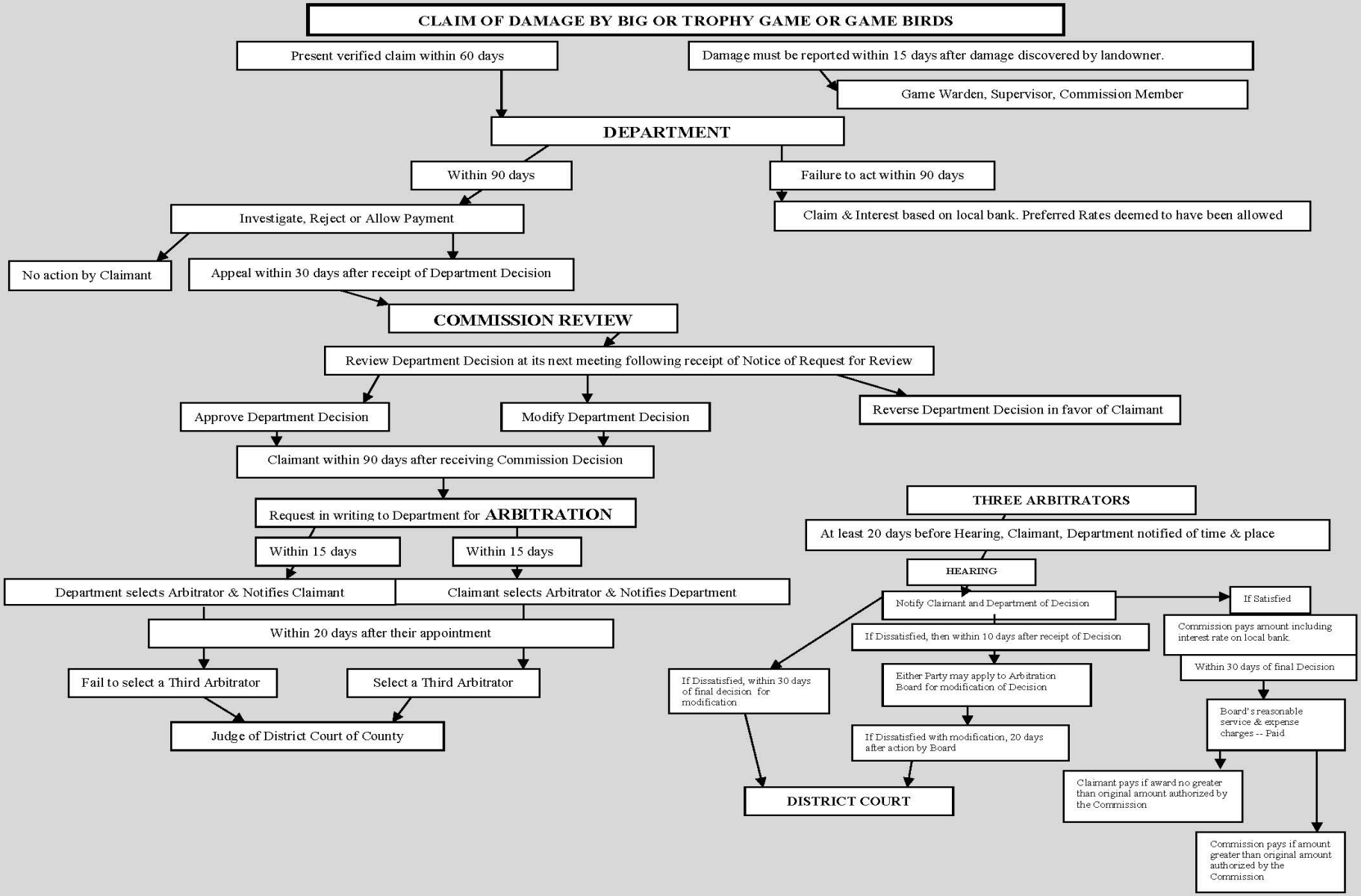
WYOMING GAME AND FISH COMMISSION

By: _____

Mike Healy, President

Dated: January 22, 2014

DAMAGE CLAIM PROCEDURE FLOW CHART



From: Steve Kallin
To: Will Meeks; Keenan Adams; Mike Blenden; Toni Griffin
Cc: Jeffrey Warren
Subject: RE: NPS/FWS NER Briefing
Date: Friday, April 17, 2015 3:27:48 PM

Hi All:

Keenan's summary is accurate. The NER and GTNP have been in close alliance and I don't see any conflicts concerning the Adaptive Management Plan at this time.

Early on, there was some concern the NER would be pulled deeply into the GTNP lawsuit and we would need to generate an administrative record. Last word from the DOJ attorneys is, although we are mentioned in the lawsuit, it should not impact NER programs. The operative word being "should." It's just hard to predict what will happen when you enter the realm of the Judiciary.

I have been in contact with the GTNP and will continue to discuss preparation for the briefing on May 7.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Will Meeks [mailto:Will_Meeks@fws.gov]
Sent: Thursday, April 09, 2015 11:43 AM
To: Keenan Adams; Steve Kallin; Mike Blenden; Toni Griffin
Cc: Jeffrey Warren
Subject: RE: NPS/FWS NER Briefing

Thanks Keenan. The only thing I'll add is if the previous agenda (not lead ammo/bear spray – that's an internal NWR discussion that's yet to be finalized) had a high profile thing that Steve wants on the agenda, we can add it. As we prepare the final agenda, let's take a moment to consider if we've missed anything. Thanks.

Will Meeks
U.S. Fish and Wildlife Service, Region 6
ARD-NWRS and PFW
303-236-4303 (w)
720-541-0310 (c)

From: Adams, Keenan [mailto:keenan_adams@fws.gov]
Sent: Thursday, April 09, 2015 11:15 AM

To: Steve Kallin; Mike Blenden; Toni Griffin
Cc: Jeffrey Warren; Will Meeks
Subject: NPS/FWS NER Briefing

All,

We received more direction for Noreen and Will's joint briefing with the NPS. The "Day light" is in reference to the Adaptive Management Plan and the NPS litigation. **Not** about lead ammunition and bear spray.

I talked with Jeff (Steve, please feel free to chime in) regarding the Adaptive Mgmt Plan and the key points are:

-The team set aside last two weeks of April to finalize the models and provide a "rough draft." The team consist of 2 State, 2 FS, 2 NPS, and NWRS Staff.
-The core team will meet in late May early June to finalize the draft.
-Draft will then go to the RO for an internal review (*need to decide how we allow respecting partners can internally comment)
-There is general consensus among the core group. As of now, all entities are "on-board." The NPS and NWR has been mostly "hand-in-hand."
-The NPS's lead biologist retired in February and he was contracted by the NWR to assist with the plan development.
-The NPS has mentioned the current grizzly bear litigation in the discussions, but the issue has not been elevated or has redirected any of the management plan.
-The elk culling inside the Park is important for the NWR to meet the objective
-The Spring-gulch subdivision (State of WY jurisdiction) has a high population that will impact the NWR to meet the objective

Steve,

Do you have any further information about the NPS litigation and the potential impacts for how the NPS views this management plan?

Regards,

--
Keenan Adams
Chief, Division of Biological Resources
National Wildlife Refuge System
Mountain-Prairie Region
Lakewood, CO
303-236-8102 (Office)

Make everything as simple as possible, but not simpler. ~Albert Einstein

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Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
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steve_kallin@fws.gov

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Will Meeks
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ARD-NWRS and PFW
303-236-4303 (w)
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Keenan Adams
Chief, Division of Biological Resources
National Wildlife Refuge System
Mountain-Prairie Region
Lakewood, CO
303-236-8102 (Office)

Make everything as simple as possible, but not simpler. ~Albert Einstein

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Planning Meeting" Update
Date: Friday, April 17, 2015 5:13:36 PM

View this poll on your dashboard

Hi Steve Kallin,

"Murphy" just provided information to the poll "BEMP Adaptive Management Planning Meeting."

Go to poll **Close poll**

Doodle is also available for iOS and Android.

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Steve Kallin
To: Tim Fuchs; Doug Brimeyer
Subject: FW: AMP Doodle Poll Cancelled for week of May 18; NEW Doodle Poll for May 26-June 5
Date: Saturday, April 18, 2015 7:37:28 AM

Hi Tim & Doug:

Just touching base to see if you know your schedule and availability for an AMP meeting the last week of May or first week of June (see below). This will be an important meeting as we discuss the updated draft plan, so we would certainly like to schedule so you can be involved. We hope to send out that draft plan by the end of this month. Ideally, after input and review from the next meeting, we will be close to providing the plan for internal review by our respective agencies.

I would like to select a date early this week so we can get it on everyone's calendars.

Hope all is well,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Tuesday, March 31, 2015 8:23 AM
To: Dale Deiter; Kerry Murphy; Tim Fuchs; Doug Brimeyer; sue_consolo-murphy@nps.gov; Sarah Dewey; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Cain; Steve Kallin
Subject: AMP Doodle Poll Cancelled for week of May 18; NEW Doodle Poll for May 26-June 5

Hi All:

It appears the week of May 18 will not work for an AMP meeting. Those who have not yet responded to the Doodle poll for that week, please disregard.

A link for a new Doodle Poll for May 26 through June 5 is below. Please complete this new poll at your earliest convenience.

http://doodle.com/3ty3c6mgu2heckd7

We still hope to send out a rough draft of the AMP for your review by the first of May.

Thanks again for your help!

Steve Kallin
Project Leader

National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From:	Cole, Eric
To:	Jeffrey Warren; Steve Cain
Subject:	Data for proportional use of feedgrounds model
Date:	Monday, April 20, 2015 8:20:42 AM
Attachments:	Proportional use of NER Model Data.xlsx

These are the data that I have assembled to date. We still need some sort of metric to account for hunting pressure.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

	A	B	C	D				
FEEDYEAR	NER Classif	NER Ave Da	JEH Total C	JEH Popula	ProporAof(	ProporAof[	ProporBof(	ProporBof[
2000	5054	5849	12360	14178	41	36	47	41
2001	6128	5242	12584	14277	49	43	42	37
2002	6366	6036	12132	13318	52	48	50	45
2003	6992	6213	12458	13457	56	52	50	46
2004	5876	5963	12095	13730	49	43	49	43
2005	4969	5021	10858	12610	46	39	46	40
2006	6730	6027	11853	12855	57	52	51	47
2007	7279	6115	11786	12777	62	57	52	48
2008	7947	7390	12370	12582	64	63	60	59
2009	7269	7310	10794	12550	67	58	68	58
2010	4348	5454	9136	11691	48	37	60	47
2011	7746	7468	11503	11978	67	65	65	62
2012	7360	7024	11519	11982	64	61	61	59
2013	6285	6397	11051	11200	57	56	58	57
2014	8296	8100	11423	11600	73	72	71	70
2015	8390	8035	10633	11000	79	76	76	73

FEEDYEAR=Year of feed season of interest. Example even if a feed season began in December 2003, the
NumWolves=Total number of wolves measured the previous breeding season in Jackson Hole. GTNP da
WolfPacks=Total number of wolf packs monitored by GTNP in Jackson Hole. Note does not include Gro
MayAugD2Precip= Total precip (inches) May through August in Wyoming climate division 2 (Snake Rive
SWETH01FEB=SWE on 01 February at the Thumb Divide monitoring site for given water year
FEEDSTART=First day of feed season (day of year)

NumWolve	WolfPacks	MayAugD2	SWETH30DEC	SWETH01F	FEEDSTART
6	1	8.77	4.1	8.2	56
4	1	6.67	3.5	4.1	25
12	1	5.19	6.3	9.4	10
14	1	5.47	6.0	9.3	48
12	1	5.19	10.2	14.1	-1
13	2	11.02	6.0	9.6	59
30	3	10.32	7.9	13.7	16
34	5	4.96	5.4	8.0	13
43	5	5.21	6.0	11.2	14
53	6	7.12	7.5	11.0	27
76	6	10.33	4.4	6.1	43
59	6	10.36	11.7	13.7	5
56	6	10.12	5.6	10.4	33
48	7	5.38	8.5	11.3	31
53	7	6.19	5.3	7.7	35
44	7	9.64	6.2	8.2	19

: feed season year would be 2004
ata does not include Gros Ventre Packs
s Ventre wolf packs
r Basin). Note because we are interested in precip effects on forage, 2000 denotes 1999 precipitaiton values

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: feed season year would be 2004
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r Basin). Note because we are interested in precip effects on forage, 2000 denotes 1999 precipitaiton values

From: Jeffrey Warren
To: Steve Kallin
Cc: Cris Dippel; Eric Cole
Subject: RE: damage payments wildlife Wyoming
Date: Tuesday, April 21, 2015 3:29:54 PM

Great, thanks. Looking at this presentation it looks like WGFD is already collecting the information we need to capture potential increases in conflicts (see slide 9). If you have different thoughts let me know and we can still explore creating a system to track conflict as needed for the AMP.

Cheers,

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

---

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Wednesday, April 15, 2015 11:33 AM
To: Jeffrey Warren
Cc: Cris Dippel; Eric Cole
Subject: FW: damage payments wildlife Wyoming

Jeff:

Attached is a bit of information concerning the WGFD process of paying for wildlife damage and their tally of conflicts. You were interested in having a "wildlife conflicts" database developed prior to the implementation of the AMP. The attached provides a bit of info about what they are already doing.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Huijser, Marcel [mailto:mhuijser@coe.montana.edu]
Sent: Monday, March 16, 2015 1:17 PM
To: Steve Kallin
Subject: damage payments wildlife Wyoming

From: Doug Brimeyer [mailto:doug.brimeyer@wyo.gov]
Sent: Friday, March 13, 2015 9:23 AM
To: Huijser, Marcel
Subject: Re: question for report National Elk Refuge

Marcel
The figures I mentioned earlier were for the entire state. I am attaching the latest damage claim summary for your review. The document breaks down the costs by species and region in the state. It may be useful to pull out the figures for damage in the Jackson Region. Please take a look at the attachment and let me know if you have any other questions.

On Thu, Mar 12, 2015 at 4:57 PM, Huijser, Marcel <mhuijser@coe.montana.edu> wrote:

> Hello Doug,
>
> The National Elk Refuge is almost done reviewing the report on the highway and the refuge. I interviewed you last summer for this report.
> A quick question: the $700,000 mentioned below for the entire state of Wyoming, correct? Not just for Jackson Hole area, correct?
>
> "Even with the ongoing hazing and supplementary feeding programs in the area, Wyoming Game & Fish Department spends about $700,000 per year to compensate private landowners for crop damage (Pers. Comm. Doug Brimeyer , Wyoming Game & Fish Department)."
>
> Note: I hope that NER will allow me to send the draft report to you and other interviewees sometime in April for final check/corrections.
>
> Thanks again for your help, Marcel

--
Doug Brimeyer
Jackson/Pinedale Wildlife Management Coordinator
Wyoming Game and Fish Department
doug.brimeyer@wyo.gov
307-733-2321 ext. 230

E-Mail to and from me, in connection with the transaction
of public business, is subject to the Wyoming Public Records
Act and may be disclosed to third parties.

From: Jeffrey Warren
To: Steve Kallin
Subject: Checking in
Date: Tuesday, April 28, 2015 5:17:51 PM

Steve,

I've been working on the AM plan this week and wanted to quickly touch base with a simple idea for moving forward.

What Steve Cain put together is a thoughtful history of where we're at and why. However, it is redundant with existing plans and distracting from the purpose of the AM plan, which is to provide a blueprint for managing and learning from that management. What we have to create is a document that can be implemented by your staff and the staff that follow. That is why I am so adamant about managers as the audience. I don't want to create a document that in 5 years has to be re-written because it was too vague to learn from.

I also understand that you want to be able to communicate this process/project to the public, also a very important component of this work. However, creating a 'hybrid' document will likely fail on both accounts.

It seems to me there is a very simple solution – craft an explicit AM plan that directs management experiments based on simple models of the system and key uncertainties that need to be reduced (my soapbox) and, using the 'technical plan', have Steve C. (or whomever else you decide) create a second document as an outreach tool to explain the process to the public. This latter document could be a 'frontispiece' to the technical report when released to the public. This would allow those interested in the details of the AM plan to have it for review, while providing a general overview for those not needing/wanting to dig into the details.

This isn't terribly different than what we've discussed already, but I do think it is important to not try and make a single 'plan' that is both a public communication tool and a technical plan for management and learning.

If this sounds good to you I will continue on as I was – crafting a technical plan to guide NER management and learning based on the last two years of conversations with the group. The technical plan can later be distilled into an outreach document and frontispiece. If you have any concerns give me a call at your convenience.

Cheers,

Jeff Warren
406 276-3536 ext. 106

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“A great many people think they are thinking when they are merely rearranging their prejudices.”
William James

From: Blenden, Mike
To: Steve Kallin
Subject: Fwd: FW: NPS/FWS conf call
Date: Wednesday, April 29, 2015 2:04:03 PM

Hi Steve,

The latest e-mail string shows NPS agreeing with the short agenda. What else do we know?

Do we know who/how many will becoming from NPS? I can invite or notify any NPS staff you think appropriate from the field level. I assume the NPS RD will notify appropriate RO staff. Maybe you could check that assumption with the park.

I will let Kris know that we do not need conf. call or webex capability unless I'm told otherwise, soon.

Thanks for working on this.

Mike
---------- Forwarded message ----------
From: **Kristine Martin** <kristine_martin@fws.gov>
Date: Tue, Apr 28, 2015 at 3:43 PM
Subject: FW: NPS/FWS conf call
To: Mike Blenden <mike_blenden@fws.gov>

Mike,

Just checking to see if you have all of the details for this meeting confirmed (conf call, webex, etc.) and all participants have been invited/notified about it? And is the RD conf room still big enough for everyone that will attend?

v/r

Kris Martin

From: Szmul, Cherry [mailto:cherry_szmul@nps.gov]
Sent: Tuesday, April 14, 2015 7:38 AM
To: Kristine Martin
Subject: Re: NPS/FWS conf call

Thank you Kristine. Has the decision been made to just have a conference call? Will this be at your location?

Sorry to inundate you with so many questions, however, this is less than a month away so I would like to narrow down the logistics.

I appreciate your assistance in getting this scheduled.

Respectfully,

On Tue, Apr 14, 2015 at 7:33 AM, Kristine Martin <kristine_martin@fws.gov> wrote:

Cherry,

We will have 5 people in attendance and a few that would join on the phone. Thanks so much for your patience!

v/r

Kris Martin

From: Szmul, Cherry [mailto:cherry_szmul@nps.gov]
Sent: Friday, April 10, 2015 11:38 AM
To: Kristine Martin; Deborah (Deb) Frauson
Subject: Re: NPS/FWS conf call

Hi Kristine,

Have you heard back regarding how many folks will be in attendance and if there is any decision as to where this will be held, your office or ours? If you could let me know so that we can get the invite out and let folks block off their calendars.

Respectfully,

On Wed, Apr 1, 2015 at 7:44 AM, Kristine Martin <kristine_martin@fws.gov> wrote:

I'm not sure but I'll get you an answer shortly.

v/r

Kris Martin

From: Szmul, Cherry [mailto:cherry_szmul@nps.gov]
Sent: Wednesday, April 01, 2015 7:39 AM
To: Kristine Martin
Subject: Re: NPS/FWS conf call

How many of your folks will be in attendance?

On Wed, Apr 1, 2015 at 7:34 AM, Kristine Martin <kristine_martin@fws.gov> wrote:

Yes, let's lock that in now! Do you want to have at your facility or ours?

v/r

Kris Martin

From: Szmul, Cherry [mailto:cherry_szmul@nps.gov]
Sent: Tuesday, March 31, 2015 4:23 PM
To: Kristine Martin
Subject: Re: NPS/FWS conf call

Kristen,

Based on the current schedule, I would like to suggest we put a hold on May 7th, 2:30-4:00 p.m.

Will that work?

Thank you for assisting me in locking this in.

On Tue, Mar 31, 2015 at 3:45 PM, Kristine Martin <kristine_martin@fws.gov> wrote:

How about May 7th? She's open all day right now. I assume this will take at least an hour quite possibly more with all of the discussion. I can check with our folks on actual time unless you have an idea?

v/r

Kris Martin

From: Szmul, Cherry [mailto:cherry_szmul@nps.gov]
Sent: Tuesday, March 31, 2015 3:30 PM
To: Kristine Martin
Subject: Re: NPS/FWS conf call

Yes I do believe that would work. Sue is prepared either way. We should lock in the date and time as soon as possible. I'd hate to have something else get scheduled.

Thank you,

On Tue, Mar 31, 2015 at 3:21 PM, Kristine Martin <kristine_martin@fws.gov> wrote:

Cherry, we can make the dates work without a problem. I believe the idea was to meet in person either at NPS or FWS facility and conference/WebEx in those that are not in Denver. Do you think that will work?

v/r

Kris Martin

From: Szmul, Cherry [mailto:cherry_szmul@nps.gov]
Sent: Tuesday, March 31, 2015 3:18 PM
To: Kristine Martin
Cc: Deborah (Deb) Frauson
Subject: Re: NPS/FWS conf call

Hi Kristine,

I've had some further discussion with Sue. If we can still make May 6-8th work (and it sounds like everyone is available then), Sue will be able to make that work. Just let me know if that is on site at the park or if this is a conference call.

Thank you!

On Mon, Mar 30, 2015 at 3:56 PM, Kristine Martin <kristine_martin@fws.gov> wrote:

Cherry,

I'll check with Noreen to see if that works for her and get back to you on it ASAP.

v/r

Kris Martin

From: Szmul, Cherry [mailto:cherry_szmul@nps.gov]
Sent: Monday, March 30, 2015 3:53 PM
To: Kristine Martin
Subject: Re: NPS/FWS conf call

Thought... Are we looking to do this face to face? With Sue's extensive travel the next few months I would like to recommend this to be a briefing via telephone conference or webex?

Let me know what the thoughts are. We may be able to make the May dates work is she does not have to travel. She will be coming off of and going into back-to-back travel.

Thank you,

On Mon, Mar 30, 2015 at 1:50 PM, Kristine Martin <kristine_martin@fws.gov> wrote:

The original dates I sent should still work. If you have another couple of days before July you think might work, please let me know.

v/r

Kris Martin

From: Szmul, Cherry [mailto:cherry_szmul@nps.gov]
Sent: Monday, March 30, 2015 1:42 PM
To: Frauson, Deborah (Deb)
Cc: Kristine Martin
Subject: Re: NPS/FWS conf call

This doesn't look like it will work on Sue's end. My error, I forgot that I was not to schedule in May due to a pending obligation. Other options?

I will still double check with her but at this time I'd don't think we should focus on this date.

On Mon, Mar 30, 2015 at 1:20 PM, Frauson, Deborah (Deb) <deb_frauson@nps.gov> wrote:

Hello,

The week of May 5-8 looks good from the GRTE perspective. Is this a conference call?

THANKS!

Deb Frauson
Executive Assistant, Superintendent's Office
Grand Teton National Park
John D. Rockefeller, Jr. Memorial Parkway
P.O. Drawer 170
Moose, Wyoming 83012-0170
Office: 307-739-3411

deb_frauson@nps.gov

On Mon, Mar 30, 2015 at 12:21 PM, Szmul, Cherry <cherry_szmul@nps.gov> wrote:

I will have to confirm that directly with Sue and we also need to make sure that the folks at the park are available before we lock that in.

On Mon, Mar 30, 2015 at 11:22 AM, Kristine Martin <kristine_martin@fws.gov> wrote:

Cherry,

Let's go for the week of May 5-8. I know Noreen would like to do it sooner rather than later.

v/r

Kris Martin

From: Szmul, Cherry [mailto:cherry_szmul@nps.gov]
Sent: Monday, March 30, 2015 10:02 AM
To: Kristine Martin
Cc: Deborah (Deb) Frauson

Subject: Re: NPS/FWS conf call

Hi Kristine,

Thank you for getting some dates to us. I'm including Deb, from the park, on the email as well since we need to also coordinate with their availability.

The only time remotely close for Sue would be May 5-8, especially if there is any travel involved. I may be able to find a day here and there if this is set up as a conference call. Other than that we are looking at the next available week being July 6-10.

Thank you,

On Mon, Mar 30, 2015 at 9:17 AM, Kristine Martin <kristine_martin@fws.gov> wrote:

Cherry,

Noreen is traveling extensively during that same timeframe. Weeks that look good for her are:

April 15-17,

April 27-2 May

May 2-8

May 18-22

June 3-5

June 15-19

June 29-1 July

v/r

Kris Martin

From: Szmul, Cherry [mailto:cherry_szmul@nps.gov]
Sent: Friday, March 27, 2015 6:15 PM
To: Kristine Martin
Subject: Re: NPS/FWS conf call

Thank you clarifying Kristine.

Let me know when you are ready to schedule the briefing. I will let you know that Sue's schedule is getting very tight. She will be on leave the majority of April, May and June.

On Fri, Mar 27, 2015 at 11:37 AM, Kristine Martin <kristine_martin@fws.gov> wrote:

Cherry,

Noreen says that she and Sue have already had the D/D call and would like us to set up the joint briefing with all of the principals instead. So let's cancel the Monday call and look for a potential date that will work for all parties for the joint briefing.

v/r

Kris Martin

From: Szmul, Cherry [mailto:cherry_szmul@nps.gov]
Sent: Wednesday, March 25, 2015 3:27 PM
To: Kristine Martin
Subject: Re: NPS/FWS conf call

Not a problem Kristine. Thank you so much for helping me get to the bottom of this. We will continue to proceed with their regular call.

On Wed, Mar 25, 2015 at 3:11 PM, Kristine Martin <kristine_martin@fws.gov> wrote:

Cherry,

Just wanted to let you know I spoke to Mike Blenden and clarified everything. Mike had prepared the agenda for a joint briefing/meeting but it is definitely not this meeting. He was mistaken in thinking the Director meeting was this briefing and shared the agenda based on that. I have advised them that this is a Director only call and this is something that can obviously be set up after they talk.

We would definitely want all of the principals for both organizations to be well informed and present for a joint meeting and this can be worked out post Director discussion. Please accept our apology for the confusion!!

v/r

Kristine Martin

Executive Assistant – Office of the Regional Director

U.S. Fish & Wildlife Service

Mountain Prairie Region

134 Union Blvd, Rm 400

Lakewood, CO 80228

303-236-7920 Office

303-236-8295 FAX

Kristine_martin@fws.gov

--

Chérry L. Szmul
Executive Assistant to the Regional Director
National Park Service
Intermountain Regional Office
303-969-2503 Phone
303-969-2785 Fax



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--

Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

From: Raymond Vela
To: Deb Frauson
Cc: Schneider Kevin; Steve Kallin; Gary Pollock
Subject: Conference Call
Date: Thursday, April 30, 2015 11:12:51 AM

Hi Deb,
Please arrange a conference call with the folks copied on this message prior to Wednesday of next week involving the USFWS/NPS RD briefing in Denver.

Steve will be in attendance and will travel on Wednesday, and we were going to call-in. We want to be on the same page on what we share and or discuss at our level. Thanks in advance for your assistance with this matter.

Have a great day.

David Vela
Superintendent
Grand Teton National Park
John D. Rockefeller, Jr. Memorial Parkway
(307) 739-3411

From: Google Calendar on behalf of Mike Blenden
To: steve_kallin@fws.gov; Keenan Adams; Will Meeks
Subject: NPS/FWS RD joint elk/bison briefing
Attachments: invite.ics

HYPERLINK "https://www.google.com/calendar/event?
action=VIEW&eid=dml0ODFmdm1ndG1ycDhyMGVmbDluazE1ZGMgc3RldmVfa2FsbGluQGZ3cy5nb3Y&tok=MjAjbWlrZV9ibGVuZGVuQGZ3cy5nb3ZmNGVkMWVmMGM2NjdjMzlkNmM4YTdmZmJhNGQ4ODg3N2JjMzg3M2Nh&ctz=America/Denver&hl=en"more details »

NPS/FWS RD joint elk/bison briefing

When
Thu May 7, 2015 3pm – 4:30pm Mountain Time
Video call
HYPERLINK "https://plus.google.com/hangouts/_/doi.gov/mike?hceid=bWlrZV9ibGVuZGVuQGZ3cy5nb3Y.vit81fvmgtmrp8r0efl9nk15dc"https://plus.google.com/hangouts/_/doi.gov/mike
Calendar
steve_kallin@fws.gov
Who
• Mike Blenden
- organizer
• Keenan Adams
• Steve Kallin
• Will Meeks

Going?
HYPERLINK "https://www.google.com/calendar/event?
action=RESPOND&eid=dml0ODFmdm1ndG1ycDhyMGVmbDluazE1ZGMgc3RldmVfa2FsbGluQGZ3cy5nb3Y&rst=1&tok=MjAjbWlrZV9ibGVuZGVuQGZ3cy5nb3ZmNGVkMWVmMGM2NjdjMzlkNmM4YTdmZmJhNGQ4ODg3N2JjMzg3M2Nh&ctz=America/Denver&hl=en"Yes -
HYPERLINK "https://www.google.com/calendar/event?
action=RESPOND&eid=dml0ODFmdm1ndG1ycDhyMGVmbDluazE1ZGMgc3RldmVfa2FsbGluQGZ3cy5nb3Y&rst=3&tok=MjAjbWlrZV9ibGVuZGVuQGZ3cy5nb3ZmNGVkMWVmMGM2NjdjMzlkNmM4YTdmZmJhNGQ4ODg3N2JjMzg3M2Nh&ctz=America/Denver&hl=en"Maybe -
HYPERLINK "https://www.google.com/calendar/event?
action=RESPOND&eid=dml0ODFmdm1ndG1ycDhyMGVmbDluazE1ZGMgc3RldmVfa2FsbGluQGZ3cy5nb3Y&rst=2&tok=MjAjbWlrZV9ibGVuZGVuQGZ3cy5nb3ZmNGVkMWVmMGM2NjdjMzlkNmM4YTdmZmJhNGQ4ODg3N2JjMzg3M2Nh&ctz=America/Denver&hl=en"No HYPERLINK
"https://www.google.com/calendar/event?
action=VIEW&eid=dml0ODFmdm1ndG1ycDhyMGVmbDluazE1ZGMgc3RldmVfa2FsbGluQGZ3cy5nb3Y&tok=MjAjbWlrZV9ibGVuZGVuQGZ3cy5nb3ZmNGVkMWVmMGM2NjdjMzlkNmM4YTdmZmJhNGQ4ODg3N2JjMzg3M2Nh&ctz=America/Denver&hl=en"more options »

Invitation from HYPERLINK "https://www.google.com/calendar/"Google Calendar

You are receiving this email at the account steve_kallin@fws.gov because you are subscribed for invitations on calendar steve_kallin@fws.gov.

To stop receiving these emails, please log in to https://www.google.com/calendar/ and change your notification settings for this calendar.

Attachment 20150430 1355_Email_NPS_FWS RD joint elk_bison briefing.ics (1329 Bytes) cannot be converted to PDF format

From: Matt Hogan
To: Will Meeks
Subject: FW: FWS/NPS Joint Briefing
Date: Friday, May 01, 2015 8:59:01 AM

Can you call Tammy at 11 and try to sort this out.

From: Tamara Whittington [mailto:tammy_whittington@nps.gov]
Sent: Friday, May 01, 2015 8:55 AM
To: Matt Hogan
Subject: Re: FWS/NPS Joint Briefing

Thanks Matt. Not sure things are jiving at all. The deputy supt contacted me yesterday to see if I knew what was going on. Last I knew, directly from Sue, is that the two of us are going to your place for the meeting and that the grand Teton and refuge folks would be calling in. And that we were uncertain as to an agenda.

Can you talk today? Say at 11am?

Tammy
Work 303-969-2073
Cell 303-476-1060

Sent from my iPad

On May 1, 2015, at 8:44 AM, Matt Hogan <Matt_Hogan@fws.gov> wrote:

> Tammy,
> Got your text and asked our refuge chief what was going on. Here is what I got back… let me know if this does not jive from what you are hearing from your folks.
>
> ---
>
> **From:** Will Meeks [mailto:Will_Meeks@fws.gov]
> **Sent:** Friday, May 01, 2015 8:41 AM
> **To:** Matt Hogan; Noreen Walsh
> **Cc:** Kristine Martin; Mike Blenden
> **Subject:** FWS/NPS Joint Briefing
>
> Matt,
>
> Per your email, here is the agenda and my recommendation for attendance. The agenda was jointly developed by Steve Kallin (NER) and the Grand Teton Park Superintendent. I believe the Park Service has seen the agenda also.
>
> Attendance (recommendation) is as follows:
>
> FWS – RD, DRD, ARD, Mike Blenden, Keenan Adams, Steve Kallin
> NPS – RD, Park Superintendent, (and anyone they may deem appropriate)

If there is anything else needed, please let me know.

I believe Kris was waiting for approval of the agenda before we sent it to NPS with call-in information.

Thanks.

Will Meeks
U.S. Fish and Wildlife Service, Region 6
ARD-NWRS and PFW
303-236-4303 (w)
720-541-0310 (c)

<FWS_NPS Joint briefing agenda updated 5-1-15.docx>

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Will Meeks
U.S. Fish and Wildlife Service, Region 6
ARD-NWRS and PFW
303-236-4303 (w)
720-541-0310 (c)

<FWS_NPS Joint briefing agenda updated 5-1-15.docx>

From: Cole, Eric
To: Steve Kallin
Subject: Short Distance Migrant (summer range) figure
Date: Tuesday, May 05, 2015 10:04:30 AM
Attachments: Short Distance Migrant Figure.docx

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

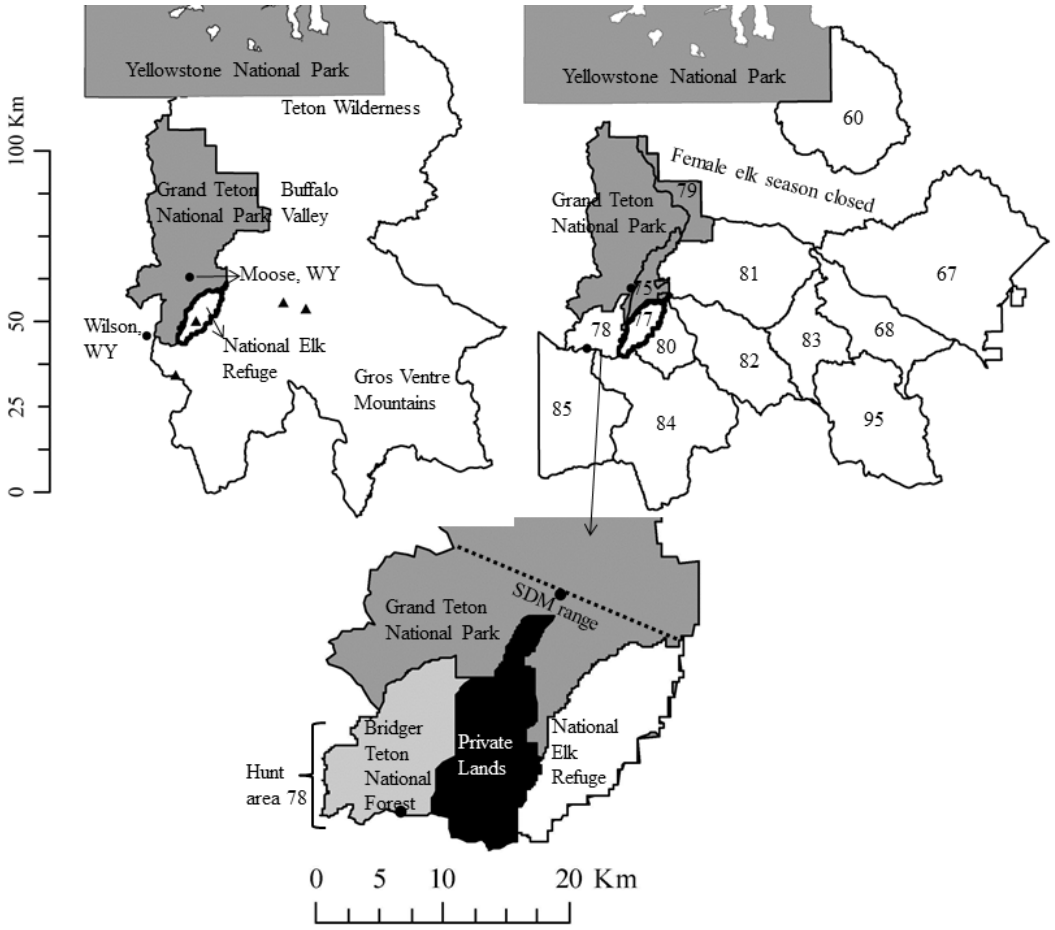


Figure 1. Elk capture sites, feedgrounds (triangles), and National Parks within the Jackson elk herd study area in northwestern Wyoming, USA (left) and hunt areas where female elk were legal for harvest (right). Note that hunt areas 75 and 79 are within Grand Teton National Park. The close-up image (bottom) depicts the summer range of short-distance migratory (SDM) elk south of the dotted line; black areas within hunt area 78 were privately owned and light grey areas were National Forest lands. Note the National Elk Refuge is hunt area 77.

From: Will Meeks
To: Mike Blenden
Subject: High Importance - NER
Date: Tuesday, May 12, 2015 2:10:38 PM

NER. Noreen and Matt want a deadline (firm) for NER AMP. Have Steve consider the date of November 15, 2015 as the deadline. They want to see the timeline. Thanks.

Will Meeks
U.S. Fish and Wildlife Service, Region 6
ARD-NWRS and PFW
303-236-4303 (w)
720-541-0310 (c)

From: Will Meeks
To: Mike Blenden
Subject: High Importance - NER
Date: Tuesday, May 12, 2015 2:10:38 PM

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Will Meeks
U.S. Fish and Wildlife Service, Region 6
ARD-NWRS and PFW
303-236-4303 (w)
720-541-0310 (c)

From:	Mike Blenden
To:	Steve Kallin
Subject:	Fwd: High Importance - NER
Date:	Wednesday, May 13, 2015 4:26:04 PM

Steve,

I'm curious how realistic you think this date is.

Mike

Sent from my iPhone

Begin forwarded message:

> **From:** Will Meeks <Will_Meeks@fws.gov>
> **Date:** May 12, 2015 at 3:10:38 PM CDT
> **To:** Mike Blenden <mike_blenden@fws.gov>
> **Subject: High Importance - NER**
>
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>
> Will Meeks
> U.S. Fish and Wildlife Service, Region 6
> ARD-NWRS and PFW
> 303-236-4303 (w)
> 720-541-0310 (c)

From: Cole, Eric
To: Jeffrey Warren
Subject: Copy of December 2002 Hobbs Model report. Note still waiting on Feb 2003 version
Date: Thursday, May 14, 2015 4:27:57 PM
Attachments: TBISON7.doc

Winter Mortality Model results appear unchanged from Feb 2003 version.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

Assessing Management Alternatives for Ungulates in the Greater Teton Ecosystem using Simulation Modeling

December 2002
Final Report



N. T. Hobbs[1], F. J. Singer[1,2], G. Wockner[1]

Collaborators: G. Wang[1], L. Zeigenfuss[2], P. Farnes[3], M. Coughenour[1], and S. Delgrosso[1]

1. Natural Resource Ecology Lab, Colorado State University, Fort Collins, CO
2. US Geological Survey, BRD, Fort Collins, CO
3. Dept. of Earth Sciences, Montana State University, Bozeman, MT

Introduction

Managers of ungulate populations in the Greater Teton Ecosystem and the National Elk Refuge have asked three questions about interactions between populations of native ungulates, notably elk and bison, and the winter habitats that support those populations. We addressed these questions using simulation modeling.

The first question focuses on understanding the balance between supplies of forage on the winter range and the size of ungulate populations. In short, managers seek to know the number animals that can be supported by natural forage supplies under a range of weather conditions. To answer this question, we created the Forage Accounting Model (Part I of this report). The Forage Accounting Model simulates forage intake by ungulates across a range of elk population sizes and during a range of climatic conditions for the growing season and for winter. In addition, we simulated varied bison populations between 250 and 2000 animals for the Teton ecosystem. This model predicts the proportion of forage supplies that are consumed across the landscape (forage utilization) and also calculates 'forage deficits' caused by different population sizes in the system. Forage deficits represent the difference between the total supply of forage and the total forage required by ungulates. We exercised the Forage Accounting Model using assumptions from four of the Alternatives in the ongoing Environmental Impact Statement for ungulate management.

The forage accounting model predicts forage utilization by ungulates, but does not provide insight into the consequences of different levels of utilization. Thus, the second question we addressed focuses on the impacts of different levels of utilization of winter forage on ecosystem processes, primarily net primary production and nutrient cycling. To answer this question, we used the CENTURY Ecosystem Model (Part II of this report). The Century model simulates biogeochemical changes in vegetation and soil due to grazing. Using this model, we simulated intense grazing effects on two vegetation types prevalent on the Teton winter range -- wet meadow and sagebrush. We examined the effects of two levels of utilization (50% and 80%) on soil carbon, mineralized nitrogen, and net annual production over a one-hundred-fifty year time-span. Ongoing fieldwork by F. Singer will later be used to corroborate these simulations.

The third question focuses on the consequences of forage deficits for population performance. Specifically, we asked "What are the effects of food shortages on elk mortality? To answer this question, we employ the Over-Winter Mortality Model (Part III of this report). The Over-Winter Mortality Model estimates the energy balance of individual elk and simulates energy intake and expenditure in four age/sex classes. We estimate starvation mortality using the same scenarios for animal abundance, available forage, and snow conditions as in the Forage Accounting Model.

These three models complement each other in important ways. The Forage Accounting Model predicts forage supply, consumption, deficits, and utilization. The Century Ecosystem Model was developed for different projects at the Natural Resource Ecology Lab at Colorado State University and then adapted to our present needs, in part by using the utilizations predicted by the Forage Accounting Model. The Over-Winter Mortality Model was first developed for mule deer in Colorado and was adapted for elk to meet the needs of this project. It uses the forage supply, consumption, and deficits predicted by the Forage Accounting Model. We brought these three models together to provide reasonable answers to the questions raised by managers.

Here, we describe each model and the insight we gained from it. The first three sections of this document focus on each model and its results. In a final, concluding section, we aggregate results across models and draw general conclusions relevant to managing ungulates in the Greater Teton Ecosystem.

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Executive Summary

The Forage Accounting Model

We describe a simple accounting model that predicts imbalances between forage supply and animal forage requirements on winter ranges used by native ungulates (elk, moose, bison) in the Greater Teton Ecosystem and the National Elk Refuge. The model predicts *forage utilization* and *forage deficits.* Forage utilization is depicted by a map across the study area where cells are coded based on the percentage of pre-winter forage supplies that are consumed by native ungulates during winter. Forage deficits are defined as the amount of forage required by ungulates that exceeds the amount available during any week of the winter, summed over all weeks. The model is driven by data on forage standing crops at the beginning of winter, snow distribution during winter, pre-winter precipitation conditions, and offtake rates of ungulate populations.

We exercised the Forage Accounting Model in the Greater Teton Ecosystem under different conditions for elk population density (0-18,000 animals), and under different bison populations (250 - 2000) while holding moose populations constant (890). In addition to simulations for the ecosystem as a whole, we also exercised the model solely on the National Elk Refuge with elk populations of 0 -10,000, bison populations of 250 -2000, and 20 moose. The number of elk at which forage deficits begin to occur during a specific winter under specified assumptions represents an "equilibrium point" on the landscape at which forage supply and demand are in balance. Table 1 below provides a quick synthesis of these equilibrium points for each scenario in the EIS process for the broader Teton study area and NER.

Table 1. Number of elk at which forage supply and demand are in equilibrium

Alternative #1 (status quo, 500 bison, flood irrigation, willow available on NER)						
Pre-winter Precipitation Scenario	Drought			Mean		
Snow Severity Type	Severe	Above-average	Average	Severe	Above-average	Average
Greater Teton Ecosystem	0	1,800	5,500	1,000	6,000	16,000
NER only	0	0	2,000	0	0	5,000
Alternative #2 (no flood-irrigation, 500 bison, willow available on NER)						
Greater Teton Ecosystem	0	1,600	5,300	900	5,900	15,800
NER only	0	0	1,700	0	0	4,500
Alternative #3 (no willow available on NER, 1,000 bison, flood-irrigation)						
Greater Teton Ecosystem	0	0	3,000	0	5,000	14,000
NER only	0	0	0	0	0	3,300
Alternative #4 (center-pivot irrigation, 350 bison, no willow available on NER)						
Greater Teton Ecosystem	0	1,600	5,700	1,500	7,200	17,000
NER only	0	0	2,000	0	0	5,500

Although the numbers in Table 1 represent clearly demarcated points of equilibrium, each is associated with a margin of error, underlying assumptions, and an accompanying graph in the body of this report which should all be evaluated together. Additionally, although the numbers of elk in Table 1 represent the point at which deficits begin to occur, elk are known to rely on stored energy reserves to survive winters and therefore can likely incur small forage deficits without starving to death.

In addition to the above analysis, we also ran experiments with the Forage Accounting Model on the Greater Teton Ecosystem to examine effects of 1) removing all domestic grazing from public lands in the Teton ecosystem and 2) removing effects of agriculture and residential development on forage supplies in and around the town of Jackson. Our simulations suggested that removing all domestic grazing would have effects on forage deficits in all winter severity types because most domestic grazing does not occur on wildlife winter range. Providing forage to elk populations equivalent to the pre-settlement vegetation now subsumed by development in and around Jackson had negligible effects on forage deficits during severe winters. During average winters adding this forage substantially reduced deficits. by allowing elk to graze on the additional forage available. However, addition of these forage supplies did not *eliminate* forage deficits for the current population size of elk, suggesting that current elk numbers may exceed what could have been support in the Greater Teton Ecosystem under pristine conditions.

The CENTURY Ecosystem Model

The CENTURY Ecosystem Model simulates exchanges of carbon (C) and nitrogen (N) among atmosphere, soil, and vegetation. Required inputs used to drive the model include monthly maximum/minimum temperature and precipitation data, soil properties, vegetation type, and current and historical land use. Disturbances and management practices such as grazing, fire, cultivation, and fertilizer additions can be simulated. We simulated response of two vegetation types (wet meadow and sagebrush) to two levels of forage utilization by elk (50% and 80%)/ Other required inputs were estimated based on CENTURY modeling in similar systems. Current and ongoing Teton field sampling work by F. Singer on nitrogen pools and vegetation will later be used to corroborate these preliminary findings.

Because elk are consuming standing dead forage of low nutritional content during winter, CENTURY predicted that ungulate grazing will have not harm plant production on the winter range at either level of grazing intensity. Further, because grazing accelerated nutrient cycling, and because ungulates returning more nitrogen to the soil than they consume, higher grazing levels may actually *increase* future plant production. Resutls from CENTURY suggest that heavy winter-season grazing in this system, as predicted by the Forage Accounting Model, is sustainable and that soil C and nutrient levels are not significantly depleted and may increase. As long as elk are concentrated at high densities on the winter range, the CENTURY model will predict positive feedbacks on production due to higher net N inputs versus N offtake from grazing.

The Over-Winter Mortality Model

Forage deficits predicted by the Forage Accounting Model will likely cause elevated mortality in over-wintering elk populations. We adapted the energy balance model of Hobbs (1989) to estimate starvation mortality by simulating energy intake and expenditure by elk in four age/sex classes (calves, yearling males, adult females, bulls) during average, above average and severe winters with average pre-winter precipitation conditions. This energy balance model allocates elk populations to map cells based on snow water equivalents, allows elk to consume available herbaceous and shrubby forage, and predicts mortality based on forage shortfalls and animal nutritional needs.

Simulated mortality of calves ranged from a low of 4% during an average winter at a total population size of 6,000 to a high of 42% during a severe winter and a population of 18,000. Increasing population density was associated with roughly proportionate increases in estimated mortality. Starvation mortality for adult cows was predicted to be 1% for a population of 6,000

animals in an average winter rising to a high of 25% for a population of 18,000 during a severe winter.

Acknowledgements

Funding was provided by the Natural Resources Preservation Program (NRPP) – US Geological Survey, BRD and NPS fund, and from Grand Teton National Park. We acknowledge Robert Schiller of Grand Teton National Park for project organization and administration as well as Bruce Smith of the National Elk Refuge. We also thank Phil Farnes of Snowcap Hydrology and Montana State University for the snow model algorithms and snow measurements, and for assistance with refining the snow model; and Michael Coughenour of the Natural Resource Ecology Lab (CSU) for developing the snow model computer code.

Part I.
The Forage Accounting Model

Introduction

We constructed a forage accounting model to examine the consequences of management actions for balancing forage supplies with forage demands of populations of native ungulates in the Greater Teton Ecosystem and the National Elk Refuge. We first describe our modeling approach and explain two predictions made by the model, forage utilization and forage deficits. We then describe how the model works. We subsequently use the model to examine relationships among elk population density, bison populations, precipitation-based forage production, and winter severity. The model was run on two study areas: the Greater Teton Ecosystem, and the National Elk Refuge, and was used to predict forage deficits for each Alternative in the EIS on both study areas. In addition to describing the modeling approach and methods, this section of this report gives and interprets the results for all four EIS Alternatives.

Modeling Approach

Our modeling philosophy favors simple models over complex ones. This is because simple models are easier to explain, understand, and defend than models that include high levels of detail. Our approach is to begin with a simple, "base model", and add detail incrementally as it is needed to address questions unresolved by the simpler model.

We built a simple accounting model that keeps track of the impacts of different densities of ungulates on forage supplies as winter progresses. The model responds to annual variation in forage production, effects of snow on forage availability, and effects of grazing and browsing on the forage supply. We call it an accounting model because it is perfectly analogous to a model of cash reserves and flows in a business. In essence, it answers questions on the bottom line -- how much forage is used by populations of ungulates? Does that use produce a deficit or surplus at the end of winter? The accounting approach was motivated by the overriding central assumption used to justify supplemental feeding -- animals are fed during winter to compensate for deficits in forage supply. Thus, a logical starting point for our efforts was to quantify the magnitude of these deficits under different conditions.

The Concept of Forage Deficits and Forage Utilization

There are two concepts that are important in understanding the accounting model. The first concept is *forage deficits*. Forage deficits represent the difference between the total supply of forage available during the winter and the total forage required by a given population of ungulates, including bison, moose, and elk. Thus, forage deficits are affected by population size, which affects forage demand, as well as snow accumulation (measured as snow water equivalents, SWE) and forage production, which affects forage supply. We calculated forage deficits by estimating the daily intake of populations of a given size, subtracting that intake from the daily forage supply, and summing negative values over all time-steps of the winter.

The second concept, a common measure of habitat use, is called *forage utilization.* Forage utilization is simply the percent of forage removed from a given location in the study area. We depict this on a map where map-cells are coded with the utilization percent. Forage utilization gives us a measure of ungulate impact on habitat. Part II of this report, which discusses the

Century Ecosystem Model, will analyze and quantify the effect forage utilization on net primary production and nutrient cycling.

Model Description

Study Areas

Two study areas were delineated (Figure 1). The first, larger area, the Greater Teton Ecosystem, corresponds to the boundary depicted in the Steele et al. (1999) report on Jackson Valley vegetation. The southern boundary reaches to the southern edge of the Town of Jackson, the northern edge is at the north end of Jackson Lake, the western edge is about halfway between the crest of the Tetons and the Idaho Border, the eastern edge runs roughly to Togwotee Pass. This boundary roughly encompasses the current boundary of the Jackson elk herd as defined by Wyoming Game and Fish. In addition, it contains all of the supplemental snow measurement sites reported by Farnes et al. (1999). The second area is the boundary of the National Elk Refuge.

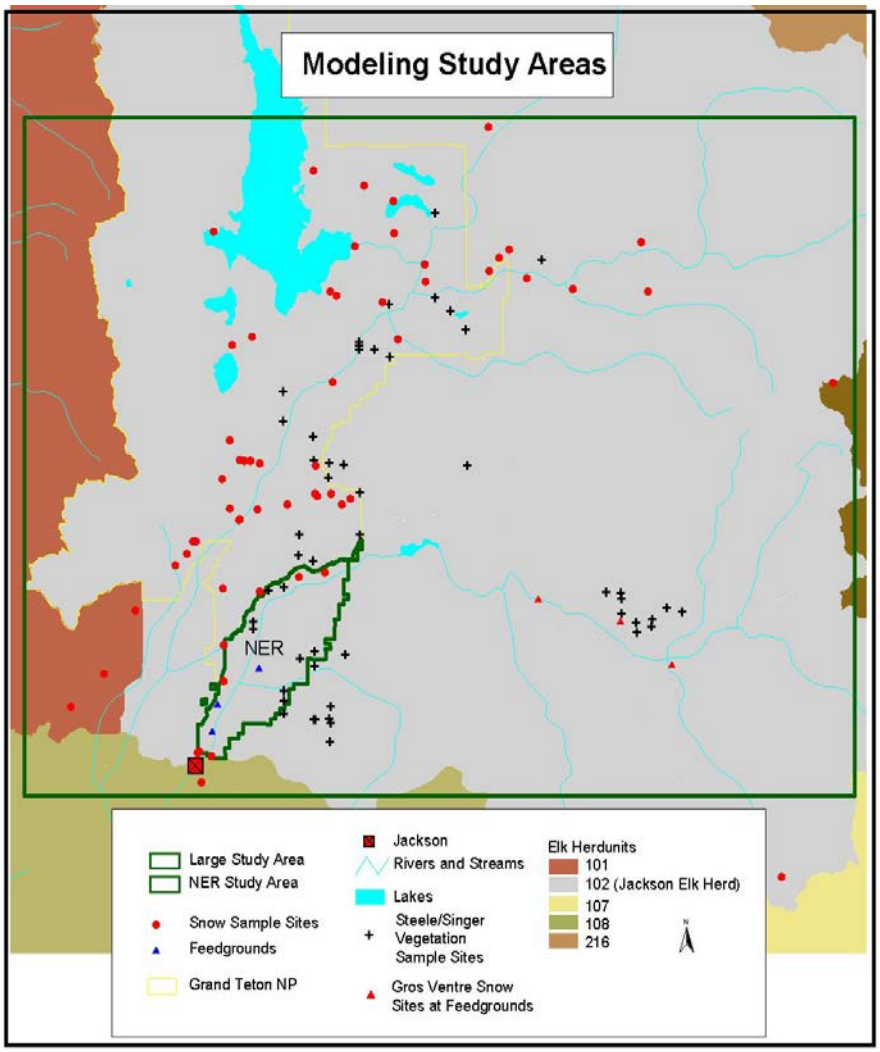


Figure 1. Study areas and other relevant locations for the project.

Algorithm

The model operates at a weekly time step (Figure 2). For each week of the winter, the model calculates snow water equivalents (SWE) on each 30 x 30 meter cell in the study area and sums the amount of forage that is available at each 1-inch SWE increment. Grazing/browsing pressure by populations of bison, elk, and moose is first allocated to the forage available in completely open areas (i.e., cells with 0 inches SWE). If additional demand exists, it is allocated to cells with 1 inch of SWE. Any additional demand is allocated to progressively greater snow depths, with a linear reduction in forage availability occurring in relation to SWE greater than 2 inches (Table 2). This approach has been used successfully to model effects of snow on forage availability in other studies (Hobbs 1989, Turner et al. 1994).

Table 2. Forage Availability Percentages

SWE inches	Percent of forage available
0	100
1	100
2	100
3	75
4	50
5	25
6	0

If there is forage demand in excess of the supply in all of the cells during any week, then this excess is accumulated in the *forage deficit*. At the end of the winter, we calculate *forage utilization* for each cell in the vegetation map by dividing the total amount of forage removed from each cell by the pre-winter standing crop of that cell.

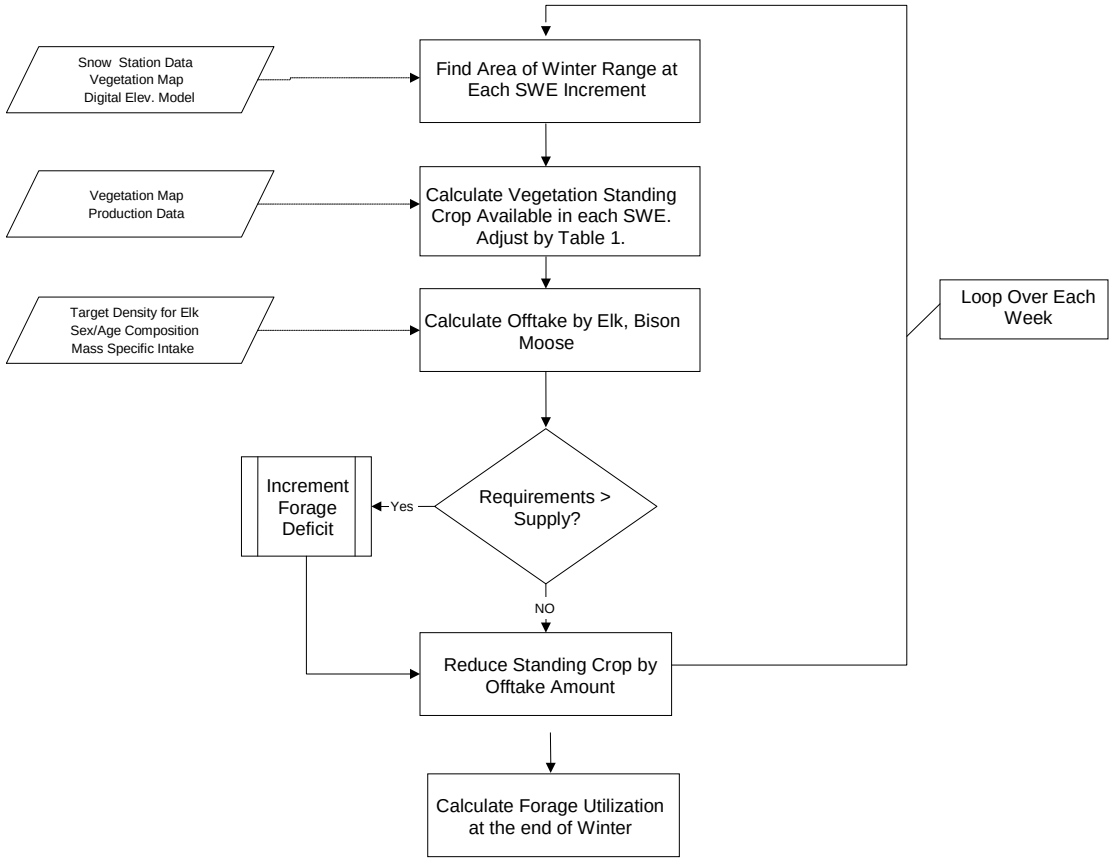


Figure 2. Flow chart of data and processes in the forage accounting model. The model cycles through these calculations at weekly intervals.

The model is driven by data on the standing crop at the beginning of winter, snow distribution during winter, and offtake rates of ungulate populations (Figure 2).

Vegetation Data
The accounting model requires spatially explicit data on production of vegetation available at the beginning of winter. We developed these data from maps of vegetation communities and field data on production in each community.

We obtained a complete vegetation coverage from Utah State University (Homer 1995) that was created in 1996 for all of U.S. Forest Service (USFS) Region 4 using remote sensing interpretation techniques. Vegetation coverages were also obtained from Grand Teton National Park (GTNP) and the National Elk Refuge (NER) (Figure 3). GTNP data were developed from aerial photography while NER data were developed from a combination of aerial photography and ground-based mapping. Discussions with other coverage users suggested that the NER coverage was the most accurate, followed by the GTNP coverage, followed by the Utah State coverage. Thus, we merged these coverages to use the most accurate data wherever it was available, using the Utah State coverage only to fill in gaps not covered by the GTNP or NER data.

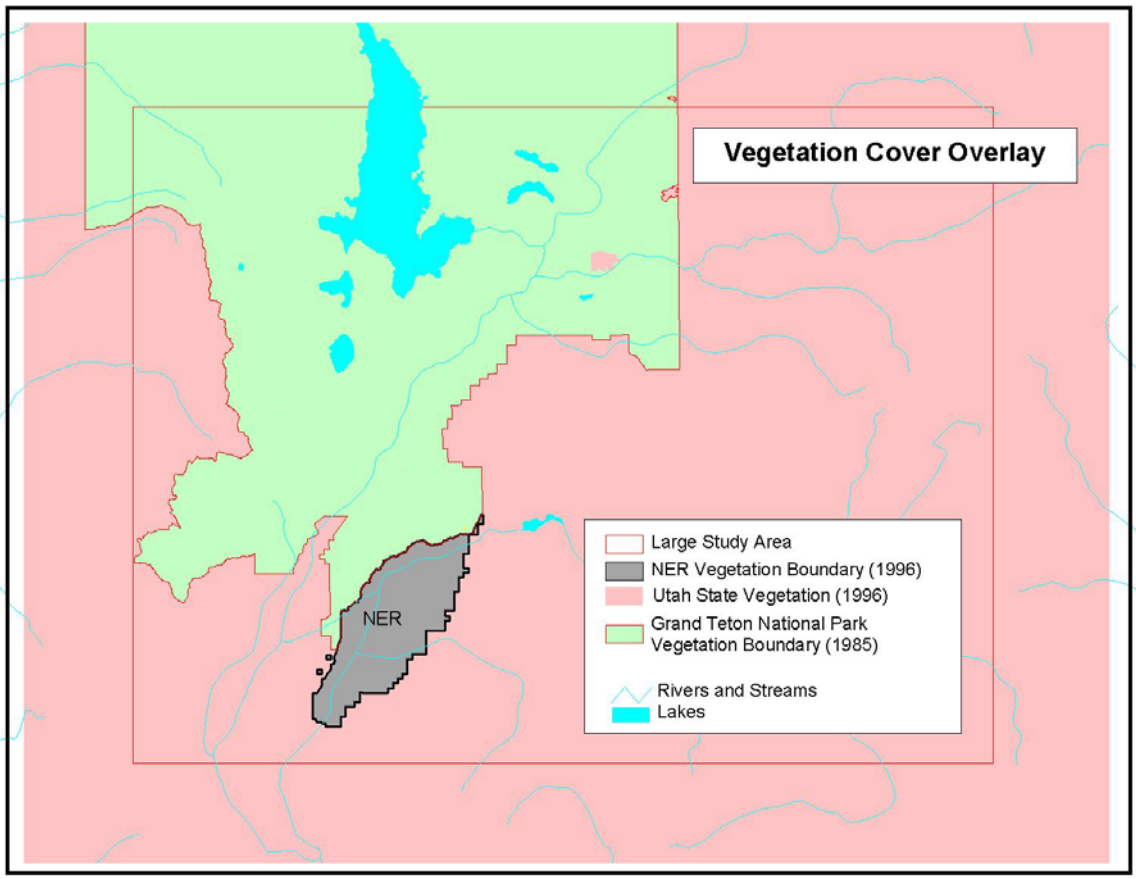


Figure 3. Coverages used to assemble unified vegetation map for the study area.

Because each coverage had different vegetation coding schemes, a crosswalk table was developed to convert the vegetation codes into a more standardized scheme (Appendix C: Table 1). The Utah State coverage had 68 separate vegetation types, GTNP had 60, and NER had 32. The

essential data in the vegetation table was the name of the vegetation type and the annual production of herb/shrub. This model folds these categories into 15 separate vegetation types (Figure 4). These categories were chosen because they provided usefully different vegetation types for which we could obtain production information in the nearby environment. Using the descriptions provided in the metadata for the Utah State University coverage, descriptions for non-forested (Mattson and Despain 1985) and forested (Steele 1983) habitat used to create the GTNP coverage, and the vegetation categories of the NER coverage, vegetation categories from each coverage were matched up as accurately as possible.

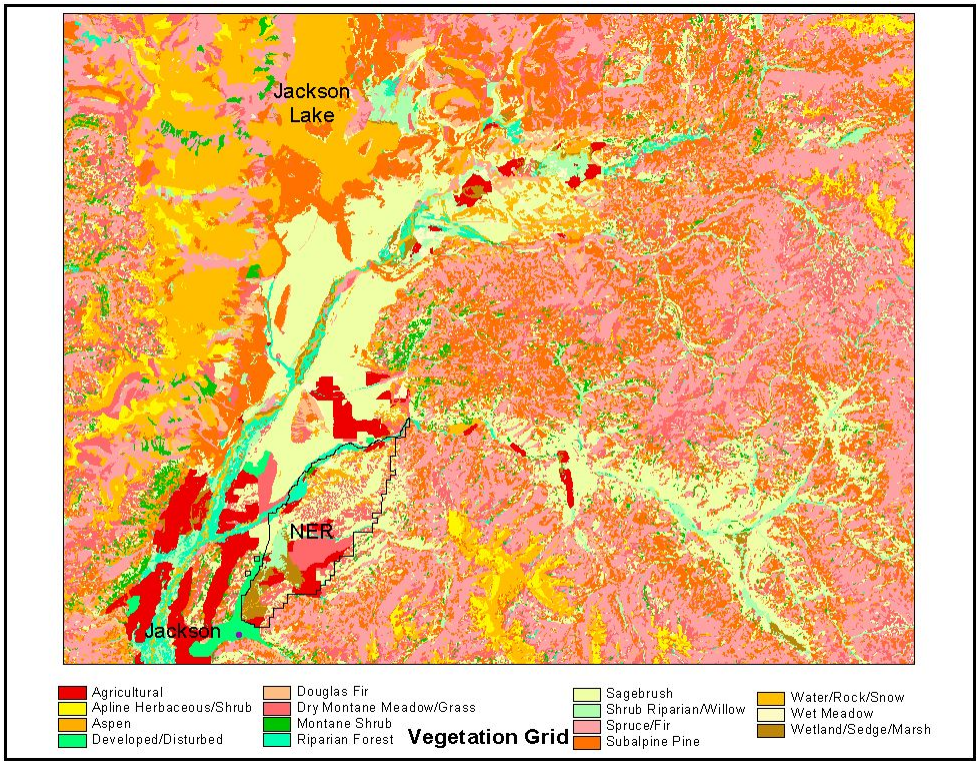


Figure 4. By using a cross-walk of vegetation categories, we combined data from three coverages to produce a single map representing 15 vegetation categories.

Data on annual production for each vegetation type were obtained from studies conducted by Biological Resources Division (BRD)--USGS, National Elk Refuge (NER)--USFWS, and Bridger-Teton National Forest (BTNF)--USFS. Each data set was collected in a different manner and so it was necessary to standardize the data so that they could be combined to create the largest data set possible for estimating average production values. Mean year, wet year, and dry year production values are given in Table 3 below. Wet year production equals 150% of the mean year; dry year equals 45% of the mean year. A detailed description of the methods used to derive these estimates are given in Appendix A.

Table 3. Vegetation Name and Production

Code	# of cells	Vegetation Name	Mean Production (pounds/acre)	Wet Year Production (pounds/acre)	Dry Year Production (pounds/acre)
1.	1158538.	Spruce/Fir	1162.	1743.	523.
2.	147739.	Douglas Fir	705.	1058.	317.
3.	834291.	Subalpine Pine	1167.	1751.	525.
4.	148500.	Aspen	1712.	2568.	770.
5.	68064.	Riparian Forest	2524.	3786.	1136.
6.	690177.	Sagebrush	1190.	1785.	536.
7.	147658.	Shrub Riparian/Willow	2125.	3188.	956.
8.	91805.	Montane Shrub	1708.	2562.	769.
9.	105584.	Alpine Herbaceous/Shrub	1693.	2540.	762.
10.	440890.	Dry Montane Meadow/Grass	895.	1343.	403.
11.	27067.	Wet Meadow	2385.	3578.	1073.
12.	34630.	Wetland/Sedge/Marsh	4760.	7140.	2142.
13.	457338.	Water/Rock/Snow	0	0	0
14.	117513.	Agricultural	2498.	3747.	1124.
15.	18881.	Developed/Disturbed	4334.	6501.	1950.

Spatial Heterogeneity of Forage and Initial Forage Availability

Managers raised a question about the spatial heterogeneity of production due to varying rainfall over the study area. For example, sagebrush on the NER may produce differently than sagebrush in the upper Gros Ventre drainage. We attempted to create a spatially explicit production map based on actual production measurements across the study area. However, these estimations did not yield significant spatial differences in production for each vegetation type. While we recognize that rainfall may vary across the area, and the production may vary with it, field data could not support these distinctions.

Although the production estimates in Table 3 represent total production on the landscape, a question was raised at a meeting of managers and modelers in Jackson in February 2002 about forage availability to ungulates. It was suggested that a significant amount of measured forage is totally unavailable to ungulates because it is unpalitiable or is obstructed by inedible plant tissue. Based on past experiences of measured offtake, meeting participants estimated this unavailability between 50% and 25%. Using elk offtake data gathered from the study area (Steele et al. 1999) and other offtake data from similar systems (Hobbs et al. 1996, Singer et al. 2002), we estimate this percentage to be 35%. Our model uses this estimation by initially decrementing the production values by 35% at the beginning of winter.

Snow Distribution

We predicted temporal and spatial variation in snow water equivalents (SWE) using a model developed by Michael Coughenour and Phil Farnes in the 1990's for Grand Teton National Park. The model uses input data from snow stations and interpolates among them to produce a surface of predictions. It was written as a broader precipitation model with the capabilities of predicting precipitation level, snow depth, and SWE, depending on various input and model switches. For

the current modeling effort, we used SWE because it is the primary determining factor for ungulate migratory behavior. A detailed description of implementation of the snow model and corrections developed for the Gros Ventre snow shadow are presented in Appendix B.

Ungulate Offtake

The model requires estimates of the total amount of forage consumed by elk, bison, and moose on the study area. We calculated offtake assuming that each animal consumes dry matter equal to 2% of its body mass each day (Cordova et al. 1978, Baker and Hansen 1985, Baker and Hobbs 1987). We estimated an average body mass for each ugulate species weighted by the sex and age composition of their current populations. Animal age/sex counts were obtained from participating state and federal wildlife agencies. Average weights for each species and for each age/sex class were gathered from literature (Meagher 1973, Houston 1982). A sample of the spreadsheet calculations used to estimate these weighted averages appear in Appendix C: Table 4.

Model Overlays

The model overlays a SWE grid on the vegetation grid during each time step. For example, when snow accumulation is relatively light, the model allows foraging over large areas of the winter range (Figure 5). However, when snow accumulation is heavy, there are very few areas that are open for foraging (Figure 6).

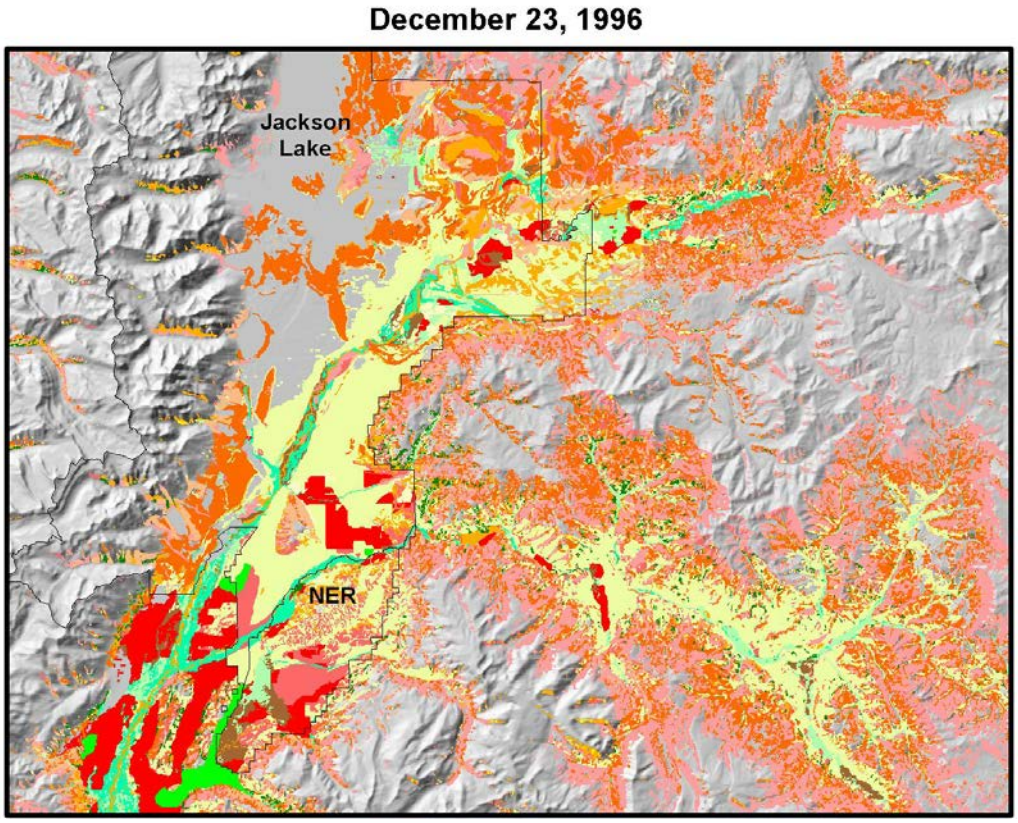


Figure 5. Overlay of snow accumulation ≥ 6 inches SWE on the vegetation map for December 23, 1996. Grey shading indicated areas of the landscape with ≥ 6 inches SWE. (Map adjusted for Gros Ventre snow correction.)

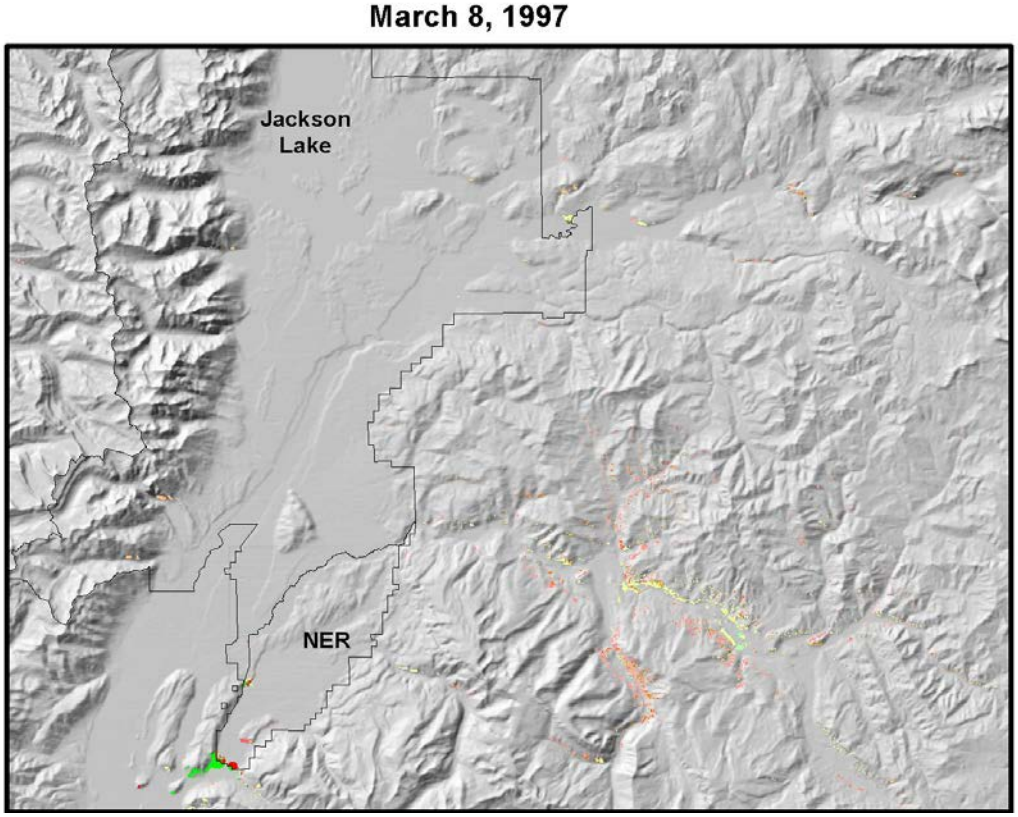


Figure 6. Overlay of snow accumulation ≥ 6 inches SWE on the vegetation map for March 8, 1997. Grey shading indicates areas of the landscape with ≥ 6 inches SWE. (Map adjusted for Gros Ventre snow correction.)

Modeling Scenarios

We exercised the model on both study areas -- the Greater Teton Ecosystem, and the NER (Figure 1). Within each study area we ran a series of simulations accounting for 1) varying populations of elk -- between 0 and 18,000, 2) varying SWE winters -- average, above average, and severe, 3) varying pre-winter precipitation conditions -- drought, mean, and wet, and 4) varying populations of bison as specified by the EIS Alternative's assumptions. On the Greater Teton Ecosystem, the model runs include offtake for 890 moose. On the NER, the model runs include offtake for 20 moose. On the Greater Teton Ecosystem, we varied elk populations between 0 and 18,000 animals, and ran enough simulations to get the shape of a trendline following the data points. On the NER, we varied elk populations between 0 and 10,000. Wintering bison populations have been growing very quickly in the valley. In 1999 there were roughly 500 bison in the study area whereas in 2002 the number was 650.

We varied winter severity using three types of winter snow conditions: average, above average, and severe. We chose 1996 as an example of an average winter, 1982 as a moderately severe winter, and 1997 as a severe winter. These choices were justified by consulting Farnes et al. (1999) which presents a table of estimated mean SWE for the 50-year recording period in the Hunter-Talbot hayfields. Using Farnes' table, we ranked snow severity using the SWE measurement on the hayfields. 1996 came in as the mean ranking while 1982 was above average. Although four winters prior to 1980 had data which was more severe than 1997, our snow data set only went back to 1980. Thus we used 1997 as the "most severe on record". We also consulted

with Farnes and got agreement about using these representative years. In addition to this ranking, we also calculated average areas open per day during the 6 snowiest weeks of each winter. Table 4 presents the areas open to ungulates, i.e., that have less than 6 inches of SWE for each winter.

Table 4. Average Acres Open per day in the six snowiest weeks of each winter

Acres Open (< 6" of SWE)	
Whole Study Area	
1996 – Average	50,947
1982 – Above Average	19,649
1997 – Severe	12,003
NER only	
1996 – Average	8,531
1982 – Above Average	2,560
1997 - Severe	690

Model Results on the Greater Jackson Ecosystem for EIS Alternative #1 (status quo)

We estimate the margin of error for the results in the Greater Teton Ecosystem to be $\pm$ 20%. We cannot firmly quantify this error, but believe, based on our expertise derived from similar systems, that $\pm$ 20% is a reasonable approximation.

These results should not be used as the sole factor in determining the appropriate numbers of elk and bison on the Teton ecosystem or the NER. Instead, these results should be used as a starting point for management decisions, and used along with other pertinent factors such as long-term local knowledge, the results of other research, and management objectives not factored into this modeling effort. We do not interpret these results as the "carrying capacity" of the landscape, nor do we support an interpretation that assumes specific levels of mortality based on forage deficits. "Carrying capacity" is a complicated ecological concept that is not directly addressed by this model, and mortality estimates are provided in Part III of this report.

Throughout this report, we refer to graphs of forage deficits as a function of elk population size. These graphs show how forage deficits change and elk numbers increase given a range of assumptions about weather and the abundance of bison. In evaluating the forage deficit graphs, we refer to the point where each line intersects the x-axis as the point where forage offtake exactly equals forage supplies. This point gives a reasonable estimate of the number animals needed to unbalance the forage supply/forage demand equilibrium. As populations increase above this level, that is, to the right of this intersection point, forage deficits will increase and forage requirements exceed supplies. Although forage deficits and an imbalance may occur, we do not suggest that mortality always follows. Elk are known to rely on stored energy reserves to survive winters and therefore can likely incur small forage deficits without starving.

Forage Deficits

Assumptions in Alternative #1 are "status quo", i.e., that management actions will be the same in the future as in the past. Flood irrigation will continue on the cultivated fields of the NER, elk will be able to browse the willow stands on the NER, and bison numbers will grow unregulated.

Figures 7 – 9 below depict forage deficits for Alternative # 1 under varying model conditions. Figure 7 depicts drought conditions, Figure 8 depicts mean precipitation conditions, and Figure 9 depicts wet precipitation conditions. Each figure has three sets of colored lines: the black set represents the average winter, the green set represents the above average winter, and the red set represents the severe winter. Each color of lines is also represented by three line types: the solid lines are the model runs for 500 bison, the dashed lines are for 1000 bison, and the dotted lines are for 2000 bison.

In Figure 7 (drought conditions), the solid black line touches the x-axis at about 5,500 elk. Thus we can interpret that in an average winter with 500 bison, as elk populations reach 5,500 and higher, forage deficits will begin to occur. Similarly, in an average winter with drought conditions with 1,000 bison (the dashed black line), forage deficits begin at approximately 3,800 elk in the entire Jackson ecosystem. In an above-average winter with 500 bison (the solid green line), forage deficits begin to occur at about 1,800 elk. As winter severity and bison numbers increase, deficits occur with smaller and smaller numbers of elk. The drought scenario utilizes 45% of the forage available in the mean precipitation scenario.

Note in Figure 7 that the solid red line (the severe winter with 500 bison) does not touch the x-axis. This is because deficits will begin to occur even when elk numbers are 0 animals. These deficits occur because in any week, all the available forage is being consumed by the 500 bison and the 890 moose on the landscape. This situation occurs in several of the modeled scenarios for the severe winter with high bison numbers, and in milder winters when bison numbers are high. This is the forage deficit that results soley from bison and moose populations, assuming that there were no elk competing with them for forage.

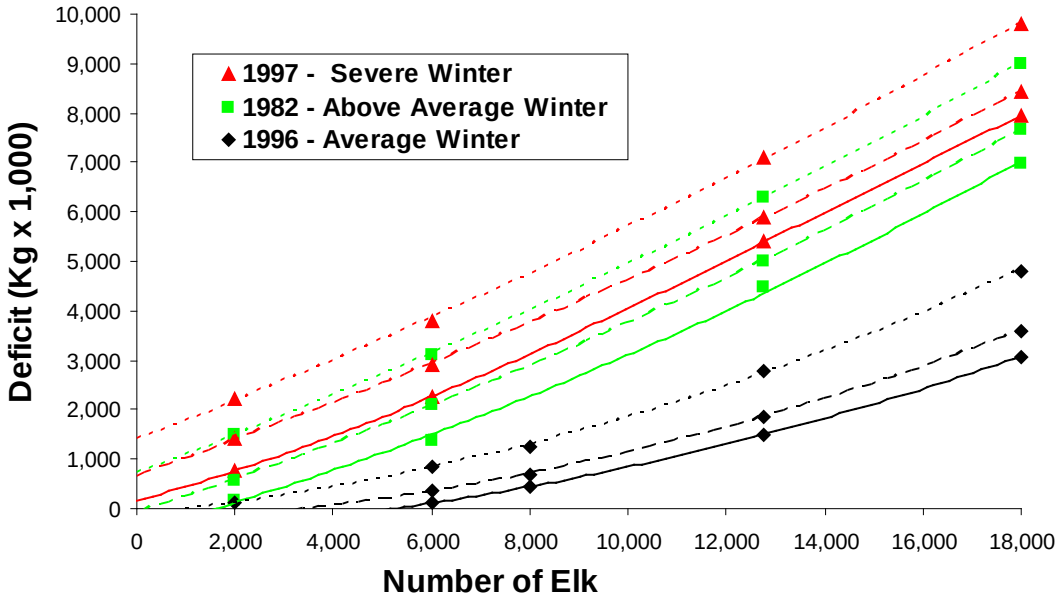


Figure 7. Drought scenarios for the Greater Teton Ecosystem -- Alternative #1.

Figure 8 depicts the modeled scenarios for mean precipitation conditions. The increase in precipitation causes significantly higher forage production across the landscape which translates into significantly more forage available to ungulates. Thus, compared to the drought scenarios,

forage deficits occur at much higher numbers of elk across all model runs. In the average winter with 500 bison (the solid black line), forage deficits occur at about 16,000 elk. In the above average winter with 500 bison (the solid green line), forage deficits occur at about 6,000 elk. The severe winter causes deficits to occur at much lower numbers of elk, about 1,000 with 500 bison. As in drought conditions with severe winters and high bison numbers, deficits occur at 0 elk.

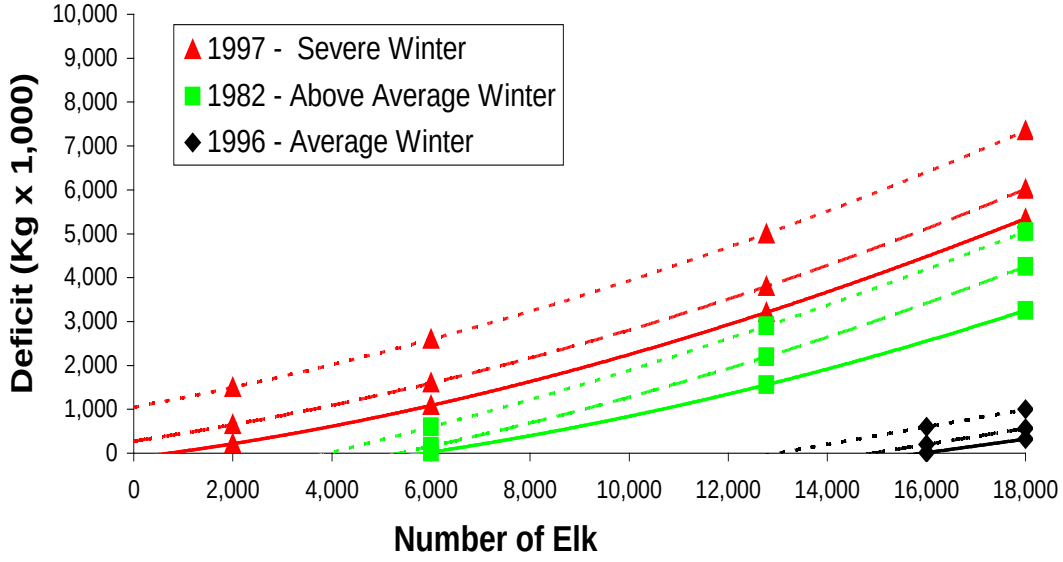


Figure 8. Mean precipitation scenarios for the Greater Teton Ecosystem -- Alternative #1.

Wet precipitation conditions (Figure 9) increase forage availability which similarly decreases forage deficits. In the wet precipitation scenarios, no deficits occur for any modeled population size of elk and bison in the average winter. In the above average winter with 500 bison, deficits occurred at 12,000 elk. In the severe winter with 500 bison, deficits started with 3,000 elk.

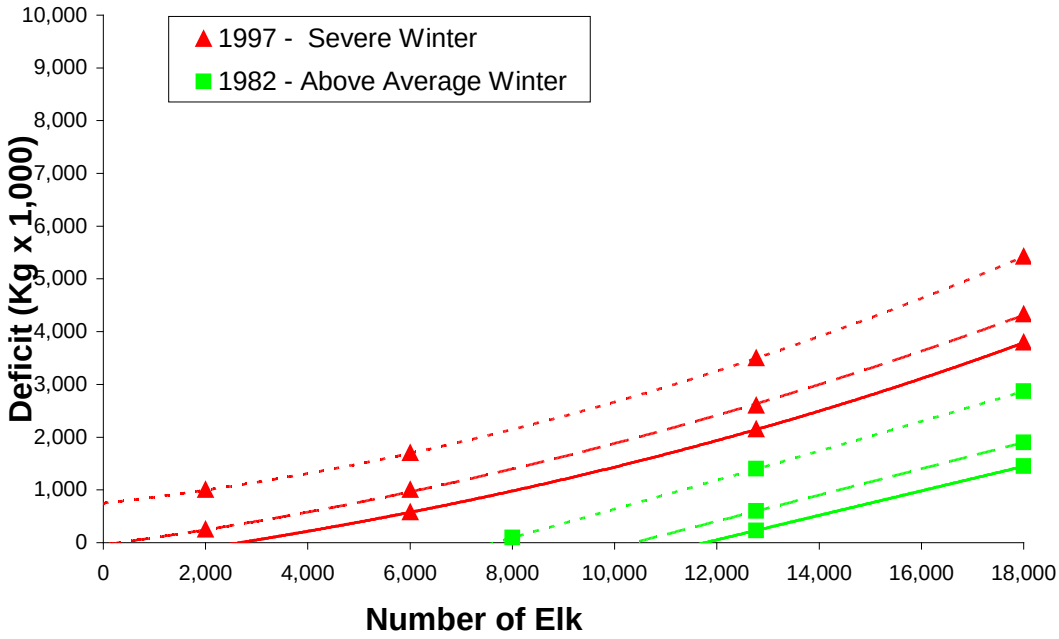


Figure 9. Wet precipitation scenarios for the Greater Teton Ecosystem –Alternative #1.

Forage Utilization

Forage utilization is simply the percent of forage removed from a given location in the study area as predicted by the forage accounting model. Managers are often concerned about forage utilization because high utilization can be construed as a measurement of habitat degradation. Here, we briefly describe utilization results, while leaving a quantified analysis of utilization effects for Part II of this report, "The Century Ecosystem Model".

For the utilization results, we held precipitation and bison variables constant, and varied the number of elk and winter severity. We estimate that between 42 and 155 km^2 of winter range will be used in excess of 50% in an average winter with 500 bison and with elk populations of 6,000 to 18,000 (Figure 10). Utilization area increases in the average winter because rising numbers of elk push out and onto low-SWE areas of the range. During above average and severe winters, we estimate between 61 and 105 sq km of winter range will be used in excess of 50%. As elk numbers rise in above average and severe winters, utilization area actually levels off. This effect occurs because snow is blanketing the landscape and prohibiting elk from moving onto outlying areas. As long as elk populations are above ~14,000 animals, more severe winters will protect forage from being highly utilized. It should be understood however, that this reduction in utilization will lead to increased deficits and probably lead to a sharp increase in starvation mortality.

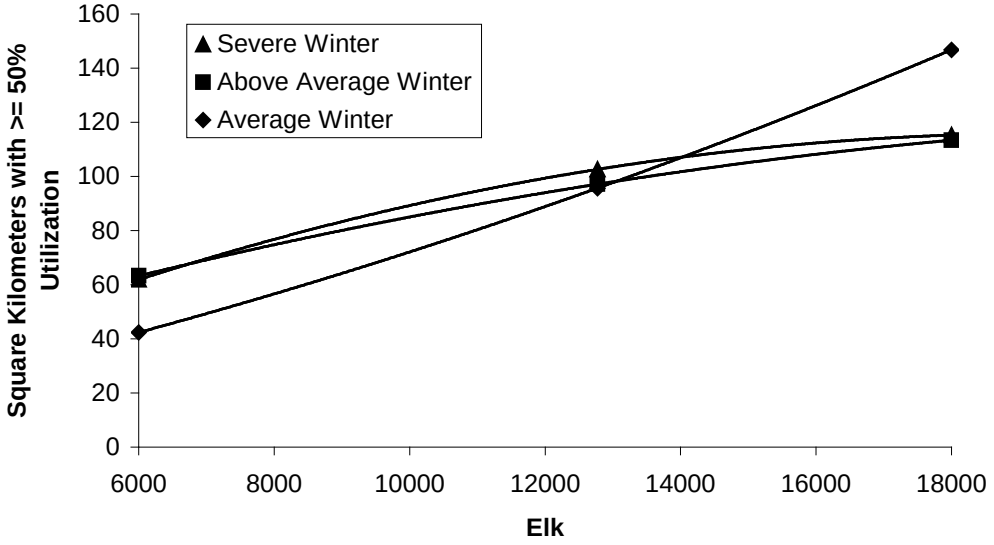


Figure 10. Area of winter range with utilization levels $\geq$ 50% as a function of elk population size during three winters with mean precipitation and 500 bison.

As an example of one utilization map, Figure 11 depicts forage utilization for the Greater Teton Ecosystem under a scenario of 12,771 elk, 500 bison, mean pre-winter precipitation in an average SWE winter. Although the maps will all differ slightly depending on winter severity and elk numbers, this map is indicative of the general layout of utilization across the Teton ecosystem. The black areas represent utilization of 50% or greater on the landscape which corresponds with areas that receive the least snow coverage during the winter.

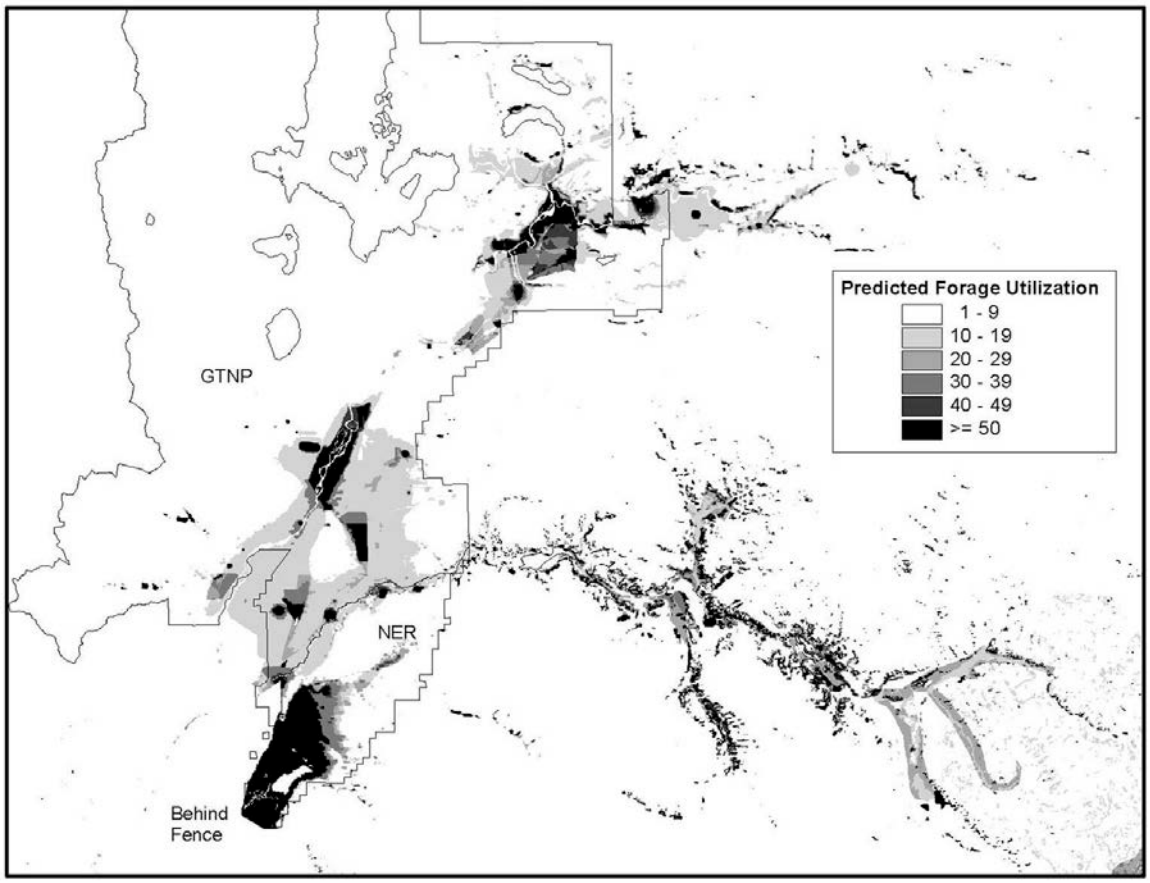


Figure 11. Predicted forage utilization for 12,771 elk in an average winter with average pre-winter precipitation and 500 bison.

Effects of Development in the Town of Jackson

One justification for supplemental feeding of elk is that it compensates for forage that would be available to native ungulates if their winter range had not been developed by human settlement in the town of Jackson. Although this justification is widely offered, it is based on a largely untested assumption of parity in the amount of forage fed and the amount lost to development. We analyzed this assumption as follows: If the development in the town of Jackson were exactly compensated by supplemental feeding, then adding the forage lost when the town was developed to the natural forage available to the currently supported population should theoretically *remove* the forage deficit. If supplemental feeding overcompensates for the development of the Jackson area, then forage deficits should remain despite "adding" the Jackson town forage base back into current supplies. If supplemental feeding undercompensates, then a forage surplus should result by adding the town of Jackson forage base back into the forage available to ungulates.

We ran two scenarios. We refer to the first scenario as "without fence." This scenario assumed that elk would no longer be restricted to habitat north of the fence on the National Elk Refuge and would be allowed to use agricultural lands and native pastures in and around Jackson. To implement this scenario, we simply added the forage in these areas to the forage supplies in the base model runs. The area added is the white area in Figure11 -- "Behind Fence".

We refer to the second scenario as "presettlement." In this scenario, we modified the current vegetation to reflect patterns that were more likely before agricultural development of the Jackson

Valley (irrigation, seeding, fertilization, etc.) As an approximation of these conditions, we assumed that vegetation south of the wildlife fence was composed of roughly equal parts of wet meadow and sagebrush-grassland.

Model results (Figure 12) suggest that at 2,000 elk in the severe winter, forage deficits are reduced by 51% (from 217,000 kg to 110,000 kg) when forage is added south of the fence. However, at 18,000 elk, this reduction shrinks to 13%. Similarly for the presettlement scenario, at 2,000 elk in the severe winter, deficits are reduced by 26%, but shrink to 6.2% at 18,000 elk. Because elk numbers are currently around 12,000 – 14,000, it is safe to say that the area south of the fence, reaching to the bottom of the study area, will not provide adequate forage for elk in severe winters. If high populations of elk need to find adequate forage in severe winters, they would more likely need to migrate further south down the Snake River drainage. Forage deficits are completely offset in the average winter, even at 18,000 elk. However, the "with fence" deficits were small in the average winter, so the offset is less meaningful.

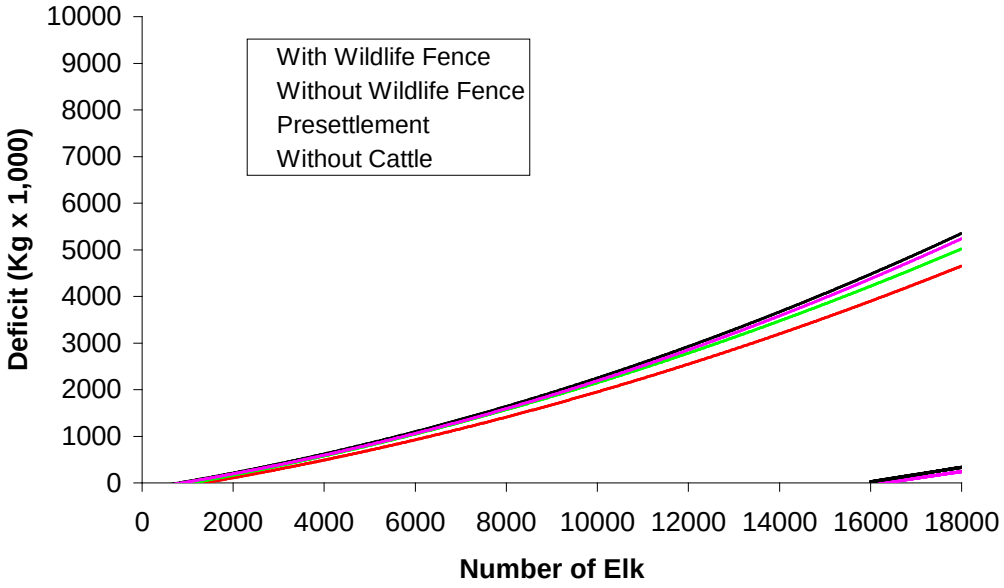


Figure 12. Forage deficits predicted under different assumptions about effects of the town of Jackson, and without cattle offtake. The model was run on severe and average winters with mean precipitation and 500 bison. Severe winters are depicted by the four lines which cross the x-axis at ~1,000 elk; average winters are depicted by the two lines which cross the x-axis at ~16,000 elk. The "with fence" scenario assumes no forage use by native ungulates south of the wildlife fence. The "without fence" scenario assumes that native ungulates are able to use vegetation south of the wildlife fence as currently mapped. The "presettlement" scenario assumes that native ungulates are able to use vegetation south of the wildlife fence and that this vegetation is composed of 50% sagebrush and 50% wet meadow. The "without cattle" scenario assumes no cattle grazing on the Greater Teton Ecosystem.

Removal of the Wildlife Fence

A model run that accurately portrays the spatial effects of removing the wildlife fence is not feasible with current data and understanding. If the fence were removed and feeding were discontinued, the Jackson elk herd would probably migrate south of Jackson and intermingle with other herds from which they have been separated for many years. We are able to offer two general scenarios that shed light on the effects of removing the wildlife fence and cessation of feeding. First, the graphical depiction of the "without fence" scenario discussed in Figures 12 corresponds to the visual representation of utilization in and around the town of Jackson depicted in Figure 13 below. Utilizations would cover the town of Jackson at the >50% level, and would be constrained only by the elevational gradient that exists around the town.

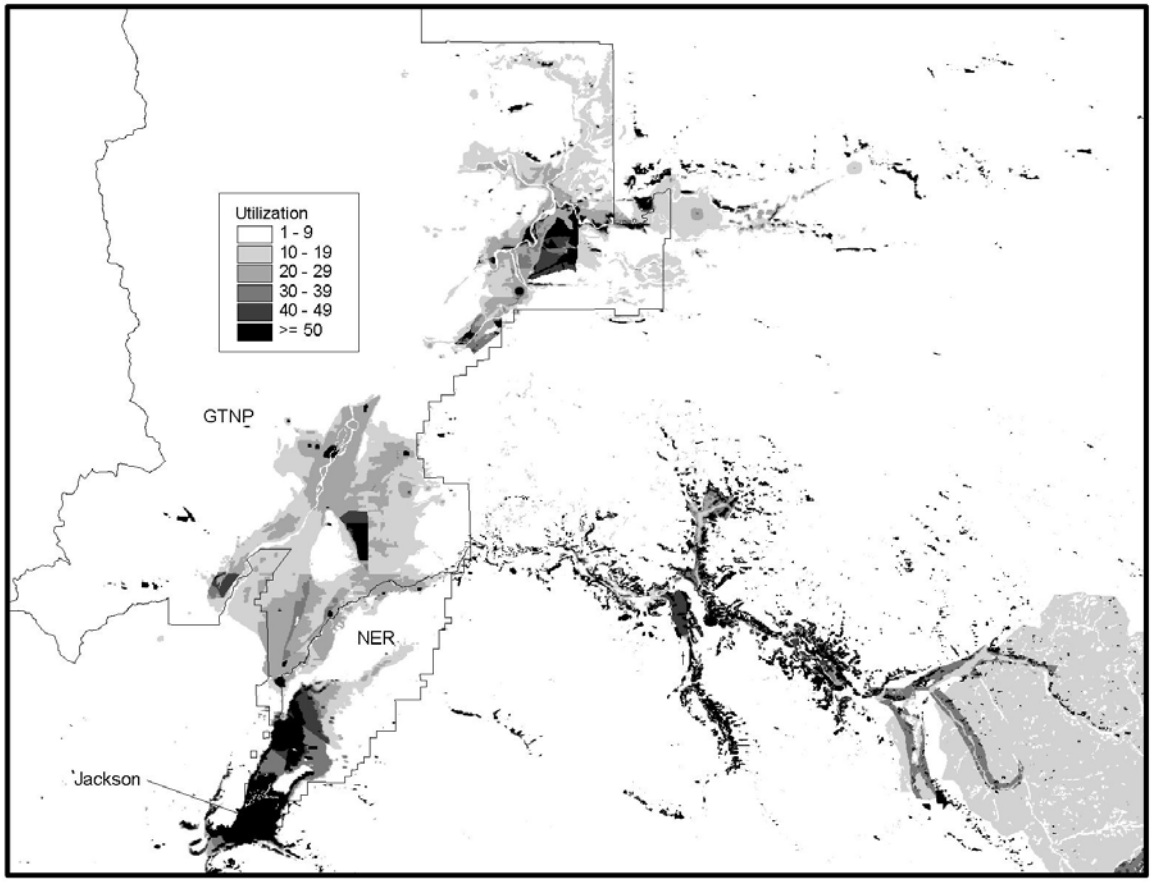


Figure 13. Utilizations in an average winter with average precipitation and 12,771 elk without the wildlife fence. Very high utilizations would likely continue south of the NER into the town of Jackson.

Second, we ran the snow model on a larger area and corrected it for the Gros Ventre snow shadow (Figure 14). The black cells on the map depict areas with 6 inches or less of SWE on March 8, 1997, the snowiest day available in the database. Results indicate that elk could winter in the Gros Ventre valley or south of Jackson in the Snake River valley as it winds towards Alpine, and lower areas of Hoback Canyon.

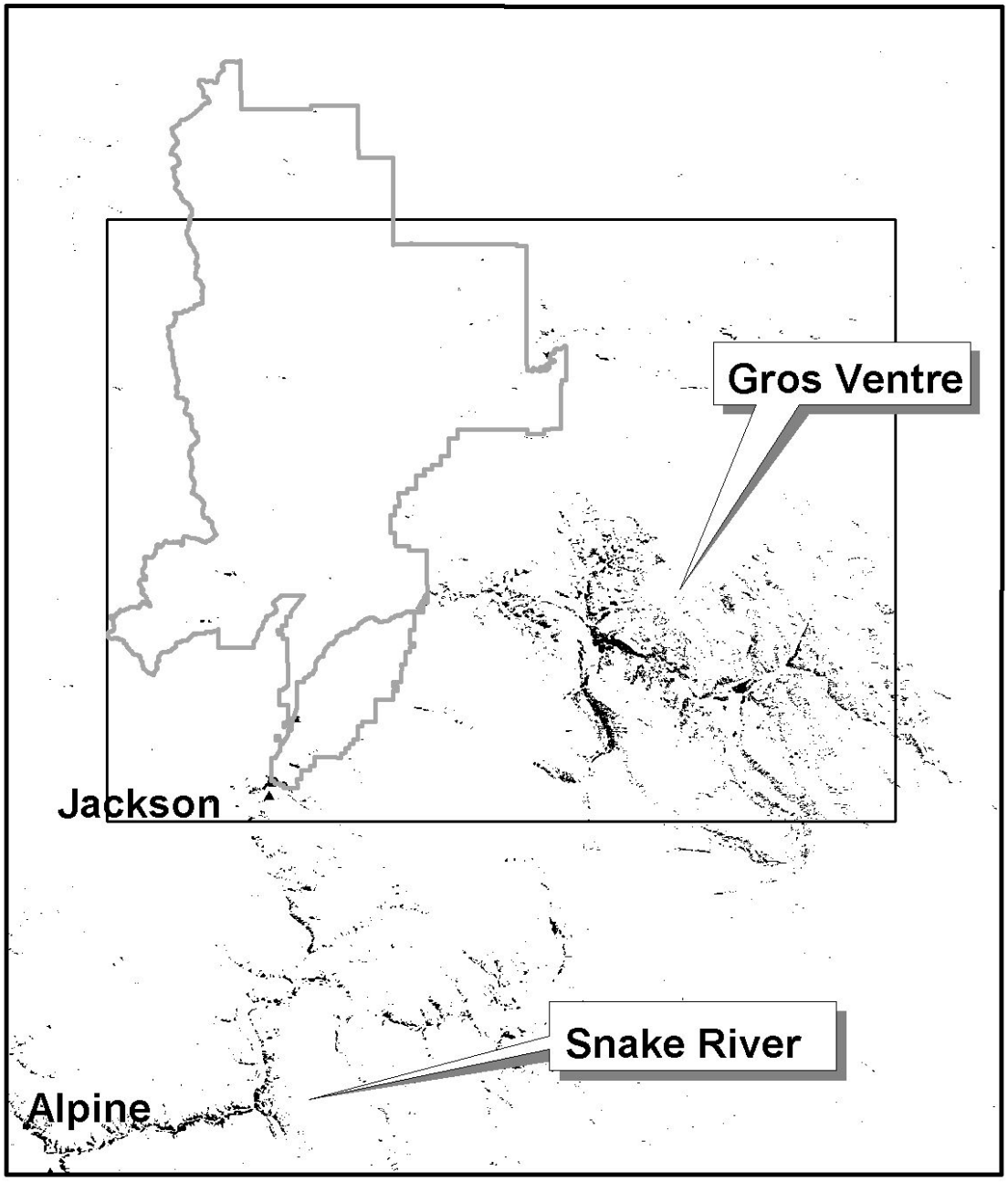


Figure 14. Black cells indicate likely migration routes and wintering areas in severe winters. The Gros Ventre and the lower Snake areas are predicted to receive the highest elk numbers and utilizations should the wildlife fence be removed.

Effects of Cattle Grazing

To examine the effects of cattle grazing on forage deficits we estimated the biomass consumed by cattle during summer and subtracted that from the prewinter standing crop. We did this by overlaying coverages of grazing allotments on the vegetation map, estimating the total forage removed as a function of the stocking rate, and subtracting that estimate from the prewinter forage supply. In addition, Steve Kilpatrick (WGFD), reviewed and offered small changes to the cattle offtake map.

The model runs (the purple lines on Figure 12) revealed negligible effects of cattle grazing on forage deficits for wild ungulates. Although the total amount of forage consumed by livestock was substantial -- about 0.5% of the total production on the Teton ecosystem -- most of this consumption occurred on areas that were not important elk winter range. As elk numbers increased, deficit differences with and without cattle became quantifiable (the difference between the black line and the purple line in Figure 12). At 18,000 elk, "with fence" deficits were 5,346,000 kilograms whereas "without cattle" deficits were 5,229,000 kilograms, a difference of 117,000 kilograms or 2.2%.

Model Results on the National Elk Refuge for Alternative #1

Adapting the Forage Accounting Model to the NER

The Forage Accounting Model was initially written to run on the Greater Teton Ecosystem utilizing the weekly SWE maps created by the snow model. These weekly snow maps are the factor which drives elk migration throughout the study area. To adapt the model to run only on the NER, we continued to use the snow maps as the migratory switch but we only allow elk to consume forage on the NER rather than on any area beyond the NER's borders. This forces all elk onto the NER's forage as soon as snow begins (roughly on Nov. 1st) and keeps them there until the end of snow (roughly June 1st). At the beginning of the snow season, the animals are allowed to spread out over the entire NER, but as snow accumulates, they are restricted to low SWE areas. As snow melts, they are allowed to spread out over the low-SWE areas on the NER.

Real migratory movements are likely to be different. In a real scenario, elk slowly move onto the NER as snow accumulates, and slowly move off as snow melts. Because our model cannot mimic these real movements, our numeric estimates of forage deficits are overly high, i.e., real deficits may be lower than those depicted in the following figures, and higher numbers of elk may be supported before deficits occur. For example, if deficits start at 6,000 elk, this can be interpreted as "at least" 6,000 elk are needed to incur deficits. While the actual number may be 7,000 or 8,000, it is definitely not 5,000. Thus, the margin of error for the NER should be construed differently than for the Greater Teton Ecosystem. On the NER, deficit predictions represent the lowest limit in the margin of error. We roughly estimate the upper limit as the lower limit plus 50%. Again, we cannot firmly quantify this error but believe it is a reasonable approximation.

Modeled Scenarios

For Alternative #1, we exercised the forage accounting model on the National Elk Refuge and ran simulations for 1) varying populations of elk -- between 0 and 10,000, 2) varying winter severity -- average, above average, and severe, 3) varying pre-winter precipitation conditions -- drought, mean, and wet, and 4) three populations of bison -- 500, 1000, and 2000. These model runs include offtake by 20 moose. We also ran a scenario which simulates center-pivot irrigation of 1,170 acres of the cultivated fields on the NER which are currently flood-irrigated.

In Figure 15 (severe drought conditions), the solid black line touches the x-axis at about 2,000 elk. Thus we can interpret that in an average winter in drought conditions with 500 bison, as elk populations reach 2,000 and higher, forage deficits will begin to occur on the NER. Note in Figure 1 that all of the other lines do not touch the x-axis, i.e., deficits occur even when elk numbers are 0 animals. These deficits occur because in any week, all forage is being consumed by the 500 bison and the 20 moose.

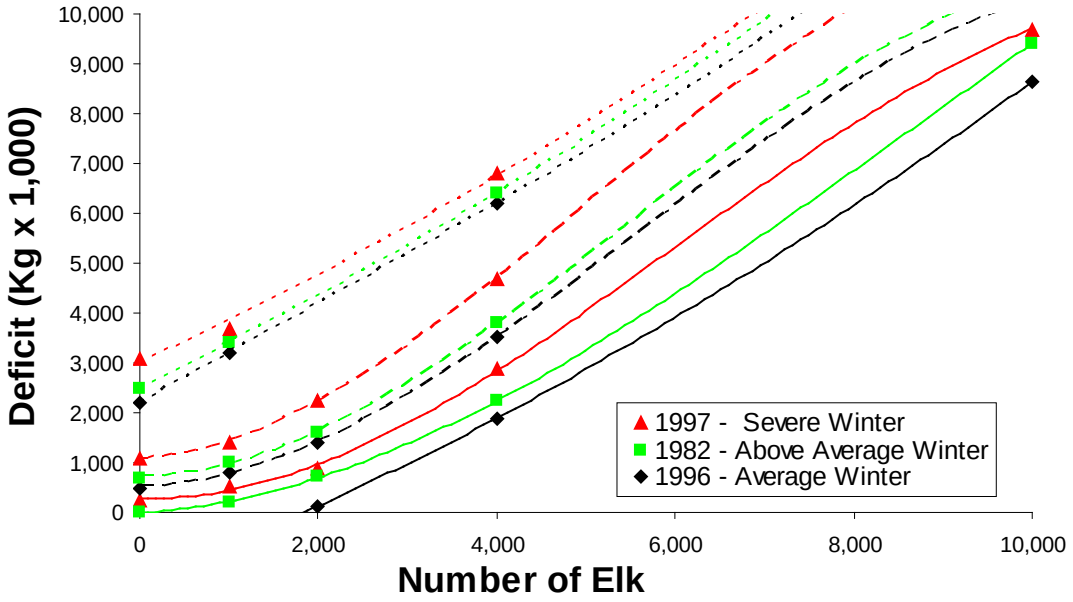


Figure 15. Forage Deficits for Drought Conditions on the NER.

Figure 16 depicts the modeled scenarios for mean precipitation conditions which create significantly more forage for ungulates and cause deficits to occur at much higher numbers of elk in average winters. With 500 bison in the average winter (the solid black line), forage deficits occur at about 5,000 elk, occur at about 4,000 elk with 1,000 bison, and 2,000 elk with 2,000 bison. Though mean precipitation increases forage production, there is still sufficient snow in above average and severe winters to incur deficits at 0 elk across all bison numbers.

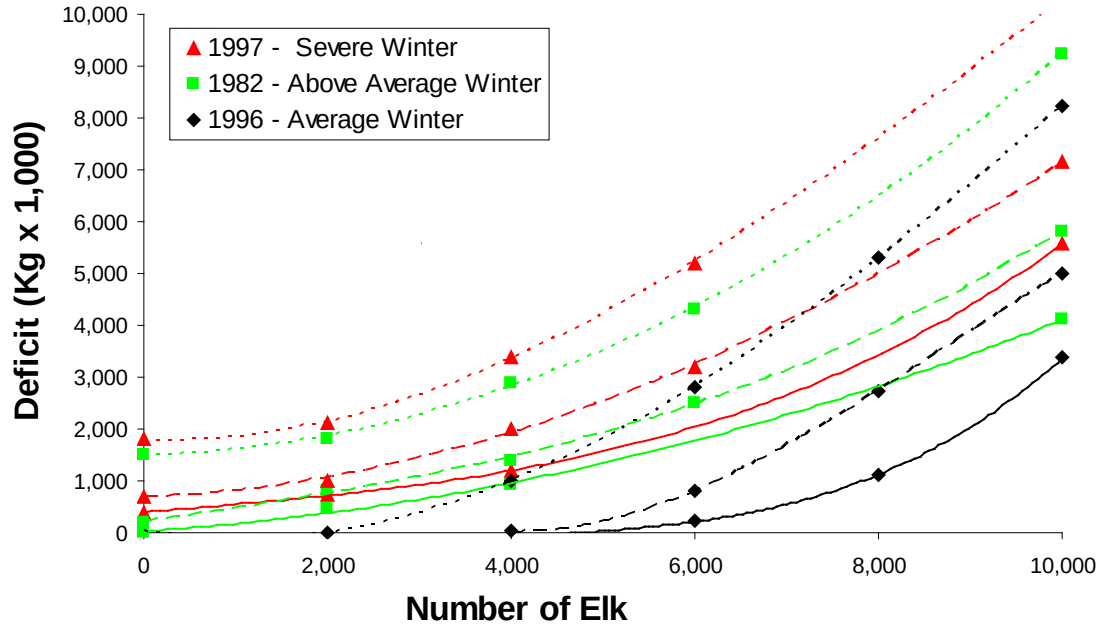


Figure 16. Forage Deficits for Mean Precipitation Conditions on the NER.

Wet precipitation conditions (Figure 17) increase forage availability which similarly decreases forage deficits. In the wet precipitation scenarios, deficits occur at roughly 9,200 elk in the average winter and 800 elk in the above average winter with 500 bison. Severe winters still cause deficits to begin at 0 elk due to the extreme snow cover on the landscape.

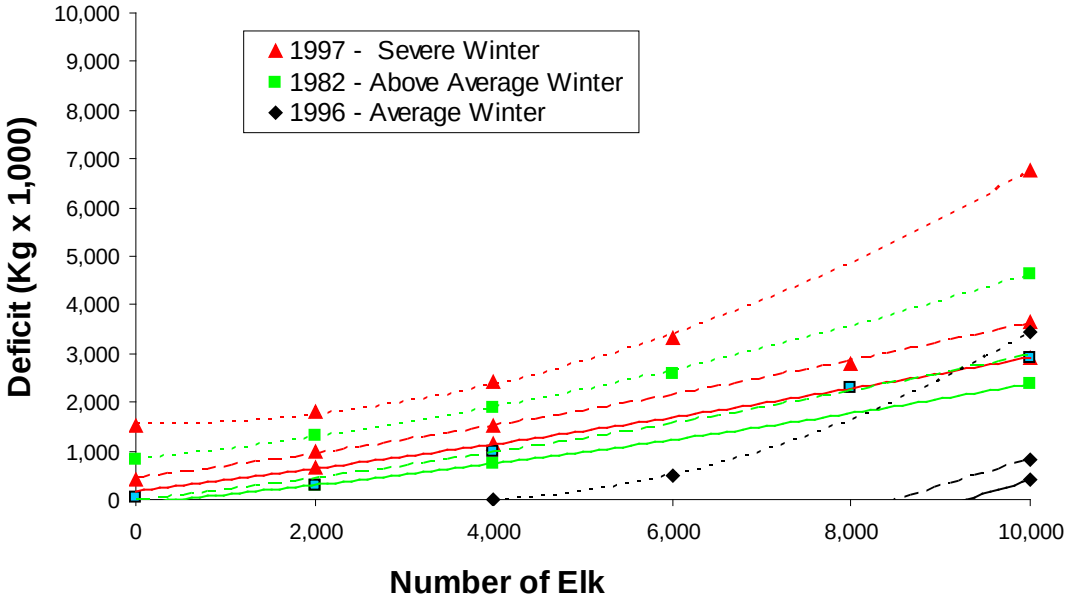


Figure 17. Forage Deficits for Wet Precipitation Conditions on the NER.

Irrigation Experiment

We created an additional model experiment to address an questions on the value of irrigation on the NER. Managers may want to center-pivot irrigate ~1,170 acres of the NER to raise production, thereby increasing the biomass of forage available to wintering elk. As per the description in the document "Irrigation System Rehabilitation Plan Environmental Assessment" (National Elk Refuge, October 1998), we created a model scenario in which production values on the following NER project areas were increased to reflect center-pivot irrigation: McBride, Chambers, Nowlin, Ben Goe, and Headquarters (Figure 18). Currently these areas are flood-irrigated resulting in about 2,500 lbs/acre of production whereas center-pivot irrigation will result in about 5,000 lbs/acre. For this experiment, we varied only the irrigation acreage, holding precipitation and bison constant (average precipitation and 500 bison).

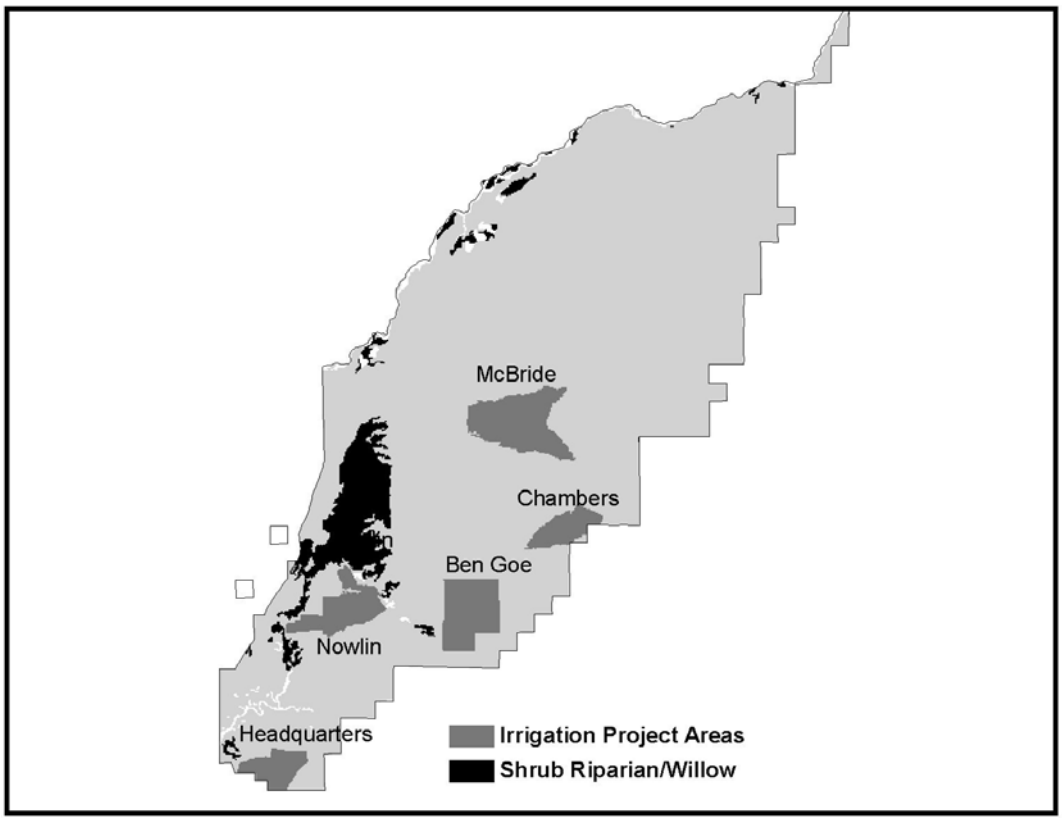


Figure 18. Irrigation Project Areas and willow locations on the NER.

As shown in Figure 19, center-pivot irrigating the four NER project areas has a significant impact on forage deficits in an average winter under average precipitation with 500 bison (solid lines). For the flood-irrigated scenario in the average winter, deficits begin at about 5,000 elk and are 3,371,000 kilograms at 10,000 elk. For the center-pivot irrigated scenario, deficits begin at about 6,000 elk and are 2,207,000 kilograms at 10,000 elk. In a severe and above-average winter, the change in deficits is less pronounced. All irrigation scenarios have deficits beginning right at 0 elk, and as the number of elk increases, a slight difference exists between the two scenarios, culminating in a deficit of 5,560,000 kilograms at 10,000 elk for the flood-irrigated scenario and a deficit of 4,711,000 kilograms for the center-pivot irrigated scenario. With center-pivot irrigation, the average winter yields more deficit reduction because more of the range is open to ungulates. In the severe and above-average winter, the upper NER irrigated project areas are covered in too much snow at critical weeks during the winter.

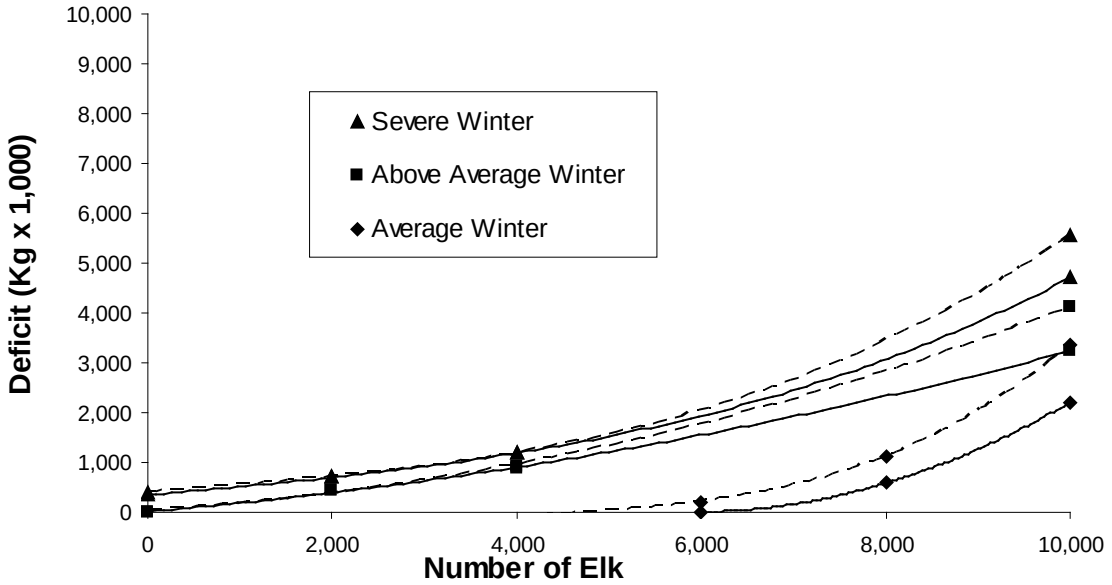


Figure 19. Forage Deficits for the Irrigation Model Experiment on the NER. Solid lines represent center-pivot irrigation; dotted lines represent flood (status-quo) irrigation.

Discussion for Alternative #1

Our model revealed that balance between forage supply the forage requirements of wintering ungulates are tightly linked to winter severity and growing season precipitation. Although both of these weather conditions can determine the number of animals that can be supported by native forage, snow accumulation exerts the strongest effects. During average winters with average precipitation conditions and 500 bison, the number of elk that can be sustained on the landscape approaches 16,000. But as winter severity or drought are encountered, this number drops dramatically.

Currently, elk and bison are supplementally fed on the NER to alleviate food shortages caused by snow severity as well as drought conditions. Additionally, it is argued that supplemental feeding is needed to compensate for forage supplies lost to the area behind the NER's wildlife fence. Our model experiments suggest that the wildlife fence plays an important role by inhibiting migration and foraging for native ungulates, and that removing the fence would increase forage availability especially during average winters. However, our model predicts that significant forage deficits would still occur during more severe winters if the wildlife fence were removed and native ungulates were allowed to graze in and around the town of Jackson as well as on nearby agricultural lands. This suggests that historic elk populations: (1) may have been smaller than current ones, and/or (2) may have suffered high levels of mortality during severe winters, and/or (3) more likely have used lower elevation ranges south of Jackson and larger areas of the Gros Ventre.

The influence of grazing by livestock on forage supplies for native ungulates has emerged as a controversial question for managers in the Greater Teton Ecosystem. Our model experiments suggest that cattle grazing does not play an important role in determining availability of forage for native ungulates during winter. This is the case because the preponderance of livestock

grazing occurs on areas of the landscape that accumulate deep snow during the winter. As a result, increasing forage on these areas by removing livestock grazing may increase forage biomass but it does not increase forage available to wintering ungulates. Removing cattle from the system had negligible impacts on predicted forage deficits.

We predict that approximately 100 km^2 of winter range will be utilized at a 50% rate or higher given current numbers of elk and bison, and varying climatic conditions. Part of this high level of use is caused by the wildlife fence because it inhibits natural foraging patterns and migration. However, we emphasize that as long as animals select areas that are relatively snow free in preference to areas where snows are deep, we should anticipate locally high levels of forage utilization on some sites. Although reducing population density can reduce the area of the landscape that falls into the "high-use" category, we project that some "hot spots" will occur at any reasonable level of population numbers. The effect of these forage utilization rates and hot-spots will be analyzed in the next section of this report -- Part II, The Century Ecosystem Model.

Bison numbers play an important role in forage deficits. Given the number of bison at the start of this project, 500, approximately 16,000 elk can forage on the whole system without incurring deficits in an average winter with average pre-winter precipitation conditions. When bison numbers double to 1,000, elk numbers drop to 15,000; when bison numbers quadruple to 2,000, elk numbers drop to 13,000. Doubling bison numbers to 1,000 also substantially increases forage deficits in more severe winters, and quadrupling bison numbers to 2,000 causes severe stress on the system during most climatic conditions.

The results for the NER should be evaluated differently than those for the Greater Teton Ecosystem. Instead of a mean estimation with a surrounding margin of error, the NER's results should be construed as "lowest possible number of elk" which correspond to the deficit measurement. On the NER Study Area, this number represents the lowest limit in the margin of error. We roughly estimate the upper limit as equal to the lower limit plus 50%.

Given this stipulation, we estimate that the NER can support at least 5,000 elk in average winters with mean pre-winter precipitation and 500 bison. In above-average and severe winters, deficits occur at all levels of elk except in the wet precipitation scenario. In our irrigation experiment, we found that 1,000 more elk could forage on the NER before deficits would occur in average winters with mean pre-winter precipitation and 500 bison, and that forage deficits would be reduced in severe winters especially with high numbers of elk.

Forage Accounting Model Results for all the EIS Alternatives

We were asked to run the model and provide results for Alternatives #1 - #4 in the EIS and also provide a summary table of where deficits begin for each Alternative given its underlying assumptions as follows:

Alternative #1: (status quo) Flood irrigation of the NER's cultivated fields. All of the NER's willow is available to ungulates. Three levels of bison -- 500, 1,000, 2,000.

Alternative #2: No irrigation of the NER's cultivated fields. All of the NER's willow is available to ungulates. Two levels of bison -- 250, 500.

Alternative #3: Flood irrigation of the NER's cultivated fields. Bison = 1,000. Two amounts of the NER's willow are available to ungulates -- none and one-half.

Alternative #4: Center-pivot irrigation of the NER's cultivated fields. Bison = 350. Two amounts of the NER's willow are available to ungulates -- none and one-half.

For all of the alternatives, the Forage Accounting Model was run on both the Greater Teton Ecosystem and the NER study area. The cautions for interpretation discussed for Alternative #1 in the previous sections also apply to the results for Alternative #2 - #4. In addition to these stipulations, please note that the model is not sufficiently sensitive to discriminate between some of the Alternatives and their underlying assumptions. For example, the difference between the forage offtake from 350 bison and 500 bison is so small that the difference between the deficit results from those runs is subsumed by the model's margin of error. Similarly, the difference between types of irrigation, and the question of willow exclusion, also offered results which were subsumed by the model's margin of error.

We report these results with both a summary table and deficit graphs. First, Table 5 reports the number of elk at which forage deficits begin to occur. The number in each cell represents the "equilibrium point" on the landscape at which the estimated forage supply exactly offsets demand by the elk population. This number is the point at which the deficit curve hits the x-axis. Higher numbers of elk will cause deficits to occur. When interpreting these numbers, keep in mind that it is almost assured that wintering elk can sustain small levels of forage deficits by using stored energy reserves (fat and lean body mass) to survive. Because of this, we suggest interpreting the numbers in the table together with the curves in the graphs that follow. If the deficit curve remains low (near the x-axis), i.e., < 500,000 kg, then wintering elk may be able to utilize stored energy reserves to survive rather than incur starvation mortality. In other words, small forage deficits can occur without causing high levels of starvation.

Table 5. Summary Table for number of elk at which forage equilibrium occurs for all EIS Alternatives

Alternative #1 (status quo)									
Pre-winter Precipitation Scenario	**Drought**			**Mean**			**Wet**		
Snow Severity Type	**Severe**	**Above**	**Average**	**Severe**	**Above**	**Average**	**Severe**	**Above**	**Average**
With 500 Bison									
Greater Teton Ecosystem	0	1,800	5,500	1,000	6,000	16,000	3,000	12,000	>18,000
NER only	0	0	2,000	0	0	5,000	0	800	9,200
- with center-pivot irrigation				0	0	6,000			
With 1,000 Bison									
Greater Teton Ecosystem	0	200	3,800	0	5,800	15,000	200	10,200	>18,000
NER only	0	0	0	0	0	4,000	0	500	8,500
With 2,000 Bison									
Greater Teton Ecosystem	0	0	1,500	0	4,000	13,000	0	7,800	>18,000
NER only	0	0	0	0	0	2,000	0	0	4,000
Alternative #2 (no irrigation of cultivated fields on NER)									
With 250 Bison									
Greater Teton Ecosystem	700	1,800	6,000	1,800	7,500	16,400			

NER only	0	0	2,000	0	0	5,700			
With 500 Bison									
Greater Teton Ecosystem	0	1,600	5,300	900	5,900	15,800			
NER only	0	0	1,700	0	0	4,500			
Alternative #3 (with 1,000 bison and flood-irrigation of NER's cultivated fields)									
No Willow on NER Available									
Greater Teton Ecosystem	0	0	3,000	0	5,000	14,000			
NER only	0	0	0	0	0	3,300			
One-half of Willow on NER Available									
Greater Teton Ecosystem	0	0	3,200	0	5,500	14,200			
NER only	0	0	0	0	0	3,500			
Alternative #4 (with 350 bison and center-pivot irrigation of NER's cultivated fields)									
No Willow on NER Available									
Greater Teton Ecosystem	0	1,600	5,700	1,500	7,200	17,000			
NER only	0	0	2,000	0	0	5,500			
One-half of Willow on NER Available									
Greater Teton Ecosystem	0	1,800	6,000	1,800	7,400	17,100			
NER only	0	0	2,500	0	200	6,000			

Graphical Model Results for the EIS Alternatives #2 - #4

Model Results for Alternative #2

Alternative #2 assumptions: 1) 250 and 500 bison, and 2) no irrigation of the cultivated fields on the NER, 3) all willow is available.

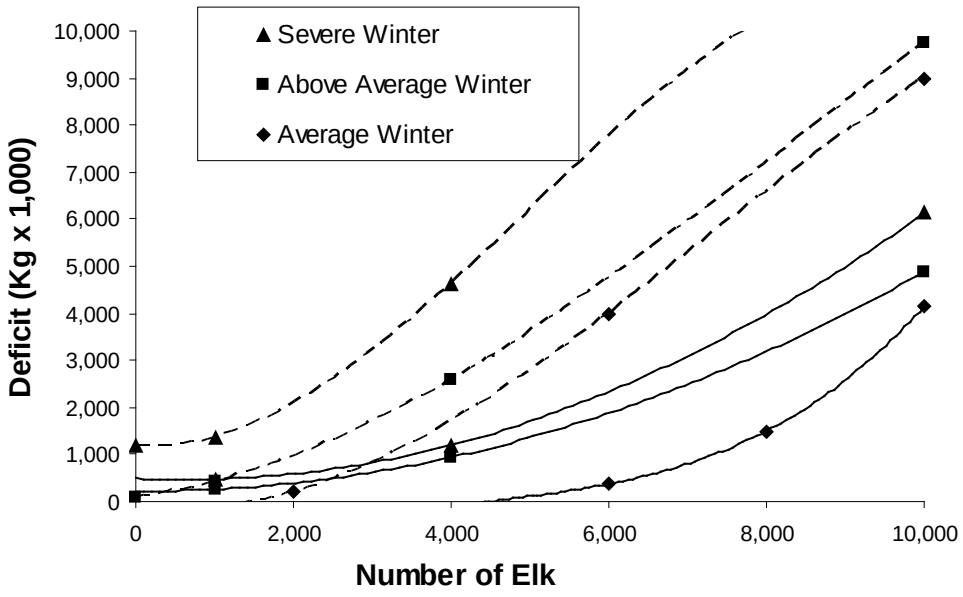


Figure 20. Deficit results for the NER using 500 bison. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

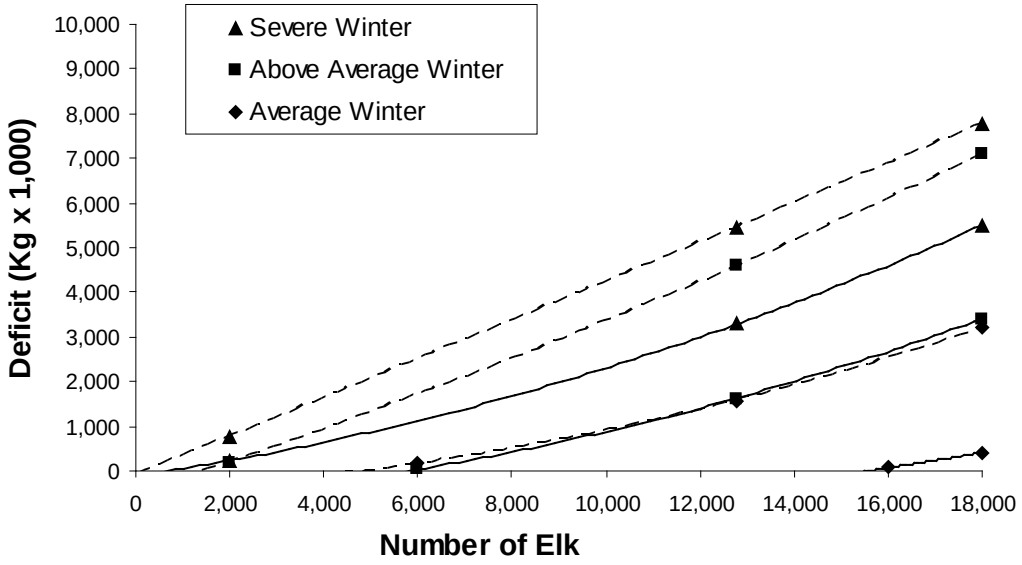


Figure 21. Deficit results on the Greater Teton Ecosystem using 500 bison. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

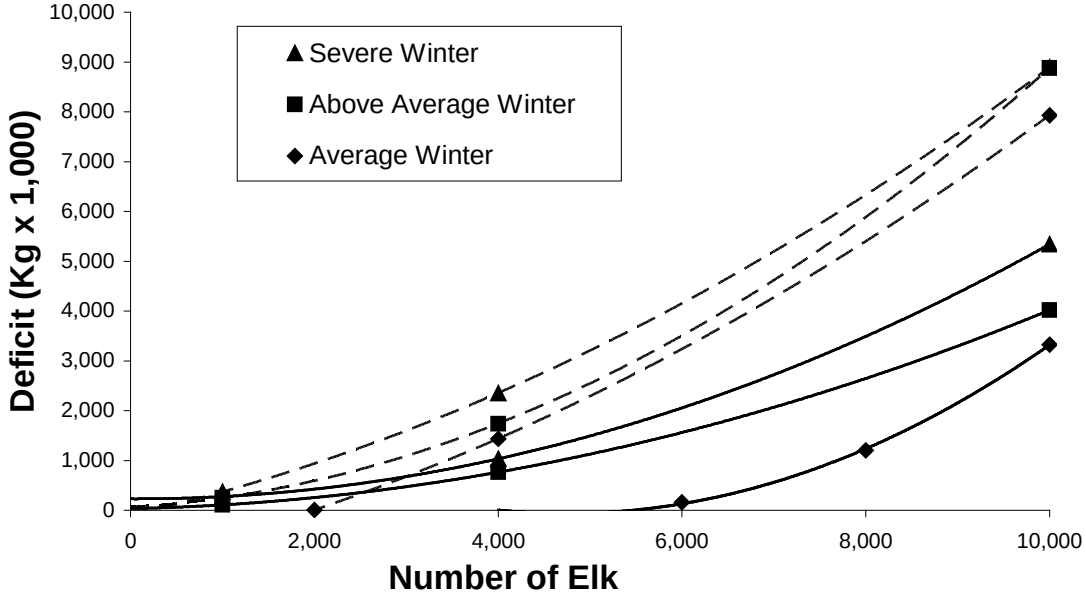


Figure 22. Deficit results for the NER using 250 bison. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

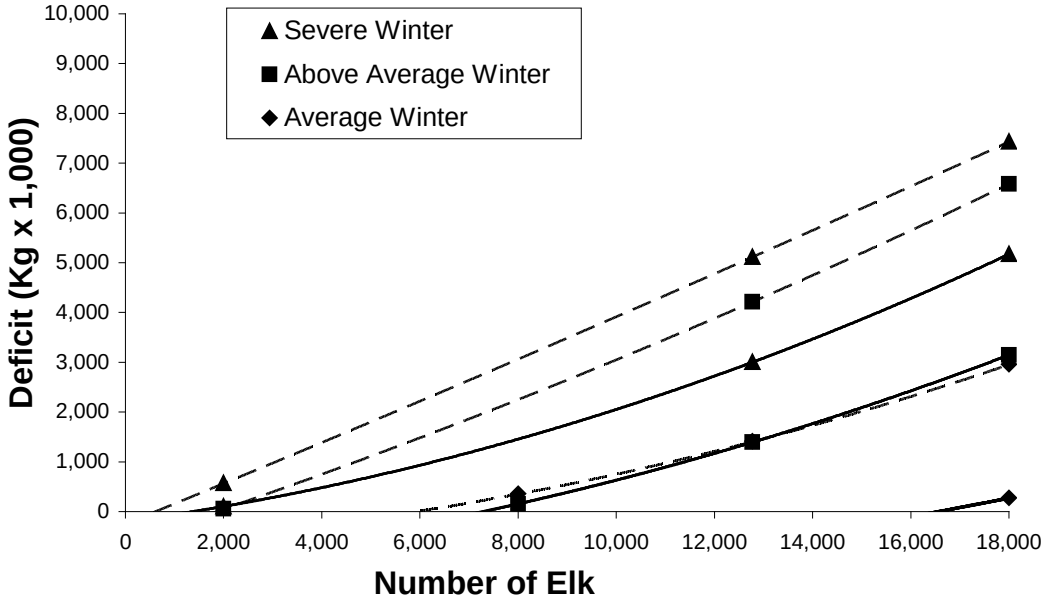


Figure 23. Deficit results for the Greater Teton Ecosystem using 250 bison. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

Model Results for Alternative #3

Alternative #3 assumptions: 1) 1000 bison, 2) cultivated fields on the NER are flood-irrigated (status quo), and 3) willow on the NER is all fenced off or half-fenced off.

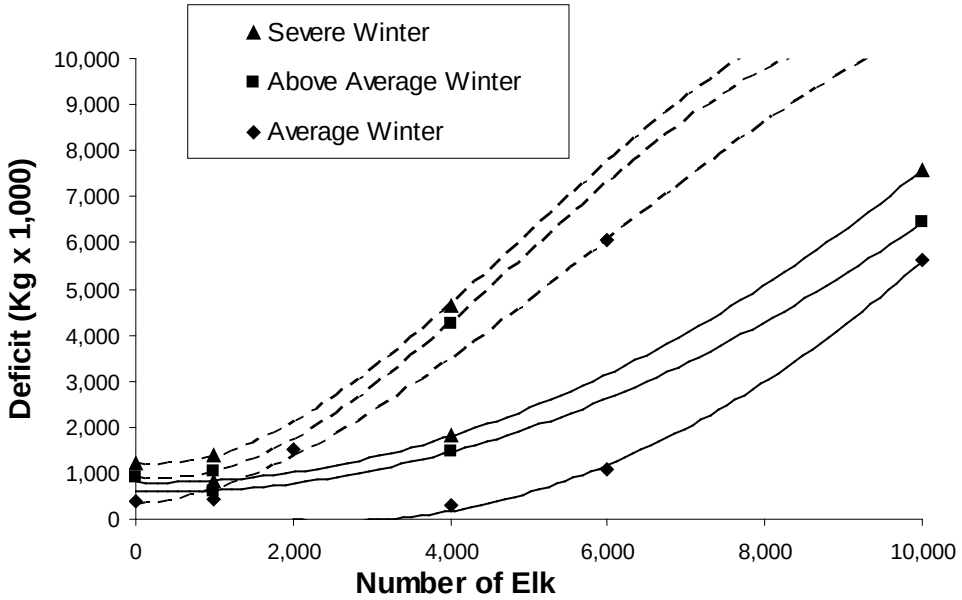


Figure 24. Deficit results for the NER with no forage available in vegetation coded "shrub riparian/willow". The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

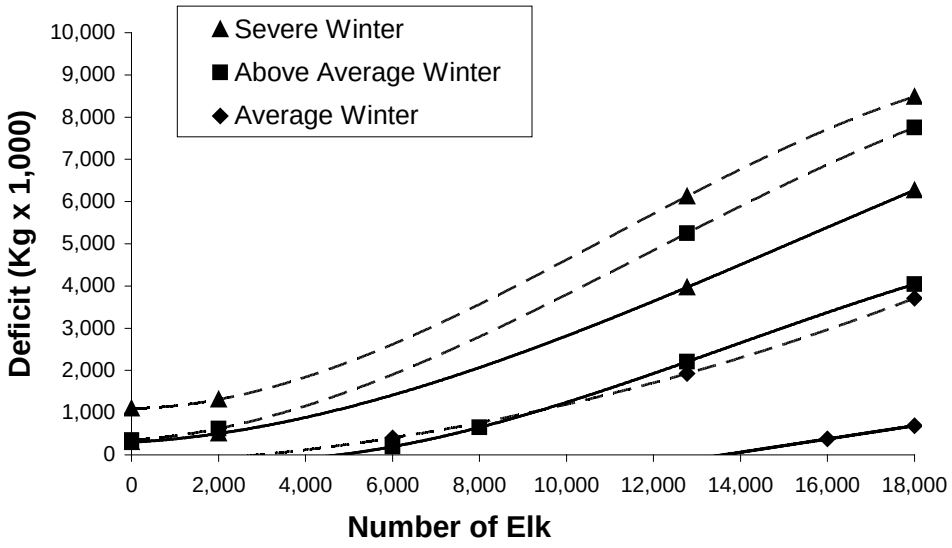


Figure 25. Deficit results for the Greater Teton Ecosystem with no forage available in vegetation coded "shrub riparian/willow" on the NER. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

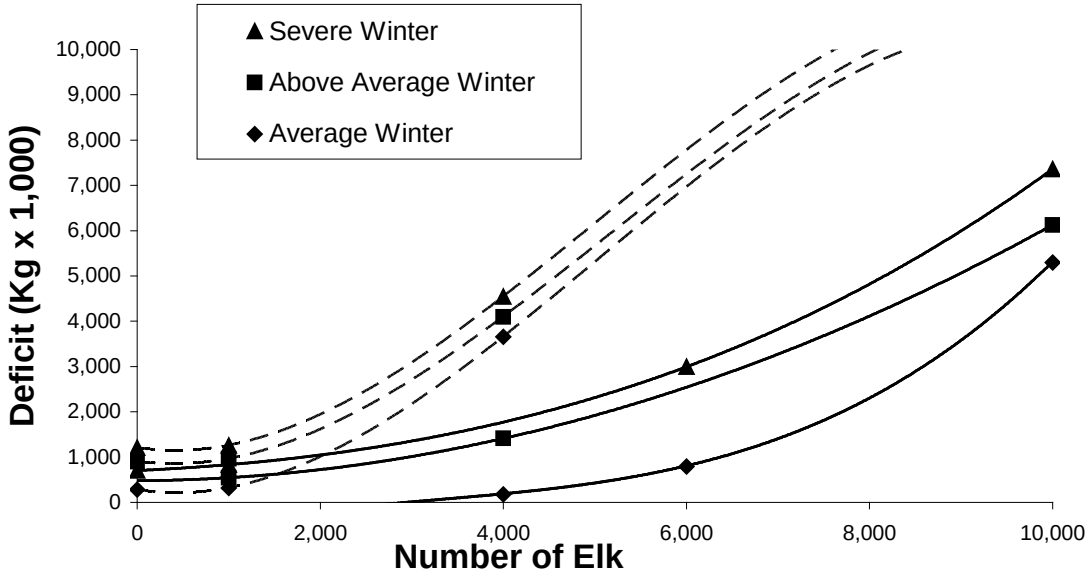


Figure 26. Deficit results for the NER with one-half of the forage available in vegetation coded "shrub riparian/willow". The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions

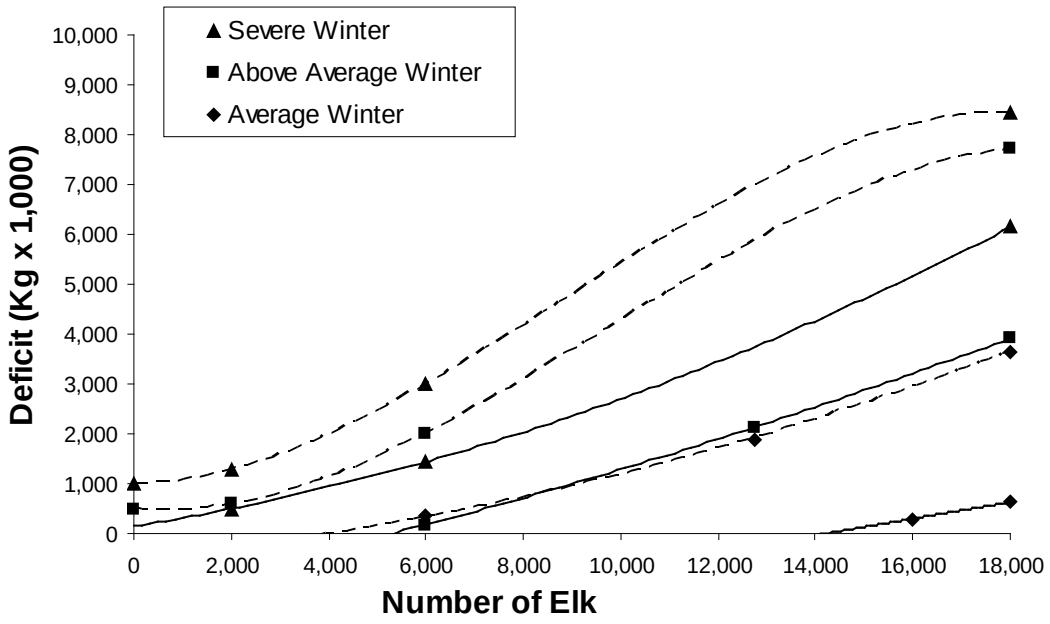


Figure 27. Deficit results for the Greater Teton Ecosystem with one-half of the forage available in vegetation coded "shrub riparian/willow" on the NER. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

Model Results for Alternative #4

Alternative #4 assumptions: 1) 350 bison, 2) cultivated fields on the NER are center-pivot irrigated, and 3) willow on the NER is all fenced off or half-fenced off.

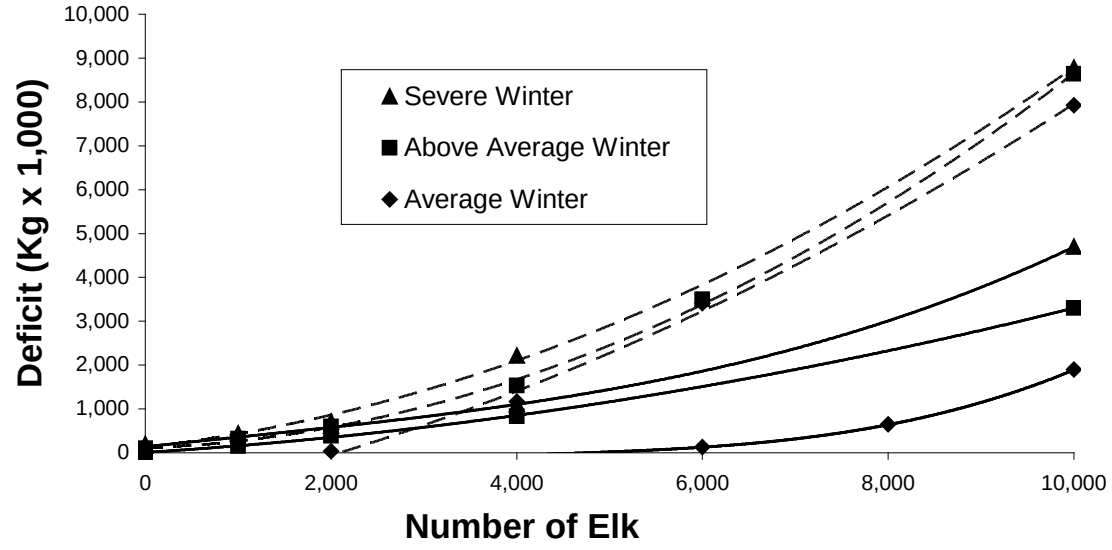


Figure 28. Deficit results for the NER with no forage available in vegetation coded "shrub riparian/willow". The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

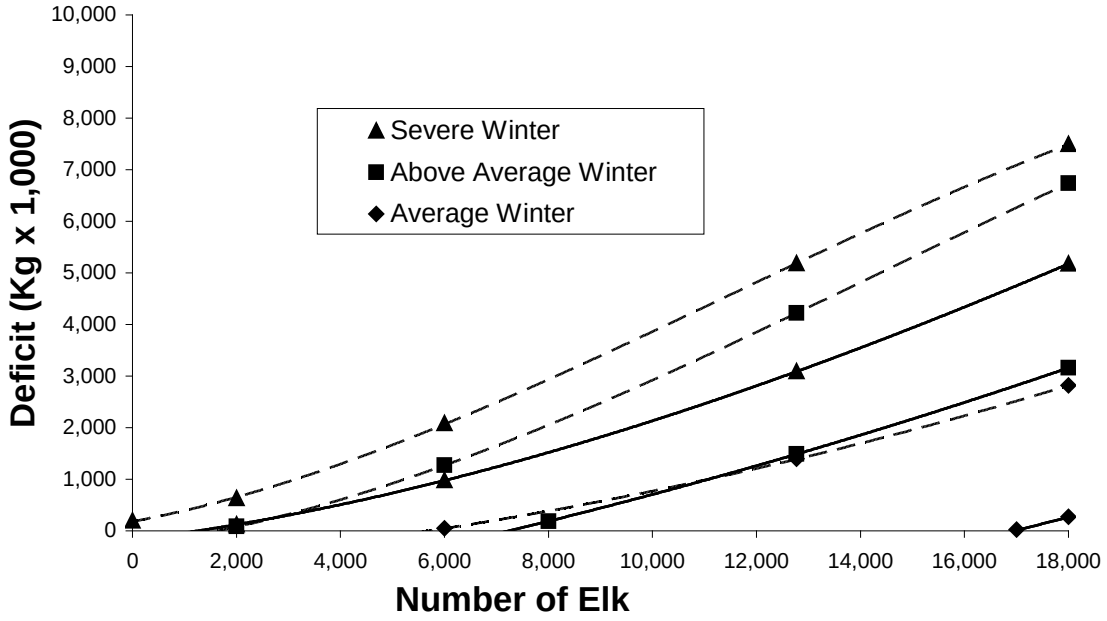


Figure 29. Deficit results for the Greater Teton Ecosystem with no forage available in vegetation coded "shrub riparian/willow" on the NER. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

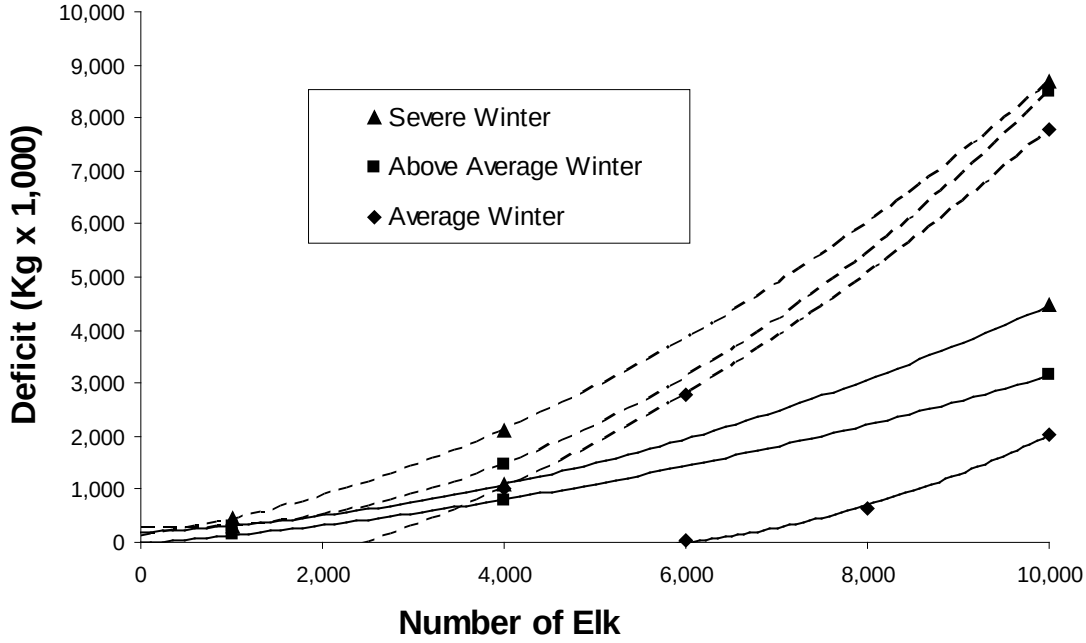


Figure 30. Deficit results for the NER with one-half of the forage available in vegetation coded "shrub riparian/willow". The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

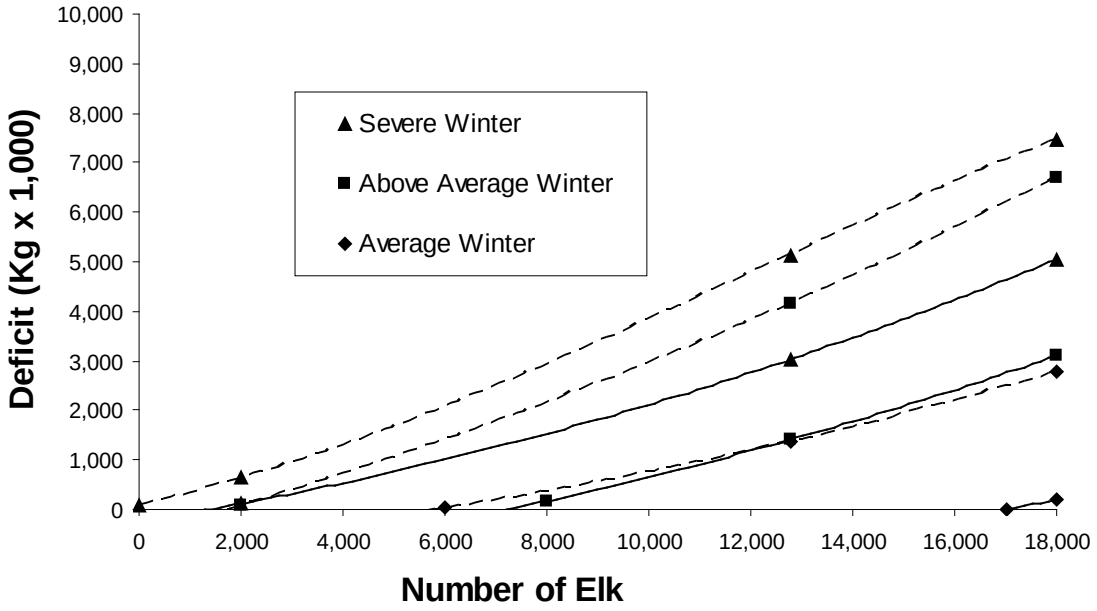


Figure 31. Deficit results for the Greater Teton Ecosystem with one-half of the forage available in vegetation coded "shrub riparian/willow" on the NER. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

Discussion for Alternatives #2 - #4

The EIS Alternatives attempt consider effects of manipuating three variables: bison numbers, willow availability on the NER, and irrigation of the NER's cultivated fields. The net effect on forage deficits of these three variables will be the following:

1. increasing bison numbers will increase deficits
2. fencing off willow on the NER will increase deficits
3. irrigating the cultivated fields on the NER will decrease deficits -- center-pivot more so, flood irrigation less so.

Because the vegetation manipulations (willow, irrigation) occur on the lower portion of the NER, the effects will be less pronounced when the model is run on the Greater Teton Ecosystem than the NER. Additionally, because above average and severe winters have some weeks where snow blankets the landscape, the effects of vegetation manipulations are less pronounced than in average winters.

Alternative #2 tries to mimic "natural vegetation conditions" by allowing willow use and not irrigating the cultivated fields. This alternative also tries to manipulate bison numbers, keeping them at either 250 or 500. The net effect of "natural conditions" is slightly higher overall deficits than Alternative #1, and slightly fewer elk before deficits occur. In the average winter with average precipitation and 500 bison, deficits begin at 5,000 elk in Alternative #1 but begin at 4,500 for Alternative #2. If bison numbers are kept at 250, deficits begin at 5,700 elk for Alternative #2.

Alternative #3 lets bison numbers increase naturally to 1,000, and tries to fence off half or all of the willow stands on the NER. This Alternative restricts forage for elk more than any other Alternative because both increased bison numbers and willow fencing cause higher deficits. In

an average winter with average precipitation and no willow availability, deficits begin at 3,300 elk. With one-half willow availability, deficits begin at 3,500 elk.

Alternative #4 attempts to hold bison numbers to 350 while center-pivot irrigating the cultivated fields and fencing off willows. Taken in pieces, lower bison numbers (350) will decrease deficits, center-pivot irrigation will decrease deficits, and willow fencing will increase deficits. The net effect of these three manipulations is slightly lower deficits than Alternative #1 which allows slightly more elk to find forage before deficits occur. In an average winter with average precipitation conditions and 350 bison, deficits begin at 5,500 elk when all the willow is fenced off and 6,000 elk when one-half of the willow is fenced off.

In total, the manipulations in the three EIS Alternatives have fairly mild effects on forage deficits and elk numbers. Only Alternative #3, which allows 1,000 bison and fences willow has a significant restricting effect. The net effects of Alternatives #2 and #4 vary little from status quo management. Both the willow area and the irrigated fields on the NER comprise roughly 1,000 acres, and are relatively minor portions of the Greater Teton Ecosystem. If managers want to have a significant impact on the deficits for the entire Jackson elk herd, vegetation manipulations will have to occur on a much larger scale. And, as stated earlier, because snow blankets the landscape in some weeks of above average and severe winters, vegetation manipulations have significantly less effect than in average winters.

Part II.
CENTURY Ecosystem Modeling

Results from simulations using the Forage Accounting Model in Part I of this report suggest that significant areas of the range will experience forage utilization exceeding 50% . High levels of use will occur for virtually all population levels of elk during all winters. This heavy utilization on the winter range is intensified by the existence of the wildlife fence that inhibits natural migration to lower snow-free elevations. Additionally, field measurements (Steele et al. 1999) also depict heavy utilizations throughout the winter range in the lower portion of the NER and the lower elevations of the Gros Ventre Valley. In this section, we report results from simulation modeling using CENTURY to portray biogeochemical changes in vegetation and soil resulting from grazing by elk and bison in the Jackson Valley. This modeling effort is based on estimated inputs of soil and vegetation chemistry because field data were not yet available. Current and ongoing field sampling work by F. Singer on nitrogen pools and vegetation will later be used to corroborate these preliminary findings. The central question we address is whether or not high levels of grazing will harm long term productivity of vegetation communities.

The CENTURY Model

The CENTURY ecosystem model (Metherell et al. 1993) simulates exchanges of carbon (C) and nitrogen (N) among the atmosphere, soil, and vegetation. Required inputs used to drive the model include monthly maximum/minimum temperature and precipitation data, soil properties, vegetation type, and current and historical land use. Disturbances and management practices such as grazing, fire, cultivation, and fertilizer additions can be simulated. CENTURY includes submodels for plant productivity, decomposition of dead plant material and soil organic matter (SOM), and soil water and temperature dynamics. Flows of C and N are controlled by the amount of C in the various pools (e.g. SOM, plant biomass), the N and lignin concentrations of the pools, abiotic temperature/soil water factors, and soil physical properties related to texture. SOM is divided into three pools based on decomposition rates (Parton et al. 1993, 1994). Decomposition of SOM and external nutrient additions supply the nutrient pool that is available for plant growth. Plant growth is controlled by a plant-specific maximum growth parameter, nutrient availability, and 0-1 multipliers that reflect shading, water, and temperature stress. Net Primary Productivity (NPP) is allocated among leafy, woody, and root compartments as a function of plant type, season, soil water content, and nutrient availability.

CENTURY has been used to successfully simulate soil C and NPP levels in various natural and managed systems including grasslands (Parton et al. 1993) and agricultural systems (Parton and Rasmussen 1994). For this project, the grazing subroutine was used to model the effect of migrating elk on the native, otherwise-unimpacted grass and shrublands on the NER and the Gros Ventre Valley. Although dozens of output variables are available, this modeling effort focused on soil C, soil N, and annual NPP because these variables are of most interest to range managers. A flowchart representing the CENTURY model is in Figure 1.

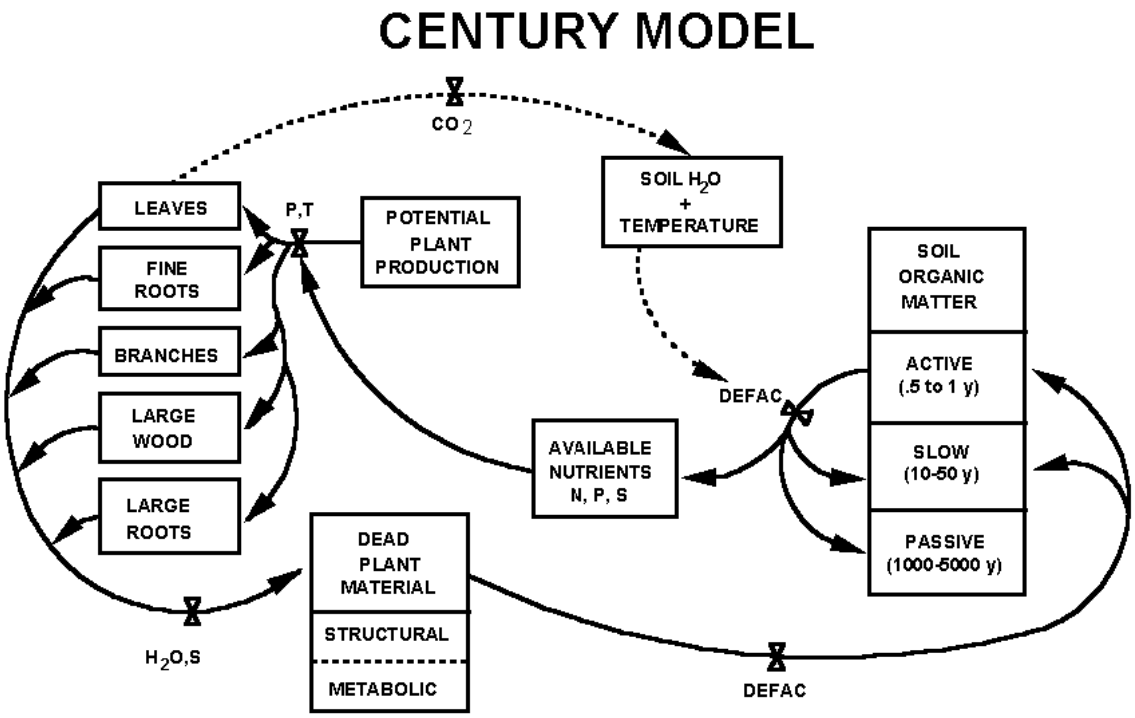


Figure 1. Flowchart of CENTURY Model

Model Input Parameters

Vegetation Types

Two vegetation types were simulated -- wet meadow and sagebrush. We assumed wet meadow is 100% herbaceous with annual production values of ~200 gC/m^2; sagebrush is a 50/50 herbacesou/sagebrush mix with annual production values ~120 gC/m^2. These production values were also used in the Forage Accounting Model, and were derived from field measurements (Zeigenfuss et al. 2001).

These vegetation types were chosen for two reasons. First, they are the same vegetation types being sampled by F. Singer for N processes and N pools for the future nitrogen/CENTURY modeling work in the Jackson Valley. Field measurements will be taken in these types in 2001 and 2002. Second, they also correspond with the major vegetation types that receive significant offtake in the Forage Accounting Model, and comprise much of the NER and the winter range in the Gros Ventre. Figure 2 below, predicted by the Forage Accounting Model, depicts the areas in an average winter with average precipitation and 500 bison where utilizations were 50% or greater.

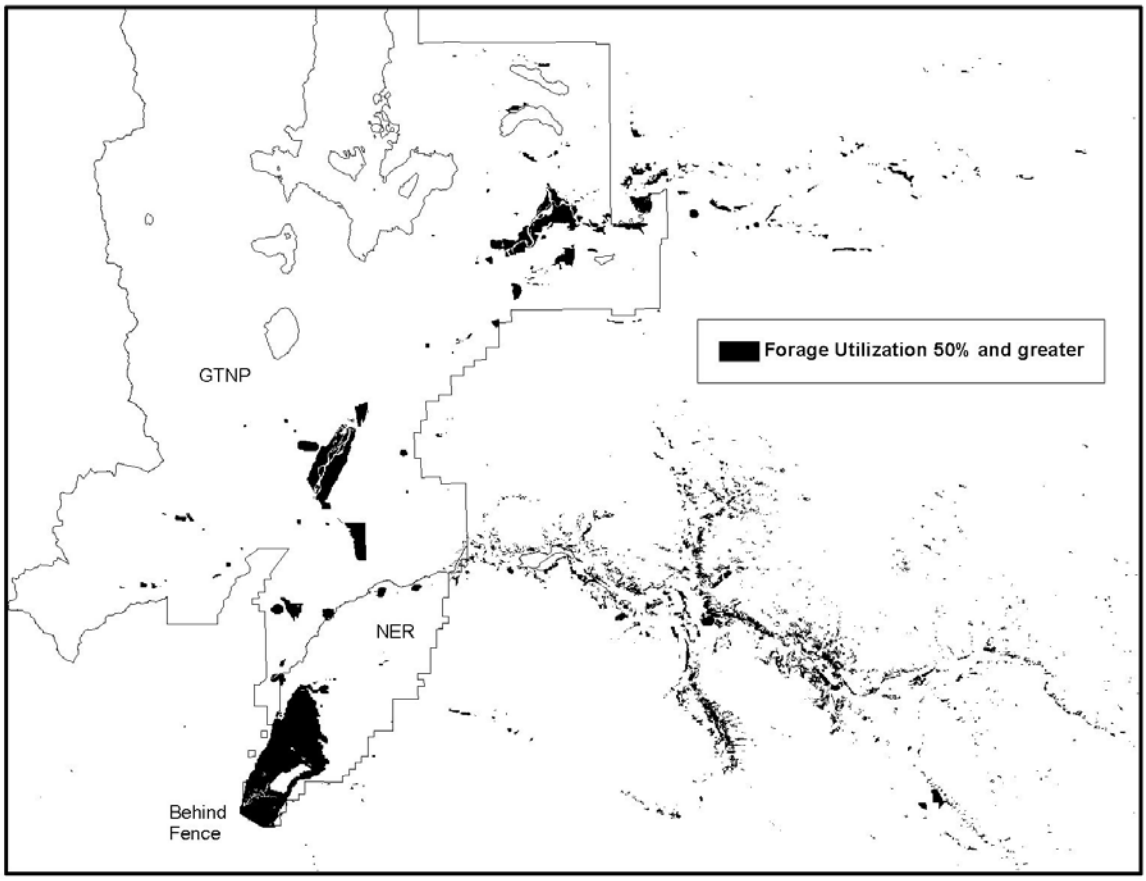


Figure 2. Areas in an average winter with average precipitation and 500 bision where utilization was 50% or greater.

Weather

Weather is a primary driver of the CENTURY model. Monthly weather data were obtained from the permanent weather station at Moose, Wyoming. Although stations at Jackson and Moran were also available, the station at Moose provided temperature and precipitation measurements midway between the poles of Jackson and Moran, and thus provided a reasonable compromise that could be used for the entire low-lying winter range in the Valley.

Other Input Parameters

Other primary input parameters include soil type and texture, C/N ratios, life span and other parameters for the vegetation types, and annual N inputs from wet and dry deposition. Soil and vegetation parameters were based on values used in CENTURY simulations of a similar system in Rocky Mountain National Park (Schoenecker et al. 2002). Annual N inputs were tuned so that simulated NPP values agreed with observed NPP for the sagebrush and meadow communities. Required N inputs were higher for the meadow than the sagebrush/grass system. This is reasonable because low-lying meadows are depositional zones and they receive nutrient inputs from surface runoff and other sources.

Modeling Assumptions

Three modeling assumptions guided this process. The wildlife fence near Jackson was built in the 1950s to keep elk from feeding on farmland during the winter. The fence partially obstructs natural migration paths down the Valley especially in severe winters when elk usually migrated to lower elevations down the Snake River through and beyond the town of Jackson. Thus, for the simplified purposes of modeling, we first assumed that no grazing occurred on the winter range prior to the construction of the fence. Using Annual Net Primary Production values measured from field data, we let the model reach equilibrium over a 2,900-year time-span during this no-grazing period. This assumption is reasonable because the production values were derived from elk-free enclosures on the winter range and therefore mimic grazed-free pre-fence production on native vegetation types.

The second assumption is that after the wildlife fence is built, elk are artificially concentrated on the winter range and therefore graze at unnatural levels on the grass and shrubland. This is the same assumption that guides grazing in the Forage Accounting Model. We modeled two grazing intensities, 50% and 80%, of standing dead grass and shrub. All grazing occurs during the months of January through April, and, because the forage is dead and the ground frozen, this causes no negative effect on the next year's production.

Third, standing dead grass is poor quality forage for elk and has significantly less nitrogen content than summer grasses. One of the driving input parameters for CENTURY in a grazed system is the ratio of nitrogen excreted by the animal to nitrogen consumed. When elk consume standing dead forage, this ratio typically exceeds 1.0. This occurs because the endogenous nitrogen lost from the animal in urine and feces exceeds the nitrogen consumed in forage. Hobbs (1996) and Mould and Robbins (1981) have calculated nitrogen levels in elk excrement in relation to forage quality. These calculations yielded 1.09 gN/day of output-to-intake for poor-quality, standing-dead forage when elk have a stable bodyweight. Additionally, when elk are eating poor quality forage in the depth of winter, they often lose weight. Thus, we also modeled a scenario where elk lost 15% of their body weight over the four-month grazing period. Losing weight causes yet more nitrogen from the animal's lean body mass to pass through the urine therefore increasing the nitrogen output/intake ratio (Hobbs 1989, D.M. Swift pers. comm.). When elk lose weight, we used a ratio of 1.25 gN/day of output-to-intake.

Results

In the wet meadow graphs (Figure 3), the first 50 years of the model depict the pre-grazing equilibrium scenario. Beginning in year 51, when the fence was built, we simulated two levels of grazing intensity, 50% and 80%. Both grazing levels accelerate nutrient cycling and cause increases in soil carbon and net annual production. The magnitude of this accelerating effect is proportionate to grazing intensity, with greater effects occurring at 80% grazing intensity. When elk are losing weight, higher N inputs accelerate the system to an even greater extent and increased plant production leads to higher soil carbon levels.

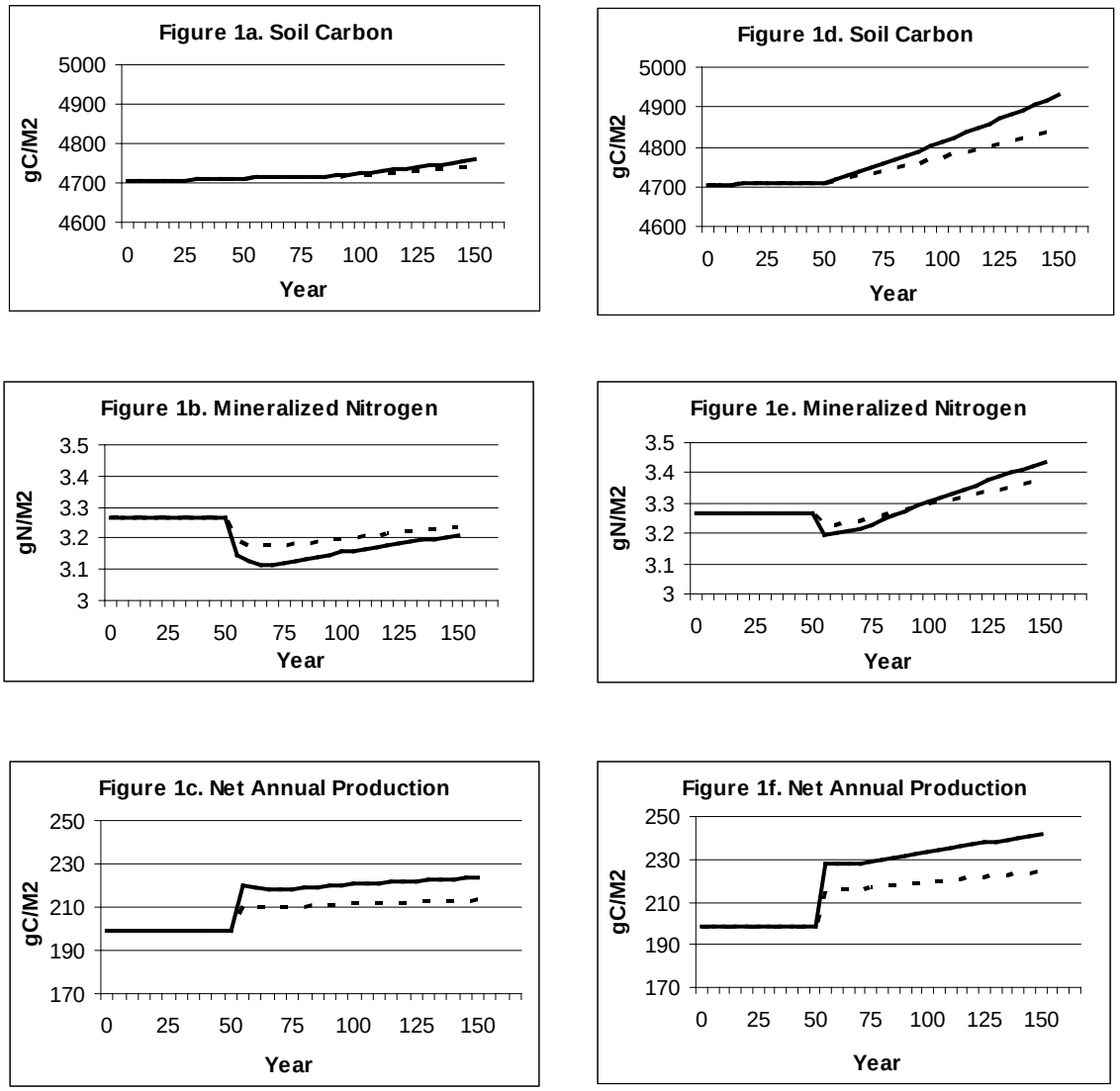


Figure 3. Model Results for Wet Meadow at two grazing levels. The solid black line depicts 80% removal of forage and the dotted line depicts 50% removal. The three graphs on the left depict the "Elk not losing weight" scenario; the three graphs on the right "Elk losing weight" scenario.

Similarly, in the sagebrush graphs (Figure 4), the first 50 years of the model depict the pre-grazing equilibrium scenario. Beginning in year 51, when the fence was built, we simulated two levels of grazing intensity, 50% and 80%. When elk are not losing weight (Figure 4 – left), soil carbon and mineralized nitrogen remain stable or slowly decline. Net annual production initially jumps to a higher level and then stabilizes over the 100-year model run. The higher level of grazing causes slightly increased production; the lower level causes stabilized production. When elk are losing weight (Figure 4 – right), all values increase. Net annual production increases faster with the higher grazing level and when elk are losing weight. Both of these can be explained by N inputs. Because the dead forage is of such poor quality the animals excrete more N than they extract from the system and this shifts carbon-nitrogen ratios in soil toward levels favoring N-mineralization. As grazing intensity increases, net N inputs to the system also increase, and when elk are losing weight the ratio of N outputs to inputs is even higher. Higher N inputs lead to enhanced mineralization, which release more N from soil organic matter. This feedback causes increased plant growth and stable or increasing soil C levels.

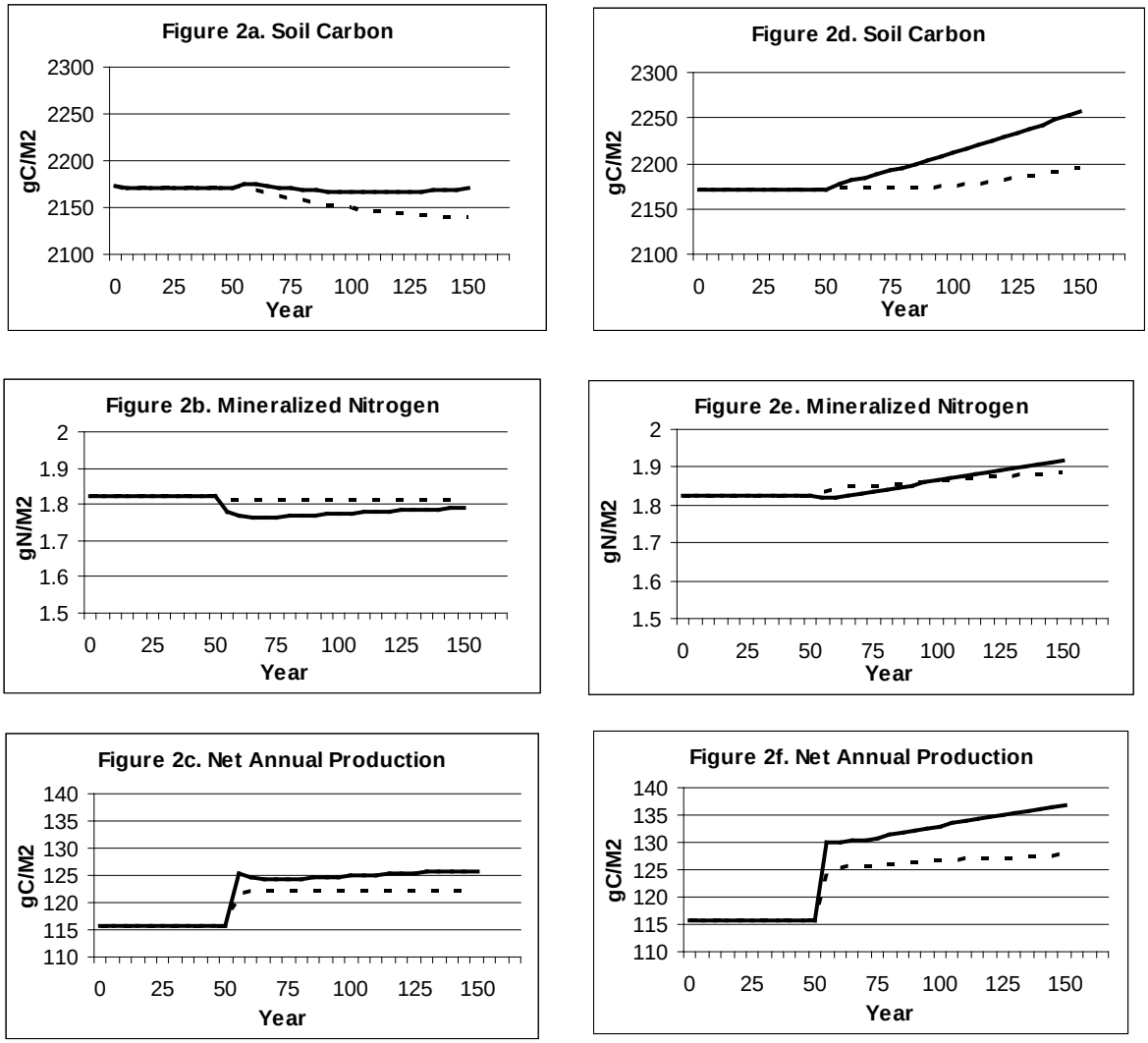


Figure 4. Model Results for Sagebrush at two grazing levels. The solid black line depicts 80% removal of forage and the dotted line depicts 50% removal. Figure 2a – 2c depict the "Elk not losing weight" scenario. Figure 1d – 1f depict the "Elk losing weight" scenario.

Overall, all twelve charts depict a similar scenario. Because elk are consuming standing dead forage in the depth of winter, there is no negative effect on plant production. Further, because elk cause accelerated nutrient cycling, and because elk are returning more nitrogen to the soil than they consume, higher grazing levels will cause higher future production levels. As long as elk are concentrated at high densities on the winter range, the CENTURY model will predict positive feedbacks on production due to higher net N inputs related to grazing. The feedback is exacerbated due to low N volatilization because of weather conditions. We presume that cold weather and snow cover keep N from volatizing into the atmosphere during winter.

These CENTURY results suggest that heavy winter-season grazing in this system, as predicted by the Forage Accounting Model, is sustainable and that soil C and nutrient levels are not significantly depleted and may increase. Nitrogen 'hotspots' and higher production will occur corresponding to animal density. If elk stay on the winter range longer with low-grade forage resulting in weight loss, increased nitrogen hotspots and increased future production will result. Figure 1 could also been seen as a 'nitrogen deposition map' wherein animals deposit nitrogen gathered throughout the entire summer range onto this limited winter area. Further fieldwork by F. Singer, will help corroborate these findings.

Part III.
The Over-Winter Mortality Model

Introduction

Forage deficits, predicted by the Forage Accounting Model (described in Part I), will likely cause elevated mortality in over-wintering elk populations. We adapted the energy balance model of Hobbs (1989) to estimate starvation mortality by simulating energy intake and expenditure by elk in four age/sex classes (calves, yearling males, adult females, bulls) during winter. The predictions of mortality provided by this model are perhaps more easily interpreted than the predictions of forage deficits and overuse provided by the Forage Accounting Model. However, while these interpretations may be easier to understand, they are also subject to a far greater potential for error. This is simply because the Over-Winter Mortality Model has approximately 10 times as many parameters as the Forage Accounting Model, and all of these parameters are estimated with some uncertainty. Therefore, we suggest that quantitative results of the energy balance model should be viewed with caution. However, we are confident that the qualitative trends we have observed are reasonable.

Methods

Elk populations were allocated to map cells based on snow water equivalents (SWE) under the assumption that elk use the areas of the landscape with shallow SWE in preference to areas with deep SWE, and that they will not use areas with > 6" SWE. So, during each week of the winter, we distributed the total population to map cells with SWE < 6" in order of increasing SWE. The number of animals assigned to a cell was determined by the available biomass of forage within that cell, an output variable in the Forage Accounting Model. We calculated the weekly requirements of individuals and assigned no more animals than could be supported for 1 week by the available biomass. We assumed that a group of elk or sub-herd in the cells of a SWE category (0, 1, 2, … , inch) had the same age/sex composition as the entire herd (proportion of calves: 0.15; yearling males: 0.05; bulls: 0.15; cows: 0.65). If a SWE-depth category of cells could support < 5 elk, then only bulls were assigned to these cells. We calculated daily intake based on the average body mass of sex and age classes and their proportions in the population assuming the body mass of a calf (age = 6 months) was 200 pounds, yearling 350 pounds, bull 675 pounds, and cow 500 pounds.

Foods were categorized into two categories, herbaceous and shrubs. We assumed that when SWE > 30 cm, shrubs comprised 100% of elk diet. If the SWE depth was in the range of 20-30 cm, the proportion of herbs in the diet increased in direct proportion to decreasing SWE. When SWE < 20 cm, the diet consisted of 100% herbs. Available foods of the cells of each SWE-depth category were updated daily by removing the amount of biomass consumed by elk.

The percentage of each age class that dies was based on assumed average fatness and the standard deviation in fat reserves at the beginning of the winter. We assumed that 67% of pre-winter energy reserves came from fat and 33% from lean body and that the size of these reserves was a normally distributed random variable. Based on that assumption, we used the standard normal probability density function to calculate the proportion of the population that had energy reserves less than the magnitude of the energy deficits incurred during winter. We assumed that this was the proportion of each age class that starves (Hobbs 1989).

We ran simulations with initial conditions for populations set at 6,000, 12,771 and 18,000 animals for an average winter (1996), above average winter (1982), and severe winter (1997).

Results

Simulated mortality of calves ranged from a low of 4% during an average winter at a total population size of 6,000 to a high of 42% during a severe winter and a population of 18,000 (Figure 1 - 3). Increasing population density was associated with roughly proportionate increases in estimated mortality. Starvation mortality for adult cows was predicted to be 1% for a population of 6,000 animals in an average winter rising to a high of 25% for a population of 18,000 during a severe winter.

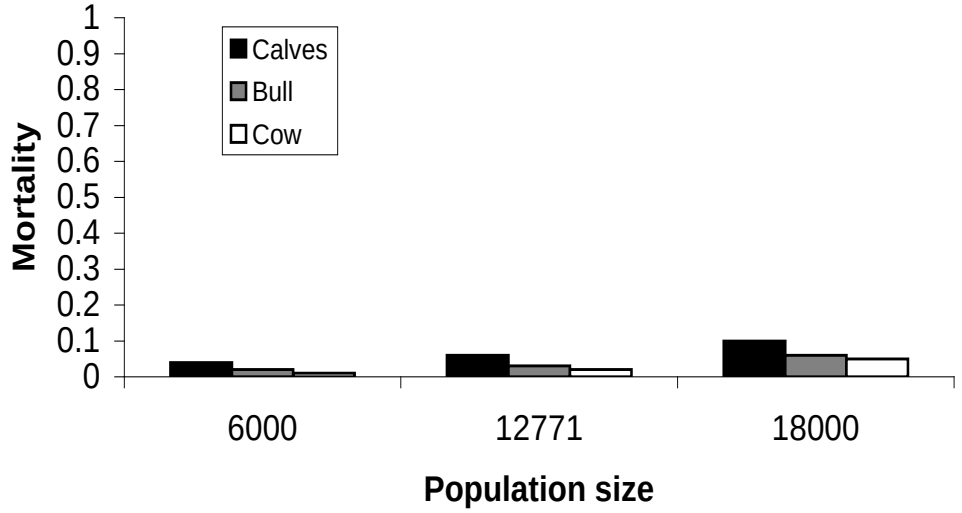


Figure 1. Simulations of elk winter mortalities for the Jackson Elk Herd under different densities in average winter (1996).

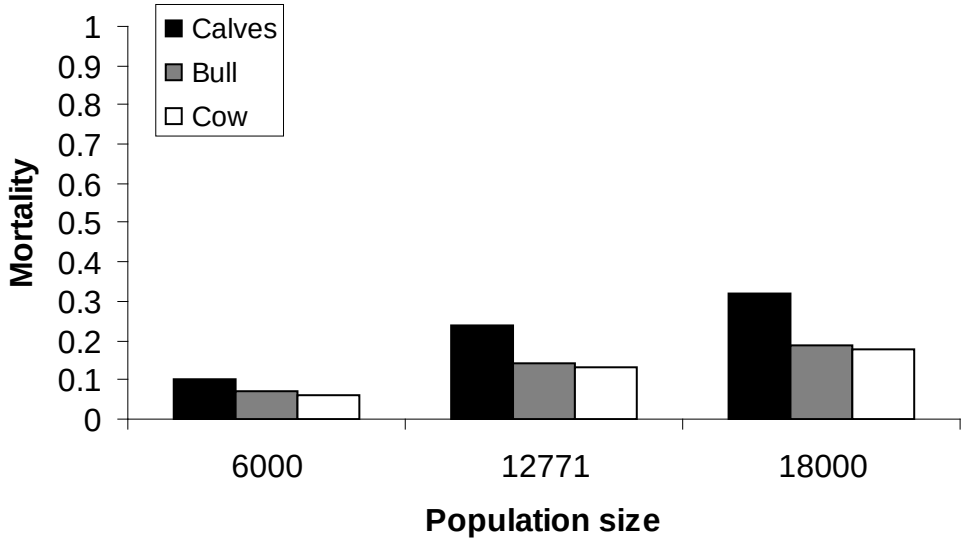


Figure 2. Simulations of elk winter mortalities for the Jackson Elk Herd under different densities in above average winter (1982).

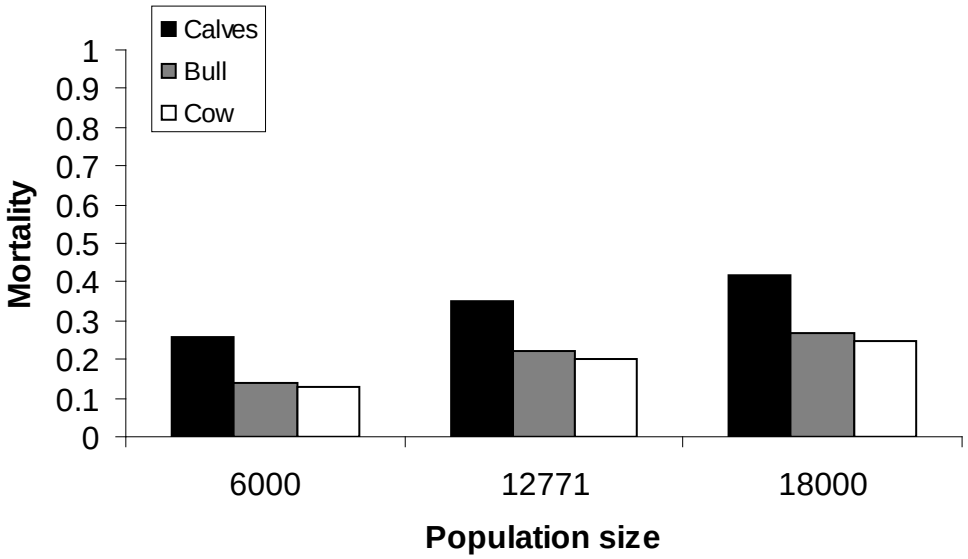


Figure 3. Simulations of elk winter mortalities for the Jackson Elk Herd under different densities in severe winter (1997).

Conclusions

The main implications of these three overlapping models are:

1. Forage utilization rates of 50% and greater will occur on the winter range at all elk population levels and during all winter severities. The area of winter range used in excess of 50% will increase with the elk population and winter severity. However, although high utilization rates will occur on the winter range, they may not negatively effect, and may even enhance, future soil fertility and plant production.

2. In average SWE winters with average pre-winter precipitation and 500 bison, roughly 16,000 elk can find forage on the Greater Teton Ecosystem without incurring forage deficits and roughly 5,000 elk can find forage on the NER without incurring deficits.

3. Winter snow severity has a deleterious effect on forage availability and causes critical imbalances in forage supply/demand at most elk population levels.

4. Drought reduces forage production to 45% of the mean and increases deficits in all winter conditions and with all elk populations levels. When drought during the growing season precedes deep-snow winters, forage deficits are extreme.

5. Increasing the number of bison has a mild effect on forage deficits on the Greater Teton Ecosystem during average winters with average precipitation conditions, but has a more significant effect when climatic conditions worsen. On the NER, increasing bison numbers will greatly exacerbate deficits and the ability of elk to find adequate forage.

6. Cattle grazing has a negligible effect on forage deficits because it does not occur on areas where forage is available to native ungulates during winter.

7. Supplemental feeding overcompensates for the forage unavailable south of the wildlife fence. Historic elk populations either: (1) were smaller than current ones, and/or (2) may have suffered high levels of mortality during severe winters, and/or (3) more likely have used lower elevation ranges south of Jackson and larger areas of the Gros Ventre.

8. Starvation of adult animals is expected to occur at relatively low levels (about 5%) at all levels of population and winter severity, but may increase to as high as 30% during severe winters and with high population levels (18,000).

9. Only EIS Alternative #3 has the significant effect of restricting forage availability for elk and increasing forage deficits. Alternatives #2 and #4 have only mild effects. The EIS Alternatives attempt to manipulate three variables: bison numbers, willow availability on the NER, and irrigation of the NER's cultivated fields. The net effect on forage deficits of these three variables will be the following:

   a. increasing bison numbers will increase deficits
   b. fencing off willow on the NER will increase deficits
   c. irrigating the cultivated fields on the NER will decrease deficits -- center-pivot more so, flood irrigation less so.

References

Baker, D. L., and D. R. Hansen. 1985. Comparative digestion of grass in mule deer and elk. Journal of Wildlife Management 49:77-79.

Baker, D. L., and N. T. Hobbs. 1987. Strategies of digestion: digestive efficiency and retention time of forage diets in montane ungulates. Canadian Journal of Zoology 654:1978-1984.

Biondini, M., B.D. Patton, and P.E. Nyren. 1998. Grazing intensity and ecosystem processes in a northern mixed-grass prairie, USA. Ecological Applications 8:469-479.

Cordova, F. H., J. O. Wallace, and R. D. Pieper. 1978. Forage intake by grazing livestock: a review. Journal of Range Management 31:430-438.

Coughenour, M. B. 1992. Spatial modeling and landscape characterization of an African pastoral ecosystem: a prototype model and its potential use for monitoring drought. Pp. 787-810 in: D.H. McKenzie, D.E. Hyatt and V.J. McDonald (eds.). Ecological Indicators, Vol. I. Elsevier Applied Science, London and New York.

Coughenour, M. B. 1993. The SAVANNA landscape model – Documentation and Users Guide. Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO.

Coughenour, M.B. 1994. Elk carrying capacity on Yellowstone's northern elk winter range - Preliminary modeling to integrate climate, landscape, and elk nutritional requirements. Pp. 97-112 in: Plants and Their Environments: Proceedings of the First Biennial Scientific Conference on the Greater Yellowstone Ecosystem, Mammoth Hot Springs, Sept. 1991. D. Despain (ed.). Technical Report NPS/NRYELL.NRTR-93/XX. USDI/NPS. Denver, CO.

Coughenour, M.B., and F.J. Singer. 1996. Yellowstone elk population responses to fire - a comparison of landscape carrying capacity and spatial-dynamic ecosystem modeling approaches. Pp. 169-180 in J. Greenlee (ed.), The Ecological Implications of Fire in Greater Yellowstone. International Association of Wildland Fire, Fairfield, WA.

Despain, D. G. 1990. Yellowstone Vegetation: Consequences of Environment and History in a Natural Setting. Roberts Rinehart Publishers, Boulder, CO.

Farnes, P.E., and W. H. Romme. 1993. Estimating localized SWE on the Yellowstone Northern Range. Presented at the Joint Eastern-Wester Snow Conference, Quebec City, Quebec.

Farnes, P., C. Heydon and K. Hansen. 1999. Snowpack in Grand Teton National Park and Snake River Drainage above Jackson, Wyoming. Department of Earth Sciences, Montana State University.

Hobbs, N. T. 1989. Linking energy balance to survival in mule deer: development and test of a simulation model. Wildlife Monographs 101.

Hobbs, N.T. 1996. Modification of Ecosystems by Ungulates. Journal of Wildlife Management. 60(4):695-713.

Hobbs, N. T., D. L. Baker, G. D. Bear, and D. C. Bowden. 1996. Ungulate grazing in sagebrush grassland: Mechanisms of resource competition. Ecological Applications 6:200-217.

Homer, C. G. 1995. Intermountain Region: Land Cover Characterization. Metadata on CD from Utah State University.

Houston, D. B. 1982. The Northern Yellowstone elk: ecology and management. Macmillan Publishing Company, New York, New York.

Mattson, D., and D. Despain. 1985. Grizzly bear habitat component mapping handbook for the Yellowstone ecosystem. YNP document.

Meagher, M. 1973. The Bison of Yellowstone National Park. National Park Service, Scientific Monograph Series, Number One.

Metherell, A.K., L.S. Harding, C.V. Cole, and W.J. Parton. 1993. CENTURY soil organic matter model environment, Technical documentation, Agroecosystem version 4.0. Great Plains System Research Unit Technical Report No. 4. USDA-ARS, Fort Collins, Colorado.

Mould, E. D., and C. T. Robbins. 1981. Nitrogen metabolism in elk. Journal of Wildlife Management 45(2):323-334.

Parton, W. J., and P. E. Rasmussen. 1994. Long-term effects of crop management in wheat/fallow: II. CENTURY model simulations. Soil Science Society of America Journal 58:530-536.

Parton, W.J., J.M.O. Scurlock, D.S. Ojima, T.G. Gilmanov, R.J. Scholes, D.S. Schimel, T. Kirchner, J.C. Menaut, T. Seastedt, E. Garcia Moya, A. Kamnalrut, and J.L. Kinyamario. 1993. Observations and modeling of biomass and soil organic matter dynamics for the grassland biome worldwide. Global Biogeochemical Cycles 7:785-809.

Parton, W.J., D.S. Ojima, C.V. Cole, and D.S. Schimel. 1994. A general model for soil organic matter dynamics: sensitivity to litter chemistry, texture and management. Pp. 147-167 in: Quantitative Modeling of Soil Forming Processes. Soil Science Society of America, Special Pub. 39, Madison, WI.

Schoenecker, K., F. Singer, R. Menezes, L. Zeigenfuss, D. Binkley 2001. Sustainability of vegetation communities grazed by elk in Rocky Mountain National Park. USGS-BRD. In F.J. Singer, ed. Ecological evaluation of the abundance and effects of elk in Rocky Mountain National Park, Colorado, 1994-1999. Unpublished report.

Schoenecker, K. A., F. J. Singer, R. S. C. Menezes, L. C. Zeigenfuss, and D. Binkley. 2002. Sustainability of vegetation communities grazed by elk in Rocky Mountain National Park. Pp. 187-204 in F. J. Singer and L. C. Zeigenfuss, compilers, Ecological Evaluation of the Abundance and Effects of Elk Herbivory in Rocky Mountain National Park, Colorado, 1994-1999. Final report to the National Park Service, Rocky Mountain National Park on Cooperative Agreement No. 1445-0009-94-1074 (USGS) Subagreement 2 between the National Park Service, Biological Resources Discipline of U.S. Geological Survey, and Natural Resources Ecology Lab, Colorado State University. Open File Report 02-208. 268 pp.

Singer, F.J., L.C. Zeigenfuss, B. Lubow, and M. Rock. 2001. Ecological evaluation of the appropriate number of ungulates in U.S. national parks: A case study of elk in Rocky Mountain

National Park. In F.J. Singer, ed. Ecological evaluation of the abundance and effects of elk in Rocky Mountain National Park, Colorado, 1994-1999. Unpublished report.

Singer, F. J., L.C. Zeigenfuss, B. Lubow, and M.J. Rock. 2002. Ecological evaluation of potential overabundance of ungulates in U.S. national parks: a case study. Pp. 205-248 in F. J. Singer and L. C. Zeigenfuss, compilers, Ecological Evaluation of the Abundance and Effects of Elk Herbivory in Rocky Mountain National Park, Colorado, 1994-1999. Final report to the National Park Service, Rocky Mountain National Park on Cooperative Agreement No. 1445-0009-94-1074 (USGS) Subagreement 2 between the National Park Service, Biological Resources Discipline of U.S. Geological Survey, and Natural Resources Ecology Lab, Colorado State University. Open File Report 02-208. 268 pp.

Steele, R. 1983. Forest habitat types of eastern Idaho-western Wyoming. USFS Report INT-144.

Steele, V., F. Singer, and M. Coughenour. 1999. Percent Utilization of Vegetation in Grand Teton National Park, the National Elk Refuge and the Gros Ventre Area of Bridger Teton National Forest: Mid-Season Progress Report.

Turner, M. G., L. Wallace, W. H. Romme, and A. Brenkert. 1994. Simulating winter interactions among ungulates, vegetation, and fire in northern Yellowstone Park. Ecological Applications 4(3):472-496.

U.S. Fish and Wildlife Service, National Elk Refuge. 1998. Irrigation System Rehabilitation Plan Environmental Assessment. Jackson, WY.

Zeigenfuss, L., F. Singer, M. Rock, and M. Tobler. 2001. A synthesis of data, model-based analyses, and refinements of possible management scenarios for bison and elk in the Jackson Valley. USGS-BRD, Annual Report.

Appendix A: Vegetation Production Methods

Data on annual production for each vegetation type were obtained from studies conducted by Biological Resources Division (BRD)--USGS, National Elk Refuge (NER)--USFWS, and Bridger-Teton National Forest (BTNF)--USFS. Each data set was collected in a different manner and so it was necessary to standardize the data so that they could be combined to create the largest data set possible for estimating average production values.

The BTNF data were collected from 1994-1999. Sample points were randomly generated in areas of highest priority for forest management activities. As a result, less information was available on vegetation types that do not encompass areas of high management priority. Data on plant production was visually estimated in weight classes. For the purpose of estimating average production, the midpoint of the class was assigned to the sample point (Appendix C: Table 2).

Data on dominant and codominant tree, shrub, and herbaceous species were assessed to determine the appropriate USU vegetation categories for each sample. Because no data were available on forest canopy closure at the sample points, all points in forested types of a species (or species grouping) were combined. Total production was calculated by summing the midpoints for shrub, grass, and forb production.

Data from the NER were collected from 1987-1999, however, data for the entire refuge exists in electronic format for 1999 only. The remainder of the 1987-1999 data is from the south end of the refuge, and as a result, some vegetation types which only occur in the north end of the refuge are only represented in 1999. Production was estimated using the SCS double sampling method, whereby ocular estimates are made for all points on a transect in a particular vegetation type, and a subsample of these points are clipped and weighed and used to calibrate the points which had only ocular estimation.

Plant productivity estimates for the BRD study were collected from 1996-1998 and were obtained by clipping, drying, and weighing vegetation in several 0.25 m^2 quadrats at several sites for each vegetation type.

Mean production values were calculated for each vegetation category in each of the data sets. Vegetation was grouped in broad categories based on dominant tree, shrub, or herb species and tested for differences between all the individual categories within these broad groups using Fisher's least significant difference test for multiple comparison of means. Based on the results of these tests, 15 new vegetation categories were developed. The final mean production values for the new vegetation categories were calculated using all data from the three data sets. No data existed in the available data sets for three of the new categories: alpine herbaceous, alpine shrub, and disturbed/developed. Production values for the alpine categories were approximated based on work done by Marilyn Walker at the Niwot Ridge Long Term Experimental Range near Nederland, Colorado. These data were found on the Niwot LTER web site. Values for disturbed/developed areas, where irrigated and fertilized lawns are maintained, were expected to be similar to values for sub-irrigated bluegrass found in the NER and BRD data. The values estimated using these data were similar to those measured in disturbed sites in the town of Estes Park, Colorado in another study (Singer et al. 2002) and such values were therefore considered adequate.

Estimating production in wet and dry years was approached two ways. First, using annual precipitation and 30-year average precipitation values available on the web from the University of

Nebraska's High Plains Climate Center, several years with greater than average (1996 and 1997) and lower than average (2001, 1994, 1992, 1988) precipitation at the Jackson, Moose, and Moran weather stations were chosen. Average production values were calculated for the wet years and dry years for each vegetation category and each data set separately. Because reliable data for wet, dry, and average years were not available for all vegetation types, the percentage of mean annual production for those types that were best represented were calculated for each data set for both wet and dry years, and then these best data were averaged to get a mean percentage of production to be applied across all vegetation types.

Dry year production ranged from .45 -.91 of annual production across the data sets with a mean of 0.85. Wet year production ranged from 1.29-1.8 of annual production across all data sets with a mean of 1.5. We chose to use 1.5 as the wet year production and 0.45 as the dry year. 0.45 was chosen because managers wanted a severe draught scenario based on recent 2001 precipitation.

Managers raised a question about the spatial heterogeneity of production due to varying rainfall over the study area. For example, sagebrush on the NER may produce differently than sagebrush in the Gros Ventre. We attempted to create a spatially explicit production map based on actual production measurements across the study area. However, these estimations did not yield significant spatial differences in production for each vegetation type. While we recognize that rainfall may vary across this area, and that production may vary with it, field data could not support these distinctions.

Appendix B: Snow Model Methods

The model is based on an algorithm to spatially interpolate point data, while correcting for effects of elevation. This algorithm was first developed by Michael Coughenour as part of a spatially explicit ecosystem model called SAVANNA (Coughenour 1992, 1993). The same algorithm was used in a Landscape Carrying Capacity Model for elk on Yellowstone's northern elk winter range (Coughenour 1994, Coughenour and Singer 1996). The first application of the model to Yellowstone was at a research conference held in Yellowstone in 1991 (Coughenour 1994). In this application, GRASS GIS maps for elevation and vegetation were read into a model to calculate snow depth maps, available forage for elk, and elk carrying capacity on a biweekly basis throughout the winter. The model produced output files that were read into the GRASS GIS, to produce maps of snow depth and elk carrying capacity. These output maps were presented at the 1991 conference.

At about the same time, Phil Farnes was conducting studies of snow distributions on the Yellowstone northern elk winter range (Farnes and Romme 1993). He quantified the ways that slope, aspect, and tree cover affect snow pack, as compared to measurements made on a standard, level, treeless sample site. He also developed ways to integrate data from numerous snow water sample sites into a unified data base, and ways to use snow water equivalent to calculate an index of winter severity that combines stress effects of cold temperature and heavy snow on elk (Farnes et al. 1999).

The idea of combining the Coughenour model with the Farnes data into a stand-alone data model was the outcome of initial research on bison and elk carrying capacity by the two researchers in Grand Teton National Park (GTNP). The idea for that project was conceived by Robert Schiller and Francis Singer. Coughenour conducted preliminary SAVANNA modeling studies and Farnes collected snow data in GTNP. To create the stand-alone model, Coughenour combined his earlier elevation-based model with the slope/aspect/tree cover relationships of Farnes, in order to convert the snow data assembled by Farnes into maps of snow water equivalents in GTNP. The snow data model was delivered to GTNP by Coughenour and Farnes in 1999, at the same time Farnes delivered his unique data set (Farnes et al. 1999). Subsequently, a new phase of GTNP carrying capacity research was initiated by N. T. Hobbs, F. Singer, G. Wockner, and L. Ziegenfuss.

In 2000, Gary Wockner, Tom Hobbs, and Francis Singer (CSU) obtained the model from Coughenour for this new phase of the GTNP project (Hobbs et al. 2001). Working with Farnes and Coughenour, Wockner obtained data to run it, worked through several software bugs, tested it, and then used it in the forage accounting model for the Jackson elk herd.

The snow model is driven by three primary sources of data, a digital elevation model, data on vegetation distribution, and point data on snow distribution. Using the DEM and the snow data, an initial grid is created using interpolation and regression. Then, this grid is readjusted for the effect of slope, aspect, and vegetation cover. Using slope and aspect, the more the cell tilts toward the sun, the more it is melted off; conversely, the more it is tilted away from the sun, the more snow accumulates. Using the vegetation data, the grid is adjusted for less snow accumulation under conifers. The bigger the trees and the denser the stand, the less snow accumulation.

Digital Elevation Model

A digital elevation model (DEM) was obtained from NREL researchers working on a similar project in the Greater Yellowstone Area. The DEM is at 30-meter accuracy and covers the entire

study area. In Arcview, the DEM was clipped to the study area and exported as an ASCII file for use in the snow model. The DEM was then converted into a slope grid using Arcview's "Spatial.Slope" function, and converted into an aspect grid using Arcview's "Spatial.Aspect" function. Arcview's Spatial.Aspect command assigns the value "-1" to flat areas. Because the snow model will not read "-1"s, these areas were reassigned the value "300" which results in no multiplier being used in the snow model. These two grids were then converted into integer grids to decrease file size and then exported in ASCII format for use in the snow model

Vegetation Data
The snow model uses the merged vegetation grids from Utah State University, Grand Teton National Park, and the National Elk Refuge. Each of the three grids had relevant codes to use in the snow model. The Utah State coverage had a code titled "canopy percent"; the GTNP coverage had a code for "forest successional stage"; and the NER coverage only had one applicable forested area. These codes were converted into codes readable by the snow model using a crosswalk table (Appendix C: Table 5). Because dense conifer stands will result in less snow on the ground under those stands, the following tree types cause the snow model to create an adjustment: Lodgepole Pine, Subalpine Pine, Douglas Fir, Englemann Spruce. This adjustment is a multiplier which decreases SWE based on the size of the trees and the density of the stand.

Snow Data
The model interpolates the snow station data provided by Farnes. Several types of data are available in the Jackson Valley including snow courses, SNOTEL sites, and climatological stations. In addition, Farnes collected additional monthly data at over 75 stations beginning in water-year 1996. After the large study area was chosen, snow stations within that area were identified. The snow model incorporates data from 6 long-term stations which have daily data beginning at least from 1980 and uses monthly data (Feb, Mar, Apr) from 56 additional stations primarily in Jackson Valley. Snow sampling locations are shown in Figure 1 (Part I.). The snow model also requires a file containing UTM location and elevation of each station. This data was taken from the DEM by overlaying the snow station locations on the DEM and assigning the elevation attribute of the DEM to each station.

The 6 long-term stations ranged from the highest, Togwotee Pass--9580 feet, to the lowest, Jackson--6230 feet. The other four stations were: Moose--6468 feet, Moran--6798 feet, Base Camp--7030 feet, and Phillips Bench--8200 feet. The 56 additional stations contained monthly data collected February, March, and April 1st in 1996, 1997, and 1998. The names, locations, and elevations of all stations are listed in Appendix C: Table 6.

Data at the 6 daily sites existed from water-year (W-Y) 1980 to present. Because W-Y 1981 had one of the lowest SWEs on record and W-Y 1997 had one of the highest (Farnes et al. 1999), a 20-year (1980-1999) stretch of time provided ample variability for useful modeling. At the time of this report, 1999 was the last year of data that was processed by Farnes/Heydon and available for analysis.

The current modeling effort steps through the winter from the onset of snow to its end--roughly November 1st to July 1st. Thus, year-round daily data estimates for all 19 years needed to be created for the 56 monthly stations where data was only collected on February, March, and April 1st of 1996-1999. We developed a regression technique to estimate the missing data at the additional sites. Because snow varies due to elevation and location throughout the study area, each of the original daily stations could be used as independent variables in a regression function to predict the missing data at the monthly sites. This process was carried out with these steps:

1. In S-plus a matrix of data was assembled which contained SWE on Feb, Mar, and Apr 1st in 1996, 1997, and 1998 at all 62 locations. These 9x62 data points contain measured SWE at all locations.
2. A correlation matrix was constructed to determine which of the independent daily stations would serve as best predictors for the dependent monthly stations.
3. Using this matrix, and a more subjective analysis of snow patterns and elevations, a table was constructed which divided the 6 daily stations into three groups. Group 1 contained Jackson, Group 2 contained Moose and Moran, Group 3 contained Base Camp, Phillips Bench, and Togwotee Pass. Each monthly station was assigned to one of these three groups. There were roughly three snow patterns in all the data. The first were sites that increased on March 1st and then melted to "0" or near on April 1st. The second were sites that increased on March 1st and decreased on April 1st but not to near "0". The third were sites that increased on March 1st and then increased again on April 1st. The assignment appears in Appendix C: Table 7.
4. A regression equation was developed in S-plus using stepwise linear regression with "0" as the Y-intercept for each of the 56 monthly stations from the independent predictors in each group. This particular method was developed after several attempts at using other regression methods and switches. Forcing the Y-intercept to "0" provided the best fit of the data at the tails of the curves. (The output -- r^2, equations, etc -- is available for review) Additionally, a few of the regressions did not yield a significance with any predictor site. At these supplemental stations, the predictor site with the highest correlation with the supplemental site was 'forced' to provide the regression.
5. These regression equations were pasted into an Excel spreadsheet which contained the daily data for the 6 stations. The daily data was predicted for the 56 monthly stations.
6. The predicted versus observed values were compared for Feb, Mar, and Apr 1st 1996-8, for the 56 dependent variables. Predictions were very good. (This output is also available for review)

After the process was completed Farnes pointed out that Gros Ventre Summit is a long-term daily site rather than a supplemental site. Its daily data was located on a disk from Coughenour and substituted for the predicted data. Because its snow pattern is similar to Togwotee Pass, Phillips Bench, and Base Camp, we saw no need to rerun the regressions which used those sites. Thus there are 7 long-term stations, and 55 supplemental sites used in the final snow model runs.

With the predicted daily data for all 62 stations over the 20-year time span, the snow model allows us to run a simulation of SWE for any day of the snow-year during those 20 years. The primary output of that model is an ASCII file with SWE for each of the cells in the original input grids. Additional output includes a fit-comparison of observed versus predicted SWE at each site, and a file containing r^2, slope, and intercept of the regression function used in the model.

The output ASCII file is imported into Arcview and converted to a grid for visual inspection. The grid is then smoothed twice with a 5x5 filter using Arcview's "FocalStats" function. This smoothing is recommended by Coughenour and causes most of the banding and striping remnant from the DEM to disappear. Adjusting the legends to create any SWE threshold provides the needed visual reference for the migratory switch used in the forage utilization model. A dynamic snow map was also created which visually steps through the winter on a weekly basis in 1997, 1998, and 1999.

Although SWE grids currently begin when depth hits 2 inches, they can be generated anytime snow is present. Grids were modeled four times a month for each snow-water-year on the 1st, 8th, 15th, and 23rd.

Grids were begun when SWE hit 2" at any station and continued until SWE fell below 2". The earliest occurrence was October 15th; the latest was July 15th. Grids have a 30 meter pixel size and have 1851 rows and 2425 columns for a total of 4,488,675 cells.

The Gros Ventre Correction

At the meetings in Jackson in August 2000, it was agreed that the snow model over estimated SWE in the Gros Ventre Valley because of the snow shadow downwind of the Tetons. Also in the original snow modeling, no input data for the snow model -- which comes from the daily and supplemental sites – exists in the Gros Ventre Valley, the closest being Gros Ventre summit. To test this theory, Farnes' team collected supplemental SWE data in the Gros Ventre during the winter of 2000. Two dates, February 1st and March 1st , provide enough data points to feed the snow model and check its results. The model was run using all the data for those two dates and the results were discussed with Farnes at a meeting in Fort Collins in October.

While these dates clearly provided a different snow picture than the previous modeling, it was also known that WY2000 was a very light snow year, and thus its effects were questionable. In specific, the predictions at Darwin Ranch were well below the actual measurements. Also, the correction provided a broad and sharp SWE reduction over vast areas in the Gros Ventre. During the meeting with Farnes in October, he described different data not yet analyzed from snow stations at Darwin Ranch and from the feedgrounds in the Gros Ventre. This data comes from four sites – Alkali Feedgrounds, Patrol Cabin Feedgrounds, Fish Creek Feedgrounds, and Darwin Ranch and was collected by the USFS.

This data was sent to Fort Collins in late November and fed into the snow model and was used in two ways. First, we checked the WY2000 snow correction map against these dates, and found that the WY2000 correction was indeed overcorrecting, especially at Darwin Ranch. Because this new data was spread across years 1996-1998, it provided measurements from deeper snow years. Second, we substituted this data into the snow model and made a new correction map. At a meeting in December with Hobbs, Singer, Zeigenfuss, and Wockner, we decided that this newest correction provided the best estimate. Not only did predicted/observed measurements match better at all sites, it also provided the needed correction in the Gros Ventre Valley while leaving the higher elevations with greater snow. The model and the correction were run on several dates, and all provided a reasonable fit.

Figure 1 and Figure 2 (in this appendix) are graphics of the before and after snow model runs on January 14, 1998. These figures clearly depict that the new Gros Ventre data provides a very different SWE picture for the Gros Ventre Valley. The results for several other dates are not shown here but give the same pattern. Additionally, these new data points change the SWE map only a small amount over the southeast quadrant of the study area, whereas previous corrections changed it greatly. Figure 3 is the actual correction map, the details of its creation are below.

Creating the Gros Ventre Correction Map

The correction map was created using these steps:

1. Run the snow model with and without the Gros Ventre data for 12/20/1996 and 01/14/1998. These two dates were picked because they had the highest SWE of the additional dates. Because the larger carrying capacity model is driven by depth-of-winter forage needs in above average snow winters, these highest SWE dates provide the best estimation of severe conditions.
2. Create a 'multiplier grid' on each date which reflects the value the "before" grid must by multiplied by to create the "after" corrected grid. For each date, divide the 'after'

SWE by the 'before' SWE. Thus, if the before SWE grid had a cell that was "7" and after was "4", then a new grid is created with the "multiplier" of "0.5714" in that cell.

3. Average the two "multiplier grids" from the two different dates to best take advantage of the temporal data, thus creating an "average multiplier grid".
4. Define a geographic area around the Gros Ventre Valley in which SWE are measurably different in the "before" and "after" grids and select out the "average multiplier grid" in this area. This area was defined by the Gros Ventre watershed from a GIS coverage.
5. Create a final "correction grid" in which all cells in the broader study area are "1" and the Gros Ventre selection area has the value of the "average multiplier grid".

Thus finally, in the Forage Accounting Model loop, the SWE grid will be multiplied by the "correction grid". The SWE values will be retained in all areas except the Gros Ventre Valley which will be adjusted downward accordingly. This will happen quickly, easily, and unnoticeably in the model. The "correction grid values" are the numbers by which the original SWE grids will be multiplied to adjust downward.

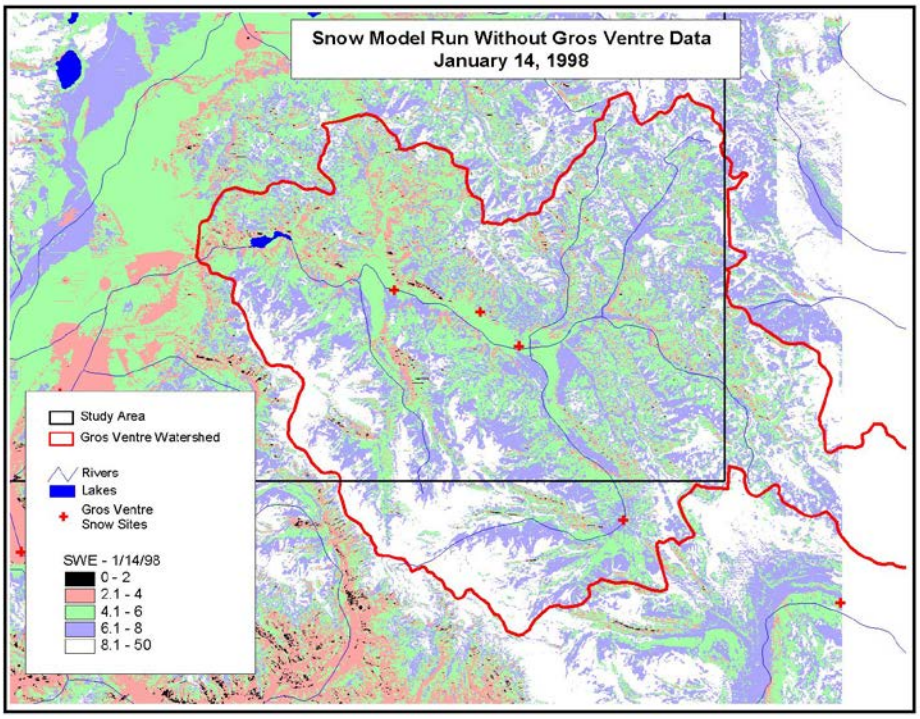


Figure 1. Snow model run without Gros Ventre data on January 14, 1998.

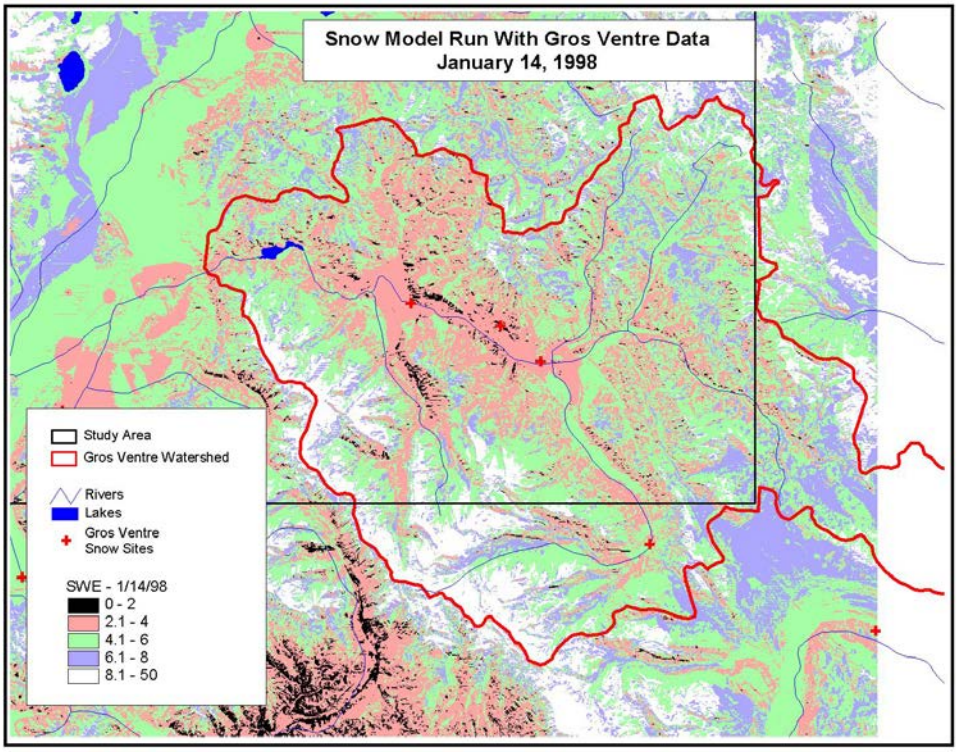


Figure 2. Snow model run with Gros Ventre data on January 14, 1998.

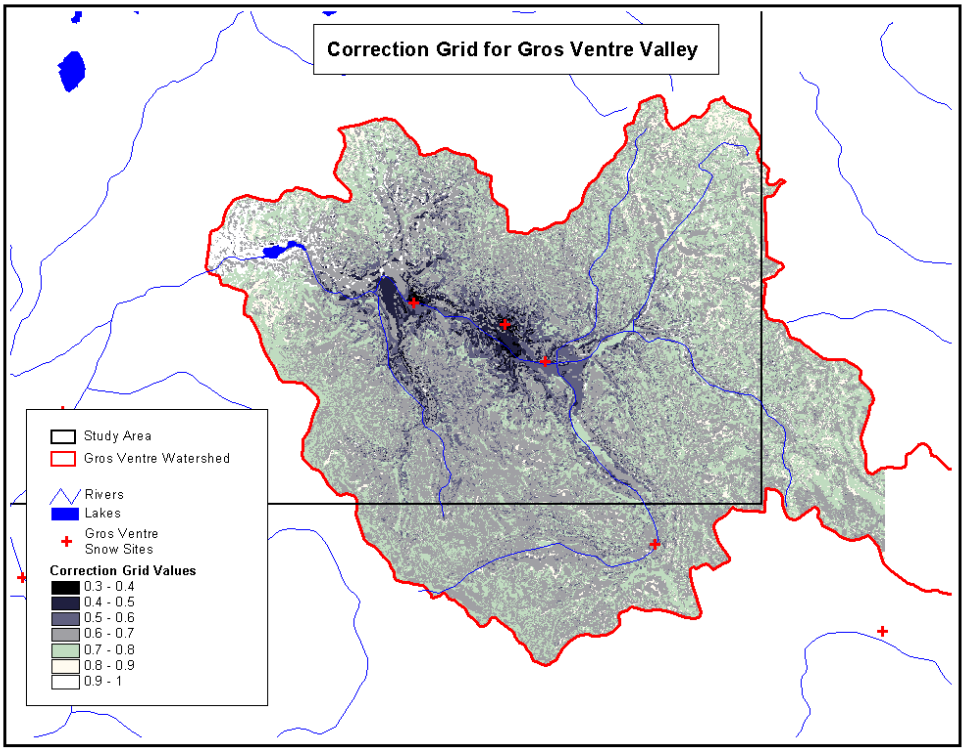


Figure 3. Correction grid for the GrosVentre valley.

Appendix C: Tables

Table 1. Vegetation Coverage Crosswalk Table

	Utah State			NER		GTNP		Our Model	
CODE	COVER_TYPE	Canopy	CODE	COVER_TYPE	CODE	COVER_TYPE	**CODE**	COVER_TYPE
	Conifer Trees			**Woodlands**		**Trees (successional stage)**		**Trees**
1	alpine fir	<30%					**1**	Spruce-fir
2	alpine fir	30-59%						
3	alpine fir	>59%						
8	alpine fir/lodgepole pine	30-59%						
9	alpine fir/lodgepole pine	>59%						
10	alpine fir/spruce	<30%			40	Spruce-Fir(0)		
11	alpine fir/spruce	30-59%			41	Spruce-Fir(1)		
12	alpine fir/spruce	>59%			42	Spruce-Fir(2)		
46	spruce, englemann	30-59%			43	Spruce-Fir(3)		
47	spruce, englemann	>59%			44	Spruce-Fir(4)		
14	alpine fir/whitebark	30-59%						
16	doug fir	<30%			20	Douglas-Fir(0)	**2**	Douglas Fir
17	doug fir	30-59%			21	Douglas-Fir(1)		
18	doug fir	>59%			22	Douglas-Fir(2)		
					23	Douglas-Fir(3)		
					24	Douglas-Fir(4)		
23	doug fir/lodgepole pine	30-59%	21	PSEUDOTSUGA MENZIESII-PINUS CONTORTA				
5	alpine fir/doug fir	30-59%						
6	alpine fir/doug fir	>59%						
32	juniper, utah	30-59%	20	JUNIPERUS SCOPULORUM-AGROPYRON	64	Open_Woods/Juniper		
67	maple	>59%						
70	mountain mahogany	30-59%						
71	mountain mahogany	>59%						
37	lodgepole pine	<30%			31	Lodgepole_Pine(1)	**3**	Subalpine Pine
38	lodgepole pine	30-59%			32	Lodgepole_Pine(2)		
39	lodgepole pine	>59%			33	Lodgepole_Pine(3)		
					34	Lodgepole_Pine(4)		
40	lodgepole sapling	>59%			30	Lodgepole_Pine(0)		
48	subalpine pine	<30%			50	Whitebark(0)		
49	subalpine pine	30-59%			51	Whitebark(1)		
64	aspen/conifer	30-59%			52	Whitebark(2)		
					53	Whitebark(3)		
					54	Whitebark(4)		
52	doug fir/limber pine	30-59%						
60	aspen	<30%	16	POPULUS TREMULOIDES-CALAMAGROSTIS RUBESCENS	70	Aspen(0)	**4**	Aspen
61	aspen	30-59%	17	POPULUS TREMULOIDES/SYMPHORICARPOS	71	Aspen(1)		
62	aspen	>59%	18	POPULUS-TREMULOIDES-SALIX	72	Aspen(2)		
			19	POPULUS TREMULOIDES-	73	Aspen(3)		

				PSEUDOTSUGA				
					74	Aspen(4)		
111	decidious tree riparian		22	POPULUS ANGUSTIFOLIA-POA	90	Cottonwood(0)	**5**	Riparian Forest
			23	POPULUS-ANGUSTIFOLIA-ARTEMISIA TRIDENTATA	91	Cottonwood(1)		
			24	POPULUS ANGUSTIFOLIA-MIXED SHRUB	92	Cottonwood(2)		
			25	POPULUS ANGUSTIFOLIA-DECIDUOUS SHRUB	93	Cottonwood(3)		
					94	Cottonwood(4)		
112	riverine riparian				81	Mixed_Forest(1)		
					82	Mixed_Forest(2)		
					83	Mixed_Forest(3)		
					84	Mixed_Forest(4)		
	Shrubs			**Shrublands**		**Shrubs**		**Shrubs**
75	big sagebrush		9	ARTEMESIA TRIDENTATA -POA (on flats)	13	Dry_Sagebrush	**6**	Sagebrush
			10	AR- TRIDENTATA-AR-TRIPARTITA (grass on slopes)				
			15	ARTEMISIA TRIDENTATA-BROMUS				
82	mountain big sage				12	Moist_Sagebrush/Cinquefoil		
					15	Moist_Sagebrush		
114	shrub riparian		12	SALIX/CAREX	11	Tall_Shrub	**7**	Shrub Riparian/Willow
			13	SALIX/BROMUS	14	Low_Willow		
					81	Tall_Shrub (>7400')		
			5	SUBIRRIGATED POA				
113	herbaceous riparian							
81	montane shrub		14	SYMPHORICARPOS-ROSA			**8**	Montane Shrub
76	bitterbrush							
77	burn shrub							
80	low sagebrush							
83	mountain low sage							
86	silver sage				57	Shrub-dominated_Avalanche_Chute		
	Herbaceous			**Grassland**		**Grasses**		**Grasses**
87	alpine shrub				63	Krumholtz		
90	alpine herbaceous				34	High_Elevation_Grassland	**9**	Alpine Herbaceous/Shrub
					51	Tundra		
92	burn herbaceous						**10**	Dry Montane Meadow/Grassland
93	clearcut herbaceous							
94	dry meadow		7	AGROPYRON-STIPA (Gros Ventre hills and slopes)	24	Dry_Forb_Meadow		
					74	Dry_Forb_Meadow (>7400')		
95	perennial grass		6	AGROPYRON POA (on flat)				
96	perennial grass slope		8	AGROPYRON/POA (Miller Butte)	35	Dry_Grassland/Meadow		
97	perennial grass montane				42	Dry-Moist_Forest_Opening		
					33	Moist_Grassland/Meadow		
					73	Moist_Grassland/Meadow (>7400')		
98	tall forb montane				21	Forb_Dominated_Seep		
					22	Wet_Forb_meadow		
					82	Wet_Forb_Meadow (>7400')		

					23	Moist_Forb_Meadow		
					58	Graminoid/Forb-dominated_Avalalanche Chute		
99	wet meadow		11	POTENTILLA-FRUCTICOSA/CAREX	32	Wet_Meadow	**11**	Wet Meadow
					72	Wet_Meadow (>7400')		
					41	Wet_Forest_Opening		
	Wetland			**Wetlands**		**Wetland**		**Wetland**
120	deep marsh						**12**	Wetland/Sedge Marsh
121	shallow marsh		3	CATTAIL/ (TYPHA-SCIRPUS)	71	Marsh/Fen (>7400')		
			4	CAREX-JUNCUS	31	Marsh/Fen		
122	aquatic bed							
123	mud flat							
	Miscellaneous			**Other**		**Other**		**Other**
107	water		1	Pond	55	Water_Body	**13**	Water/Rock/Snow
			2	Stream	54	Water_Course		
101	barren				56	Cliff		
104	rock				52	Bedrock		
					53	Talus		
108	snow							
	Land-use			**Cultivated Fields**		**Agricultural**		**Agricultural**
126	agricultural		26	BROMUS INERMIS-MEDICAGO SATIVA	59	Agricultural	**14**	Agricultural
			27	BROMUS INERMIS-MIXED GRASS				
			28	ELYMUS JUNCEUS				
			29	ELYMUS CINEREUS				
			30	POA PRATENSIS				
			31	AGROPYRON-MIXED GRASS				
			32	ALOPECURUS ARUNDINACEUS				
			33	PHLEUM PRATENSIS-POA				
			34	AGRPPYRON INTERMEDIUM				
			35	AGROPYRON ELONGATUM				
129	disturbed, high						**15**	Developed/disturbed
130	disturbed low							
131	urban, high density				60	Human_Development		
132	urban, low density							

Table 2. Conversions of U.S. Forest Service production classes used in this analysis.

Class	Production range (lbs/acre)	Midpoint used for analysis (lbs/acre)
0	No production	0
1	1-50	25
2	50-300	175
3	300-500	400
4	500-750	625
5	750-1200	975
6	1200-2500	1850
7	2500-4000	3250
8	4000+	6000

Table 4. Offtake Calculations

Spreadsheet for calculating Pounds Offtake from Animal Numbers						
Actual numbers Year 2000 -- 12,771 elk						
Elk	**Number of Animals**	**Average Weight (lbs)**	**Total Animal Pounds**	**Daily Offtake**	**Weekly Offtake**	**Elk % of Total**
Juveniles	1915	200	383000			0.1499491
Yearlings	646	350	226100			0.0505834
Adults (F)	8354	500	4177000			0.6541383
Adults (M)	1856	675	1252800			0.1453293
Total	12771	1725	6038900	120778	905835	
Moose						
Calves	162	200	32400			
Cows	466	700	326200			
Bulls	261	1300	339300			
Total	889	2200	697900	13958	104685	
Bison						
Calves	50	350	17500			
Yearlings	100	600	60000			
Cows	150	1350	202500			
Bulls	200	2000	400000			
Total	500	4300	680000	13600	102000	
			Total Weekly Offtake		**1112520**	
With 6,000 Elk						
Elk	**Number of Animals**	**Average Weight (lbs)**	**Total Animal Pounds**	**Daily Offtake**	**Quarter-month Offtake**	**Elk % of Total**
Juveniles	900	200	179938			0.1499491
Yearlings	304	350	106225			0.0505834
Adults (F)	3925	500	1962414			0.6541383
Adults (M)	872	675	588583			0.1453293
Total	6000	1725	2837162	56743	425574	
Moose						
Calves	162	200	32400			
Cows	466	700	326200			
Bulls	261	1300	339300			
Total	889	2200	697900	13958	104685	
Bison						
Calves	50	350	17500			
Yearlings	100	600	60000			

Cows	150	1350	202500			
Bulls	200	2000	400000			
Total	500	4300	680000	13600	102000	
			Total Weekly Offtake		**632259**	

Table 5. Vegetation Code Crosswalk Table

Vegetation Type (Utah State)	**Percent Cover**	**Snow Model Code**
alpine fir	<30%	21
alpine fir	30-59%	22
alpine fir	>59%	24
alpine fir/doug fir	30-59%	22
alpine fir/doug fir	>59%	24
alpine fir/lodgepole pine	30-59%	22
alpine fir/lodgepole pine	>59%	24
alpine fir/spruce	<30%	21
alpine fir/spruce	30-59%	22
alpine fir/spruce	>59%	24
alpine fir/whitebark	30-59%	22
doug fir	<30%	41
doug fir	30-59%	42
doug fir	>59%	44
doug fir/lodgepole pine	30-59%	42
lodgepole pine	<30%	33
lodgepole pine	30-59%	31
lodgepole pine	>59%	32
lodgepole sapling	>59%	30
spruce, englemann	30-59%	22
spruce, englemann	>59%	24
subalpine pine	<30%	51
subalpine pine	30-59%	52
doug fir/limber pine	30-59%	42
aspen/conifer	30-59%	34

Vegetation Type GTNP (successional stage)	
Lodgepole Pine (0)	30
Lodgepole Pine (1)	31
Lodgepole Pine (2)	32
Lodgepole Pine (3)	33
Lodgepole Pine (4)	34
Spruce/Fir (0)	20
Spruce/Fir (1)	21
Spruce/Fir (2)	22
Spruce/Fir (3)	23
Spruce/Fir (4)	24
Douglas Fir (0)	40
Douglas Fir (1)	41
Douglas Fir (2)	42
Douglas Fir (3)	43
Douglas Fir (4)	44
Whitebark Pine (1)	50
Whitebark Pine (2)	51

Whitebark Pine (3)	52
Whitebark Pine (4)	53
Whitebark Pine (5)	54

Vegetation Type NER

Pseudotsuga Menziesii/Pinus Contorta	32

Table 6. Snow Sites, Elevation, Location

Site #	Elevation (meters)	UTM east	UTM north	Name
1	1895.00	519300	4814300	/Jackson
2	1966.00	522900	4833400	/Moose
3	2075.00	533100	4855800	/Moran
4	2148.00	544800	4865500	/Basecamp
5	2574.00	508200	4818100	/Phillips bench
6	2900.00	575000	4844600	/Togwotee pass
7	1974.00	519180	4831640	/Boys Ranch
8	1973.00	518910	4831620	/Death Canyon
9	1955.00	518330	4830630	/RLazy S
10	1962.00	517360	4829690	/Wilson Road
11	1965.00	522980	4833440	/Moose W.S.
12	2017.00	521470	4836720	/Beaver Creek
13	1986.00	524570	4834260	/Blacktail Butte
14	2092.00	531120	4844660	/Deadman's Bar Rd
15	2072.00	536830	4848150	/Moosehead Ranch
16	2047.00	539250	4852900	/N. Elk Ranch
17	2048.00	539180	4854300	/Buffalo R.S.
18	2056.00	536480	4856860	/Oxbow Bend
19	2092.00	544870	4853780	/Buffalo Valley R
20	2083.00	545740	4854830	/Road 30083
21	2107.00	546590	4855490	/Buffalo Run
22	2072.00	548180	4853110	/KOA Picnic Area
23	2100.00	552210	4852300	/Black Rock R.S.
24	2013.00	527170	4834620	/Antelope Flat
25	2067.00	529600	4835550	/Mailbox Corner
26	2046.00	529620	4837780	/Schwering Studio
27	2108.00	531930	4834670	/Lobo Hill
28	2026.00	530450	4829060	/Highlands Jct
29	2024.00	528200	4828730	/Highlands Loop
30	1958.00	521490	4827770	/Airport
31	1976.00	524720	4827510	/Gros Ventre Rive
32	1939.00	521550	4823160	/Gros Ventre Turn
33	1900.00	521580	4820200	/Fish Hatchery
34	1895.00	519420	4814490	/Jackson W.S.
35	1908.00	520480	4814080	/NER HQS
36	2044.00	522090	4839860	/Lupine Meadows
37	2099.00	522290	4847720	/Jenny Lake Lodge
38	2115.00	524050	4848370	/N. Jenny Lake Jc
39	2098.00	530950	4852040	/Sewage Ponds
40	2065.00	520700	4857000	/Moran Bay SC
41	2102.00	533860	4860760	/Pilgrim Creek
42	2084.00	529440	4861970	/Coulter Bay
43	2070.00	529790	4835310	/Hunter Hay WE
44	2100.00	530990	4835510	/Hunter Hay NS

```
45        1977.00     522120    4834280 /Bar BC Road
46        2023.00     523420    4838230 /Bar BC Road B
47        2022.00     523920    4838180 /Bar BC Mid
48        1983.00     524770    4837980 /Bar BC FP
49        2025.00     523020    4838280 /Bar BC Mid RD
50        2094.00     531450    4851700 /RKO Road Flats
51        2095.00     536450    4859500 /RKO PL
52        2040.00     535500    4851200 /RKO Willow Flat
53        1938.00     513860    4825940 /Ski Area Base
54        1954.00     511080    4820820 /Phillips Canyon
55        2138.00     532700    4835100 /Elbo Ranch
56        2393.00     558800    4852100 /Four Mile Meadows
57        2106.00     558200    4856100 /Turpin Meadows
58        2668.00     570500    4804200 /Gros Ventre Summit
59        2312.00     519600    4811900 /Snow King Mountain
60        2243.00     525000    4876800 /Huckleberry Divide
61        2150.00     521100    4882800 /Glade Creek
62        2456.00     502700    4816300 /Teton Pass W.S.
```

TABLE 7. STATION ASSIGNMENT FOR REGRESSION FUNCTION

PREDICTOR STATIONS		
Jackson	Moose, Moran	Base Camp, Phillips Bench, Togwotee Pass
PREDICTED STATIONS		
Buffalo Valley Road Fish Hatchery Jackson W.S. NER H.Q.	Death Canyon, R Lazy S Boys Ranch, Wilson Road Buffalo R. S., Moose W.S. Beaver Creek, Blacktail Butte Deadman's Bar, Moosehead Ranch N. Elk Ranch, Road 30083 Buffalo Run, KOA campground Blackrock, Antelope Flat Mailbox, Schwering Studio Lobo Hill, Oxbow Bend Highlands Jct., Highlands Loop Airport, Gros Ventre River Gros Ventre Turnout, Lupine Meadows Sewage Pond, Pilgrim Creek Coulter Bay, Hunters Hayfield WE Hunters Hayfield NS, Bar BC Road Bar BC Road B, Bar BC Mid Bar BC FP, Bar BC Mid Road RKO Road Flats, RKO PL RKO Willow Flat, Ski Area Base	Jenny Lake Lodge N. Jenny Lake Jct. Moran Bay S.C. Phillips Canyon Snow King Mountain Huckleberry Divide Glade Creek Teton Pass W.S. Gros Ventre Summit

From: Cole, Eric
To: Jeffrey Warren
Subject: Copy of December 2002 Hobbs Model report. Note still waiting on Feb 2003 version
Date: Thursday, May 14, 2015 4:27:57 PM
Attachments: TBISON7.doc

Winter Mortality Model results appear unchanged from Feb 2003 version.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432 (Note new phone # as of June 2014)

Assessing Management Alternatives for Ungulates in the Greater Teton Ecosystem using Simulation Modeling

December 2002
Final Report



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Introduction

Managers of ungulate populations in the Greater Teton Ecosystem and the National Elk Refuge have asked three questions about interactions between populations of native ungulates, notably elk and bison, and the winter habitats that support those populations. We addressed these questions using simulation modeling.

The first question focuses on understanding the balance between supplies of forage on the winter range and the size of ungulate populations. In short, managers seek to know the number animals that can be supported by natural forage supplies under a range of weather conditions. To answer this question, we created the Forage Accounting Model (Part I of this report). The Forage Accounting Model simulates forage intake by ungulates across a range of elk population sizes and during a range of climatic conditions for the growing season and for winter. In addition, we simulated varied bison populations between 250 and 2000 animals for the Teton ecosystem. This model predicts the proportion of forage supplies that are consumed across the landscape (forage utilization) and also calculates 'forage deficits' caused by different population sizes in the system. Forage deficits represent the difference between the total supply of forage and the total forage required by ungulates. We exercised the Forage Accounting Model using assumptions from four of the Alternatives in the ongoing Environmental Impact Statement for ungulate management.

The forage accounting model predicts forage utilization by ungulates, but does not provide insight into the consequences of different levels of utilization. Thus, the second question we addressed focuses on the impacts of different levels of utilization of winter forage on ecosystem processes, primarily net primary production and nutrient cycling. To answer this question, we used the CENTURY Ecosystem Model (Part II of this report). The Century model simulates biogeochemical changes in vegetation and soil due to grazing. Using this model, we simulated intense grazing effects on two vegetation types prevalent on the Teton winter range -- wet meadow and sagebrush. We examined the effects of two levels of utilization (50% and 80%) on soil carbon, mineralized nitrogen, and net annual production over a one-hundred-fifty year time-span. Ongoing fieldwork by F. Singer will later be used to corroborate these simulations.

The third question focuses on the consequences of forage deficits for population performance. Specifically, we asked "What are the effects of food shortages on elk mortality? To answer this question, we employ the Over-Winter Mortality Model (Part III of this report). The Over-Winter Mortality Model estimates the energy balance of individual elk and simulates energy intake and expenditure in four age/sex classes. We estimate starvation mortality using the same scenarios for animal abundance, available forage, and snow conditions as in the Forage Accounting Model.

These three models complement each other in important ways. The Forage Accounting Model predicts forage supply, consumption, deficits, and utilization. The Century Ecosystem Model was developed for different projects at the Natural Resource Ecology Lab at Colorado State University and then adapted to our present needs, in part by using the utilizations predicted by the Forage Accounting Model. The Over-Winter Mortality Model was first developed for mule deer in Colorado and was adapted for elk to meet the needs of this project. It uses the forage supply, consumption, and deficits predicted by the Forage Accounting Model. We brought these three models together to provide reasonable answers to the questions raised by managers.

Here, we describe each model and the insight we gained from it. The first three sections of this document focus on each model and its results. In a final, concluding section, we aggregate results across models and draw general conclusions relevant to managing ungulates in the Greater Teton Ecosystem.

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Executive Summary

The Forage Accounting Model

We describe a simple accounting model that predicts imbalances between forage supply and animal forage requirements on winter ranges used by native ungulates (elk, moose, bison) in the Greater Teton Ecosystem and the National Elk Refuge. The model predicts *forage utilization* and *forage deficits.* Forage utilization is depicted by a map across the study area where cells are coded based on the percentage of pre-winter forage supplies that are consumed by native ungulates during winter. Forage deficits are defined as the amount of forage required by ungulates that exceeds the amount available during any week of the winter, summed over all weeks. The model is driven by data on forage standing crops at the beginning of winter, snow distribution during winter, pre-winter precipitation conditions, and offtake rates of ungulate populations.

We exercised the Forage Accounting Model in the Greater Teton Ecosystem under different conditions for elk population density (0-18,000 animals), and under different bison populations (250 - 2000) while holding moose populations constant (890). In addition to simulations for the ecosystem as a whole, we also exercised the model solely on the National Elk Refuge with elk populations of 0 -10,000, bison populations of 250 -2000, and 20 moose. The number of elk at which forage deficits begin to occur during a specific winter under specified assumptions represents an "equilibrium point" on the landscape at which forage supply and demand are in balance. Table 1 below provides a quick synthesis of these equilibrium points for each scenario in the EIS process for the broader Teton study area and NER.

Table 1. Number of elk at which forage supply and demand are in equilibrium

Alternative #1 (status quo, 500 bison, flood irrigation, willow available on NER)						
Pre-winter Precipitation Scenario	Drought			Mean		
Snow Severity Type	Severe	Above-average	Average	Severe	Above-average	Average
Greater Teton Ecosystem	0	1,800	5,500	1,000	6,000	16,000
NER only	0	0	2,000	0	0	5,000
Alternative #2 (no flood-irrigation, 500 bison, willow available on NER)						
Greater Teton Ecosystem	0	1,600	5,300	900	5,900	15,800
NER only	0	0	1,700	0	0	4,500
Alternative #3 (no willow available on NER, 1,000 bison, flood-irrigation)						
Greater Teton Ecosystem	0	0	3,000	0	5,000	14,000
NER only	0	0	0	0	0	3,300
Alternative #4 (center-pivot irrigation, 350 bison, no willow available on NER)						
Greater Teton Ecosystem	0	1,600	5,700	1,500	7,200	17,000
NER only	0	0	2,000	0	0	5,500

Although the numbers in Table 1 represent clearly demarcated points of equilibrium, each is associated with a margin of error, underlying assumptions, and an accompanying graph in the body of this report which should all be evaluated together. Additionally, although the numbers of elk in Table 1 represent the point at which deficits begin to occur, elk are known to rely on stored energy reserves to survive winters and therefore can likely incur small forage deficits without starving to death.

In addition to the above analysis, we also ran experiments with the Forage Accounting Model on the Greater Teton Ecosystem to examine effects of 1) removing all domestic grazing from public lands in the Teton ecosystem and 2) removing effects of agriculture and residential development on forage supplies in and around the town of Jackson. Our simulations suggested that removing all domestic grazing would have effects on forage deficits in all winter severity types because most domestic grazing does not occur on wildlife winter range. Providing forage to elk populations equivalent to the pre-settlement vegetation now subsumed by development in and around Jackson had negligible effects on forage deficits during severe winters. During average winters adding this forage substantially reduced deficits. by allowing elk to graze on the additional forage available. However, addition of these forage supplies did not *eliminate* forage deficits for the current population size of elk, suggesting that current elk numbers may exceed what could have been support in the Greater Teton Ecosystem under pristine conditions.

The CENTURY Ecosystem Model

The CENTURY Ecosystem Model simulates exchanges of carbon (C) and nitrogen (N) among atmosphere, soil, and vegetation. Required inputs used to drive the model include monthly maximum/minimum temperature and precipitation data, soil properties, vegetation type, and current and historical land use. Disturbances and management practices such as grazing, fire, cultivation, and fertilizer additions can be simulated. We simulated response of two vegetation types (wet meadow and sagebrush) to two levels of forage utilization by elk (50% and 80%)/ Other required inputs were estimated based on CENTURY modeling in similar systems. Current and ongoing Teton field sampling work by F. Singer on nitrogen pools and vegetation will later be used to corroborate these preliminary findings.

Because elk are consuming standing dead forage of low nutritional content during winter, CENTURY predicted that ungulate grazing will have not harm plant production on the winter range at either level of grazing intensity. Further, because grazing accelerated nutrient cycling, and because ungulates returning more nitrogen to the soil than they consume, higher grazing levels may actually *increase* future plant production. Resutls from CENTURY suggest that heavy winter-season grazing in this system, as predicted by the Forage Accounting Model, is sustainable and that soil C and nutrient levels are not significantly depleted and may increase. As long as elk are concentrated at high densities on the winter range, the CENTURY model will predict positive feedbacks on production due to higher net N inputs versus N offtake from grazing.

The Over-Winter Mortality Model

Forage deficits predicted by the Forage Accounting Model will likely cause elevated mortality in over-wintering elk populations. We adapted the energy balance model of Hobbs (1989) to estimate starvation mortality by simulating energy intake and expenditure by elk in four age/sex classes (calves, yearling males, adult females, bulls) during average, above average and severe winters with average pre-winter precipitation conditions. This energy balance model allocates elk populations to map cells based on snow water equivalents, allows elk to consume available herbaceous and shrubby forage, and predicts mortality based on forage shortfalls and animal nutritional needs.

Simulated mortality of calves ranged from a low of 4% during an average winter at a total population size of 6,000 to a high of 42% during a severe winter and a population of 18,000. Increasing population density was associated with roughly proportionate increases in estimated mortality. Starvation mortality for adult cows was predicted to be 1% for a population of 6,000

animals in an average winter rising to a high of 25% for a population of 18,000 during a severe winter.

Acknowledgements

Funding was provided by the Natural Resources Preservation Program (NRPP) – US Geological Survey, BRD and NPS fund, and from Grand Teton National Park. We acknowledge Robert Schiller of Grand Teton National Park for project organization and administration as well as Bruce Smith of the National Elk Refuge. We also thank Phil Farnes of Snowcap Hydrology and Montana State University for the snow model algorithms and snow measurements, and for assistance with refining the snow model; and Michael Coughenour of the Natural Resource Ecology Lab (CSU) for developing the snow model computer code.

Part I.
The Forage Accounting Model

Introduction

We constructed a forage accounting model to examine the consequences of management actions for balancing forage supplies with forage demands of populations of native ungulates in the Greater Teton Ecosystem and the National Elk Refuge. We first describe our modeling approach and explain two predictions made by the model, forage utilization and forage deficits. We then describe how the model works. We subsequently use the model to examine relationships among elk population density, bison populations, precipitation-based forage production, and winter severity. The model was run on two study areas: the Greater Teton Ecosystem, and the National Elk Refuge, and was used to predict forage deficits for each Alternative in the EIS on both study areas. In addition to describing the modeling approach and methods, this section of this report gives and interprets the results for all four EIS Alternatives.

Modeling Approach

Our modeling philosophy favors simple models over complex ones. This is because simple models are easier to explain, understand, and defend than models that include high levels of detail. Our approach is to begin with a simple, "base model", and add detail incrementally as it is needed to address questions unresolved by the simpler model.

We built a simple accounting model that keeps track of the impacts of different densities of ungulates on forage supplies as winter progresses. The model responds to annual variation in forage production, effects of snow on forage availability, and effects of grazing and browsing on the forage supply. We call it an accounting model because it is perfectly analogous to a model of cash reserves and flows in a business. In essence, it answers questions on the bottom line -- how much forage is used by populations of ungulates? Does that use produce a deficit or surplus at the end of winter? The accounting approach was motivated by the overriding central assumption used to justify supplemental feeding -- animals are fed during winter to compensate for deficits in forage supply. Thus, a logical starting point for our efforts was to quantify the magnitude of these deficits under different conditions.

The Concept of Forage Deficits and Forage Utilization

There are two concepts that are important in understanding the accounting model. The first concept is *forage deficits*. Forage deficits represent the difference between the total supply of forage available during the winter and the total forage required by a given population of ungulates, including bison, moose, and elk. Thus, forage deficits are affected by population size, which affects forage demand, as well as snow accumulation (measured as snow water equivalents, SWE) and forage production, which affects forage supply. We calculated forage deficits by estimating the daily intake of populations of a given size, subtracting that intake from the daily forage supply, and summing negative values over all time-steps of the winter.

The second concept, a common measure of habitat use, is called *forage utilization.* Forage utilization is simply the percent of forage removed from a given location in the study area. We depict this on a map where map-cells are coded with the utilization percent. Forage utilization gives us a measure of ungulate impact on habitat. Part II of this report, which discusses the

Century Ecosystem Model, will analyze and quantify the effect forage utilization on net primary production and nutrient cycling.

Model Description

Study Areas

Two study areas were delineated (Figure 1). The first, larger area, the Greater Teton Ecosystem, corresponds to the boundary depicted in the Steele et al. (1999) report on Jackson Valley vegetation. The southern boundary reaches to the southern edge of the Town of Jackson, the northern edge is at the north end of Jackson Lake, the western edge is about halfway between the crest of the Tetons and the Idaho Border, the eastern edge runs roughly to Togwotee Pass. This boundary roughly encompasses the current boundary of the Jackson elk herd as defined by Wyoming Game and Fish. In addition, it contains all of the supplemental snow measurement sites reported by Farnes et al. (1999). The second area is the boundary of the National Elk Refuge.

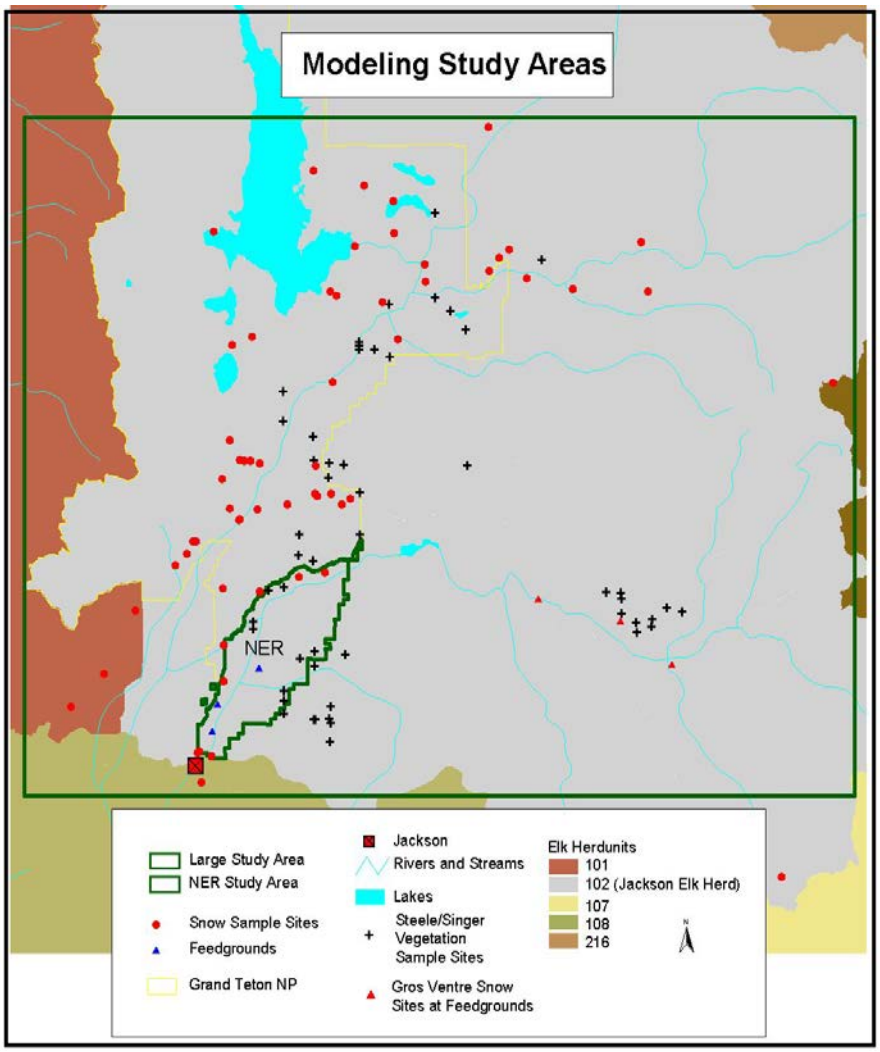


Figure 1. Study areas and other relevant locations for the project.

Algorithm

The model operates at a weekly time step (Figure 2). For each week of the winter, the model calculates snow water equivalents (SWE) on each 30 x 30 meter cell in the study area and sums the amount of forage that is available at each 1-inch SWE increment. Grazing/browsing pressure by populations of bison, elk, and moose is first allocated to the forage available in completely open areas (i.e., cells with 0 inches SWE). If additional demand exists, it is allocated to cells with 1 inch of SWE. Any additional demand is allocated to progressively greater snow depths, with a linear reduction in forage availability occurring in relation to SWE greater than 2 inches (Table 2). This approach has been used successfully to model effects of snow on forage availability in other studies (Hobbs 1989, Turner et al. 1994).

Table 2. Forage Availability Percentages

SWE inches	Percent of forage available
0	100
1	100
2	100
3	75
4	50
5	25
6	0

If there is forage demand in excess of the supply in all of the cells during any week, then this excess is accumulated in the *forage deficit*. At the end of the winter, we calculate *forage utilization* for each cell in the vegetation map by dividing the total amount of forage removed from each cell by the pre-winter standing crop of that cell.

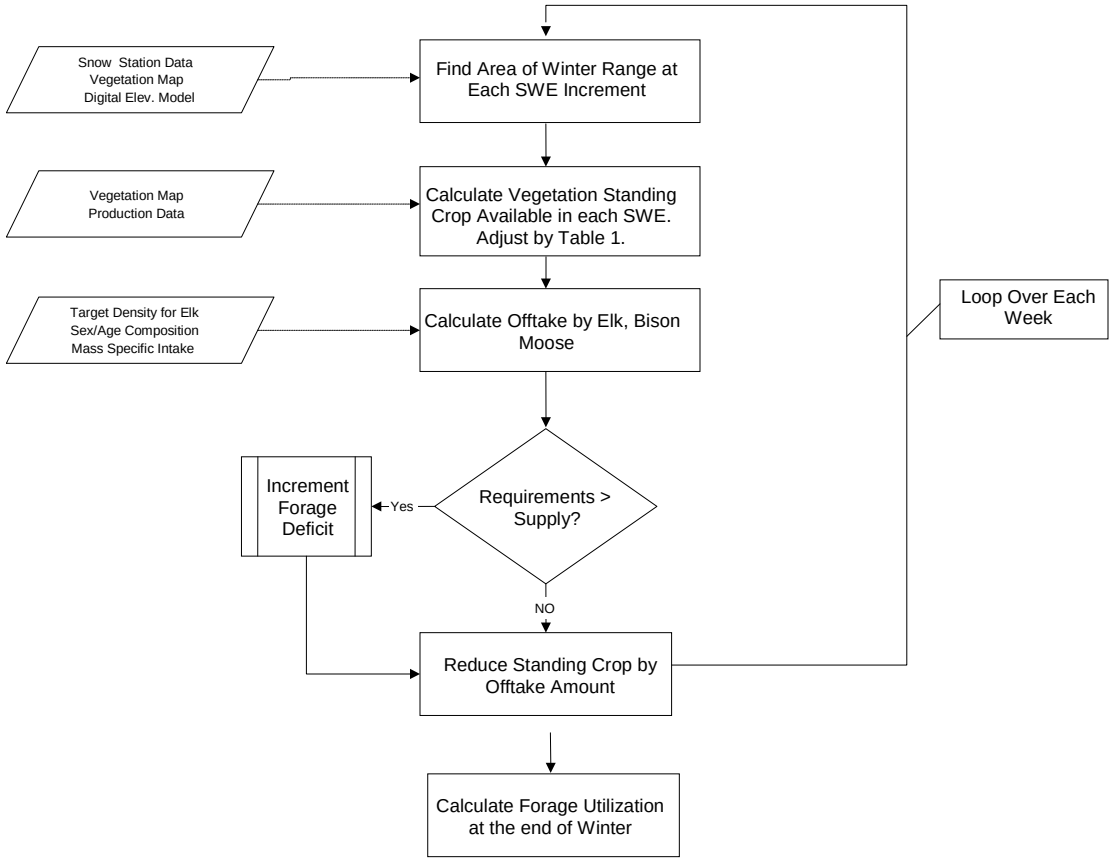


Figure 2. Flow chart of data and processes in the forage accounting model. The model cycles through these calculations at weekly intervals.

The model is driven by data on the standing crop at the beginning of winter, snow distribution during winter, and offtake rates of ungulate populations (Figure 2).

Vegetation Data
The accounting model requires spatially explicit data on production of vegetation available at the beginning of winter. We developed these data from maps of vegetation communities and field data on production in each community.

We obtained a complete vegetation coverage from Utah State University (Homer 1995) that was created in 1996 for all of U.S. Forest Service (USFS) Region 4 using remote sensing interpretation techniques. Vegetation coverages were also obtained from Grand Teton National Park (GTNP) and the National Elk Refuge (NER) (Figure 3). GTNP data were developed from aerial photography while NER data were developed from a combination of aerial photography and ground-based mapping. Discussions with other coverage users suggested that the NER coverage was the most accurate, followed by the GTNP coverage, followed by the Utah State coverage. Thus, we merged these coverages to use the most accurate data wherever it was available, using the Utah State coverage only to fill in gaps not covered by the GTNP or NER data.

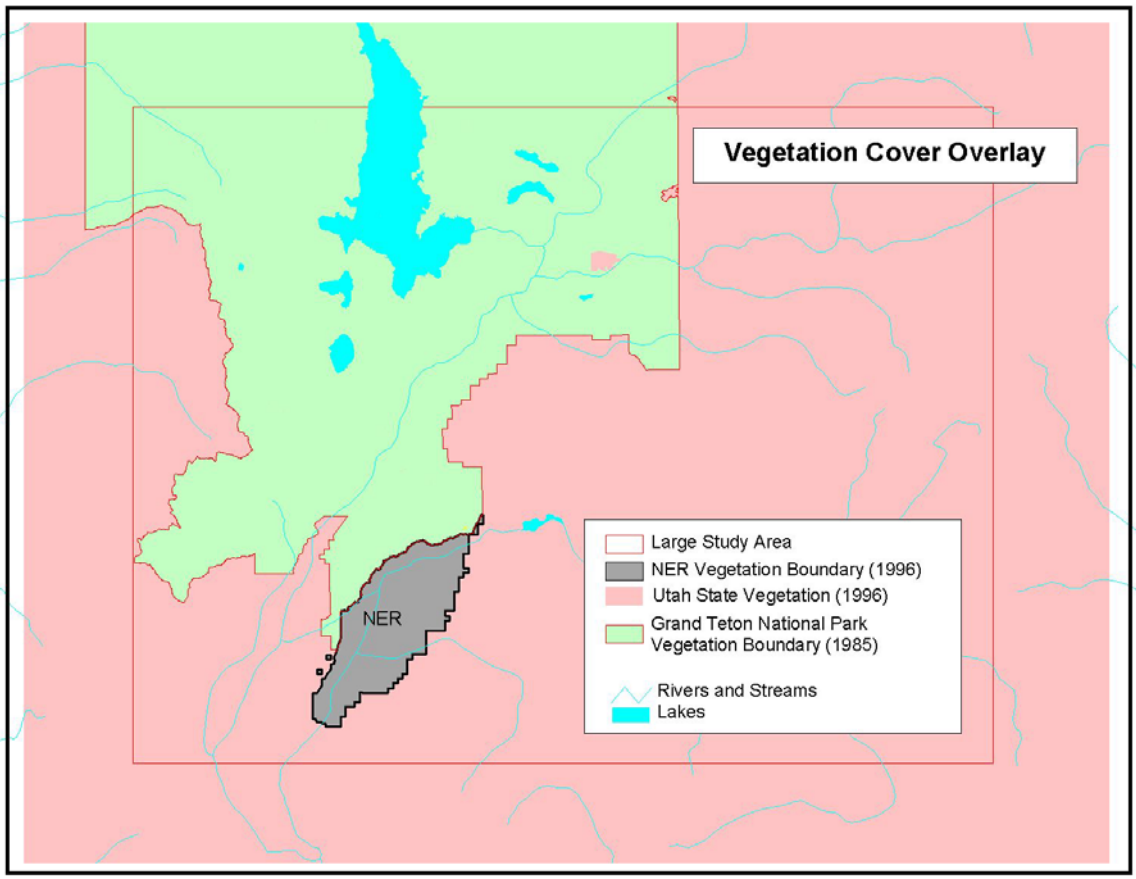


Figure 3. Coverages used to assemble unified vegetation map for the study area.

Because each coverage had different vegetation coding schemes, a crosswalk table was developed to convert the vegetation codes into a more standardized scheme (Appendix C: Table 1). The Utah State coverage had 68 separate vegetation types, GTNP had 60, and NER had 32. The

essential data in the vegetation table was the name of the vegetation type and the annual production of herb/shrub. This model folds these categories into 15 separate vegetation types (Figure 4). These categories were chosen because they provided usefully different vegetation types for which we could obtain production information in the nearby environment. Using the descriptions provided in the metadata for the Utah State University coverage, descriptions for non-forested (Mattson and Despain 1985) and forested (Steele 1983) habitat used to create the GTNP coverage, and the vegetation categories of the NER coverage, vegetation categories from each coverage were matched up as accurately as possible.

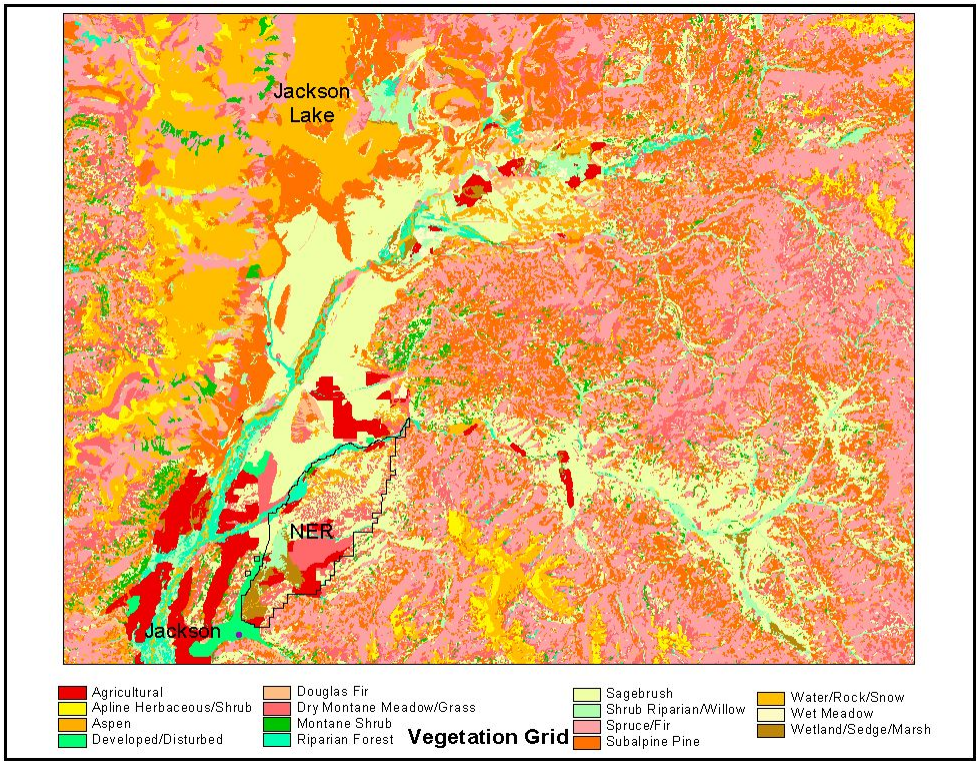


Figure 4. By using a cross-walk of vegetation categories, we combined data from three coverages to produce a single map representing 15 vegetation categories.

Data on annual production for each vegetation type were obtained from studies conducted by Biological Resources Division (BRD)--USGS, National Elk Refuge (NER)--USFWS, and Bridger-Teton National Forest (BTNF)--USFS. Each data set was collected in a different manner and so it was necessary to standardize the data so that they could be combined to create the largest data set possible for estimating average production values. Mean year, wet year, and dry year production values are given in Table 3 below. Wet year production equals 150% of the mean year; dry year equals 45% of the mean year. A detailed description of the methods used to derive these estimates are given in Appendix A.

Table 3. Vegetation Name and Production

Code	# of cells	Vegetation Name	Mean Production (pounds/acre)	Wet Year Production (pounds/acre)	Dry Year Production (pounds/acre)
1.	1158538.	Spruce/Fir	1162.	1743.	523.
2.	147739.	Douglas Fir	705.	1058.	317.
3.	834291.	Subalpine Pine	1167.	1751.	525.
4.	148500.	Aspen	1712.	2568.	770.
5.	68064.	Riparian Forest	2524.	3786.	1136.
6.	690177.	Sagebrush	1190.	1785.	536.
7.	147658.	Shrub Riparian/Willow	2125.	3188.	956.
8.	91805.	Montane Shrub	1708.	2562.	769.
9.	105584.	Alpine Herbaceous/Shrub	1693.	2540.	762.
10.	440890.	Dry Montane Meadow/Grass	895.	1343.	403.
11.	27067.	Wet Meadow	2385.	3578.	1073.
12.	34630.	Wetland/Sedge/Marsh	4760.	7140.	2142.
13.	457338.	Water/Rock/Snow	0	0	0
14.	117513.	Agricultural	2498.	3747.	1124.
15.	18881.	Developed/Disturbed	4334.	6501.	1950.

Spatial Heterogeneity of Forage and Initial Forage Availability

Managers raised a question about the spatial heterogeneity of production due to varying rainfall over the study area. For example, sagebrush on the NER may produce differently than sagebrush in the upper Gros Ventre drainage. We attempted to create a spatially explicit production map based on actual production measurements across the study area. However, these estimations did not yield significant spatial differences in production for each vegetation type. While we recognize that rainfall may vary across the area, and the production may vary with it, field data could not support these distinctions.

Although the production estimates in Table 3 represent total production on the landscape, a question was raised at a meeting of managers and modelers in Jackson in February 2002 about forage availability to ungulates. It was suggested that a significant amount of measured forage is totally unavailable to ungulates because it is unpalitiable or is obstructed by inedible plant tissue. Based on past experiences of measured offtake, meeting participants estimated this unavailability between 50% and 25%. Using elk offtake data gathered from the study area (Steele et al. 1999) and other offtake data from similar systems (Hobbs et al. 1996, Singer et al. 2002), we estimate this percentage to be 35%. Our model uses this estimation by initially decrementing the production values by 35% at the beginning of winter.

Snow Distribution

We predicted temporal and spatial variation in snow water equivalents (SWE) using a model developed by Michael Coughenour and Phil Farnes in the 1990's for Grand Teton National Park. The model uses input data from snow stations and interpolates among them to produce a surface of predictions. It was written as a broader precipitation model with the capabilities of predicting precipitation level, snow depth, and SWE, depending on various input and model switches. For

the current modeling effort, we used SWE because it is the primary determining factor for ungulate migratory behavior. A detailed description of implementation of the snow model and corrections developed for the Gros Ventre snow shadow are presented in Appendix B.

Ungulate Offtake

The model requires estimates of the total amount of forage consumed by elk, bison, and moose on the study area. We calculated offtake assuming that each animal consumes dry matter equal to 2% of its body mass each day (Cordova et al. 1978, Baker and Hansen 1985, Baker and Hobbs 1987). We estimated an average body mass for each ugulate species weighted by the sex and age composition of their current populations. Animal age/sex counts were obtained from participating state and federal wildlife agencies. Average weights for each species and for each age/sex class were gathered from literature (Meagher 1973, Houston 1982). A sample of the spreadsheet calculations used to estimate these weighted averages appear in Appendix C: Table 4.

Model Overlays

The model overlays a SWE grid on the vegetation grid during each time step. For example, when snow accumulation is relatively light, the model allows foraging over large areas of the winter range (Figure 5). However, when snow accumulation is heavy, there are very few areas that are open for foraging (Figure 6).

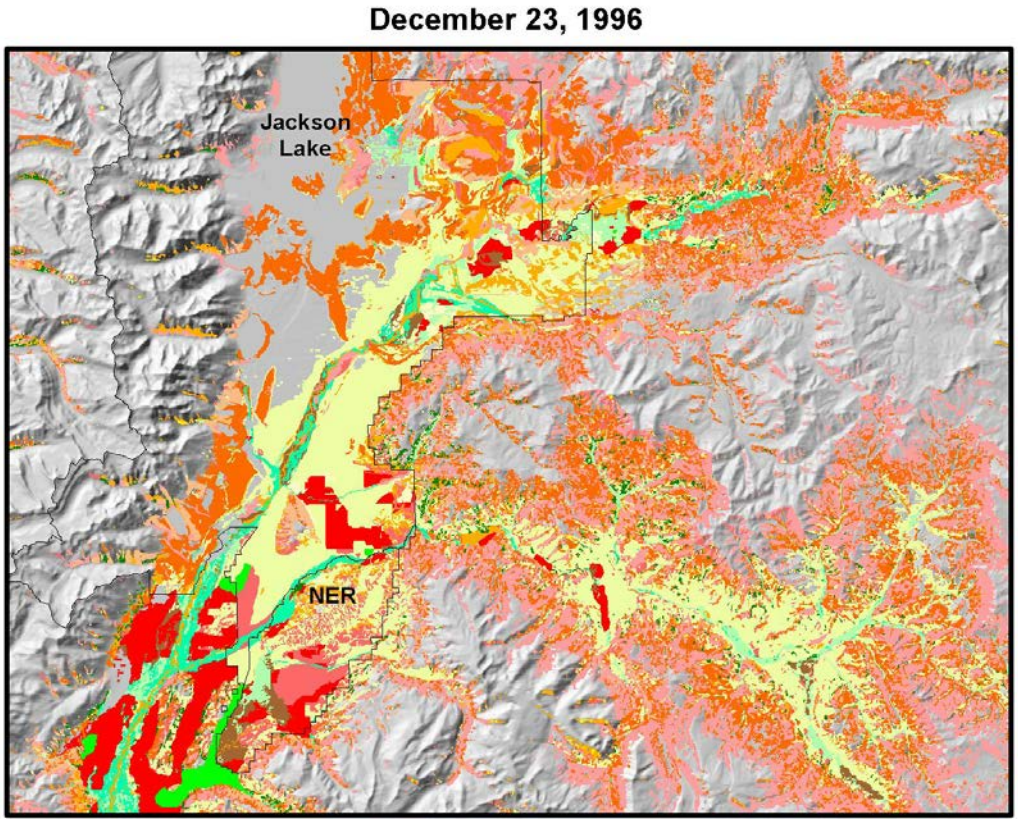


Figure 5. Overlay of snow accumulation ≥ 6 inches SWE on the vegetation map for December 23, 1996. Grey shading indicated areas of the landscape with ≥ 6 inches SWE. (Map adjusted for Gros Ventre snow correction.)

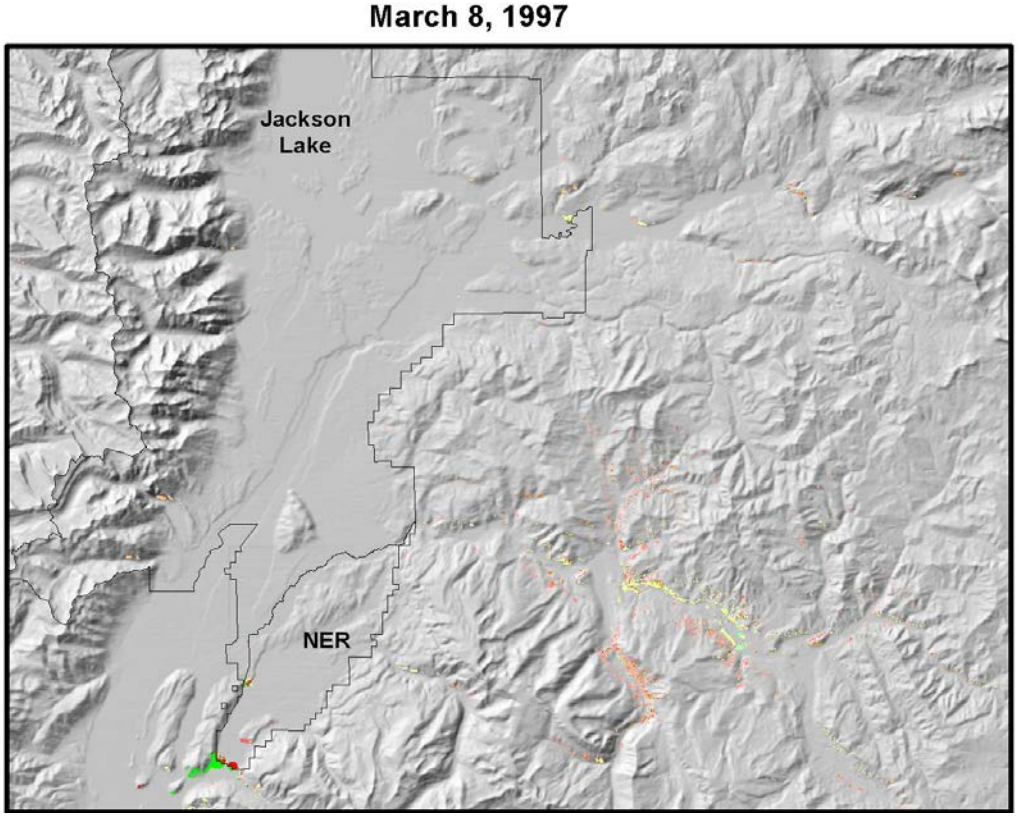


Figure 6. Overlay of snow accumulation ≥ 6 inches SWE on the vegetation map for March 8, 1997. Grey shading indicates areas of the landscape with ≥ 6 inches SWE. (Map adjusted for Gros Ventre snow correction.)

Modeling Scenarios

We exercised the model on both study areas -- the Greater Teton Ecosystem, and the NER (Figure 1). Within each study area we ran a series of simulations accounting for 1) varying populations of elk -- between 0 and 18,000, 2) varying SWE winters -- average, above average, and severe, 3) varying pre-winter precipitation conditions -- drought, mean, and wet, and 4) varying populations of bison as specified by the EIS Alternative's assumptions. On the Greater Teton Ecosystem, the model runs include offtake for 890 moose. On the NER, the model runs include offtake for 20 moose. On the Greater Teton Ecosystem, we varied elk populations between 0 and 18,000 animals, and ran enough simulations to get the shape of a trendline following the data points. On the NER, we varied elk populations between 0 and 10,000. Wintering bison populations have been growing very quickly in the valley. In 1999 there were roughly 500 bison in the study area whereas in 2002 the number was 650.

We varied winter severity using three types of winter snow conditions: average, above average, and severe. We chose 1996 as an example of an average winter, 1982 as a moderately severe winter, and 1997 as a severe winter. These choices were justified by consulting Farnes et al. (1999) which presents a table of estimated mean SWE for the 50-year recording period in the Hunter-Talbot hayfields. Using Farnes' table, we ranked snow severity using the SWE measurement on the hayfields. 1996 came in as the mean ranking while 1982 was above average. Although four winters prior to 1980 had data which was more severe than 1997, our snow data set only went back to 1980. Thus we used 1997 as the "most severe on record". We also consulted

with Farnes and got agreement about using these representative years. In addition to this ranking, we also calculated average areas open per day during the 6 snowiest weeks of each winter. Table 4 presents the areas open to ungulates, i.e., that have less than 6 inches of SWE for each winter.

Table 4. Average Acres Open per day in the six snowiest weeks of each winter

Acres Open (< 6" of SWE)	
Whole Study Area	
1996 – Average	50,947
1982 – Above Average	19,649
1997 – Severe	12,003
NER only	
1996 – Average	8,531
1982 – Above Average	2,560
1997 - Severe	690

Model Results on the Greater Jackson Ecosystem for EIS Alternative #1 (status quo)

We estimate the margin of error for the results in the Greater Teton Ecosystem to be $\pm$ 20%. We cannot firmly quantify this error, but believe, based on our expertise derived from similar systems, that $\pm$ 20% is a reasonable approximation.

These results should not be used as the sole factor in determining the appropriate numbers of elk and bison on the Teton ecosystem or the NER. Instead, these results should be used as a starting point for management decisions, and used along with other pertinent factors such as long-term local knowledge, the results of other research, and management objectives not factored into this modeling effort. We do not interpret these results as the "carrying capacity" of the landscape, nor do we support an interpretation that assumes specific levels of mortality based on forage deficits. "Carrying capacity" is a complicated ecological concept that is not directly addressed by this model, and mortality estimates are provided in Part III of this report.

Throughout this report, we refer to graphs of forage deficits as a function of elk population size. These graphs show how forage deficits change and elk numbers increase given a range of assumptions about weather and the abundance of bison. In evaluating the forage deficit graphs, we refer to the point where each line intersects the x-axis as the point where forage offtake exactly equals forage supplies. This point gives a reasonable estimate of the number animals needed to unbalance the forage supply/forage demand equilibrium. As populations increase above this level, that is, to the right of this intersection point, forage deficits will increase and forage requirements exceed supplies. Although forage deficits and an imbalance may occur, we do not suggest that mortality always follows. Elk are known to rely on stored energy reserves to survive winters and therefore can likely incur small forage deficits without starving.

Forage Deficits

Assumptions in Alternative #1 are "status quo", i.e., that management actions will be the same in the future as in the past. Flood irrigation will continue on the cultivated fields of the NER, elk will be able to browse the willow stands on the NER, and bison numbers will grow unregulated.

Figures 7 – 9 below depict forage deficits for Alternative # 1 under varying model conditions. Figure 7 depicts drought conditions, Figure 8 depicts mean precipitation conditions, and Figure 9 depicts wet precipitation conditions. Each figure has three sets of colored lines: the black set represents the average winter, the green set represents the above average winter, and the red set represents the severe winter. Each color of lines is also represented by three line types: the solid lines are the model runs for 500 bison, the dashed lines are for 1000 bison, and the dotted lines are for 2000 bison.

In Figure 7 (drought conditions), the solid black line touches the x-axis at about 5,500 elk. Thus we can interpret that in an average winter with 500 bison, as elk populations reach 5,500 and higher, forage deficits will begin to occur. Similarly, in an average winter with drought conditions with 1,000 bison (the dashed black line), forage deficits begin at approximately 3,800 elk in the entire Jackson ecosystem. In an above-average winter with 500 bison (the solid green line), forage deficits begin to occur at about 1,800 elk. As winter severity and bison numbers increase, deficits occur with smaller and smaller numbers of elk. The drought scenario utilizes 45% of the forage available in the mean precipitation scenario.

Note in Figure 7 that the solid red line (the severe winter with 500 bison) does not touch the x-axis. This is because deficits will begin to occur even when elk numbers are 0 animals. These deficits occur because in any week, all the available forage is being consumed by the 500 bison and the 890 moose on the landscape. This situation occurs in several of the modeled scenarios for the severe winter with high bison numbers, and in milder winters when bison numbers are high. This is the forage deficit that results soley from bison and moose populations, assuming that there were no elk competing with them for forage.

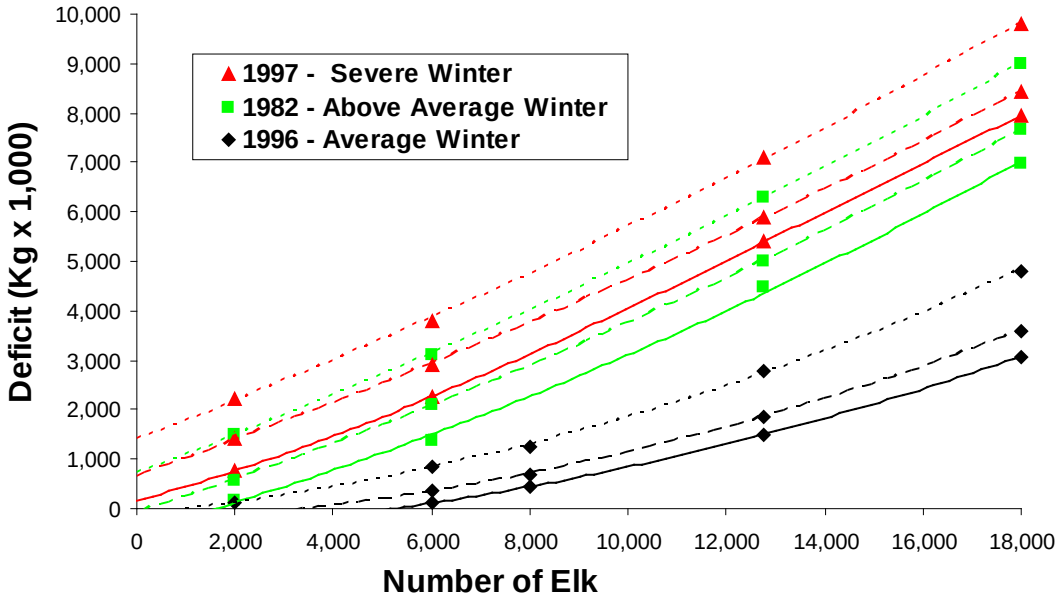


Figure 7. Drought scenarios for the Greater Teton Ecosystem -- Alternative #1.

Figure 8 depicts the modeled scenarios for mean precipitation conditions. The increase in precipitation causes significantly higher forage production across the landscape which translates into significantly more forage available to ungulates. Thus, compared to the drought scenarios,

forage deficits occur at much higher numbers of elk across all model runs. In the average winter with 500 bison (the solid black line), forage deficits occur at about 16,000 elk. In the above average winter with 500 bison (the solid green line), forage deficits occur at about 6,000 elk. The severe winter causes deficits to occur at much lower numbers of elk, about 1,000 with 500 bison. As in drought conditions with severe winters and high bison numbers, deficits occur at 0 elk.

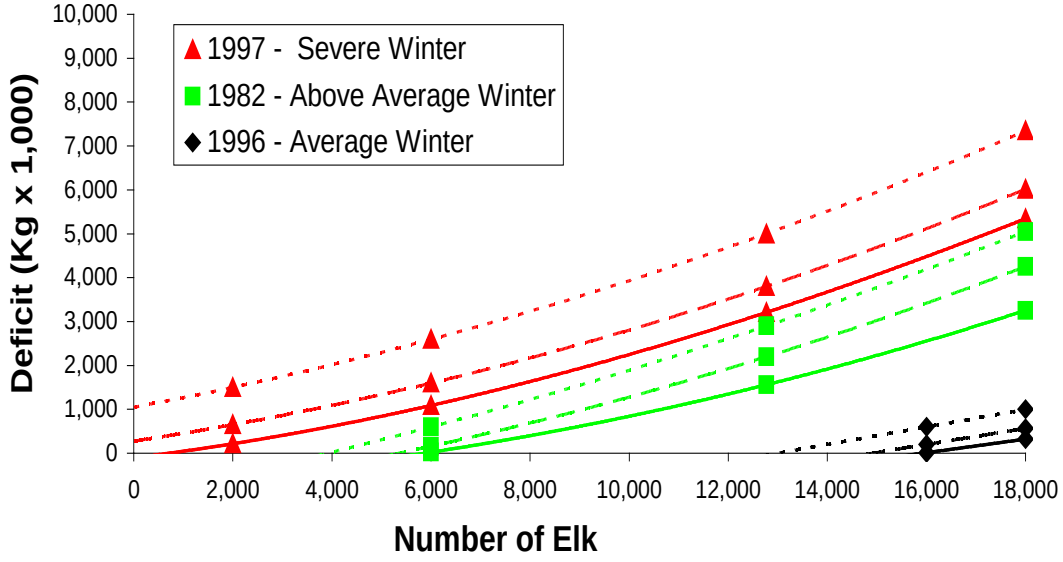


Figure 8. Mean precipitation scenarios for the Greater Teton Ecosystem -- Alternative #1.

Wet precipitation conditions (Figure 9) increase forage availability which similarly decreases forage deficits. In the wet precipitation scenarios, no deficits occur for any modeled population size of elk and bison in the average winter. In the above average winter with 500 bison, deficits occurred at 12,000 elk. In the severe winter with 500 bison, deficits started with 3,000 elk.

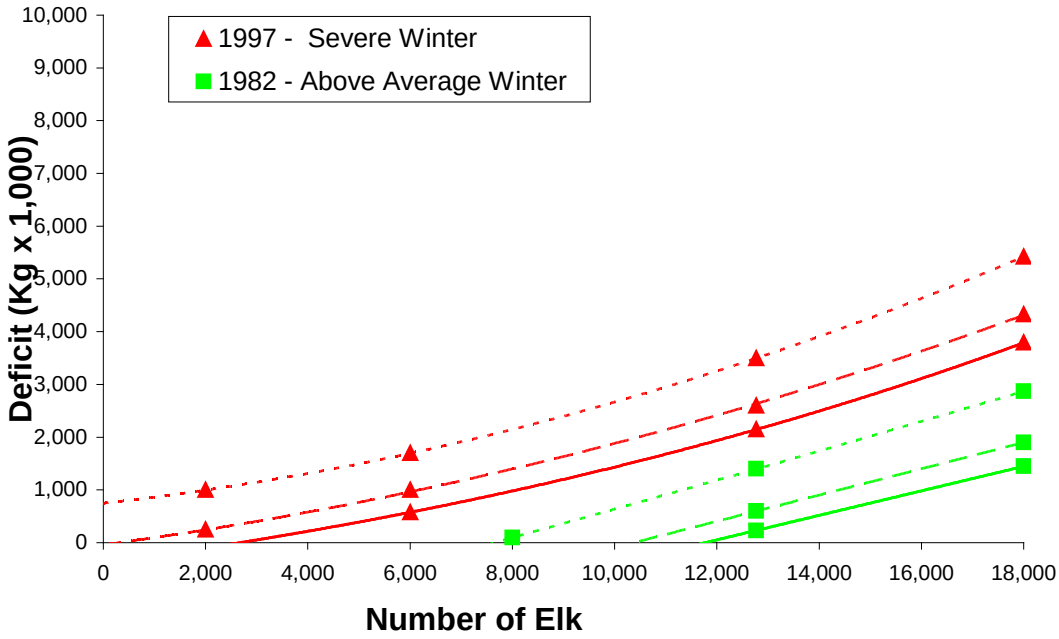


Figure 9. Wet precipitation scenarios for the Greater Teton Ecosystem –Alternative #1.

Forage Utilization

Forage utilization is simply the percent of forage removed from a given location in the study area as predicted by the forage accounting model. Managers are often concerned about forage utilization because high utilization can be construed as a measurement of habitat degradation. Here, we briefly describe utilization results, while leaving a quantified analysis of utilization effects for Part II of this report, "The Century Ecosystem Model".

For the utilization results, we held precipitation and bison variables constant, and varied the number of elk and winter severity. We estimate that between 42 and 155 km^2 of winter range will be used in excess of 50% in an average winter with 500 bison and with elk populations of 6,000 to 18,000 (Figure 10). Utilization area increases in the average winter because rising numbers of elk push out and onto low-SWE areas of the range. During above average and severe winters, we estimate between 61 and 105 sq km of winter range will be used in excess of 50%. As elk numbers rise in above average and severe winters, utilization area actually levels off. This effect occurs because snow is blanketing the landscape and prohibiting elk from moving onto outlying areas. As long as elk populations are above ~14,000 animals, more severe winters will protect forage from being highly utilized. It should be understood however, that this reduction in utilization will lead to increased deficits and probably lead to a sharp increase in starvation mortality.

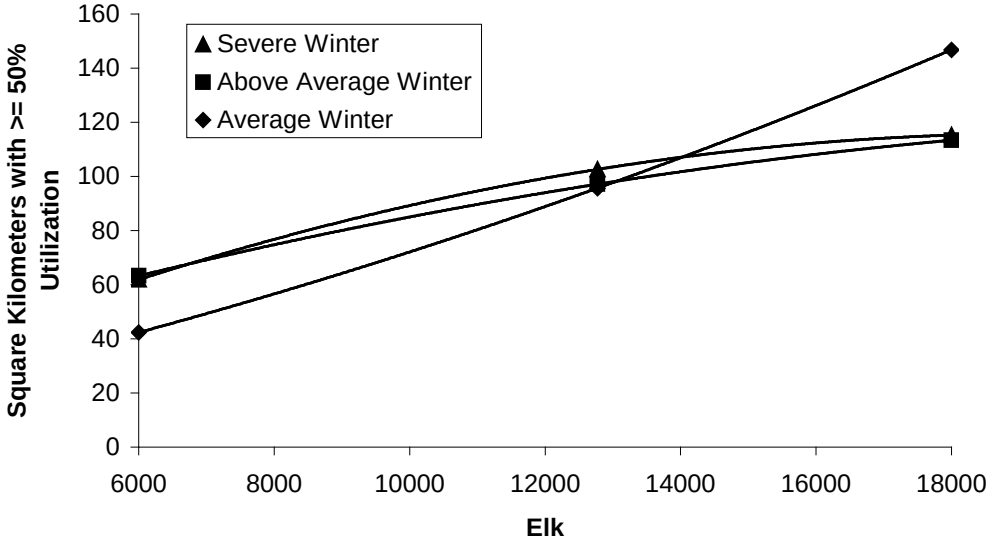


Figure 10. Area of winter range with utilization levels $\geq$ 50% as a function of elk population size during three winters with mean precipitation and 500 bison.

As an example of one utilization map, Figure 11 depicts forage utilization for the Greater Teton Ecosystem under a scenario of 12,771 elk, 500 bison, mean pre-winter precipitation in an average SWE winter. Although the maps will all differ slightly depending on winter severity and elk numbers, this map is indicative of the general layout of utilization across the Teton ecosystem. The black areas represent utilization of 50% or greater on the landscape which corresponds with areas that receive the least snow coverage during the winter.

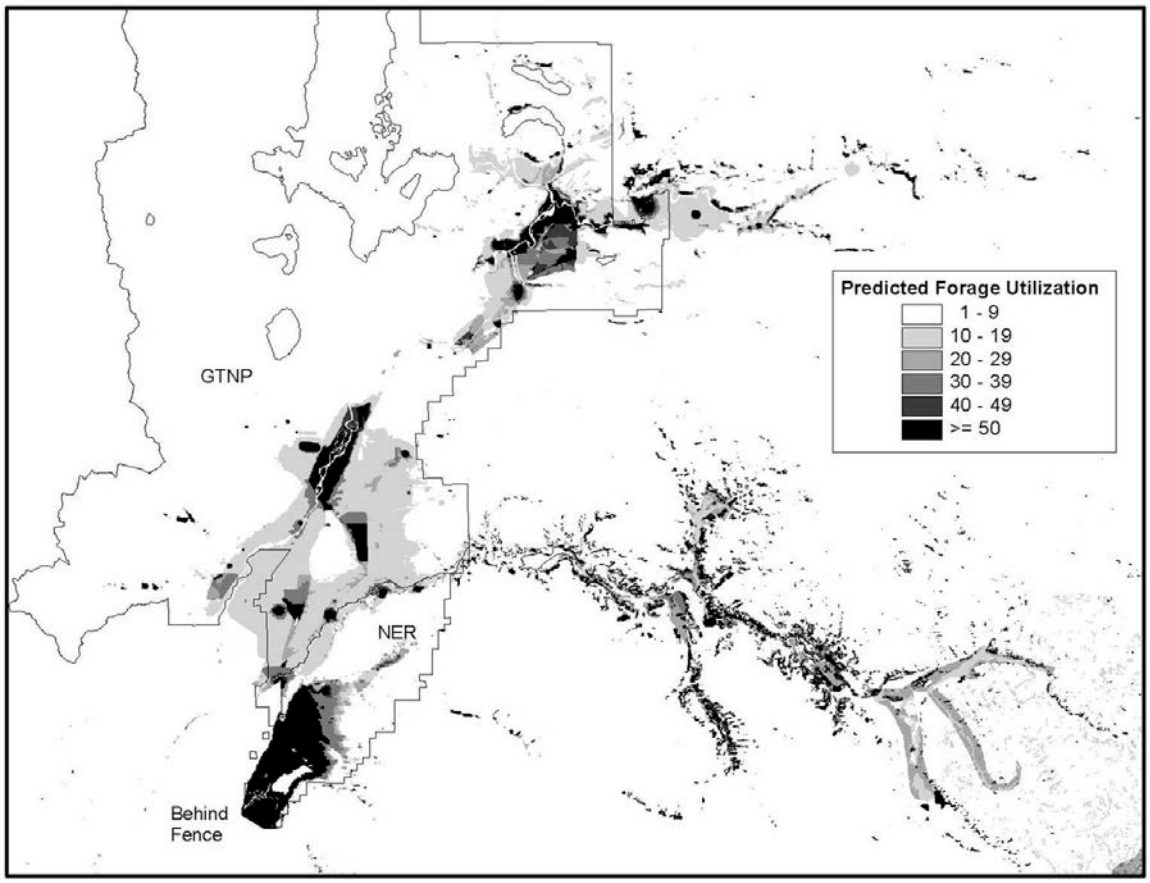


Figure 11. Predicted forage utilization for 12,771 elk in an average winter with average pre-winter precipitation and 500 bison.

Effects of Development in the Town of Jackson

One justification for supplemental feeding of elk is that it compensates for forage that would be available to native ungulates if their winter range had not been developed by human settlement in the town of Jackson. Although this justification is widely offered, it is based on a largely untested assumption of parity in the amount of forage fed and the amount lost to development. We analyzed this assumption as follows: If the development in the town of Jackson were exactly compensated by supplemental feeding, then adding the forage lost when the town was developed to the natural forage available to the currently supported population should theoretically *remove* the forage deficit. If supplemental feeding overcompensates for the development of the Jackson area, then forage deficits should remain despite "adding" the Jackson town forage base back into current supplies. If supplemental feeding undercompensates, then a forage surplus should result by adding the town of Jackson forage base back into the forage available to ungulates.

We ran two scenarios. We refer to the first scenario as "without fence." This scenario assumed that elk would no longer be restricted to habitat north of the fence on the National Elk Refuge and would be allowed to use agricultural lands and native pastures in and around Jackson. To implement this scenario, we simply added the forage in these areas to the forage supplies in the base model runs. The area added is the white area in Figure11 -- "Behind Fence".

We refer to the second scenario as "presettlement." In this scenario, we modified the current vegetation to reflect patterns that were more likely before agricultural development of the Jackson

Valley (irrigation, seeding, fertilization, etc.) As an approximation of these conditions, we assumed that vegetation south of the wildlife fence was composed of roughly equal parts of wet meadow and sagebrush-grassland.

Model results (Figure 12) suggest that at 2,000 elk in the severe winter, forage deficits are reduced by 51% (from 217,000 kg to 110,000 kg) when forage is added south of the fence. However, at 18,000 elk, this reduction shrinks to 13%. Similarly for the presettlement scenario, at 2,000 elk in the severe winter, deficits are reduced by 26%, but shrink to 6.2% at 18,000 elk. Because elk numbers are currently around 12,000 – 14,000, it is safe to say that the area south of the fence, reaching to the bottom of the study area, will not provide adequate forage for elk in severe winters. If high populations of elk need to find adequate forage in severe winters, they would more likely need to migrate further south down the Snake River drainage. Forage deficits are completely offset in the average winter, even at 18,000 elk. However, the "with fence" deficits were small in the average winter, so the offset is less meaningful.

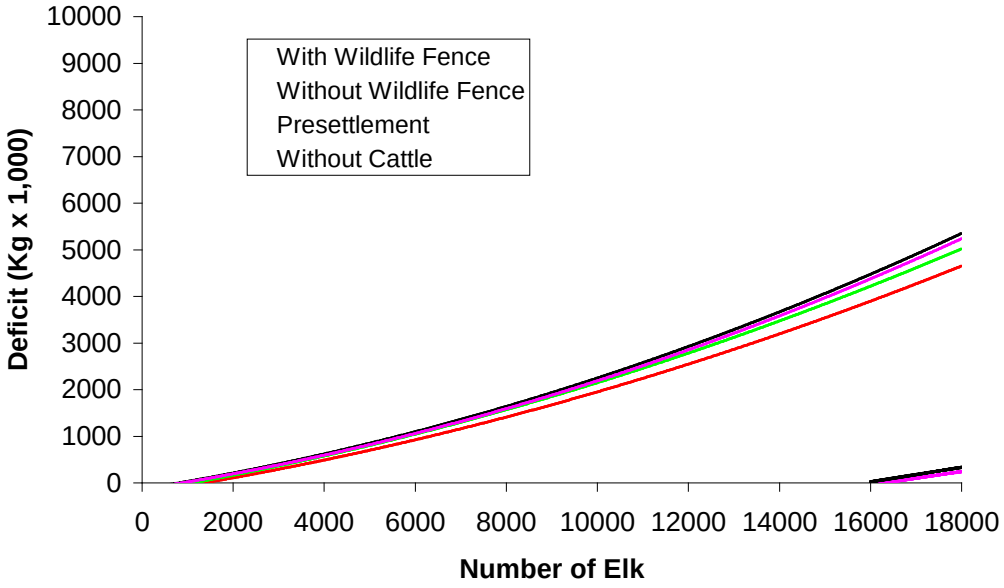


Figure 12. Forage deficits predicted under different assumptions about effects of the town of Jackson, and without cattle offtake. The model was run on severe and average winters with mean precipitation and 500 bison. Severe winters are depicted by the four lines which cross the x-axis at ~1,000 elk; average winters are depicted by the two lines which cross the x-axis at ~16,000 elk. The "with fence" scenario assumes no forage use by native ungulates south of the wildlife fence. The "without fence" scenario assumes that native ungulates are able to use vegetation south of the wildlife fence as currently mapped. The "presettlement" scenario assumes that native ungulates are able to use vegetation south of the wildlife fence and that this vegetation is composed of 50% sagebrush and 50% wet meadow. The "without cattle" scenario assumes no cattle grazing on the Greater Teton Ecosystem.

Removal of the Wildlife Fence

A model run that accurately portrays the spatial effects of removing the wildlife fence is not feasible with current data and understanding. If the fence were removed and feeding were discontinued, the Jackson elk herd would probably migrate south of Jackson and intermingle with other herds from which they have been separated for many years. We are able to offer two general scenarios that shed light on the effects of removing the wildlife fence and cessation of feeding. First, the graphical depiction of the "without fence" scenario discussed in Figures 12 corresponds to the visual representation of utilization in and around the town of Jackson depicted in Figure 13 below. Utilizations would cover the town of Jackson at the >50% level, and would be constrained only by the elevational gradient that exists around the town.

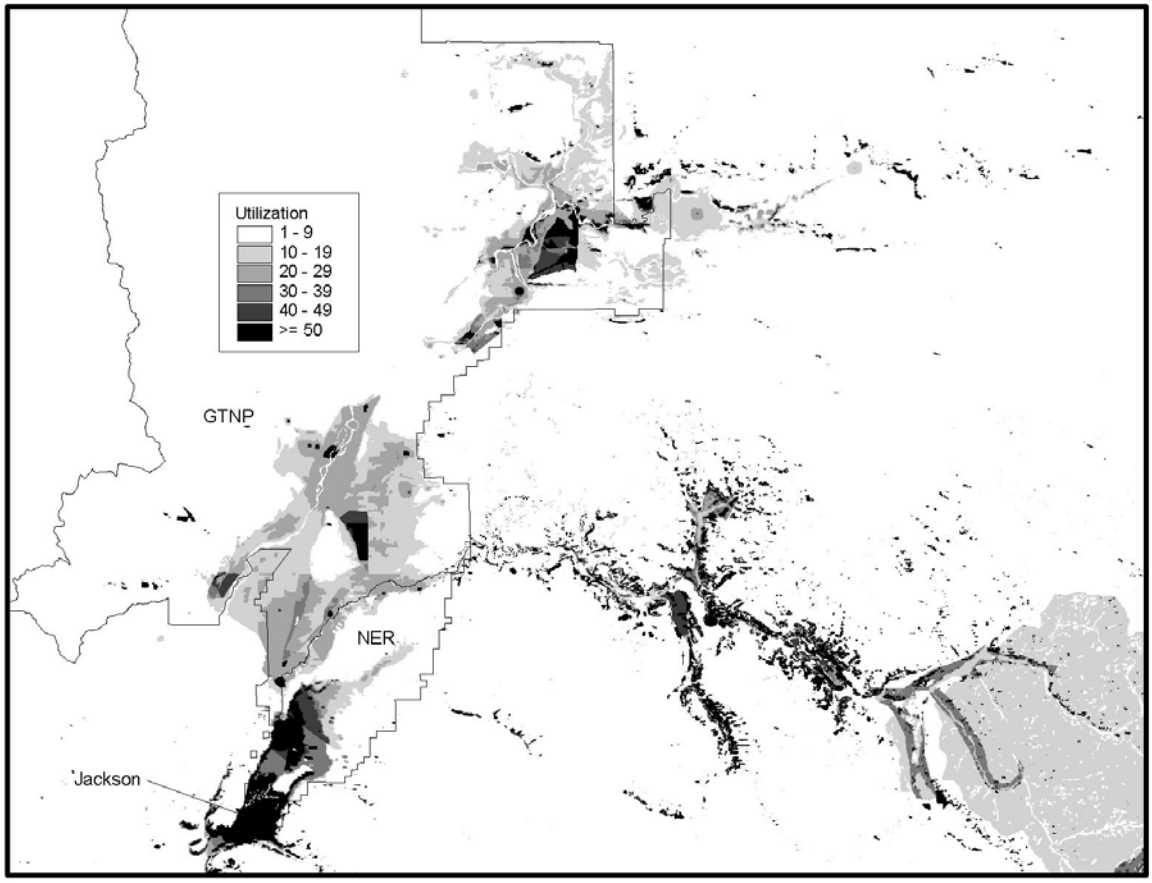


Figure 13. Utilizations in an average winter with average precipitation and 12,771 elk without the wildlife fence. Very high utilizations would likely continue south of the NER into the town of Jackson.

Second, we ran the snow model on a larger area and corrected it for the Gros Ventre snow shadow (Figure 14). The black cells on the map depict areas with 6 inches or less of SWE on March 8, 1997, the snowiest day available in the database. Results indicate that elk could winter in the Gros Ventre valley or south of Jackson in the Snake River valley as it winds towards Alpine, and lower areas of Hoback Canyon.

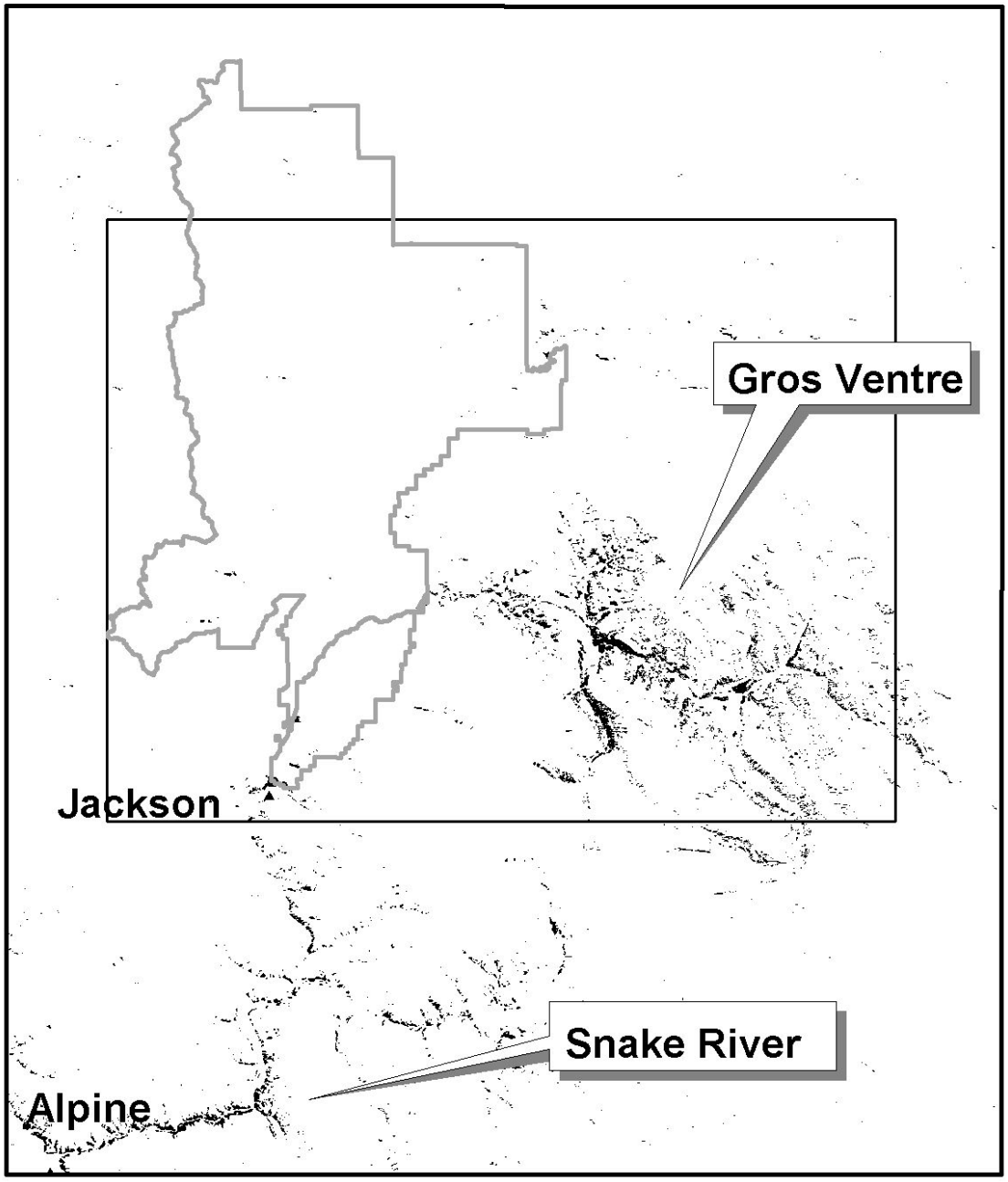


Figure 14. Black cells indicate likely migration routes and wintering areas in severe winters. The Gros Ventre and the lower Snake areas are predicted to receive the highest elk numbers and utilizations should the wildlife fence be removed.

Effects of Cattle Grazing

To examine the effects of cattle grazing on forage deficits we estimated the biomass consumed by cattle during summer and subtracted that from the prewinter standing crop. We did this by overlaying coverages of grazing allotments on the vegetation map, estimating the total forage removed as a function of the stocking rate, and subtracting that estimate from the prewinter forage supply. In addition, Steve Kilpatrick (WGFD), reviewed and offered small changes to the cattle offtake map.

The model runs (the purple lines on Figure 12) revealed negligible effects of cattle grazing on forage deficits for wild ungulates. Although the total amount of forage consumed by livestock was substantial -- about 0.5% of the total production on the Teton ecosystem -- most of this consumption occurred on areas that were not important elk winter range. As elk numbers increased, deficit differences with and without cattle became quantifiable (the difference between the black line and the purple line in Figure 12). At 18,000 elk, "with fence" deficits were 5,346,000 kilograms whereas "without cattle" deficits were 5,229,000 kilograms, a difference of 117,000 kilograms or 2.2%.

Model Results on the National Elk Refuge for Alternative #1

Adapting the Forage Accounting Model to the NER

The Forage Accounting Model was initially written to run on the Greater Teton Ecosystem utilizing the weekly SWE maps created by the snow model. These weekly snow maps are the factor which drives elk migration throughout the study area. To adapt the model to run only on the NER, we continued to use the snow maps as the migratory switch but we only allow elk to consume forage on the NER rather than on any area beyond the NER's borders. This forces all elk onto the NER's forage as soon as snow begins (roughly on Nov. 1st) and keeps them there until the end of snow (roughly June 1st). At the beginning of the snow season, the animals are allowed to spread out over the entire NER, but as snow accumulates, they are restricted to low SWE areas. As snow melts, they are allowed to spread out over the low-SWE areas on the NER.

Real migratory movements are likely to be different. In a real scenario, elk slowly move onto the NER as snow accumulates, and slowly move off as snow melts. Because our model cannot mimic these real movements, our numeric estimates of forage deficits are overly high, i.e., real deficits may be lower than those depicted in the following figures, and higher numbers of elk may be supported before deficits occur. For example, if deficits start at 6,000 elk, this can be interpreted as "at least" 6,000 elk are needed to incur deficits. While the actual number may be 7,000 or 8,000, it is definitely not 5,000. Thus, the margin of error for the NER should be construed differently than for the Greater Teton Ecosystem. On the NER, deficit predictions represent the lowest limit in the margin of error. We roughly estimate the upper limit as the lower limit plus 50%. Again, we cannot firmly quantify this error but believe it is a reasonable approximation.

Modeled Scenarios

For Alternative #1, we exercised the forage accounting model on the National Elk Refuge and ran simulations for 1) varying populations of elk -- between 0 and 10,000, 2) varying winter severity -- average, above average, and severe, 3) varying pre-winter precipitation conditions -- drought, mean, and wet, and 4) three populations of bison -- 500, 1000, and 2000. These model runs include offtake by 20 moose. We also ran a scenario which simulates center-pivot irrigation of 1,170 acres of the cultivated fields on the NER which are currently flood-irrigated.

In Figure 15 (severe drought conditions), the solid black line touches the x-axis at about 2,000 elk. Thus we can interpret that in an average winter in drought conditions with 500 bison, as elk populations reach 2,000 and higher, forage deficits will begin to occur on the NER. Note in Figure 1 that all of the other lines do not touch the x-axis, i.e., deficits occur even when elk numbers are 0 animals. These deficits occur because in any week, all forage is being consumed by the 500 bison and the 20 moose.

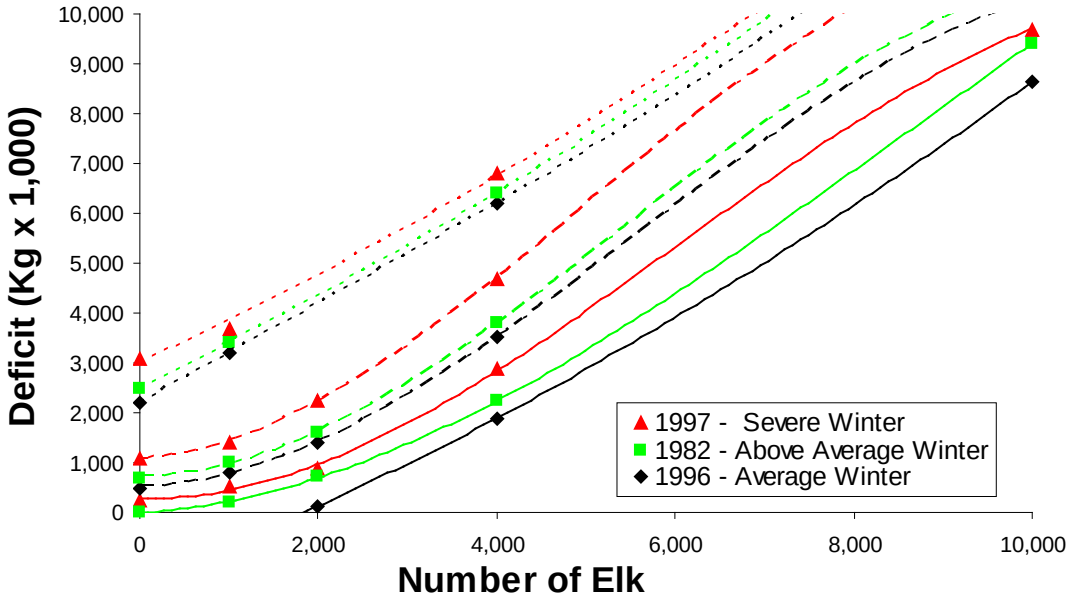


Figure 15. Forage Deficits for Drought Conditions on the NER.

Figure 16 depicts the modeled scenarios for mean precipitation conditions which create significantly more forage for ungulates and cause deficits to occur at much higher numbers of elk in average winters. With 500 bison in the average winter (the solid black line), forage deficits occur at about 5,000 elk, occur at about 4,000 elk with 1,000 bison, and 2,000 elk with 2,000 bison. Though mean precipitation increases forage production, there is still sufficient snow in above average and severe winters to incur deficits at 0 elk across all bison numbers.

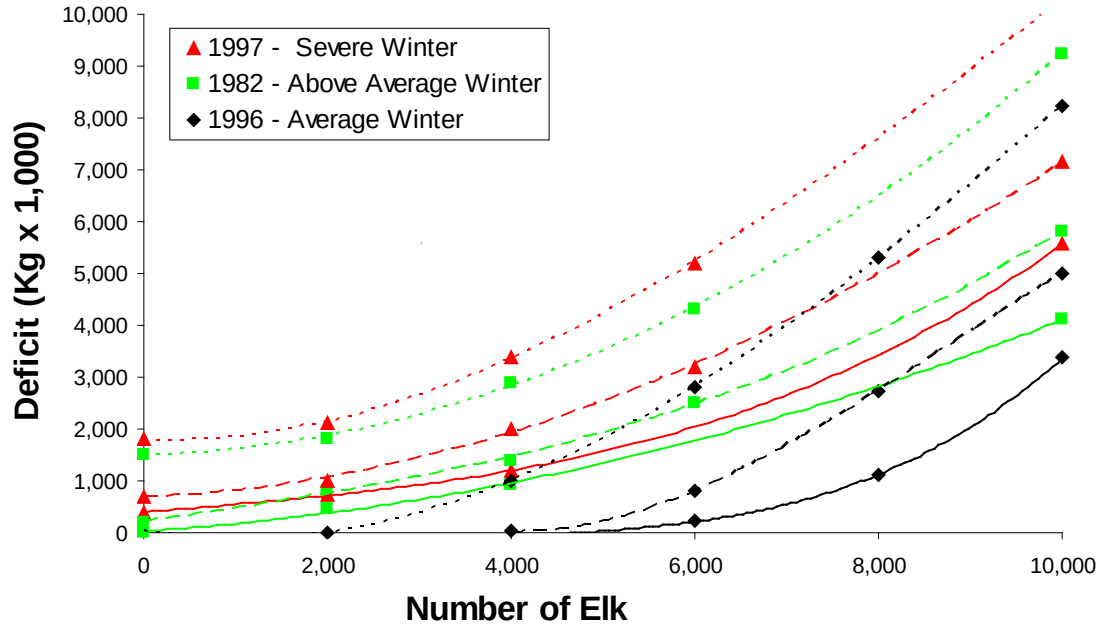


Figure 16. Forage Deficits for Mean Precipitation Conditions on the NER.

Wet precipitation conditions (Figure 17) increase forage availability which similarly decreases forage deficits. In the wet precipitation scenarios, deficits occur at roughly 9,200 elk in the average winter and 800 elk in the above average winter with 500 bison. Severe winters still cause deficits to begin at 0 elk due to the extreme snow cover on the landscape.

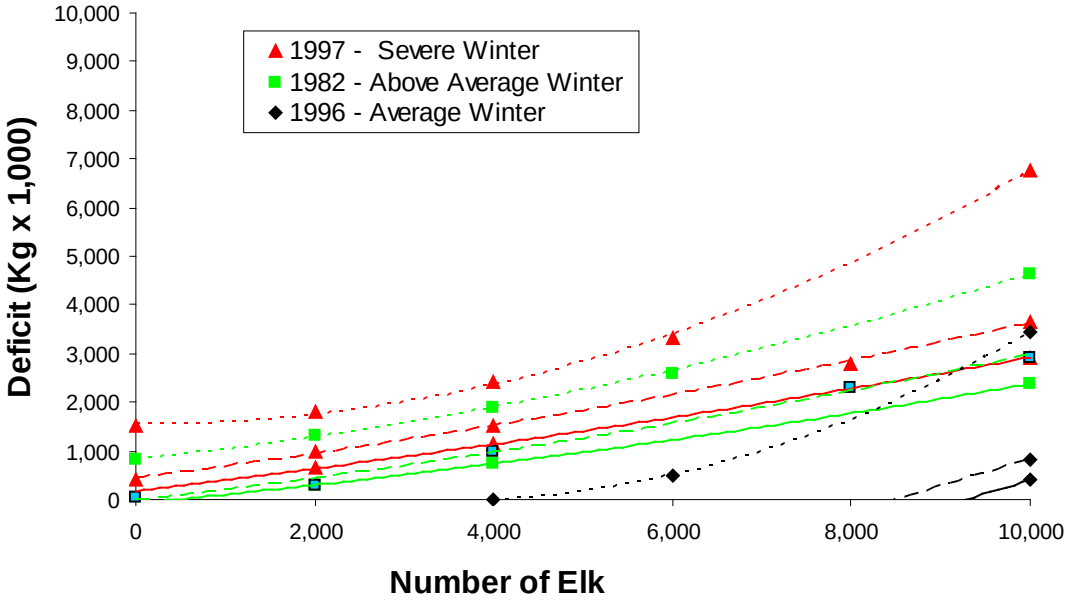


Figure 17. Forage Deficits for Wet Precipitation Conditions on the NER.

Irrigation Experiment

We created an additional model experiment to address an questions on the value of irrigation on the NER. Managers may want to center-pivot irrigate ~1,170 acres of the NER to raise production, thereby increasing the biomass of forage available to wintering elk. As per the description in the document "Irrigation System Rehabilitation Plan Environmental Assessment" (National Elk Refuge, October 1998), we created a model scenario in which production values on the following NER project areas were increased to reflect center-pivot irrigation: McBride, Chambers, Nowlin, Ben Goe, and Headquarters (Figure 18). Currently these areas are flood-irrigated resulting in about 2,500 lbs/acre of production whereas center-pivot irrigation will result in about 5,000 lbs/acre. For this experiment, we varied only the irrigation acreage, holding precipitation and bison constant (average precipitation and 500 bison).

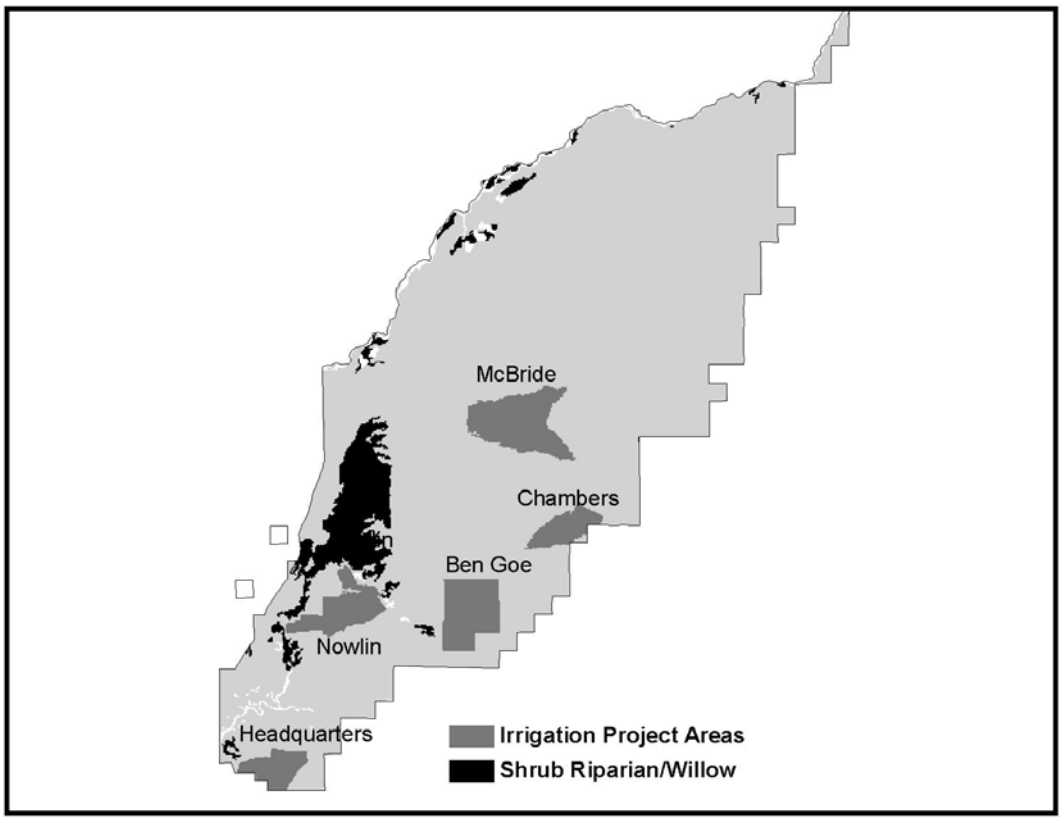


Figure 18. Irrigation Project Areas and willow locations on the NER.

As shown in Figure 19, center-pivot irrigating the four NER project areas has a significant impact on forage deficits in an average winter under average precipitation with 500 bison (solid lines). For the flood-irrigated scenario in the average winter, deficits begin at about 5,000 elk and are 3,371,000 kilograms at 10,000 elk. For the center-pivot irrigated scenario, deficits begin at about 6,000 elk and are 2,207,000 kilograms at 10,000 elk. In a severe and above-average winter, the change in deficits is less pronounced. All irrigation scenarios have deficits beginning right at 0 elk, and as the number of elk increases, a slight difference exists between the two scenarios, culminating in a deficit of 5,560,000 kilograms at 10,000 elk for the flood-irrigated scenario and a deficit of 4,711,000 kilograms for the center-pivot irrigated scenario. With center-pivot irrigation, the average winter yields more deficit reduction because more of the range is open to ungulates. In the severe and above-average winter, the upper NER irrigated project areas are covered in too much snow at critical weeks during the winter.

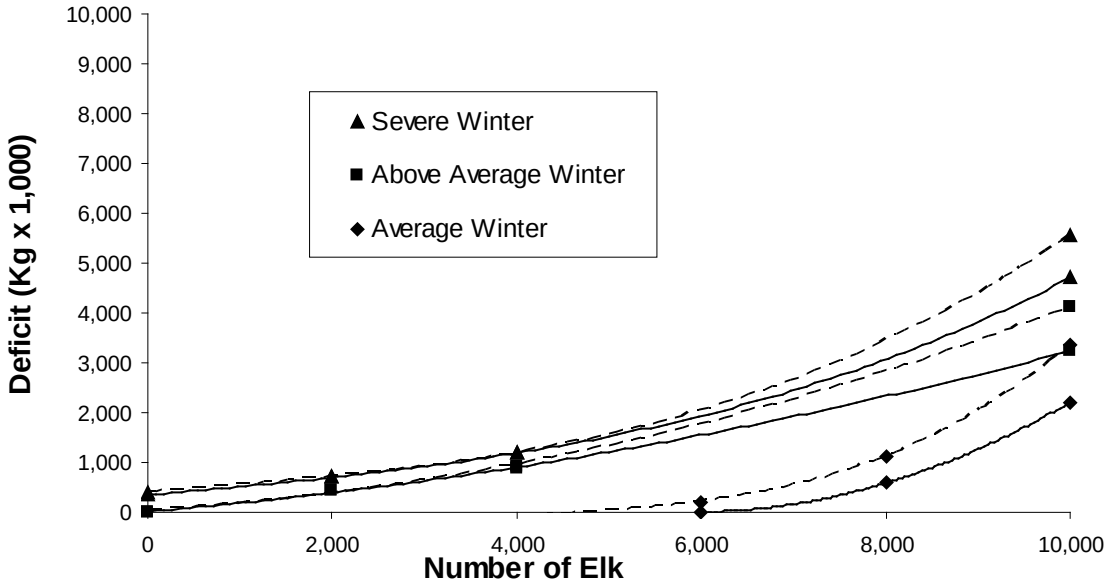


Figure 19. Forage Deficits for the Irrigation Model Experiment on the NER. Solid lines represent center-pivot irrigation; dotted lines represent flood (status-quo) irrigation.

Discussion for Alternative #1

Our model revealed that balance between forage supply the forage requirements of wintering ungulates are tightly linked to winter severity and growing season precipitation. Although both of these weather conditions can determine the number of animals that can be supported by native forage, snow accumulation exerts the strongest effects. During average winters with average precipitation conditions and 500 bison, the number of elk that can be sustained on the landscape approaches 16,000. But as winter severity or drought are encountered, this number drops dramatically.

Currently, elk and bison are supplementally fed on the NER to alleviate food shortages caused by snow severity as well as drought conditions. Additionally, it is argued that supplemental feeding is needed to compensate for forage supplies lost to the area behind the NER's wildlife fence. Our model experiments suggest that the wildlife fence plays an important role by inhibiting migration and foraging for native ungulates, and that removing the fence would increase forage availability especially during average winters. However, our model predicts that significant forage deficits would still occur during more severe winters if the wildlife fence were removed and native ungulates were allowed to graze in and around the town of Jackson as well as on nearby agricultural lands. This suggests that historic elk populations: (1) may have been smaller than current ones, and/or (2) may have suffered high levels of mortality during severe winters, and/or (3) more likely have used lower elevation ranges south of Jackson and larger areas of the Gros Ventre.

The influence of grazing by livestock on forage supplies for native ungulates has emerged as a controversial question for managers in the Greater Teton Ecosystem. Our model experiments suggest that cattle grazing does not play an important role in determining availability of forage for native ungulates during winter. This is the case because the preponderance of livestock

grazing occurs on areas of the landscape that accumulate deep snow during the winter. As a result, increasing forage on these areas by removing livestock grazing may increase forage biomass but it does not increase forage available to wintering ungulates. Removing cattle from the system had negligible impacts on predicted forage deficits.

We predict that approximately 100 km^2 of winter range will be utilized at a 50% rate or higher given current numbers of elk and bison, and varying climatic conditions. Part of this high level of use is caused by the wildlife fence because it inhibits natural foraging patterns and migration. However, we emphasize that as long as animals select areas that are relatively snow free in preference to areas where snows are deep, we should anticipate locally high levels of forage utilization on some sites. Although reducing population density can reduce the area of the landscape that falls into the "high-use" category, we project that some "hot spots" will occur at any reasonable level of population numbers. The effect of these forage utilization rates and hot-spots will be analyzed in the next section of this report -- Part II, The Century Ecosystem Model.

Bison numbers play an important role in forage deficits. Given the number of bison at the start of this project, 500, approximately 16,000 elk can forage on the whole system without incurring deficits in an average winter with average pre-winter precipitation conditions. When bison numbers double to 1,000, elk numbers drop to 15,000; when bison numbers quadruple to 2,000, elk numbers drop to 13,000. Doubling bison numbers to 1,000 also substantially increases forage deficits in more severe winters, and quadrupling bison numbers to 2,000 causes severe stress on the system during most climatic conditions.

The results for the NER should be evaluated differently than those for the Greater Teton Ecosystem. Instead of a mean estimation with a surrounding margin of error, the NER's results should be construed as "lowest possible number of elk" which correspond to the deficit measurement. On the NER Study Area, this number represents the lowest limit in the margin of error. We roughly estimate the upper limit as equal to the lower limit plus 50%.

Given this stipulation, we estimate that the NER can support at least 5,000 elk in average winters with mean pre-winter precipitation and 500 bison. In above-average and severe winters, deficits occur at all levels of elk except in the wet precipitation scenario. In our irrigation experiment, we found that 1,000 more elk could forage on the NER before deficits would occur in average winters with mean pre-winter precipitation and 500 bison, and that forage deficits would be reduced in severe winters especially with high numbers of elk.

Forage Accounting Model Results for all the EIS Alternatives

We were asked to run the model and provide results for Alternatives #1 - #4 in the EIS and also provide a summary table of where deficits begin for each Alternative given its underlying assumptions as follows:

Alternative #1: (status quo) Flood irrigation of the NER's cultivated fields. All of the NER's willow is available to ungulates. Three levels of bison -- 500, 1,000, 2,000.

Alternative #2: No irrigation of the NER's cultivated fields. All of the NER's willow is available to ungulates. Two levels of bison -- 250, 500.

Alternative #3: Flood irrigation of the NER's cultivated fields. Bison = 1,000. Two amounts of the NER's willow are available to ungulates -- none and one-half.

Alternative #4: Center-pivot irrigation of the NER's cultivated fields. Bison = 350. Two amounts of the NER's willow are available to ungulates -- none and one-half.

For all of the alternatives, the Forage Accounting Model was run on both the Greater Teton Ecosystem and the NER study area. The cautions for interpretation discussed for Alternative #1 in the previous sections also apply to the results for Alternative #2 - #4. In addition to these stipulations, please note that the model is not sufficiently sensitive to discriminate between some of the Alternatives and their underlying assumptions. For example, the difference between the forage offtake from 350 bison and 500 bison is so small that the difference between the deficit results from those runs is subsumed by the model's margin of error. Similarly, the difference between types of irrigation, and the question of willow exclusion, also offered results which were subsumed by the model's margin of error.

We report these results with both a summary table and deficit graphs. First, Table 5 reports the number of elk at which forage deficits begin to occur. The number in each cell represents the "equilibrium point" on the landscape at which the estimated forage supply exactly offsets demand by the elk population. This number is the point at which the deficit curve hits the x-axis. Higher numbers of elk will cause deficits to occur. When interpreting these numbers, keep in mind that it is almost assured that wintering elk can sustain small levels of forage deficits by using stored energy reserves (fat and lean body mass) to survive. Because of this, we suggest interpreting the numbers in the table together with the curves in the graphs that follow. If the deficit curve remains low (near the x-axis), i.e., < 500,000 kg, then wintering elk may be able to utilize stored energy reserves to survive rather than incur starvation mortality. In other words, small forage deficits can occur without causing high levels of starvation.

Table 5. Summary Table for number of elk at which forage equilibrium occurs for all EIS Alternatives

Alternative #1 (status quo)									
Pre-winter Precipitation Scenario	**Drought**			**Mean**			**Wet**		
Snow Severity Type	**Severe**	**Above**	**Average**	**Severe**	**Above**	**Average**	**Severe**	**Above**	**Average**
With 500 Bison									
Greater Teton Ecosystem	0	1,800	5,500	1,000	6,000	16,000	3,000	12,000	>18,000
NER only	0	0	2,000	0	0	5,000	0	800	9,200
- with center-pivot irrigation				0	0	6,000			
With 1,000 Bison									
Greater Teton Ecosystem	0	200	3,800	0	5,800	15,000	200	10,200	>18,000
NER only	0	0	0	0	0	4,000	0	500	8,500
With 2,000 Bison									
Greater Teton Ecosystem	0	0	1,500	0	4,000	13,000	0	7,800	>18,000
NER only	0	0	0	0	0	2,000	0	0	4,000
Alternative #2 (no irrigation of cultivated fields on NER)									
With 250 Bison									
Greater Teton Ecosystem	700	1,800	6,000	1,800	7,500	16,400			

NER only	0	0	2,000	0	0	5,700			
With 500 Bison									
Greater Teton Ecosystem	0	1,600	5,300	900	5,900	15,800			
NER only	0	0	1,700	0	0	4,500			
Alternative #3 (with 1,000 bison and flood-irrigation of NER's cultivated fields)									
No Willow on NER Available									
Greater Teton Ecosystem	0	0	3,000	0	5,000	14,000			
NER only	0	0	0	0	0	3,300			
One-half of Willow on NER Available									
Greater Teton Ecosystem	0	0	3,200	0	5,500	14,200			
NER only	0	0	0	0	0	3,500			
Alternative #4 (with 350 bison and center-pivot irrigation of NER's cultivated fields)									
No Willow on NER Available									
Greater Teton Ecosystem	0	1,600	5,700	1,500	7,200	17,000			
NER only	0	0	2,000	0	0	5,500			
One-half of Willow on NER Available									
Greater Teton Ecosystem	0	1,800	6,000	1,800	7,400	17,100			
NER only	0	0	2,500	0	200	6,000			

Graphical Model Results for the EIS Alternatives #2 - #4

Model Results for Alternative #2

Alternative #2 assumptions: 1) 250 and 500 bison, and 2) no irrigation of the cultivated fields on the NER, 3) all willow is available.

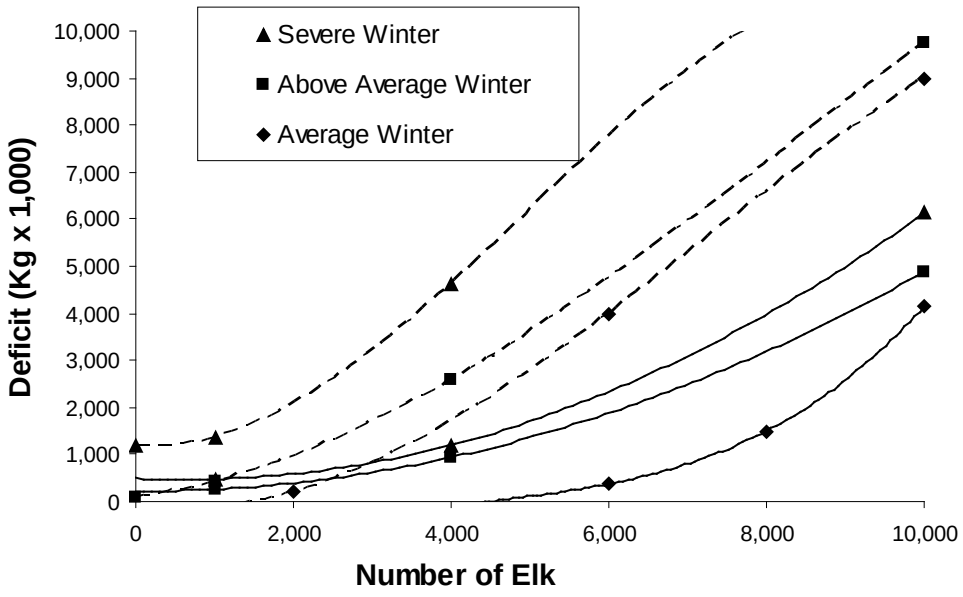


Figure 20. Deficit results for the NER using 500 bison. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

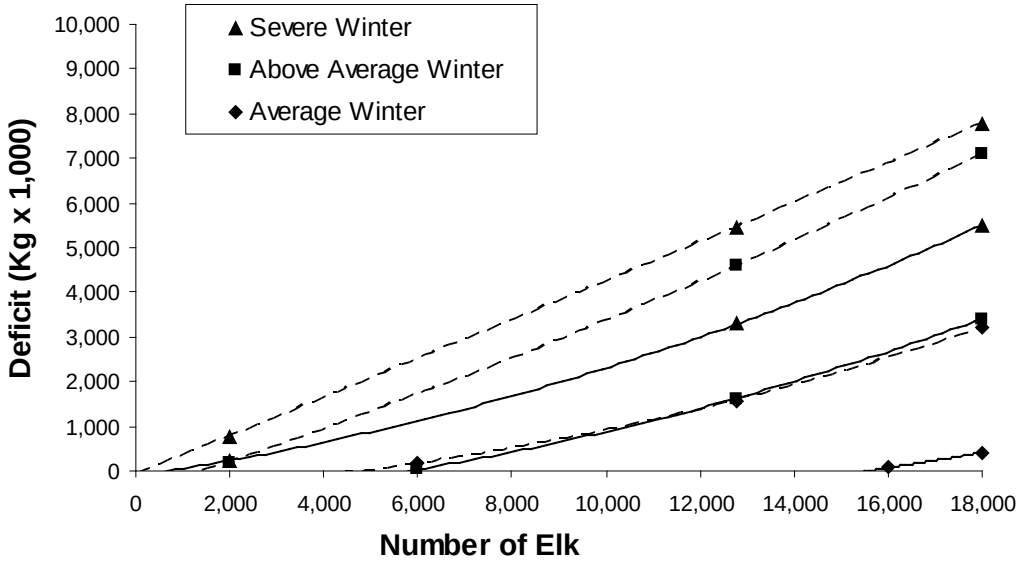


Figure 21. Deficit results on the Greater Teton Ecosystem using 500 bison. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

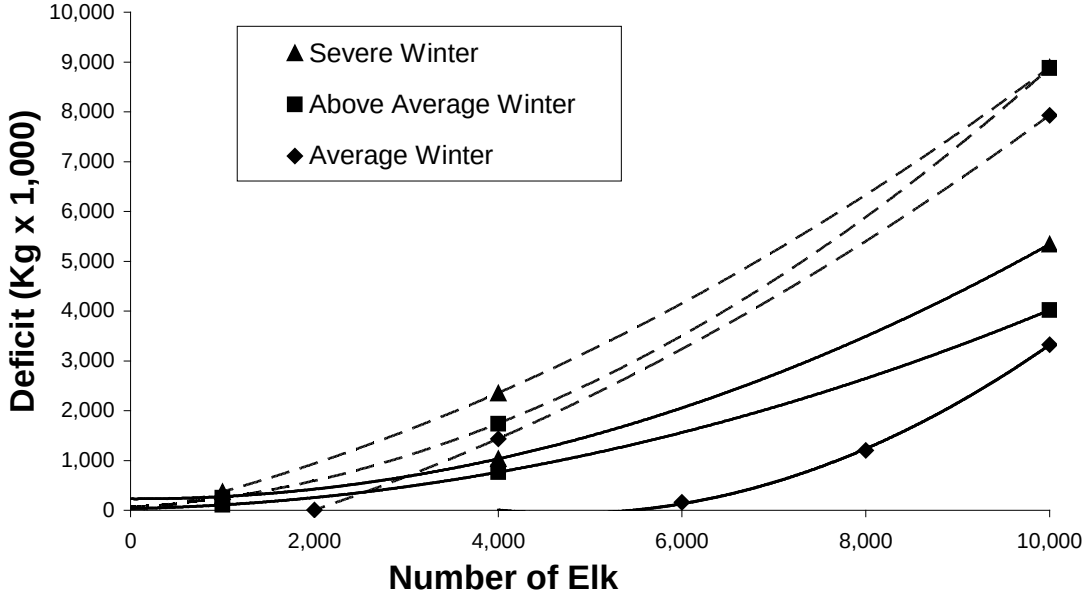


Figure 22. Deficit results for the NER using 250 bison. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

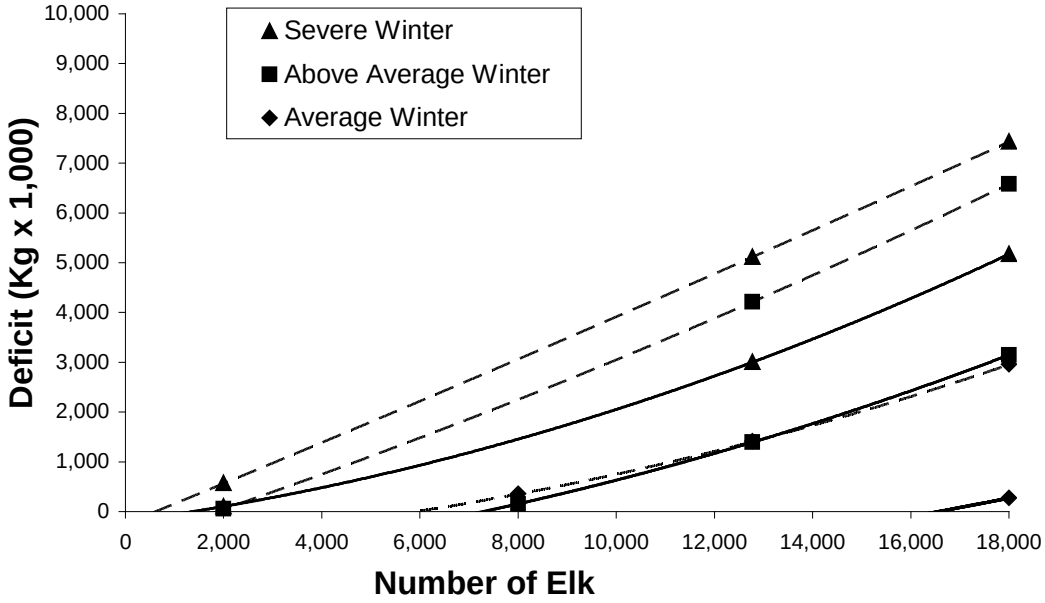


Figure 23. Deficit results for the Greater Teton Ecosystem using 250 bison. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

Model Results for Alternative #3

Alternative #3 assumptions: 1) 1000 bison, 2) cultivated fields on the NER are flood-irrigated (status quo), and 3) willow on the NER is all fenced off or half-fenced off.

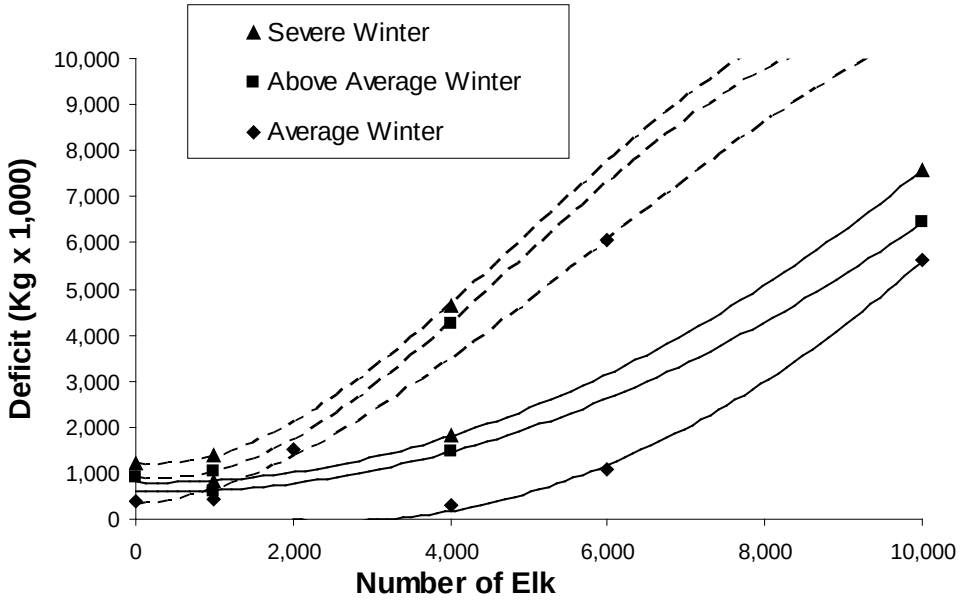


Figure 24. Deficit results for the NER with no forage available in vegetation coded "shrub riparian/willow". The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

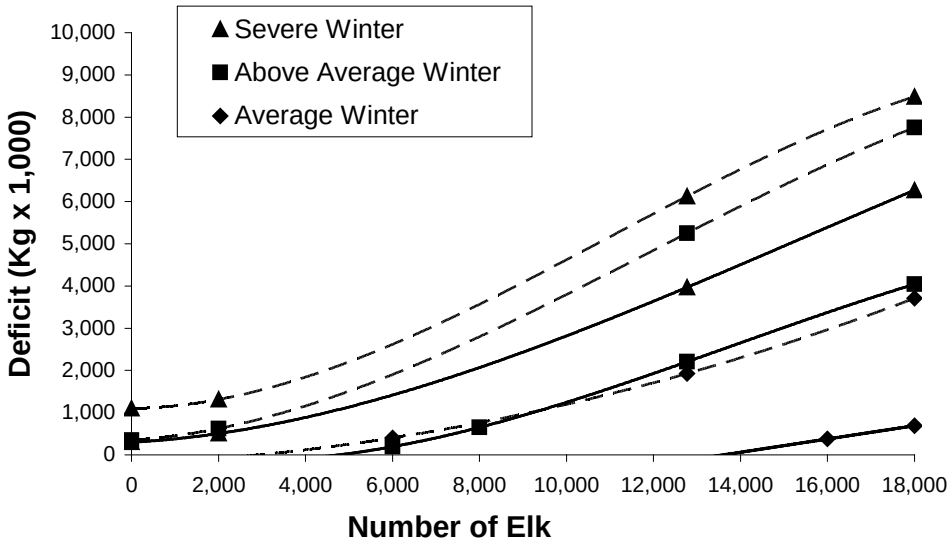


Figure 25. Deficit results for the Greater Teton Ecosystem with no forage available in vegetation coded "shrub riparian/willow" on the NER. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

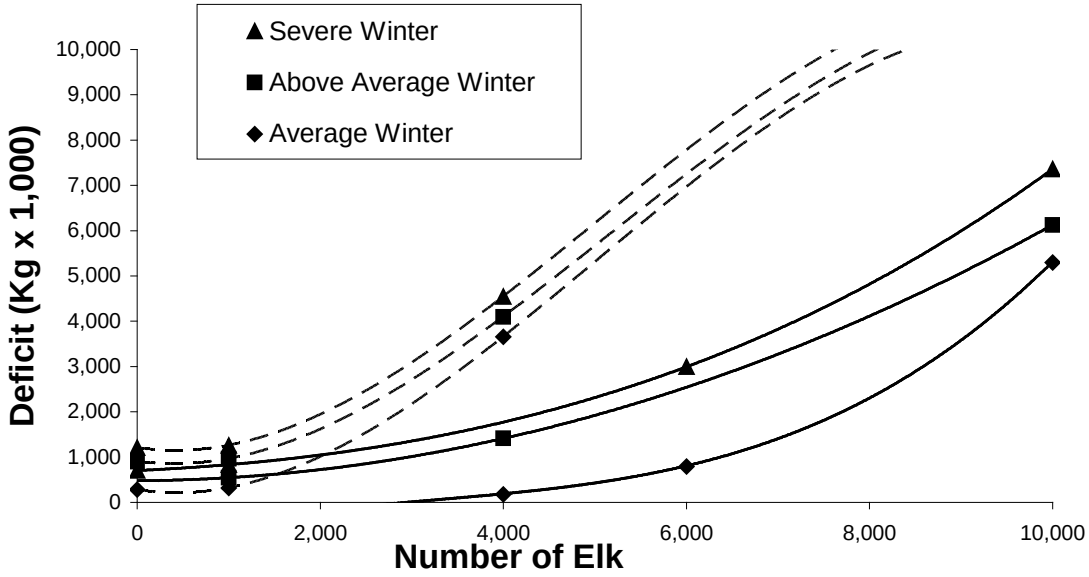


Figure 26. Deficit results for the NER with one-half of the forage available in vegetation coded "shrub riparian/willow". The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions

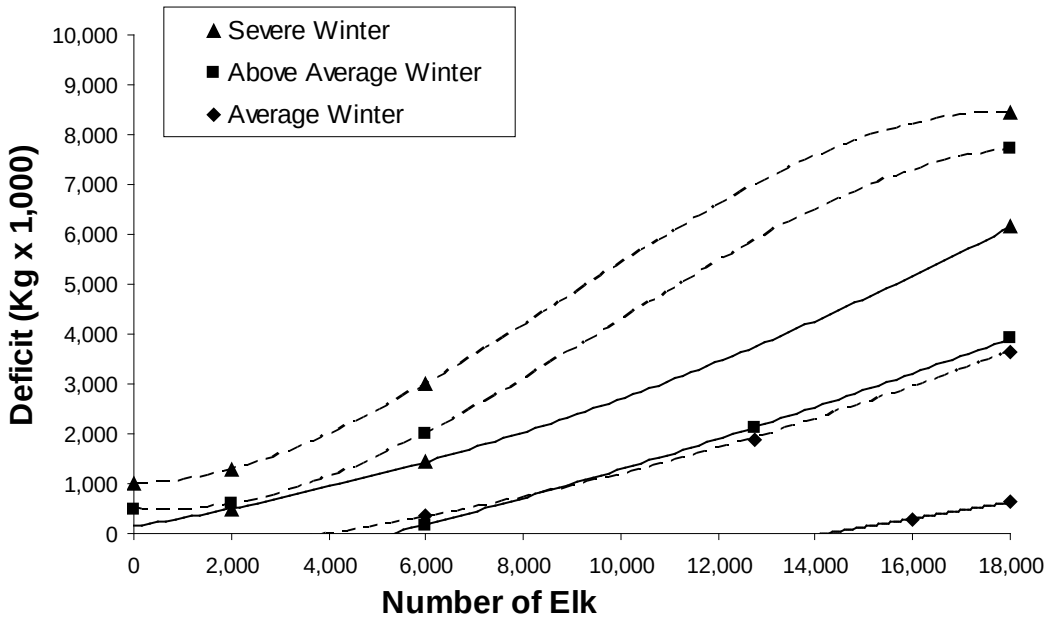


Figure 27. Deficit results for the Greater Teton Ecosystem with one-half of the forage available in vegetation coded "shrub riparian/willow" on the NER. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

Model Results for Alternative #4

Alternative #4 assumptions: 1) 350 bison, 2) cultivated fields on the NER are center-pivot irrigated, and 3) willow on the NER is all fenced off or half-fenced off.

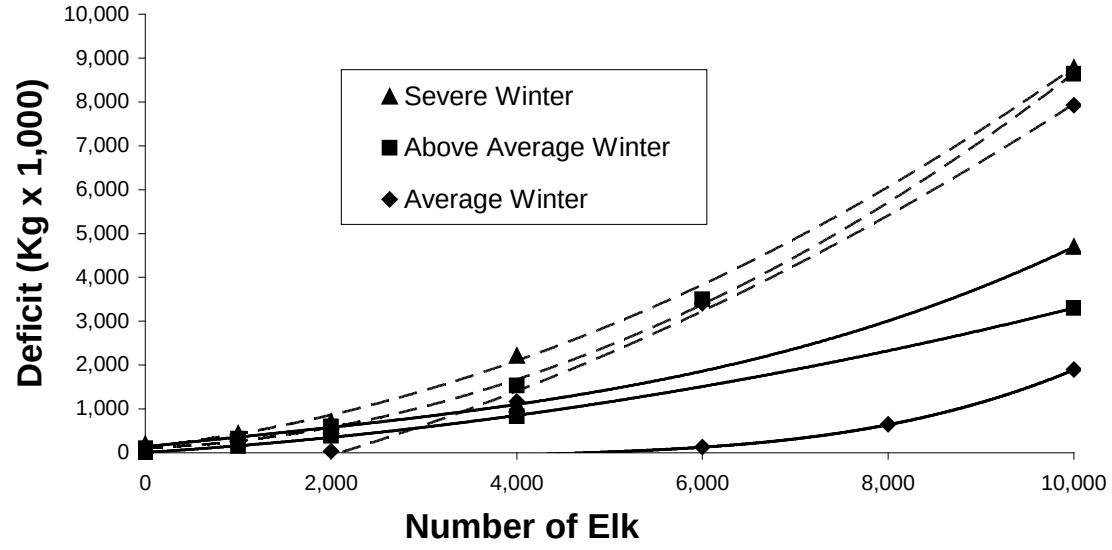


Figure 28. Deficit results for the NER with no forage available in vegetation coded "shrub riparian/willow". The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

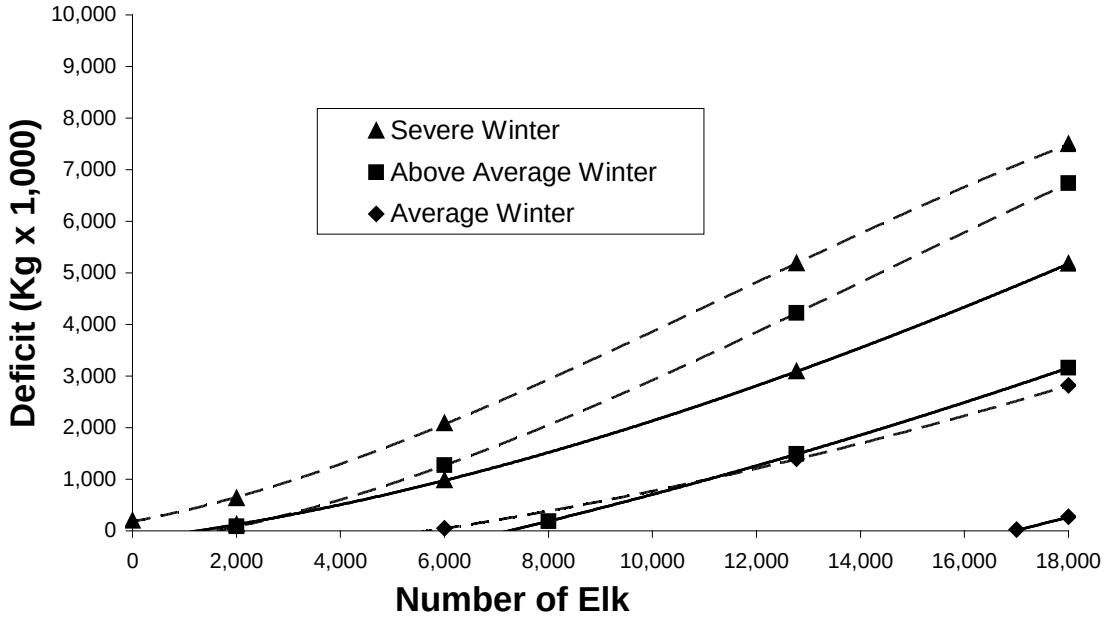


Figure 29. Deficit results for the Greater Teton Ecosystem with no forage available in vegetation coded "shrub riparian/willow" on the NER. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

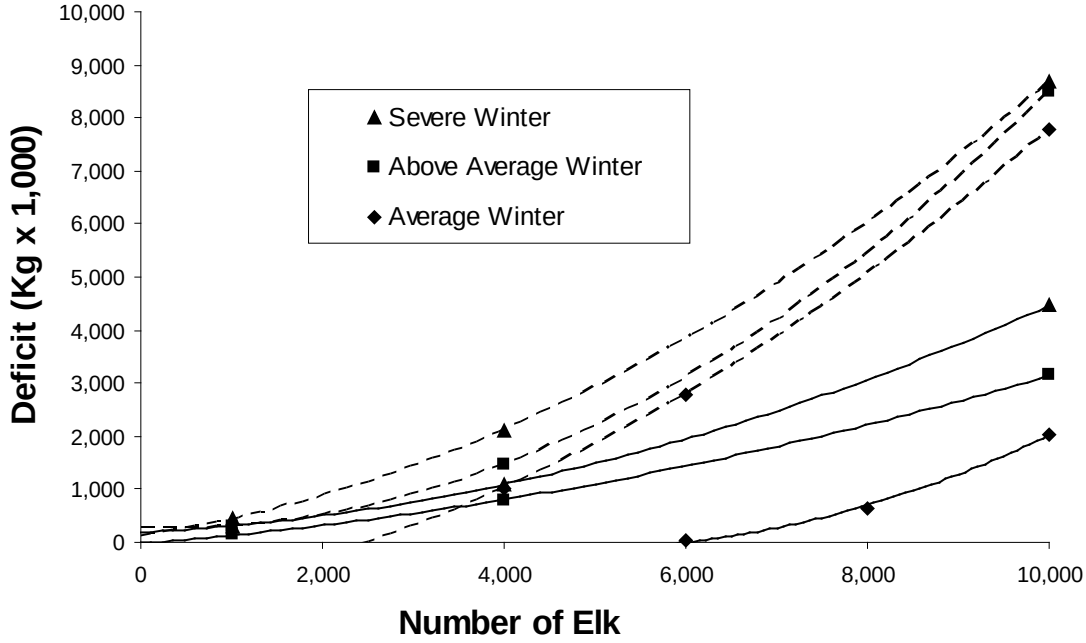


Figure 30. Deficit results for the NER with one-half of the forage available in vegetation coded "shrub riparian/willow". The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

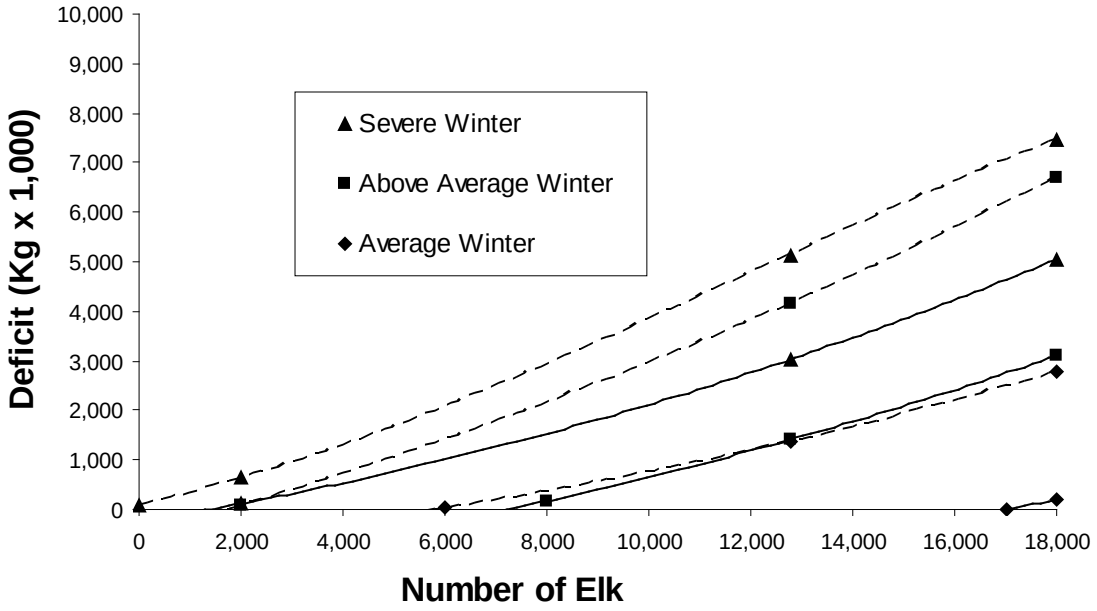


Figure 31. Deficit results for the Greater Teton Ecosystem with one-half of the forage available in vegetation coded "shrub riparian/willow" on the NER. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

Discussion for Alternatives #2 - #4

The EIS Alternatives attempt consider effects of manipuating three variables: bison numbers, willow availability on the NER, and irrigation of the NER's cultivated fields. The net effect on forage deficits of these three variables will be the following:

1. increasing bison numbers will increase deficits
2. fencing off willow on the NER will increase deficits
3. irrigating the cultivated fields on the NER will decrease deficits -- center-pivot more so, flood irrigation less so.

Because the vegetation manipulations (willow, irrigation) occur on the lower portion of the NER, the effects will be less pronounced when the model is run on the Greater Teton Ecosystem than the NER. Additionally, because above average and severe winters have some weeks where snow blankets the landscape, the effects of vegetation manipulations are less pronounced than in average winters.

Alternative #2 tries to mimic "natural vegetation conditions" by allowing willow use and not irrigating the cultivated fields. This alternative also tries to manipulate bison numbers, keeping them at either 250 or 500. The net effect of "natural conditions" is slightly higher overall deficits than Alternative #1, and slightly fewer elk before deficits occur. In the average winter with average precipitation and 500 bison, deficits begin at 5,000 elk in Alternative #1 but begin at 4,500 for Alternative #2. If bison numbers are kept at 250, deficits begin at 5,700 elk for Alternative #2.

Alternative #3 lets bison numbers increase naturally to 1,000, and tries to fence off half or all of the willow stands on the NER. This Alternative restricts forage for elk more than any other Alternative because both increased bison numbers and willow fencing cause higher deficits. In

an average winter with average precipitation and no willow availability, deficits begin at 3,300 elk. With one-half willow availability, deficits begin at 3,500 elk.

Alternative #4 attempts to hold bison numbers to 350 while center-pivot irrigating the cultivated fields and fencing off willows. Taken in pieces, lower bison numbers (350) will decrease deficits, center-pivot irrigation will decrease deficits, and willow fencing will increase deficits. The net effect of these three manipulations is slightly lower deficits than Alternative #1 which allows slightly more elk to find forage before deficits occur. In an average winter with average precipitation conditions and 350 bison, deficits begin at 5,500 elk when all the willow is fenced off and 6,000 elk when one-half of the willow is fenced off.

In total, the manipulations in the three EIS Alternatives have fairly mild effects on forage deficits and elk numbers. Only Alternative #3, which allows 1,000 bison and fences willow has a significant restricting effect. The net effects of Alternatives #2 and #4 vary little from status quo management. Both the willow area and the irrigated fields on the NER comprise roughly 1,000 acres, and are relatively minor portions of the Greater Teton Ecosystem. If managers want to have a significant impact on the deficits for the entire Jackson elk herd, vegetation manipulations will have to occur on a much larger scale. And, as stated earlier, because snow blankets the landscape in some weeks of above average and severe winters, vegetation manipulations have significantly less effect than in average winters.

Part II.
CENTURY Ecosystem Modeling

Results from simulations using the Forage Accounting Model in Part I of this report suggest that significant areas of the range will experience forage utilization exceeding 50% . High levels of use will occur for virtually all population levels of elk during all winters. This heavy utilization on the winter range is intensified by the existence of the wildlife fence that inhibits natural migration to lower snow-free elevations. Additionally, field measurements (Steele et al. 1999) also depict heavy utilizations throughout the winter range in the lower portion of the NER and the lower elevations of the Gros Ventre Valley. In this section, we report results from simulation modeling using CENTURY to portray biogeochemical changes in vegetation and soil resulting from grazing by elk and bison in the Jackson Valley. This modeling effort is based on estimated inputs of soil and vegetation chemistry because field data were not yet available. Current and ongoing field sampling work by F. Singer on nitrogen pools and vegetation will later be used to corroborate these preliminary findings. The central question we address is whether or not high levels of grazing will harm long term productivity of vegetation communities.

The CENTURY Model

The CENTURY ecosystem model (Metherell et al. 1993) simulates exchanges of carbon (C) and nitrogen (N) among the atmosphere, soil, and vegetation. Required inputs used to drive the model include monthly maximum/minimum temperature and precipitation data, soil properties, vegetation type, and current and historical land use. Disturbances and management practices such as grazing, fire, cultivation, and fertilizer additions can be simulated. CENTURY includes submodels for plant productivity, decomposition of dead plant material and soil organic matter (SOM), and soil water and temperature dynamics. Flows of C and N are controlled by the amount of C in the various pools (e.g. SOM, plant biomass), the N and lignin concentrations of the pools, abiotic temperature/soil water factors, and soil physical properties related to texture. SOM is divided into three pools based on decomposition rates (Parton et al. 1993, 1994). Decomposition of SOM and external nutrient additions supply the nutrient pool that is available for plant growth. Plant growth is controlled by a plant-specific maximum growth parameter, nutrient availability, and 0-1 multipliers that reflect shading, water, and temperature stress. Net Primary Productivity (NPP) is allocated among leafy, woody, and root compartments as a function of plant type, season, soil water content, and nutrient availability.

CENTURY has been used to successfully simulate soil C and NPP levels in various natural and managed systems including grasslands (Parton et al. 1993) and agricultural systems (Parton and Rasmussen 1994). For this project, the grazing subroutine was used to model the effect of migrating elk on the native, otherwise-unimpacted grass and shrublands on the NER and the Gros Ventre Valley. Although dozens of output variables are available, this modeling effort focused on soil C, soil N, and annual NPP because these variables are of most interest to range managers. A flowchart representing the CENTURY model is in Figure 1.

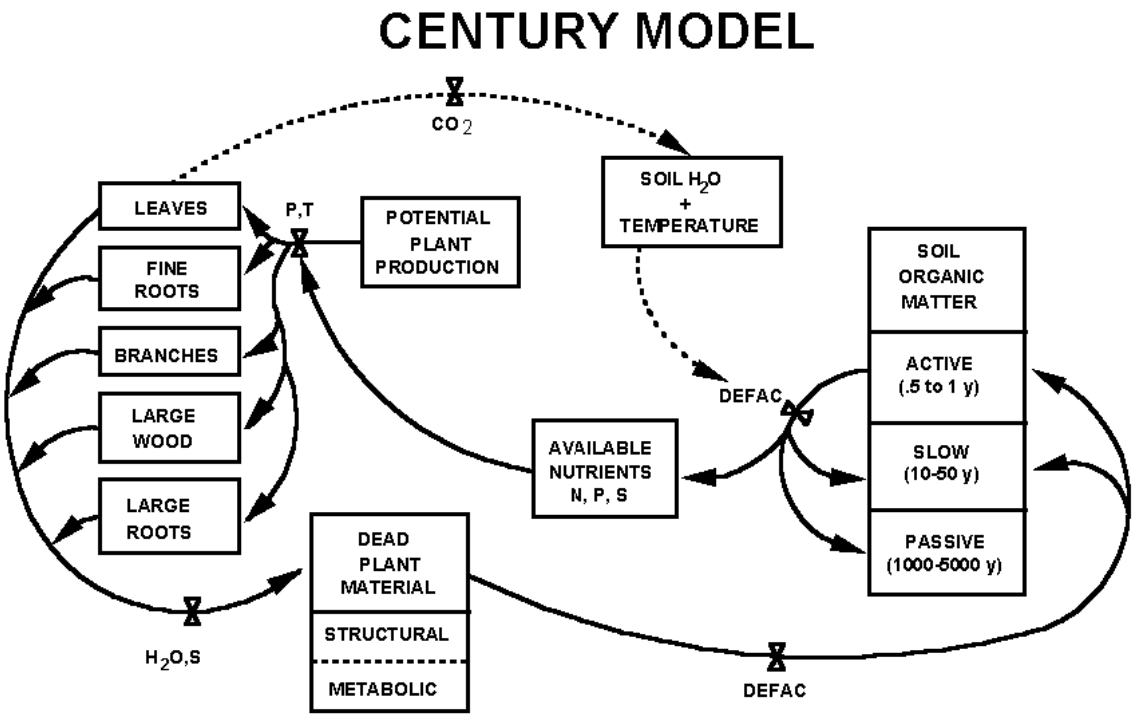


Figure 1. Flowchart of CENTURY Model

Model Input Parameters

Vegetation Types

Two vegetation types were simulated -- wet meadow and sagebrush. We assumed wet meadow is 100% herbaceous with annual production values of ~200 gC/m^2; sagebrush is a 50/50 herbacesou/sagebrush mix with annual production values ~120 gC/m^2. These production values were also used in the Forage Accounting Model, and were derived from field measurements (Zeigenfuss et al. 2001).

These vegetation types were chosen for two reasons. First, they are the same vegetation types being sampled by F. Singer for N processes and N pools for the future nitrogen/CENTURY modeling work in the Jackson Valley. Field measurements will be taken in these types in 2001 and 2002. Second, they also correspond with the major vegetation types that receive significant offtake in the Forage Accounting Model, and comprise much of the NER and the winter range in the Gros Ventre. Figure 2 below, predicted by the Forage Accounting Model, depicts the areas in an average winter with average precipitation and 500 bison where utilizations were 50% or greater.

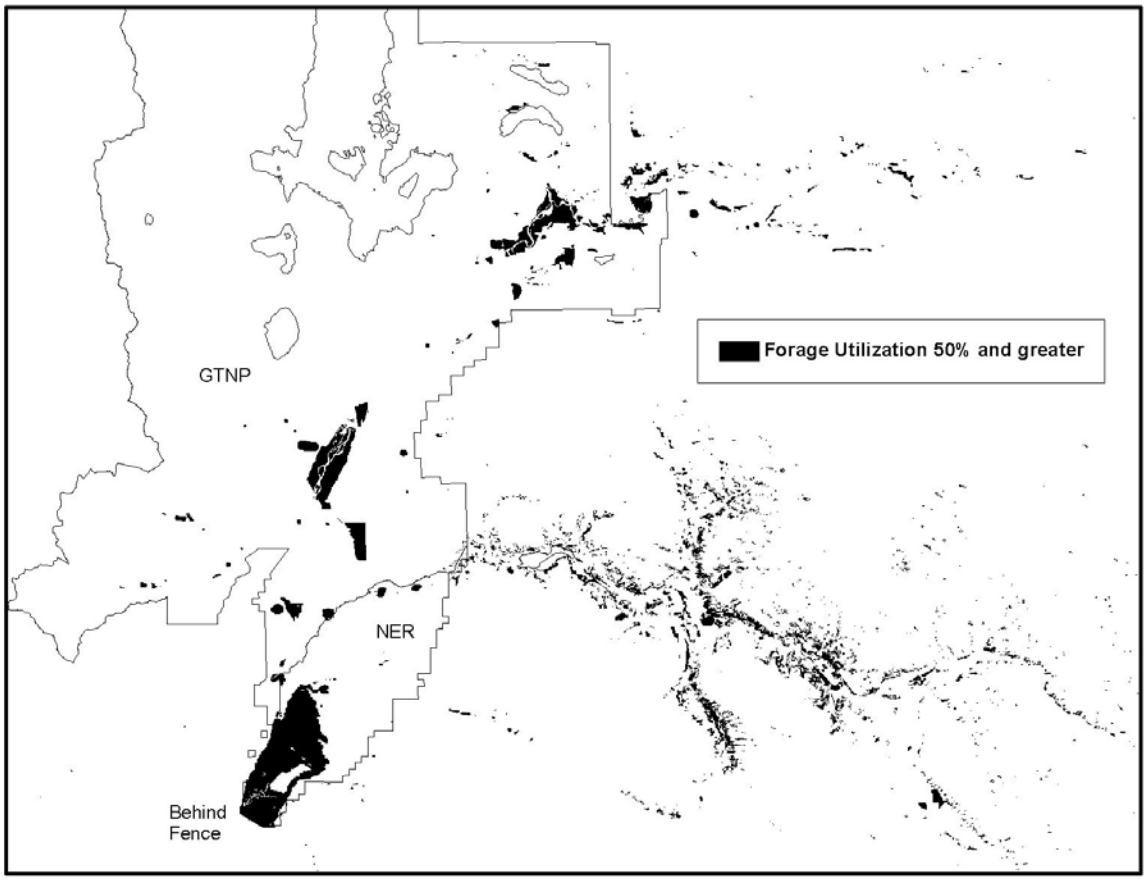


Figure 2. Areas in an average winter with average precipitation and 500 bision where utilization was 50% or greater.

Weather

Weather is a primary driver of the CENTURY model. Monthly weather data were obtained from the permanent weather station at Moose, Wyoming. Although stations at Jackson and Moran were also available, the station at Moose provided temperature and precipitation measurements midway between the poles of Jackson and Moran, and thus provided a reasonable compromise that could be used for the entire low-lying winter range in the Valley.

Other Input Parameters

Other primary input parameters include soil type and texture, C/N ratios, life span and other parameters for the vegetation types, and annual N inputs from wet and dry deposition. Soil and vegetation parameters were based on values used in CENTURY simulations of a similar system in Rocky Mountain National Park (Schoenecker et al. 2002). Annual N inputs were tuned so that simulated NPP values agreed with observed NPP for the sagebrush and meadow communities. Required N inputs were higher for the meadow than the sagebrush/grass system. This is reasonable because low-lying meadows are depositional zones and they receive nutrient inputs from surface runoff and other sources.

Modeling Assumptions

Three modeling assumptions guided this process. The wildlife fence near Jackson was built in the 1950s to keep elk from feeding on farmland during the winter. The fence partially obstructs natural migration paths down the Valley especially in severe winters when elk usually migrated to lower elevations down the Snake River through and beyond the town of Jackson. Thus, for the simplified purposes of modeling, we first assumed that no grazing occurred on the winter range prior to the construction of the fence. Using Annual Net Primary Production values measured from field data, we let the model reach equilibrium over a 2,900-year time-span during this no-grazing period. This assumption is reasonable because the production values were derived from elk-free enclosures on the winter range and therefore mimic grazed-free pre-fence production on native vegetation types.

The second assumption is that after the wildlife fence is built, elk are artificially concentrated on the winter range and therefore graze at unnatural levels on the grass and shrubland. This is the same assumption that guides grazing in the Forage Accounting Model. We modeled two grazing intensities, 50% and 80%, of standing dead grass and shrub. All grazing occurs during the months of January through April, and, because the forage is dead and the ground frozen, this causes no negative effect on the next year's production.

Third, standing dead grass is poor quality forage for elk and has significantly less nitrogen content than summer grasses. One of the driving input parameters for CENTURY in a grazed system is the ratio of nitrogen excreted by the animal to nitrogen consumed. When elk consume standing dead forage, this ratio typically exceeds 1.0. This occurs because the endogenous nitrogen lost from the animal in urine and feces exceeds the nitrogen consumed in forage. Hobbs (1996) and Mould and Robbins (1981) have calculated nitrogen levels in elk excrement in relation to forage quality. These calculations yielded 1.09 gN/day of output-to-intake for poor-quality, standing-dead forage when elk have a stable bodyweight. Additionally, when elk are eating poor quality forage in the depth of winter, they often lose weight. Thus, we also modeled a scenario where elk lost 15% of their body weight over the four-month grazing period. Losing weight causes yet more nitrogen from the animal's lean body mass to pass through the urine therefore increasing the nitrogen output/intake ratio (Hobbs 1989, D.M. Swift pers. comm.). When elk lose weight, we used a ratio of 1.25 gN/day of output-to-intake.

Results

In the wet meadow graphs (Figure 3), the first 50 years of the model depict the pre-grazing equilibrium scenario. Beginning in year 51, when the fence was built, we simulated two levels of grazing intensity, 50% and 80%. Both grazing levels accelerate nutrient cycling and cause increases in soil carbon and net annual production. The magnitude of this accelerating effect is proportionate to grazing intensity, with greater effects occurring at 80% grazing intensity. When elk are losing weight, higher N inputs accelerate the system to an even greater extent and increased plant production leads to higher soil carbon levels.

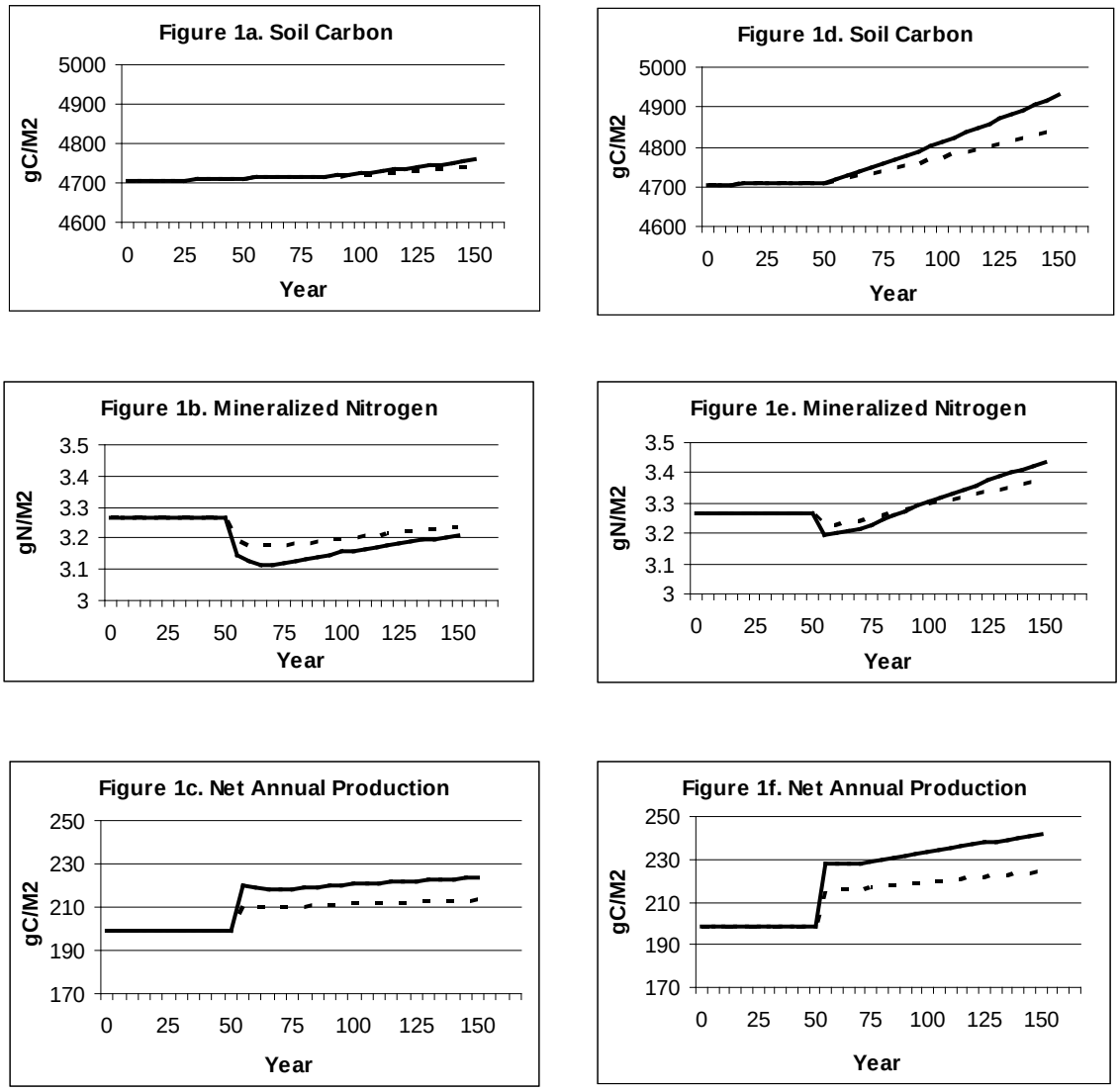


Figure 3. Model Results for Wet Meadow at two grazing levels. The solid black line depicts 80% removal of forage and the dotted line depicts 50% removal. The three graphs on the left depict the "Elk not losing weight" scenario; the three graphs on the right "Elk losing weight" scenario.

Similarly, in the sagebrush graphs (Figure 4), the first 50 years of the model depict the pre-grazing equilibrium scenario. Beginning in year 51, when the fence was built, we simulated two levels of grazing intensity, 50% and 80%. When elk are not losing weight (Figure 4 – left), soil carbon and mineralized nitrogen remain stable or slowly decline. Net annual production initially jumps to a higher level and then stabilizes over the 100-year model run. The higher level of grazing causes slightly increased production; the lower level causes stabilized production. When elk are losing weight (Figure 4 – right), all values increase. Net annual production increases faster with the higher grazing level and when elk are losing weight. Both of these can be explained by N inputs. Because the dead forage is of such poor quality the animals excrete more N than they extract from the system and this shifts carbon-nitrogen ratios in soil toward levels favoring N-mineralization. As grazing intensity increases, net N inputs to the system also increase, and when elk are losing weight the ratio of N outputs to inputs is even higher. Higher N inputs lead to enhanced mineralization, which release more N from soil organic matter. This feedback causes increased plant growth and stable or increasing soil C levels.

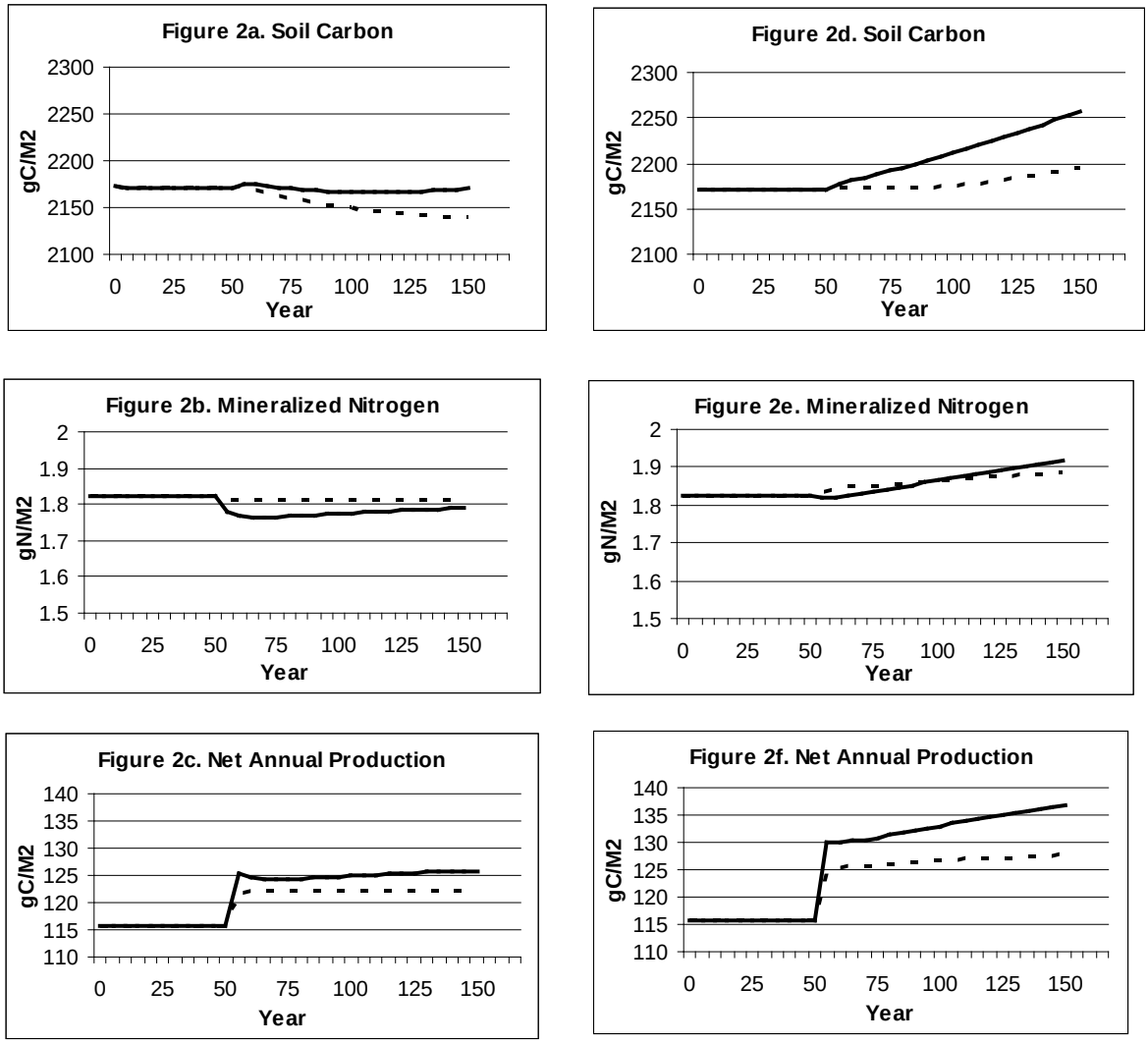


Figure 4. Model Results for Sagebrush at two grazing levels. The solid black line depicts 80% removal of forage and the dotted line depicts 50% removal. Figure 2a – 2c depict the "Elk not losing weight" scenario. Figure 1d – 1f depict the "Elk losing weight" scenario.

Overall, all twelve charts depict a similar scenario. Because elk are consuming standing dead forage in the depth of winter, there is no negative effect on plant production. Further, because elk cause accelerated nutrient cycling, and because elk are returning more nitrogen to the soil than they consume, higher grazing levels will cause higher future production levels. As long as elk are concentrated at high densities on the winter range, the CENTURY model will predict positive feedbacks on production due to higher net N inputs related to grazing. The feedback is exacerbated due to low N volatilization because of weather conditions. We presume that cold weather and snow cover keep N from volatizing into the atmosphere during winter.

These CENTURY results suggest that heavy winter-season grazing in this system, as predicted by the Forage Accounting Model, is sustainable and that soil C and nutrient levels are not significantly depleted and may increase. Nitrogen 'hotspots' and higher production will occur corresponding to animal density. If elk stay on the winter range longer with low-grade forage resulting in weight loss, increased nitrogen hotspots and increased future production will result. Figure 1 could also been seen as a 'nitrogen deposition map' wherein animals deposit nitrogen gathered throughout the entire summer range onto this limited winter area. Further fieldwork by F. Singer, will help corroborate these findings.

Part III.
The Over-Winter Mortality Model

Introduction

Forage deficits, predicted by the Forage Accounting Model (described in Part I), will likely cause elevated mortality in over-wintering elk populations. We adapted the energy balance model of Hobbs (1989) to estimate starvation mortality by simulating energy intake and expenditure by elk in four age/sex classes (calves, yearling males, adult females, bulls) during winter. The predictions of mortality provided by this model are perhaps more easily interpreted than the predictions of forage deficits and overuse provided by the Forage Accounting Model. However, while these interpretations may be easier to understand, they are also subject to a far greater potential for error. This is simply because the Over-Winter Mortality Model has approximately 10 times as many parameters as the Forage Accounting Model, and all of these parameters are estimated with some uncertainty. Therefore, we suggest that quantitative results of the energy balance model should be viewed with caution. However, we are confident that the qualitative trends we have observed are reasonable.

Methods

Elk populations were allocated to map cells based on snow water equivalents (SWE) under the assumption that elk use the areas of the landscape with shallow SWE in preference to areas with deep SWE, and that they will not use areas with > 6" SWE. So, during each week of the winter, we distributed the total population to map cells with SWE < 6" in order of increasing SWE. The number of animals assigned to a cell was determined by the available biomass of forage within that cell, an output variable in the Forage Accounting Model. We calculated the weekly requirements of individuals and assigned no more animals than could be supported for 1 week by the available biomass. We assumed that a group of elk or sub-herd in the cells of a SWE category (0, 1, 2, … , inch) had the same age/sex composition as the entire herd (proportion of calves: 0.15; yearling males: 0.05; bulls: 0.15; cows: 0.65). If a SWE-depth category of cells could support < 5 elk, then only bulls were assigned to these cells. We calculated daily intake based on the average body mass of sex and age classes and their proportions in the population assuming the body mass of a calf (age = 6 months) was 200 pounds, yearling 350 pounds, bull 675 pounds, and cow 500 pounds.

Foods were categorized into two categories, herbaceous and shrubs. We assumed that when SWE > 30 cm, shrubs comprised 100% of elk diet. If the SWE depth was in the range of 20-30 cm, the proportion of herbs in the diet increased in direct proportion to decreasing SWE. When SWE < 20 cm, the diet consisted of 100% herbs. Available foods of the cells of each SWE-depth category were updated daily by removing the amount of biomass consumed by elk.

The percentage of each age class that dies was based on assumed average fatness and the standard deviation in fat reserves at the beginning of the winter. We assumed that 67% of pre-winter energy reserves came from fat and 33% from lean body and that the size of these reserves was a normally distributed random variable. Based on that assumption, we used the standard normal probability density function to calculate the proportion of the population that had energy reserves less than the magnitude of the energy deficits incurred during winter. We assumed that this was the proportion of each age class that starves (Hobbs 1989).

We ran simulations with initial conditions for populations set at 6,000, 12,771 and 18,000 animals for an average winter (1996), above average winter (1982), and severe winter (1997).

Results

Simulated mortality of calves ranged from a low of 4% during an average winter at a total population size of 6,000 to a high of 42% during a severe winter and a population of 18,000 (Figure 1 - 3). Increasing population density was associated with roughly proportionate increases in estimated mortality. Starvation mortality for adult cows was predicted to be 1% for a population of 6,000 animals in an average winter rising to a high of 25% for a population of 18,000 during a severe winter.

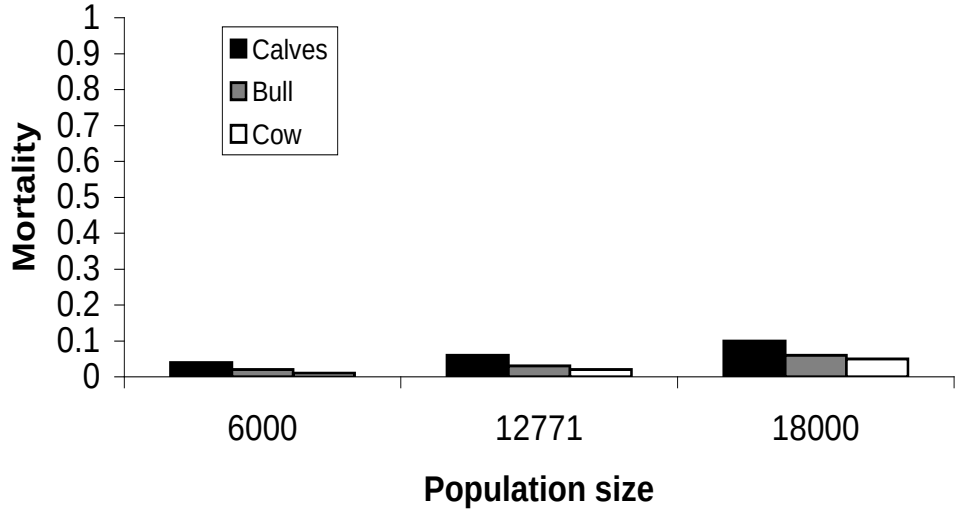


Figure 1. Simulations of elk winter mortalities for the Jackson Elk Herd under different densities in average winter (1996).

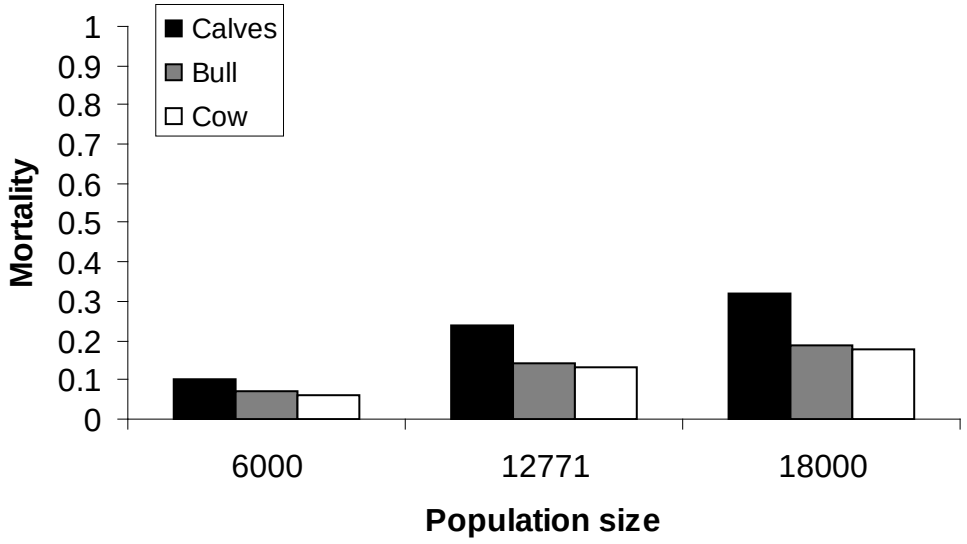


Figure 2. Simulations of elk winter mortalities for the Jackson Elk Herd under different densities in above average winter (1982).

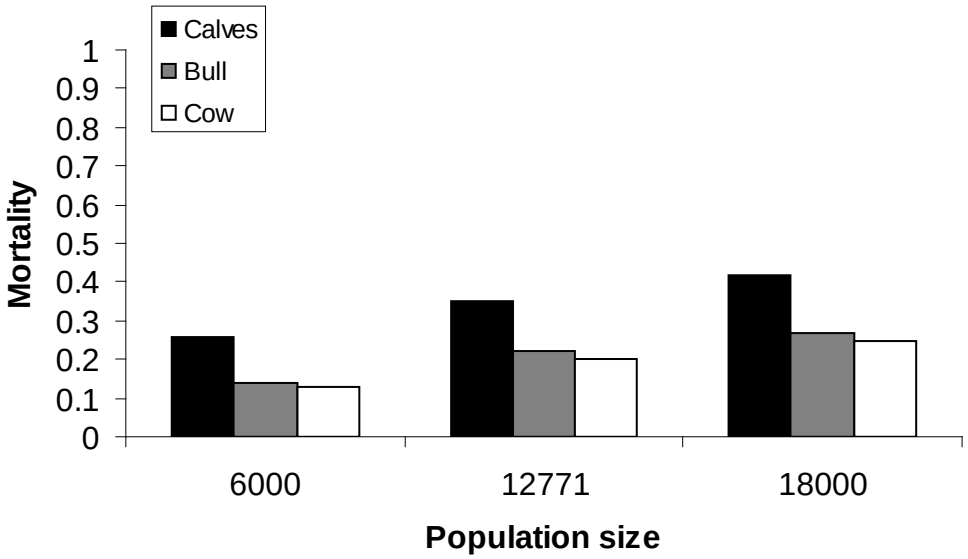


Figure 3. Simulations of elk winter mortalities for the Jackson Elk Herd under different densities in severe winter (1997).

Conclusions

The main implications of these three overlapping models are:

1. Forage utilization rates of 50% and greater will occur on the winter range at all elk population levels and during all winter severities. The area of winter range used in excess of 50% will increase with the elk population and winter severity. However, although high utilization rates will occur on the winter range, they may not negatively effect, and may even enhance, future soil fertility and plant production.

2. In average SWE winters with average pre-winter precipitation and 500 bison, roughly 16,000 elk can find forage on the Greater Teton Ecosystem without incurring forage deficits and roughly 5,000 elk can find forage on the NER without incurring deficits.

3. Winter snow severity has a deleterious effect on forage availability and causes critical imbalances in forage supply/demand at most elk population levels.

4. Drought reduces forage production to 45% of the mean and increases deficits in all winter conditions and with all elk populations levels. When drought during the growing season precedes deep-snow winters, forage deficits are extreme.

5. Increasing the number of bison has a mild effect on forage deficits on the Greater Teton Ecosystem during average winters with average precipitation conditions, but has a more significant effect when climatic conditions worsen. On the NER, increasing bison numbers will greatly exacerbate deficits and the ability of elk to find adequate forage.

6. Cattle grazing has a negligible effect on forage deficits because it does not occur on areas where forage is available to native ungulates during winter.

7. Supplemental feeding overcompensates for the forage unavailable south of the wildlife fence. Historic elk populations either: (1) were smaller than current ones, and/or (2) may have suffered high levels of mortality during severe winters, and/or (3) more likely have used lower elevation ranges south of Jackson and larger areas of the Gros Ventre.

8. Starvation of adult animals is expected to occur at relatively low levels (about 5%) at all levels of population and winter severity, but may increase to as high as 30% during severe winters and with high population levels (18,000).

9. Only EIS Alternative #3 has the significant effect of restricting forage availability for elk and increasing forage deficits. Alternatives #2 and #4 have only mild effects. The EIS Alternatives attempt to manipulate three variables: bison numbers, willow availability on the NER, and irrigation of the NER's cultivated fields. The net effect on forage deficits of these three variables will be the following:

   a. increasing bison numbers will increase deficits
   b. fencing off willow on the NER will increase deficits
   c. irrigating the cultivated fields on the NER will decrease deficits -- center-pivot more so, flood irrigation less so.

References

Baker, D. L., and D. R. Hansen. 1985. Comparative digestion of grass in mule deer and elk. Journal of Wildlife Management 49:77-79.

Baker, D. L., and N. T. Hobbs. 1987. Strategies of digestion: digestive efficiency and retention time of forage diets in montane ungulates. Canadian Journal of Zoology 654:1978-1984.

Biondini, M., B.D. Patton, and P.E. Nyren. 1998. Grazing intensity and ecosystem processes in a northern mixed-grass prairie, USA. Ecological Applications 8:469-479.

Cordova, F. H., J. O. Wallace, and R. D. Pieper. 1978. Forage intake by grazing livestock: a review. Journal of Range Management 31:430-438.

Coughenour, M. B. 1992. Spatial modeling and landscape characterization of an African pastoral ecosystem: a prototype model and its potential use for monitoring drought. Pp. 787-810 in: D.H. McKenzie, D.E. Hyatt and V.J. McDonald (eds.). Ecological Indicators, Vol. I. Elsevier Applied Science, London and New York.

Coughenour, M. B. 1993. The SAVANNA landscape model – Documentation and Users Guide. Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO.

Coughenour, M.B. 1994. Elk carrying capacity on Yellowstone's northern elk winter range - Preliminary modeling to integrate climate, landscape, and elk nutritional requirements. Pp. 97-112 in: Plants and Their Environments: Proceedings of the First Biennial Scientific Conference on the Greater Yellowstone Ecosystem, Mammoth Hot Springs, Sept. 1991. D. Despain (ed.). Technical Report NPS/NRYELL.NRTR-93/XX. USDI/NPS. Denver, CO.

Coughenour, M.B., and F.J. Singer. 1996. Yellowstone elk population responses to fire - a comparison of landscape carrying capacity and spatial-dynamic ecosystem modeling approaches. Pp. 169-180 in J. Greenlee (ed.), The Ecological Implications of Fire in Greater Yellowstone. International Association of Wildland Fire, Fairfield, WA.

Despain, D. G. 1990. Yellowstone Vegetation: Consequences of Environment and History in a Natural Setting. Roberts Rinehart Publishers, Boulder, CO.

Farnes, P.E., and W. H. Romme. 1993. Estimating localized SWE on the Yellowstone Northern Range. Presented at the Joint Eastern-Wester Snow Conference, Quebec City, Quebec.

Farnes, P., C. Heydon and K. Hansen. 1999. Snowpack in Grand Teton National Park and Snake River Drainage above Jackson, Wyoming. Department of Earth Sciences, Montana State University.

Hobbs, N. T. 1989. Linking energy balance to survival in mule deer: development and test of a simulation model. Wildlife Monographs 101.

Hobbs, N.T. 1996. Modification of Ecosystems by Ungulates. Journal of Wildlife Management. 60(4):695-713.

Hobbs, N. T., D. L. Baker, G. D. Bear, and D. C. Bowden. 1996. Ungulate grazing in sagebrush grassland: Mechanisms of resource competition. Ecological Applications 6:200-217.

Homer, C. G. 1995. Intermountain Region: Land Cover Characterization. Metadata on CD from Utah State University.

Houston, D. B. 1982. The Northern Yellowstone elk: ecology and management. Macmillan Publishing Company, New York, New York.

Mattson, D., and D. Despain. 1985. Grizzly bear habitat component mapping handbook for the Yellowstone ecosystem. YNP document.

Meagher, M. 1973. The Bison of Yellowstone National Park. National Park Service, Scientific Monograph Series, Number One.

Metherell, A.K., L.S. Harding, C.V. Cole, and W.J. Parton. 1993. CENTURY soil organic matter model environment, Technical documentation, Agroecosystem version 4.0. Great Plains System Research Unit Technical Report No. 4. USDA-ARS, Fort Collins, Colorado.

Mould, E. D., and C. T. Robbins. 1981. Nitrogen metabolism in elk. Journal of Wildlife Management 45(2):323-334.

Parton, W. J., and P. E. Rasmussen. 1994. Long-term effects of crop management in wheat/fallow: II. CENTURY model simulations. Soil Science Society of America Journal 58:530-536.

Parton, W.J., J.M.O. Scurlock, D.S. Ojima, T.G. Gilmanov, R.J. Scholes, D.S. Schimel, T. Kirchner, J.C. Menaut, T. Seastedt, E. Garcia Moya, A. Kamnalrut, and J.L. Kinyamario. 1993. Observations and modeling of biomass and soil organic matter dynamics for the grassland biome worldwide. Global Biogeochemical Cycles 7:785-809.

Parton, W.J., D.S. Ojima, C.V. Cole, and D.S. Schimel. 1994. A general model for soil organic matter dynamics: sensitivity to litter chemistry, texture and management. Pp. 147-167 in: Quantitative Modeling of Soil Forming Processes. Soil Science Society of America, Special Pub. 39, Madison, WI.

Schoenecker, K., F. Singer, R. Menezes, L. Zeigenfuss, D. Binkley 2001. Sustainability of vegetation communities grazed by elk in Rocky Mountain National Park. USGS-BRD. In F.J. Singer, ed. Ecological evaluation of the abundance and effects of elk in Rocky Mountain National Park, Colorado, 1994-1999. Unpublished report.

Schoenecker, K. A., F. J. Singer, R. S. C. Menezes, L. C. Zeigenfuss, and D. Binkley. 2002. Sustainability of vegetation communities grazed by elk in Rocky Mountain National Park. Pp. 187-204 in F. J. Singer and L. C. Zeigenfuss, compilers, Ecological Evaluation of the Abundance and Effects of Elk Herbivory in Rocky Mountain National Park, Colorado, 1994-1999. Final report to the National Park Service, Rocky Mountain National Park on Cooperative Agreement No. 1445-0009-94-1074 (USGS) Subagreement 2 between the National Park Service, Biological Resources Discipline of U.S. Geological Survey, and Natural Resources Ecology Lab, Colorado State University. Open File Report 02-208. 268 pp.

Singer, F.J., L.C. Zeigenfuss, B. Lubow, and M. Rock. 2001. Ecological evaluation of the appropriate number of ungulates in U.S. national parks: A case study of elk in Rocky Mountain

National Park. In F.J. Singer, ed. Ecological evaluation of the abundance and effects of elk in Rocky Mountain National Park, Colorado, 1994-1999. Unpublished report.

Singer, F. J., L.C. Zeigenfuss, B. Lubow, and M.J. Rock. 2002. Ecological evaluation of potential overabundance of ungulates in U.S. national parks: a case study. Pp. 205-248 in F. J. Singer and L. C. Zeigenfuss, compilers, Ecological Evaluation of the Abundance and Effects of Elk Herbivory in Rocky Mountain National Park, Colorado, 1994-1999. Final report to the National Park Service, Rocky Mountain National Park on Cooperative Agreement No. 1445-0009-94-1074 (USGS) Subagreement 2 between the National Park Service, Biological Resources Discipline of U.S. Geological Survey, and Natural Resources Ecology Lab, Colorado State University. Open File Report 02-208. 268 pp.

Steele, R. 1983. Forest habitat types of eastern Idaho-western Wyoming. USFS Report INT-144.

Steele, V., F. Singer, and M. Coughenour. 1999. Percent Utilization of Vegetation in Grand Teton National Park, the National Elk Refuge and the Gros Ventre Area of Bridger Teton National Forest: Mid-Season Progress Report.

Turner, M. G., L. Wallace, W. H. Romme, and A. Brenkert. 1994. Simulating winter interactions among ungulates, vegetation, and fire in northern Yellowstone Park. Ecological Applications 4(3):472-496.

U.S. Fish and Wildlife Service, National Elk Refuge. 1998. Irrigation System Rehabilitation Plan Environmental Assessment. Jackson, WY.

Zeigenfuss, L., F. Singer, M. Rock, and M. Tobler. 2001. A synthesis of data, model-based analyses, and refinements of possible management scenarios for bison and elk in the Jackson Valley. USGS-BRD, Annual Report.

Appendix A: Vegetation Production Methods

Data on annual production for each vegetation type were obtained from studies conducted by Biological Resources Division (BRD)--USGS, National Elk Refuge (NER)--USFWS, and Bridger-Teton National Forest (BTNF)--USFS. Each data set was collected in a different manner and so it was necessary to standardize the data so that they could be combined to create the largest data set possible for estimating average production values.

The BTNF data were collected from 1994-1999. Sample points were randomly generated in areas of highest priority for forest management activities. As a result, less information was available on vegetation types that do not encompass areas of high management priority. Data on plant production was visually estimated in weight classes. For the purpose of estimating average production, the midpoint of the class was assigned to the sample point (Appendix C: Table 2).

Data on dominant and codominant tree, shrub, and herbaceous species were assessed to determine the appropriate USU vegetation categories for each sample. Because no data were available on forest canopy closure at the sample points, all points in forested types of a species (or species grouping) were combined. Total production was calculated by summing the midpoints for shrub, grass, and forb production.

Data from the NER were collected from 1987-1999, however, data for the entire refuge exists in electronic format for 1999 only. The remainder of the 1987-1999 data is from the south end of the refuge, and as a result, some vegetation types which only occur in the north end of the refuge are only represented in 1999. Production was estimated using the SCS double sampling method, whereby ocular estimates are made for all points on a transect in a particular vegetation type, and a subsample of these points are clipped and weighed and used to calibrate the points which had only ocular estimation.

Plant productivity estimates for the BRD study were collected from 1996-1998 and were obtained by clipping, drying, and weighing vegetation in several 0.25 m^2 quadrats at several sites for each vegetation type.

Mean production values were calculated for each vegetation category in each of the data sets. Vegetation was grouped in broad categories based on dominant tree, shrub, or herb species and tested for differences between all the individual categories within these broad groups using Fisher's least significant difference test for multiple comparison of means. Based on the results of these tests, 15 new vegetation categories were developed. The final mean production values for the new vegetation categories were calculated using all data from the three data sets. No data existed in the available data sets for three of the new categories: alpine herbaceous, alpine shrub, and disturbed/developed. Production values for the alpine categories were approximated based on work done by Marilyn Walker at the Niwot Ridge Long Term Experimental Range near Nederland, Colorado. These data were found on the Niwot LTER web site. Values for disturbed/developed areas, where irrigated and fertilized lawns are maintained, were expected to be similar to values for sub-irrigated bluegrass found in the NER and BRD data. The values estimated using these data were similar to those measured in disturbed sites in the town of Estes Park, Colorado in another study (Singer et al. 2002) and such values were therefore considered adequate.

Estimating production in wet and dry years was approached two ways. First, using annual precipitation and 30-year average precipitation values available on the web from the University of

Nebraska's High Plains Climate Center, several years with greater than average (1996 and 1997) and lower than average (2001, 1994, 1992, 1988) precipitation at the Jackson, Moose, and Moran weather stations were chosen. Average production values were calculated for the wet years and dry years for each vegetation category and each data set separately. Because reliable data for wet, dry, and average years were not available for all vegetation types, the percentage of mean annual production for those types that were best represented were calculated for each data set for both wet and dry years, and then these best data were averaged to get a mean percentage of production to be applied across all vegetation types.

Dry year production ranged from .45 -.91 of annual production across the data sets with a mean of 0.85. Wet year production ranged from 1.29-1.8 of annual production across all data sets with a mean of 1.5. We chose to use 1.5 as the wet year production and 0.45 as the dry year. 0.45 was chosen because managers wanted a severe draught scenario based on recent 2001 precipitation.

Managers raised a question about the spatial heterogeneity of production due to varying rainfall over the study area. For example, sagebrush on the NER may produce differently than sagebrush in the Gros Ventre. We attempted to create a spatially explicit production map based on actual production measurements across the study area. However, these estimations did not yield significant spatial differences in production for each vegetation type. While we recognize that rainfall may vary across this area, and that production may vary with it, field data could not support these distinctions.

Appendix B: Snow Model Methods

The model is based on an algorithm to spatially interpolate point data, while correcting for effects of elevation. This algorithm was first developed by Michael Coughenour as part of a spatially explicit ecosystem model called SAVANNA (Coughenour 1992, 1993). The same algorithm was used in a Landscape Carrying Capacity Model for elk on Yellowstone's northern elk winter range (Coughenour 1994, Coughenour and Singer 1996). The first application of the model to Yellowstone was at a research conference held in Yellowstone in 1991 (Coughenour 1994). In this application, GRASS GIS maps for elevation and vegetation were read into a model to calculate snow depth maps, available forage for elk, and elk carrying capacity on a biweekly basis throughout the winter. The model produced output files that were read into the GRASS GIS, to produce maps of snow depth and elk carrying capacity. These output maps were presented at the 1991 conference.

At about the same time, Phil Farnes was conducting studies of snow distributions on the Yellowstone northern elk winter range (Farnes and Romme 1993). He quantified the ways that slope, aspect, and tree cover affect snow pack, as compared to measurements made on a standard, level, treeless sample site. He also developed ways to integrate data from numerous snow water sample sites into a unified data base, and ways to use snow water equivalent to calculate an index of winter severity that combines stress effects of cold temperature and heavy snow on elk (Farnes et al. 1999).

The idea of combining the Coughenour model with the Farnes data into a stand-alone data model was the outcome of initial research on bison and elk carrying capacity by the two researchers in Grand Teton National Park (GTNP). The idea for that project was conceived by Robert Schiller and Francis Singer. Coughenour conducted preliminary SAVANNA modeling studies and Farnes collected snow data in GTNP. To create the stand-alone model, Coughenour combined his earlier elevation-based model with the slope/aspect/tree cover relationships of Farnes, in order to convert the snow data assembled by Farnes into maps of snow water equivalents in GTNP. The snow data model was delivered to GTNP by Coughenour and Farnes in 1999, at the same time Farnes delivered his unique data set (Farnes et al. 1999). Subsequently, a new phase of GTNP carrying capacity research was initiated by N. T. Hobbs, F. Singer, G. Wockner, and L. Ziegenfuss.

In 2000, Gary Wockner, Tom Hobbs, and Francis Singer (CSU) obtained the model from Coughenour for this new phase of the GTNP project (Hobbs et al. 2001). Working with Farnes and Coughenour, Wockner obtained data to run it, worked through several software bugs, tested it, and then used it in the forage accounting model for the Jackson elk herd.

The snow model is driven by three primary sources of data, a digital elevation model, data on vegetation distribution, and point data on snow distribution. Using the DEM and the snow data, an initial grid is created using interpolation and regression. Then, this grid is readjusted for the effect of slope, aspect, and vegetation cover. Using slope and aspect, the more the cell tilts toward the sun, the more it is melted off; conversely, the more it is tilted away from the sun, the more snow accumulates. Using the vegetation data, the grid is adjusted for less snow accumulation under conifers. The bigger the trees and the denser the stand, the less snow accumulation.

Digital Elevation Model

A digital elevation model (DEM) was obtained from NREL researchers working on a similar project in the Greater Yellowstone Area. The DEM is at 30-meter accuracy and covers the entire

study area. In Arcview, the DEM was clipped to the study area and exported as an ASCII file for use in the snow model. The DEM was then converted into a slope grid using Arcview's "Spatial.Slope" function, and converted into an aspect grid using Arcview's "Spatial.Aspect" function. Arcview's Spatial.Aspect command assigns the value "-1" to flat areas. Because the snow model will not read "-1"s, these areas were reassigned the value "300" which results in no multiplier being used in the snow model. These two grids were then converted into integer grids to decrease file size and then exported in ASCII format for use in the snow model

Vegetation Data
The snow model uses the merged vegetation grids from Utah State University, Grand Teton National Park, and the National Elk Refuge. Each of the three grids had relevant codes to use in the snow model. The Utah State coverage had a code titled "canopy percent"; the GTNP coverage had a code for "forest successional stage"; and the NER coverage only had one applicable forested area. These codes were converted into codes readable by the snow model using a crosswalk table (Appendix C: Table 5). Because dense conifer stands will result in less snow on the ground under those stands, the following tree types cause the snow model to create an adjustment: Lodgepole Pine, Subalpine Pine, Douglas Fir, Englemann Spruce. This adjustment is a multiplier which decreases SWE based on the size of the trees and the density of the stand.

Snow Data
The model interpolates the snow station data provided by Farnes. Several types of data are available in the Jackson Valley including snow courses, SNOTEL sites, and climatological stations. In addition, Farnes collected additional monthly data at over 75 stations beginning in water-year 1996. After the large study area was chosen, snow stations within that area were identified. The snow model incorporates data from 6 long-term stations which have daily data beginning at least from 1980 and uses monthly data (Feb, Mar, Apr) from 56 additional stations primarily in Jackson Valley. Snow sampling locations are shown in Figure 1 (Part I.). The snow model also requires a file containing UTM location and elevation of each station. This data was taken from the DEM by overlaying the snow station locations on the DEM and assigning the elevation attribute of the DEM to each station.

The 6 long-term stations ranged from the highest, Togwotee Pass--9580 feet, to the lowest, Jackson--6230 feet. The other four stations were: Moose--6468 feet, Moran--6798 feet, Base Camp--7030 feet, and Phillips Bench--8200 feet. The 56 additional stations contained monthly data collected February, March, and April 1st in 1996, 1997, and 1998. The names, locations, and elevations of all stations are listed in Appendix C: Table 6.

Data at the 6 daily sites existed from water-year (W-Y) 1980 to present. Because W-Y 1981 had one of the lowest SWEs on record and W-Y 1997 had one of the highest (Farnes et al. 1999), a 20-year (1980-1999) stretch of time provided ample variability for useful modeling. At the time of this report, 1999 was the last year of data that was processed by Farnes/Heydon and available for analysis.

The current modeling effort steps through the winter from the onset of snow to its end--roughly November 1st to July 1st. Thus, year-round daily data estimates for all 19 years needed to be created for the 56 monthly stations where data was only collected on February, March, and April 1st of 1996-1999. We developed a regression technique to estimate the missing data at the additional sites. Because snow varies due to elevation and location throughout the study area, each of the original daily stations could be used as independent variables in a regression function to predict the missing data at the monthly sites. This process was carried out with these steps:

1. In S-plus a matrix of data was assembled which contained SWE on Feb, Mar, and Apr 1st in 1996, 1997, and 1998 at all 62 locations. These 9x62 data points contain measured SWE at all locations.
2. A correlation matrix was constructed to determine which of the independent daily stations would serve as best predictors for the dependent monthly stations.
3. Using this matrix, and a more subjective analysis of snow patterns and elevations, a table was constructed which divided the 6 daily stations into three groups. Group 1 contained Jackson, Group 2 contained Moose and Moran, Group 3 contained Base Camp, Phillips Bench, and Togwotee Pass. Each monthly station was assigned to one of these three groups. There were roughly three snow patterns in all the data. The first were sites that increased on March 1st and then melted to "0" or near on April 1st. The second were sites that increased on March 1st and decreased on April 1st but not to near "0". The third were sites that increased on March 1st and then increased again on April 1st. The assignment appears in Appendix C: Table 7.
4. A regression equation was developed in S-plus using stepwise linear regression with "0" as the Y-intercept for each of the 56 monthly stations from the independent predictors in each group. This particular method was developed after several attempts at using other regression methods and switches. Forcing the Y-intercept to "0" provided the best fit of the data at the tails of the curves. (The output -- r^2, equations, etc -- is available for review) Additionally, a few of the regressions did not yield a significance with any predictor site. At these supplemental stations, the predictor site with the highest correlation with the supplemental site was 'forced' to provide the regression.
5. These regression equations were pasted into an Excel spreadsheet which contained the daily data for the 6 stations. The daily data was predicted for the 56 monthly stations.
6. The predicted versus observed values were compared for Feb, Mar, and Apr 1st 1996-8, for the 56 dependent variables. Predictions were very good. (This output is also available for review)

After the process was completed Farnes pointed out that Gros Ventre Summit is a long-term daily site rather than a supplemental site. Its daily data was located on a disk from Coughenour and substituted for the predicted data. Because its snow pattern is similar to Togwotee Pass, Phillips Bench, and Base Camp, we saw no need to rerun the regressions which used those sites. Thus there are 7 long-term stations, and 55 supplemental sites used in the final snow model runs.

With the predicted daily data for all 62 stations over the 20-year time span, the snow model allows us to run a simulation of SWE for any day of the snow-year during those 20 years. The primary output of that model is an ASCII file with SWE for each of the cells in the original input grids. Additional output includes a fit-comparison of observed versus predicted SWE at each site, and a file containing r^2, slope, and intercept of the regression function used in the model.

The output ASCII file is imported into Arcview and converted to a grid for visual inspection. The grid is then smoothed twice with a 5x5 filter using Arcview's "FocalStats" function. This smoothing is recommended by Coughenour and causes most of the banding and striping remnant from the DEM to disappear. Adjusting the legends to create any SWE threshold provides the needed visual reference for the migratory switch used in the forage utilization model. A dynamic snow map was also created which visually steps through the winter on a weekly basis in 1997, 1998, and 1999.

Although SWE grids currently begin when depth hits 2 inches, they can be generated anytime snow is present. Grids were modeled four times a month for each snow-water-year on the 1st, 8th, 15th, and 23rd.

Grids were begun when SWE hit 2" at any station and continued until SWE fell below 2". The earliest occurrence was October 15th; the latest was July 15th. Grids have a 30 meter pixel size and have 1851 rows and 2425 columns for a total of 4,488,675 cells.

The Gros Ventre Correction

At the meetings in Jackson in August 2000, it was agreed that the snow model over estimated SWE in the Gros Ventre Valley because of the snow shadow downwind of the Tetons. Also in the original snow modeling, no input data for the snow model -- which comes from the daily and supplemental sites – exists in the Gros Ventre Valley, the closest being Gros Ventre summit. To test this theory, Farnes' team collected supplemental SWE data in the Gros Ventre during the winter of 2000. Two dates, February 1st and March 1st , provide enough data points to feed the snow model and check its results. The model was run using all the data for those two dates and the results were discussed with Farnes at a meeting in Fort Collins in October.

While these dates clearly provided a different snow picture than the previous modeling, it was also known that WY2000 was a very light snow year, and thus its effects were questionable. In specific, the predictions at Darwin Ranch were well below the actual measurements. Also, the correction provided a broad and sharp SWE reduction over vast areas in the Gros Ventre. During the meeting with Farnes in October, he described different data not yet analyzed from snow stations at Darwin Ranch and from the feedgrounds in the Gros Ventre. This data comes from four sites – Alkali Feedgrounds, Patrol Cabin Feedgrounds, Fish Creek Feedgrounds, and Darwin Ranch and was collected by the USFS.

This data was sent to Fort Collins in late November and fed into the snow model and was used in two ways. First, we checked the WY2000 snow correction map against these dates, and found that the WY2000 correction was indeed overcorrecting, especially at Darwin Ranch. Because this new data was spread across years 1996-1998, it provided measurements from deeper snow years. Second, we substituted this data into the snow model and made a new correction map. At a meeting in December with Hobbs, Singer, Zeigenfuss, and Wockner, we decided that this newest correction provided the best estimate. Not only did predicted/observed measurements match better at all sites, it also provided the needed correction in the Gros Ventre Valley while leaving the higher elevations with greater snow. The model and the correction were run on several dates, and all provided a reasonable fit.

Figure 1 and Figure 2 (in this appendix) are graphics of the before and after snow model runs on January 14, 1998. These figures clearly depict that the new Gros Ventre data provides a very different SWE picture for the Gros Ventre Valley. The results for several other dates are not shown here but give the same pattern. Additionally, these new data points change the SWE map only a small amount over the southeast quadrant of the study area, whereas previous corrections changed it greatly. Figure 3 is the actual correction map, the details of its creation are below.

Creating the Gros Ventre Correction Map

The correction map was created using these steps:

1. Run the snow model with and without the Gros Ventre data for 12/20/1996 and 01/14/1998. These two dates were picked because they had the highest SWE of the additional dates. Because the larger carrying capacity model is driven by depth-of-winter forage needs in above average snow winters, these highest SWE dates provide the best estimation of severe conditions.
2. Create a 'multiplier grid' on each date which reflects the value the "before" grid must by multiplied by to create the "after" corrected grid. For each date, divide the 'after'

SWE by the 'before' SWE. Thus, if the before SWE grid had a cell that was "7" and after was "4", then a new grid is created with the "multiplier" of "0.5714" in that cell.

3. Average the two "multiplier grids" from the two different dates to best take advantage of the temporal data, thus creating an "average multiplier grid".
4. Define a geographic area around the Gros Ventre Valley in which SWE are measurably different in the "before" and "after" grids and select out the "average multiplier grid" in this area. This area was defined by the Gros Ventre watershed from a GIS coverage.
5. Create a final "correction grid" in which all cells in the broader study area are "1" and the Gros Ventre selection area has the value of the "average multiplier grid".

Thus finally, in the Forage Accounting Model loop, the SWE grid will be multiplied by the "correction grid". The SWE values will be retained in all areas except the Gros Ventre Valley which will be adjusted downward accordingly. This will happen quickly, easily, and unnoticeably in the model. The "correction grid values" are the numbers by which the original SWE grids will be multiplied to adjust downward.

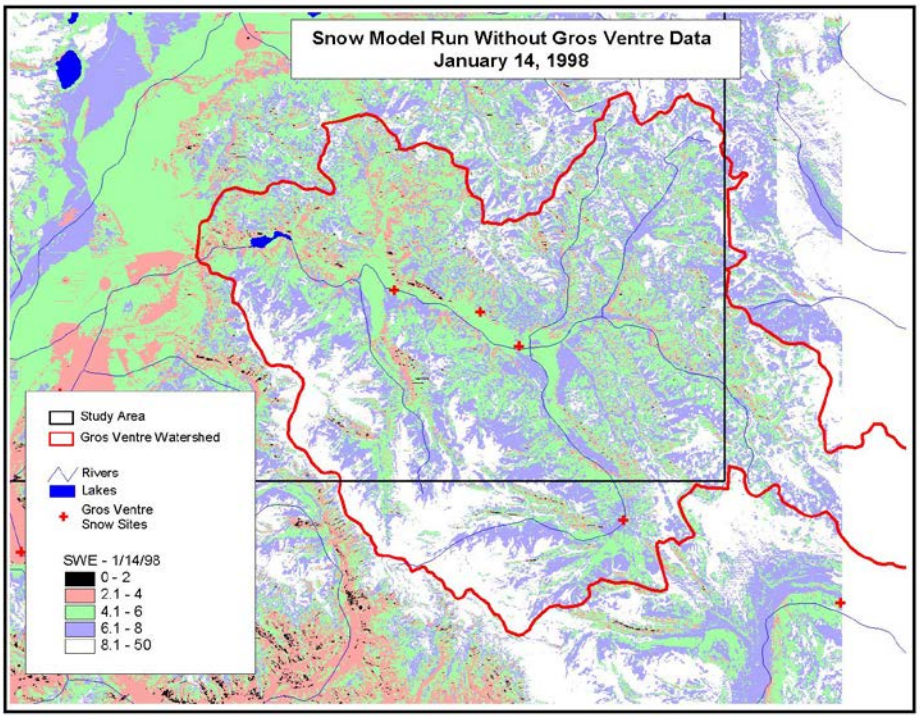


Figure 1. Snow model run without Gros Ventre data on January 14, 1998.

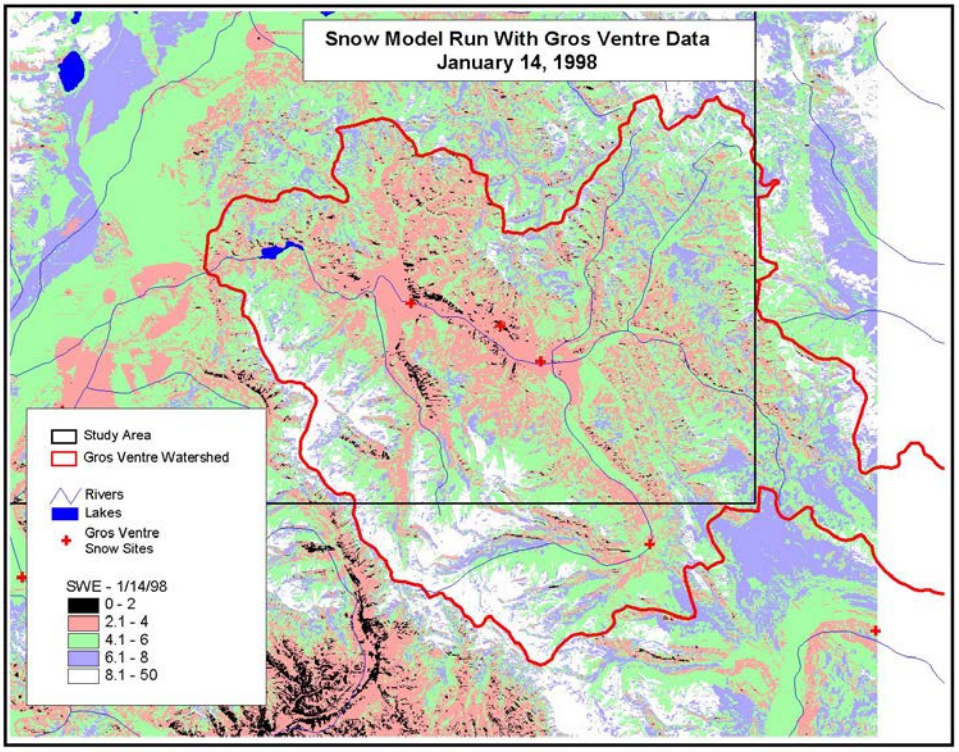


Figure 2. Snow model run with Gros Ventre data on January 14, 1998.

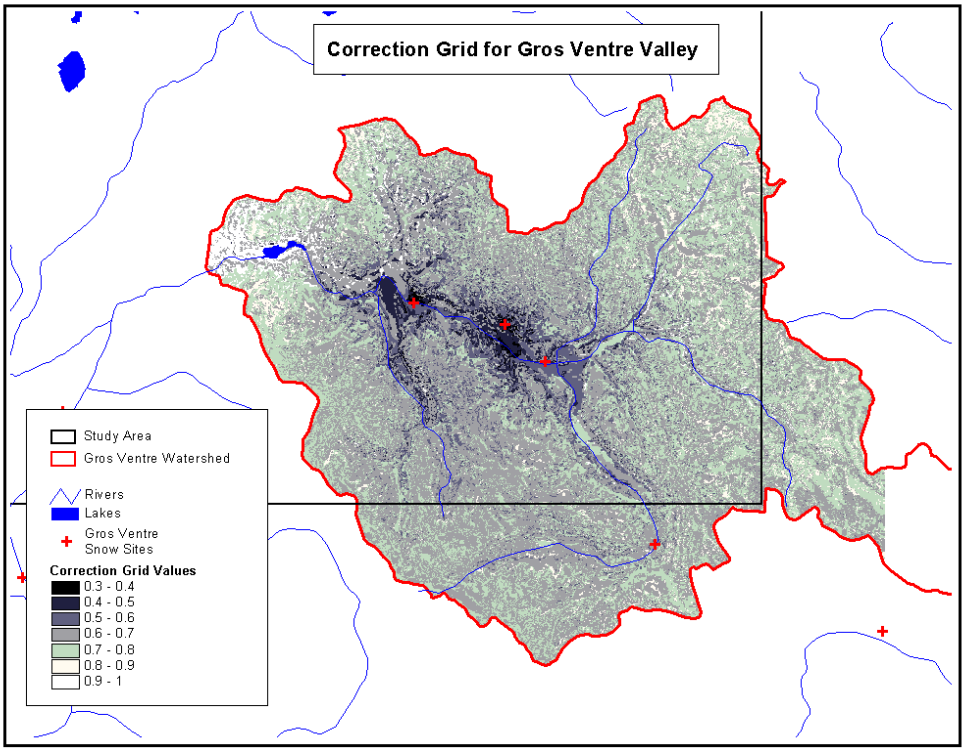


Figure 3. Correction grid for the GrosVentre valley.

Appendix C: Tables

Table 1. Vegetation Coverage Crosswalk Table

	Utah State			NER		GTNP		Our Model	
CODE	COVER_TYPE	Canopy	CODE	COVER_TYPE	CODE	COVER_TYPE	**CODE**	COVER_TYPE
	Conifer Trees			**Woodlands**		**Trees (successional stage)**		**Trees**
1	alpine fir	<30%					**1**	Spruce-fir
2	alpine fir	30-59%						
3	alpine fir	>59%						
8	alpine fir/lodgepole pine	30-59%						
9	alpine fir/lodgepole pine	>59%						
10	alpine fir/spruce	<30%			40	Spruce-Fir(0)		
11	alpine fir/spruce	30-59%			41	Spruce-Fir(1)		
12	alpine fir/spruce	>59%			42	Spruce-Fir(2)		
46	spruce, englemann	30-59%			43	Spruce-Fir(3)		
47	spruce, englemann	>59%			44	Spruce-Fir(4)		
14	alpine fir/whitebark	30-59%						
16	doug fir	<30%			20	Douglas-Fir(0)	**2**	Douglas Fir
17	doug fir	30-59%			21	Douglas-Fir(1)		
18	doug fir	>59%			22	Douglas-Fir(2)		
					23	Douglas-Fir(3)		
					24	Douglas-Fir(4)		
23	doug fir/lodgepole pine	30-59%	21	PSEUDOTSUGA MENZIESII-PINUS CONTORTA				
5	alpine fir/doug fir	30-59%						
6	alpine fir/doug fir	>59%						
32	juniper, utah	30-59%	20	JUNIPERUS SCOPULORUM-AGROPYRON	64	Open_Woods/Juniper		
67	maple	>59%						
70	mountain mahogany	30-59%						
71	mountain mahogany	>59%						
37	lodgepole pine	<30%			31	Lodgepole_Pine(1)	**3**	Subalpine Pine
38	lodgepole pine	30-59%			32	Lodgepole_Pine(2)		
39	lodgepole pine	>59%			33	Lodgepole_Pine(3)		
					34	Lodgepole_Pine(4)		
40	lodgepole sapling	>59%			30	Lodgepole_Pine(0)		
48	subalpine pine	<30%			50	Whitebark(0)		
49	subalpine pine	30-59%			51	Whitebark(1)		
64	aspen/conifer	30-59%			52	Whitebark(2)		
					53	Whitebark(3)		
					54	Whitebark(4)		
52	doug fir/limber pine	30-59%						
60	aspen	<30%	16	POPULUS TREMULOIDES-CALAMAGROSTIS RUBESCENS	70	Aspen(0)	**4**	Aspen
61	aspen	30-59%	17	POPULUS TREMULOIDES/SYMPHORICARPOS	71	Aspen(1)		
62	aspen	>59%	18	POPULUS-TREMULOIDES-SALIX	72	Aspen(2)		
			19	POPULUS TREMULOIDES-	73	Aspen(3)		

				PSEUDOTSUGA				
					74	Aspen(4)		
111	decidious tree riparian		22	POPULUS ANGUSTIFOLIA-POA	90	Cottonwood(0)	**5**	Riparian Forest
			23	POPULUS-ANGUSTIFOLIA-ARTEMISIA TRIDENTATA	91	Cottonwood(1)		
			24	POPULUS ANGUSTIFOLIA-MIXED SHRUB	92	Cottonwood(2)		
			25	POPULUS ANGUSTIFOLIA-DECIDUOUS SHRUB	93	Cottonwood(3)		
					94	Cottonwood(4)		
112	riverine riparian				81	Mixed_Forest(1)		
					82	Mixed_Forest(2)		
					83	Mixed_Forest(3)		
					84	Mixed_Forest(4)		
	Shrubs			**Shrublands**		**Shrubs**		**Shrubs**
75	big sagebrush		9	ARTEMESIA TRIDENTATA -POA (on flats)	13	Dry_Sagebrush	**6**	Sagebrush
			10	AR- TRIDENTATA-AR-TRIPARTITA (grass on slopes)				
			15	ARTEMISIA TRIDENTATA-BROMUS				
82	mountain big sage				12	Moist_Sagebrush/Cinquefoil		
					15	Moist_Sagebrush		
114	shrub riparian		12	SALIX/CAREX	11	Tall_Shrub	**7**	Shrub Riparian/Willow
			13	SALIX/BROMUS	14	Low_Willow		
					81	Tall_Shrub (>7400')		
			5	SUBIRRIGATED POA				
113	herbaceous riparian							
81	montane shrub		14	SYMPHORICARPOS-ROSA			**8**	Montane Shrub
76	bitterbrush							
77	burn shrub							
80	low sagebrush							
83	mountain low sage							
86	silver sage				57	Shrub-dominated_Avalanche_Chute		
	Herbaceous			**Grassland**		**Grasses**		**Grasses**
87	alpine shrub				63	Krumholtz		
90	alpine herbaceous				34	High_Elevation_Grassland	**9**	Alpine Herbaceous/Shrub
					51	Tundra		
92	burn herbaceous						**10**	Dry Montane Meadow/Grassland
93	clearcut herbaceous							
94	dry meadow		7	AGROPYRON-STIPA (Gros Ventre hills and slopes)	24	Dry_Forb_Meadow		
					74	Dry_Forb_Meadow (>7400')		
95	perennial grass		6	AGROPYRON POA (on flat)				
96	perennial grass slope		8	AGROPYRON/POA (Miller Butte)	35	Dry_Grassland/Meadow		
97	perennial grass montane				42	Dry-Moist_Forest_Opening		
					33	Moist_Grassland/Meadow		
					73	Moist_Grassland/Meadow (>7400')		
98	tall forb montane				21	Forb_Dominated_Seep		
					22	Wet_Forb_meadow		
					82	Wet_Forb_Meadow (>7400')		

					23	Moist_Forb_Meadow		
					58	Graminoid/Forb-dominated_Avalalanche Chute		
99	wet meadow		11	POTENTILLA-FRUCTICOSA/CAREX	32	Wet_Meadow	**11**	Wet Meadow
					72	Wet_Meadow (>7400')		
					41	Wet_Forest_Opening		
	Wetland			**Wetlands**		**Wetland**		**Wetland**
120	deep marsh						**12**	Wetland/Sedge Marsh
121	shallow marsh		3	CATTAIL/ (TYPHA-SCIRPUS)	71	Marsh/Fen (>7400')		
			4	CAREX-JUNCUS	31	Marsh/Fen		
122	aquatic bed							
123	mud flat							
	Miscellaneous			**Other**		**Other**		**Other**
107	water		1	Pond	55	Water_Body	**13**	Water/Rock/Snow
			2	Stream	54	Water_Course		
101	barren				56	Cliff		
104	rock				52	Bedrock		
					53	Talus		
108	snow							
	Land-use			**Cultivated Fields**		**Agricultural**		**Agricultural**
126	agricultural		26	BROMUS INERMIS-MEDICAGO SATIVA	59	Agricultural	**14**	Agricultural
			27	BROMUS INERMIS-MIXED GRASS				
			28	ELYMUS JUNCEUS				
			29	ELYMUS CINEREUS				
			30	POA PRATENSIS				
			31	AGROPYRON-MIXED GRASS				
			32	ALOPECURUS ARUNDINACEUS				
			33	PHLEUM PRATENSIS-POA				
			34	AGRPPYRON INTERMEDIUM				
			35	AGROPYRON ELONGATUM				
129	disturbed, high						**15**	Developed/disturbed
130	disturbed low							
131	urban, high density				60	Human_Development		
132	urban, low density							

Table 2. Conversions of U.S. Forest Service production classes used in this analysis.

Class	Production range (lbs/acre)	Midpoint used for analysis (lbs/acre)
0	No production	0
1	1-50	25
2	50-300	175
3	300-500	400
4	500-750	625
5	750-1200	975
6	1200-2500	1850
7	2500-4000	3250
8	4000+	6000

Table 4. Offtake Calculations

Spreadsheet for calculating Pounds Offtake from Animal Numbers						
Actual numbers Year 2000 -- 12,771 elk						
Elk	**Number of Animals**	**Average Weight (lbs)**	**Total Animal Pounds**	**Daily Offtake**	**Weekly Offtake**	**Elk % of Total**
Juveniles	1915	200	383000			0.1499491
Yearlings	646	350	226100			0.0505834
Adults (F)	8354	500	4177000			0.6541383
Adults (M)	1856	675	1252800			0.1453293
Total	12771	1725	6038900	120778	905835	
Moose						
Calves	162	200	32400			
Cows	466	700	326200			
Bulls	261	1300	339300			
Total	889	2200	697900	13958	104685	
Bison						
Calves	50	350	17500			
Yearlings	100	600	60000			
Cows	150	1350	202500			
Bulls	200	2000	400000			
Total	500	4300	680000	13600	102000	
			Total Weekly Offtake		**1112520**	
With 6,000 Elk						
Elk	**Number of Animals**	**Average Weight (lbs)**	**Total Animal Pounds**	**Daily Offtake**	**Quarter-month Offtake**	**Elk % of Total**
Juveniles	900	200	179938			0.1499491
Yearlings	304	350	106225			0.0505834
Adults (F)	3925	500	1962414			0.6541383
Adults (M)	872	675	588583			0.1453293
Total	6000	1725	2837162	56743	425574	
Moose						
Calves	162	200	32400			
Cows	466	700	326200			
Bulls	261	1300	339300			
Total	889	2200	697900	13958	104685	
Bison						
Calves	50	350	17500			
Yearlings	100	600	60000			

Cows	150	1350	202500			
Bulls	200	2000	400000			
Total	500	4300	680000	13600	102000	
			Total Weekly Offtake		**632259**	

Table 5. Vegetation Code Crosswalk Table

Vegetation Type (Utah State)	**Percent Cover**	**Snow Model Code**
alpine fir	<30%	21
alpine fir	30-59%	22
alpine fir	>59%	24
alpine fir/doug fir	30-59%	22
alpine fir/doug fir	>59%	24
alpine fir/lodgepole pine	30-59%	22
alpine fir/lodgepole pine	>59%	24
alpine fir/spruce	<30%	21
alpine fir/spruce	30-59%	22
alpine fir/spruce	>59%	24
alpine fir/whitebark	30-59%	22
doug fir	<30%	41
doug fir	30-59%	42
doug fir	>59%	44
doug fir/lodgepole pine	30-59%	42
lodgepole pine	<30%	33
lodgepole pine	30-59%	31
lodgepole pine	>59%	32
lodgepole sapling	>59%	30
spruce, englemann	30-59%	22
spruce, englemann	>59%	24
subalpine pine	<30%	51
subalpine pine	30-59%	52
doug fir/limber pine	30-59%	42
aspen/conifer	30-59%	34

Vegetation Type GTNP (successional stage)	
Lodgepole Pine (0)	30
Lodgepole Pine (1)	31
Lodgepole Pine (2)	32
Lodgepole Pine (3)	33
Lodgepole Pine (4)	34
Spruce/Fir (0)	20
Spruce/Fir (1)	21
Spruce/Fir (2)	22
Spruce/Fir (3)	23
Spruce/Fir (4)	24
Douglas Fir (0)	40
Douglas Fir (1)	41
Douglas Fir (2)	42
Douglas Fir (3)	43
Douglas Fir (4)	44
Whitebark Pine (1)	50
Whitebark Pine (2)	51

Whitebark Pine (3)	52
Whitebark Pine (4)	53
Whitebark Pine (5)	54

Vegetation Type NER

Pseudotsuga Menziesii/Pinus Contorta	32

Table 6. Snow Sites, Elevation, Location

Site #	Elevation (meters)	UTM east	UTM north	Name
1	1895.00	519300	4814300	/Jackson
2	1966.00	522900	4833400	/Moose
3	2075.00	533100	4855800	/Moran
4	2148.00	544800	4865500	/Basecamp
5	2574.00	508200	4818100	/Phillips bench
6	2900.00	575000	4844600	/Togwotee pass
7	1974.00	519180	4831640	/Boys Ranch
8	1973.00	518910	4831620	/Death Canyon
9	1955.00	518330	4830630	/RLazy S
10	1962.00	517360	4829690	/Wilson Road
11	1965.00	522980	4833440	/Moose W.S.
12	2017.00	521470	4836720	/Beaver Creek
13	1986.00	524570	4834260	/Blacktail Butte
14	2092.00	531120	4844660	/Deadman's Bar Rd
15	2072.00	536830	4848150	/Moosehead Ranch
16	2047.00	539250	4852900	/N. Elk Ranch
17	2048.00	539180	4854300	/Buffalo R.S.
18	2056.00	536480	4856860	/Oxbow Bend
19	2092.00	544870	4853780	/Buffalo Valley R
20	2083.00	545740	4854830	/Road 30083
21	2107.00	546590	4855490	/Buffalo Run
22	2072.00	548180	4853110	/KOA Picnic Area
23	2100.00	552210	4852300	/Black Rock R.S.
24	2013.00	527170	4834620	/Antelope Flat
25	2067.00	529600	4835550	/Mailbox Corner
26	2046.00	529620	4837780	/Schwering Studio
27	2108.00	531930	4834670	/Lobo Hill
28	2026.00	530450	4829060	/Highlands Jct
29	2024.00	528200	4828730	/Highlands Loop
30	1958.00	521490	4827770	/Airport
31	1976.00	524720	4827510	/Gros Ventre Rive
32	1939.00	521550	4823160	/Gros Ventre Turn
33	1900.00	521580	4820200	/Fish Hatchery
34	1895.00	519420	4814490	/Jackson W.S.
35	1908.00	520480	4814080	/NER HQS
36	2044.00	522090	4839860	/Lupine Meadows
37	2099.00	522290	4847720	/Jenny Lake Lodge
38	2115.00	524050	4848370	/N. Jenny Lake Jc
39	2098.00	530950	4852040	/Sewage Ponds
40	2065.00	520700	4857000	/Moran Bay SC
41	2102.00	533860	4860760	/Pilgrim Creek
42	2084.00	529440	4861970	/Coulter Bay
43	2070.00	529790	4835310	/Hunter Hay WE
44	2100.00	530990	4835510	/Hunter Hay NS

```
45        1977.00     522120    4834280 /Bar BC Road
46        2023.00     523420    4838230 /Bar BC Road B
47        2022.00     523920    4838180 /Bar BC Mid
48        1983.00     524770    4837980 /Bar BC FP
49        2025.00     523020    4838280 /Bar BC Mid RD
50        2094.00     531450    4851700 /RKO Road Flats
51        2095.00     536450    4859500 /RKO PL
52        2040.00     535500    4851200 /RKO Willow Flat
53        1938.00     513860    4825940 /Ski Area Base
54        1954.00     511080    4820820 /Phillips Canyon
55        2138.00     532700    4835100 /Elbo Ranch
56        2393.00     558800    4852100 /Four Mile Meadows
57        2106.00     558200    4856100 /Turpin Meadows
58        2668.00     570500    4804200 /Gros Ventre Summit
59        2312.00     519600    4811900 /Snow King Mountain
60        2243.00     525000    4876800 /Huckleberry Divide
61        2150.00     521100    4882800 /Glade Creek
62        2456.00     502700    4816300 /Teton Pass W.S.
```

TABLE 7. STATION ASSIGNMENT FOR REGRESSION FUNCTION

PREDICTOR STATIONS		
Jackson	Moose, Moran	Base Camp, Phillips Bench, Togwotee Pass
PREDICTED STATIONS		
Buffalo Valley Road Fish Hatchery Jackson W.S. NER H.Q.	Death Canyon, R Lazy S Boys Ranch, Wilson Road Buffalo R. S., Moose W.S. Beaver Creek, Blacktail Butte Deadman's Bar, Moosehead Ranch N. Elk Ranch, Road 30083 Buffalo Run, KOA campground Blackrock, Antelope Flat Mailbox, Schwering Studio Lobo Hill, Oxbow Bend Highlands Jct., Highlands Loop Airport, Gros Ventre River Gros Ventre Turnout, Lupine Meadows Sewage Pond, Pilgrim Creek Coulter Bay, Hunters Hayfield WE Hunters Hayfield NS, Bar BC Road Bar BC Road B, Bar BC Mid Bar BC FP, Bar BC Mid Road RKO Road Flats, RKO PL RKO Willow Flat, Ski Area Base	Jenny Lake Lodge N. Jenny Lake Jct. Moran Bay S.C. Phillips Canyon Snow King Mountain Huckleberry Divide Glade Creek Teton Pass W.S. Gros Ventre Summit

From: Keenan Adams
To: Jeffrey Warren
Cc: Steve Kettler
Subject: Re: SAV and Ouray money
Date: Monday, May 18, 2015 10:47:24 AM

---

just let us know

Sent from my iPad

On May 18, 2015, at 11:45 AM, Jeffrey Warren <jeffrey_warren@fws.gov> wrote:

> May have some funding needs relevant to the NER AM plan, too, and will know more about those this week. Eric and I made good progress on the plan last week and are going over it with Steve tomorrow. We'll get the working group's perspective on the draft at a meeting June 3rd. I think after that would be a good time for another briefing of the RO, a bit of damage control after the last one ☺.
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> **From:** Kettler, Steve [mailto:steve_kettler@fws.gov]
> **Sent:** Friday, May 15, 2015 9:48 AM
> **To:** Jeffrey Warren
> **Cc:** Keenan Adams
> **Subject:** SAV and Ouray money
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> we are good pulling the 30k back from Ouray, and funding that next year with the caveat hard questions are answered about the value of continuing that desert grassland restoration study.
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Ouray O&G monitoring for QRP/SSP won't make it. Let's talk about the grouse one after you have a chance to look into that.

--
Steve Kettler
Region 6 - Inventory & Monitoring Coordinator
National Wildlife Refuge System
U.S. Fish & Wildlife Service
134 Union Blvd.
Lakewood, CO 80228
w:(303) 236-4369
c:(720) 879-8732
steve_kettler@fws.gov

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c:(720) 879-8732
steve_kettler@fws.gov

From: Jeffrey Warren
To: Steve Kallin; Eric Cole; Cris Dippel
Subject: Hobbs forage allocation model
Date: Monday, May 18, 2015 11:34:06 AM

Tomorrow on our call I'd like to discuss the relative utility, and tractability, of obtaining estimates of available forage at initiation and termination of winter feeding using Hobbs' forage allocation model. Some thoughts:

1) Available forage at feeding initiation is the primary driver in both models, link between the two components of the plan, and the trigger for initiation of feeding.
2) We're currently working through how best to estimate available forage for triggering initiation of feeding (perhaps termination, too?).
3) If it is possible (that would take a conversation with Hobbs to determine), what value do we see in having a time series of initiation and termination available forage estimates?
    a. Would provide a link between recent feeding management and the model used to inform the BEMP.
    b. Could explore correlation between key index site estimates and NER-scale estimates.
    c. Could estimate a mean available forage at initiation and termination over a long time series to provide context for proposed changes to criteria.
    d. Could fit calf survival model as a preliminary test to make sure we're on the right track.
    e. If we can get timely predictions from the model concurrent with field sampling, we could see if it is possible to use a modeling approach moving forward (assuming there are cost/time benefits).

I don't think we'll be able to tell if, or how, this can be done, or its relative utility, until we contact Hobbs. I just wanted to bring it up because there is potential for I&M funding if we decide it is doable and worthwhile to contract Hobbs to provide predictions based on the Forage Allocation Model.

Cheers,

Jeff Warren
406 276-3536 ext. 106

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From: Blenden, Mike
To: Will Meeks
Subject: Re: High Importance - NER
Date: Wednesday, May 20, 2015 11:41:49 AM

Kallin is working with Eric Cole and Jeff Warren on this. They have a schedule but feel strongly they need to run it by the rest of the planning team at their next meeting on June 3. They would provide the timeline soon after that meeting. Right now it sounds like November 15 might be challenging but they are trying. Concerns?

On Tue, May 12, 2015 at 2:10 PM, Will Meeks <Will_Meeks@fws.gov> wrote:

> NER. Noreen and Matt want a deadline (firm) for NER AMP. Have Steve consider the date of November 15, 2015 as the deadline. They want to see the timeline. Thanks.
>
> Will Meeks
>
> U.S. Fish and Wildlife Service, Region 6
>
> ARD-NWRS and PFW
>
> 303-236-4303 (w)
>
> 720-541-0310 (c)

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

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From: Will Meeks
To: Blenden, Mike
Subject: Re: High Importance - NER
Date: Wednesday, May 20, 2015 11:48:26 AM

My only concern is that the deadline isn't met.

Will Meeks
U.S. Fish and Wildlife Service
Mountain Prairie Region
Assistant Regional Director
National Wildlife Refuge System and
Partners for Fish and Wildlife Program
303-236-4303 (w)
720-541-0310 (c)

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From: Steve Kallin
To: Jeffrey Warren
Subject: Draft AMP Meeting Schedule
Date: Friday, May 22, 2015 1:08:00 PM
Attachments: Draft AMP Agenda 6-3-2015.docx

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

Draft AMP Agenda

June 3, 2015

Key Discussion Topics

1. Change supplemental feeding protocol
    a. Delay the initiation of feeding. Two approaches to discuss:
        i. Draft AMP; p. 10-11, Management Actions

        OR

        ii. Delay two weeks from current 300 lbs/ac forage trigger
    b. Stop feeding one week earlier than average
2. Monitoring (see Draft AMP, p. 19-21)
    a. Elk response to supplemental feeding changes
    b. Elk calf survival
    c. Conflicts on private lands
    d. Changes in disease prevalence
3. AMP Peer Review
4. Draft Completion/Implementation Schedule

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From: Jeffrey Warren
To: Steve Kallin
Subject: RE: Draft AMP Meeting Schedule
Date: Friday, May 22, 2015 1:46:19 PM
Attachments: NER_AMP_meeting_agenda_6_3_2015.docx

Jeff Warren
406 276-3536 ext. 106

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Sent: Friday, May 22, 2015 1:08 PM
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NATIONAL ELK REFUGE BISON AND ELK WINTER FEEDING ADAPTIVE MANAGEMENT PLAN MEETING

3 June 2015 AGENDA

Participants:
National Elk Refuge
WGFD – Jackson region
Grand Teton NP
Forest Service

1) **12:30 – 12:45: Meeting Objectives.**
    a. **Review of draft AM plan – the plan provided to everyone is a very rough draft intended to provide an overview of the general direction we are proposing. We'll discuss if it captures what the group believes is the direction they envisioned based on meeting discussions.**
    b. **The primary actions to be taken that differ from the *status quo* are 1) alterations to initiation and termination of winter feeding, and 2) implementation of private lands mitigation efforts.**
    c. **Monitoring – what are we missing?**
    d. **AM Plan Review**
    e. **Draft Completion and Implementation Schedule**

2) **12:45 – 1:30: Review of draft AM plan**
    a. General comments/discussion of the current direction, i.e., big-picture comments
        i. Do the two primary components of the plan provide explicit links between management actions, BEMP outcomes and desired conditions, and monitoring?
            1. Elk winter distribution **pg. 4**
            2. Elk calf winter survival and forage deficits **pg. 7**
        ii. Are the stated assumptions acceptable? **pg. 4, paragraph 2**
    b. Do we need more explicit acknowledgement, actions, triggers, etc., for
        i. Conflicts on private lands
        ii. Changes in disease prevalenc

3) **1:30 – 3:00: Winter feeding initiation and termination criteria**
    a. Two potential approaches to change initiation so far
        i. Initiation based on available forage, lower threshold values **pgs. 10–11**
        ii. Keep current available forage threshold and delay specified number of days
    b. Similar options for termination

4) **3:00 – 3:30: Monitoring**
    a. Does the current monitoring provide capture the primary needs of the AMP? What data are 'need to know' and what are 'nice to know'?
        i. Elk response to supplemental feeding changes
        ii. Elk calf survival
        iii. Conflicts on private lands
        iv. Changes to disease prevalence

5) **3:30 – 3:45: AM Plan Peer Review**

6) **3:45 – 4:00: Draft Completion and Implementation Schedule**

From:	Jeffrey Warren
To:	Steve Kallin; Eric Cole
Subject:	Hobbs et al. 2003
Date:	Friday, May 22, 2015 2:38:05 PM
Attachments:	Hobbs et al 2003 Management alternatives for ungulates in the Greater Teton Ecosystem.doc

Steve,

Could you please provide the Hobbs report to everyone when you send the draft plan and completion timeline? I don't expect them to review it for the meeting, but I think it will be an important reference for them to have and they may find it useful as they review the AM plan.

Thanks,

Jeff Warren
406 276-3536 ext. 106

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"A great many people think they are thinking when they are merely rearranging their prejudices." William James

Assessing Management Alternatives for Ungulates in the Greater Teton Ecosystem using Simulation Modeling

December 2002
Final Report



N. T. Hobbs[1], F. J. Singer[1,2], G. Wockner[1]

Collaborators: G. Wang[1], L. Zeigenfuss[2], P. Farnes[3], M. Coughenour[1], and S. Delgrosso[1]

1. Natural Resource Ecology Lab, Colorado State University, Fort Collins, CO
2. US Geological Survey, BRD, Fort Collins, CO
3. Dept. of Earth Sciences, Montana State University, Bozeman, MT

Introduction

Managers of ungulate populations in the Greater Teton Ecosystem and the National Elk Refuge have asked three questions about interactions between populations of native ungulates, notably elk and bison, and the winter habitats that support those populations. We addressed these questions using simulation modeling.

The first question focuses on understanding the balance between supplies of forage on the winter range and the size of ungulate populations. In short, managers seek to know the number animals that can be supported by natural forage supplies under a range of weather conditions. To answer this question, we created the Forage Accounting Model (Part I of this report). The Forage Accounting Model simulates forage intake by ungulates across a range of elk population sizes and during a range of climatic conditions for the growing season and for winter. In addition, we simulated varied bison populations between 250 and 2000 animals for the Teton ecosystem. This model predicts the proportion of forage supplies that are consumed across the landscape (forage utilization) and also calculates 'forage deficits' caused by different population sizes in the system. Forage deficits represent the difference between the total supply of forage and the total forage required by ungulates. We exercised the Forage Accounting Model using assumptions from four of the Alternatives in the ongoing Environmental Impact Statement for ungulate management.

The forage accounting model predicts forage utilization by ungulates, but does not provide insight into the consequences of different levels of utilization. Thus, the second question we addressed focuses on the impacts of different levels of utilization of winter forage on ecosystem processes, primarily net primary production and nutrient cycling. To answer this question, we used the CENTURY Ecosystem Model (Part II of this report). The Century model simulates biogeochemical changes in vegetation and soil due to grazing. Using this model, we simulated intense grazing effects on two vegetation types prevalent on the Teton winter range -- wet meadow and sagebrush. We examined the effects of two levels of utilization (50% and 80%) on soil carbon, mineralized nitrogen, and net annual production over a one-hundred-fifty year time-span. Ongoing fieldwork by F. Singer will later be used to corroborate these simulations.

The third question focuses on the consequences of forage deficits for population performance. Specifically, we asked "What are the effects of food shortages on elk mortality? To answer this question, we employ the Over-Winter Mortality Model (Part III of this report). The Over-Winter Mortality Model estimates the energy balance of individual elk and simulates energy intake and expenditure in four age/sex classes. We estimate starvation mortality using the same scenarios for animal abundance, available forage, and snow conditions as in the Forage Accounting Model.

These three models complement each other in important ways. The Forage Accounting Model predicts forage supply, consumption, deficits, and utilization. The Century Ecosystem Model was developed for different projects at the Natural Resource Ecology Lab at Colorado State University and then adapted to our present needs, in part by using the utilizations predicted by the Forage Accounting Model. The Over-Winter Mortality Model was first developed for mule deer in Colorado and was adapted for elk to meet the needs of this project. It uses the forage supply, consumption, and deficits predicted by the Forage Accounting Model. We brought these three models together to provide reasonable answers to the questions raised by managers.

Here, we describe each model and the insight we gained from it. The first three sections of this document focus on each model and its results. In a final, concluding section, we aggregate results across models and draw general conclusions relevant to managing ungulates in the Greater Teton Ecosystem.

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Executive Summary

The Forage Accounting Model

We describe a simple accounting model that predicts imbalances between forage supply and animal forage requirements on winter ranges used by native ungulates (elk, moose, bison) in the Greater Teton Ecosystem and the National Elk Refuge. The model predicts *forage utilization* and *forage deficits.* Forage utilization is depicted by a map across the study area where cells are coded based on the percentage of pre-winter forage supplies that are consumed by native ungulates during winter. Forage deficits are defined as the amount of forage required by ungulates that exceeds the amount available during any week of the winter, summed over all weeks. The model is driven by data on forage standing crops at the beginning of winter, snow distribution during winter, pre-winter precipitation conditions, and offtake rates of ungulate populations.

We exercised the Forage Accounting Model in the Greater Teton Ecosystem under different conditions for elk population density (0-18,000 animals), and under different bison populations (250 - 2000) while holding moose populations constant (890). In addition to simulations for the ecosystem as a whole, we also exercised the model solely on the National Elk Refuge with elk populations of 0 -10,000, bison populations of 250 -2000, and 20 moose. The number of elk at which forage deficits begin to occur during a specific winter under specified assumptions represents an "equilibrium point" on the landscape at which forage supply and demand are in balance. Table 1 below provides a quick synthesis of these equilibrium points for each scenario in the EIS process for the broader Teton study area and NER.

Table 1. Number of elk at which forage supply and demand are in equilibrium

Alternative #1 (status quo, 500 bison, flood irrigation, willow available on NER)						
Pre-winter Precipitation Scenario	Drought			Mean		
Snow Severity Type	Severe	Above-average	Average	Severe	Above-average	Average
Greater Teton Ecosystem	0	1,800	5,500	1,000	6,000	16,000
NER only	0	0	2,000	0	0	5,000
Alternative #2 (no flood-irrigation, 500 bison, willow available on NER)						
Greater Teton Ecosystem	0	1,600	5,300	900	5,900	15,800
NER only	0	0	1,700	0	0	4,500
Alternative #3 (no willow available on NER, 1,000 bison, flood-irrigation)						
Greater Teton Ecosystem	0	0	3,000	0	5,000	14,000
NER only	0	0	0	0	0	3,300
Alternative #4 (center-pivot irrigation, 350 bison, no willow available on NER)						
Greater Teton Ecosystem	0	1,600	5,700	1,500	7,200	17,000
NER only	0	0	2,000	0	0	5,500

Although the numbers in Table 1 represent clearly demarcated points of equilibrium, each is associated with a margin of error, underlying assumptions, and an accompanying graph in the body of this report which should all be evaluated together. Additionally, although the numbers of elk in Table 1 represent the point at which deficits begin to occur, elk are known to rely on stored energy reserves to survive winters and therefore can likely incur small forage deficits without starving to death.

In addition to the above analysis, we also ran experiments with the Forage Accounting Model on the Greater Teton Ecosystem to examine effects of 1) removing all domestic grazing from public lands in the Teton ecosystem and 2) removing effects of agriculture and residential development on forage supplies in and around the town of Jackson. Our simulations suggested that removing all domestic grazing would have effects on forage deficits in all winter severity types because most domestic grazing does not occur on wildlife winter range. Providing forage to elk populations equivalent to the pre-settlement vegetation now subsumed by development in and around Jackson had negligible effects on forage deficits during severe winters. During average winters adding this forage substantially reduced deficits. by allowing elk to graze on the additional forage available. However, addition of these forage supplies did not *eliminate* forage deficits for the current population size of elk, suggesting that current elk numbers may exceed what could have been support in the Greater Teton Ecosystem under pristine conditions.

The CENTURY Ecosystem Model

The CENTURY Ecosystem Model simulates exchanges of carbon (C) and nitrogen (N) among atmosphere, soil, and vegetation. Required inputs used to drive the model include monthly maximum/minimum temperature and precipitation data, soil properties, vegetation type, and current and historical land use. Disturbances and management practices such as grazing, fire, cultivation, and fertilizer additions can be simulated. We simulated response of two vegetation types (wet meadow and sagebrush) to two levels of forage utilization by elk (50% and 80%)/ Other required inputs were estimated based on CENTURY modeling in similar systems. Current and ongoing Teton field sampling work by F. Singer on nitrogen pools and vegetation will later be used to corroborate these preliminary findings.

Because elk are consuming standing dead forage of low nutritional content during winter, CENTURY predicted that ungulate grazing will have not harm plant production on the winter range at either level of grazing intensity. Further, because grazing accelerated nutrient cycling, and because ungulates returning more nitrogen to the soil than they consume, higher grazing levels may actually *increase* future plant production. Resutls from CENTURY suggest that heavy winter-season grazing in this system, as predicted by the Forage Accounting Model, is sustainable and that soil C and nutrient levels are not significantly depleted and may increase. As long as elk are concentrated at high densities on the winter range, the CENTURY model will predict positive feedbacks on production due to higher net N inputs versus N offtake from grazing.

The Over-Winter Mortality Model

Forage deficits predicted by the Forage Accounting Model will likely cause elevated mortality in over-wintering elk populations. We adapted the energy balance model of Hobbs (1989) to estimate starvation mortality by simulating energy intake and expenditure by elk in four age/sex classes (calves, yearling males, adult females, bulls) during average, above average and severe winters with average pre-winter precipitation conditions. This energy balance model allocates elk populations to map cells based on snow water equivalents, allows elk to consume available herbaceous and shrubby forage, and predicts mortality based on forage shortfalls and animal nutritional needs.

Simulated mortality of calves ranged from a low of 4% during an average winter at a total population size of 6,000 to a high of 42% during a severe winter and a population of 18,000. Increasing population density was associated with roughly proportionate increases in estimated mortality. Starvation mortality for adult cows was predicted to be 1% for a population of 6,000

animals in an average winter rising to a high of 25% for a population of 18,000 during a severe winter.

Acknowledgements

Funding was provided by the Natural Resources Preservation Program (NRPP) – US Geological Survey, BRD and NPS fund, and from Grand Teton National Park. We acknowledge Robert Schiller of Grand Teton National Park for project organization and administration as well as Bruce Smith of the National Elk Refuge. We also thank Phil Farnes of Snowcap Hydrology and Montana State University for the snow model algorithms and snow measurements, and for assistance with refining the snow model; and Michael Coughenour of the Natural Resource Ecology Lab (CSU) for developing the snow model computer code.

Part I.
The Forage Accounting Model

Introduction

We constructed a forage accounting model to examine the consequences of management actions for balancing forage supplies with forage demands of populations of native ungulates in the Greater Teton Ecosystem and the National Elk Refuge. We first describe our modeling approach and explain two predictions made by the model, forage utilization and forage deficits. We then describe how the model works. We subsequently use the model to examine relationships among elk population density, bison populations, precipitation-based forage production, and winter severity. The model was run on two study areas: the Greater Teton Ecosystem, and the National Elk Refuge, and was used to predict forage deficits for each Alternative in the EIS on both study areas. In addition to describing the modeling approach and methods, this section of this report gives and interprets the results for all four EIS Alternatives.

Modeling Approach

Our modeling philosophy favors simple models over complex ones. This is because simple models are easier to explain, understand, and defend than models that include high levels of detail. Our approach is to begin with a simple, "base model", and add detail incrementally as it is needed to address questions unresolved by the simpler model.

We built a simple accounting model that keeps track of the impacts of different densities of ungulates on forage supplies as winter progresses. The model responds to annual variation in forage production, effects of snow on forage availability, and effects of grazing and browsing on the forage supply. We call it an accounting model because it is perfectly analogous to a model of cash reserves and flows in a business. In essence, it answers questions on the bottom line -- how much forage is used by populations of ungulates? Does that use produce a deficit or surplus at the end of winter? The accounting approach was motivated by the overriding central assumption used to justify supplemental feeding -- animals are fed during winter to compensate for deficits in forage supply. Thus, a logical starting point for our efforts was to quantify the magnitude of these deficits under different conditions.

The Concept of Forage Deficits and Forage Utilization

There are two concepts that are important in understanding the accounting model. The first concept is *forage deficits*. Forage deficits represent the difference between the total supply of forage available during the winter and the total forage required by a given population of ungulates, including bison, moose, and elk. Thus, forage deficits are affected by population size, which affects forage demand, as well as snow accumulation (measured as snow water equivalents, SWE) and forage production, which affects forage supply. We calculated forage deficits by estimating the daily intake of populations of a given size, subtracting that intake from the daily forage supply, and summing negative values over all time-steps of the winter.

The second concept, a common measure of habitat use, is called *forage utilization.* Forage utilization is simply the percent of forage removed from a given location in the study area. We depict this on a map where map-cells are coded with the utilization percent. Forage utilization gives us a measure of ungulate impact on habitat. Part II of this report, which discusses the

Century Ecosystem Model, will analyze and quantify the effect forage utilization on net primary production and nutrient cycling.

Model Description

Study Areas

Two study areas were delineated (Figure 1). The first, larger area, the Greater Teton Ecosystem, corresponds to the boundary depicted in the Steele et al. (1999) report on Jackson Valley vegetation. The southern boundary reaches to the southern edge of the Town of Jackson, the northern edge is at the north end of Jackson Lake, the western edge is about halfway between the crest of the Tetons and the Idaho Border, the eastern edge runs roughly to Togwotee Pass. This boundary roughly encompasses the current boundary of the Jackson elk herd as defined by Wyoming Game and Fish. In addition, it contains all of the supplemental snow measurement sites reported by Farnes et al. (1999). The second area is the boundary of the National Elk Refuge.

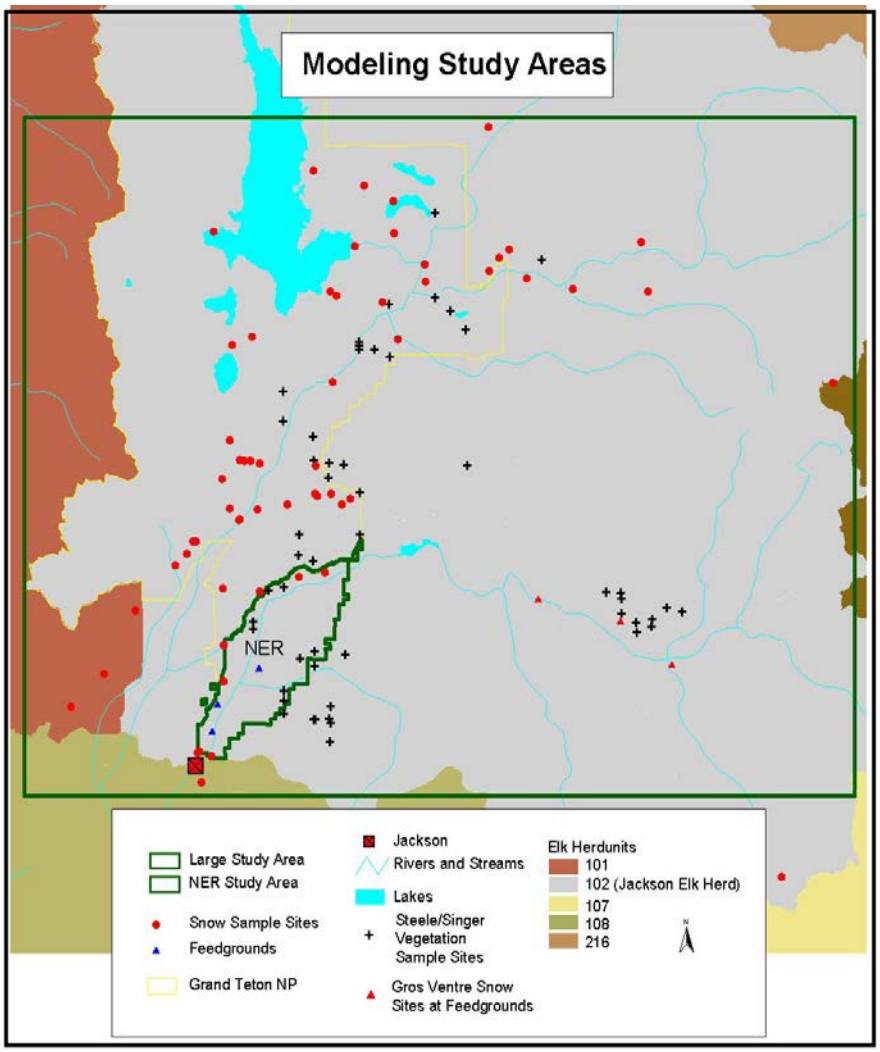


Figure 1. Study areas and other relevant locations for the project.

Algorithm

The model operates at a weekly time step (Figure 2). For each week of the winter, the model calculates snow water equivalents (SWE) on each 30 x 30 meter cell in the study area and sums the amount of forage that is available at each 1-inch SWE increment. Grazing/browsing pressure by populations of bison, elk, and moose is first allocated to the forage available in completely open areas (i.e., cells with 0 inches SWE). If additional demand exists, it is allocated to cells with 1 inch of SWE. Any additional demand is allocated to progressively greater snow depths, with a linear reduction in forage availability occurring in relation to SWE greater than 2 inches (Table 2). This approach has been used successfully to model effects of snow on forage availability in other studies (Hobbs 1989, Turner et al. 1994).

Table 2. Forage Availability Percentages

SWE inches	Percent of forage available
0	100
1	100
2	100
3	75
4	50
5	25
6	0

If there is forage demand in excess of the supply in all of the cells during any week, then this excess is accumulated in the *forage deficit*. At the end of the winter, we calculate *forage utilization* for each cell in the vegetation map by dividing the total amount of forage removed from each cell by the pre-winter standing crop of that cell.

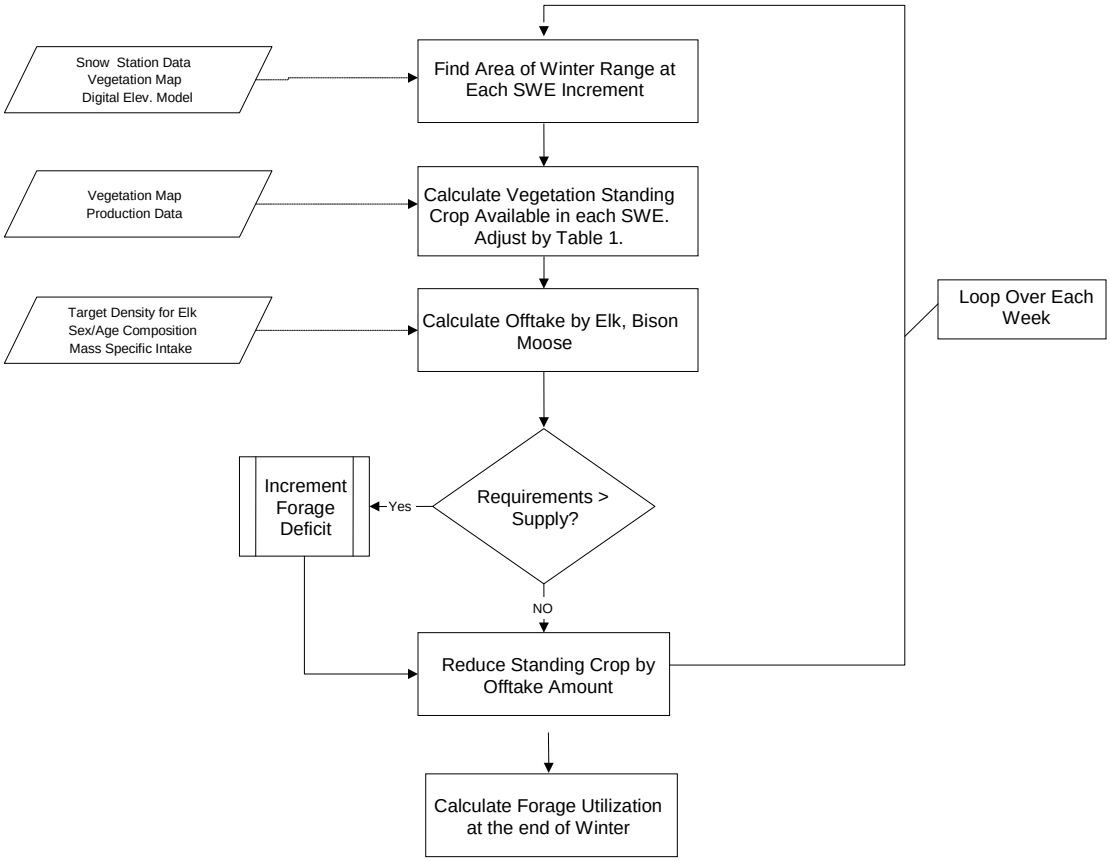


Figure 2. Flow chart of data and processes in the forage accounting model. The model cycles through these calculations at weekly intervals.

The model is driven by data on the standing crop at the beginning of winter, snow distribution during winter, and offtake rates of ungulate populations (Figure 2).

Vegetation Data
The accounting model requires spatially explicit data on production of vegetation available at the beginning of winter. We developed these data from maps of vegetation communities and field data on production in each community.

We obtained a complete vegetation coverage from Utah State University (Homer 1995) that was created in 1996 for all of U.S. Forest Service (USFS) Region 4 using remote sensing interpretation techniques. Vegetation coverages were also obtained from Grand Teton National Park (GTNP) and the National Elk Refuge (NER) (Figure 3). GTNP data were developed from aerial photography while NER data were developed from a combination of aerial photography and ground-based mapping. Discussions with other coverage users suggested that the NER coverage was the most accurate, followed by the GTNP coverage, followed by the Utah State coverage. Thus, we merged these coverages to use the most accurate data wherever it was available, using the Utah State coverage only to fill in gaps not covered by the GTNP or NER data.

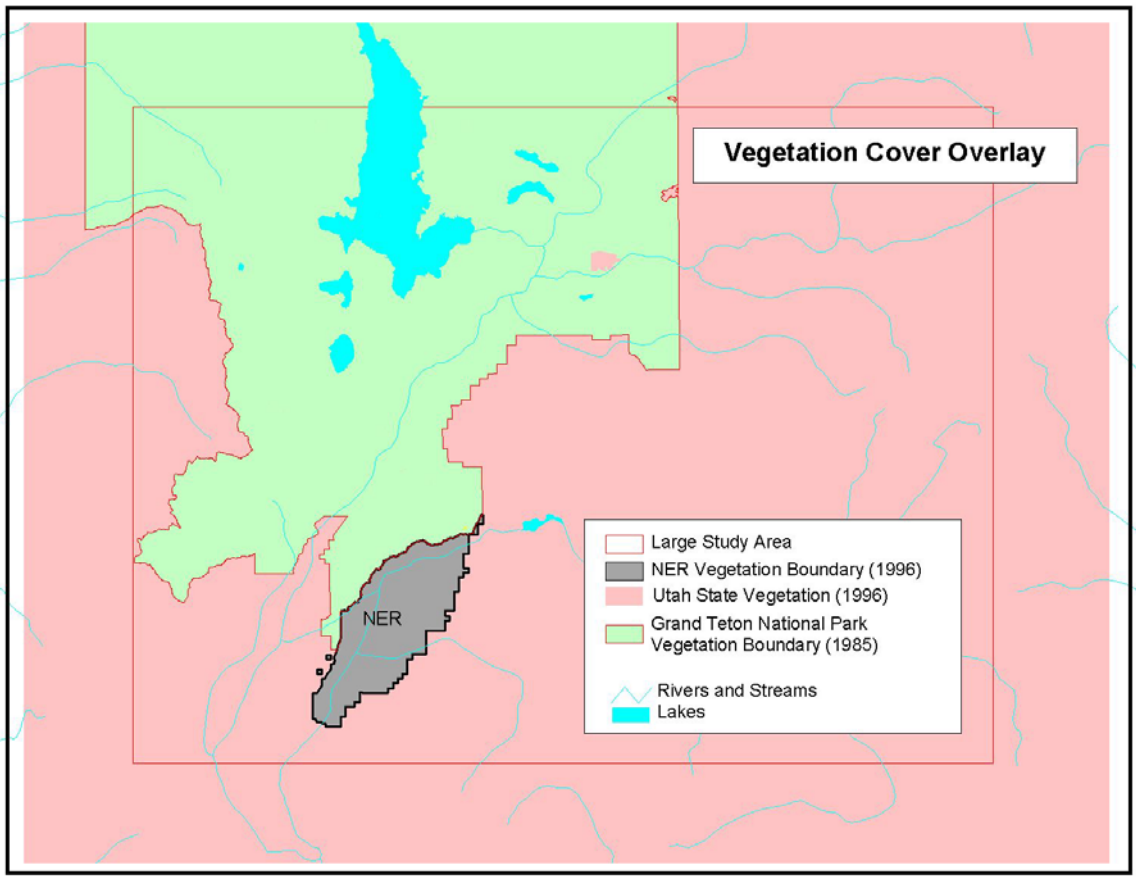


Figure 3. Coverages used to assemble unified vegetation map for the study area.

Because each coverage had different vegetation coding schemes, a crosswalk table was developed to convert the vegetation codes into a more standardized scheme (Appendix C: Table 1). The Utah State coverage had 68 separate vegetation types, GTNP had 60, and NER had 32. The

essential data in the vegetation table was the name of the vegetation type and the annual production of herb/shrub. This model folds these categories into 15 separate vegetation types (Figure 4). These categories were chosen because they provided usefully different vegetation types for which we could obtain production information in the nearby environment. Using the descriptions provided in the metadata for the Utah State University coverage, descriptions for non-forested (Mattson and Despain 1985) and forested (Steele 1983) habitat used to create the GTNP coverage, and the vegetation categories of the NER coverage, vegetation categories from each coverage were matched up as accurately as possible.

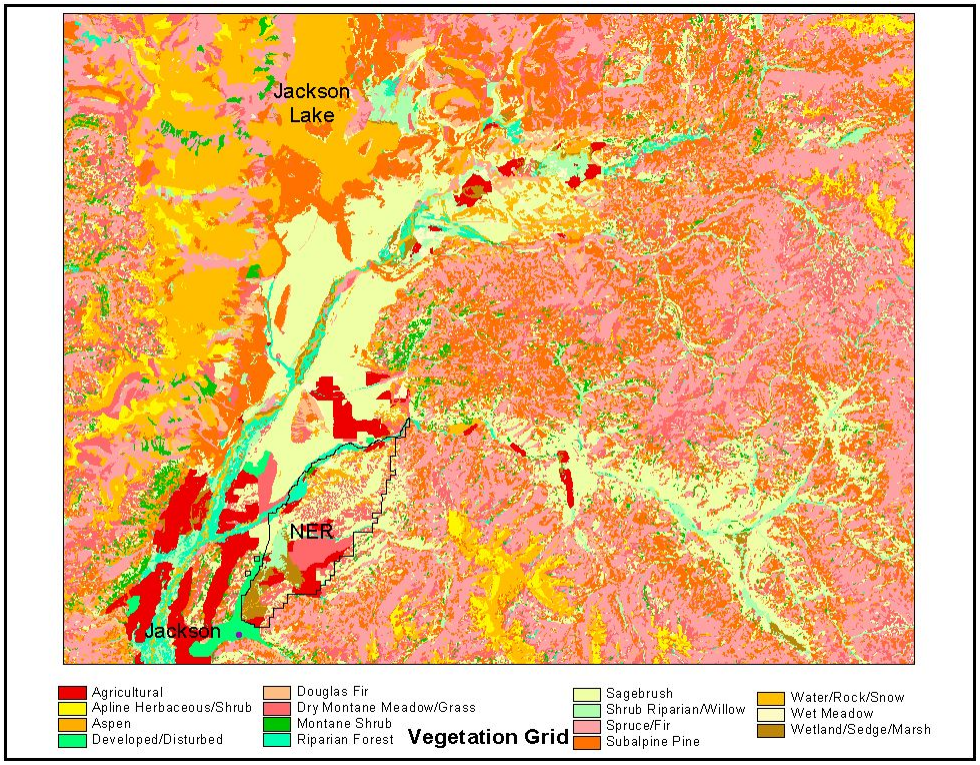


Figure 4. By using a cross-walk of vegetation categories, we combined data from three coverages to produce a single map representing 15 vegetation categories.

Data on annual production for each vegetation type were obtained from studies conducted by Biological Resources Division (BRD)--USGS, National Elk Refuge (NER)--USFWS, and Bridger-Teton National Forest (BTNF)--USFS. Each data set was collected in a different manner and so it was necessary to standardize the data so that they could be combined to create the largest data set possible for estimating average production values. Mean year, wet year, and dry year production values are given in Table 3 below. Wet year production equals 150% of the mean year; dry year equals 45% of the mean year. A detailed description of the methods used to derive these estimates are given in Appendix A.

Table 3. Vegetation Name and Production

Code	# of cells	Vegetation Name	Mean Production (pounds/acre)	Wet Year Production (pounds/acre)	Dry Year Production (pounds/acre)
1.	1158538.	Spruce/Fir	1162.	1743.	523.
2.	147739.	Douglas Fir	705.	1058.	317.
3.	834291.	Subalpine Pine	1167.	1751.	525.
4.	148500.	Aspen	1712.	2568.	770.
5.	68064.	Riparian Forest	2524.	3786.	1136.
6.	690177.	Sagebrush	1190.	1785.	536.
7.	147658.	Shrub Riparian/Willow	2125.	3188.	956.
8.	91805.	Montane Shrub	1708.	2562.	769.
9.	105584.	Alpine Herbaceous/Shrub	1693.	2540.	762.
10.	440890.	Dry Montane Meadow/Grass	895.	1343.	403.
11.	27067.	Wet Meadow	2385.	3578.	1073.
12.	34630.	Wetland/Sedge/Marsh	4760.	7140.	2142.
13.	457338.	Water/Rock/Snow	0	0	0
14.	117513.	Agricultural	2498.	3747.	1124.
15.	18881.	Developed/Disturbed	4334.	6501.	1950.

Spatial Heterogeneity of Forage and Initial Forage Availability

Managers raised a question about the spatial heterogeneity of production due to varying rainfall over the study area. For example, sagebrush on the NER may produce differently than sagebrush in the upper Gros Ventre drainage. We attempted to create a spatially explicit production map based on actual production measurements across the study area. However, these estimations did not yield significant spatial differences in production for each vegetation type. While we recognize that rainfall may vary across the area, and the production may vary with it, field data could not support these distinctions.

Although the production estimates in Table 3 represent total production on the landscape, a question was raised at a meeting of managers and modelers in Jackson in February 2002 about forage availability to ungulates. It was suggested that a significant amount of measured forage is totally unavailable to ungulates because it is unpalitiable or is obstructed by inedible plant tissue. Based on past experiences of measured offtake, meeting participants estimated this unavailability between 50% and 25%. Using elk offtake data gathered from the study area (Steele et al. 1999) and other offtake data from similar systems (Hobbs et al. 1996, Singer et al. 2002), we estimate this percentage to be 35%. Our model uses this estimation by initially decrementing the production values by 35% at the beginning of winter.

Snow Distribution

We predicted temporal and spatial variation in snow water equivalents (SWE) using a model developed by Michael Coughenour and Phil Farnes in the 1990's for Grand Teton National Park. The model uses input data from snow stations and interpolates among them to produce a surface of predictions. It was written as a broader precipitation model with the capabilities of predicting precipitation level, snow depth, and SWE, depending on various input and model switches. For

the current modeling effort, we used SWE because it is the primary determining factor for ungulate migratory behavior. A detailed description of implementation of the snow model and corrections developed for the Gros Ventre snow shadow are presented in Appendix B.

Ungulate Offtake

The model requires estimates of the total amount of forage consumed by elk, bison, and moose on the study area. We calculated offtake assuming that each animal consumes dry matter equal to 2% of its body mass each day (Cordova et al. 1978, Baker and Hansen 1985, Baker and Hobbs 1987). We estimated an average body mass for each ugulate species weighted by the sex and age composition of their current populations. Animal age/sex counts were obtained from participating state and federal wildlife agencies. Average weights for each species and for each age/sex class were gathered from literature (Meagher 1973, Houston 1982). A sample of the spreadsheet calculations used to estimate these weighted averages appear in Appendix C: Table 4.

Model Overlays

The model overlays a SWE grid on the vegetation grid during each time step. For example, when snow accumulation is relatively light, the model allows foraging over large areas of the winter range (Figure 5). However, when snow accumulation is heavy, there are very few areas that are open for foraging (Figure 6).

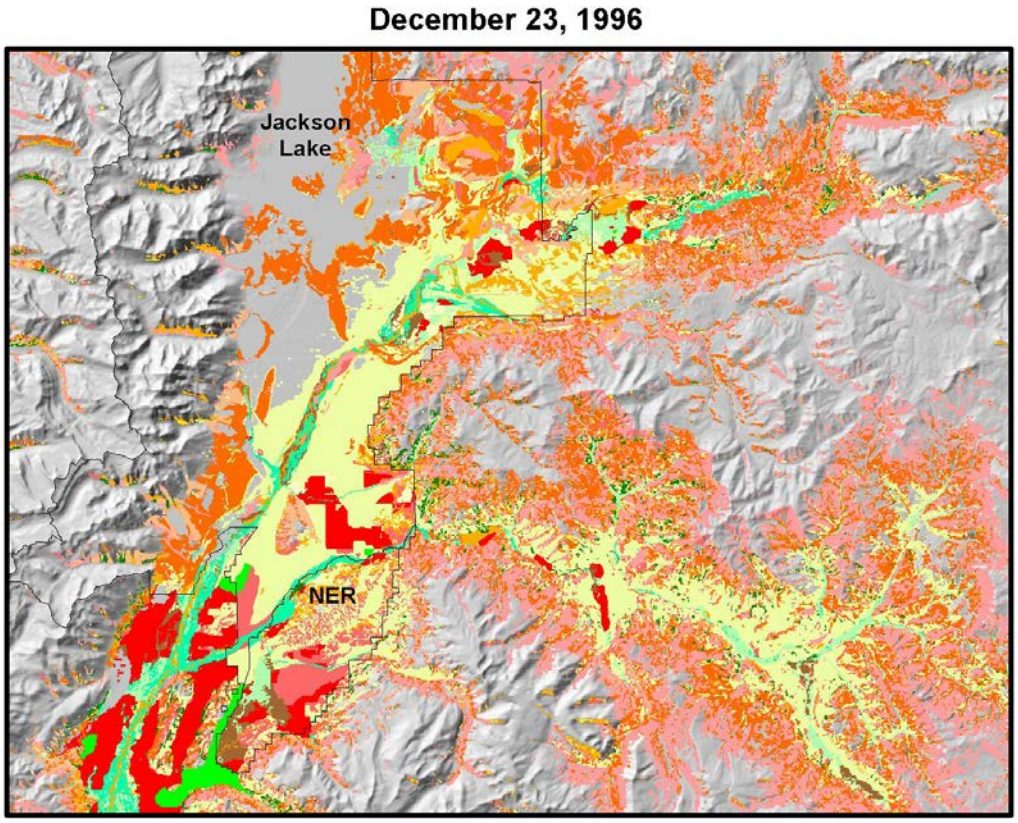


Figure 5. Overlay of snow accumulation ≥ 6 inches SWE on the vegetation map for December 23, 1996. Grey shading indicated areas of the landscape with ≥ 6 inches SWE. (Map adjusted for Gros Ventre snow correction.)

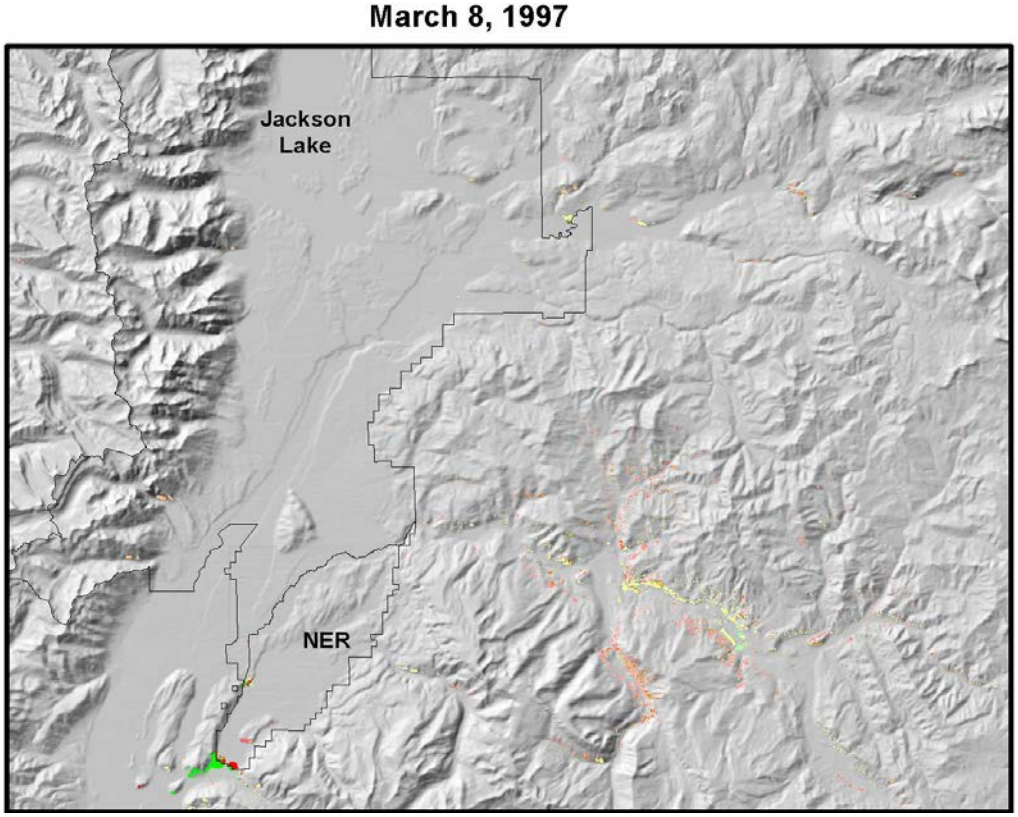


Figure 6. Overlay of snow accumulation ≥ 6 inches SWE on the vegetation map for March 8, 1997. Grey shading indicates areas of the landscape with ≥ 6 inches SWE. (Map adjusted for Gros Ventre snow correction.)

Modeling Scenarios

We exercised the model on both study areas -- the Greater Teton Ecosystem, and the NER (Figure 1). Within each study area we ran a series of simulations accounting for 1) varying populations of elk -- between 0 and 18,000, 2) varying SWE winters -- average, above average, and severe, 3) varying pre-winter precipitation conditions -- drought, mean, and wet, and 4) varying populations of bison as specified by the EIS Alternative's assumptions. On the Greater Teton Ecosystem, the model runs include offtake for 890 moose. On the NER, the model runs include offtake for 20 moose. On the Greater Teton Ecosystem, we varied elk populations between 0 and 18,000 animals, and ran enough simulations to get the shape of a trendline following the data points. On the NER, we varied elk populations between 0 and 10,000. Wintering bison populations have been growing very quickly in the valley. In 1999 there were roughly 500 bison in the study area whereas in 2002 the number was 650.

We varied winter severity using three types of winter snow conditions: average, above average, and severe. We chose 1996 as an example of an average winter, 1982 as a moderately severe winter, and 1997 as a severe winter. These choices were justified by consulting Farnes et al. (1999) which presents a table of estimated mean SWE for the 50-year recording period in the Hunter-Talbot hayfields. Using Farnes' table, we ranked snow severity using the SWE measurement on the hayfields. 1996 came in as the mean ranking while 1982 was above average. Although four winters prior to 1980 had data which was more severe than 1997, our snow data set only went back to 1980. Thus we used 1997 as the "most severe on record". We also consulted

with Farnes and got agreement about using these representative years. In addition to this ranking, we also calculated average areas open per day during the 6 snowiest weeks of each winter. Table 4 presents the areas open to ungulates, i.e., that have less than 6 inches of SWE for each winter.

Table 4. Average Acres Open per day in the six snowiest weeks of each winter

Acres Open (< 6" of SWE)	
Whole Study Area	
1996 – Average	50,947
1982 – Above Average	19,649
1997 – Severe	12,003
NER only	
1996 – Average	8,531
1982 – Above Average	2,560
1997 - Severe	690

Model Results on the Greater Jackson Ecosystem for EIS Alternative #1 (status quo)

We estimate the margin of error for the results in the Greater Teton Ecosystem to be $\pm$ 20%. We cannot firmly quantify this error, but believe, based on our expertise derived from similar systems, that $\pm$ 20% is a reasonable approximation.

These results should not be used as the sole factor in determining the appropriate numbers of elk and bison on the Teton ecosystem or the NER. Instead, these results should be used as a starting point for management decisions, and used along with other pertinent factors such as long-term local knowledge, the results of other research, and management objectives not factored into this modeling effort. We do not interpret these results as the "carrying capacity" of the landscape, nor do we support an interpretation that assumes specific levels of mortality based on forage deficits. "Carrying capacity" is a complicated ecological concept that is not directly addressed by this model, and mortality estimates are provided in Part III of this report.

Throughout this report, we refer to graphs of forage deficits as a function of elk population size. These graphs show how forage deficits change and elk numbers increase given a range of assumptions about weather and the abundance of bison. In evaluating the forage deficit graphs, we refer to the point where each line intersects the x-axis as the point where forage offtake exactly equals forage supplies. This point gives a reasonable estimate of the number animals needed to unbalance the forage supply/forage demand equilibrium. As populations increase above this level, that is, to the right of this intersection point, forage deficits will increase and forage requirements exceed supplies. Although forage deficits and an imbalance may occur, we do not suggest that mortality always follows. Elk are known to rely on stored energy reserves to survive winters and therefore can likely incur small forage deficits without starving.

Forage Deficits

Assumptions in Alternative #1 are "status quo", i.e., that management actions will be the same in the future as in the past. Flood irrigation will continue on the cultivated fields of the NER, elk will be able to browse the willow stands on the NER, and bison numbers will grow unregulated.

Figures 7 – 9 below depict forage deficits for Alternative # 1 under varying model conditions. Figure 7 depicts drought conditions, Figure 8 depicts mean precipitation conditions, and Figure 9 depicts wet precipitation conditions. Each figure has three sets of colored lines: the black set represents the average winter, the green set represents the above average winter, and the red set represents the severe winter. Each color of lines is also represented by three line types: the solid lines are the model runs for 500 bison, the dashed lines are for 1000 bison, and the dotted lines are for 2000 bison.

In Figure 7 (drought conditions), the solid black line touches the x-axis at about 5,500 elk. Thus we can interpret that in an average winter with 500 bison, as elk populations reach 5,500 and higher, forage deficits will begin to occur. Similarly, in an average winter with drought conditions with 1,000 bison (the dashed black line), forage deficits begin at approximately 3,800 elk in the entire Jackson ecosystem. In an above-average winter with 500 bison (the solid green line), forage deficits begin to occur at about 1,800 elk. As winter severity and bison numbers increase, deficits occur with smaller and smaller numbers of elk. The drought scenario utilizes 45% of the forage available in the mean precipitation scenario.

Note in Figure 7 that the solid red line (the severe winter with 500 bison) does not touch the x-axis. This is because deficits will begin to occur even when elk numbers are 0 animals. These deficits occur because in any week, all the available forage is being consumed by the 500 bison and the 890 moose on the landscape. This situation occurs in several of the modeled scenarios for the severe winter with high bison numbers, and in milder winters when bison numbers are high. This is the forage deficit that results soley from bison and moose populations, assuming that there were no elk competing with them for forage.

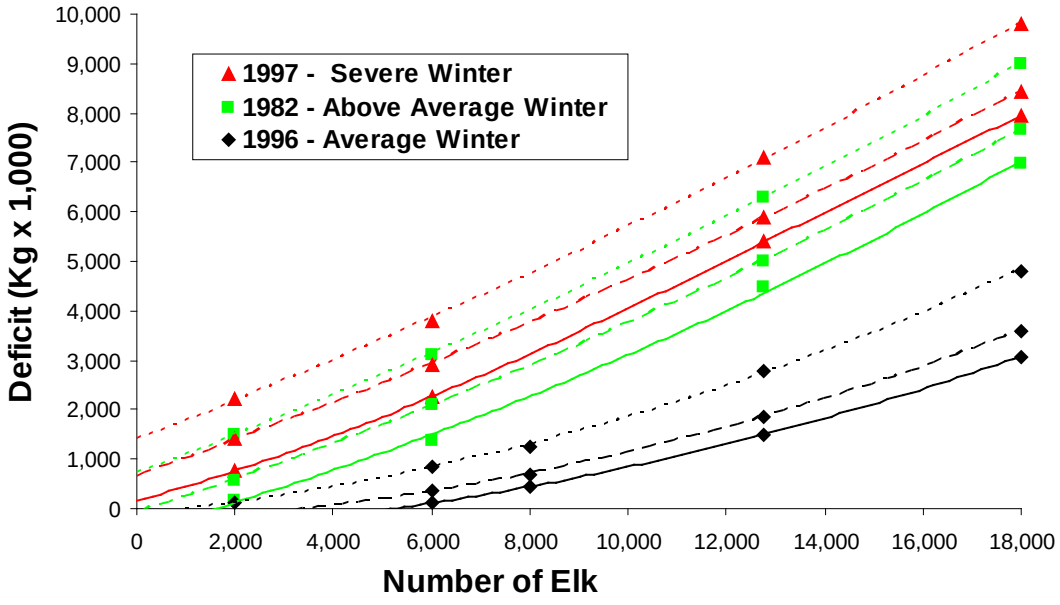


Figure 7. Drought scenarios for the Greater Teton Ecosystem -- Alternative #1.

Figure 8 depicts the modeled scenarios for mean precipitation conditions. The increase in precipitation causes significantly higher forage production across the landscape which translates into significantly more forage available to ungulates. Thus, compared to the drought scenarios,

forage deficits occur at much higher numbers of elk across all model runs. In the average winter with 500 bison (the solid black line), forage deficits occur at about 16,000 elk. In the above average winter with 500 bison (the solid green line), forage deficits occur at about 6,000 elk. The severe winter causes deficits to occur at much lower numbers of elk, about 1,000 with 500 bison. As in drought conditions with severe winters and high bison numbers, deficits occur at 0 elk.

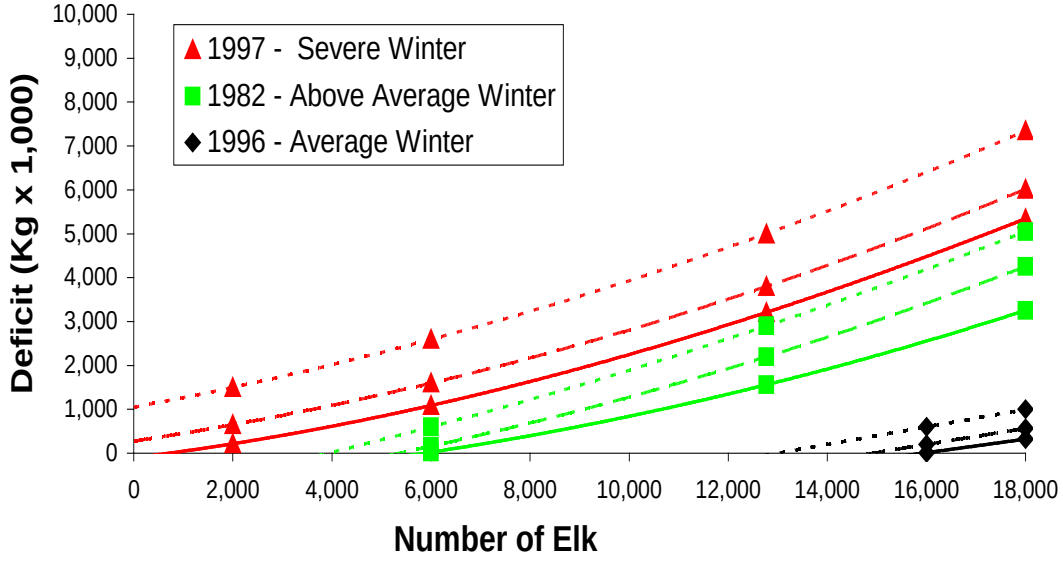


Figure 8. Mean precipitation scenarios for the Greater Teton Ecosystem -- Alternative #1.

Wet precipitation conditions (Figure 9) increase forage availability which similarly decreases forage deficits. In the wet precipitation scenarios, no deficits occur for any modeled population size of elk and bison in the average winter. In the above average winter with 500 bison, deficits occurred at 12,000 elk. In the severe winter with 500 bison, deficits started with 3,000 elk.

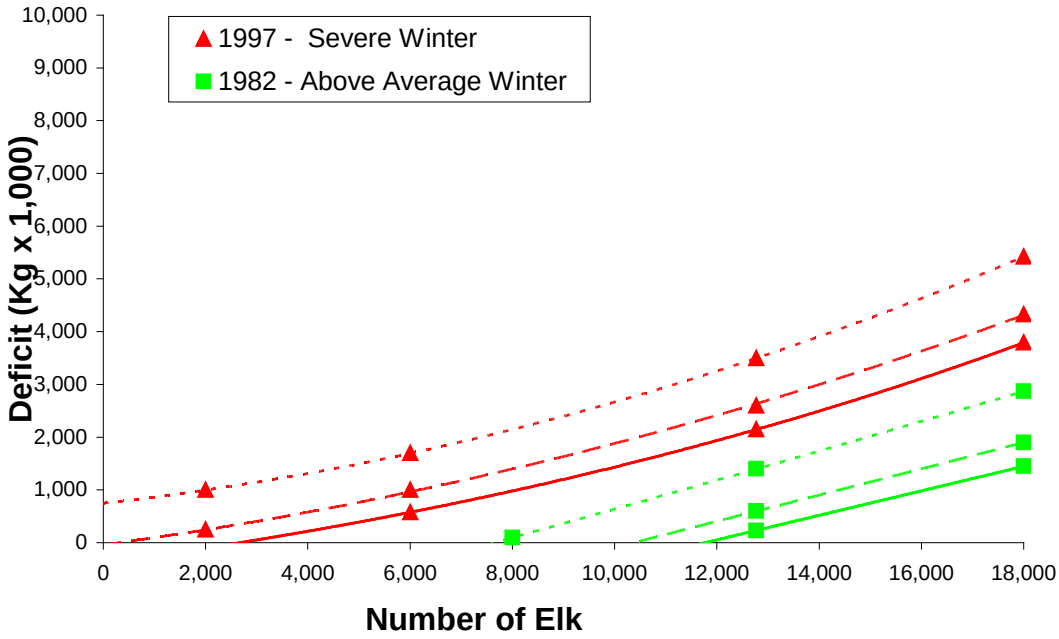


Figure 9. Wet precipitation scenarios for the Greater Teton Ecosystem –Alternative #1.

Forage Utilization

Forage utilization is simply the percent of forage removed from a given location in the study area as predicted by the forage accounting model. Managers are often concerned about forage utilization because high utilization can be construed as a measurement of habitat degradation. Here, we briefly describe utilization results, while leaving a quantified analysis of utilization effects for Part II of this report, "The Century Ecosystem Model".

For the utilization results, we held precipitation and bison variables constant, and varied the number of elk and winter severity. We estimate that between 42 and 155 km^2 of winter range will be used in excess of 50% in an average winter with 500 bison and with elk populations of 6,000 to 18,000 (Figure 10). Utilization area increases in the average winter because rising numbers of elk push out and onto low-SWE areas of the range. During above average and severe winters, we estimate between 61 and 105 sq km of winter range will be used in excess of 50%. As elk numbers rise in above average and severe winters, utilization area actually levels off. This effect occurs because snow is blanketing the landscape and prohibiting elk from moving onto outlying areas. As long as elk populations are above ~14,000 animals, more severe winters will protect forage from being highly utilized. It should be understood however, that this reduction in utilization will lead to increased deficits and probably lead to a sharp increase in starvation mortality.

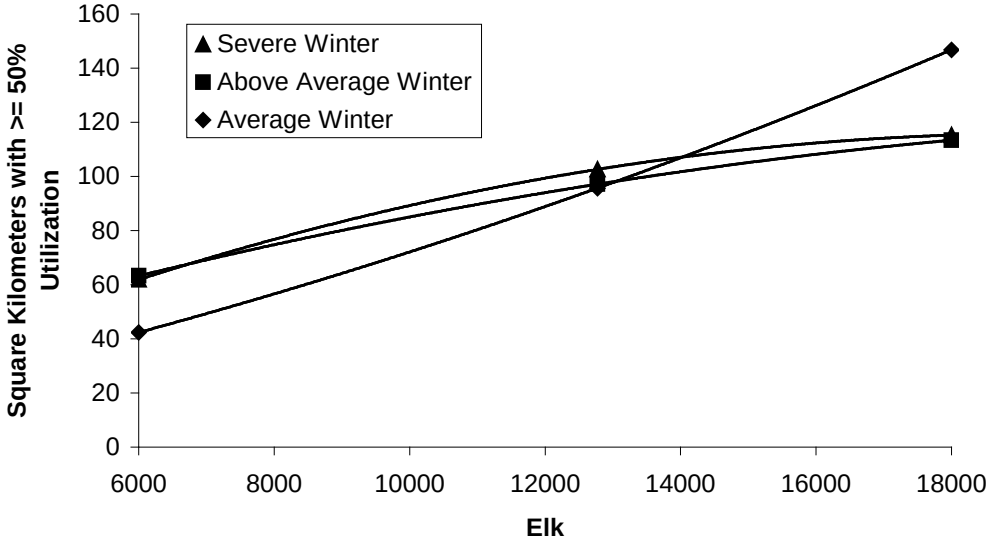


Figure 10. Area of winter range with utilization levels $\geq$ 50% as a function of elk population size during three winters with mean precipitation and 500 bison.

As an example of one utilization map, Figure 11 depicts forage utilization for the Greater Teton Ecosystem under a scenario of 12,771 elk, 500 bison, mean pre-winter precipitation in an average SWE winter. Although the maps will all differ slightly depending on winter severity and elk numbers, this map is indicative of the general layout of utilization across the Teton ecosystem. The black areas represent utilization of 50% or greater on the landscape which corresponds with areas that receive the least snow coverage during the winter.

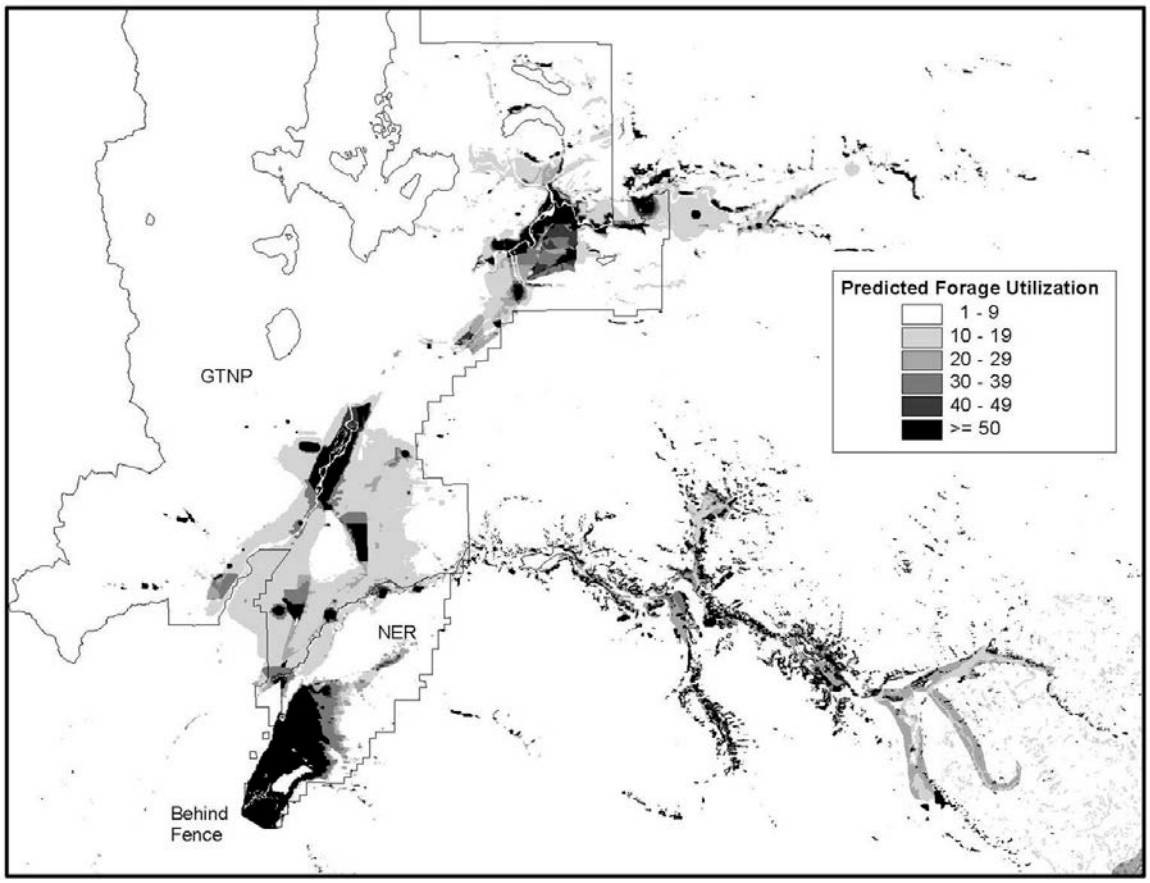


Figure 11. Predicted forage utilization for 12,771 elk in an average winter with average pre-winter precipitation and 500 bison.

Effects of Development in the Town of Jackson

One justification for supplemental feeding of elk is that it compensates for forage that would be available to native ungulates if their winter range had not been developed by human settlement in the town of Jackson. Although this justification is widely offered, it is based on a largely untested assumption of parity in the amount of forage fed and the amount lost to development. We analyzed this assumption as follows: If the development in the town of Jackson were exactly compensated by supplemental feeding, then adding the forage lost when the town was developed to the natural forage available to the currently supported population should theoretically *remove* the forage deficit. If supplemental feeding overcompensates for the development of the Jackson area, then forage deficits should remain despite "adding" the Jackson town forage base back into current supplies. If supplemental feeding undercompensates, then a forage surplus should result by adding the town of Jackson forage base back into the forage available to ungulates.

We ran two scenarios. We refer to the first scenario as "without fence." This scenario assumed that elk would no longer be restricted to habitat north of the fence on the National Elk Refuge and would be allowed to use agricultural lands and native pastures in and around Jackson. To implement this scenario, we simply added the forage in these areas to the forage supplies in the base model runs. The area added is the white area in Figure11 -- "Behind Fence".

We refer to the second scenario as "presettlement." In this scenario, we modified the current vegetation to reflect patterns that were more likely before agricultural development of the Jackson

Valley (irrigation, seeding, fertilization, etc.) As an approximation of these conditions, we assumed that vegetation south of the wildlife fence was composed of roughly equal parts of wet meadow and sagebrush-grassland.

Model results (Figure 12) suggest that at 2,000 elk in the severe winter, forage deficits are reduced by 51% (from 217,000 kg to 110,000 kg) when forage is added south of the fence. However, at 18,000 elk, this reduction shrinks to 13%. Similarly for the presettlement scenario, at 2,000 elk in the severe winter, deficits are reduced by 26%, but shrink to 6.2% at 18,000 elk. Because elk numbers are currently around 12,000 – 14,000, it is safe to say that the area south of the fence, reaching to the bottom of the study area, will not provide adequate forage for elk in severe winters. If high populations of elk need to find adequate forage in severe winters, they would more likely need to migrate further south down the Snake River drainage. Forage deficits are completely offset in the average winter, even at 18,000 elk. However, the "with fence" deficits were small in the average winter, so the offset is less meaningful.

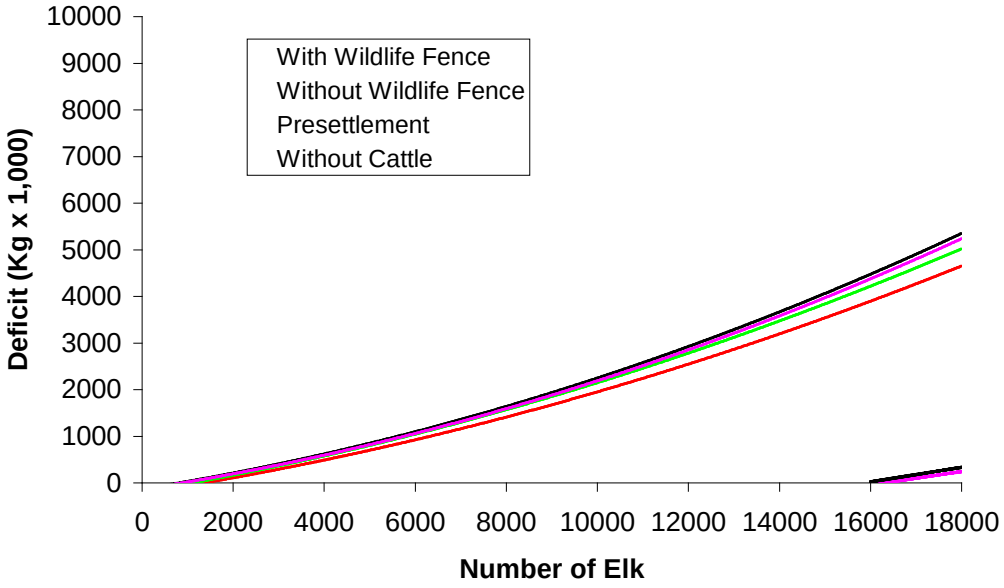


Figure 12. Forage deficits predicted under different assumptions about effects of the town of Jackson, and without cattle offtake. The model was run on severe and average winters with mean precipitation and 500 bison. Severe winters are depicted by the four lines which cross the x-axis at ~1,000 elk; average winters are depicted by the two lines which cross the x-axis at ~16,000 elk. The "with fence" scenario assumes no forage use by native ungulates south of the wildlife fence. The "without fence" scenario assumes that native ungulates are able to use vegetation south of the wildlife fence as currently mapped. The "presettlement" scenario assumes that native ungulates are able to use vegetation south of the wildlife fence and that this vegetation is composed of 50% sagebrush and 50% wet meadow. The "without cattle" scenario assumes no cattle grazing on the Greater Teton Ecosystem.

Removal of the Wildlife Fence

A model run that accurately portrays the spatial effects of removing the wildlife fence is not feasible with current data and understanding. If the fence were removed and feeding were discontinued, the Jackson elk herd would probably migrate south of Jackson and intermingle with other herds from which they have been separated for many years. We are able to offer two general scenarios that shed light on the effects of removing the wildlife fence and cessation of feeding. First, the graphical depiction of the "without fence" scenario discussed in Figures 12 corresponds to the visual representation of utilization in and around the town of Jackson depicted in Figure 13 below. Utilizations would cover the town of Jackson at the >50% level, and would be constrained only by the elevational gradient that exists around the town.

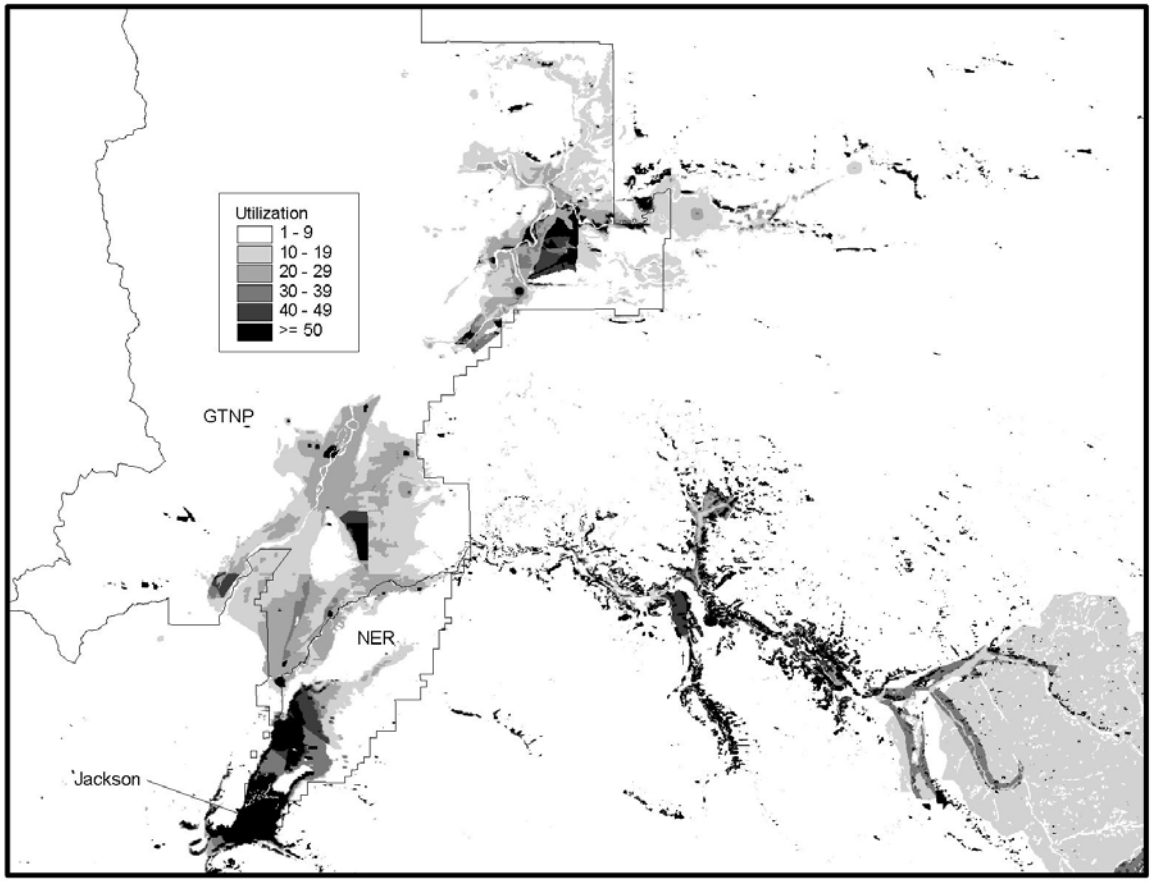


Figure 13. Utilizations in an average winter with average precipitation and 12,771 elk without the wildlife fence. Very high utilizations would likely continue south of the NER into the town of Jackson.

Second, we ran the snow model on a larger area and corrected it for the Gros Ventre snow shadow (Figure 14). The black cells on the map depict areas with 6 inches or less of SWE on March 8, 1997, the snowiest day available in the database. Results indicate that elk could winter in the Gros Ventre valley or south of Jackson in the Snake River valley as it winds towards Alpine, and lower areas of Hoback Canyon.

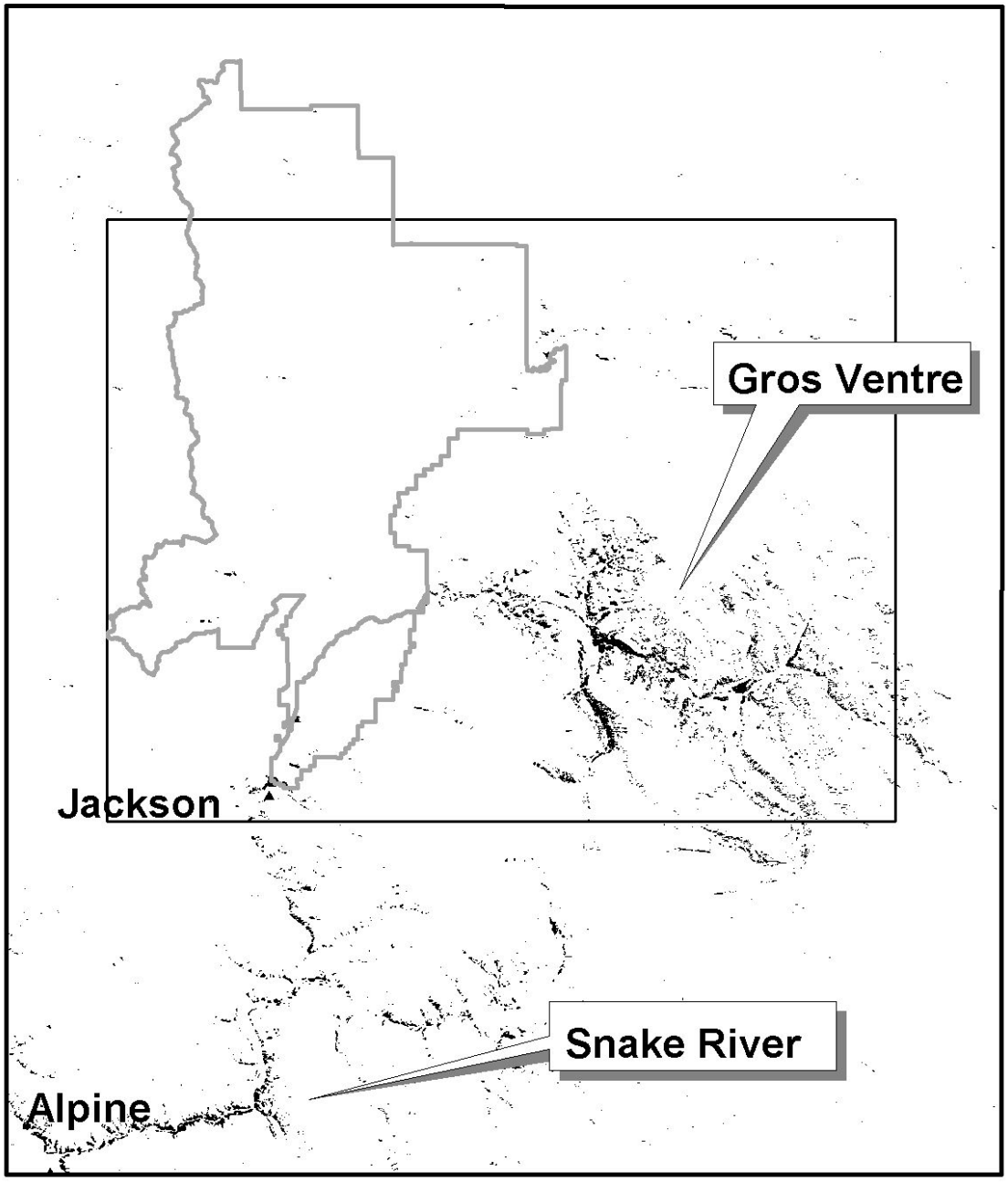


Figure 14. Black cells indicate likely migration routes and wintering areas in severe winters. The Gros Ventre and the lower Snake areas are predicted to receive the highest elk numbers and utilizations should the wildlife fence be removed.

Effects of Cattle Grazing

To examine the effects of cattle grazing on forage deficits we estimated the biomass consumed by cattle during summer and subtracted that from the prewinter standing crop. We did this by overlaying coverages of grazing allotments on the vegetation map, estimating the total forage removed as a function of the stocking rate, and subtracting that estimate from the prewinter forage supply. In addition, Steve Kilpatrick (WGFD), reviewed and offered small changes to the cattle offtake map.

The model runs (the purple lines on Figure 12) revealed negligible effects of cattle grazing on forage deficits for wild ungulates. Although the total amount of forage consumed by livestock was substantial -- about 0.5% of the total production on the Teton ecosystem -- most of this consumption occurred on areas that were not important elk winter range. As elk numbers increased, deficit differences with and without cattle became quantifiable (the difference between the black line and the purple line in Figure 12). At 18,000 elk, "with fence" deficits were 5,346,000 kilograms whereas "without cattle" deficits were 5,229,000 kilograms, a difference of 117,000 kilograms or 2.2%.

Model Results on the National Elk Refuge for Alternative #1

Adapting the Forage Accounting Model to the NER

The Forage Accounting Model was initially written to run on the Greater Teton Ecosystem utilizing the weekly SWE maps created by the snow model. These weekly snow maps are the factor which drives elk migration throughout the study area. To adapt the model to run only on the NER, we continued to use the snow maps as the migratory switch but we only allow elk to consume forage on the NER rather than on any area beyond the NER's borders. This forces all elk onto the NER's forage as soon as snow begins (roughly on Nov. 1st) and keeps them there until the end of snow (roughly June 1st). At the beginning of the snow season, the animals are allowed to spread out over the entire NER, but as snow accumulates, they are restricted to low SWE areas. As snow melts, they are allowed to spread out over the low-SWE areas on the NER.

Real migratory movements are likely to be different. In a real scenario, elk slowly move onto the NER as snow accumulates, and slowly move off as snow melts. Because our model cannot mimic these real movements, our numeric estimates of forage deficits are overly high, i.e., real deficits may be lower than those depicted in the following figures, and higher numbers of elk may be supported before deficits occur. For example, if deficits start at 6,000 elk, this can be interpreted as "at least" 6,000 elk are needed to incur deficits. While the actual number may be 7,000 or 8,000, it is definitely not 5,000. Thus, the margin of error for the NER should be construed differently than for the Greater Teton Ecosystem. On the NER, deficit predictions represent the lowest limit in the margin of error. We roughly estimate the upper limit as the lower limit plus 50%. Again, we cannot firmly quantify this error but believe it is a reasonable approximation.

Modeled Scenarios

For Alternative #1, we exercised the forage accounting model on the National Elk Refuge and ran simulations for 1) varying populations of elk -- between 0 and 10,000, 2) varying winter severity -- average, above average, and severe, 3) varying pre-winter precipitation conditions -- drought, mean, and wet, and 4) three populations of bison -- 500, 1000, and 2000. These model runs include offtake by 20 moose. We also ran a scenario which simulates center-pivot irrigation of 1,170 acres of the cultivated fields on the NER which are currently flood-irrigated.

In Figure 15 (severe drought conditions), the solid black line touches the x-axis at about 2,000 elk. Thus we can interpret that in an average winter in drought conditions with 500 bison, as elk populations reach 2,000 and higher, forage deficits will begin to occur on the NER. Note in Figure 1 that all of the other lines do not touch the x-axis, i.e., deficits occur even when elk numbers are 0 animals. These deficits occur because in any week, all forage is being consumed by the 500 bison and the 20 moose.

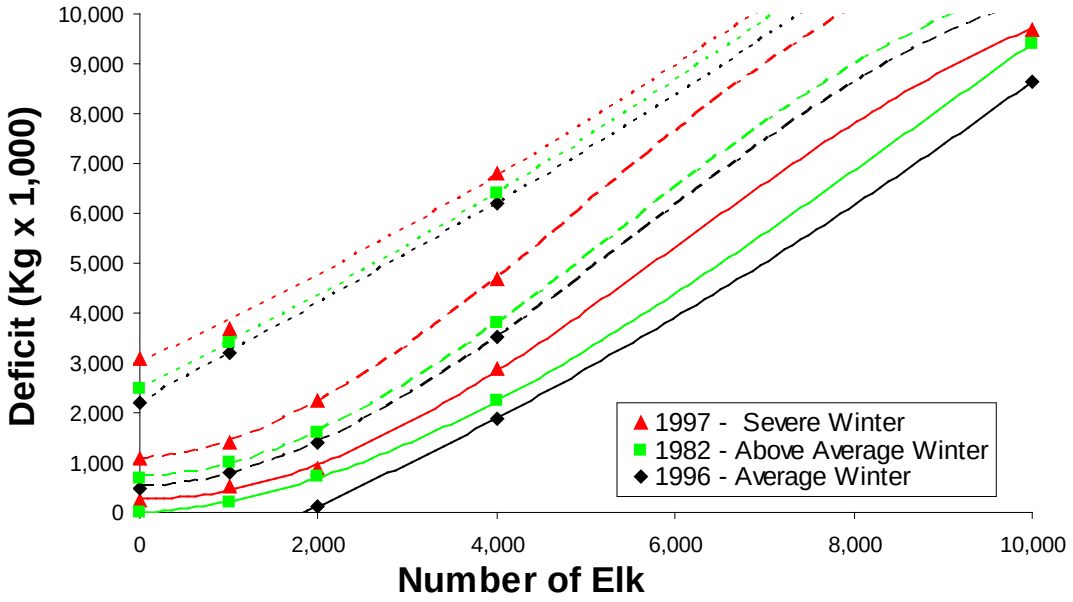


Figure 15. Forage Deficits for Drought Conditions on the NER.

Figure 16 depicts the modeled scenarios for mean precipitation conditions which create significantly more forage for ungulates and cause deficits to occur at much higher numbers of elk in average winters. With 500 bison in the average winter (the solid black line), forage deficits occur at about 5,000 elk, occur at about 4,000 elk with 1,000 bison, and 2,000 elk with 2,000 bison. Though mean precipitation increases forage production, there is still sufficient snow in above average and severe winters to incur deficits at 0 elk across all bison numbers.

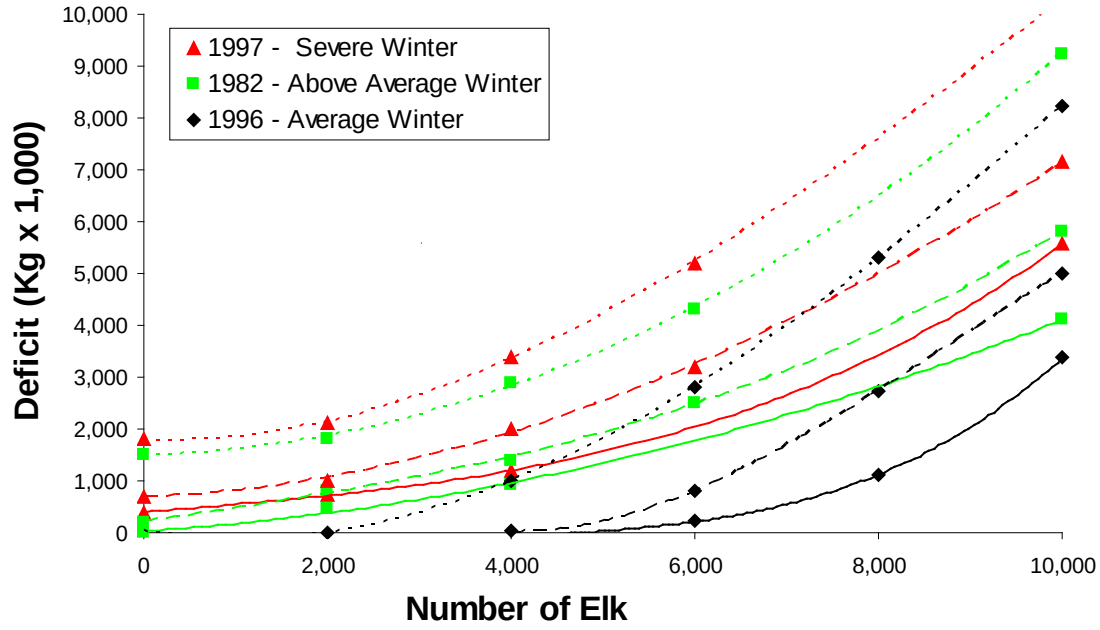


Figure 16. Forage Deficits for Mean Precipitation Conditions on the NER.

Wet precipitation conditions (Figure 17) increase forage availability which similarly decreases forage deficits. In the wet precipitation scenarios, deficits occur at roughly 9,200 elk in the average winter and 800 elk in the above average winter with 500 bison. Severe winters still cause deficits to begin at 0 elk due to the extreme snow cover on the landscape.

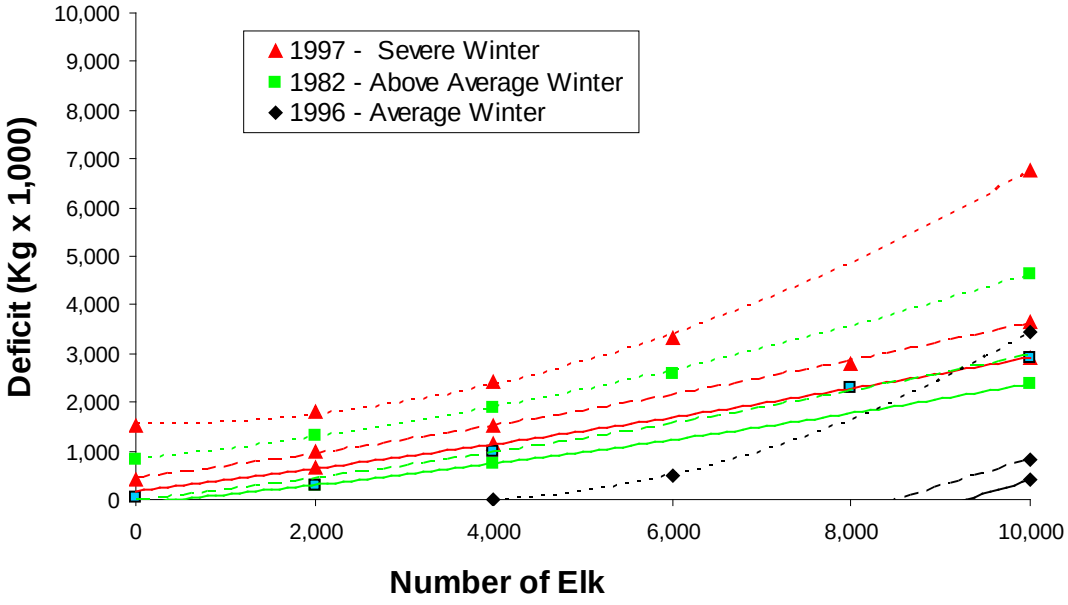


Figure 17. Forage Deficits for Wet Precipitation Conditions on the NER.

Irrigation Experiment

We created an additional model experiment to address an questions on the value of irrigation on the NER. Managers may want to center-pivot irrigate ~1,170 acres of the NER to raise production, thereby increasing the biomass of forage available to wintering elk. As per the description in the document "Irrigation System Rehabilitation Plan Environmental Assessment" (National Elk Refuge, October 1998), we created a model scenario in which production values on the following NER project areas were increased to reflect center-pivot irrigation: McBride, Chambers, Nowlin, Ben Goe, and Headquarters (Figure 18). Currently these areas are flood-irrigated resulting in about 2,500 lbs/acre of production whereas center-pivot irrigation will result in about 5,000 lbs/acre. For this experiment, we varied only the irrigation acreage, holding precipitation and bison constant (average precipitation and 500 bison).

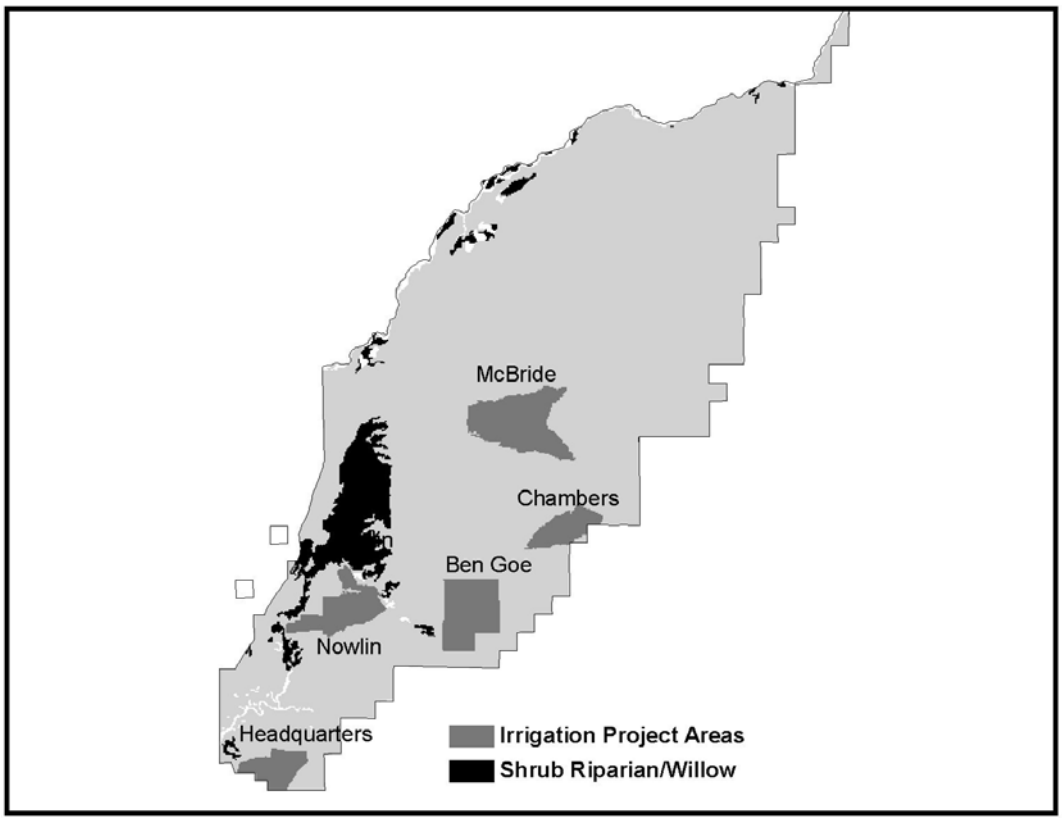


Figure 18. Irrigation Project Areas and willow locations on the NER.

As shown in Figure 19, center-pivot irrigating the four NER project areas has a significant impact on forage deficits in an average winter under average precipitation with 500 bison (solid lines). For the flood-irrigated scenario in the average winter, deficits begin at about 5,000 elk and are 3,371,000 kilograms at 10,000 elk. For the center-pivot irrigated scenario, deficits begin at about 6,000 elk and are 2,207,000 kilograms at 10,000 elk. In a severe and above-average winter, the change in deficits is less pronounced. All irrigation scenarios have deficits beginning right at 0 elk, and as the number of elk increases, a slight difference exists between the two scenarios, culminating in a deficit of 5,560,000 kilograms at 10,000 elk for the flood-irrigated scenario and a deficit of 4,711,000 kilograms for the center-pivot irrigated scenario. With center-pivot irrigation, the average winter yields more deficit reduction because more of the range is open to ungulates. In the severe and above-average winter, the upper NER irrigated project areas are covered in too much snow at critical weeks during the winter.

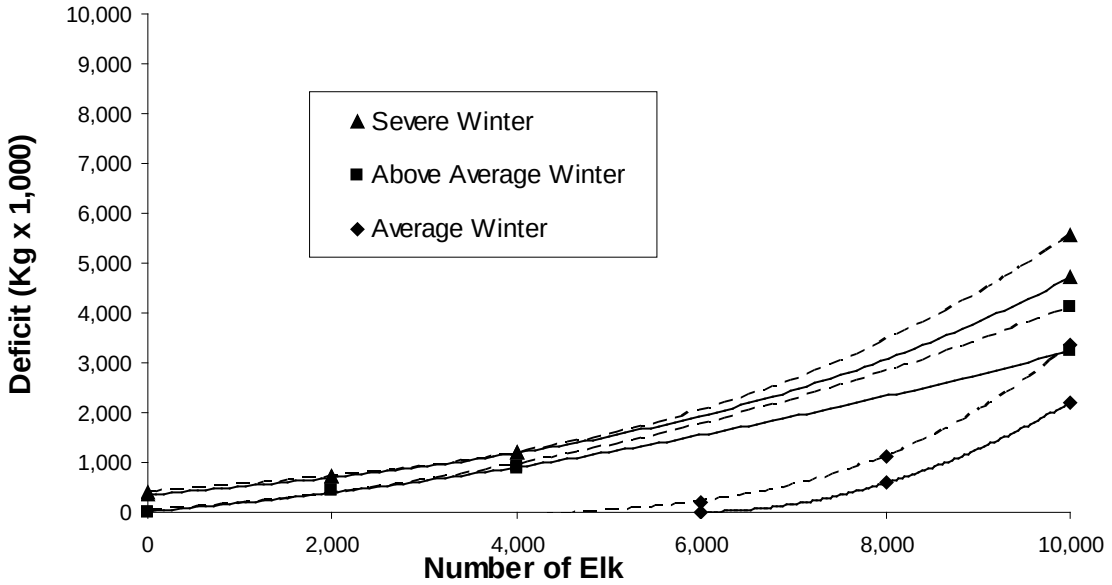


Figure 19. Forage Deficits for the Irrigation Model Experiment on the NER. Solid lines represent center-pivot irrigation; dotted lines represent flood (status-quo) irrigation.

Discussion for Alternative #1

Our model revealed that balance between forage supply the forage requirements of wintering ungulates are tightly linked to winter severity and growing season precipitation. Although both of these weather conditions can determine the number of animals that can be supported by native forage, snow accumulation exerts the strongest effects. During average winters with average precipitation conditions and 500 bison, the number of elk that can be sustained on the landscape approaches 16,000. But as winter severity or drought are encountered, this number drops dramatically.

Currently, elk and bison are supplementally fed on the NER to alleviate food shortages caused by snow severity as well as drought conditions. Additionally, it is argued that supplemental feeding is needed to compensate for forage supplies lost to the area behind the NER's wildlife fence. Our model experiments suggest that the wildlife fence plays an important role by inhibiting migration and foraging for native ungulates, and that removing the fence would increase forage availability especially during average winters. However, our model predicts that significant forage deficits would still occur during more severe winters if the wildlife fence were removed and native ungulates were allowed to graze in and around the town of Jackson as well as on nearby agricultural lands. This suggests that historic elk populations: (1) may have been smaller than current ones, and/or (2) may have suffered high levels of mortality during severe winters, and/or (3) more likely have used lower elevation ranges south of Jackson and larger areas of the Gros Ventre.

The influence of grazing by livestock on forage supplies for native ungulates has emerged as a controversial question for managers in the Greater Teton Ecosystem. Our model experiments suggest that cattle grazing does not play an important role in determining availability of forage for native ungulates during winter. This is the case because the preponderance of livestock

grazing occurs on areas of the landscape that accumulate deep snow during the winter. As a result, increasing forage on these areas by removing livestock grazing may increase forage biomass but it does not increase forage available to wintering ungulates. Removing cattle from the system had negligible impacts on predicted forage deficits.

We predict that approximately 100 km^2 of winter range will be utilized at a 50% rate or higher given current numbers of elk and bison, and varying climatic conditions. Part of this high level of use is caused by the wildlife fence because it inhibits natural foraging patterns and migration. However, we emphasize that as long as animals select areas that are relatively snow free in preference to areas where snows are deep, we should anticipate locally high levels of forage utilization on some sites. Although reducing population density can reduce the area of the landscape that falls into the "high-use" category, we project that some "hot spots" will occur at any reasonable level of population numbers. The effect of these forage utilization rates and hot-spots will be analyzed in the next section of this report -- Part II, The Century Ecosystem Model.

Bison numbers play an important role in forage deficits. Given the number of bison at the start of this project, 500, approximately 16,000 elk can forage on the whole system without incurring deficits in an average winter with average pre-winter precipitation conditions. When bison numbers double to 1,000, elk numbers drop to 15,000; when bison numbers quadruple to 2,000, elk numbers drop to 13,000. Doubling bison numbers to 1,000 also substantially increases forage deficits in more severe winters, and quadrupling bison numbers to 2,000 causes severe stress on the system during most climatic conditions.

The results for the NER should be evaluated differently than those for the Greater Teton Ecosystem. Instead of a mean estimation with a surrounding margin of error, the NER's results should be construed as "lowest possible number of elk" which correspond to the deficit measurement. On the NER Study Area, this number represents the lowest limit in the margin of error. We roughly estimate the upper limit as equal to the lower limit plus 50%.

Given this stipulation, we estimate that the NER can support at least 5,000 elk in average winters with mean pre-winter precipitation and 500 bison. In above-average and severe winters, deficits occur at all levels of elk except in the wet precipitation scenario. In our irrigation experiment, we found that 1,000 more elk could forage on the NER before deficits would occur in average winters with mean pre-winter precipitation and 500 bison, and that forage deficits would be reduced in severe winters especially with high numbers of elk.

Forage Accounting Model Results for all the EIS Alternatives

We were asked to run the model and provide results for Alternatives #1 - #4 in the EIS and also provide a summary table of where deficits begin for each Alternative given its underlying assumptions as follows:

Alternative #1: (status quo) Flood irrigation of the NER's cultivated fields. All of the NER's willow is available to ungulates. Three levels of bison -- 500, 1,000, 2,000.

Alternative #2: No irrigation of the NER's cultivated fields. All of the NER's willow is available to ungulates. Two levels of bison -- 250, 500.

Alternative #3: Flood irrigation of the NER's cultivated fields. Bison = 1,000. Two amounts of the NER's willow are available to ungulates -- none and one-half.

Alternative #4: Center-pivot irrigation of the NER's cultivated fields. Bison = 350. Two amounts of the NER's willow are available to ungulates -- none and one-half.

For all of the alternatives, the Forage Accounting Model was run on both the Greater Teton Ecosystem and the NER study area. The cautions for interpretation discussed for Alternative #1 in the previous sections also apply to the results for Alternative #2 - #4. In addition to these stipulations, please note that the model is not sufficiently sensitive to discriminate between some of the Alternatives and their underlying assumptions. For example, the difference between the forage offtake from 350 bison and 500 bison is so small that the difference between the deficit results from those runs is subsumed by the model's margin of error. Similarly, the difference between types of irrigation, and the question of willow exclusion, also offered results which were subsumed by the model's margin of error.

We report these results with both a summary table and deficit graphs. First, Table 5 reports the number of elk at which forage deficits begin to occur. The number in each cell represents the "equilibrium point" on the landscape at which the estimated forage supply exactly offsets demand by the elk population. This number is the point at which the deficit curve hits the x-axis. Higher numbers of elk will cause deficits to occur. When interpreting these numbers, keep in mind that it is almost assured that wintering elk can sustain small levels of forage deficits by using stored energy reserves (fat and lean body mass) to survive. Because of this, we suggest interpreting the numbers in the table together with the curves in the graphs that follow. If the deficit curve remains low (near the x-axis), i.e., < 500,000 kg, then wintering elk may be able to utilize stored energy reserves to survive rather than incur starvation mortality. In other words, small forage deficits can occur without causing high levels of starvation.

Table 5. Summary Table for number of elk at which forage equilibrium occurs for all EIS Alternatives

Alternative #1 (status quo)									
Pre-winter Precipitation Scenario	**Drought**			**Mean**			**Wet**		
Snow Severity Type	**Severe**	**Above**	**Average**	**Severe**	**Above**	**Average**	**Severe**	**Above**	**Average**
With 500 Bison									
Greater Teton Ecosystem	0	1,800	5,500	1,000	6,000	16,000	3,000	12,000	>18,000
NER only	0	0	2,000	0	0	5,000	0	800	9,200
- with center-pivot irrigation				0	0	6,000			
With 1,000 Bison									
Greater Teton Ecosystem	0	200	3,800	0	5,800	15,000	200	10,200	>18,000
NER only	0	0	0	0	0	4,000	0	500	8,500
With 2,000 Bison									
Greater Teton Ecosystem	0	0	1,500	0	4,000	13,000	0	7,800	>18,000
NER only	0	0	0	0	0	2,000	0	0	4,000
Alternative #2 (no irrigation of cultivated fields on NER)									
With 250 Bison									
Greater Teton Ecosystem	700	1,800	6,000	1,800	7,500	16,400			

NER only	0	0	2,000	0	0	5,700			
With 500 Bison									
Greater Teton Ecosystem	0	1,600	5,300	900	5,900	15,800			
NER only	0	0	1,700	0	0	4,500			
Alternative #3 (with 1,000 bison and flood-irrigation of NER's cultivated fields)									
No Willow on NER Available									
Greater Teton Ecosystem	0	0	3,000	0	5,000	14,000			
NER only	0	0	0	0	0	3,300			
One-half of Willow on NER Available									
Greater Teton Ecosystem	0	0	3,200	0	5,500	14,200			
NER only	0	0	0	0	0	3,500			
Alternative #4 (with 350 bison and center-pivot irrigation of NER's cultivated fields)									
No Willow on NER Available									
Greater Teton Ecosystem	0	1,600	5,700	1,500	7,200	17,000			
NER only	0	0	2,000	0	0	5,500			
One-half of Willow on NER Available									
Greater Teton Ecosystem	0	1,800	6,000	1,800	7,400	17,100			
NER only	0	0	2,500	0	200	6,000			

Graphical Model Results for the EIS Alternatives #2 - #4

Model Results for Alternative #2

Alternative #2 assumptions: 1) 250 and 500 bison, and 2) no irrigation of the cultivated fields on the NER, 3) all willow is available.

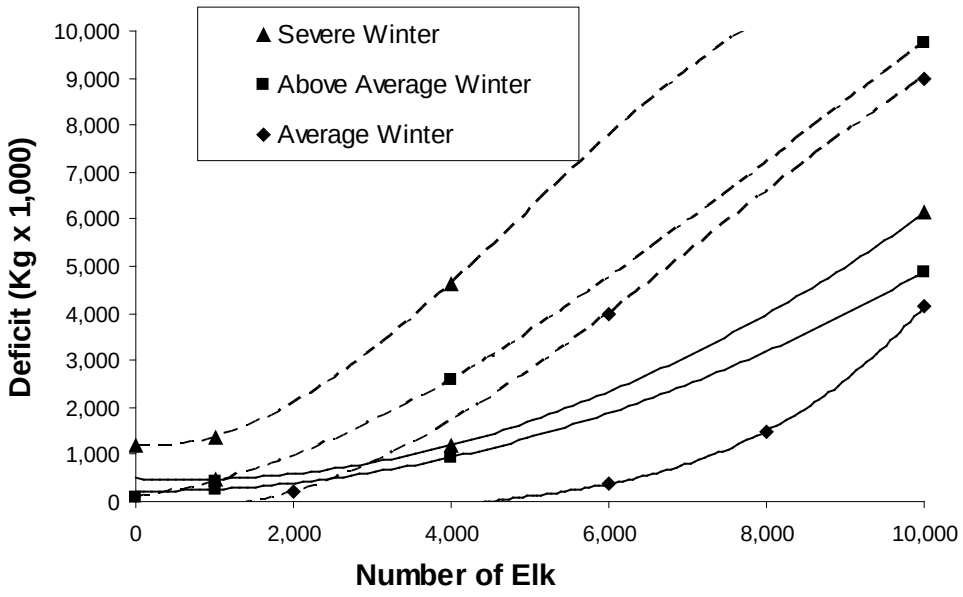


Figure 20. Deficit results for the NER using 500 bison. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

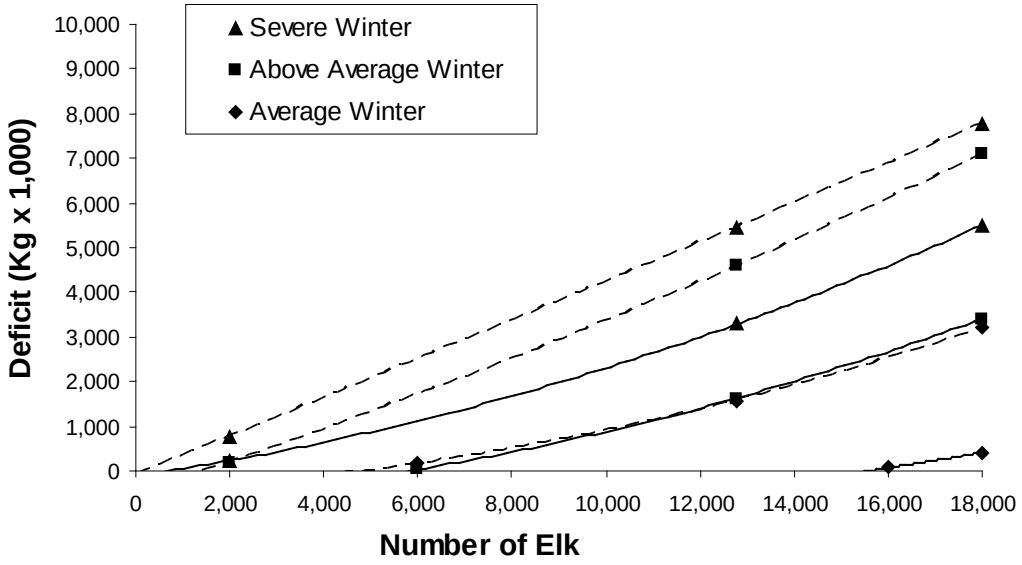


Figure 21. Deficit results on the Greater Teton Ecosystem using 500 bison. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

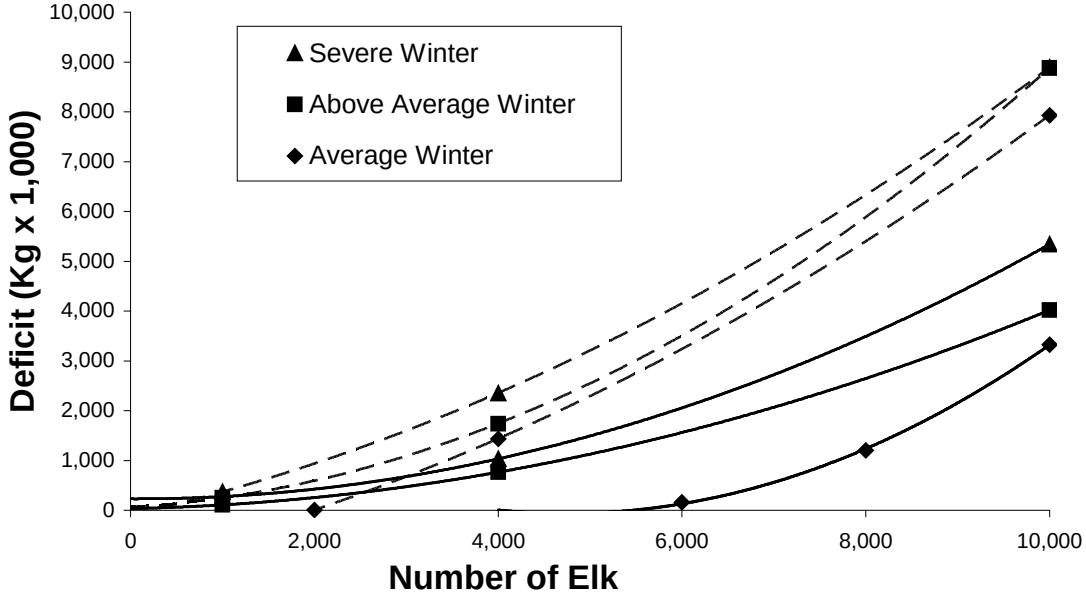


Figure 22. Deficit results for the NER using 250 bison. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

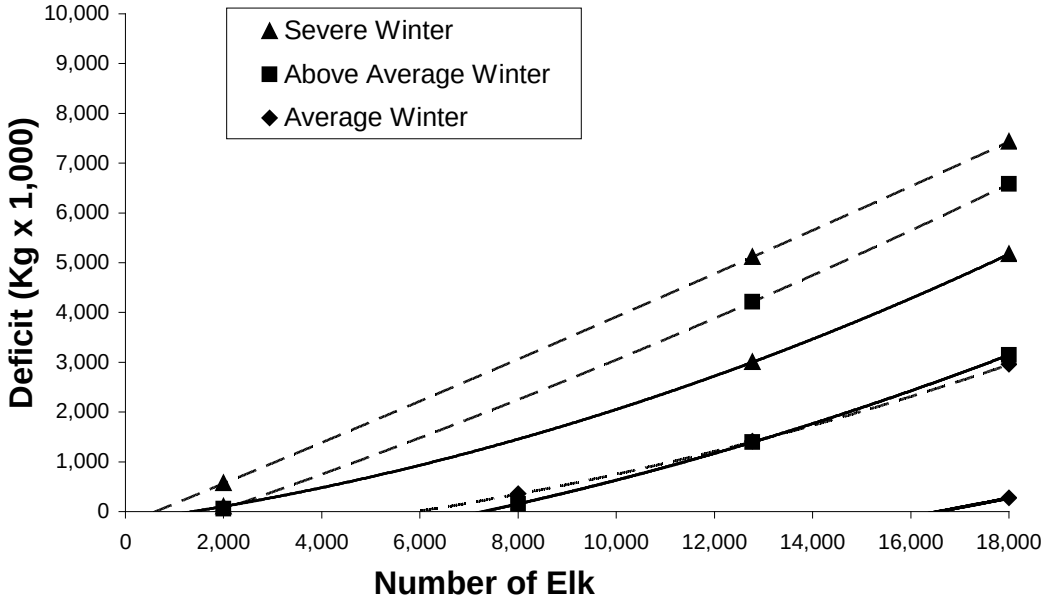


Figure 23. Deficit results for the Greater Teton Ecosystem using 250 bison. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

Model Results for Alternative #3

Alternative #3 assumptions: 1) 1000 bison, 2) cultivated fields on the NER are flood-irrigated (status quo), and 3) willow on the NER is all fenced off or half-fenced off.

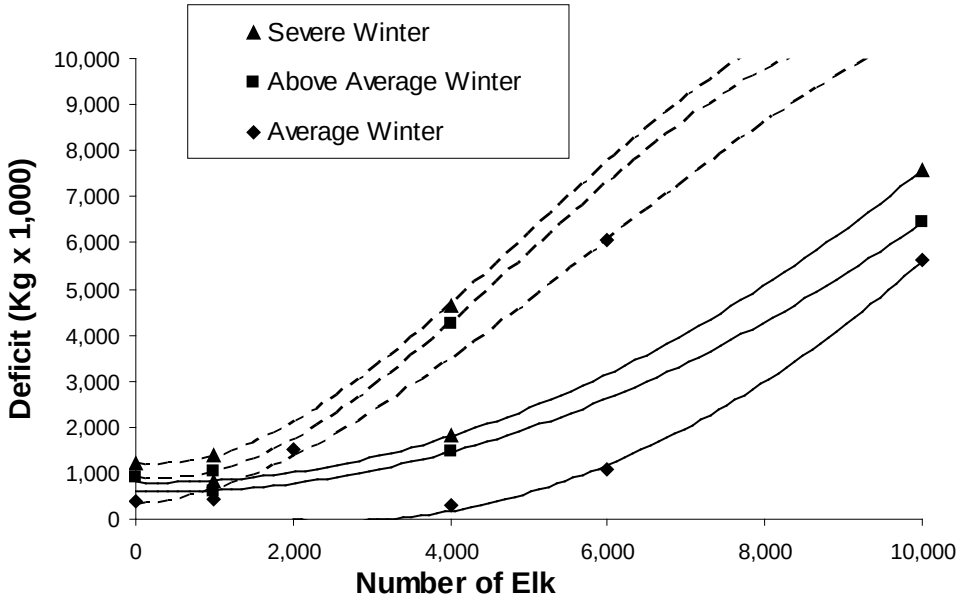


Figure 24. Deficit results for the NER with no forage available in vegetation coded "shrub riparian/willow". The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

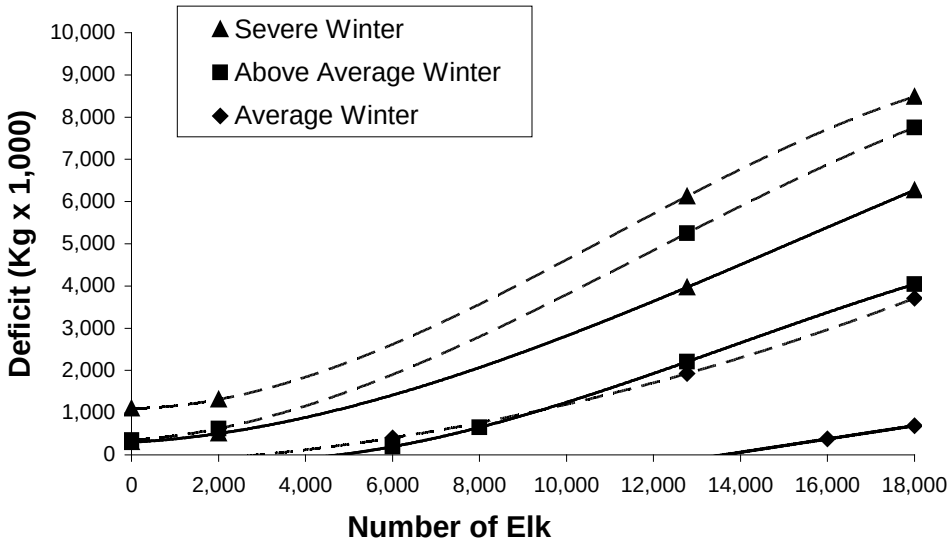


Figure 25. Deficit results for the Greater Teton Ecosystem with no forage available in vegetation coded "shrub riparian/willow" on the NER. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

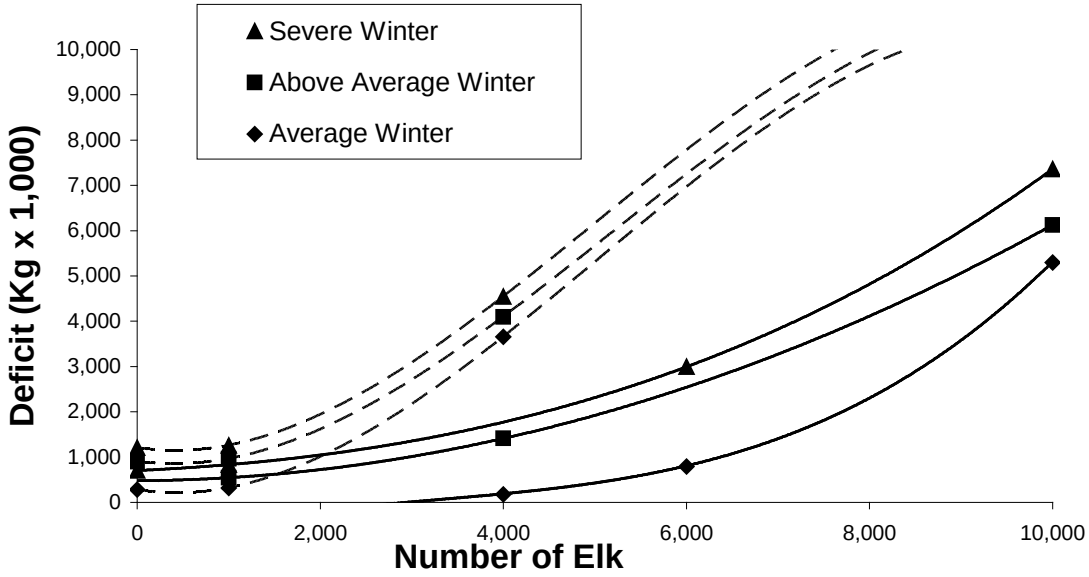


Figure 26. Deficit results for the NER with one-half of the forage available in vegetation coded "shrub riparian/willow". The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions

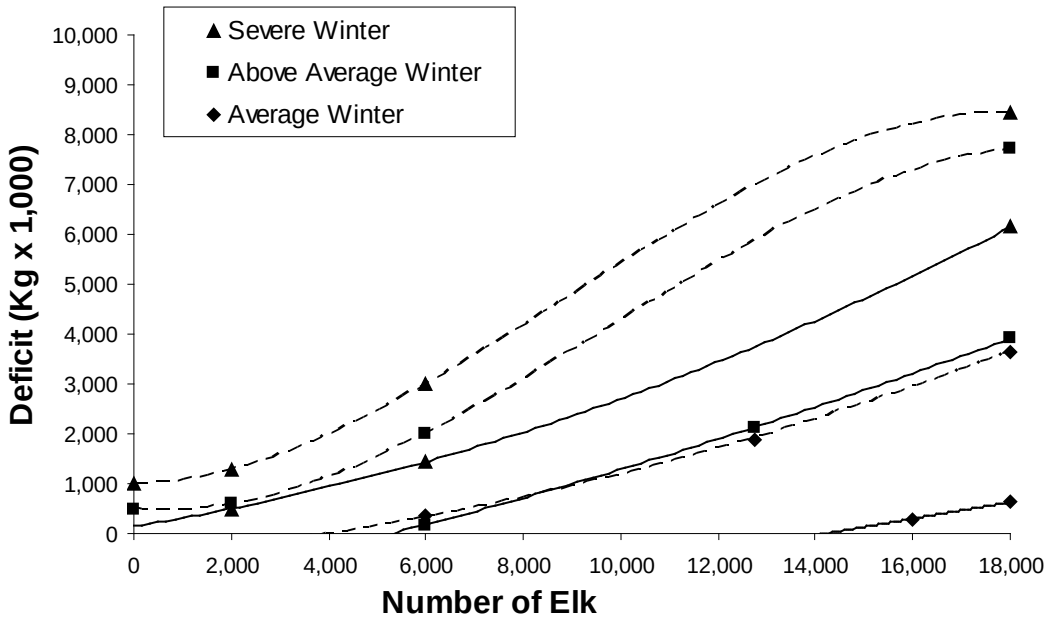


Figure 27. Deficit results for the Greater Teton Ecosystem with one-half of the forage available in vegetation coded "shrub riparian/willow" on the NER. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

Model Results for Alternative #4

Alternative #4 assumptions: 1) 350 bison, 2) cultivated fields on the NER are center-pivot irrigated, and 3) willow on the NER is all fenced off or half-fenced off.

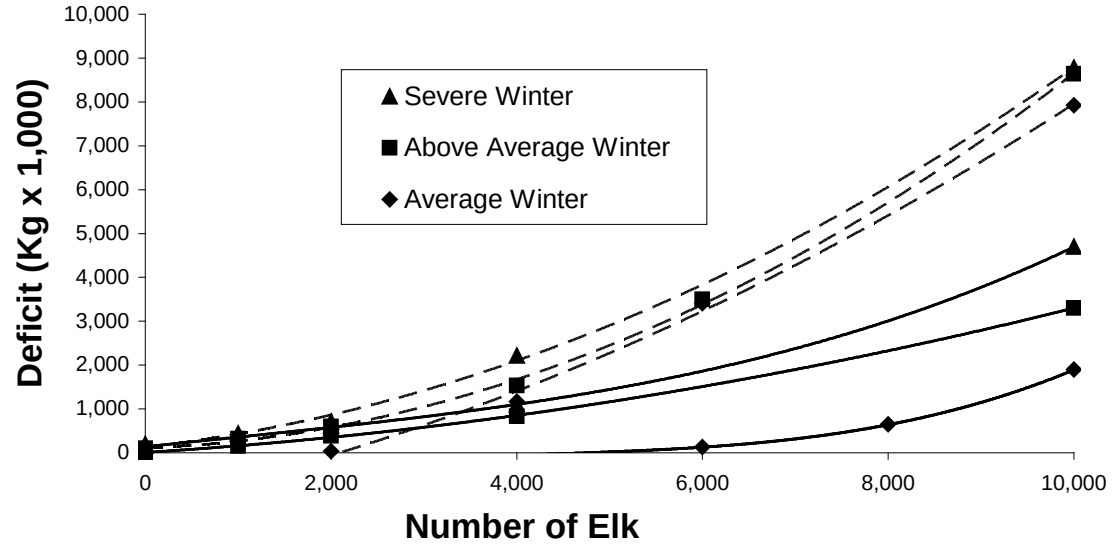


Figure 28. Deficit results for the NER with no forage available in vegetation coded "shrub riparian/willow". The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

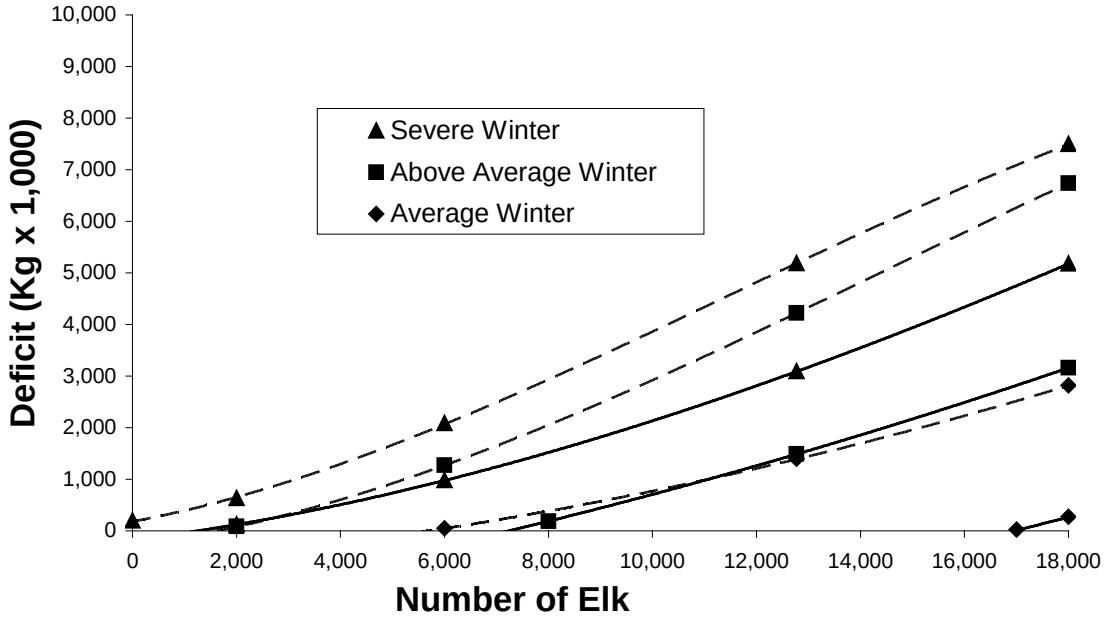


Figure 29. Deficit results for the Greater Teton Ecosystem with no forage available in vegetation coded "shrub riparian/willow" on the NER. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

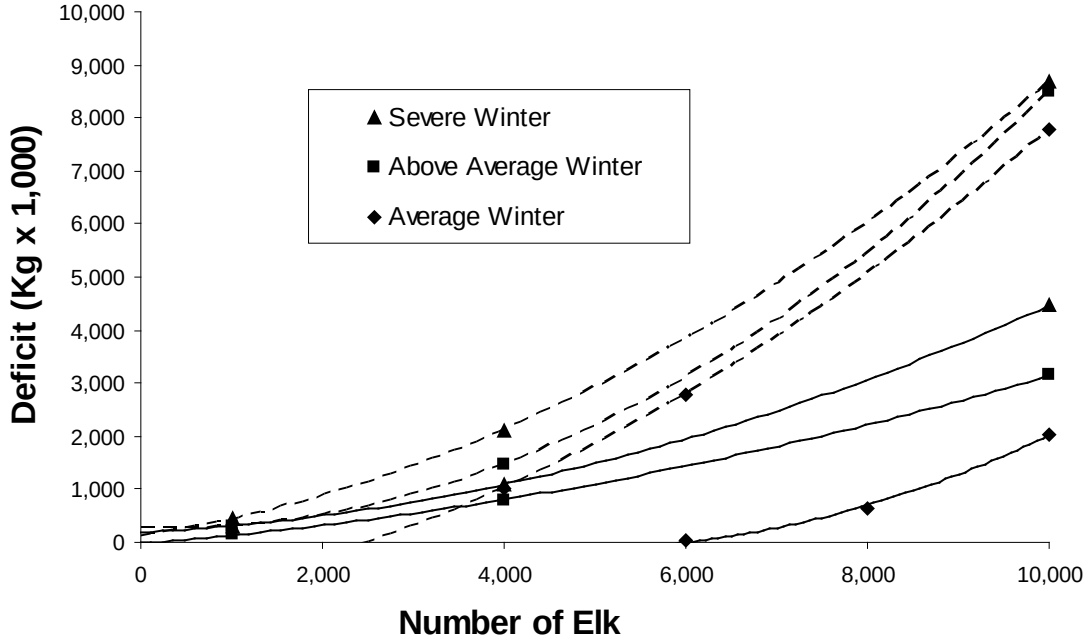


Figure 30. Deficit results for the NER with one-half of the forage available in vegetation coded "shrub riparian/willow". The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

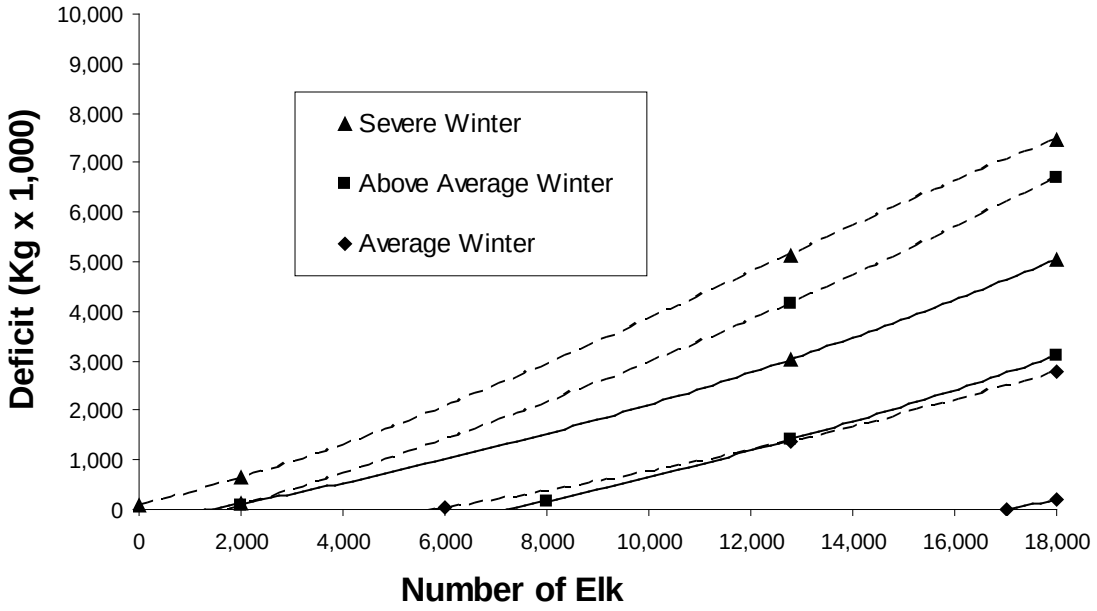


Figure 31. Deficit results for the Greater Teton Ecosystem with one-half of the forage available in vegetation coded "shrub riparian/willow" on the NER. The solid lines represent mean precipitation conditions, and the dashed lines represent drought precipitation conditions.

Discussion for Alternatives #2 - #4

The EIS Alternatives attempt consider effects of manipuating three variables: bison numbers, willow availability on the NER, and irrigation of the NER's cultivated fields. The net effect on forage deficits of these three variables will be the following:

1. increasing bison numbers will increase deficits
2. fencing off willow on the NER will increase deficits
3. irrigating the cultivated fields on the NER will decrease deficits -- center-pivot more so, flood irrigation less so.

Because the vegetation manipulations (willow, irrigation) occur on the lower portion of the NER, the effects will be less pronounced when the model is run on the Greater Teton Ecosystem than the NER. Additionally, because above average and severe winters have some weeks where snow blankets the landscape, the effects of vegetation manipulations are less pronounced than in average winters.

Alternative #2 tries to mimic "natural vegetation conditions" by allowing willow use and not irrigating the cultivated fields. This alternative also tries to manipulate bison numbers, keeping them at either 250 or 500. The net effect of "natural conditions" is slightly higher overall deficits than Alternative #1, and slightly fewer elk before deficits occur. In the average winter with average precipitation and 500 bison, deficits begin at 5,000 elk in Alternative #1 but begin at 4,500 for Alternative #2. If bison numbers are kept at 250, deficits begin at 5,700 elk for Alternative #2.

Alternative #3 lets bison numbers increase naturally to 1,000, and tries to fence off half or all of the willow stands on the NER. This Alternative restricts forage for elk more than any other Alternative because both increased bison numbers and willow fencing cause higher deficits. In

an average winter with average precipitation and no willow availability, deficits begin at 3,300 elk. With one-half willow availability, deficits begin at 3,500 elk.

Alternative #4 attempts to hold bison numbers to 350 while center-pivot irrigating the cultivated fields and fencing off willows. Taken in pieces, lower bison numbers (350) will decrease deficits, center-pivot irrigation will decrease deficits, and willow fencing will increase deficits. The net effect of these three manipulations is slightly lower deficits than Alternative #1 which allows slightly more elk to find forage before deficits occur. In an average winter with average precipitation conditions and 350 bison, deficits begin at 5,500 elk when all the willow is fenced off and 6,000 elk when one-half of the willow is fenced off.

In total, the manipulations in the three EIS Alternatives have fairly mild effects on forage deficits and elk numbers. Only Alternative #3, which allows 1,000 bison and fences willow has a significant restricting effect. The net effects of Alternatives #2 and #4 vary little from status quo management. Both the willow area and the irrigated fields on the NER comprise roughly 1,000 acres, and are relatively minor portions of the Greater Teton Ecosystem. If managers want to have a significant impact on the deficits for the entire Jackson elk herd, vegetation manipulations will have to occur on a much larger scale. And, as stated earlier, because snow blankets the landscape in some weeks of above average and severe winters, vegetation manipulations have significantly less effect than in average winters.

Part II.
CENTURY Ecosystem Modeling

Results from simulations using the Forage Accounting Model in Part I of this report suggest that significant areas of the range will experience forage utilization exceeding 50% . High levels of use will occur for virtually all population levels of elk during all winters. This heavy utilization on the winter range is intensified by the existence of the wildlife fence that inhibits natural migration to lower snow-free elevations. Additionally, field measurements (Steele et al. 1999) also depict heavy utilizations throughout the winter range in the lower portion of the NER and the lower elevations of the Gros Ventre Valley. In this section, we report results from simulation modeling using CENTURY to portray biogeochemical changes in vegetation and soil resulting from grazing by elk and bison in the Jackson Valley. This modeling effort is based on estimated inputs of soil and vegetation chemistry because field data were not yet available. Current and ongoing field sampling work by F. Singer on nitrogen pools and vegetation will later be used to corroborate these preliminary findings. The central question we address is whether or not high levels of grazing will harm long term productivity of vegetation communities.

The CENTURY Model

The CENTURY ecosystem model (Metherell et al. 1993) simulates exchanges of carbon (C) and nitrogen (N) among the atmosphere, soil, and vegetation. Required inputs used to drive the model include monthly maximum/minimum temperature and precipitation data, soil properties, vegetation type, and current and historical land use. Disturbances and management practices such as grazing, fire, cultivation, and fertilizer additions can be simulated. CENTURY includes submodels for plant productivity, decomposition of dead plant material and soil organic matter (SOM), and soil water and temperature dynamics. Flows of C and N are controlled by the amount of C in the various pools (e.g. SOM, plant biomass), the N and lignin concentrations of the pools, abiotic temperature/soil water factors, and soil physical properties related to texture. SOM is divided into three pools based on decomposition rates (Parton et al. 1993, 1994). Decomposition of SOM and external nutrient additions supply the nutrient pool that is available for plant growth. Plant growth is controlled by a plant-specific maximum growth parameter, nutrient availability, and 0-1 multipliers that reflect shading, water, and temperature stress. Net Primary Productivity (NPP) is allocated among leafy, woody, and root compartments as a function of plant type, season, soil water content, and nutrient availability.

CENTURY has been used to successfully simulate soil C and NPP levels in various natural and managed systems including grasslands (Parton et al. 1993) and agricultural systems (Parton and Rasmussen 1994). For this project, the grazing subroutine was used to model the effect of migrating elk on the native, otherwise-unimpacted grass and shrublands on the NER and the Gros Ventre Valley. Although dozens of output variables are available, this modeling effort focused on soil C, soil N, and annual NPP because these variables are of most interest to range managers. A flowchart representing the CENTURY model is in Figure 1.

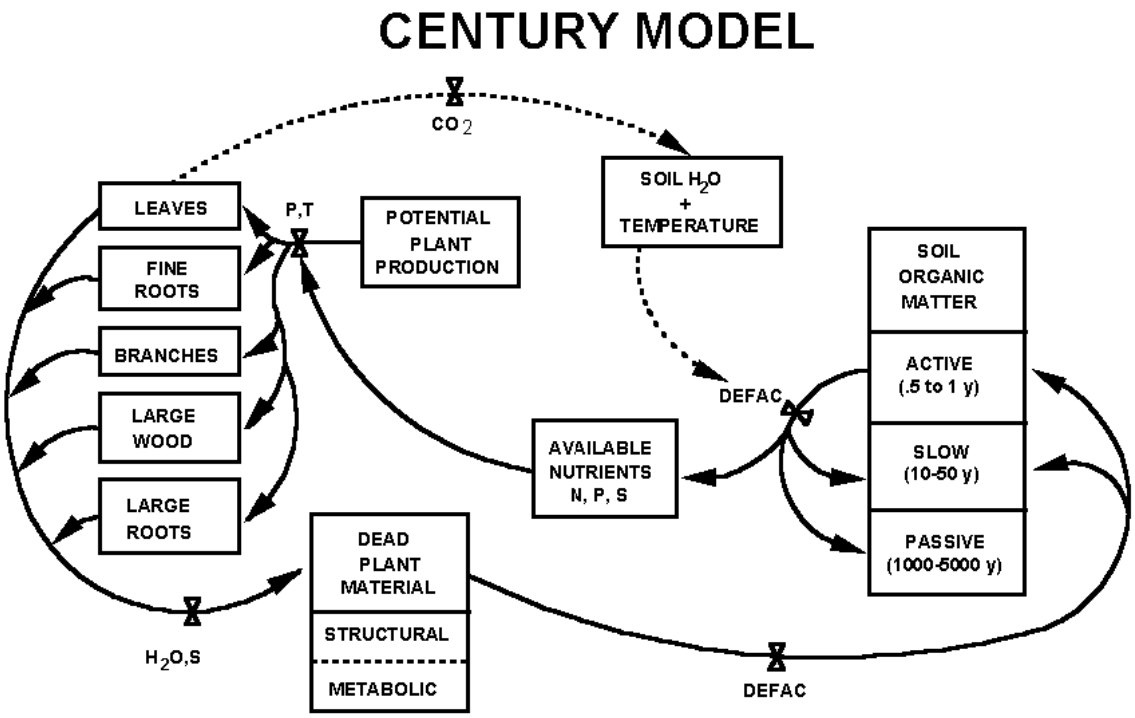


Figure 1. Flowchart of CENTURY Model

Model Input Parameters

Vegetation Types

Two vegetation types were simulated -- wet meadow and sagebrush. We assumed wet meadow is 100% herbaceous with annual production values of ~200 gC/m^2; sagebrush is a 50/50 herbacesou/sagebrush mix with annual production values ~120 gC/m^2. These production values were also used in the Forage Accounting Model, and were derived from field measurements (Zeigenfuss et al. 2001).

These vegetation types were chosen for two reasons. First, they are the same vegetation types being sampled by F. Singer for N processes and N pools for the future nitrogen/CENTURY modeling work in the Jackson Valley. Field measurements will be taken in these types in 2001 and 2002. Second, they also correspond with the major vegetation types that receive significant offtake in the Forage Accounting Model, and comprise much of the NER and the winter range in the Gros Ventre. Figure 2 below, predicted by the Forage Accounting Model, depicts the areas in an average winter with average precipitation and 500 bison where utilizations were 50% or greater.

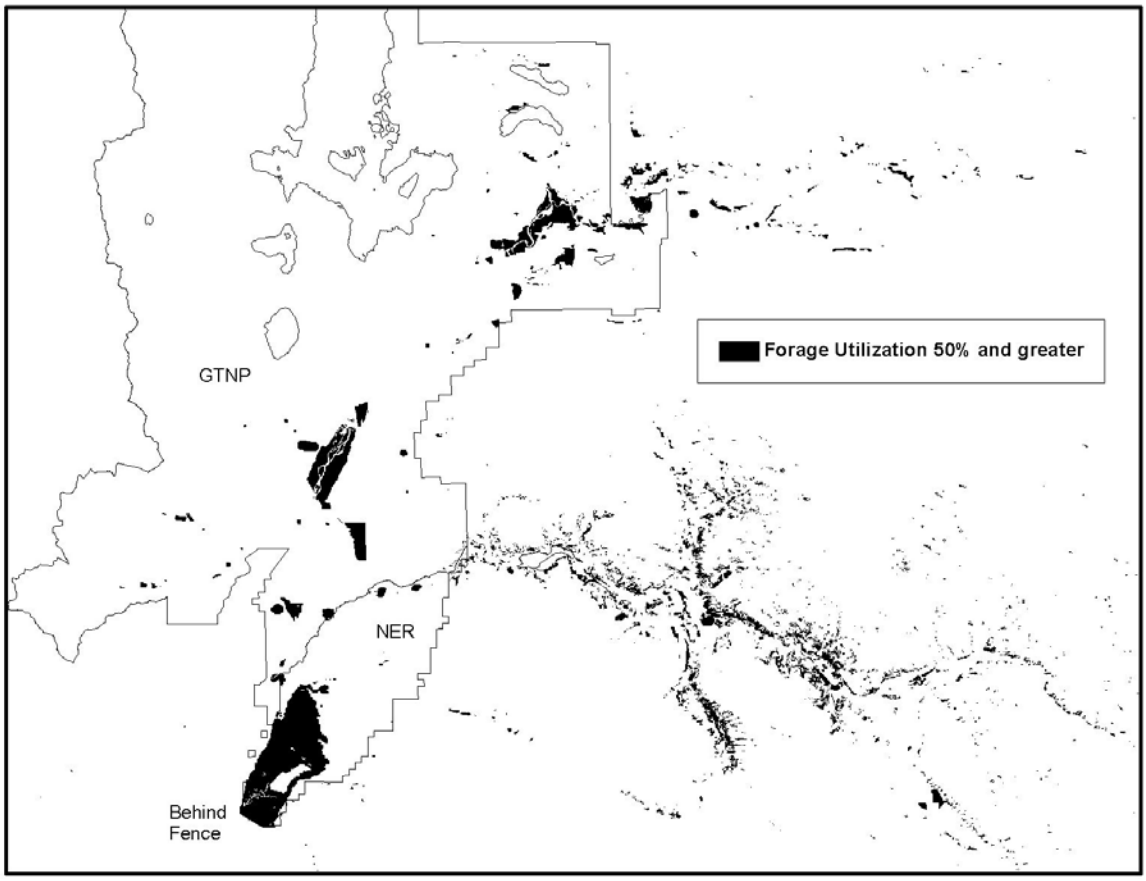


Figure 2. Areas in an average winter with average precipitation and 500 bision where utilization was 50% or greater.

Weather

Weather is a primary driver of the CENTURY model. Monthly weather data were obtained from the permanent weather station at Moose, Wyoming. Although stations at Jackson and Moran were also available, the station at Moose provided temperature and precipitation measurements midway between the poles of Jackson and Moran, and thus provided a reasonable compromise that could be used for the entire low-lying winter range in the Valley.

Other Input Parameters

Other primary input parameters include soil type and texture, C/N ratios, life span and other parameters for the vegetation types, and annual N inputs from wet and dry deposition. Soil and vegetation parameters were based on values used in CENTURY simulations of a similar system in Rocky Mountain National Park (Schoenecker et al. 2002). Annual N inputs were tuned so that simulated NPP values agreed with observed NPP for the sagebrush and meadow communities. Required N inputs were higher for the meadow than the sagebrush/grass system. This is reasonable because low-lying meadows are depositional zones and they receive nutrient inputs from surface runoff and other sources.

Modeling Assumptions

Three modeling assumptions guided this process. The wildlife fence near Jackson was built in the 1950s to keep elk from feeding on farmland during the winter. The fence partially obstructs natural migration paths down the Valley especially in severe winters when elk usually migrated to lower elevations down the Snake River through and beyond the town of Jackson. Thus, for the simplified purposes of modeling, we first assumed that no grazing occurred on the winter range prior to the construction of the fence. Using Annual Net Primary Production values measured from field data, we let the model reach equilibrium over a 2,900-year time-span during this no-grazing period. This assumption is reasonable because the production values were derived from elk-free enclosures on the winter range and therefore mimic grazed-free pre-fence production on native vegetation types.

The second assumption is that after the wildlife fence is built, elk are artificially concentrated on the winter range and therefore graze at unnatural levels on the grass and shrubland. This is the same assumption that guides grazing in the Forage Accounting Model. We modeled two grazing intensities, 50% and 80%, of standing dead grass and shrub. All grazing occurs during the months of January through April, and, because the forage is dead and the ground frozen, this causes no negative effect on the next year's production.

Third, standing dead grass is poor quality forage for elk and has significantly less nitrogen content than summer grasses. One of the driving input parameters for CENTURY in a grazed system is the ratio of nitrogen excreted by the animal to nitrogen consumed. When elk consume standing dead forage, this ratio typically exceeds 1.0. This occurs because the endogenous nitrogen lost from the animal in urine and feces exceeds the nitrogen consumed in forage. Hobbs (1996) and Mould and Robbins (1981) have calculated nitrogen levels in elk excrement in relation to forage quality. These calculations yielded 1.09 gN/day of output-to-intake for poor-quality, standing-dead forage when elk have a stable bodyweight. Additionally, when elk are eating poor quality forage in the depth of winter, they often lose weight. Thus, we also modeled a scenario where elk lost 15% of their body weight over the four-month grazing period. Losing weight causes yet more nitrogen from the animal's lean body mass to pass through the urine therefore increasing the nitrogen output/intake ratio (Hobbs 1989, D.M. Swift pers. comm.). When elk lose weight, we used a ratio of 1.25 gN/day of output-to-intake.

Results

In the wet meadow graphs (Figure 3), the first 50 years of the model depict the pre-grazing equilibrium scenario. Beginning in year 51, when the fence was built, we simulated two levels of grazing intensity, 50% and 80%. Both grazing levels accelerate nutrient cycling and cause increases in soil carbon and net annual production. The magnitude of this accelerating effect is proportionate to grazing intensity, with greater effects occurring at 80% grazing intensity. When elk are losing weight, higher N inputs accelerate the system to an even greater extent and increased plant production leads to higher soil carbon levels.

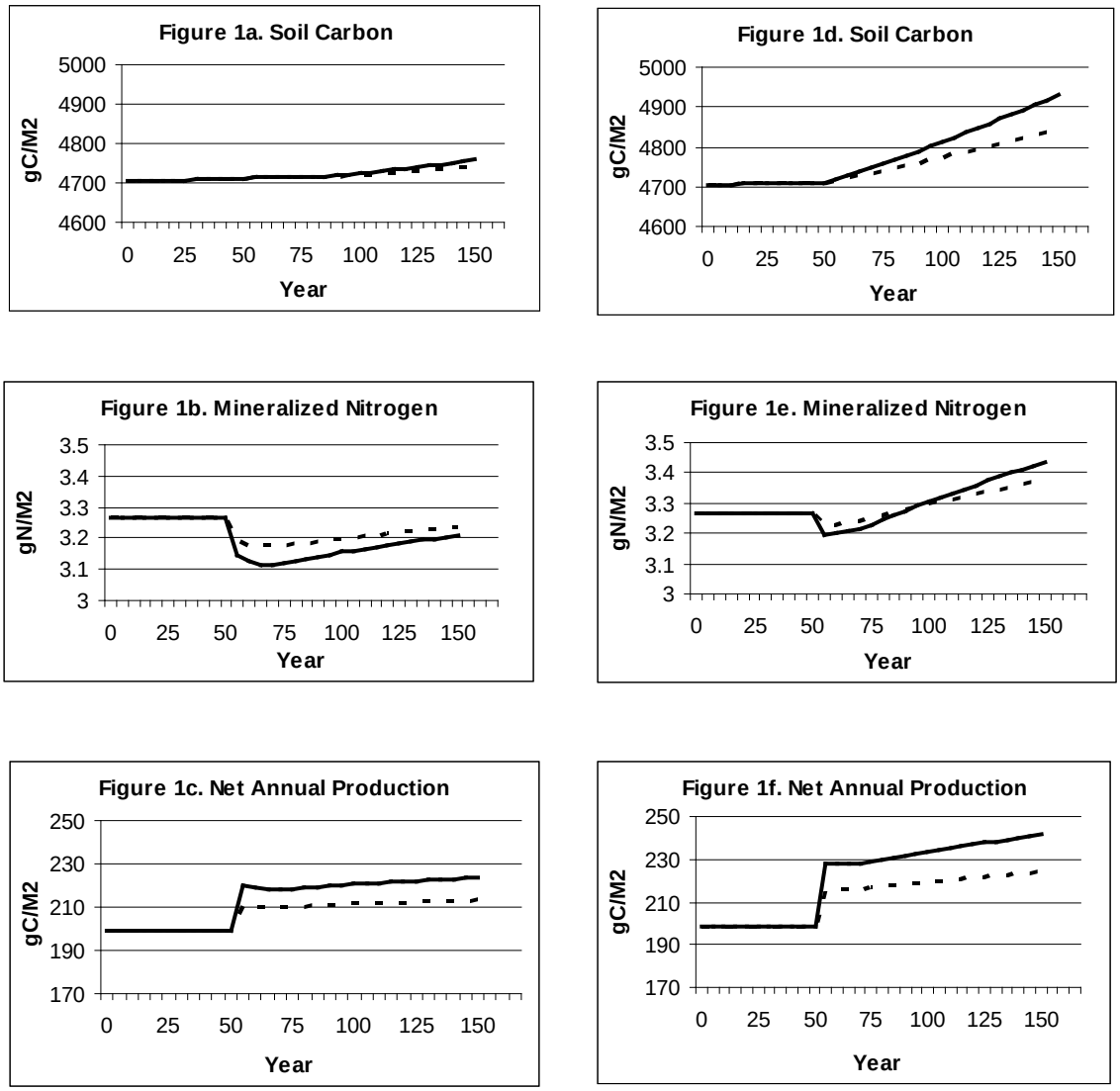


Figure 3. Model Results for Wet Meadow at two grazing levels. The solid black line depicts 80% removal of forage and the dotted line depicts 50% removal. The three graphs on the left depict the "Elk not losing weight" scenario; the three graphs on the right "Elk losing weight" scenario.

Similarly, in the sagebrush graphs (Figure 4), the first 50 years of the model depict the pre-grazing equilibrium scenario. Beginning in year 51, when the fence was built, we simulated two levels of grazing intensity, 50% and 80%. When elk are not losing weight (Figure 4 – left), soil carbon and mineralized nitrogen remain stable or slowly decline. Net annual production initially jumps to a higher level and then stabilizes over the 100-year model run. The higher level of grazing causes slightly increased production; the lower level causes stabilized production. When elk are losing weight (Figure 4 – right), all values increase. Net annual production increases faster with the higher grazing level and when elk are losing weight. Both of these can be explained by N inputs. Because the dead forage is of such poor quality the animals excrete more N than they extract from the system and this shifts carbon-nitrogen ratios in soil toward levels favoring N-mineralization. As grazing intensity increases, net N inputs to the system also increase, and when elk are losing weight the ratio of N outputs to inputs is even higher. Higher N inputs lead to enhanced mineralization, which release more N from soil organic matter. This feedback causes increased plant growth and stable or increasing soil C levels.

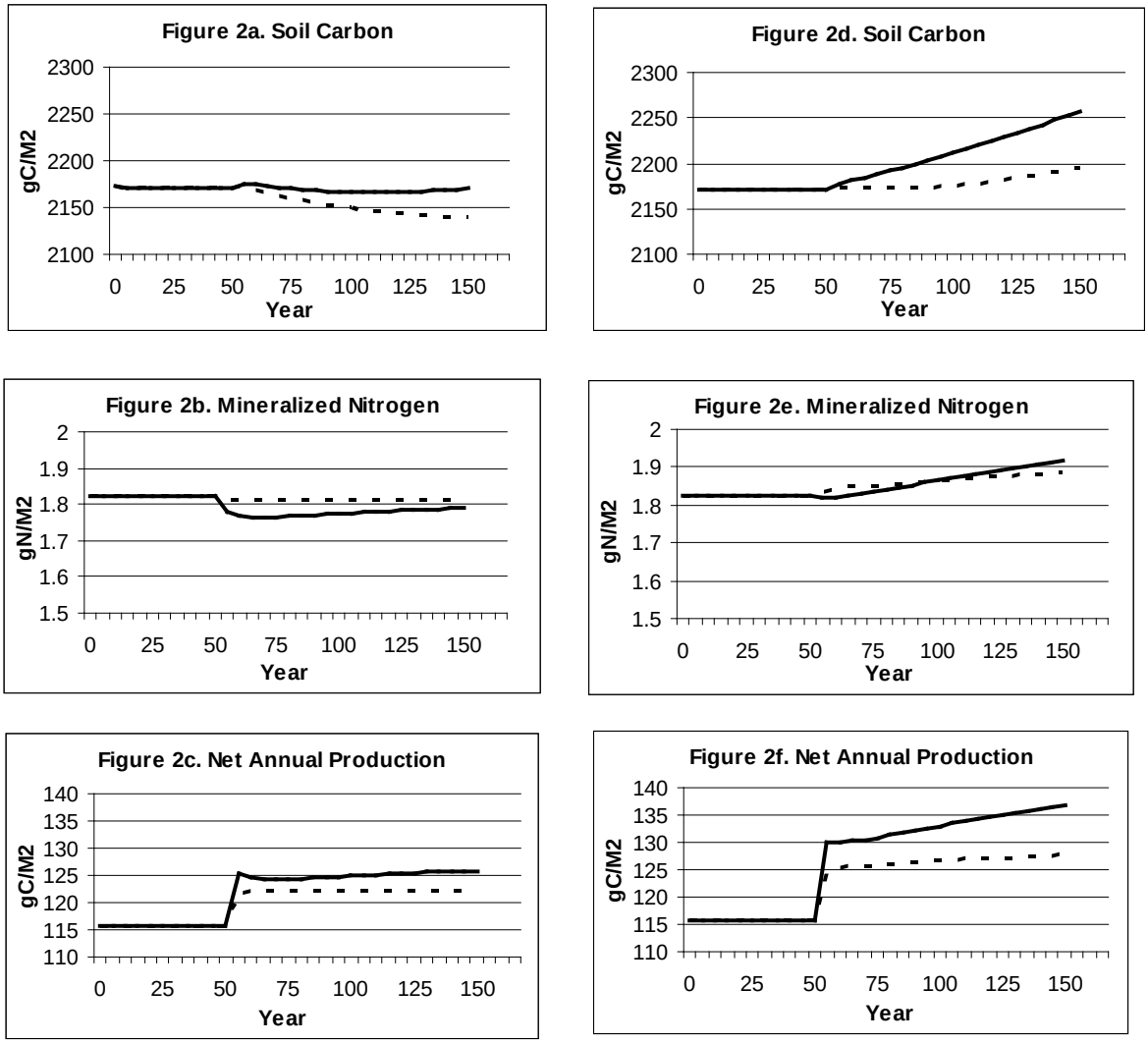


Figure 4. Model Results for Sagebrush at two grazing levels. The solid black line depicts 80% removal of forage and the dotted line depicts 50% removal. Figure 2a – 2c depict the "Elk not losing weight" scenario. Figure 1d – 1f depict the "Elk losing weight" scenario.

Overall, all twelve charts depict a similar scenario. Because elk are consuming standing dead forage in the depth of winter, there is no negative effect on plant production. Further, because elk cause accelerated nutrient cycling, and because elk are returning more nitrogen to the soil than they consume, higher grazing levels will cause higher future production levels. As long as elk are concentrated at high densities on the winter range, the CENTURY model will predict positive feedbacks on production due to higher net N inputs related to grazing. The feedback is exacerbated due to low N volatilization because of weather conditions. We presume that cold weather and snow cover keep N from volatizing into the atmosphere during winter.

These CENTURY results suggest that heavy winter-season grazing in this system, as predicted by the Forage Accounting Model, is sustainable and that soil C and nutrient levels are not significantly depleted and may increase. Nitrogen 'hotspots' and higher production will occur corresponding to animal density. If elk stay on the winter range longer with low-grade forage resulting in weight loss, increased nitrogen hotspots and increased future production will result. Figure 1 could also been seen as a 'nitrogen deposition map' wherein animals deposit nitrogen gathered throughout the entire summer range onto this limited winter area. Further fieldwork by F. Singer, will help corroborate these findings.

Part III.
The Over-Winter Mortality Model

Introduction

Forage deficits, predicted by the Forage Accounting Model (described in Part I), will likely cause elevated mortality in over-wintering elk populations. We adapted the energy balance model of Hobbs (1989) to estimate starvation mortality by simulating energy intake and expenditure by elk in four age/sex classes (calves, yearling males, adult females, bulls) during winter. The predictions of mortality provided by this model are perhaps more easily interpreted than the predictions of forage deficits and overuse provided by the Forage Accounting Model. However, while these interpretations may be easier to understand, they are also subject to a far greater potential for error. This is simply because the Over-Winter Mortality Model has approximately 10 times as many parameters as the Forage Accounting Model, and all of these parameters are estimated with some uncertainty. Therefore, we suggest that quantitative results of the energy balance model should be viewed with caution. However, we are confident that the qualitative trends we have observed are reasonable.

Methods

Elk populations were allocated to map cells based on snow water equivalents (SWE) under the assumption that elk use the areas of the landscape with shallow SWE in preference to areas with deep SWE, and that they will not use areas with > 6" SWE. So, during each week of the winter, we distributed the total population to map cells with SWE < 6" in order of increasing SWE. The number of animals assigned to a cell was determined by the available biomass of forage within that cell, an output variable in the Forage Accounting Model. We calculated the weekly requirements of individuals and assigned no more animals than could be supported for 1 week by the available biomass. We assumed that a group of elk or sub-herd in the cells of a SWE category (0, 1, 2, … , inch) had the same age/sex composition as the entire herd (proportion of calves: 0.15; yearling males: 0.05; bulls: 0.15; cows: 0.65). If a SWE-depth category of cells could support < 5 elk, then only bulls were assigned to these cells. We calculated daily intake based on the average body mass of sex and age classes and their proportions in the population assuming the body mass of a calf (age = 6 months) was 200 pounds, yearling 350 pounds, bull 675 pounds, and cow 500 pounds.

Foods were categorized into two categories, herbaceous and shrubs. We assumed that when SWE > 30 cm, shrubs comprised 100% of elk diet. If the SWE depth was in the range of 20-30 cm, the proportion of herbs in the diet increased in direct proportion to decreasing SWE. When SWE < 20 cm, the diet consisted of 100% herbs. Available foods of the cells of each SWE-depth category were updated daily by removing the amount of biomass consumed by elk.

The percentage of each age class that dies was based on assumed average fatness and the standard deviation in fat reserves at the beginning of the winter. We assumed that 67% of pre-winter energy reserves came from fat and 33% from lean body and that the size of these reserves was a normally distributed random variable. Based on that assumption, we used the standard normal probability density function to calculate the proportion of the population that had energy reserves less than the magnitude of the energy deficits incurred during winter. We assumed that this was the proportion of each age class that starves (Hobbs 1989).

We ran simulations with initial conditions for populations set at 6,000, 12,771 and 18,000 animals for an average winter (1996), above average winter (1982), and severe winter (1997).

Results

Simulated mortality of calves ranged from a low of 4% during an average winter at a total population size of 6,000 to a high of 42% during a severe winter and a population of 18,000 (Figure 1 - 3). Increasing population density was associated with roughly proportionate increases in estimated mortality. Starvation mortality for adult cows was predicted to be 1% for a population of 6,000 animals in an average winter rising to a high of 25% for a population of 18,000 during a severe winter.

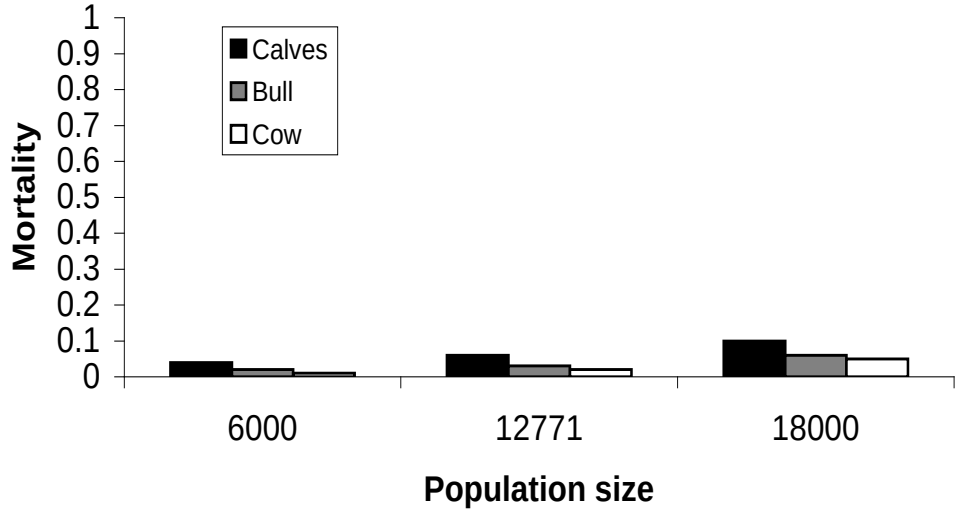


Figure 1. Simulations of elk winter mortalities for the Jackson Elk Herd under different densities in average winter (1996).

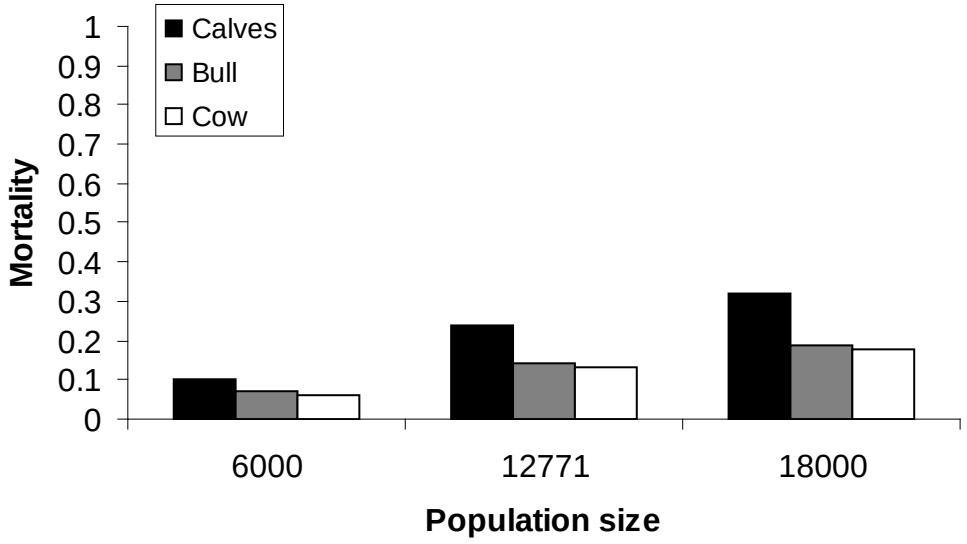


Figure 2. Simulations of elk winter mortalities for the Jackson Elk Herd under different densities in above average winter (1982).

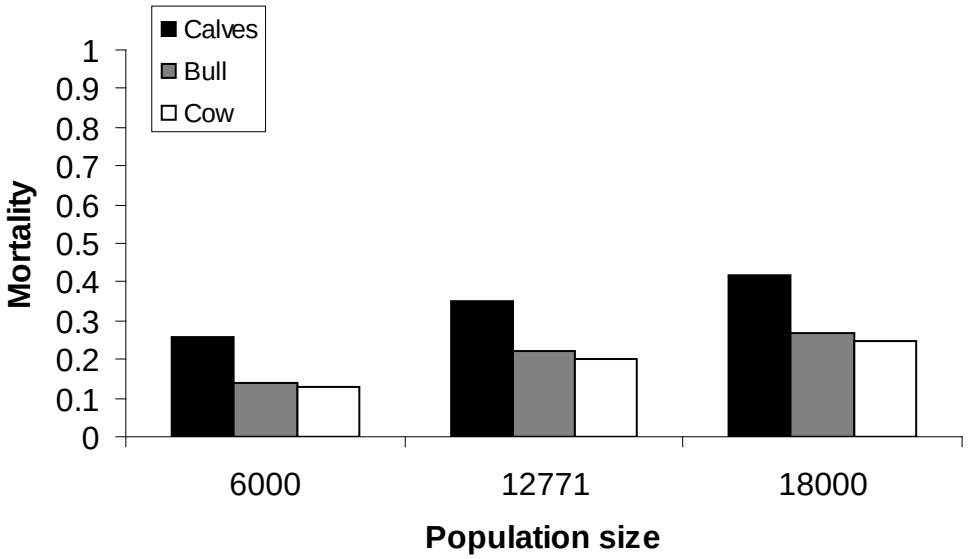


Figure 3. Simulations of elk winter mortalities for the Jackson Elk Herd under different densities in severe winter (1997).

Conclusions

The main implications of these three overlapping models are:

1. Forage utilization rates of 50% and greater will occur on the winter range at all elk population levels and during all winter severities. The area of winter range used in excess of 50% will increase with the elk population and winter severity. However, although high utilization rates will occur on the winter range, they may not negatively effect, and may even enhance, future soil fertility and plant production.

2. In average SWE winters with average pre-winter precipitation and 500 bison, roughly 16,000 elk can find forage on the Greater Teton Ecosystem without incurring forage deficits and roughly 5,000 elk can find forage on the NER without incurring deficits.

3. Winter snow severity has a deleterious effect on forage availability and causes critical imbalances in forage supply/demand at most elk population levels.

4. Drought reduces forage production to 45% of the mean and increases deficits in all winter conditions and with all elk populations levels. When drought during the growing season precedes deep-snow winters, forage deficits are extreme.

5. Increasing the number of bison has a mild effect on forage deficits on the Greater Teton Ecosystem during average winters with average precipitation conditions, but has a more significant effect when climatic conditions worsen. On the NER, increasing bison numbers will greatly exacerbate deficits and the ability of elk to find adequate forage.

6. Cattle grazing has a negligible effect on forage deficits because it does not occur on areas where forage is available to native ungulates during winter.

7. Supplemental feeding overcompensates for the forage unavailable south of the wildlife fence. Historic elk populations either: (1) were smaller than current ones, and/or (2) may have suffered high levels of mortality during severe winters, and/or (3) more likely have used lower elevation ranges south of Jackson and larger areas of the Gros Ventre.

8. Starvation of adult animals is expected to occur at relatively low levels (about 5%) at all levels of population and winter severity, but may increase to as high as 30% during severe winters and with high population levels (18,000).

9. Only EIS Alternative #3 has the significant effect of restricting forage availability for elk and increasing forage deficits. Alternatives #2 and #4 have only mild effects. The EIS Alternatives attempt to manipulate three variables: bison numbers, willow availability on the NER, and irrigation of the NER's cultivated fields. The net effect on forage deficits of these three variables will be the following:

   a. increasing bison numbers will increase deficits
   b. fencing off willow on the NER will increase deficits
   c. irrigating the cultivated fields on the NER will decrease deficits -- center-pivot more so, flood irrigation less so.

References

Baker, D. L., and D. R. Hansen. 1985. Comparative digestion of grass in mule deer and elk. Journal of Wildlife Management 49:77-79.

Baker, D. L., and N. T. Hobbs. 1987. Strategies of digestion: digestive efficiency and retention time of forage diets in montane ungulates. Canadian Journal of Zoology 654:1978-1984.

Biondini, M., B.D. Patton, and P.E. Nyren. 1998. Grazing intensity and ecosystem processes in a northern mixed-grass prairie, USA. Ecological Applications 8:469-479.

Cordova, F. H., J. O. Wallace, and R. D. Pieper. 1978. Forage intake by grazing livestock: a review. Journal of Range Management 31:430-438.

Coughenour, M. B. 1992. Spatial modeling and landscape characterization of an African pastoral ecosystem: a prototype model and its potential use for monitoring drought. Pp. 787-810 in: D.H. McKenzie, D.E. Hyatt and V.J. McDonald (eds.). Ecological Indicators, Vol. I. Elsevier Applied Science, London and New York.

Coughenour, M. B. 1993. The SAVANNA landscape model – Documentation and Users Guide. Natural Resource Ecology Laboratory, Colorado State University, Fort Collins, CO.

Coughenour, M.B. 1994. Elk carrying capacity on Yellowstone's northern elk winter range - Preliminary modeling to integrate climate, landscape, and elk nutritional requirements. Pp. 97-112 in: Plants and Their Environments: Proceedings of the First Biennial Scientific Conference on the Greater Yellowstone Ecosystem, Mammoth Hot Springs, Sept. 1991. D. Despain (ed.). Technical Report NPS/NRYELL.NRTR-93/XX. USDI/NPS. Denver, CO.

Coughenour, M.B., and F.J. Singer. 1996. Yellowstone elk population responses to fire - a comparison of landscape carrying capacity and spatial-dynamic ecosystem modeling approaches. Pp. 169-180 in J. Greenlee (ed.), The Ecological Implications of Fire in Greater Yellowstone. International Association of Wildland Fire, Fairfield, WA.

Despain, D. G. 1990. Yellowstone Vegetation: Consequences of Environment and History in a Natural Setting. Roberts Rinehart Publishers, Boulder, CO.

Farnes, P.E., and W. H. Romme. 1993. Estimating localized SWE on the Yellowstone Northern Range. Presented at the Joint Eastern-Wester Snow Conference, Quebec City, Quebec.

Farnes, P., C. Heydon and K. Hansen. 1999. Snowpack in Grand Teton National Park and Snake River Drainage above Jackson, Wyoming. Department of Earth Sciences, Montana State University.

Hobbs, N. T. 1989. Linking energy balance to survival in mule deer: development and test of a simulation model. Wildlife Monographs 101.

Hobbs, N.T. 1996. Modification of Ecosystems by Ungulates. Journal of Wildlife Management. 60(4):695-713.

Hobbs, N. T., D. L. Baker, G. D. Bear, and D. C. Bowden. 1996. Ungulate grazing in sagebrush grassland: Mechanisms of resource competition. Ecological Applications 6:200-217.

Homer, C. G. 1995. Intermountain Region: Land Cover Characterization. Metadata on CD from Utah State University.

Houston, D. B. 1982. The Northern Yellowstone elk: ecology and management. Macmillan Publishing Company, New York, New York.

Mattson, D., and D. Despain. 1985. Grizzly bear habitat component mapping handbook for the Yellowstone ecosystem. YNP document.

Meagher, M. 1973. The Bison of Yellowstone National Park. National Park Service, Scientific Monograph Series, Number One.

Metherell, A.K., L.S. Harding, C.V. Cole, and W.J. Parton. 1993. CENTURY soil organic matter model environment, Technical documentation, Agroecosystem version 4.0. Great Plains System Research Unit Technical Report No. 4. USDA-ARS, Fort Collins, Colorado.

Mould, E. D., and C. T. Robbins. 1981. Nitrogen metabolism in elk. Journal of Wildlife Management 45(2):323-334.

Parton, W. J., and P. E. Rasmussen. 1994. Long-term effects of crop management in wheat/fallow: II. CENTURY model simulations. Soil Science Society of America Journal 58:530-536.

Parton, W.J., J.M.O. Scurlock, D.S. Ojima, T.G. Gilmanov, R.J. Scholes, D.S. Schimel, T. Kirchner, J.C. Menaut, T. Seastedt, E. Garcia Moya, A. Kamnalrut, and J.L. Kinyamario. 1993. Observations and modeling of biomass and soil organic matter dynamics for the grassland biome worldwide. Global Biogeochemical Cycles 7:785-809.

Parton, W.J., D.S. Ojima, C.V. Cole, and D.S. Schimel. 1994. A general model for soil organic matter dynamics: sensitivity to litter chemistry, texture and management. Pp. 147-167 in: Quantitative Modeling of Soil Forming Processes. Soil Science Society of America, Special Pub. 39, Madison, WI.

Schoenecker, K., F. Singer, R. Menezes, L. Zeigenfuss, D. Binkley 2001. Sustainability of vegetation communities grazed by elk in Rocky Mountain National Park. USGS-BRD. In F.J. Singer, ed. Ecological evaluation of the abundance and effects of elk in Rocky Mountain National Park, Colorado, 1994-1999. Unpublished report.

Schoenecker, K. A., F. J. Singer, R. S. C. Menezes, L. C. Zeigenfuss, and D. Binkley. 2002. Sustainability of vegetation communities grazed by elk in Rocky Mountain National Park. Pp. 187-204 in F. J. Singer and L. C. Zeigenfuss, compilers, Ecological Evaluation of the Abundance and Effects of Elk Herbivory in Rocky Mountain National Park, Colorado, 1994-1999. Final report to the National Park Service, Rocky Mountain National Park on Cooperative Agreement No. 1445-0009-94-1074 (USGS) Subagreement 2 between the National Park Service, Biological Resources Discipline of U.S. Geological Survey, and Natural Resources Ecology Lab, Colorado State University. Open File Report 02-208. 268 pp.

Singer, F.J., L.C. Zeigenfuss, B. Lubow, and M. Rock. 2001. Ecological evaluation of the appropriate number of ungulates in U.S. national parks: A case study of elk in Rocky Mountain

National Park. In F.J. Singer, ed. Ecological evaluation of the abundance and effects of elk in Rocky Mountain National Park, Colorado, 1994-1999. Unpublished report.

Singer, F. J., L.C. Zeigenfuss, B. Lubow, and M.J. Rock. 2002. Ecological evaluation of potential overabundance of ungulates in U.S. national parks: a case study. Pp. 205-248 in F. J. Singer and L. C. Zeigenfuss, compilers, Ecological Evaluation of the Abundance and Effects of Elk Herbivory in Rocky Mountain National Park, Colorado, 1994-1999. Final report to the National Park Service, Rocky Mountain National Park on Cooperative Agreement No. 1445-0009-94-1074 (USGS) Subagreement 2 between the National Park Service, Biological Resources Discipline of U.S. Geological Survey, and Natural Resources Ecology Lab, Colorado State University. Open File Report 02-208. 268 pp.

Steele, R. 1983. Forest habitat types of eastern Idaho-western Wyoming. USFS Report INT-144.

Steele, V., F. Singer, and M. Coughenour. 1999. Percent Utilization of Vegetation in Grand Teton National Park, the National Elk Refuge and the Gros Ventre Area of Bridger Teton National Forest: Mid-Season Progress Report.

Turner, M. G., L. Wallace, W. H. Romme, and A. Brenkert. 1994. Simulating winter interactions among ungulates, vegetation, and fire in northern Yellowstone Park. Ecological Applications 4(3):472-496.

U.S. Fish and Wildlife Service, National Elk Refuge. 1998. Irrigation System Rehabilitation Plan Environmental Assessment. Jackson, WY.

Zeigenfuss, L., F. Singer, M. Rock, and M. Tobler. 2001. A synthesis of data, model-based analyses, and refinements of possible management scenarios for bison and elk in the Jackson Valley. USGS-BRD, Annual Report.

Appendix A: Vegetation Production Methods

Data on annual production for each vegetation type were obtained from studies conducted by Biological Resources Division (BRD)--USGS, National Elk Refuge (NER)--USFWS, and Bridger-Teton National Forest (BTNF)--USFS. Each data set was collected in a different manner and so it was necessary to standardize the data so that they could be combined to create the largest data set possible for estimating average production values.

The BTNF data were collected from 1994-1999. Sample points were randomly generated in areas of highest priority for forest management activities. As a result, less information was available on vegetation types that do not encompass areas of high management priority. Data on plant production was visually estimated in weight classes. For the purpose of estimating average production, the midpoint of the class was assigned to the sample point (Appendix C: Table 2).

Data on dominant and codominant tree, shrub, and herbaceous species were assessed to determine the appropriate USU vegetation categories for each sample. Because no data were available on forest canopy closure at the sample points, all points in forested types of a species (or species grouping) were combined. Total production was calculated by summing the midpoints for shrub, grass, and forb production.

Data from the NER were collected from 1987-1999, however, data for the entire refuge exists in electronic format for 1999 only. The remainder of the 1987-1999 data is from the south end of the refuge, and as a result, some vegetation types which only occur in the north end of the refuge are only represented in 1999. Production was estimated using the SCS double sampling method, whereby ocular estimates are made for all points on a transect in a particular vegetation type, and a subsample of these points are clipped and weighed and used to calibrate the points which had only ocular estimation.

Plant productivity estimates for the BRD study were collected from 1996-1998 and were obtained by clipping, drying, and weighing vegetation in several 0.25 m^2 quadrats at several sites for each vegetation type.

Mean production values were calculated for each vegetation category in each of the data sets. Vegetation was grouped in broad categories based on dominant tree, shrub, or herb species and tested for differences between all the individual categories within these broad groups using Fisher's least significant difference test for multiple comparison of means. Based on the results of these tests, 15 new vegetation categories were developed. The final mean production values for the new vegetation categories were calculated using all data from the three data sets. No data existed in the available data sets for three of the new categories: alpine herbaceous, alpine shrub, and disturbed/developed. Production values for the alpine categories were approximated based on work done by Marilyn Walker at the Niwot Ridge Long Term Experimental Range near Nederland, Colorado. These data were found on the Niwot LTER web site. Values for disturbed/developed areas, where irrigated and fertilized lawns are maintained, were expected to be similar to values for sub-irrigated bluegrass found in the NER and BRD data. The values estimated using these data were similar to those measured in disturbed sites in the town of Estes Park, Colorado in another study (Singer et al. 2002) and such values were therefore considered adequate.

Estimating production in wet and dry years was approached two ways. First, using annual precipitation and 30-year average precipitation values available on the web from the University of

Nebraska's High Plains Climate Center, several years with greater than average (1996 and 1997) and lower than average (2001, 1994, 1992, 1988) precipitation at the Jackson, Moose, and Moran weather stations were chosen. Average production values were calculated for the wet years and dry years for each vegetation category and each data set separately. Because reliable data for wet, dry, and average years were not available for all vegetation types, the percentage of mean annual production for those types that were best represented were calculated for each data set for both wet and dry years, and then these best data were averaged to get a mean percentage of production to be applied across all vegetation types.

Dry year production ranged from .45 -.91 of annual production across the data sets with a mean of 0.85. Wet year production ranged from 1.29-1.8 of annual production across all data sets with a mean of 1.5. We chose to use 1.5 as the wet year production and 0.45 as the dry year. 0.45 was chosen because managers wanted a severe draught scenario based on recent 2001 precipitation.

Managers raised a question about the spatial heterogeneity of production due to varying rainfall over the study area. For example, sagebrush on the NER may produce differently than sagebrush in the Gros Ventre. We attempted to create a spatially explicit production map based on actual production measurements across the study area. However, these estimations did not yield significant spatial differences in production for each vegetation type. While we recognize that rainfall may vary across this area, and that production may vary with it, field data could not support these distinctions.

Appendix B: Snow Model Methods

The model is based on an algorithm to spatially interpolate point data, while correcting for effects of elevation. This algorithm was first developed by Michael Coughenour as part of a spatially explicit ecosystem model called SAVANNA (Coughenour 1992, 1993). The same algorithm was used in a Landscape Carrying Capacity Model for elk on Yellowstone's northern elk winter range (Coughenour 1994, Coughenour and Singer 1996). The first application of the model to Yellowstone was at a research conference held in Yellowstone in 1991 (Coughenour 1994). In this application, GRASS GIS maps for elevation and vegetation were read into a model to calculate snow depth maps, available forage for elk, and elk carrying capacity on a biweekly basis throughout the winter. The model produced output files that were read into the GRASS GIS, to produce maps of snow depth and elk carrying capacity. These output maps were presented at the 1991 conference.

At about the same time, Phil Farnes was conducting studies of snow distributions on the Yellowstone northern elk winter range (Farnes and Romme 1993). He quantified the ways that slope, aspect, and tree cover affect snow pack, as compared to measurements made on a standard, level, treeless sample site. He also developed ways to integrate data from numerous snow water sample sites into a unified data base, and ways to use snow water equivalent to calculate an index of winter severity that combines stress effects of cold temperature and heavy snow on elk (Farnes et al. 1999).

The idea of combining the Coughenour model with the Farnes data into a stand-alone data model was the outcome of initial research on bison and elk carrying capacity by the two researchers in Grand Teton National Park (GTNP). The idea for that project was conceived by Robert Schiller and Francis Singer. Coughenour conducted preliminary SAVANNA modeling studies and Farnes collected snow data in GTNP. To create the stand-alone model, Coughenour combined his earlier elevation-based model with the slope/aspect/tree cover relationships of Farnes, in order to convert the snow data assembled by Farnes into maps of snow water equivalents in GTNP. The snow data model was delivered to GTNP by Coughenour and Farnes in 1999, at the same time Farnes delivered his unique data set (Farnes et al. 1999). Subsequently, a new phase of GTNP carrying capacity research was initiated by N. T. Hobbs, F. Singer, G. Wockner, and L. Ziegenfuss.

In 2000, Gary Wockner, Tom Hobbs, and Francis Singer (CSU) obtained the model from Coughenour for this new phase of the GTNP project (Hobbs et al. 2001). Working with Farnes and Coughenour, Wockner obtained data to run it, worked through several software bugs, tested it, and then used it in the forage accounting model for the Jackson elk herd.

The snow model is driven by three primary sources of data, a digital elevation model, data on vegetation distribution, and point data on snow distribution. Using the DEM and the snow data, an initial grid is created using interpolation and regression. Then, this grid is readjusted for the effect of slope, aspect, and vegetation cover. Using slope and aspect, the more the cell tilts toward the sun, the more it is melted off; conversely, the more it is tilted away from the sun, the more snow accumulates. Using the vegetation data, the grid is adjusted for less snow accumulation under conifers. The bigger the trees and the denser the stand, the less snow accumulation.

Digital Elevation Model

A digital elevation model (DEM) was obtained from NREL researchers working on a similar project in the Greater Yellowstone Area. The DEM is at 30-meter accuracy and covers the entire

study area. In Arcview, the DEM was clipped to the study area and exported as an ASCII file for use in the snow model. The DEM was then converted into a slope grid using Arcview's "Spatial.Slope" function, and converted into an aspect grid using Arcview's "Spatial.Aspect" function. Arcview's Spatial.Aspect command assigns the value "-1" to flat areas. Because the snow model will not read "-1"s, these areas were reassigned the value "300" which results in no multiplier being used in the snow model. These two grids were then converted into integer grids to decrease file size and then exported in ASCII format for use in the snow model

Vegetation Data
The snow model uses the merged vegetation grids from Utah State University, Grand Teton National Park, and the National Elk Refuge. Each of the three grids had relevant codes to use in the snow model. The Utah State coverage had a code titled "canopy percent"; the GTNP coverage had a code for "forest successional stage"; and the NER coverage only had one applicable forested area. These codes were converted into codes readable by the snow model using a crosswalk table (Appendix C: Table 5). Because dense conifer stands will result in less snow on the ground under those stands, the following tree types cause the snow model to create an adjustment: Lodgepole Pine, Subalpine Pine, Douglas Fir, Englemann Spruce. This adjustment is a multiplier which decreases SWE based on the size of the trees and the density of the stand.

Snow Data
The model interpolates the snow station data provided by Farnes. Several types of data are available in the Jackson Valley including snow courses, SNOTEL sites, and climatological stations. In addition, Farnes collected additional monthly data at over 75 stations beginning in water-year 1996. After the large study area was chosen, snow stations within that area were identified. The snow model incorporates data from 6 long-term stations which have daily data beginning at least from 1980 and uses monthly data (Feb, Mar, Apr) from 56 additional stations primarily in Jackson Valley. Snow sampling locations are shown in Figure 1 (Part I.). The snow model also requires a file containing UTM location and elevation of each station. This data was taken from the DEM by overlaying the snow station locations on the DEM and assigning the elevation attribute of the DEM to each station.

The 6 long-term stations ranged from the highest, Togwotee Pass--9580 feet, to the lowest, Jackson--6230 feet. The other four stations were: Moose--6468 feet, Moran--6798 feet, Base Camp--7030 feet, and Phillips Bench--8200 feet. The 56 additional stations contained monthly data collected February, March, and April 1st in 1996, 1997, and 1998. The names, locations, and elevations of all stations are listed in Appendix C: Table 6.

Data at the 6 daily sites existed from water-year (W-Y) 1980 to present. Because W-Y 1981 had one of the lowest SWEs on record and W-Y 1997 had one of the highest (Farnes et al. 1999), a 20-year (1980-1999) stretch of time provided ample variability for useful modeling. At the time of this report, 1999 was the last year of data that was processed by Farnes/Heydon and available for analysis.

The current modeling effort steps through the winter from the onset of snow to its end--roughly November 1st to July 1st. Thus, year-round daily data estimates for all 19 years needed to be created for the 56 monthly stations where data was only collected on February, March, and April 1st of 1996-1999. We developed a regression technique to estimate the missing data at the additional sites. Because snow varies due to elevation and location throughout the study area, each of the original daily stations could be used as independent variables in a regression function to predict the missing data at the monthly sites. This process was carried out with these steps:

1. In S-plus a matrix of data was assembled which contained SWE on Feb, Mar, and Apr 1st in 1996, 1997, and 1998 at all 62 locations. These 9x62 data points contain measured SWE at all locations.
2. A correlation matrix was constructed to determine which of the independent daily stations would serve as best predictors for the dependent monthly stations.
3. Using this matrix, and a more subjective analysis of snow patterns and elevations, a table was constructed which divided the 6 daily stations into three groups. Group 1 contained Jackson, Group 2 contained Moose and Moran, Group 3 contained Base Camp, Phillips Bench, and Togwotee Pass. Each monthly station was assigned to one of these three groups. There were roughly three snow patterns in all the data. The first were sites that increased on March 1st and then melted to "0" or near on April 1st. The second were sites that increased on March 1st and decreased on April 1st but not to near "0". The third were sites that increased on March 1st and then increased again on April 1st. The assignment appears in Appendix C: Table 7.
4. A regression equation was developed in S-plus using stepwise linear regression with "0" as the Y-intercept for each of the 56 monthly stations from the independent predictors in each group. This particular method was developed after several attempts at using other regression methods and switches. Forcing the Y-intercept to "0" provided the best fit of the data at the tails of the curves. (The output -- r^2, equations, etc -- is available for review) Additionally, a few of the regressions did not yield a significance with any predictor site. At these supplemental stations, the predictor site with the highest correlation with the supplemental site was 'forced' to provide the regression.
5. These regression equations were pasted into an Excel spreadsheet which contained the daily data for the 6 stations. The daily data was predicted for the 56 monthly stations.
6. The predicted versus observed values were compared for Feb, Mar, and Apr 1st 1996-8, for the 56 dependent variables. Predictions were very good. (This output is also available for review)

After the process was completed Farnes pointed out that Gros Ventre Summit is a long-term daily site rather than a supplemental site. Its daily data was located on a disk from Coughenour and substituted for the predicted data. Because its snow pattern is similar to Togwotee Pass, Phillips Bench, and Base Camp, we saw no need to rerun the regressions which used those sites. Thus there are 7 long-term stations, and 55 supplemental sites used in the final snow model runs.

With the predicted daily data for all 62 stations over the 20-year time span, the snow model allows us to run a simulation of SWE for any day of the snow-year during those 20 years. The primary output of that model is an ASCII file with SWE for each of the cells in the original input grids. Additional output includes a fit-comparison of observed versus predicted SWE at each site, and a file containing r^2, slope, and intercept of the regression function used in the model.

The output ASCII file is imported into Arcview and converted to a grid for visual inspection. The grid is then smoothed twice with a 5x5 filter using Arcview's "FocalStats" function. This smoothing is recommended by Coughenour and causes most of the banding and striping remnant from the DEM to disappear. Adjusting the legends to create any SWE threshold provides the needed visual reference for the migratory switch used in the forage utilization model. A dynamic snow map was also created which visually steps through the winter on a weekly basis in 1997, 1998, and 1999.

Although SWE grids currently begin when depth hits 2 inches, they can be generated anytime snow is present. Grids were modeled four times a month for each snow-water-year on the 1st, 8th, 15th, and 23rd.

Grids were begun when SWE hit 2" at any station and continued until SWE fell below 2". The earliest occurrence was October 15th; the latest was July 15th. Grids have a 30 meter pixel size and have 1851 rows and 2425 columns for a total of 4,488,675 cells.

The Gros Ventre Correction

At the meetings in Jackson in August 2000, it was agreed that the snow model over estimated SWE in the Gros Ventre Valley because of the snow shadow downwind of the Tetons. Also in the original snow modeling, no input data for the snow model -- which comes from the daily and supplemental sites – exists in the Gros Ventre Valley, the closest being Gros Ventre summit. To test this theory, Farnes' team collected supplemental SWE data in the Gros Ventre during the winter of 2000. Two dates, February 1st and March 1st , provide enough data points to feed the snow model and check its results. The model was run using all the data for those two dates and the results were discussed with Farnes at a meeting in Fort Collins in October.

While these dates clearly provided a different snow picture than the previous modeling, it was also known that WY2000 was a very light snow year, and thus its effects were questionable. In specific, the predictions at Darwin Ranch were well below the actual measurements. Also, the correction provided a broad and sharp SWE reduction over vast areas in the Gros Ventre. During the meeting with Farnes in October, he described different data not yet analyzed from snow stations at Darwin Ranch and from the feedgrounds in the Gros Ventre. This data comes from four sites – Alkali Feedgrounds, Patrol Cabin Feedgrounds, Fish Creek Feedgrounds, and Darwin Ranch and was collected by the USFS.

This data was sent to Fort Collins in late November and fed into the snow model and was used in two ways. First, we checked the WY2000 snow correction map against these dates, and found that the WY2000 correction was indeed overcorrecting, especially at Darwin Ranch. Because this new data was spread across years 1996-1998, it provided measurements from deeper snow years. Second, we substituted this data into the snow model and made a new correction map. At a meeting in December with Hobbs, Singer, Zeigenfuss, and Wockner, we decided that this newest correction provided the best estimate. Not only did predicted/observed measurements match better at all sites, it also provided the needed correction in the Gros Ventre Valley while leaving the higher elevations with greater snow. The model and the correction were run on several dates, and all provided a reasonable fit.

Figure 1 and Figure 2 (in this appendix) are graphics of the before and after snow model runs on January 14, 1998. These figures clearly depict that the new Gros Ventre data provides a very different SWE picture for the Gros Ventre Valley. The results for several other dates are not shown here but give the same pattern. Additionally, these new data points change the SWE map only a small amount over the southeast quadrant of the study area, whereas previous corrections changed it greatly. Figure 3 is the actual correction map, the details of its creation are below.

Creating the Gros Ventre Correction Map

The correction map was created using these steps:

1. Run the snow model with and without the Gros Ventre data for 12/20/1996 and 01/14/1998. These two dates were picked because they had the highest SWE of the additional dates. Because the larger carrying capacity model is driven by depth-of-winter forage needs in above average snow winters, these highest SWE dates provide the best estimation of severe conditions.
2. Create a 'multiplier grid' on each date which reflects the value the "before" grid must by multiplied by to create the "after" corrected grid. For each date, divide the 'after'

SWE by the 'before' SWE. Thus, if the before SWE grid had a cell that was "7" and after was "4", then a new grid is created with the "multiplier" of "0.5714" in that cell.

3. Average the two "multiplier grids" from the two different dates to best take advantage of the temporal data, thus creating an "average multiplier grid".
4. Define a geographic area around the Gros Ventre Valley in which SWE are measurably different in the "before" and "after" grids and select out the "average multiplier grid" in this area. This area was defined by the Gros Ventre watershed from a GIS coverage.
5. Create a final "correction grid" in which all cells in the broader study area are "1" and the Gros Ventre selection area has the value of the "average multiplier grid".

Thus finally, in the Forage Accounting Model loop, the SWE grid will be multiplied by the "correction grid". The SWE values will be retained in all areas except the Gros Ventre Valley which will be adjusted downward accordingly. This will happen quickly, easily, and unnoticeably in the model. The "correction grid values" are the numbers by which the original SWE grids will be multiplied to adjust downward.

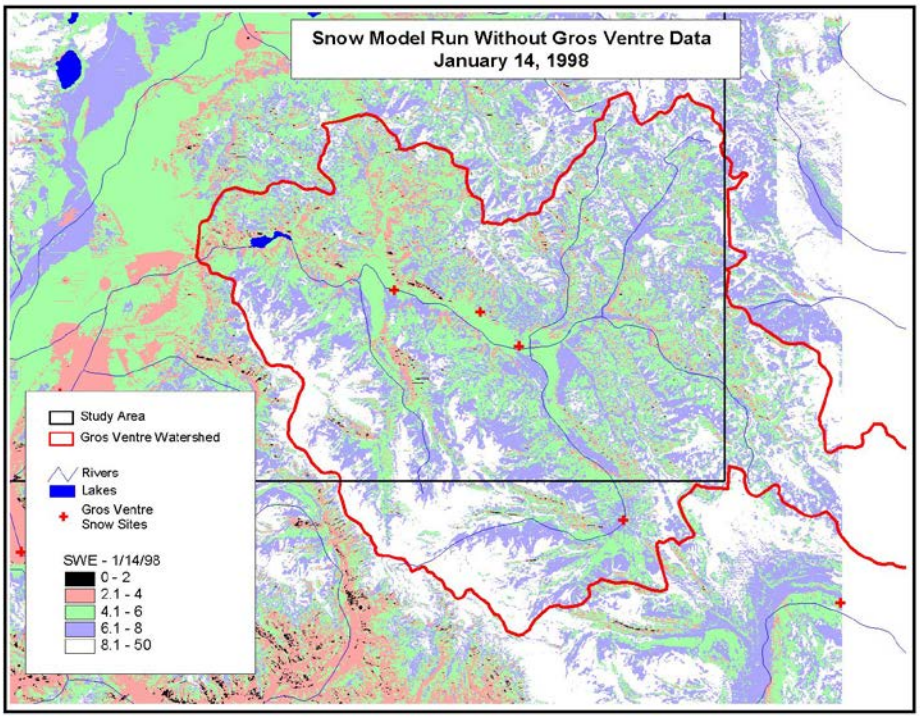


Figure 1. Snow model run without Gros Ventre data on January 14, 1998.

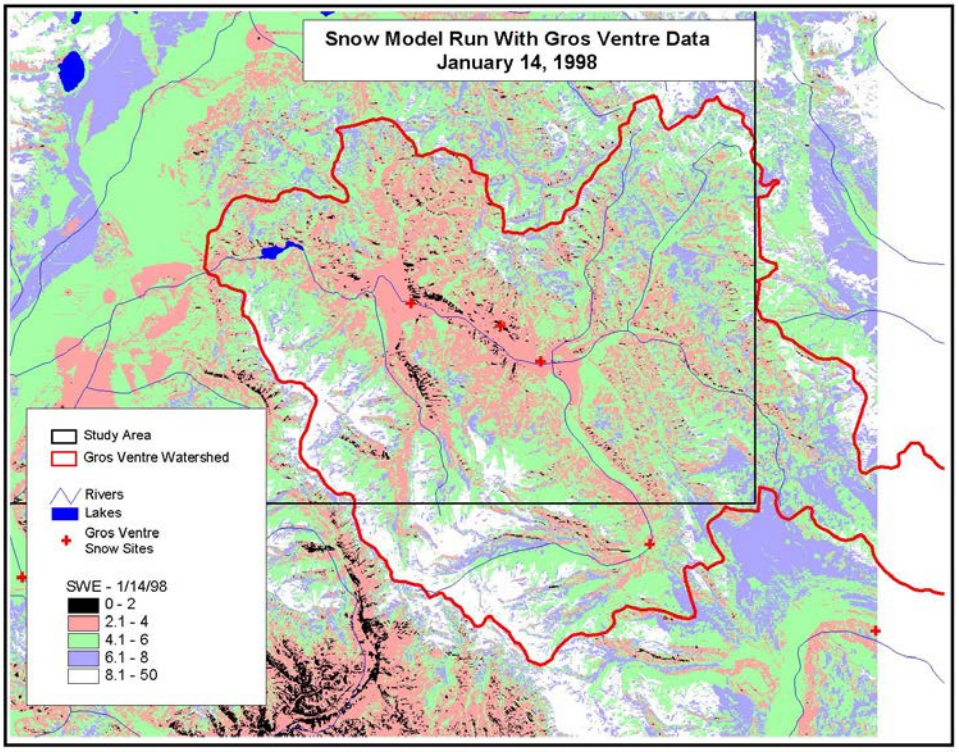


Figure 2. Snow model run with Gros Ventre data on January 14, 1998.

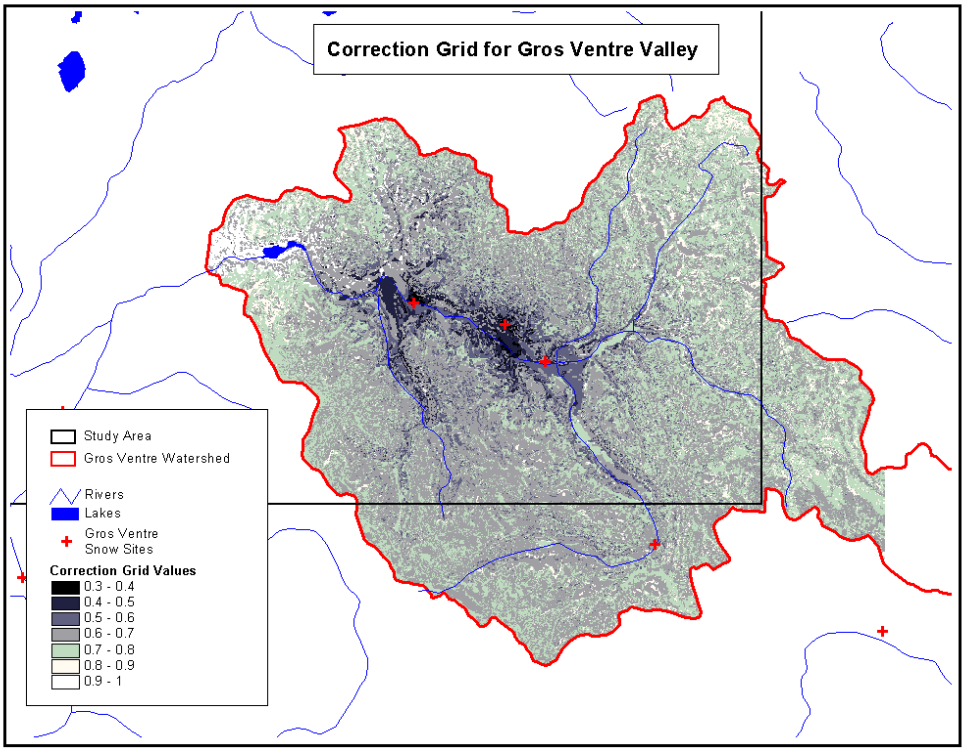


Figure 3. Correction grid for the GrosVentre valley.

Appendix C: Tables

Table 1. Vegetation Coverage Crosswalk Table

	Utah State			NER		GTNP		Our Model	
CODE	COVER_TYPE	Canopy	CODE	COVER_TYPE	CODE	COVER_TYPE	**CODE**	COVER_TYPE
	Conifer Trees			**Woodlands**		**Trees (successional stage)**		**Trees**
1	alpine fir	<30%					**1**	Spruce-fir
2	alpine fir	30-59%						
3	alpine fir	>59%						
8	alpine fir/lodgepole pine	30-59%						
9	alpine fir/lodgepole pine	>59%						
10	alpine fir/spruce	<30%			40	Spruce-Fir(0)		
11	alpine fir/spruce	30-59%			41	Spruce-Fir(1)		
12	alpine fir/spruce	>59%			42	Spruce-Fir(2)		
46	spruce, englemann	30-59%			43	Spruce-Fir(3)		
47	spruce, englemann	>59%			44	Spruce-Fir(4)		
14	alpine fir/whitebark	30-59%						
16	doug fir	<30%			20	Douglas-Fir(0)	**2**	Douglas Fir
17	doug fir	30-59%			21	Douglas-Fir(1)		
18	doug fir	>59%			22	Douglas-Fir(2)		
					23	Douglas-Fir(3)		
					24	Douglas-Fir(4)		
23	doug fir/lodgepole pine	30-59%	21	PSEUDOTSUGA MENZIESII-PINUS CONTORTA				
5	alpine fir/doug fir	30-59%						
6	alpine fir/doug fir	>59%						
32	juniper, utah	30-59%	20	JUNIPERUS SCOPULORUM-AGROPYRON	64	Open_Woods/Juniper		
67	maple	>59%						
70	mountain mahogany	30-59%						
71	mountain mahogany	>59%						
37	lodgepole pine	<30%			31	Lodgepole_Pine(1)	**3**	Subalpine Pine
38	lodgepole pine	30-59%			32	Lodgepole_Pine(2)		
39	lodgepole pine	>59%			33	Lodgepole_Pine(3)		
					34	Lodgepole_Pine(4)		
40	lodgepole sapling	>59%			30	Lodgepole_Pine(0)		
48	subalpine pine	<30%			50	Whitebark(0)		
49	subalpine pine	30-59%			51	Whitebark(1)		
64	aspen/conifer	30-59%			52	Whitebark(2)		
					53	Whitebark(3)		
					54	Whitebark(4)		
52	doug fir/limber pine	30-59%						
60	aspen	<30%	16	POPULUS TREMULOIDES-CALAMAGROSTIS RUBESCENS	70	Aspen(0)	**4**	Aspen
61	aspen	30-59%	17	POPULUS TREMULOIDES/SYMPHORICARPOS	71	Aspen(1)		
62	aspen	>59%	18	POPULUS-TREMULOIDES-SALIX	72	Aspen(2)		
			19	POPULUS TREMULOIDES-	73	Aspen(3)		

				PSEUDOTSUGA				
					74	Aspen(4)		
111	decidious tree riparian		22	POPULUS ANGUSTIFOLIA-POA	90	Cottonwood(0)	**5**	Riparian Forest
			23	POPULUS-ANGUSTIFOLIA-ARTEMISIA TRIDENTATA	91	Cottonwood(1)		
			24	POPULUS ANGUSTIFOLIA-MIXED SHRUB	92	Cottonwood(2)		
			25	POPULUS ANGUSTIFOLIA-DECIDUOUS SHRUB	93	Cottonwood(3)		
					94	Cottonwood(4)		
112	riverine riparian				81	Mixed_Forest(1)		
					82	Mixed_Forest(2)		
					83	Mixed_Forest(3)		
					84	Mixed_Forest(4)		
	Shrubs			**Shrublands**		**Shrubs**		**Shrubs**
75	big sagebrush		9	ARTEMESIA TRIDENTATA -POA (on flats)	13	Dry_Sagebrush	**6**	Sagebrush
			10	AR- TRIDENTATA-AR-TRIPARTITA (grass on slopes)				
			15	ARTEMISIA TRIDENTATA-BROMUS				
82	mountain big sage				12	Moist_Sagebrush/Cinquefoil		
					15	Moist_Sagebrush		
114	shrub riparian		12	SALIX/CAREX	11	Tall_Shrub	**7**	Shrub Riparian/Willow
			13	SALIX/BROMUS	14	Low_Willow		
					81	Tall_Shrub (>7400')		
			5	SUBIRRIGATED POA				
113	herbaceous riparian							
81	montane shrub		14	SYMPHORICARPOS-ROSA			**8**	Montane Shrub
76	bitterbrush							
77	burn shrub							
80	low sagebrush							
83	mountain low sage							
86	silver sage				57	Shrub-dominated_Avalanche_Chute		
	Herbaceous			**Grassland**		**Grasses**		**Grasses**
87	alpine shrub				63	Krumholtz		
90	alpine herbaceous				34	High_Elevation_Grassland	**9**	Alpine Herbaceous/Shrub
					51	Tundra		
92	burn herbaceous						**10**	Dry Montane Meadow/Grassland
93	clearcut herbaceous							
94	dry meadow		7	AGROPYRON-STIPA (Gros Ventre hills and slopes)	24	Dry_Forb_Meadow		
					74	Dry_Forb_Meadow (>7400')		
95	perennial grass		6	AGROPYRON POA (on flat)				
96	perennial grass slope		8	AGROPYRON/POA (Miller Butte)	35	Dry_Grassland/Meadow		
97	perennial grass montane				42	Dry-Moist_Forest_Opening		
					33	Moist_Grassland/Meadow		
					73	Moist_Grassland/Meadow (>7400')		
98	tall forb montane				21	Forb_Dominated_Seep		
					22	Wet_Forb_meadow		
					82	Wet_Forb_Meadow (>7400')		

					23	Moist_Forb_Meadow		
					58	Graminoid/Forb-dominated_Avalalanche Chute		
99	wet meadow		11	POTENTILLA-FRUCTICOSA/CAREX	32	Wet_Meadow	**11**	Wet Meadow
					72	Wet_Meadow (>7400')		
					41	Wet_Forest_Opening		
	Wetland			**Wetlands**		**Wetland**		**Wetland**
120	deep marsh						**12**	Wetland/Sedge Marsh
121	shallow marsh		3	CATTAIL/ (TYPHA-SCIRPUS)	71	Marsh/Fen (>7400')		
			4	CAREX-JUNCUS	31	Marsh/Fen		
122	aquatic bed							
123	mud flat							
	Miscellaneous			**Other**		**Other**		**Other**
107	water		1	Pond	55	Water_Body	**13**	Water/Rock/Snow
			2	Stream	54	Water_Course		
101	barren				56	Cliff		
104	rock				52	Bedrock		
					53	Talus		
108	snow							
	Land-use			**Cultivated Fields**		**Agricultural**		**Agricultural**
126	agricultural		26	BROMUS INERMIS-MEDICAGO SATIVA	59	Agricultural	**14**	Agricultural
			27	BROMUS INERMIS-MIXED GRASS				
			28	ELYMUS JUNCEUS				
			29	ELYMUS CINEREUS				
			30	POA PRATENSIS				
			31	AGROPYRON-MIXED GRASS				
			32	ALOPECURUS ARUNDINACEUS				
			33	PHLEUM PRATENSIS-POA				
			34	AGRPPYRON INTERMEDIUM				
			35	AGROPYRON ELONGATUM				
129	disturbed, high						**15**	Developed/disturbed
130	disturbed low							
131	urban, high density				60	Human_Development		
132	urban, low density							

Table 2. Conversions of U.S. Forest Service production classes used in this analysis.

Class	Production range (lbs/acre)	Midpoint used for analysis (lbs/acre)
0	No production	0
1	1-50	25
2	50-300	175
3	300-500	400
4	500-750	625
5	750-1200	975
6	1200-2500	1850
7	2500-4000	3250
8	4000+	6000

Table 4. Offtake Calculations

Spreadsheet for calculating Pounds Offtake from Animal Numbers						
Actual numbers Year 2000 -- 12,771 elk						
Elk	**Number of Animals**	**Average Weight (lbs)**	**Total Animal Pounds**	**Daily Offtake**	**Weekly Offtake**	**Elk % of Total**
Juveniles	1915	200	383000			0.1499491
Yearlings	646	350	226100			0.0505834
Adults (F)	8354	500	4177000			0.6541383
Adults (M)	1856	675	1252800			0.1453293
Total	12771	1725	6038900	120778	905835	
Moose						
Calves	162	200	32400			
Cows	466	700	326200			
Bulls	261	1300	339300			
Total	889	2200	697900	13958	104685	
Bison						
Calves	50	350	17500			
Yearlings	100	600	60000			
Cows	150	1350	202500			
Bulls	200	2000	400000			
Total	500	4300	680000	13600	102000	
			Total Weekly Offtake		**1112520**	
With 6,000 Elk						
Elk	**Number of Animals**	**Average Weight (lbs)**	**Total Animal Pounds**	**Daily Offtake**	**Quarter-month Offtake**	**Elk % of Total**
Juveniles	900	200	179938			0.1499491
Yearlings	304	350	106225			0.0505834
Adults (F)	3925	500	1962414			0.6541383
Adults (M)	872	675	588583			0.1453293
Total	6000	1725	2837162	56743	425574	
Moose						
Calves	162	200	32400			
Cows	466	700	326200			
Bulls	261	1300	339300			
Total	889	2200	697900	13958	104685	
Bison						
Calves	50	350	17500			
Yearlings	100	600	60000			

Cows	150	1350	202500			
Bulls	200	2000	400000			
Total	500	4300	680000	13600	102000	
			Total Weekly Offtake		**632259**	

Table 5. Vegetation Code Crosswalk Table

Vegetation Type (Utah State)	**Percent Cover**	**Snow Model Code**
alpine fir	<30%	21
alpine fir	30-59%	22
alpine fir	>59%	24
alpine fir/doug fir	30-59%	22
alpine fir/doug fir	>59%	24
alpine fir/lodgepole pine	30-59%	22
alpine fir/lodgepole pine	>59%	24
alpine fir/spruce	<30%	21
alpine fir/spruce	30-59%	22
alpine fir/spruce	>59%	24
alpine fir/whitebark	30-59%	22
doug fir	<30%	41
doug fir	30-59%	42
doug fir	>59%	44
doug fir/lodgepole pine	30-59%	42
lodgepole pine	<30%	33
lodgepole pine	30-59%	31
lodgepole pine	>59%	32
lodgepole sapling	>59%	30
spruce, englemann	30-59%	22
spruce, englemann	>59%	24
subalpine pine	<30%	51
subalpine pine	30-59%	52
doug fir/limber pine	30-59%	42
aspen/conifer	30-59%	34

Vegetation Type GTNP (successional stage)	
Lodgepole Pine (0)	30
Lodgepole Pine (1)	31
Lodgepole Pine (2)	32
Lodgepole Pine (3)	33
Lodgepole Pine (4)	34
Spruce/Fir (0)	20
Spruce/Fir (1)	21
Spruce/Fir (2)	22
Spruce/Fir (3)	23
Spruce/Fir (4)	24
Douglas Fir (0)	40
Douglas Fir (1)	41
Douglas Fir (2)	42
Douglas Fir (3)	43
Douglas Fir (4)	44
Whitebark Pine (1)	50
Whitebark Pine (2)	51

Whitebark Pine (3)	52
Whitebark Pine (4)	53
Whitebark Pine (5)	54

Vegetation Type NER

Pseudotsuga Menziesii/Pinus Contorta	32

Table 6. Snow Sites, Elevation, Location

Site #	Elevation (meters)	UTM east	UTM north	Name
1	1895.00	519300	4814300	/Jackson
2	1966.00	522900	4833400	/Moose
3	2075.00	533100	4855800	/Moran
4	2148.00	544800	4865500	/Basecamp
5	2574.00	508200	4818100	/Phillips bench
6	2900.00	575000	4844600	/Togwotee pass
7	1974.00	519180	4831640	/Boys Ranch
8	1973.00	518910	4831620	/Death Canyon
9	1955.00	518330	4830630	/RLazy S
10	1962.00	517360	4829690	/Wilson Road
11	1965.00	522980	4833440	/Moose W.S.
12	2017.00	521470	4836720	/Beaver Creek
13	1986.00	524570	4834260	/Blacktail Butte
14	2092.00	531120	4844660	/Deadman's Bar Rd
15	2072.00	536830	4848150	/Moosehead Ranch
16	2047.00	539250	4852900	/N. Elk Ranch
17	2048.00	539180	4854300	/Buffalo R.S.
18	2056.00	536480	4856860	/Oxbow Bend
19	2092.00	544870	4853780	/Buffalo Valley R
20	2083.00	545740	4854830	/Road 30083
21	2107.00	546590	4855490	/Buffalo Run
22	2072.00	548180	4853110	/KOA Picnic Area
23	2100.00	552210	4852300	/Black Rock R.S.
24	2013.00	527170	4834620	/Antelope Flat
25	2067.00	529600	4835550	/Mailbox Corner
26	2046.00	529620	4837780	/Schwering Studio
27	2108.00	531930	4834670	/Lobo Hill
28	2026.00	530450	4829060	/Highlands Jct
29	2024.00	528200	4828730	/Highlands Loop
30	1958.00	521490	4827770	/Airport
31	1976.00	524720	4827510	/Gros Ventre Rive
32	1939.00	521550	4823160	/Gros Ventre Turn
33	1900.00	521580	4820200	/Fish Hatchery
34	1895.00	519420	4814490	/Jackson W.S.
35	1908.00	520480	4814080	/NER HQS
36	2044.00	522090	4839860	/Lupine Meadows
37	2099.00	522290	4847720	/Jenny Lake Lodge
38	2115.00	524050	4848370	/N. Jenny Lake Jc
39	2098.00	530950	4852040	/Sewage Ponds
40	2065.00	520700	4857000	/Moran Bay SC
41	2102.00	533860	4860760	/Pilgrim Creek
42	2084.00	529440	4861970	/Coulter Bay
43	2070.00	529790	4835310	/Hunter Hay WE
44	2100.00	530990	4835510	/Hunter Hay NS

```
45        1977.00     522120    4834280 /Bar BC Road
46        2023.00     523420    4838230 /Bar BC Road B
47        2022.00     523920    4838180 /Bar BC Mid
48        1983.00     524770    4837980 /Bar BC FP
49        2025.00     523020    4838280 /Bar BC Mid RD
50        2094.00     531450    4851700 /RKO Road Flats
51        2095.00     536450    4859500 /RKO PL
52        2040.00     535500    4851200 /RKO Willow Flat
53        1938.00     513860    4825940 /Ski Area Base
54        1954.00     511080    4820820 /Phillips Canyon
55        2138.00     532700    4835100 /Elbo Ranch
56        2393.00     558800    4852100 /Four Mile Meadows
57        2106.00     558200    4856100 /Turpin Meadows
58        2668.00     570500    4804200 /Gros Ventre Summit
59        2312.00     519600    4811900 /Snow King Mountain
60        2243.00     525000    4876800 /Huckleberry Divide
61        2150.00     521100    4882800 /Glade Creek
62        2456.00     502700    4816300 /Teton Pass W.S.
```

TABLE 7. STATION ASSIGNMENT FOR REGRESSION FUNCTION

PREDICTOR STATIONS		
Jackson	Moose, Moran	Base Camp, Phillips Bench, Togwotee Pass
PREDICTED STATIONS		
Buffalo Valley Road Fish Hatchery Jackson W.S. NER H.Q.	Death Canyon, R Lazy S Boys Ranch, Wilson Road Buffalo R. S., Moose W.S. Beaver Creek, Blacktail Butte Deadman's Bar, Moosehead Ranch N. Elk Ranch, Road 30083 Buffalo Run, KOA campground Blackrock, Antelope Flat Mailbox, Schwering Studio Lobo Hill, Oxbow Bend Highlands Jct., Highlands Loop Airport, Gros Ventre River Gros Ventre Turnout, Lupine Meadows Sewage Pond, Pilgrim Creek Coulter Bay, Hunters Hayfield WE Hunters Hayfield NS, Bar BC Road Bar BC Road B, Bar BC Mid Bar BC FP, Bar BC Mid Road RKO Road Flats, RKO PL RKO Willow Flat, Ski Area Base	Jenny Lake Lodge N. Jenny Lake Jct. Moran Bay S.C. Phillips Canyon Snow King Mountain Huckleberry Divide Glade Creek Teton Pass W.S. Gros Ventre Summit

From: Steve Cain
To: Steve Kallin
Subject: Re: DRAFT AMP Schedule
Date: Tuesday, May 26, 2015 10:00:51 AM

Hey Steve,

Really sorry I did not get back to you sooner on this. I was out of the office for 2 weeks and had less time than I anticipated for keeping up with things. This schedule looks good to me, realistic, and attainable. My August will be super busy but I think I can free up enough time to stay up with the schedule and updates to the plan. I will be on vacation and trying my best not to work during June 27-July 12. Anything we should talk about before the meeting June 3rd?

Steve

On Mon, May 11, 2015 at 1:38 PM, Steve Kallin <steve_kallin@fws.gov> wrote:

> Steve:
>
> Per our conversation.
>
> Thank you,
>
> Steve Kallin
>
> Project Leader
>
> National Elk Refuge
>
> PO Box 510
>
> 675 East Broadway
>
> Jackson, WY 83001
>
> Phone: (307) 201-5409
>
> Fax: (307) 733-9729
>
> steve_kallin@fws.gov

From: Will Meeks
To: Mike Blenden
Subject: Can you check with . . .
Date: Wednesday, June 03, 2015 10:06:08 AM

. . . NER and the outcome of the meeting with a recommendation for a timeline by the end of the week.

Will Meeks
U.S. Fish and Wildlife Service
R6 - Assistant Regional Director
NWRS and PFW
303-236-4303

From: Will Meeks
To: Mike Blenden
Subject: Can you check with . . .
Date: Wednesday, June 03, 2015 10:06:08 AM

. . . NER and the outcome of the meeting with a recommendation for a timeline by the end of the week.

Will Meeks
U.S. Fish and Wildlife Service
R6 - Assistant Regional Director
NWRS and PFW
303-236-4303

From: Blenden, Mike
To: Will Meeks
Subject: Re: Can you check with . . .
Date: Wednesday, June 03, 2015 1:24:00 PM

---

roger. I'll report back to you. I'll call Steve in the morning.

On Wed, Jun 3, 2015 at 10:06 AM, Will Meeks <will_meeks@fws.gov> wrote:

> . . . NER and the outcome of the meeting with a recommendation for a timeline by the end of the week.
>
> Will Meeks
> U.S. Fish and Wildlife Service
> R6 - Assistant Regional Director
> NWRS and PFW
> 303-236-4303

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

From: Blenden, Mike
To: Will Meeks
Subject: Re: Can you check with . . .
Date: Wednesday, June 03, 2015 1:24:00 PM

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Michael Blenden
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134 Union Boulevard
Lakewood, CO 80228
303-236-4306

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John F. Kennedy

From: Will Meeks
To: Mike Blenden; Keenan Adams
Subject: RE: NER AMP plan
Date: Friday, June 05, 2015 11:28:26 AM

I'm not sure what to say. The RD wants it done sooner.

Will Meeks
U.S. Fish and Wildlife Service, Region 6
ARD-NWRS and PFW
303-236-4303 (w)
720-541-0310 (c)

From: Blenden, Mike [mailto:mike_blenden@fws.gov]
Sent: Friday, June 05, 2015 11:27 AM
To: Will Meeks; Keenan Adams
Subject: NER AMP plan

Will and Keenan,

I spoke to Steve Kallin this morning. The AMP planning team met on Wednesday and generally agreed they could meet this (attached) implementation schedule. I know this is not as fast as the NPS/FWS RDs desire. Should we discuss alternatives?

Mike

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

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Mike

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

From:	Cole, Eric
To:	Steve Kallin
Subject:	NER proportion of Jackson Elk Herd
Date:	Monday, June 15, 2015 3:09:22 PM
Attachments:	Herd-wide versus NER elk numbers.xlsx

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

Jackson Elk Herd Winter Count Data

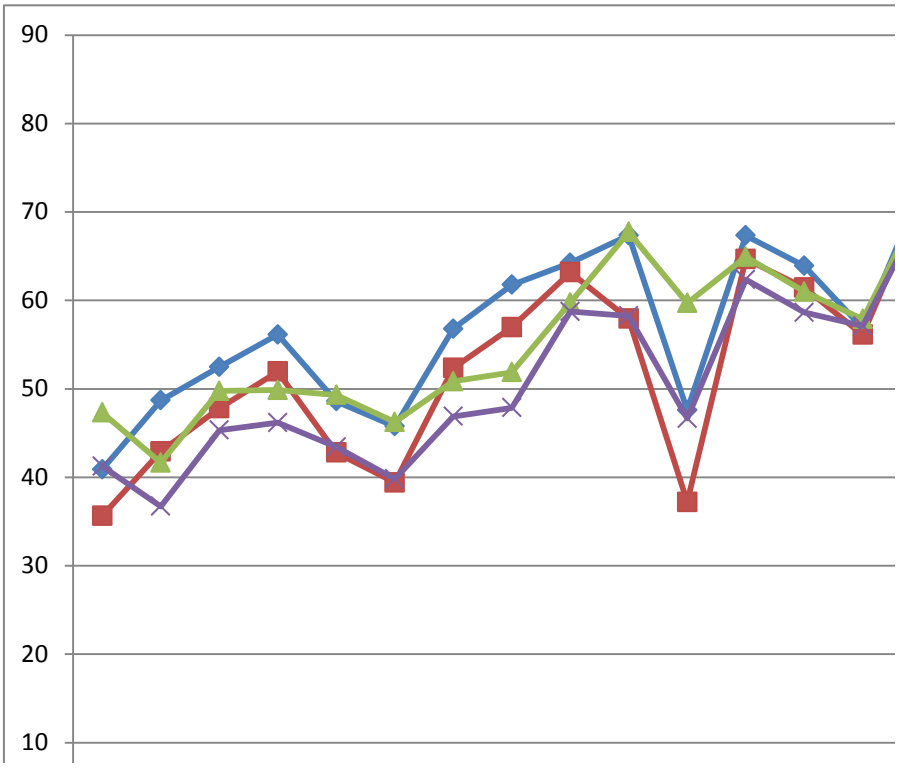
	A NER Classified	B NER Ave Daily on Feed	C JEH Total Classified	D JEH Population Estimate
2000	5054	5849	12360	14178
2001	6128	5242	12584	14277
2002	6366	6036	12132	13318
2003	6992	6213	12458	13457
2004	5876	5963	12095	13730
2005	4969	5021	10858	12610
2006	6730	6027	11853	12855
2007	7279	6115	11786	12777
2008	7947	7390	12370	12582
2009	7269	7310	10794	12550
2010	4348	5454	9136	11691
2011	7746	7468	11503	11978
2012	7360	7024	11519	11982
2013	6285	6397	11051	11200
2014	8296	8100	11423	11600
2015	8390	8035	10633	11000

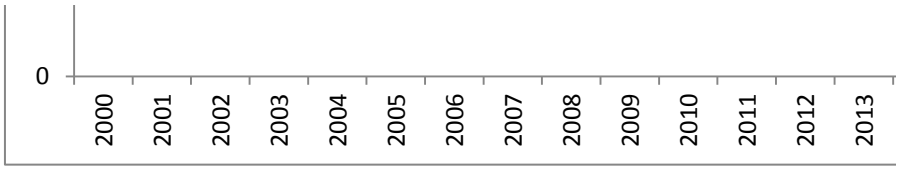
NER classified= elk counted on feed during classification count in February

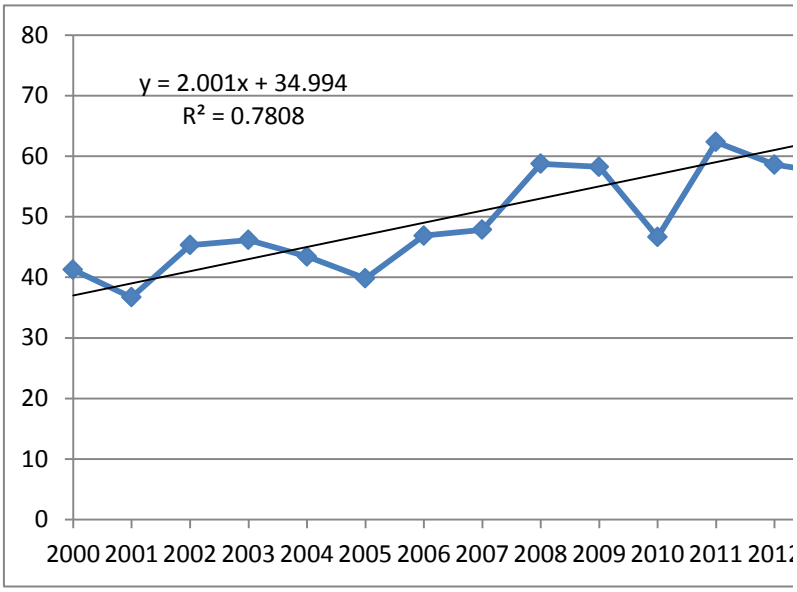
NER Ave Daily on Feed is the annual mean based on the number of elk estimated on feed during each

JEH Total Classified= Total number of elk counted in the Jackson Elk Herd during February Classificatio
(Feedground ground counts and helicopter survey of native winter range)

JEH Population Estimate= Modeled estimated for the JEH derived from total elk counted during classif
and accounting for sightability



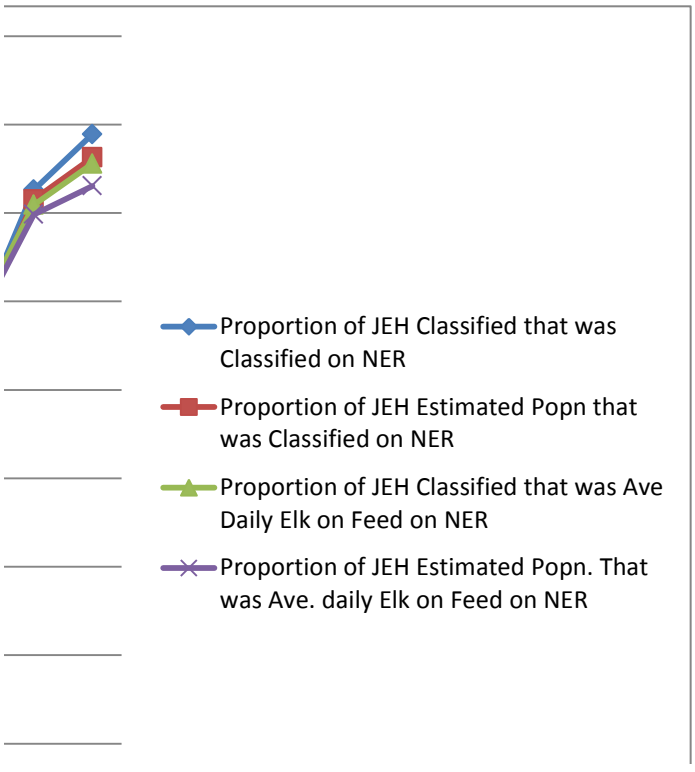

0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013


80
70
60
50
40
30
20
10
0
y = 2.001x + 34.994
R² = 0.7808
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

ProporAofC	ProporAofD	ProporBofC	ProporBofD
41	36	47	41
49	43	42	37
52	48	50	45
56	52	50	46
49	43	49	43
46	39	46	40
57	52	51	47
62	57	52	48
64	63	60	59
67	58	68	58
48	37	60	47
67	65	65	62
64	61	61	59
57	56	58	57
73	72	71	70
79	76	76	73

feeding day
n counts

ication count



2014
2015

2 2013 2014 2015

From: Noreen Walsh
To: Will Meeks; Matt Hogan
Subject: supplemental feeding
Date: Wednesday, June 17, 2015 7:48:10 PM

“symbolic step” to phasing out feeding at Alkali feedground on Brider Teton. Mentions NER.

http://www.jhnewsandguide.com/news/environmental/alkali-feeding-will-phase-out/article_4f9feb1e-3ac8-5267-a6b6-9f2e5b54311f.html

Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service
303 236 7920

From: Noreen Walsh
To: Will Meeks; Matt Hogan
Subject: supplemental feeding
Date: Wednesday, June 17, 2015 7:48:10 PM

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Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service
303 236 7920

From: Will Meeks
To: Keenan Adams
Subject: Fwd: supplemental feeding
Date: Thursday, June 18, 2015 10:27:38 AM

Will Meeks
U.S. Fish and Wildlife Service
R6 - Assistant Regional Director
NWRS and PFW
303-236-4303

Begin forwarded message:

> **From:** Noreen Walsh <noreen_walsh@fws.gov>
> **Date:** June 17, 2015 at 5:48:10 PM AKDT
> **To:** Will Meeks <will_meeks@fws.gov>, Matt Hogan <matt_hogan@fws.gov>
> **Subject: supplemental feeding**
>
> "symbolic step" to phasing out feeding at Alkali feedground on Brider Teton. Mentions NER.
>
> http://www.jhnewsandguide.com/news/environmental/alkali-feeding-will-phase-out/article_4f9feb1e-3ac8-5267-a6b6-9f2e5b54311f.html
>
> *Noreen Walsh*
> *Regional Director*
> *Mountain-Prairie Region*
> *U. S. Fish and Wildlife Service*
> *303 236 7920*

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To: Will Meeks
Subject: Re: supplemental feeding
Date: Thursday, June 18, 2015 11:31:06 AM

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From: Steve Kallin
To: Tim Fuchs; Brad Hovinga
Subject: Brief AMP Mtg.
Date: Thursday, June 18, 2015 12:06:05 PM

Hi Tim & Brad:

Just checking to see if there is an hour next week when I can meet with both of you to follow-up on the private lands and public outreach topics concerning the AMP. Tim, hopefully we can meet briefly before you leave. I want to ensure the needs from the WGFD perspective on these topics are accurately included into the next draft version of the AMP. Mid-week works best for me, but I should be able to adjust my schedule to meet almost any time. I'd be happy to come to your office.

Hope all is going well,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Will Meeks
To: Adams, Keenan
Subject: Re: supplemental feeding
Date: Thursday, June 18, 2015 12:20:29 PM

Thanks. True, but you can influence the discussion by interjecting that "the big boss wants it done more quickly." I am not taking a recommendation to her that we are a whole year out when we clearly said we can work this out by Jan 2016.

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From: Will Meeks
To: Keenan Adams
Subject: Fwd: supplemental feeding
Date: Thursday, June 18, 2015 12:30:24 PM

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Will Meeks
U.S. Fish and Wildlife Service
R6 - Assistant Regional Director
NWRS and PFW
303-236-4303

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Date: Thursday, June 18, 2015 12:32:21 PM

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From: Jeffrey Warren
To: Eric Cole; Steve Kallin
Subject: RE: AMP Monitoring Section
Date: Friday, June 26, 2015 8:37:22 AM

I just read through the modeling section again, and looked at Kerry's comments, and think it is fine to include as is in the next version for the group. Kerry's comments in the modeling section are likely better addressed in the introductory sections, so I'll leave that to Steve to address.

Cheers,

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

From: Cole, Eric [mailto:eric_cole@fws.gov]
Sent: Friday, June 19, 2015 2:35 PM
To: Steve Kallin; Jeffrey Warren
Subject: AMP Monitoring Section

Please see the attached draft monitoring section for the AMP. Given our discussion about the intended audience of the AMP, I have made things less technical and specific. This will ensure that the public and regional office will understand it, but many details will need to be fleshed out prior to us implementing monitoring. Some cost details also need to be worked out.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

From: Cole, Eric

To: Bryan Yetter; troffe@exchange.montana.edu; Aly Courtemanch; Amanda Soliday; Arnie Dood; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Cris Dippel; Daniel Huckel; Daniel Sharps; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Nick Dobric; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan Patla; Terry Roper; Tim Fuchs; Tim Pratt; Tom Reed; Ture Schoultz

Subject: 6/26/15 National Elk Refuge Biological Update

Date: Friday, June 26, 2015 10:55:01 AM

6/26/15 National Elk Refuge Biological Update

Upcoming Journal of Wildlife Management Article

Our article "Changing Migratory Patterns in the Jackson Elk Herd" will appear in the August edition of the Journal of Wildlife Management.

Citation:

Cole, E.K., A.M. Foley, J.M. Warren, B.L. Smith, S.R. Dewey, D.G. Brimeyer, W.S. Fairbanks, H. Sawyer, and P.C. Cross. 2015. Changing migratory patterns in the Jackson elk herd. Journal of Wildlife Management 79:in press. Although not denoted in the citation, Aaron Foley and I contributed equally to this work and are considered co-senior authors.

Abstract:

Migratory behavior in ungulates has declined globally and understanding the causative factors(environmental change vs. human mediated) is needed to formulate effective management strategies. In the Jackson elk herd of northwest Wyoming, demographic differences between summer elk (Cervus elaphus) population segments have led to changes in migratory patterns over a 35-year time period. The proportion of short-distance migrants (SDM) has increased and the proportion of long-distance migrants (LDM) has concurrently declined. The probability of winter-captured elk on the National Elk Refuge being LDM decreased from 0.99 (95% CI=0.97–1.00) to 0.59 (95% CI=0.47–0.70) from 1978 to 2012. We tested 4 hypotheses that could contribute toward the decline in the LDM segment: behavioral switching from LDM to SDM, differential survival, harvest availability, and calf recruitment. Switching rates from LDM to SDM were very low (0.2% each elk-year). Survival rates were similar between LDM and SDM, although harvest availability was relatively low for SDM that tended to use areas close to human development during the hunting season. Average summer calf/cow ratios of LDM declined from 42 to 23 calves per 100 cows from 1978–1984 to 2006–2012. Further, during 2006–2012, LDM summer calf/cow ratios were less than half of SDM (23 vs. 47 calves per 100 cows). Our data suggest recruitment is the driving factor behind the declining proportion of LDM in this region. Effectiveness of altering harvest management strategies to conserve the LDM portion of the Jackson elk herd may be limited.

Management Implications

There are significant management implications associated with these findings. Based on our analysis, in the late 1970s- early 1980s <2% of the elk that winter on the Refuge were Short Distance Migrants (spent the summer in the area between Wilson and Moose, WY), but now approximately 40%. of the elk that winter on NER migrate from this area. Over the same 35-year time span the proportion of elk summering in areas north of Moose declined from around 97% to around 60%. The greatest decline in these Long Distance Migrants appears to have been for elk that summer in Yellowstone NP and the Teton Wilderness. In the late 1970s and early 1980s elk that

migrated to southern YNP and TW represented about 40% of the elk wintering on the Refuge, but now are only about 10% of the elk that winter on NER. Our findings suggest that like other long distance ungulate migrations around the world, long distance migration in the Jackson Elk Herd is threatened. Further, a growing population of Short Distance Migrants that summer primarily in subdivisions and agricultural land are difficult to harvest and will make reaching the refuge's 5,000 elk population objective very difficult, which subsequently makes our efforts to reduce reliance on supplemental feeding on NER even more challenging.

A .PDF version of the full article is available upon request subject to copyright restrictions.

Thanks for your interest,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

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From: Steve Kallin
To: Mike Blenden
Subject: Change in Jackson Elk Herd Composition/Behavior
Date: Thursday, July 02, 2015 9:58:37 AM

Mike:

The attached article in the Jackson News & Guide does a good job of identifying some of the complexities of managing the Jackson elk herd. This article is a result of the JWM article by Cole (Eric) et. al.

http://www.jhnewsandguide.com/news/environmental/elk-sticking-closer-to-town/article_792f864f-2ff4-5ef7-8c88-76414bbb2863.html

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Will Meeks
To: Keenan Adams
Subject: Accepted: NER AM Plan

From: Will Meeks
To: Keenan Adams
Subject: Accepted: NER AM Plan

From: Steve Kallin
To: Jeffrey Warren
Subject: AMP Modeling Section
Date: Wednesday, July 08, 2015 9:11:30 AM

Hi Jeff:

How is the AMP Modeling section coming? I'm working on the AMP document and ready to incorporate this section. If it's not quite ready, let me know when it will be done, so I can plan for sending the draft AMP to the team in advance of our next meeting on the 20th.

Thank you,

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From:	Steve Kallin
To:	Brad Hovinga; Doug Brimeyer; Dale Deiter; Kerry Murphy; Susan (Sue) Consolo-Murphy; Sarah Dewey; Cris Dippel; Eric Cole; Jeffrey Warren; Steve Cain
Subject:	AMP Meeting Reminder; Monday, July 20 at 8:30 AM
Date:	Wednesday, July 08, 2015 10:35:39 AM

Hi All:

Just a reminder that at our last AMP meeting, we agreed our next meeting would be on Monday, July 20. Let's meet at the Refuge Headquarters at 8:30 AM.

We will email you the latest draft AMP next week before the meeting so you can start your review. Your review will be greatly appreciated because we plan to send the Plan out for Peer Review in early August.

Please let me know at your earliest convenience if a scheduling conflict has developed and you are unable to make the meeting.

Thanks again for all of your help in developing the AMP,

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From: Dewey, Sarah
To: Steve Kallin
Subject: Re: AMP Meeting Reminder; Monday, July 20 at 8:30 AM
Date: Wednesday, July 08, 2015 12:40:58 PM

Steve,

I am not able to make the meeting on the 20th.

Sarah

On Wed, Jul 8, 2015 at 10:35 AM, Steve Kallin <steve_kallin@fws.gov> wrote:

> Hi All:
>
> Just a reminder that at our last AMP meeting, we agreed our next meeting would be on Monday, July 20. Let's meet at the Refuge Headquarters at 8:30 AM.
>
> We will email you the latest draft AMP next week before the meeting so you can start your review. Your review will be greatly appreciated because we plan to send the Plan out for Peer Review in early August.
>
> Please let me know at your earliest convenience if a scheduling conflict has developed and you are unable to make the meeting.
>
> Thanks again for all of your help in developing the AMP,
>
> Steve Kallin
>
> Project Leader
>
> National Elk Refuge
>
> PO Box 510
>
> 675 East Broadway
>
> Jackson, WY 83001
>
> Phone: (307) 201-5409
>
> Fax: (307) 733-9729

> steve_kallin@fws.gov

--
Sarah Dewey, Wildlife Biologist
Grand Teton National Park
Science and Resource Management
P.O. Box 170
Moose, WY 83012
(307) 739-3488

From: Steve Kallin
To: Jeffrey Warren
Subject: RE: AMP Meeting Reminder; Monday, July 20 at 8:30 AM
Date: Wednesday, July 08, 2015 1:56:42 PM

I will check with the rest of the team to see if they are available for an afternoon meeting. We certainly want to have you there!

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Wednesday, July 08, 2015 1:38 PM
To: Steve Kallin
Subject: RE: AMP Meeting Reminder; Monday, July 20 at 8:30 AM

I can only do an afternoon meeting on Monday the 20th.

Thanks,

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

---

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Wednesday, July 08, 2015 10:36 AM
To: Brad Hovinga; Doug Brimeyer; Dale Deiter; Kerry Murphy; Susan (Sue) Consolo-Murphy; Sarah Dewey; Cris Dippel; Eric Cole; Jeffrey Warren; Steve Cain
Subject: AMP Meeting Reminder; Monday, July 20 at 8:30 AM

Hi All:

Just a reminder that at our last AMP meeting, we agreed our next meeting would be on Monday, July 20. Let's meet at the Refuge Headquarters at 8:30 AM.

We will email you the latest draft AMP next week before the meeting so you can start your review. Your review will be greatly appreciated because we plan to send the Plan out for Peer Review in early August.

Please let me know at your earliest convenience if a scheduling conflict has developed and you are unable to make the meeting.

Thanks again for all of your help in developing the AMP,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Steve Kallin
To: Jeffrey Warren
Subject: RE: AMP Monitoring Section
Date: Wednesday, July 08, 2015 2:34:08 PM

Jeff:

Sorry I focused on the Kerry's comments notation and missed the modeling section was ready to go.

Thanks for resending,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Wednesday, July 08, 2015 1:37 PM
To: Steve Kallin
Subject: FW: AMP Monitoring Section

Steve,

Here is my email from last month, and I attached a version of the AM plan with Kerry's comments.

Cheers,

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

---

From: Jeffrey Warren [mailto:jeffrey_warren@fws.gov]
Sent: Friday, June 26, 2015 8:37 AM
To: Eric Cole; Steve Kallin
Subject: RE: AMP Monitoring Section

I just read through the modeling section again, and looked at Kerry's comments, and think it is fine to include as is in the next version for the group. Kerry's comments in the modeling section are likely better addressed in the introductory sections, so I'll leave that to Steve to address.

Cheers,

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

From: Cole, Eric [mailto:eric_cole@fws.gov]
Sent: Friday, June 19, 2015 2:35 PM
To: Steve Kallin; Jeffrey Warren
Subject: AMP Monitoring Section

Please see the attached draft monitoring section for the AMP. Given our discussion about the intended audience of the AMP, I have made things less technical and specific. This will ensure that the public and regional office will understand it, but many details will need to be fleshed out prior to us implementing monitoring. Some cost details also need to be worked out.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

From: Doodle
To: Steve Kallin
Subject: Doodle: Link for poll "Adaptive Management Plan Meeting"
Date: Wednesday, July 15, 2015 10:25:38 AM

Hi Steve Kallin,

You have initiated a poll "Adaptive Management Plan Meeting" at Doodle. The link to your poll is:

http://doodle.com/ivcvzxssy6e28neg

Share this link with all those who should cast their votes. Do not forget to cast your vote, too.

(If you did not initiate this poll, somebody must accidentally have used your e-mail address; simply ignore this e-mail, please.)

- Your Doodle Team

Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Steve Kallin
To:	Brad Hovinga; Doug Brimeyer; Susan (Sue) Consolo-Murphy; Sarah Dewey; Dale Deiter; Kerry Murphy; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Cain
Subject:	Cancel July 20 AMP Meeting; Reschedule using Doodle Poll
Date:	Wednesday, July 15, 2015 12:55:10 PM

Hi Everyone:

I am cancelling the upcoming AMP Meeting scheduled for Monday, July 20. My apologies for any inconvenience. The purpose of the next meeting is to review a near-final draft of the AMP. Unfortunately we have not been able to send you this near-final draft plan with enough time for most to review it prior to the Monday meeting. I want to be respectful of your time and want to ensure our meetings are as productive as possible. So, we will be sending you the near-final draft of the AMP next week. We will ideally schedule the next AMP meeting the first week of August or the second week as a backup. Please use the Doodle Poll link below at your earliest opportunity to list your availability. This schedule will provide everyone at least a week to review the plan and allow everyone to be prepared for the next meeting.

http://doodle.com/ivcvzxssy6e28neg

Thank you again for all of your valuable assistance,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From:	Steve Kallin
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http://doodle.com/ivcvzxssy6e28neg

Thank you again for all of your valuable assistance,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From:	Steve Kallin
To:	Brad Hovinga; Doug Brimeyer; Susan (Sue) Consolo-Murphy; Sarah Dewey; Dale Deiter; Kerry Murphy; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Cain
Subject:	Cancel July 20 AMP Meeting; Reschedule using Doodle Poll
Date:	Wednesday, July 15, 2015 12:55:04 PM

Hi Everyone:

I am cancelling the upcoming AMP Meeting scheduled for Monday, July 20. My apologies for any inconvenience. The purpose of the next meeting is to review a near-final draft of the AMP. Unfortunately we have not been able to send you this near-final draft plan with enough time for most to review it prior to the Monday meeting. I want to be respectful of your time and want to ensure our meetings are as productive as possible. So, we will be sending you the near-final draft of the AMP next week. We will ideally schedule the next AMP meeting the first week of August or the second week as a backup. Please use the Doodle Poll link below at your earliest opportunity to list your availability. This schedule will provide everyone at least a week to review the plan and allow everyone to be prepared for the next meeting.

http://doodle.com/ivcvzxssy6e28neg

Thank you again for all of your valuable assistance,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Doodle
To: Steve Kallin
Subject: Doodle: "Adaptive Management Plan Meeting" Update
Date: Wednesday, July 15, 2015 12:58:23 PM

View this poll on your dashboard

Hi Steve Kallin,

"Sarah Dewey" just participated in the poll "Adaptive Management Plan Meeting"

Go to poll **Close poll**

Doodle is also available for iOS and Android.

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Steve Kallin
To: Sean O"Malley
Subject: RE: Gates
Date: Wednesday, July 15, 2015 1:04:38 PM

Sean:

Great info; thank you for these drawings/photos. Several of these designs could work well at the end of Broadway. We will keep you apprised of progress concerning a cattle guard.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Sean O'Malley [mailto:somalley@tetonwyo.org]
Sent: Wednesday, July 15, 2015 10:22 AM
To: steve_kallin@fws.gov
Subject: Gates

Steve,

As promised, here is some information about possible people-access wildlife barriers. The photos are from a gate on the Walton access road north of Emily's Pond. The rest of the attachments are variations on Scottish "kissing gates."

Sean E. O'Malley, PE
Teton County Engineer
PO Box 3594
320 South King Street
Jackson, Wyoming 83001
307.733.3317
307.732-8580 - direct
www.tetonwyo.org

From:	Steve Kallin
To:	Cris Dippel
Cc:	Eric Cole
Subject:	FW: Gates
Date:	Wednesday, July 15, 2015 1:05:23 PM
Attachments:	People Gate IMG_0475.jpg People Gate IMG_0476.jpg People Gate IMG_0477.jpg Kissing Gate.docx 0623-2340-MTDC_ AUSFS Kissing Gate.pdf Kissing Gate Hampshire.pdf Scottish Kissing Gate 2a.pdf

---

Info concerning pedestrian gates for the end of Broadway.

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Sean O'Malley [mailto:somalley@tetonwyo.org]
Sent: Wednesday, July 15, 2015 10:22 AM
To: steve_kallin@fws.gov
Subject: Gates

Steve,

As promised, here is some information about possible people-access wildlife barriers. The photos are from a gate on the Walton access road north of Emily's Pond. The rest of the attachments are variations on Scottish "kissing gates."

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307.732-8580 - direct
www.tetonwyo.org







12.6.3.2.3 Gates, stiles, and fences

Gates, stiles, and fences are most effective when the purpose is to exclude large vehicles. Gates that comply with ADAAG in terms of size, force to operate, and with a latch mechanism that is considered accessible to users with disabilities should be installed instead of designs that limit access. Trails that do not permit bicycles or equestrians should consider gates with zigzag mazes. Other creative designs might include a maze with maneuvering space for a wheelchair user at lower heights with a narrower passage above the lap height of the wheelchair user.

Gates are often used in rural settings on trails that cross private property especially in areas where a trail may cross pastureland. A kissing gate is one solution that can be used by people who use wheelchairs and other pedestrians, but prevents animals from exiting. The design requires the user to push the gate in front of them, enter a small holding area, and then push the gate behind them in order to leave the holding area. An animal that entered the holding area will get stuck because it will not have the dexterity or the knowledge to operate the gate. The holding area must be designed to be at least 1.525 m x 1.525 m (60 in x 60 in) to allow maneuvering space for a wheelchair user.

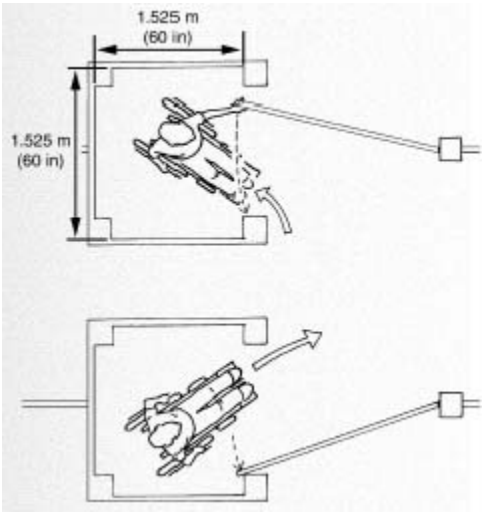


Figure 12-6. GOOD DESIGN: The kissing gate allows pedestrian access, but prevents animals from leaving the fenced area. In this design, the user pushes the gate in front of them, enters the holding area, and then swings the gate over to pass through.

Recreation, Transportation Tech Tips

October 2006

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Accessible Gates for Trails and Roads

James "Scott" Groenier, Project Leader

The Missoula Technology and Development Center (MTDC) has reviewed available gate designs from around the world that allow wheelchair access, but restrict all-terrain vehicles (ATVs), motorcycles, and mountain bikes. We also searched for an existing gate or gate design that would allow access by wheelchairs and horses, but keep out ATVs and motorcycles.

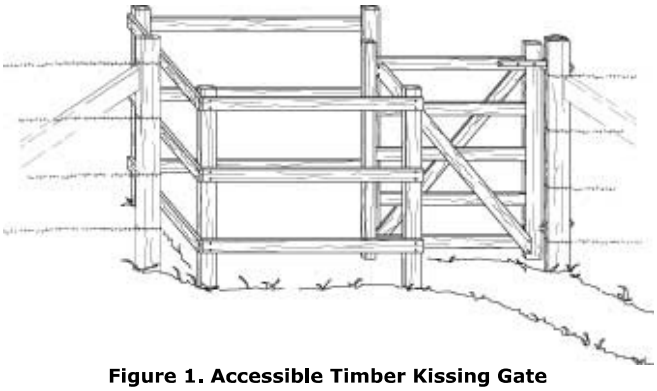


Figure 1. Accessible Timber Kissing Gate for Wheelchair Accessibility
click image for technical drawing

Highlights...

- When foot travel is encouraged past a gate blocking motorized access, the Forest Service must provide a 32-inch-wide passage for persons using wheelchairs.
- This tech tip includes drawings of gate designs that will block all-terrain vehicles and motorcycles, but will allow wheel- chairs and, in some cases, horses to pass.

When the Forest Service installs a gate, berm, or other type of device to restrict motor vehicles on a road or trail, but encourages foot travel beyond the restriction, a passage 32 inches wide must be provided for someone using a wheelchair (Section 504 of the Rehabilitation Act of 1973).

Wheelchair Accessible Gates

Web sites with designs that allow wheelchair access while restricting access by ATVs and motorcycles are listed near the end of this tech tip. The best Web site was that of Scottish Natural Heritage, an organization in the United Kingdom (UK). They have a series of drawings for gate designs that meet accessibility requirements in the UK.

The Scottish Natural Heritage gates are smaller than those required for accessibility in the United States. We increased the opening dimensions to meet Federal requirements in the United States. The timber kissing gate (figure 1) and the chicane (figure 2) have been modified to meet the Federal requirements. In addition, a modified kissing gate design was developed to be used for existing fence openings (figure 3).

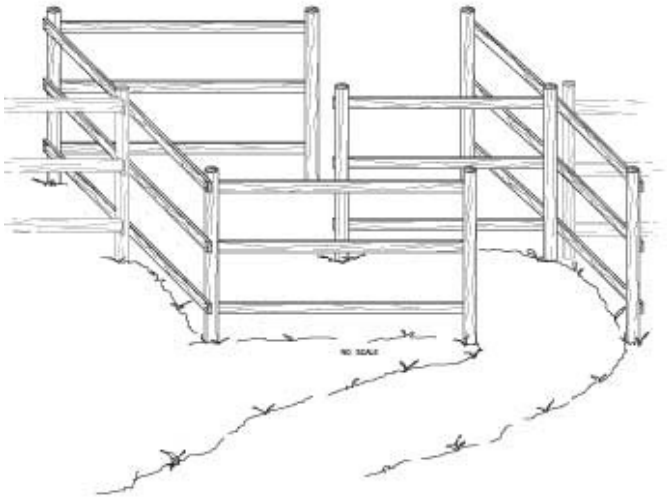


Figure 2. Chicane for Wheelchair Accessibility
click image for technical drawing

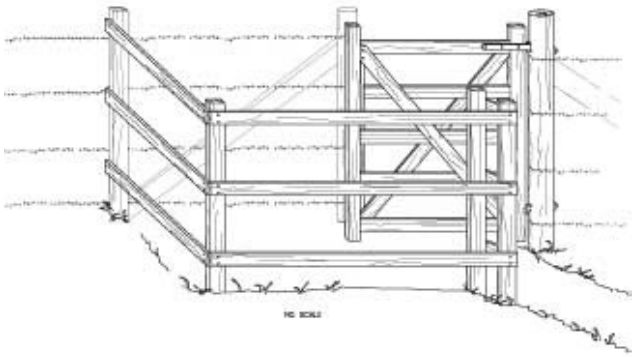


Figure 3. Timber Kissing Gate—Modification for Existing Fence Opening for Wheelchair Accessibility
click image for technical drawing

Horse Accessible Gates

Another concern was finding a way to allow horse and pedestrian access, while restricting ATVs and motorcycles. Two types of structures that will allow horse access, but restrict ATVs, are the "V" gates used at the Ashley National Forest (figures 4 and 5) and at the Lolo National Forest (figure 6).



Figure 4. A horse walking through a "V" gate in Utah. This gate is not accessible because it is narrower than the minimum width required for passage of a wheelchair (32 inches) and the bar across the opening is higher than 1 inch.



Figure 5. "V" Horse Gate with Wheelchair Accessibility click image for technical drawing

The bottom log should be removed from the gate shown in figure 6 because the log could be a tripping hazard and it prevents wheelchair access. A horse stile restricts ATVs and motorcycles and discourages mountain bikes, while allowing passage by horses (figure 7).



Figure 6—A gate in the Lolo National Forest that allows horses to pass, but restricts ATVs. This gate is not accessible because it is narrower than the minimum width required for passage of a wheelchair (32 inches) and the bar across the opening is higher than 1 inch.



Figure 7—A horse stile. This gate is not accessible because the bars across the opening are higher than 1 inch.

Combination Wheelchair/Horse Accessible Gates

The greatest challenge was to find a gate that allowed horses and wheelchairs to pass, but restricted all motorized traffic. The "V" gate design (see figure 5) allows wheelchairs and horses, but only restricts ATVs—not motorcycles. We combined the kissing gate (see figure 1) with the horse stile to design the horse gate with wheelchair accessibility (figure 8). Wheelchairs are able to go into the center of the gate, turn around and go out the other side. Horses can walk over the two stiles. The gate dimensions work well together because the required turning diameter for a wheelchair is 60 inches. This corresponds to the minimum required spacing of the stiles for horses to step over them in stride. The stile should be no higher than 12 inches because horses may choose to jump over stiles that are higher.

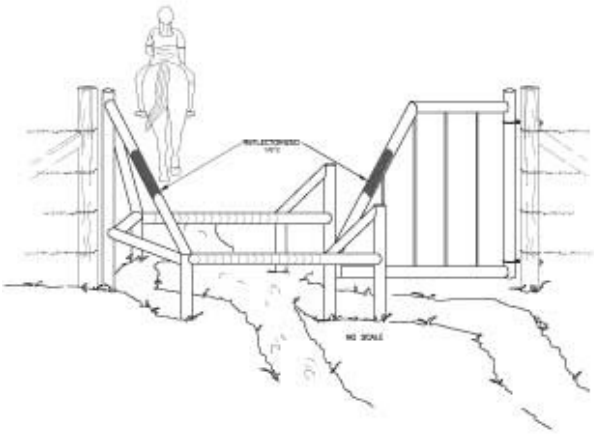


Figure 8. Horse Gate with Wheelchair Accessibility
click image for technical drawing

Road Closure Drawings

Many forest roads are closed to motor vehicle traffic by gates or other types of barriers. Often, foot travel is allowed beyond the restriction device. When foot travel is encouraged on the other side of the barrier, passage for someone in a wheelchair must be provided. The road closure drawings (figures 9 and 10) show four different ways to allow wheelchair access around a road closure gate, while restricting ATV use.

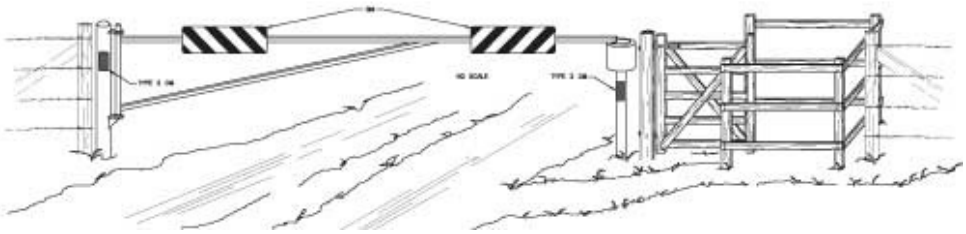


Figure 9. Forest Road Closure Gate with Wheelchair Accessibility
click image for technical drawing

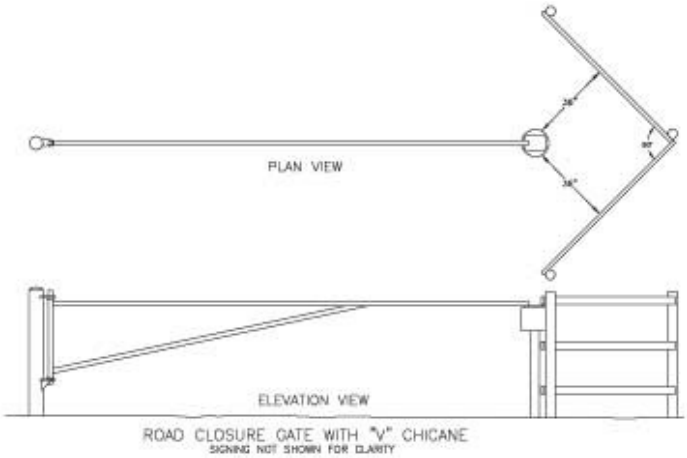


Figure 10. Plan View and Elevation View of
Forest Road Closure Gate with "V" and "U" Chicanes
for Horse and Wheelchair Accessibility
click image for technical drawing

Another concern is not having enough room to allow both horse and wheelchair access around a road closure barrier. This may be remedied by installing an accessible gate for wheelchair access (see figures 9 and 10) and replacing the road gate with a horse-friendly barrier (figure 11). The kissing gate (see figure 1) may be added adjacent to a cattleguard on a road to allow wheelchair access, while restricting cattle.

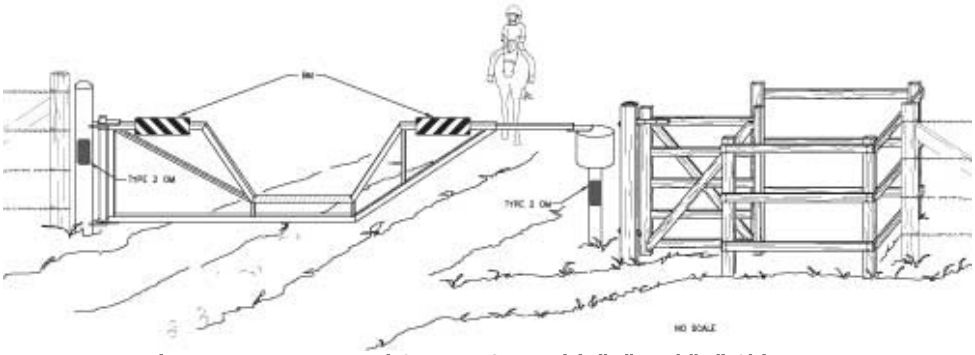


Figure 11. Forest Road Closure Gate with "V" and "U" Chicanes for Horse and Wheelchair Accessibility
click image for technical drawing

Signs

Mountain bikes, motorcycles, and small ATVs may be able to maneuver around obstacles and gates. In these cases, signs should be considered for additional travel management. All signs (including object markers) must meet the requirements of the Sign and Poster Guidelines for the Forest Service (EM 7100-15), chapter 6. Additionally, signs are required when mountain bikes or motorized vehicles are allowed on Forest Service trails.

Summary

This project developed drawings for gates that meet the accessibility requirements for wheelchairs, horses, or both, but restrict motorized vehicle access. The new gates can help the Forest Service fulfill its policy of universal design, providing access to public lands for all people.

Web Sites for Gate Designs and Suppliers in the United Kingdom

- **Scottish Natural Heritage**
  - http://www.snh.org.uk/publications/on-line/accessguide/gates.asp
- **BTCV (British Trust for Conservation Volunteers)**
  - http://handbooks.btcv.org.uk/handbooks/content/section/2372
- **Bushey and District Footpaths Association (BADFA)**
  - http://www.badfa.org.uk/gates&stiles/GATES.htm
- **Centrewire Ltd.**
  - http://www.centrewire.com/
- **Jackson's Fine Fencing**
  - http://www.jacksons-fencing.co.uk/pages/products/timber_prod_range.aspx?tc1=BD

Other Accessibility Web Sites

- **American Trails**
  - http://www.americantrails.org/resources/accessible/
- **National Center on Accessibility**
  - http://ncaonline.org/index.php?q=taxonomy/term/138/
- **USDA Forest Service—Accessibility**
  - http://www.fs.fed.us/recreation/programs/accessibility/

Other Related Projects

Beneficial Designs, Inc., is working on a project called *Designing an Accessible Vehicle Barrier for Trails. Beneficial Designs, Inc.*

Beneficial Designs, Inc.
2240 Meridian Blvd., Suite C
Minden, NV 89423-8628
Phone: 775-783-8822
Fax: 775-783-8823
Web site: http://beneficialdesigns.com/169/

Acknowledgments

For information and assistance, the author would like to thank Ellen Eubanks, San Dimas Technology and Development Center; Gina Reese, Ashley National Forest; Donna Sheehy, Northern Region; and Janet Zeller, Washington Office.

Thanks to MTDC's publication and photography staffs, especially Sunni Bradshaw, for technical support and to Deb Mucci for design drawings.

Drawings

The drawings in this tech tip are available on this disc.

These drawings can be viewed by Forest Service and Bureau of Land Management employees on their internal computer network at: http://fsweb.wo.fs.fed.us/eng/facilities/accrec/gates/

About the Author

James "Scott" Groenier, professional engineer, began working for MTDC as a project leader in 2003. Scott earned a bachelor's degree in civil and environmental engineering from the University of Wisconsin at Madison and a master's degree in civil engineering from Montana State University. He worked for the Wisconsin and Illinois State Departments of Transportation and with an engineering consulting firm before joining the Forest Service in 1992. He worked as the east zone structural engineer for the Eastern Region and as a civil engineer for the Ashley and Tongass National Forests before coming to MTDC.

Additional single copies of this publication may be ordered from:
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Missoula Technology and Development Center
5785 Hwy. 10 West
Missoula, MT 59808–9361
Phone: 406–329–3978
Fax: 406–329–3719
Email: wo_mtdc_pubs@fs.fed.us

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http://fsweb.mtdc.wo.fs.fed.us/search/

For additional information contact MTDC:
Phone: (406) 329-3900
Fax: 406–329–3719

Countryside Service

Kissing Gates

Countryside Service Design Standards (2013)

Any structure on a path will impede use and so a gap in the fence/hedge is always preferred; a gap is also virtually maintenance and cost-free. If a structure is required, for example to prevent livestock getting into or out of an area, the best option is a gate; a kissing gate is less accessible than a standard gate and so should only be considered if conditions make a standard gate unsuitable.

Kissing gates should only be used on paths which are open solely to walkers. If the path is used by cyclists or horse-riders a kissing gate will generally be unsuitable. Kissing gates are not permitted on Bridleways, Restricted Byways or BOATS.

Responsibilities

Landowners are legally responsible for the maintenance of, and are liable for, any gates on public rights of way over their land. Landowners are legally obliged to obtain permission from the County Council before installing any additional (not replacement) gates or stiles.

The County Council is willing to contribute substantially towards the cost of a kissing gate where it replaces an existing stile and there is significant evidence that a gap or gate is not suitable.

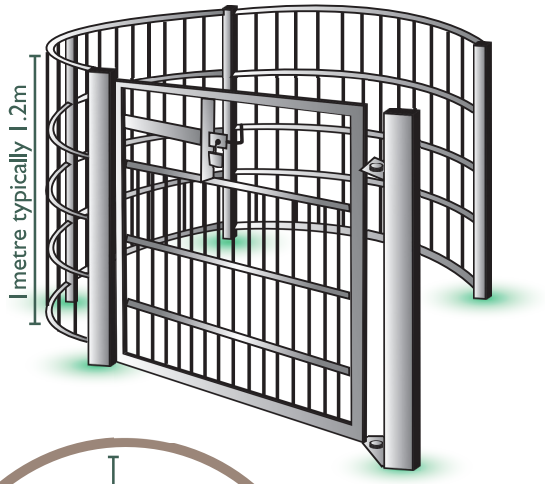
Gate Design

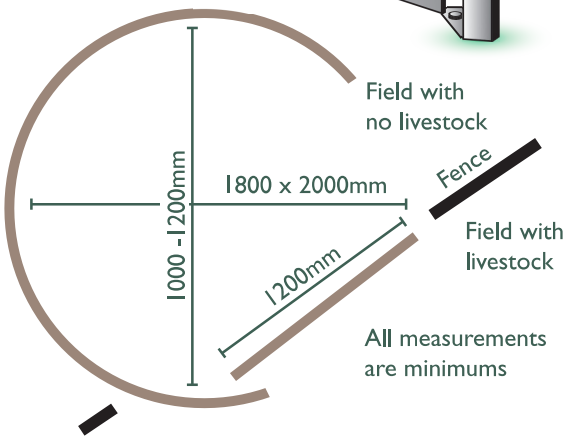
- Kissing gates are available in different widths; the County Council's default is to use the largest gate which the site will allow, which gives easy passage for pushchairs, dogs and people with mobility difficulties. The default is to use gates which have provision for Radar padlocks, as these allow wheelchair users to open the gate past the posts and also these also facilitate access for mowers and maintenance equipment.
- At absolute minimum, the internal manoeuvring space should be one that allows a one metre diameter cylinder to pass through the gate.
- If livestock are present the gate should swing closed on its own; see also diagrams showing siting and the 'livestock' section overleaf.
- Latches, if fitted, should be visible, accessible and simple to operate from both sides of the gate; a simple lifting latch is preferred.
- There should be good hard ground either side of the gate and within the enclosure.
- Barbed wire and electric fencing must not be attached to the gateposts; if present, it should be attached to an adjacent but separate post, ideally 1metre away.

Wood or Metal?

Both wooden and metal gates are used in Hampshire; the decision on which to use is guided by the specific location, level and type of use, budget and aesthetics.

Metal gates last longer (25 years or more), are more expensive and are usually more simple to install as they are pre-formed and part assembled, ensuring the correct distances and angles. They can also be more easily made stock-proof – many gates incorporate mesh already (to keep smaller animals from escaping). Gate posts should be dug in to approx 900mm and enclosure posts.





This guidance is suitable for most situations in Hampshire; for further advice email **countryside@hants.gov.uk** or call **0845 603 5636**

Hampshire County Council

www.hants.gov.uk

Metal kissing gate components:

1 x hanging post 60mm diameter x 1.9m long

1 x gate 1.2m wide x approx 1-1.2m high

1 x circular compound 1.2m approx high

Maximum length needed in fence line 2.6m

Wooden gates

Wooden gates are usually softwood and slightly cheaper but will not last as long (typically 10 years) and will need occasional maintenance as the posts move over time and use, affecting the swing and closure of the gate. They are more difficult to install correctly than metal gates. The hanging post should be sunk into the ground by 1100mm and the other posts by 700mm approx.

Wooden kissing gate components:

1 x Hanging post 160mm x 160mm x 2.4m

2 x Closing posts 100mm x 100mm x 2m

2 x Corner posts 100mm x 100mm x 2m approx

1 x Gate 1.2m width x approx 1-1.2m high

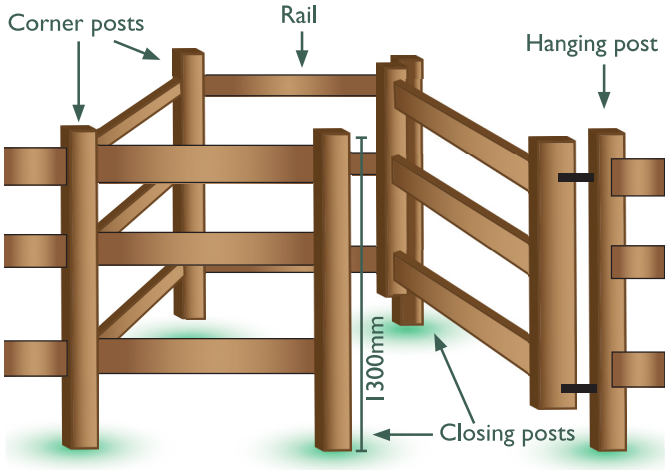
1 x Hinge set

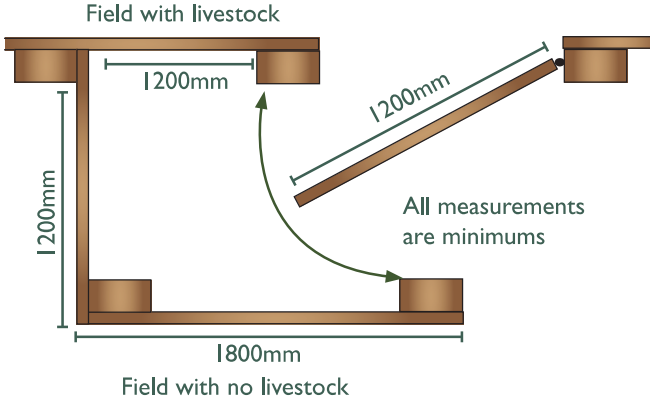
1 x Latch (if needed) Plus either

15m length x 100mm x 50mm for 3 Rails or

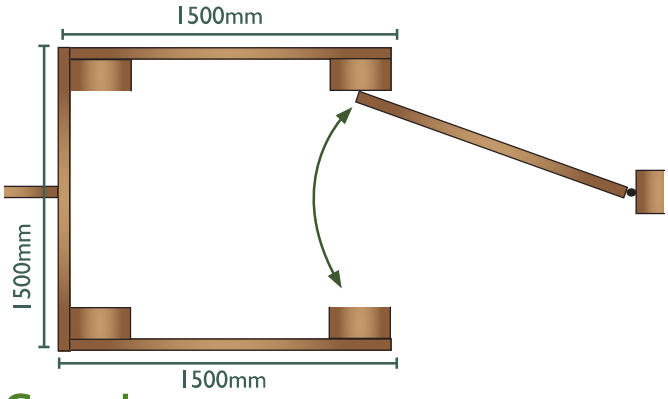
20m length x 100mm x 50mm for 4 Rails (4 makes the structure more stockproof)

Maximum length needed in fence line 3m





Alternative fence-line arrangement:



Ground

The ground around the gate and within the enclosure will become well trampled and so may be prone to getting muddy. If this is likely, use a material such as scalpings to protect the ground to around a metre either side.

Livestock

- If livestock are present, the gate should be fitted with self-closing hinges; mesh or closely-spaced rails should be used across the bottom half of the enclosure and the gate.
- Cattle and horses kept in adjoining fields have the strength to damage the gate enclosure so its best to install it so that it sits flush with the fenceline (see metal gate aerial diagram and first wooden gate aerial diagram).
- If livestock are present on both sides a judgement should be made as to the best siting.
- In areas of deer fencing please contact us for advice.

Installation Tips

- A wooden gate will require five post holes and time to get the posts upright, the correct distance apart and the gate to swing correctly.
- A metal gate typically has an H frame which fixes the angles, distances and hinges and the hoops are pre-formed, so is easier to set up but will require a trench dug across the path as well as 4 holes, to sink the frame and hoops into.
- Make holes in the ground as narrow as possible and backfill with well-rammed earth and stones. Post-crete (a quick-set cement mix) may be required where ground conditions prevent the post hole being dug to the full depth or there is a danger of it being removed.
- On wooden gates the top hinge pin should point downwards and the lower one should point upwards –this prevents someone just lifting the gate off. An extra nut and plenty of grease on the lower hinge will make future maintanance easier.
- Be particularly careful not to disturb underground services and take all normal precautions for working outdoors, with manual or power tools and lifting and handling.
- This is necessarily brief—further guidance is available from County Council officers.

SCOTTISH NATURAL HERITAGE

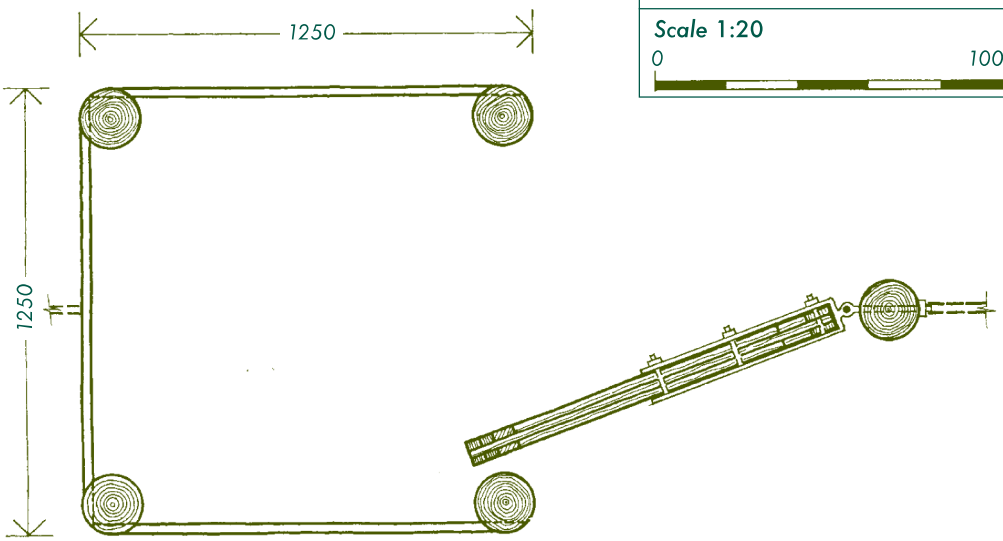
Information Sheet **No.2.16**

Deer Fence Kissing Gate

2.16A Plan

Scale 1:20

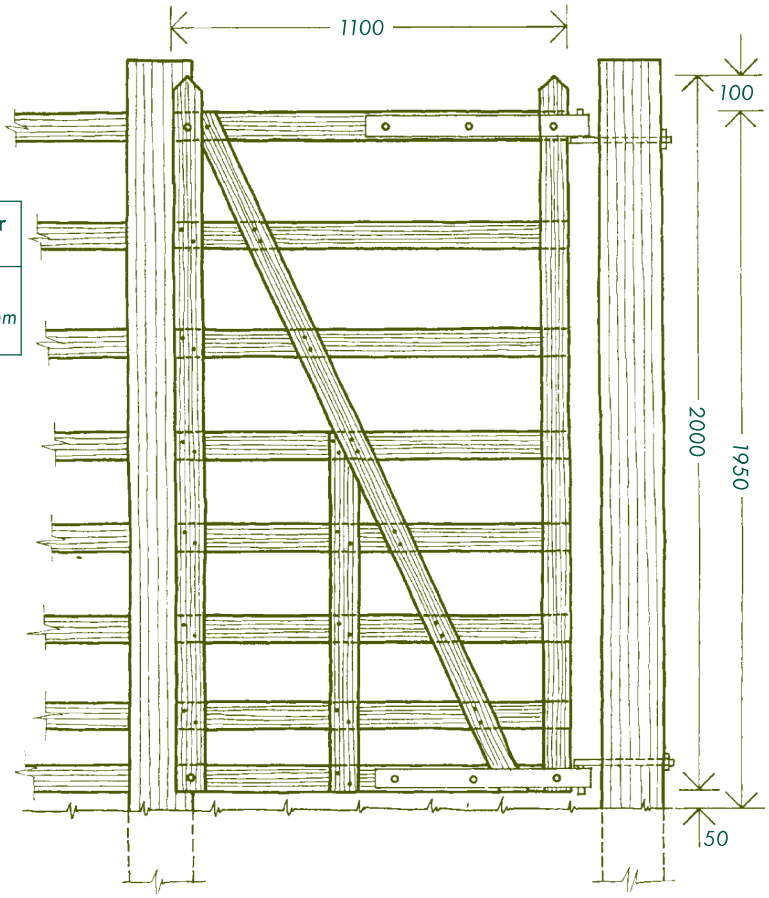
0 1000mm



2.16B Side Elevation (showing only far side of kissing enclosure)

Scale 1:20

0 1000mm



Conforms to BS 5709	Stockproof	Ease of use for Pedestrians	Accessible to Motorised Wheelchair Users	Accessible to Manual Wheelchair and Pushchair Users	Accessible to Horseriders	Accessible to Pedal Cyclists	Accessible to Motorcyclists
✘	✓	😐	✘	✓	✘	✓[1]	✘

[1] accessible but not very convenient or suitable for the purpose

SCOTTISH NATURAL HERITAGE

• Notes

A kissing gate, specifically designed for installation in deer fences, which is currently used on the West Highland Way.

It can be conveniently used by pedestrians, including walkers with large rucksacks. Although its suitability for other users has not been tested, it is likely to be accessible to single (and possibly double) pushchairs and people in manual wheelchairs, although the size and weight of the gate may cause problems for some users. Cycles could be taken through if tipped up on the back wheel. It will not be accessible to motorised-wheelchair users.

The gate is fabricated wholly from rails and is based on the design detailed in Information Sheet 2.5 but with a total gate height of 2000 rather than 1170. To reduce its overall weight, this gate is fabricated from 75 x 25 rails rather than 88 x 38 rails.

The internal width of the enclosure is 1200 although the use of large support posts restricts the accessible width to approximately 900. The effective depth of the enclosure (from the back of the enclosure to the end of the gate in its central position) is approximately 950. These dimensions mean that the design does not conform to BS5709.

The design on the West Highland Way is not fitted with self-closing hinges: it is possible that with a gate of these dimensions, such hinges would not function properly. It is completely effective against deer but it is understood that some hill sheep and lambs may be able to get through; this could be overcome by installing an internal V enclosure as detailed in Information Sheet 2.9.

• Construction and Installation Details

Gate Hanging Post : 1 no. 3500 (min.) x 175 diam. round; erected to a top height of 2075 above ground level.

Enclosure Posts : 4 no. 3500 (min.) x 175 diam. round; erected to a height of 2075 above ground level.

Enclosure Rails : 8 no. rows of 75 x 25 rails (c. 1250 long) on each side and on the back. All erected to a top height of 1950 above ground level.

Gate Fabrication : all from 75 x 25 rails (see Information Sheet 2.5 for construction details).

Hinges : Top - 600 double strap band with normal eye.

Bottom - 600 double strap band with normal eye.

Given the height of this structure, the gate hanging and enclosure posts should be fixed firmly in the ground. Make the hole as narrow as possible and backfill with well rammed earth and stones. Concreting should not be necessary, except where ground conditions prevent the hole being dug to the full depth.

The bottom hinge pin should be reversed, if necessary, to prevent gate removal.

• Design Source and Contacts for Further Information

Design Source and Contact : Access and Rural Skills Department, Loch Lomond and The Trossachs National Park, Balloch Castle, Balloch, Dunbartonshire. G53 8LX. Tel. 01389 722600.

• User Notes : Design Modifications and Reference Information

From: Doodle
To: Steve Kallin
Subject: Doodle: "Adaptive Management Plan Meeting" Update
Date: Wednesday, July 15, 2015 1:11:42 PM



View this poll on your dashboard

Hi Steve Kallin,

"cris dippel" just participated in the poll "Adaptive Management Plan Meeting"

Go to poll **Close poll**

Doodle is also available for iOS and Android.



If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "Adaptive Management Plan Meeting" Update
Date: Wednesday, July 15, 2015 3:55:05 PM

View this poll on your dashboard

Hi Steve Kallin,

"Kerry Murphy" just participated in the poll "Adaptive Management Plan Meeting"

Go to poll **Close poll**

Doodle is also available for iOS and Android.

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: "Adaptive Management Plan Meeting" Update
Date: Friday, July 17, 2015 8:10:47 AM

View this poll on your dashboard

Hi Steve Kallin,

"Brad Hovinga" has changed information in your poll "Adaptive Management Plan Meeting."

Go to poll

Doodle is also available for iOS and Android.

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Steve Kallin
To:	Brad Hovinga; Doug Brimeyer; Susan (Sue) Consolo-Murphy; Sarah Dewey; Dale Deiter; Kerry Murphy; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Cain
Subject:	SAVE THE DATE - AMP Meeting Monday, August 3, 12:30 PM to 4:00 PM
Date:	Monday, July 20, 2015 2:06:34 PM

Hello Everyone:

The best day/time for the next AMP Meeting is on Monday, August 3, from 12:30 to 4:00 PM. The purpose of this meeting is to discuss the latest draft of the Adaptive Management Plan. You will receive a copy of the latest draft by the end of this week, which should provide you a week to review the plan. For those that will not be able to attend, we would really appreciate your comments or suggested changes. Please use the Track Changes feature in Word, and send me the Draft AMP with your comments/changes before the next meeting.

You will receive the draft plan later this week. Thanks again for all of your help,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

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675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From:	Steve Kallin
To:	Brad Hovinga; Doug Brimeyer; Susan (Sue) Consolo-Murphy; Sarah Dewey; Dale Deiter; Kerry Murphy; Jeffrey Warren; Cris Dippel; Eric Cole; Steve Cain
Subject:	SAVE THE DATE - AMP Meeting Monday, August 3, 12:30 PM to 4:00 PM
Date:	Monday, July 20, 2015 2:06:29 PM

Hello Everyone:

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Fax: (307) 733-9729
steve_kallin@fws.gov

From:	Will Meeks
To:	Keenan Adams
Subject:	RE: Talked with Jeff Warren
Date:	Tuesday, July 21, 2015 8:36:41 AM

When were you and Blenden getting back with me on next steps? That's how I remember it.

Will Meeks
U.S. Fish and Wildlife Service, Region 6
Acting ARD External Affairs (through September 2015)
303-236-4510 (w)
720-541-0310 (c)

From: Adams, Keenan [mailto:keenan_adams@fws.gov]
Sent: Tuesday, July 21, 2015 8:21 AM
To: Will Meeks
Subject: Talked with Jeff Warren

Said if you're going to make a decision (NER), it would be best that you do it quickly, otherwise, we will not be able to set up the science to analysis the response.

--
Keenan Adams
Chief, Division of Biological Resources
National Wildlife Refuge System
Mountain-Prairie Region
Lakewood, CO
303-236-8102 (Office)

Make everything as simple as possible, but not simpler. ~Albert Einstein

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U.S. Fish and Wildlife Service, Region 6
Acting ARD External Affairs (through September 2015)
303-236-4510 (w)
720-541-0310 (c)

From: Adams, Keenan [mailto:keenan_adams@fws.gov]
Sent: Tuesday, July 21, 2015 8:21 AM
To: Will Meeks
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Chief, Division of Biological Resources
National Wildlife Refuge System
Mountain-Prairie Region
Lakewood, CO
303-236-8102 (Office)

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From: Will Meeks
To: Mike Blenden
Cc: Keenan Adams; Maureen Gallagher
Subject: NER
Date: Tuesday, July 21, 2015 8:54:26 AM

Mike,

I need to push you for a recommendation on a path forward re: the Adaptive Management Plan at the Elk Refuge.

As you know, I am not going to Matt/Noreen and telling them we've slipped a year. Please get me something by the end of the week.

Thanks.

Will Meeks
U.S. Fish and Wildlife Service, Region 6
Acting ARD External Affairs (through September 2015)
303-236-4510 (w)
720-541-0310 (c)

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Thanks.

Will Meeks
U.S. Fish and Wildlife Service, Region 6
Acting ARD External Affairs (through September 2015)
303-236-4510 (w)
720-541-0310 (c)

From: Blenden, Mike
To: Steve Kallin
Subject: Fwd: NER
Date: Tuesday, July 21, 2015 11:48:49 AM

Let's talk. I need to give Will something other than what I've given so far.

---------- Forwarded message ----------
From: **Will Meeks** <Will_Meeks@fws.gov>
Date: Tue, Jul 21, 2015 at 8:54 AM
Subject: NER
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Keenan Adams <keenan_adams@fws.gov>, Maureen Gallagher <maureen_gallagher@fws.gov>

Mike,

I need to push you for a recommendation on a path forward re: the Adaptive Management Plan at the Elk Refuge.

As you know, I am not going to Matt/Noreen and telling them we've slipped a year. Please get me something by the end of the week.

Thanks.

Will Meeks

U.S. Fish and Wildlife Service, Region 6

Acting ARD External Affairs (through September 2015)

303-236-4510 (w)

720-541-0310 (c)

--

Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

From: Cole, Eric
To: Steve Kallin
Subject: Notes on feeding cessation criteria
Date: Wednesday, July 22, 2015 1:00:31 PM

Based on status quo management, the average NER feeding termination date is April 2nd, but there is considerable annual variation in the feeding termination date depending on the persistence of Spring snow-pack (range March 20-April 20).

Current feeding termination criteria are generally based on there being enough snow free ground for elk to find natural forage. Typically the last day of supplemental feeding occurs within one week of the first day that snow-pack reaches zero at the NER Headquarters snow monitoring site. Under status quo management, we begin reducing elk and bison feed rations when the HQ snow-pack measurement first reaches zero, and feeding ends about 1 week after that date. 2016 will be the first season that we terminate feeding 1-week earlier than status quo management, and our goal will be to end feeding near the time that snow pack reaches zero at the Headquarters monitoring site. This sounds easy enough, but because we gradually reduce feed rations to enable elk and bison time to adjust to natural forage, it will require predicting the date of zero snow pack at the Headquarters monitoring site about 1 week in advance. We can use historic snow depth data in combination with weather forecasts to predict this date each season, but there will be considerable error associated with this prediction.

Over time, monitoring will be enhanced to better quantify feeding cessation date including the use of photo points to quantify percent snow versus bare ground on NER and southern GTNP, and as we accumulate more data this will allow us to better predict when feeding cessation should occur relative to our objective of ending feeding one week earlier than the status quo. However these data have not been collected to date.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

From: julian.j.maskeroni@dot.gov
To: cris_dippel@fws.gov; dgustafson@tetonwyo.org; steve_kallin@fws.gov
Cc: Thomas.Bonar@dot.gov; glundberg@yeh-eng.com
Subject: WY NAEL - Cattle Guards
Date: Friday, August 07, 2015 1:49:49 PM
Attachments: WY NAEL_Cattle Guard.pdf

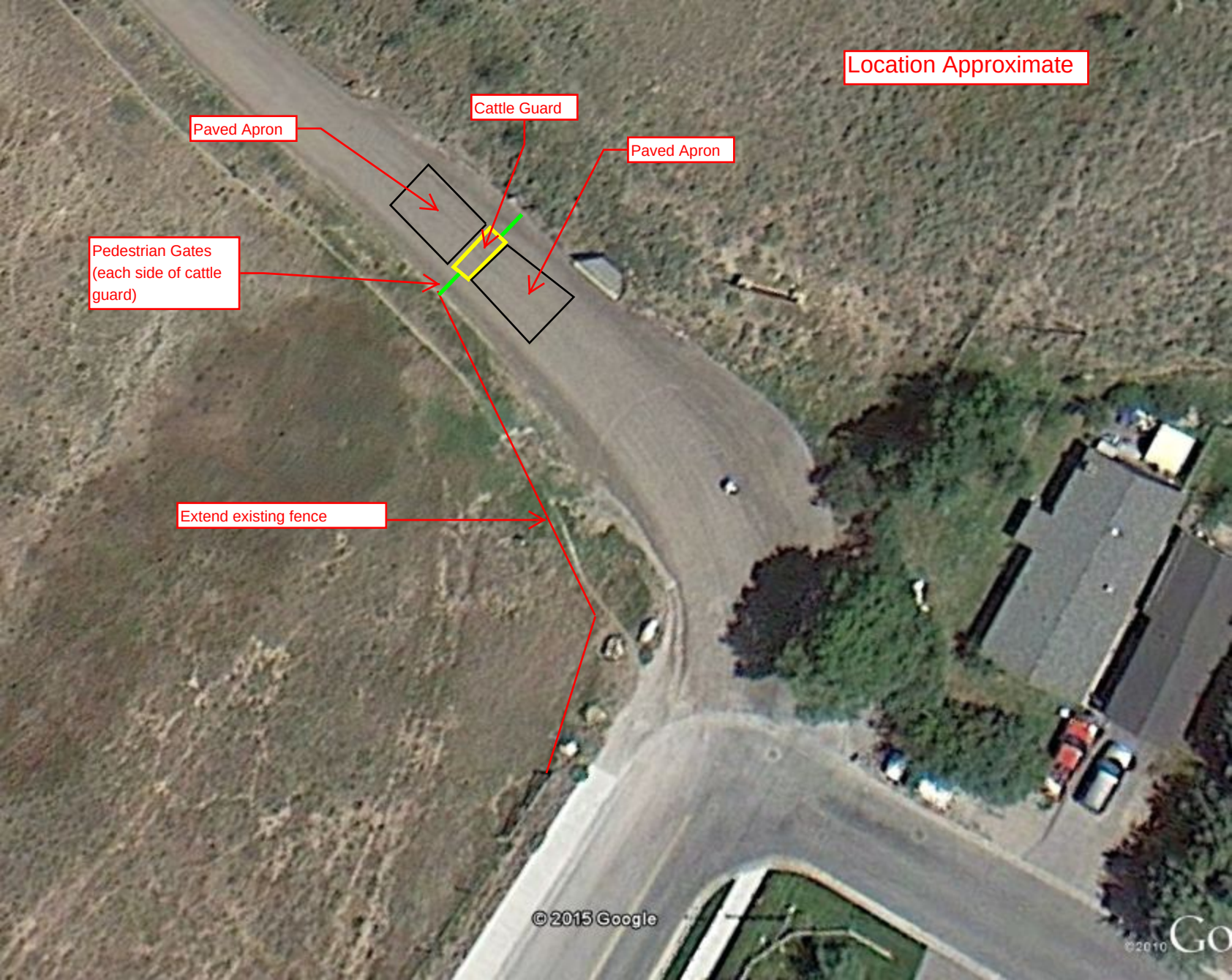
Gents,

Attached is a quick sketch of what we discussed Wednesday regarding the cattle guard/gate layout.

As discussed, CFL has executed a modification to install the cattle guards (width to be determined) and pave the approach aprons no each side. The FWS will determine what type/size of gates needed and will install them separately along with extending the existing fence.

Thanks,

Julian Maskeroni
Project Manager/Construction Operations Engineer
Federal Highway Administration
Central Federal Lands Highway Division
Office: 720-963-3721
Cell: 720-626-7207


Location Approximate
Cattle Guard
Paved Apron
Paved Apron
Pedestrian Gates (each side of cattle guard)
Extend existing fence
© 2015 Google

From: Will Meeks
To: Maureen Gallagher
Subject: Accepted: Discuss Elk AMP

From: Will Meeks
To: Maureen Gallagher
Subject: Accepted: Discuss Elk AMP

From: Steve Kallin
To: julian.j.maskeroni@dot.gov
Cc: Cris Dippel
Subject: RE: WY NAEL - Cattle Guards
Date: Thursday, August 20, 2015 3:31:49 PM

Julian:

Thanks for your suggestions and help on this project. I believe we will end up with a structure that will allow public use of the road but prevent bison/elk from entering Jackson through this route.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: julian.j.maskeroni@dot.gov [mailto:julian.j.maskeroni@dot.gov]
Sent: Friday, August 07, 2015 1:49 PM
To: cris_dippel@fws.gov; dgustafson@tetonwyo.org; steve_kallin@fws.gov
Cc: Thomas.Bonar@dot.gov; glundberg@yeh-eng.com
Subject: WY NAEL - Cattle Guards

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Julian Maskeroni
Project Manager/Construction Operations Engineer
Federal Highway Administration
Central Federal Lands Highway Division
Office: 720-963-3721
Cell: 720-626-7207

From: Mike Blenden
To: Will Meeks
Subject: Kallin meeting
Date: Thursday, August 20, 2015 7:32:35 PM

Will, After our meeting with Matt H. on Monday I came away understanding he wanted me to find a time when Steve could meet with him and Noreen again about the AMP. Steve is more than willing to do so next week or sometime after mid September. Unless you read things differently I will work with Maureen, Steve and Kris to make that all happen. I assume you would want to be involved in both of your roles in EA and Refuges. Let me know if you have other thoughts.

Sent from my iPad

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Date: Thursday, August 20, 2015 7:32:35 PM

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Sent from my iPad

From: Will Meeks
To: Mike Blenden
Subject: Re: Kallin meeting
Date: Friday, August 21, 2015 5:35:13 AM

My understanding too. Sooner the better I'd say. Probably good to characterize the discussion Hogan has with us to Maureen.

Will Meeks
U.S. Fish and Wildlife Service
Mountain Prairie Region
Assistant Regional Director
External Affairs (acting through September 2015)
303-236-4510 (w)
720-541-0310 (c)

> On Aug 20, 2015, at 10:54 PM, Mike Blenden <mike_blenden@fws.gov> wrote:
>
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> in EA and Refuges. Let me know if you have other thoughts.
>
> Sent from my iPad

From: matt_hogan@fws.gov
To: Mike Blenden; Steve Kallin; Maureen Gallagher
Subject: AMP & Final CCP Briefings

From: eric_cole@addthis.com on behalf of eric_cole@fws.gov
To: steve_kallin@fws.gov
Subject: eric_cole@fws.gov has shared something with you
Date: Tuesday, August 25, 2015 12:46:47 PM

Steve, I'm not sure if you have seen this, but the article and particularly the associated comments might be useful to send to the RO to give them some idea about the importance of public outreach and monitoring associated with the Step Down Plan.

http://www.jhnewsandguide.com/opinion/columnists/cowboy_common_sense/what-really-happens-if-we-stop-feeding-elk/article_792e8bed-a6bf-5389-8252-53854453720a.html#.Vdy38gXMZtY.email

--- This message was sent by eric_cole@fws.gov via http://addthis.com. Please note that AddThis does not verify email addresses.

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From:	Steve Kallin
To:	Mike Blenden
Cc:	Cris Dippel; Lori Iverson
Subject:	"What really happens if we stop feeding elk"; Jackson Hole News and Guide with community comments
Date:	Wednesday, August 26, 2015 11:43:49 AM

Mike:

The attached link is to the local article and discussion concerning elk feeding.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: eric_cole@addthis.com [mailto:eric_cole@addthis.com] **On Behalf Of** eric_cole@fws.gov
Sent: Tuesday, August 25, 2015 12:46 PM
To: steve_kallin@fws.gov
Subject: eric_cole@fws.gov has shared something with you

Steve, I'm not sure if you have seen this, but the article and particularly the associated comments might be useful to send to the RO to give them some idea about the importance of public outreach and monitoring associated with the Step Down Plan.

http://www.jhnewsandguide.com/opinion/columnists/cowboy_common_sense/what-really-happens-if-we-stop-feeding-elk/article_792e8bed-a6bf-5389-8252-53854453720a.html#.Vdy38gXMZtY.email

--- This message was sent by eric_cole@fws.gov via http://addthis.com. Please note that AddThis does not verify email addresses.

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From:	Steve Kallin
To:	Susan (Sue) Consolo-Murphy
Cc:	Cris Dippel; Eric Cole; Kerry Murphy; Steve Cain
Subject:	RE: AMP
Date:	Tuesday, September 08, 2015 4:26:26 PM

Hi Sue:

Welcome back! Glad you had a good trip.

We have an updated Draft Step Down Plan but we are awaiting information from the WGFD. Sounds like the WGFD Wildlife Administration Office has questions. Brad Hovengay will participate in a WFGD conference call on Sept. 25, which may clarify their questions/concerns.

I will keep you posted on our progress and send out an updated draft, which will include updated WGFD info, in advance of our next meeting. Keep in touch.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Consolo-Murphy, Susan (Sue) [mailto:sue_consolo-murphy@nps.gov]
Sent: Friday, September 04, 2015 11:26 AM
To: Steve Kallin
Subject: AMP

Hi Steve,

I regretted missing the last AMP meeting (but did not at all regret the great trip to the Alps). Are there notes of the meeting, and/or a revised draft of the plan coming soon that I can review? Thanks.

Sue Consolo-Murphy
Chief, Science & Resource Management
Grand Teton NP & the John D. Rockefeller, Jr. Memorial Parkway
P.O. Drawer 170
Moose, WY 83012
(307) 739-3481 (w)
(307) 690-8005 (c)
Sue_Consolo-murphy@nps.gov

From: Steve Kallin
To: Mike Blenden
Cc: Eric Cole; Cris Dippel
Subject: Draft Briefing Agenda for 9/18/2015
Date: Tuesday, September 08, 2015 5:36:05 PM
Attachments: Draft RO Briefing Agenda 9-18-2015.docx

Mike:

Please see the attached. I will contact you while I travel to the RO on September 17.

All the best,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

DRAFT

Agenda

Briefing with Deputy Regional Director, Region 6

National Elk Refuge CCP & Bison/Elk Management

September 18, 2015

1. **CCP**: Section 7 and Grizzly Bear Biological Opinion

2. **Bison/Elk Management**

    a. Background

        i. Community context

        ii. Management actions taken since 2007 Bison & Elk Management Plan

        iii. Adaptive Management Plan vs. Step Down Management Plan

    b. Summary of key recommendations by Planning Team (Draft Step Down Plan)

        i. Management actions

        ii. Proposed implementation schedule

        iii. Estimated cost

    c. Questions/concerns by Wyoming Game and Fish Department

From:	Matt Hogan
To:	Steve Kallin
Cc:	Maureen Gallagher; Mike Blenden
Subject:	RE: Step Down Plan Update
Date:	Monday, September 21, 2015 11:03:26 AM

You bet….we understand this is complicated and has lots of moving parts. Thanks for coming down.

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Monday, September 21, 2015 10:30 AM
To: Matt Hogan
Cc: Maureen Gallagher; Blenden, Mike
Subject: Step Down Plan Update

Matt:

Just wanted to thank you for taking the time last Friday for an update on the Bison and Elk Management Step Down Plan. We really appreciate your support and the opportunity to provide information that is vital to the successful implementation of management actions recommended by the multi-agency Planning Team.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Will Meeks
To: Matt Hogan (Matt_Hogan@fws.gov)
Subject: AMP
Date: Wednesday, September 23, 2015 1:26:00 PM

Matt,

Any updates from your meeting with Steve Kallin last Friday?

Will Meeks
U.S. Fish and Wildlife Service, Region 6
Acting ARD External Affairs (through September 2015)
303-236-4510 (w)
720-541-0310 (c)

From: Will Meeks
To: Matt Hogan (Matt_Hogan@fws.gov)
Subject: AMP
Date: Wednesday, September 23, 2015 1:26:00 PM

Matt,

Any updates from your meeting with Steve Kallin last Friday?

Will Meeks
U.S. Fish and Wildlife Service, Region 6
Acting ARD External Affairs (through September 2015)
303-236-4510 (w)
720-541-0310 (c)

From: Will Meeks
To: Matt Hogan
Subject: RE: AMP
Date: Wednesday, September 23, 2015 1:40:38 PM

Whenever is good for you. I'm hunkered in my office.

Will Meeks
U.S. Fish and Wildlife Service, Region 6
Acting ARD External Affairs (through September 2015)
303-236-4510 (w)
720-541-0310 (c)

From: Matt Hogan [mailto:matt_hogan@fws.gov]
Sent: Wednesday, September 23, 2015 1:32 PM
To: Will Meeks
Subject: Re: AMP

Yeah. Let's talk.

On Sep 23, 2015, at 1:27 PM, Will Meeks <Will_Meeks@fws.gov> wrote:

> Matt,
>
> Any updates from your meeting with Steve Kallin last Friday?
>
> Will Meeks
> U.S. Fish and Wildlife Service, Region 6
> Acting ARD External Affairs (through September 2015)
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Will Meeks
U.S. Fish and Wildlife Service, Region 6
Acting ARD External Affairs (through September 2015)
303-236-4510 (w)
720-541-0310 (c)

From: Matt Hogan [mailto:matt_hogan@fws.gov]
Sent: Wednesday, September 23, 2015 1:32 PM
To: Will Meeks
Subject: Re: AMP

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>
> Will Meeks
> U.S. Fish and Wildlife Service, Region 6
> Acting ARD External Affairs (through September 2015)
> 303-236-4510 (w)
> 720-541-0310 (c)

From: Will Meeks
To: "Steve Kallin"
Subject: meeting last week
Date: Tuesday, September 29, 2015 11:06:00 AM

Any update from the state re: AMP from last week's meeting? Thanks.

Will Meeks
U.S. Fish and Wildlife Service, Region 6
Acting ARD External Affairs (through October 2015)
303-236-4510 (w)
720-541-0310 (c)

From: Will Meeks
To: "Steve Kallin"
Subject: meeting last week
Date: Tuesday, September 29, 2015 11:06:00 AM

Any update from the state re: AMP from last week's meeting? Thanks.

Will Meeks
U.S. Fish and Wildlife Service, Region 6
Acting ARD External Affairs (through October 2015)
303-236-4510 (w)
720-541-0310 (c)

From:	Mike Blenden
To:	Steve Kallin
Cc:	Eric Cole; Cris Dippel
Subject:	Fwd: Thank you and follow-up questions
Date:	Monday, October 05, 2015 5:51:41 PM

Never mind my question. I didn't scroll down far enough in your message. Good work Eric and thank you!

Sent from my iPhone

Begin forwarded message:

> **From:** Mike Blenden <mike_blenden@fws.gov>
> **Date:** October 5, 2015 at 5:45:15 PM MDT
> **To:** Steve Kallin <steve_kallin@fws.gov>
> **Cc:** Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>
> **Subject: Re: Thank you and follow-up questions**
>
> Steve,
>
> I appreciate you sharing this with me as I do Eric's precise responses. What is the background? Was Eric invited to give the presentation following the JWM publication?
>
> Mike
>
> Sent from my iPhone
>
> On Oct 5, 2015, at 4:19 PM, Steve Kallin <steve_kallin@fws.gov> wrote:
>
> > Mike:
> >
> > Eric Cole recently gave a presentation about the NER supplemental feeding program to the National Academy of Sciences Brucellosis Committee. The committee followed up with a number of questions which Eric answered in a very succinct and informative manner. You may find the answers to these key questions helpful.
> >
> > Take care,
> >
> Steve Kallin
> Project Leader
> National Elk Refuge
> PO Box 510
> 675 East Broadway
> Jackson, WY 83001
> Phone: (307) 201-5409

Fax: (307) 733-9729
steve_kallin@fws.gov

From: Cole, Eric [mailto:eric_cole@fws.gov]
Sent: Thursday, October 01, 2015 6:05 PM
To: Yih, Peggy T
Cc: Steve_kallin@fws.gov; Cris Dippel
Subject: Re: Thank you and follow-up questions

Hello Peggy,

In response to the committee's follow up questions regarding the National Elk Refuge (NER)

1. How are the objectives determined in setting the number of elk on each of the feedgrounds? What is the carrying capacity, and how is that determined for all feedgrounds? (VR): How does that compare to actual population over the last 10 years?:

Relevant to the Jackson Elk Herd, NER manages a complex of 4 feeding areas which cover about 5,000 acres on the south end of the Refuge (see training handout 1_14_09.pdf attached), and Wyoming Game and Fish Department (WGFD) manages 3 additional feedgrounds in the Gros Ventre drainage. NER has no role in setting management objectives or covering costs for WGFD feeding operations in the Gros Ventre drainage.

There is a 5,000 elk objective for elk wintering on NER in the 2007 Bison and Elk Management Plan and Environmental Impact Statement (BEMP, USFWS and NPS 2007 a and b), but there are no sub objectives or carrying capacity estimates for the 4 feeding areas on the Refuge. The 5,000 refuge-wide elk objective was based on a carrying capacity model for the National Elk Refuge developed by Hobbs et al. in 2003. The Hobbs model predicted that NER could support 5,000 elk and 500 bison during winter months under average forage production and average winter severity. Feeding increases refuge carrying capacity to potentially unlimited levels if nutrition limitation was the only factor being considered, and the refuge has fed as many as 11,612 elk (in 1956) and 10,736 (in 1997) elk with mortality rates well below those found in unfed elk populations. Winter elk mortality on NER averages 1.5% under the current feeding regime. In the past 2 winters years NER has fed over 8,000 elk and the 10-year running average of elk on feed was 7,165. Once feeding operations begin in a given year, we feed whatever number of elk arrive, regardless of population objectives.

2. What is the rationale for maintaining 11,000 elk? What was your last count?

Herd wide population objectives are set by the Wyoming Game and Fish Department not NER. WGFD sets this objective using a public process, but in general the number is set to support desired elk hunting opportunities. In general the overall Jackson Elk Herd population has decline significantly since the mid 1990s, and based on last winter's count was very close to the 11,000 elk objective. Based on elk distribution at the time that BEMP was developed, it appeared possible to winter 5,000 elk on NER while maintaining 11,000 elk in the overall Jackson Elk Herd. However the percentage of the overall Jackson elk herd that winters on NER has increased since about 2000. In the early 2000s it was common for 50-60% of the Jackson Elk Herd to winter on NER. In recent years 70-75% of the Jackson Elk Herd has wintered on NER. As discussed at the NAS meeting the most likely explanation for the increasing percentage of the Jackson Elk Herd wintering on NER

is a distributional shift in wintering animals associated with wolves and a higher percentage of the Jackson Elk Herd summering immediately adjacent to NER (Cole and Foley et al. 2015). It not longer possible to maintain 11,000 elk in the Jackson Herd with only 5,000 elk wintering on NER given current elk distribution.

3. Could you provide the budgets over time for feedgrounds, and how that corresponds with changes in feed rations and elk populations? When did you transition from hay to pellets? Can you provide budgets detailing feed expense separate from labor, equipment, and other expense categories? Is this available by feedground to assess relationships to elk populations over time?

We do not have year to year cost estimates of refuge feeding operations. Smith (2001) estimated NER annual feeding costs under average conditions of (7,500 elk for 79 feeding days) of $337,488 in 1999 dollars. This did not include bison feeding costs which are roughly equivalent to 2.5 elk per bison. He broke down feeding cost per year in 1999 dollars as labor=$14,220, Fuel=$2,528, Alfalfa pellets= $320,740. He noted that WGFD and NER split pellet costs, but NER covers all other costs. His analysis did not include capital expenditures for feed equipment, feed storage sheds or administrative costs, but these are likely significant on an annualized basis.

We transitioned from baled hay to pellets in the 1970s. In my estimation, the odds of ending feeding entirely are greater than switching back to baled hay.

4. Have you conducted an impact assessment and EIS?

As mentioned in question 1, we conducted this analysis for the Bison and Elk Management Plan and EIS (USFWS and NPS 2007 a and b).

Literature cited:

Cole, E. K., Foley, A. M., Warren, J. M., Smith, B. L., Dewey, S. R., Brimeyer, D. G., Fairbanks, W. S., Sawyer, H. and Cross, P. C. 2015. Changing migratory patterns in the Jackson elk herd. Journal of Wildlife Management, 79: 877–886.

Hobbs, N. T., G. Wockner, and F. J. Singer. 2003. Assessing management alternatives for ungulates in the Greater Teton Ecosystem using simulation modeling. Unpublished report, Natural Resources Ecology Lab, Colorado State University, Fort Collins, CO.

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[USFWS and USNPS] U.S. Fish and Wildlife Service and National Park Service. 2007b. Bison and elk management plan. National Elk Refuge and Grand Teton National Park. http://www.fws.gov/bisonandelkplan/, accessed April 2015.

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I hope that this information is useful to the committee. Please let me know if you have further questions or need clarification to my responses.

Thanks,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

On Fri, Sep 25, 2015 at 4:07 PM, Yih, Peggy T <PYih@nas.edu> wrote:
Dear Eric,

On behalf of the committee, I wanted to thank you for taking time from your busy schedule to speak at their meeting last week at the Jackson Lake Lodge. Thank you for helping them learn more about the National Elk Refuge in relation to the issue of brucellosis.

In response to your presentation and the presentations of others, the committee came up with a list of questions that I hope you're willing to address (I've cc'ed Steve Kallin so that he's in the loop with the information request):

1. How are the objectives determined in setting the number of elk on each of the feedgrounds? What is the carrying capacity, and how is that determined for all feedgrounds? (VR): How does that compare to actual population over the last 10 years?

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equipment, and other expense categories? Is this available by feedground to assess relationships to elk populations over time?

4. Have you conducted an impact assessment and EIS?

I'd be glad to clarify any of those if you'd like more details or would like to better understand the nature of the request. Would it be feasible to respond to these questions in 2 weeks (by October 9)? If not, please let me know and I'd be happy to discuss a more workable timeline that would allow the committee to receive the information as it becomes available.

Please let me know if you have any questions. Thank you in advance! And have a great weekend.

Best,
Peggy

Peggy Tsai Yih
Senior Program Officer
Board on Agriculture and Natural Resources
The National Academies of Sciences, Engineering, and Medicine
500 Fifth Street, N.W.
Washington, D.C. 20001
Phone: (202) 334-3277
Fax: (202) 334-1978
E-mail: pyih@nas.edu



<training handout 1_14_09.pdf>

From:	Mike Blenden
To:	Maureen Gallagher; Keenan Adams; Will Meeks
Subject:	Fwd: Thank you and follow-up questions
Date:	Monday, October 05, 2015 5:55:15 PM
Attachments:	Untitled attachment 02060.htm training handout 1_14_09.pdf Untitled attachment 02063.htm

---

The following is an informative exchange between Eric Cole, biologist at the National Elk Refuge and the National Academy of Sciences Brucellosis Committee.

Sent from my iPhone

Begin forwarded message:

From: Steve Kallin <steve_kallin@fws.gov>
Date: October 5, 2015 at 4:19:07 PM MDT
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>
Subject: FW: Thank you and follow-up questions

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Project Leader
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PO Box 510
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Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
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Best,
Peggy

Peggy Tsai Yih
Senior Program Officer
Board on Agriculture and Natural Resources
The National Academies of Sciences, Engineering, and Medicine
500 Fifth Street, N.W.
Washington, D.C. 20001
Phone: (202) 334-3277
Fax: (202) 334-1978
E-mail: pyih@nas.edu

GOALS OF THE SUPPLEMENTAL FEEDING PROGRAM

1) Minimize elk starvation in all age/sex classes.

2) Support wintering elk numbers on NER consistent with the Elk and Bison Management Plan and EIS and Wyoming Game and Fish Department objectives

3) Minimize elk conflicts on surrounding lands including co-mingling with domestic livestock, elk damage to private property, and collisions with vehicles on Highway 89.

4) Feed bison as necessary to ensure that elk are adequately fed.

Research has shown that feeding alfalfa pellets reduces waste and is less labor intensive than feeding baled hay, but feeding pellets does present unique challenges: There is a dominance hierarchy on the feedgrounds whereby bison displace all elk age and sex classes from feed, mature bull elk displace other elk, and all elk and bison displace elk calves. Because alfalfa pellets are consumed quickly, it is critical that feed is distributed in an amount and manner that even the least dominant elements of the herd (elk calves) receive an adequate ration. In general this means that the feed must be distributed as thinly as possible, over as large an area as practical.

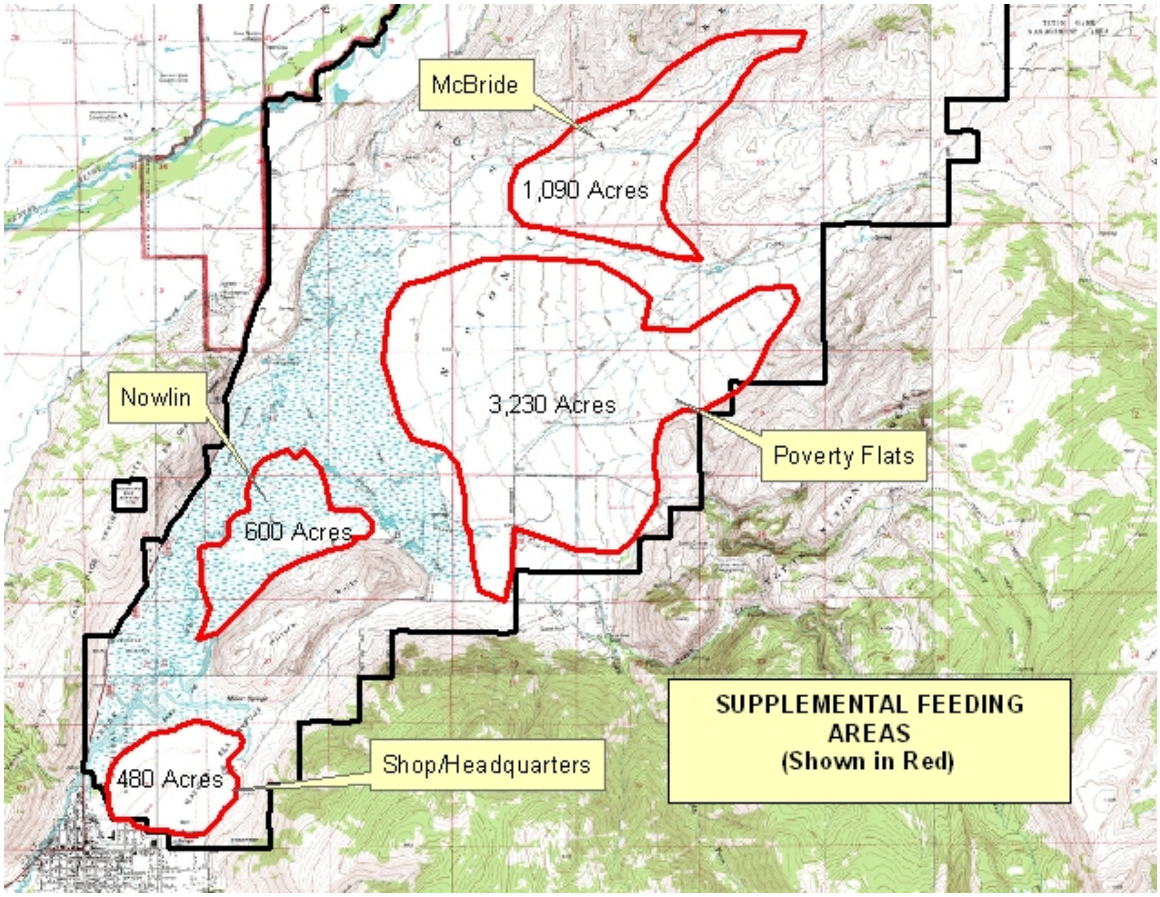


Figure 1. National Elk Refuge feedgrounds. McBride is primarily a bison feedground, and most elk are fed in the Shop, Nowlin and Poverty Flats areas.

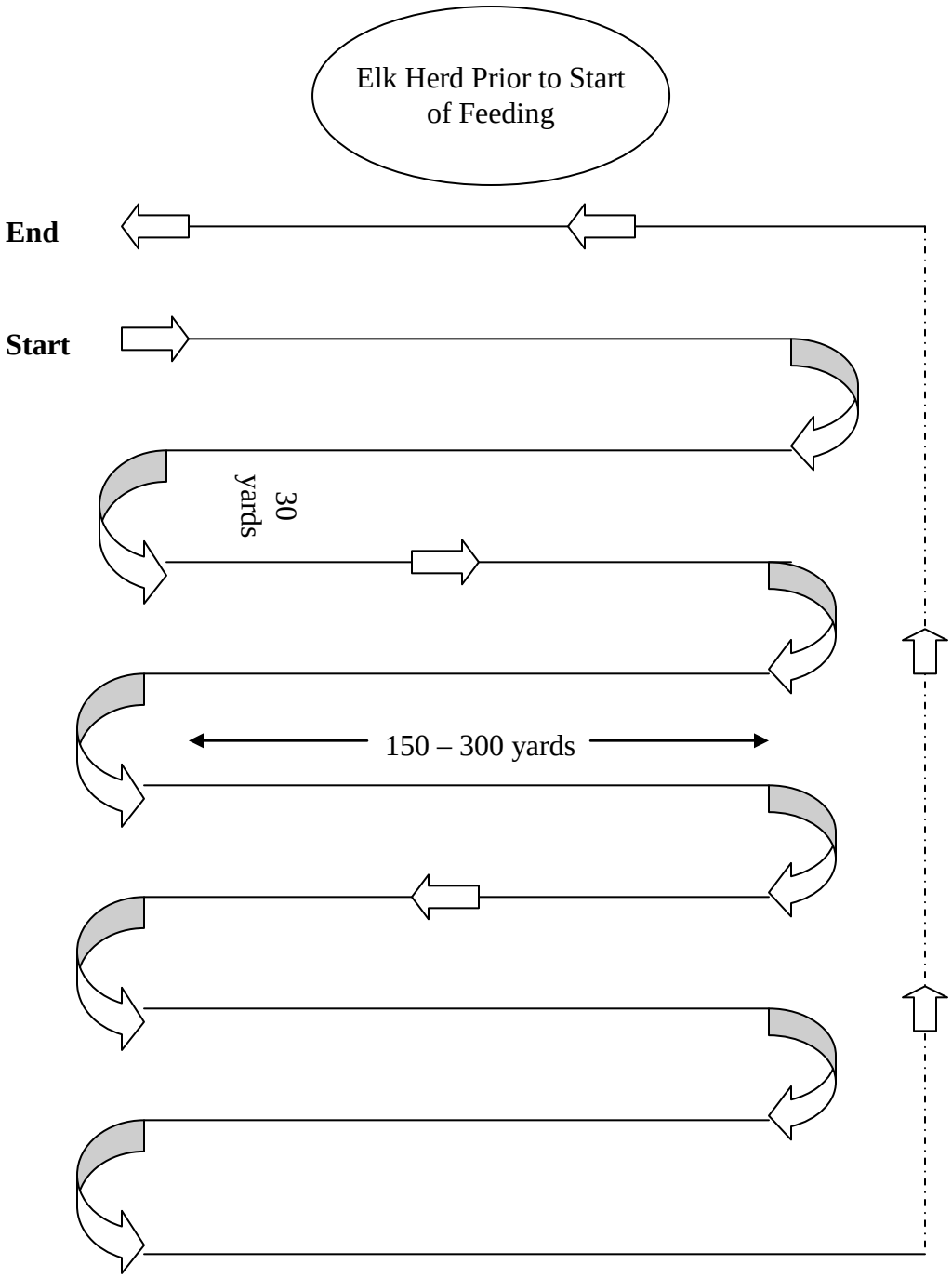


Figure 2. Generalized feeding pattern. Terrain, elk and bison distribution and other environmental factors may require modification of this pattern.

From:	Mike Blenden
To:	Maureen Gallagher; Keenan Adams; Will Meeks
Subject:	Fwd: Thank you and follow-up questions
Date:	Monday, October 05, 2015 5:55:15 PM
Attachments:	Untitled attachment 02060.htm training handout 1_14_09.pdf Untitled attachment 02063.htm

---

The following is an informative exchange between Eric Cole, biologist at the National Elk Refuge and the National Academy of Sciences Brucellosis Committee.

Sent from my iPhone

Begin forwarded message:

From: Steve Kallin <steve_kallin@fws.gov>
Date: October 5, 2015 at 4:19:07 PM MDT
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>
Subject: FW: Thank you and follow-up questions

Mike:

Eric Cole recently gave a presentation about the NER supplemental feeding program to the National Academy of Sciences Brucellosis Committee. The committee followed up with a number of questions which Eric answered in a very succinct and informative manner. You may find the answers to these key questions helpful.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Cole, Eric [mailto:eric_cole@fws.gov]
Sent: Thursday, October 01, 2015 6:05 PM
To: Yih, Peggy T
Cc: Steve_kallin@fws.gov; Cris Dippel
Subject: Re: Thank you and follow-up questions

Hello Peggy,

In response to the committee's follow up questions regarding the National Elk Refuge (NER)

1. How are the objectives determined in setting the number of elk on each of the feedgrounds? What is the carrying capacity, and how is that determined for all feedgrounds? (VR): How does that compare to actual population over the last 10 years?:

Relevant to the Jackson Elk Herd, NER manages a complex of 4 feeding areas which cover about 5,000 acres on the south end of the Refuge (see training handout 1_14_09.pdf attached), and Wyoming Game and Fish Department (WGFD) manages 3 additional feedgrounds in the Gros Ventre drainage. NER has no role in setting management objectives or covering costs for WGFD feeding operations in the Gros Ventre drainage.

There is a 5,000 elk objective for elk wintering on NER in the 2007 Bison and Elk Management Plan and Environmental Impact Statement (BEMP, USFWS and NPS 2007 a and b), but there are no sub objectives or carrying capacity estimates for the 4 feeding areas on the Refuge. The 5,000 refuge-wide elk objective was based on a carrying capacity model for the National Elk Refuge developed by Hobbs et al. in 2003. The Hobbs model predicted that NER could support 5,000 elk and 500 bison during winter months under average forage production and average winter severity. Feeding increases refuge carrying capacity to potentially unlimited levels if nutrition limitation was the only factor being considered, and the refuge has fed as many as 11,612 elk (in 1956) and 10,736 (in 1997) elk with mortality rates well below those found in unfed elk populations. Winter elk mortality on NER averages 1.5% under the current feeding regime. In the past 2 winters years NER has fed over 8,000 elk and the 10-year running average of elk on feed was 7,165. Once feeding operations begin in a given year, we feed whatever number of elk arrive, regardless of population objectives.

2. What is the rationale for maintaining 11,000 elk? What was your last count?

Herd wide population objectives are set by the Wyoming Game and Fish Department not NER. WGFD sets this objective using a public process, but in general the number is set to support desired elk hunting opportunities. In general the overall Jackson Elk Herd population has decline significantly since the mid 1990s, and based on last winter's count was very close to the 11,000 elk objective. Based on elk distribution at the time that BEMP was developed, it appeared possible to winter 5,000 elk on NER while maintaining 11,000 elk in the overall Jackson Elk Herd. However the percentage of the overall Jackson elk herd that winters on NER has increased since about 2000. In the early 2000s it was common for 50-60% of the Jackson Elk Herd to winter on NER. In recent years 70-75% of the Jackson Elk Herd has wintered on NER. As discussed at the NAS meeting the most likely explanation for the increasing percentage of the Jackson Elk Herd wintering on NER is a distributional shift in wintering animals associated with wolves and a higher percentage of the Jackson Elk Herd summering immediately adjacent to NER (Cole and Foley et al. 2015). It not longer possible to maintain 11,000 elk in the Jackson Herd with only 5,000 elk wintering on NER given current elk distribution.

3. Could you provide the budgets over time for feedgrounds, and how that corresponds with changes in feed rations and elk populations? When did you transition from hay to pellets? Can you provide budgets detailing feed expense separate from labor, equipment, and other expense categories? Is this available by feedground to assess relationships to elk populations over time?

We do not have year to year cost estimates of refuge feeding operations. Smith (2001) estimated NER annual feeding costs under average conditions of (7,500 elk for 79 feeding days) of $337,488 in 1999 dollars. This did not include bison feeding costs which are roughly equivalent to 2.5 elk per bison. He broke down feeding cost per year in 1999 dollars as labor=$14,220, Fuel=$2,528, Alfalfa pellets= $320,740. He noted that WGFD and NER split pellet costs, but NER covers all other costs. His analysis did not include capital expenditures for feed equipment, feed storage sheds or administrative costs, but these are likely significant on an annualized basis.

We transitioned from baled hay to pellets in the 1970s. In my estimation, the odds of ending feeding entirely are greater than switching back to baled hay.

4. Have you conducted an impact assessment and EIS?

As mentioned in question 1, we conducted this analysis for the Bison and Elk Management Plan and EIS (USFWS and NPS 2007 a and b).

Literature cited:

Cole, E. K., Foley, A. M., Warren, J. M., Smith, B. L., Dewey, S. R., Brimeyer, D. G., Fairbanks, W. S., Sawyer, H. and Cross, P. C. 2015. Changing migratory patterns in the Jackson elk herd. Journal of Wildlife Management, 79: 877–886.

Hobbs, N. T., G. Wockner, and F. J. Singer. 2003. Assessing management alternatives for ungulates in the Greater Teton Ecosystem using simulation modeling. Unpublished report, Natural Resources Ecology Lab, Colorado State University, Fort Collins, CO.

Smith, B.L. 2007. Winter feeding of elk in western North America. Journal of Wildlife Management, 65: 173-190.

[USFWS and USNPS] U.S. Fish and Wildlife Service and National Park Service. 2007b. Bison and elk management plan. National Elk Refuge and Grand Teton National Park. http://www.fws.gov/bisonandelkplan/, accessed April 2015.

[USFWS and USNPS] U.S. Fish and Wildlife Service and National Park Service. 2007a. Record of Decision, final bison and elk management plan and environmental impact statement. National Elk Refuge and Grand Teton National Park. http://www.fws.gov/bisonandelkplan/ROD.pdf, accessed April 2015.

I hope that this information is useful to the committee. Please let me know if you have further questions or need clarification to my responses.

Thanks,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

On Fri, Sep 25, 2015 at 4:07 PM, Yih, Peggy T <PYih@nas.edu> wrote:
Dear Eric,

On behalf of the committee, I wanted to thank you for taking time from your busy schedule to speak at their meeting last week at the Jackson Lake Lodge. Thank you for helping them learn more about the National Elk Refuge in relation to the issue of brucellosis.

In response to your presentation and the presentations of others, the committee came up with a list of questions that I hope you're willing to address (I've cc'ed Steve Kallin so that he's in the loop with the information request):

1. How are the objectives determined in setting the number of elk on each of the feedgrounds? What is the carrying capacity, and how is that determined for all feedgrounds? (VR): How does that compare to actual population over the last 10 years?

2. What is the rationale for maintaining 11,000 elk? What was your last count?

3. Could you provide the budgets over time for feedgrounds, and how that corresponds with changes in feed rations and elk populations? When did you transition from hay to pellets? Can you provide budgets detailing feed expense separate from labor, equipment, and other expense categories? Is this available by feedground to assess relationships to elk populations over time?

4. Have you conducted an impact assessment and EIS?

I'd be glad to clarify any of those if you'd like more details or would like to better understand the nature of the request. Would it be feasible to respond to these questions in 2 weeks (by October 9)? If not, please let me know and I'd be happy to discuss a more workable timeline that would allow the committee to receive the information as it becomes available.

Please let me know if you have any questions. Thank you in advance! And have a great weekend.

Best,
Peggy

Peggy Tsai Yih
Senior Program Officer
Board on Agriculture and Natural Resources
The National Academies of Sciences, Engineering, and Medicine
500 Fifth Street, N.W.
Washington, D.C. 20001
Phone: (202) 334-3277
Fax: (202) 334-1978
E-mail: pyih@nas.edu

GOALS OF THE SUPPLEMENTAL FEEDING PROGRAM

1) Minimize elk starvation in all age/sex classes.

2) Support wintering elk numbers on NER consistent with the Elk and Bison Management Plan and EIS and Wyoming Game and Fish Department objectives

3) Minimize elk conflicts on surrounding lands including co-mingling with domestic livestock, elk damage to private property, and collisions with vehicles on Highway 89.

4) Feed bison as necessary to ensure that elk are adequately fed.

Research has shown that feeding alfalfa pellets reduces waste and is less labor intensive than feeding baled hay, but feeding pellets does present unique challenges: There is a dominance hierarchy on the feedgrounds whereby bison displace all elk age and sex classes from feed, mature bull elk displace other elk, and all elk and bison displace elk calves. Because alfalfa pellets are consumed quickly, it is critical that feed is distributed in an amount and manner that even the least dominant elements of the herd (elk calves) receive an adequate ration. In general this means that the feed must be distributed as thinly as possible, over as large an area as practical.

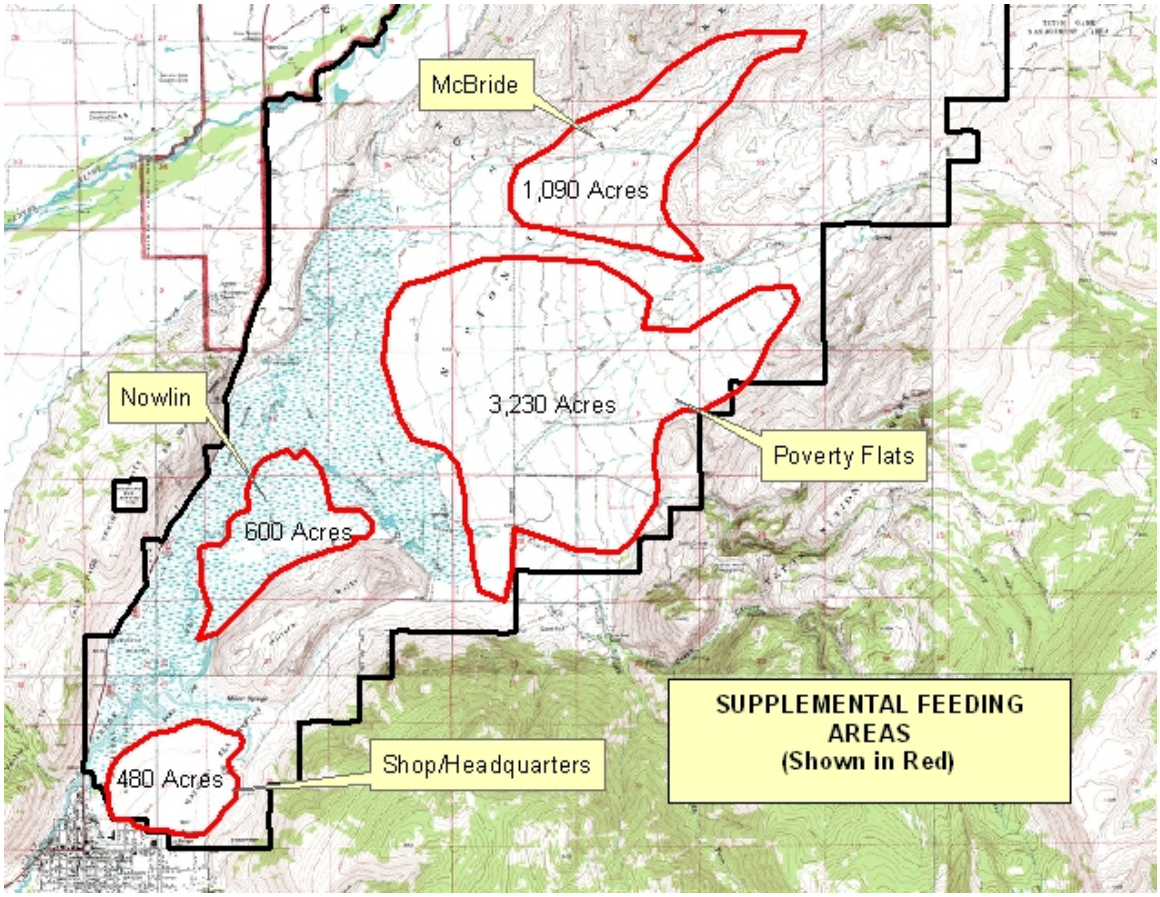


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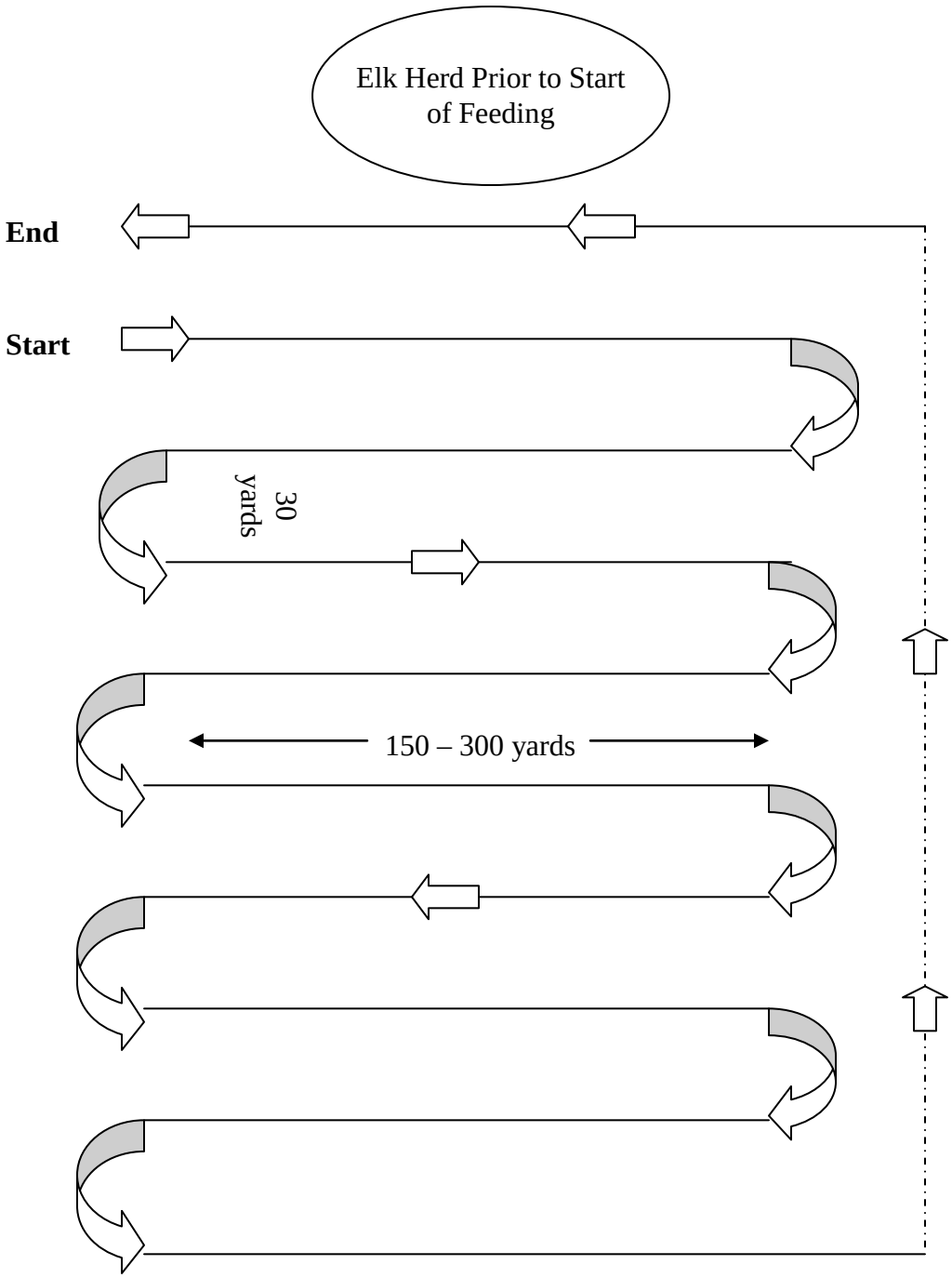


Figure 2. Generalized feeding pattern. Terrain, elk and bison distribution and other environmental factors may require modification of this pattern.

From: Steve Kallin
To: Will Meeks
Cc: Maureen Gallagher; Mike Blenden
Subject: RE: meeting last week
Date: Wednesday, October 07, 2015 4:07:50 PM

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I asked if the NER could provide any additional information which may be helpful for this upcoming discussion. None is needed at this time.

Sorry for this delayed reply; just came back from leave.

Take care,

Steve Kallin
Project Leader
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PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Will Meeks [mailto:Will_Meeks@fws.gov]
Sent: Tuesday, September 29, 2015 11:07 AM
To: Steve Kallin
Subject: meeting last week

Any update from the state re: AMP from last week's meeting? Thanks.

Will Meeks
U.S. Fish and Wildlife Service, Region 6
Acting ARD External Affairs (through October 2015)
303-236-4510 (w)
720-541-0310 (c)

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From:	Will Meeks
To:	Keenan Adams
Subject:	Fwd: meeting last week
Date:	Thursday, October 08, 2015 3:10:18 PM

Will Meeks
U.S. Fish and Wildlife Service
Mountain Prairie Region
Assistant Regional Director
External Affairs (acting through October 2015)
303-236-4510 (w)
720-541-0310 (c)

Begin forwarded message:

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Date: Thursday, October 08, 2015 3:12:04 PM

Should discuss.

Will Meeks
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From:	Cole, Eric
To:	Steve Kallin; Cris Dippel; Lori Iverson; Ture Schoultz; Chuck Mulcahy; Joe Lozar
Subject:	2015 forage production report
Date:	Tuesday, November 03, 2015 1:23:18 PM
Attachments:	2015 Forage Production Report.pdf

My latest biological update provided a summary of 2015 forage production results. The attached report provides more detailed information. Many thanks to Ture, Chuck, and Joe for assistance conducting the field work, and to Missy for providing accurate maps of the areas that were irrigated.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

11/1/2015

National Elk Refuge Annual Forage Production Sampling and Related Irrigation Analysis, 2015

From: Eric Cole, Refuge Biologist

To: Refuge Files

Executive Summary:

NER Forage production has been monitored annually using consistent methods since 1998. Sixty-two transects representing a combination of 33 plant community types and irrigated versus non-irrigated areas were sampled from September-October 2015.

Estimated 2015 refuge-wide herbaceous forage production was 17,746 tons. Estimated total refuge-wide forage production, which includes herbaceous and woody plants, was 20,802 tons. Herbaceous forage production was 22% above the 1998-2015 average. In general NER forage sampling methods are best suited to evaluate annual differences in herbaceous rather than woody vegetation on the refuge, and therefore herbaceous measurements provide a useful index of the amount of forage that will be available for ungulates during the winter. For comparison record low refuge-wide herbaceous forage production occurred in the drought year of 2003 (6,710 tons) and record high herbaceous forage production occurred in the wet years of 1998 and 2004 (19,647 and 19,597 tons respectively).

NER staff irrigated 3,238 acres using the K-line irrigation system and an additional 43 acres using flood irrigation in the Pedersen management unit. Estimated herbaceous production in the irrigated area was 3,472 tons. Predicted herbaceous forage production in the irrigated area would have been 1,953 tons in the complete absence of irrigation, which suggests that the NER irrigation program produced 1,519 tons of additional forage in 2015 (approximately 925 additional lbs. per acre in irrigated areas). This represents a 9% increase in refuge-wide production and a 12% increase in production in the high elk and bison use area on the southern portion of NER as a result of irrigation.

Relatively high forage production on NER was attributed to above average total precipitation during the growing season (May through August) plus irrigation effects. Although 2015 forage production was 22% above average it was not a record high due to below average precipitation in June. Modeling suggests that NER herbaceous forage production is strongly correlated with May plus June precipitation as seen in years with higher forage production than 2015 (1998, 2004, 2005, and 2011). Additionally, late season precipitation produced significant basal green up of grass plants, which increased the nutritional quality of the forage. Assuming that this greening effect also occurred on summer and transitional ranges, this could delay elk and bison migration to the refuge.

Forage quantity influences feeding start date. All else being equal, above average forage production on NER suggests that a later than average feeding initiation date is possible. However, snow conditions and cumulative forage consumption by elk and bison are also important factors, and NER and WGFD staff will closely monitor conditions to determine when supplemental feeding is necessary.

Methods:

National Elk Biologist Eric Cole, biological volunteers Ture Schoultz, Joe Lozar, and Chuck MulCahy conducted annual forage production sampling in 2015. Sampling was conducted from September 3 to October 11. Eric Cole has been the primary observer since 1998, making results since this time comparable without observer bias.

All transects were sampled using the SCS double sampling technique as described in previous forage production reports and analyzed using a Microsoft Access database designed to calculate forage production in lbs. per acre for each transect (G:\Biological\Habitat\Forage Production\2015 calculations\2015 transect production calculation.mdb.)

Based on the original sampling design developed in the 1980's, there is at least 1 transect representing each plant community type. Transect starting points are permanent and are marked with a metal fence post when possible. However, bison repeatedly destroy fence posts, and in areas of high bison use we rely on GPS units to locate the starting point (Appendix A). Beginning in 2012 we have attempted to sample at least 1 transect representing each combination of plant community type and irrigation status and this has required sampling 10-20 additional transects per year. However given the similarity in production levels among some agronomic plant communities, in some cases we have used transects to represent forage production in a different plant community but the same irrigation status.

Ten, 13.27" diameter circular plots are sampled along each transect. The 13.27" diameter frame makes each gram sampled in the frame equivalent to 100 lbs. per acre. To prevent sampling induced changes to the vegetation over time, there is a systematic scheme that changes each year to prevent repeated trampling and clipping of the same sites (Appendix B). At each plot the 13.27" diameter sampling ring is placed at the designated site and the wet weight (g) of current growing season vegetation by the categories grass, forb, noxious weed and woody is estimated. Only grass, forbs, and noxious weeds that are rooted within the plot ring are measured. Current year woody growth that intersects a column above the plot ring up to a height 8 feet above the ground is measured. At plots 2, 5, and 8 vegetation is clipped after the visual estimate has been recorded. Clipped vegetation is sorted into separate bags for grass, forbs, noxious weeds and woody vegetation, and wet weight (g) is measured minus the weight of the bags. These measurements allow the relationship between estimated wet weight and clipped weights to be determined for each vegetation class at each transect. Sample bags from the clipped plots are placed in a drying oven for at least 2 days and dry weight (g) minus bag weight is recorded. These measurements allow the relationship between estimated wet weight and dry weight to be determined for each vegetation class at each transect, and in turn dry weight estimates for grass, forb, noxious weed, and woody growth in lbs. per acre to be calculated for each transect.

Plots were clipped approximately 0.25 inches from the ground, and duff and residual vegetation from previous growing seasons was not included in the sample. Exclusion of residual material ensures that estimates truly reflect forage produced during the current growing season. Relatively higher forage production estimates at comparable precipitation levels from 1988-1997 may be the result of inclusion of duff and residual material in the samples. However, sampling prior to 1998 was not conducted by the author, and therefore these differences are difficult to evaluate.

Beginning in 2000, noxious weeds were measured separately from other forbs to allow monitoring of these species over time. Although quackgrass (*Elymus repens*) and cheatgrass (*Bromus tectorum*) have been identified as noxious weeds by Teton County, WY, these species are categorized as grasses for the purposes of forage production analysis. From 2002-2004 prickly lettuce (*Lactuca serriola*), a forb, was likely misidentified as the weed, sow thistle. Canada thistle (*Cirsium arvense*) and bull thistle (*Cirsium vulgare*) were the only noxious weed species encountered at forage production sites in 2015, but large-scale refuge weed mapping suggests greater weed species diversity and extent than that found through forage production sampling.

Forage production was summarized by 4 forage classes (Grass, Forb, Woody, and Weed). From 1987 to 2004 sampling was conducted at the taxonomic level and then aggregated into forage classes for the report. Starting in 2005 we estimated and clipped plots by the 4 forage classes instead of by taxonomic groups, because taxonomic level production data have not been used for any analyses, and sampling at the taxonomic level may reduce the accuracy of weight estimates. However, taxonomic groups encountered within plots are noted on each data sheet to allow analysis of frequency trends in the future if desired. (Appendix C) lists taxonomic groups encountered in 2015 and their respective forage class.

Although the refuge completed a new Plant Community Map in 2007, forage production sampling was designed for the plant community type scheme used in earlier versions of the plant community map. Therefore to facilitate comparison among years, the 1999 Plant Community Map with 2012 edits rather than the 2007 Plant Community Map was used to determine acreage by plant community types. 1999 plant community type acreages were adjusted to account for new agronomic grass plantings since that time and totaled 24,231 acres. Open water areas and private land inholdings were excluded from the calculations.

Prior to 2012 we estimated total forage production refuge-wide by multiplying average forage production from relevant transects in each plant community type by the number of acres in that plant community type to arrive at refuge-wide forage production estimates, regardless of how much area within a plant community type had been irrigated. Beginning in 2012 and continuing this year we mapped the actual areas irrigated on the refuge to the precision of k-line irrigation cells boundaries (Figure 2) and created a ArcGis shapefile of these areas. We then used the ArcGis union tool to determine the number of irrigated and non-irrigated acres for each plant community type. Beginning in 2012 and continuing this year we estimated refuge-wide forage production by multiplying average forage production by the acreage of each plant community and irrigation status combination

We also predicted what forage production would have been with no irrigation on the refuge by assigning forage production values for non-irrigated transects to all plant communities. This allowed us to estimate the effects of irrigation on refuge-wide forage production and for the area heavily used by elk and bison in the south end of NER.

I noted local factors that might influence forage production at each transect including 1) the degree of bison grazing during the growing season (% of plots with evidence of bison grazing), 2) a subjective estimate of the level of grasshopper defoliation on herbaceous vegetation at each transect (none = no grasshopper defoliation observed, light=<5% reduction in potential forage production, moderate=5-30% reduction in potential forage production, heavy=>30% reduction in potential forage production), and 3) irrigation at that site (none = no irrigation, Natural sub = irrigation from saturated soils and ground water at or near soil surface for at least part of the growing season, Flood = flood irrigation by diversion

through ditches and spreading via dams in ditches, Sprinkler = irrigation using hand line, wheel line, or K-line sprinkler systems). Data are summarized in (Appendices D through G).

Results:

Estimated 2015 refuge-wide herbaceous forage production was 17,746 tons. Estimated total refuge-wide forage production, which includes herbaceous and woody plants, was 20,802 tons. Herbaceous forage production was 22% above the 1998-2015 average. In general NER forage sampling methods are best suited to evaluate annual differences in herbaceous rather than woody vegetation on the refuge, and therefore herbaceous measurements provide a useful index of the amount of forage that will be available for ungulates during the winter. For comparison record low refuge-wide herbaceous forage production occurred in the drought year of 2003 (6,710 tons) and record high herbaceous forage production occurred in the wet years of 1998 and 2004 (19,647 and 19,597 tons respectively) (Figure 1 and Table 1).

NER staff irrigated 3,238 acres (Figure 2) using the K-line irrigation system and an additional 43 acres using flood irrigation in the Pedersen management unit. Estimated herbaceous production in the irrigated area was 3,472 tons. Predicted herbaceous forage production in the irrigated area would have been 1,953 tons in the complete absence of irrigation, which suggests that the NER irrigation program produced 1,519 tons of additional forage in 2015 (approximately 925 additional lbs. per acre in irrigated areas). This represents a 9% increase in refuge-wide production and a 12% increase in production in the high elk and bison use area on the southern portion of NER as a result of irrigation.

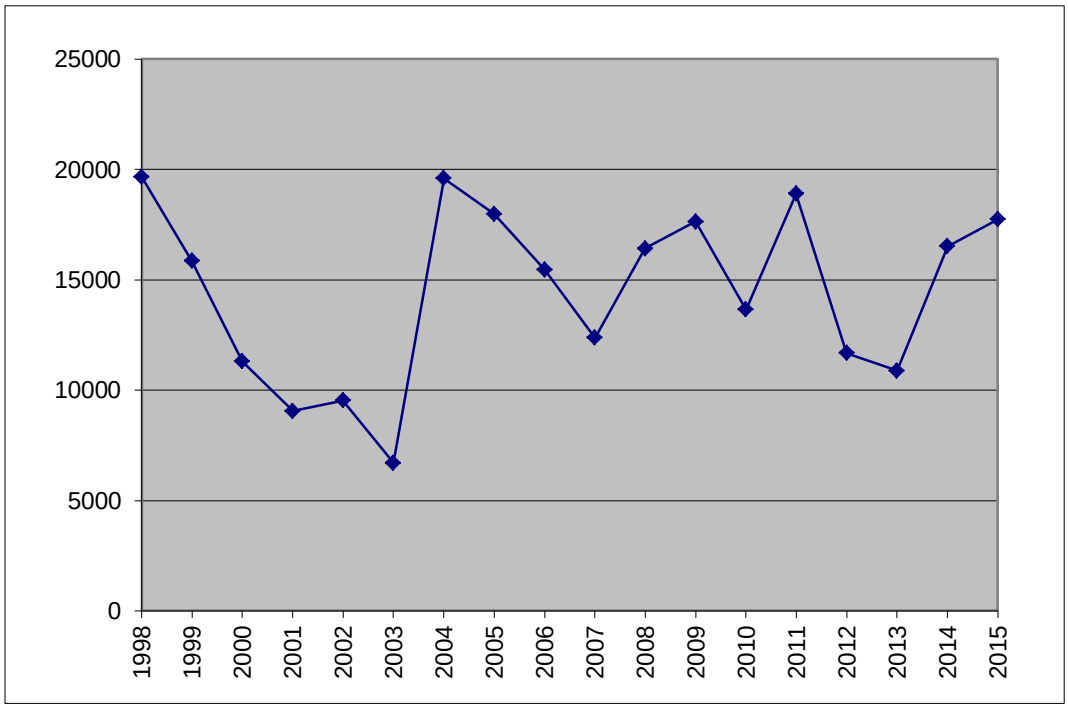


Figure 1. Estimated Refuge-wide herbaceous forage production (tons) on the National Elk Refuge, 1998-2015.

Table 1. The number of acres used in forage production calculations, and estimated amount of forage (tons) by forage class on the National Elk Refuge, 1998-2014.

YEAR	NERACRES	HERBACEOUS	GRASS	FORB	WOODY	WEED	TOTAL
1998	24299	19647	17655	1849	1344	170	21018
1999	24299	15850	13904	1924	3120	0	18948
2000	23752	11299	9879	1304	2189	116	13488
2001	23752	9059	7641	1353	2230	65	11289
2002	23924	9531	7980	1323	4571	228	14102
2003	23924	6710	5185	1307	3923	218	10633
2004	23924	19597	16324	2927	5153	345	24749
2005	23924	17990	15881	2011	3998	98	21988
2006	24229	15468	12757	2523	3505	187	18972
2007	24229	12374	10019	2310	2861	45	15235
2008	24230	16414	13087	3272	4009	57	20425
2009	24231	17635	15100	2524	3809	11	21444
2010	24231	13653	11374	2241	2335	37	15987
2011	24231	18907	15677	3226	2445	4	21352
2012	24231	11677	9873	1800	1844	7	13524
2013	24231	10885	8834	2030	2822	21	13708
2014	24234	16517	13978	2816	3712	23	20195
2015	24234	17746	15073	2330	3057	343	20802
MEAN	24117	14498	12218	2171	3163	110	17659

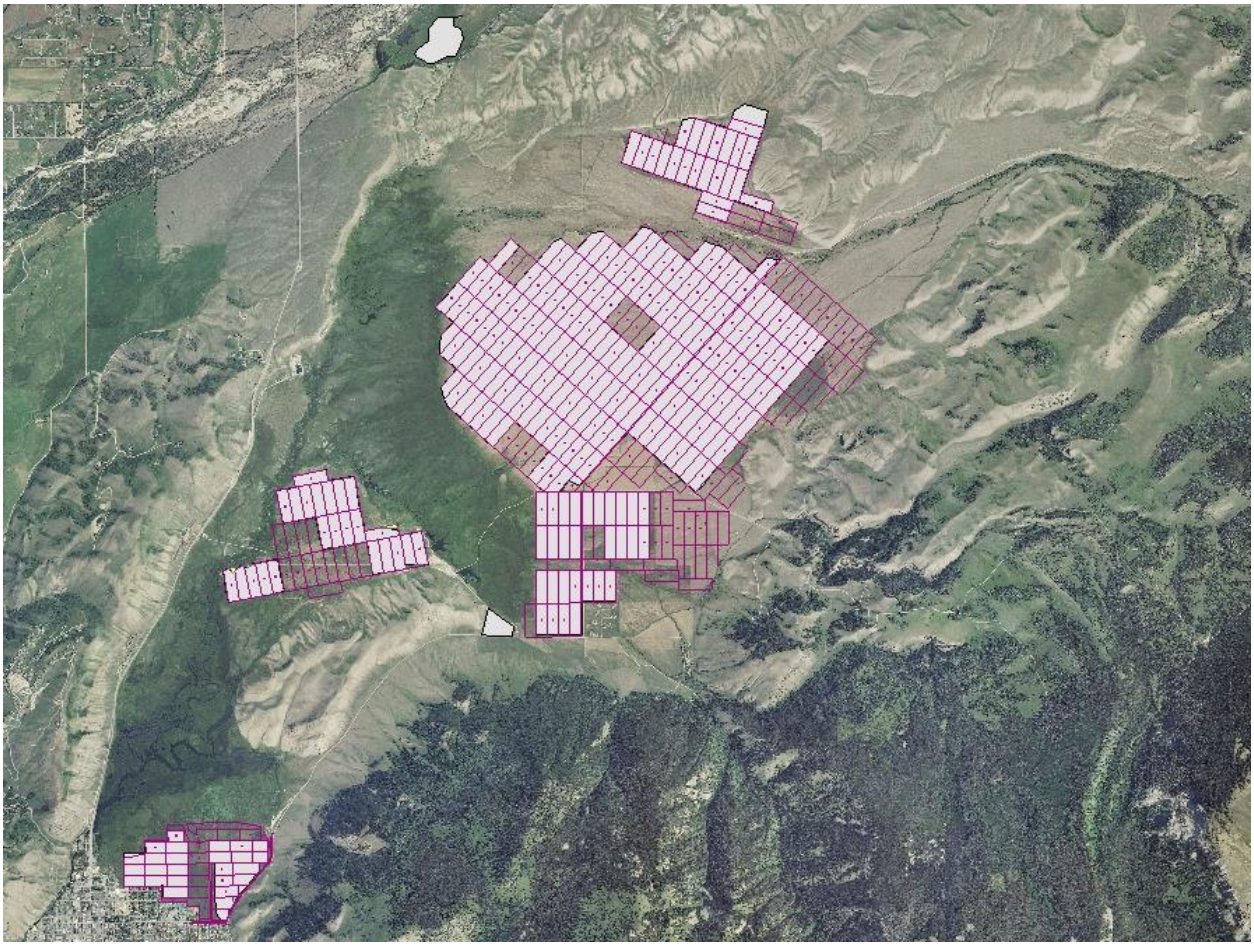


Figure 2. Areas irrigated in 2015 (shown in gray) and K-line irrigation cell boundaries (purple lines) on the National Elk Refuge. In general, non-irrigated areas within the K-line irrigation cells were control sites to allow evaluation of irrigation effects on forage production.

Relatively high forage production on NER was attributed to above average total precipitation during the growing season (May through August) plus irrigation effects (Table 2). Although 2015 forage production was 22% above average it was not a record high due to below average precipitation in June. Modeling suggests that NER herbaceous forage production is strongly correlated with May plus June precipitation as seen in years with higher forage production than 2015 (1998, 2004, 2005, and 2011). Additionally, late season precipitation produced significant basal green up of grass plants, which increased the nutritional quality of the forage. Assuming that this greening effect also occurred on summer and transitional ranges, this could delay elk and bison migration to the refuge.

Forage quantity influences feeding start date. All else being equal, above average forage production on NER suggests that a later than average feeding initiation date is possible. However, snow conditions and cumulative forage consumption by elk and bison are also important factors, and NER and WGFD staff will closely monitor conditions to determine when supplemental feeding is necessary.

Table 2. Monthly precipitation (inches) versus herbaceous forage production on the National Elk Refuge, 1986-2015. Biologist Eric Cole has been the principal observer since 1998.

YEAR	Herbaceous	May	June	July	August	Total
1986	17,599	1.56	0.22	1.53	1.09	4.4
1987	14,821	3.63	0.71	3.05	1.16	8.55
1988	14,791	1.67	0.09	0	0.45	2.18
1989	20,825	2.32	0.26	0.07	2.31	4.96
1990	20,019	1.51	1.07	1.01	0.68	4.27
1991	20,452	2.78	0.87	0.95	1.25	5.85
1992	19,288	0.83	1.47	1.31	0.62	4.23
1993	27,584	3.7	2.46	3.26	2.06	11.48
1994	18,796	1.92	0.35	0.21	1.47	3.95
1995	22,731	3.66	1.65	1.63	1.33	8.27
1996	21,189	2.63	1.19	0.34	0.2	4.36
1997	23,141	2.13	2.41	2.93	1.43	8.9
1998	19,647	1.51	4.19	1.14	1.28	8.12
1999	15,850	1.71	3.06	0.58	0.99	6.34
2000	11,299	1.62	1.1	0.97	0.98	4.67
2001	9,059	0.79	0.74	0.46	0.3	2.29
2002	9,531	0.73	1.08	1.06	0.19	3.06
2003	6,710	1.08	0.32	0.42	1.29	3.11
2004	19,597	2.35	2.21	1.25	2.53	8.34
2005	17,990	2.72	2.17	0.15	1.36	6.4
2006	15,468	1.01	1.42	0.71	0.94	4.08
2007	12,374	0.23	0.4	0.7	2.7	4.03
2008	16,414	1.75	0.97	0.25	0.17	3.14
2009	17,635	0.47	3.8	0.98	0.91	6.16
2010	13,653	1.55	2.76	0.84	2.07	7.22
2011	18,907	2.63	2.12	0.29	0.99	6.03
2012	11,278	1.62	0.2	1.54	0.04	3.4
2013	10,885	0.91	0.33	0.98	0.5	2.72
2014	16,517	0.69	1.55	0.48	2.37	5.09
2015	17,746	3.53	0.84	2.43	1.02	6.16
1986-2014 mean	16,727	1.84	1.40	1.05	1.16	5.45
1998-2014 mean	14,476	1.49	1.63	0.85	1.15	5.11

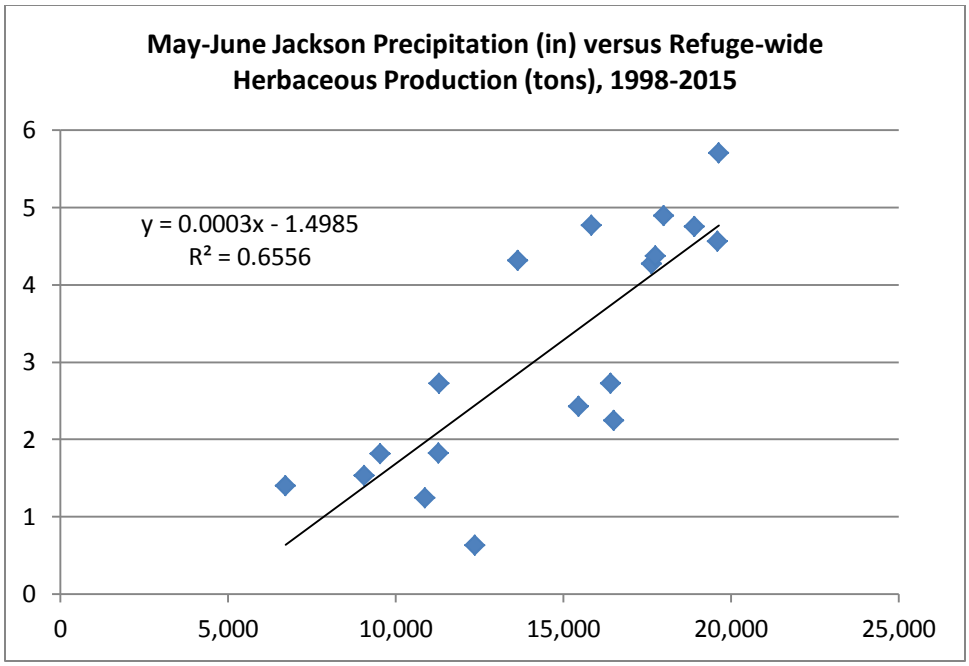


Figure 3. Linear correlation between May-June precipitation (inches) and refuge-wide herbaceous forage production (tons) on the National Elk Refuge, 1998-2015.

Appendices:

Appendix A. Description of forage production transect type, start point of the transect in NAD 83 UTM coordinates, and true north compass bearing from start point on the National Elk Refuge, 2015.

TRANID	Old_TRANID	TYPE	NAD83X	NAD83Y	BEARING
FP1	1.3.1	Permanent	521206	4815848	200
FP10	2.36.1	Permanent	522323	4818184	50
FP11	2.11.2	Permanent	522098	4821195	30
FP12	3.8.1	Permanent	523588	4817533	250
FP13	3.8.2	Permanent	521772	4816850	170
FP14	4.27.1	Permanent	524548	4817273	110
FP15	4.26.3	Permanent	525199	4818056	180
FP16	4.26.4	Permanent	524757	4818826	270
FP17	4.35.1	Permanent	524693	4817786	270

FP18	5.27.1	Permanent	523532	4820697	270
FP19	5.29.1	Permanent	524714	4822724	270
FP2	1.4.1	Permanent	520374	4815609	90
FP20	5.30.1	Permanent	524716	4822858	270
FP21	5.34.1	Permanent	524664	4822557	270
FP22	6.25.1	Permanent	524879	4821948	25
FP23	6.28.1	Permanent	526594	4822995	10
FP24	6.35.1	Permanent	526838	4823231	10
FP25	6.34.1	Permanent	526219	4822675	20
FP26	6.9.1	Permanent	525014	4822245	120
FP27	7.35.1	Permanent	525340	4819993	60
FP28	7.6.2	Permanent	525530	4821707	60
FP29	8.25.1	Permanent	527593	4821724	170
FP3	1.5.1	Permanent	520486	4815330	360
FP30	8.28.2	Permanent	525192	4819408	10
FP37	8.34.1	Permanent	528237	4820903	234
FP38	8.36.1	Permanent	525946	4819605	240
FP39	8.6.1	Permanent	528045	4821042	300
FP4	1.32.1	Permanent	521186	4815071	180
FP40	9.33.2	Permanent	523342	4824167	270
FP41	10.10.1	Permanent	526504	4827813	110
FP42	10.12.1	Permanent	525896	4827789	15
FP43	10.13.1	Permanent	525383	4827558	310
FP44	10.14.2	Permanent	524991	4824818	240
FP45	10.15.1	Permanent	526409	4828019	270
FP46	10.16.1	Permanent	527339	4827492	220
FP47	10.17.1	Permanent	529673	4827092	110

FP48	10.18.2	Permanent	528041	4824286	150
FP49	10.19.1	Permanent	525283	4825926	110
FP5	1.27.1	Both	520445	4814766	270
FP50	10.21.1	Permanent	525090	4826644	50
FP51	10.22.1	Permanent	524019	4825049	250
FP52	10.23.1	Permanent	521866	4823536	50
FP53	10.24.1	Permanent	524362	4826239	255
FP54	10.7.1	Permanent	525245	4823538	260
FP55	3.20.1	Permanent	523048	4817574	60
FP56	5.4.1	Permanent	523114	4820728	270
FP59	Not Applic.	Supplemental	519892	4814820	315
FP6	2.5.1	Permanent	520885	4818981	150
FP60	Not Applic.	Supplemental	525938	4820180	68
FP63	Not Applic.	Supplemental	525204	4821024	225
FP64	Not Applic.	Supplemental	526453	4822762	55
FP66	Not Applic.	Supplemental	526644	4822142	245
FP67	Not Applic.	Supplemental	520767	4817954	110
FP7	2.5.2	Permanent	521777	4818632	270
FP70	Not Applic.	Supplemental	521639	4818352	45
FP72	Not Applic.	Supplemental	523996	4819567	245
FP73	Not Applic.	Supplemental	524694	4819833	354
FP75	10.9.1	Permanent	528795	4822406	330
FP77	Not Applic.	Supplemental	521956	4817169	40
FP8	2.31.1	Permanent	521865	4818218	65
FP9	2.31.2	Permanent	522303	4818133	160

Appendix B. National Elk Refuge forage production sampling scheme. See Appendix A for appropriate true compass bearing (azimuth). 10 plots with visual estimate, and clip plots number 2, 5 and 8 in addition to estimate.	
YEAR	LOCATION OF PLOTS ALONG TRANSECT
2013	From transect start point; first plot at 10 single steps along azimuth, subsequent plots every 10 single steps.
2014	From transect start point, 5 single steps to the right perpendicular to the azimuth; then first plot at 15 single steps along azimuth, subsequent plots every 10 single steps along azimuth.
2015	From transect start point, 5 single steps to the left perpendicular to the azimuth; then first plot at 15 single steps along azimuth, subsequent plots every 10 single steps along azimuth.
2016	From transect start point; first plot at 15 single steps along azimuth, subsequent plots every 10 single steps.
2017	From transect start point, 5 single steps to the right perpendicular to the azimuth; then first plot at 15 single steps along azimuth, subsequent plots every 10 single steps along azimuth.
2018	From transect start point, 5 single steps to the left perpendicular to the azimuth; then first plot at 15 single steps along azimuth, subsequent plots every 10 single steps along azimuth.
2019	Repeat the order begun in 2013

Appendix C. Taxa encountered within forage production subplots during 2015 forage production sampling. Time of year precludes identification below Genus and in some cases family level.	
TAXA	FORAGE CLASS
Agrostis sp.	grass
alfalfa	forb
Alopecuris sp.	grass
Alysum sp.	forb
antelope bitterbrush	woody
arrowleaf balsamroot	forb
Artemesia ludoviciana	forb
aspen	woody

Aster sp.	forb
Astragalus sp.	forb
bedstraw	forb
black medic	forb
blue flax	forb
boxwood	woody
Bromus tectorum	grass
broom snakeweed	woody
buckwheat	forb
buffaloberry	woody
Bull thistle (*Cirsium vulgare*)	weed
Cactus	forb
Calamagrostis canadensis	grass
Calamagrostis rubescens	grass
canada thistle (*Cirsium arvense*)	weed
Carex sp. (sedge species)	grass
Cheatgrass (Bromus tectorum)	grass
chokecherry	woody
cinquefoil sp. (herbaceous)	forb
Cirsium undulatum (gray colored native thistle, wavyleaf thistle)	forb
clover sp. (red,white, or alsike)	forb

common juniper	woody
crested wheatgrass	grass
dandelion	forb
Douglas fir	woody
Elymus glaucus	grass
Elymus sp. (native wheatgrass)	grass
Equisetum	forb
Fescue sp.	grass
field pennycress	forb
fireweed	forb
flixweed	forb
fringed sage	woody
goldenrod	forb
Granite phlox	woody
great basin wildrye	grass
green rabbitbrush	woody
heartleaf arnica	forb
indian ricegrass	grass
intermediate wheatgrass	grass
Juncus sp.	grass
junegrass	grass
lichen (forb)	forb
Lomatium sp	forb
Lonicera sp.	woody

Lupinus sp.	forb
meadow brome	grass
Medicago sativa	forb
mountain big sagebrush	woody
Muhlenbergia sp.	grass
mustard sp.	forb
native wheatgrass	grass
orchard grass	grass
oregon grape	woody
pinegrass	grass
Poa sp.	grass
prickly lettuce	forb
prickly phlox	forb
quackgrass	grass
red clover	forb
Ribes sp.	woody
rocky mountain juniper	woody
Rosa sp.	woody
rubber rabbitbrush	woody
russian wildrye	grass
Salix exigua	woody
Salix sp.	woody
Salix sp. (geyer's)	woody
Scirpus sp.	grass

Sego lily	forb
serviceberry	woody
shrubby cinquefoil	woody
smooth brome	grass
snowberry	woody
Stemless goldenweed	forb
sticky geranium	forb
Stipa sp.	grass
sweet clover	forb
tall wheatgrass	grass
three-tip sagebrush	woody
timothy	grass
tufted hairgrass	grass
Typha sp.	grass
Unknown aster	forb
Unknown composite	forb
Unknown forb	forb
Unknown mustard	forb
violet	forb
western sticktight	forb
winterfat	woody
yarrow	forb
yellow salsify	forb

Appendix D. Forage production (lbs./acre) by forage class for each transect sampled in 2015 on the National Elk Refuge. Factors that affect forage production are also listed including the percentage of plots with evidence of bison grazing during the growing season, intensity of grasshopper defoliation, and irrigation status.

TRANID	TOTAL	GRASS	FORB	WOODY	WEED	HERB	HERBTOT	BISON	GRASSHOPPER	IRRIGATION
FP1	3914	3914	0	0	0	3914	3914	0	none	sub
FP2	6525	6525	0	0	0	6525	6525	0	light	sub
FP3	6095	5813	282	0	0	6095	6095	0	light	sub
FP4	802	681	61	0	60	742	802	0	light	none
FP5	2555	2545	5	0	5	2550	2555	0	light	none
FP6	1072	872	200	0	0	1072	1072	0	light	sub
FP7	2556	2196	360	0	0	2556	2556	0	moderate	sub
FP8	8221	8196	25	0	0	8221	8221	0	moderate	sprinkler
FP9	2028	2000	28	0	0	2028	2028	0	moderate	none
FP10	1729	1682	47	0	0	1729	1729	0	light	none
FP11	1716	1102	301	313	0	1403	1403	0	moderate	sub
FP12	347	187	93	68	0	280	280	0	none	none
FP13	537	286	73	178	0	359	359	0	light	none
FP14	1294	1227	67	0	0	1294	1294	0	light	none
FP15	1603	1430	173	0	0	1603	1603	0	light	none
FP16	2012	1691	320	0	0	2012	2012	0	moderate	sprinkler
FP17	2205	2170	35	0	0	2205	2205	0	light	sprinkler
FP18	1029	621	407	0	0	1029	1029	0	heavy	sprinkler
FP19	1814	1784	30	0	0	1814	1814	0	moderate	none
FP20	2111	2081	30	0	0	2111	2111	0	moderate	none
FP21	2265	2215	50	0	0	2265	2265	0	light	none
FP22	2755	2680	55	20	0	2735	2735	0	light	none
FP23	2889	2864	25	0	0	2889	2889	0	light	sprinkler
FP24	3078	3078	0	0	0	3078	3078	0	moderate	sprinkler
FP25	4893	4799	94	0	0	4893	4893	0	light	sprinkler
FP26	717	516	119	82	0	635	635	0	moderate	none
FP27	995	955	40	0	0	995	995	0	heavy	sprinkler
FP28	1217	1102	70	45	0	1172	1172	0	heavy	sprinkler
FP29	3072	2339	10	723	0	2349	2349	0	moderate	none
FP30	768	697	71	0	0	768	768	0	moderate	none
FP37	1848	1818	30	0	0	1848	1848	0	light	none
FP38	2466	2461	5	0	0	2466	2466	0	moderate	sprinkler
FP39	752	632	75	45	0	707	707	0	light	none
FP40	4595	3959	351	0	285	4310	4595	0	light	flood

FP41	1137	704	79	354	0	783	783	0	none	none
FP42	2359	1811	192	300	57	2002	2059	0	light	sub
FP43	3408	2049	282	837	240	2331	2571	0	light	none
FP44	1726	760	737	229	0	1497	1497	0	light	none
FP45	1648	1351	101	197	0	1451	1451	0	light	none
FP46	1692	1408	93	191	0	1501	1501	0	none	none
FP47	1654	1128	207	319	0	1335	1335	0	none	none
FP48	1676	722	396	559	0	1118	1118	0	none	none
FP49	2528	1001	117	60	1350	1118	2468	0	none	none
FP50	381	83	215	82	0	298	298	0	none	none
FP51	588	365	223	0	0	588	588	0	none	none
FP52	1051	257	209	586	0	466	466	0	none	none
FP53	901	525	261	115	0	786	786	0	none	none
FP54	1200	440	90	670	0	530	530	0	light	none
FP55	451	221	90	140	0	311	311	0	none	none
FP56	4410	4305	105	0	0	4410	4410	0	moderate	sub
FP59	2910	2781	130	0	0	2910	2910	0	light	sprinkler
FP60	1153	1086	35	32	0	1121	1121	0	moderate	sprinkler
FP63	441	338	57	47	0	394	394	0	moderate	none
FP64	4218	4120	98	0	0	4218	4218	0	light	sprinkler
FP66	1286	866	420	0	0	1286	1286	0	moderate	none
FP67	2992	2610	382	0	0	2992	2992	0	light	sprinkler
FP70	4403	4403	0	0	0	4403	4403	0	light	sub
FP72	522	401	121	0	0	522	522	0	light	none
FP73	881	831	50	0	0	881	881	0	light	sprinkler
FP75	1073	636	117	320	0	753	753	0	light	none
FP77	838	739	55	44	0	794	794	0	light	none

Appendix E. Transects used to calculate forage production rates for each irrigation/plant community combination in 2015 on the National Elk Refuge.

IRRIGATION	Community	TOTALlbs/acre	GRASSlbs/acre	FORBlbs/acre	WOODYlbs/acre	WEEDlbs/acre	GRASSFORBlbs/acre	HERBACEOUSlbs/acre	TRANNUM
none	3 Cattail-Bulrush (Typha-Scirpus)	3914	3914	0	0	0	3914	3914	1
none	4 Sedge-Rush (Carex-Juncus)	6525	6525	0	0	0	6525	6525	2
		4410	4305	105	0	0	4410	4410	56
	mean	5468	5415	53	0	0	5468	5468	
none	5 Subirrigated bluegrass (Poa sp.)	6095	5813	282	0	0	6095	6095	3
		1072	872	200	0	0	1072	1072	6
		2556	2196	360	0	0	2556	2556	7

	mean	3241	2960	281	0	0	3241	3241	
yes	5 Subirrigated bluegrass (Poa sp.)	2910	2781	130	0	0	2910	2910	59
		2992	2610	382	0	0	2992	2992	67
	mean	2951	2696	256	0	0	2951	2951	
none	6 Native wheatgrass-Native bluegrass on flats	441	338	57	47	0	394	394	63
		752	632	75	45	0	707	707	39
		522	401	121	0	0	522	522	72
	mean	572	457	84	31	0	541	541	
yes	6 Native wheatgrass-Native bluegrass on flats	1217	1102	70	45	0	1172	1172	28
		1153	1086	35	32	0	1121	1121	60
	mean	1185	1094	53	39	0	1147	1147	
none	7 Native wheatgrass-Native needlegrass Gros Ventre Hills and slopes	1200	440	90	670	0	530	530	54
yes	7 Native wheatgrass-Native needlegrass Gros Ventre Hills and slopes	1153	1086	35	32	0	1121	1121	60
none	8 Native wheatgrass-Native bluegrass Miller Butte	347	187	93	68	0	280	280	12
		537	286	73	178	0	359	359	13
	mean	442	237	83	123	0	320	320	
none	9 Mountain big sagebrush-Native bluegrass on flats	717	516	119	82	0	635	635	26
		1073	636	117	320	0	753	753	75
	mean	895	576	118	201	0	694	694	
yes	9 Mountain big sagebrush-Native bluegrass on flats	1153	1086	35	32	0	1121	1121	60
none	10 Mountain big sagebrush-Threetip sagebrush on slopes	1137	704	79	354	0	783	783	41
yes	10 Mountain big sagebrush-Threetip sagebrush on slopes	1153	1086	35	32	0	1121	1121	60
none	11 Shrubby cinquefoil-Sedge (Potentilla fruticosa-Carex)	1716	1102	301	313	0	1403	1403	11
yes	11 Shrubby cinquefoil-Sedge (Potentilla fruticosa-Carex)	2359	1811	192	300	57	2002	2059	42

none	12 Willow-Sedge (Salix sp.-Carex sp)	2359	1811	192	300	57	2002	2059	42
none	13 Willow-Smooth brome (Salix sp.-Bromus inermis)	3408	2049	282	837	240	2331	2571	43
none	14 Snowberry-Rose sp. (Symphoricarpus-rosa sp)	1726	760	737	229	0	1497	1497	44
none	15 Mountain big sagebush-Smooth brome (Artemesia tridentata-Bromus inermis)	1648	1351	101	197	0	1451	1451	45
none	16 Aspen-Pinegrass (Populus tremuloides-Calamagrostis rubescens)	1692	1408	93	191	0	1501	1501	46
none	17 Aspen-Snowberry (Populus tremuloides-Symphoricarpus)	1654	1128	207	319	0	1335	1335	47
none	18 Aspen-Willow	1676	722	396	559	0	1118	1118	48
none	19 Aspen-Douglas fir	2528	1001	117	60	1350	1118	2468	49
none	20 Rocky mountain juniper-Native wheatgrass (Juniperus scopulorum)	451	221	90	140	0	311	311	55
none	21 Douglas fir-Lodgepole pine	381	83	215	82	0	298	298	50
none	22 Narrow-leaf cottonwood-Bluegrass sp. (Populus angustifolia-Poa sp.)	588	365	223	0	0	588	588	51
none	23 Narrow-leaf cottonwood-Mountain big sagebrush	1051	257	209	586	0	466	466	52
none	24 Narrow-leaf cottonwood-mixed shrub	901	525	261	115	0	786	786	53
none	25 Narrow-leaf cotonwood-deciduous shrub	2755	2680	55	20	0	2735	2735	22
		3072	2339	10	723	0	2349	2349	29
	mean	2914	2510	33	372	0	2542	2542	
none	26 Smooth brome-alfalfa	1603	1430	173	0	0	1603	1603	15
		1286	866	420	0	0	1286	1286	66
	mean	1445	1148	297	0	0	1445	1445	

yes	26 Smooth brome-alfalfa	2012	1691	320	0	0	2012	2012	16
none	27 Smooth brome-mixed grass	2555	2545	5	0	5	2550	2555	5
		1294	1227	67	0	0	1294	1294	14
	mean	1925	1886	36	0	3	1922	1925	
yes	27 Smooth brome-mixed grass	2910	2781	130	0	0	2910	2910	59
		1029	621	407	0	0	1029	1029	18
		2992	2610	382	0	0	2992	2992	67
	mean	2310	2004	306	0	0	2310	2310	
none	28 Russian wildrye (Elymus junceus)	768	697	71	0	0	768	768	30
yes	28 Russian wildrye (Elymus junceus)	2889	2864	25	0	0	2889	2889	23
none	29 Great Basin wildrye (Elymus cinereus)	1814	1784	30	0	0	1814	1814	19
none	30 Kentucky bluegrass on upland sites (Poa pratensis)	2111	2081	30	0	0	2111	2111	20
yes	30 Kentucky bluegrass on upland sites (Poa pratensis)	2205	2170	35	0	0	2205	2205	17
none	31 Quackgrass-mixed grass (Elymus repens-mixed grass)	2028	2000	28	0	0	2028	2028	9
yes	31 Quackgrass-mixed grass (Elymus repens-mixed grass)	8221	8196	25	0	0	8221	8221	8
none	32 Foxtail species (Alopecurus sp.)	802	681	61	0	60	742	802	4
		4403	4403	0	0	0	4403	4403	70
	mean	2603	2542	31	0	30	2573	2603	
yes	32 Foxtail species (Alopecurus sp.)	4595	3959	351	0	285	4310	4595	40
none	33 Timothy-bluegrass (Phleum pratensis-Poa sp)	802	681	61	0	60	742	802	4
		4403	4403	0	0	0	4403	4403	70
	mean	2603	2542	31	0	30	2573	2603	
yes	33 Timothy-bluegrass (Phleum pratensis-Poa sp)	4595	3959	351	0	285	4310	4595	40
none	34 Intermediate wheatgrass (Elymus	2265	2215	50	0	0	2265	2265	21

	intermedium)								
		1848	1818	30	0	0	1848	1848	*37*
	mean	2057	2017	40	0	0	2057	2057	
yes	34 Intermediate wheatgrass (Elymus intermedium)	4893	4799	94	0	0	4893	4893	25
		4218	4120	98	0	0	4218	4218	*64*
	mean	4556	4460	96	0	0	4556	4556	
none	35 Crested wheatgrass (Agropyron cristatum)	838	739	55	44	0	794	794	77
yes	35 Crested wheatgrass (Agropyron cristatum)	3078	3078	0	0	0	3078	3078	24
		2205	2170	35	0	0	2205	2205	17
		995	955	40	0	0	995	995	27
	mean	2093	2068	25	0	0	2093	2093	
none	36 Meadow brome	1729	1682	47	0	0	1729	1729	10
yes	36 Meadow brome	2466	2461	5	0	0	2466	2466	*38*

Appendix F. Estimate of tons of forage by plant community type and forage class taking into account irrigated and non-irrigated acreage on the National Elk Refuge in 2015

IRRIGATION	Community	2015 ACRES	TOTAL	GRASS	FORB	WOODY	WEED	HERBACEOUS
none	3 Cattail-Bulrush (Typha-Scirpus)	134	262	262	0	0	0	262
none	4 Sedge-Rush (Carex-Juncus)	1102	3013	2984	29	0	0	3013
none	5 Subirrigated bluegrass (Poa sp.)	785	1272	1162	110	0	0	1272
none	6 Native wheatgrass-Native bluegrass on flats	849	243	194	36	13	0	230
none	7 Native wheatgrass-Native needlegrass Gros Ventre Hills and slopes	3709	2225	816	167	1243	0	983
none	8 Native wheatgrass-Native bluegrass Miller Butte	491	109	58	20	30	0	78
none	9 Mountain big sagebrush-Native bluegrass on flats	1190	533	343	70	120	0	413
none	10 Mountain big sagebrush-Threetip sagebrush on slopes	3989	2268	1404	158	706	0	1562
none	11 Shrubby cinquefoil-Sedge (Potentilla fruticosa-Carex)	1088	934	599	164	170	0	763
none	12 Willow-Sedge (Salix sp.-Carex sp)	219	258	198	21	33	6	226

none	13 Willow-Smooth brome (Salix sp.-Bromus inermis)	75	128	77	11	31	9	96
none	14 Snowberry-Rose sp. (Symphoricarpus-rosa sp)	2735	2360	1039	1008	313	0	2047
none	15 Mountain big sagebush-Smooth brome (Artemesia tridentata-Bromus inermis)	74	61	50	4	7	0	54
none	16 Aspen-Pinegrass (Populus tremuloides-Calamagrostis rubescens)	468	396	329	22	45	0	351
none	17 Aspen-Snowberry (Populus tremuloides-Symphoricarpus)	727	601	410	75	116	0	485
none	18 Aspen-Willow	185	155	67	37	52	0	103
none	19 Aspen-Douglas fir	468	592	234	27	14	316	578
none	20 Rocky mountain juniper-Native wheatgrass (Juniperus scopulorum)	30	7	3	1	2	0	5
none	21 Douglas fir-Lodgepole pine	131	25	5	14	5	0	20
none	22 Narrow-leaf cottonwood-Bluegrass sp. (Populus angustifolia-Poa sp.)	56	16	10	6	0	0	16
none	23 Narrow-leaf cottonwood-Mountain big sagebrush	240	126	31	25	70	0	56
none	24 Narrow-leaf cottonwood-mixed shrub	699	315	183	91	40	0	275
none	25 Narrow-leaf cotonwood-deciduous shrub	89	130	112	1	17	0	113
none	26 Smooth brome-alfalfa	274	198	157	41	0	0	198
none	27 Smooth brome-mixed grass	332	319	313	6	0	0	319
none	28 Russian wildrye (Elymus junceus)	90	35	31	3	0	0	35
none	29 Great Basin wildrye (Elymus cinereus)	21	19	19	0	0	0	19
none	30 Kentucky bluegrass on upland sites (Poa pratensis)	30	32	31	0	0	0	32
none	31 Quackgrass-mixed grass (Elymus repens-mixed grass)	166	168	166	2	0	0	168
none	32 Foxtail species (Alopecurus sp.)	21	27	27	0	0	0	27
none	33 Timothy-bluegrass (Phleum pratensis-Poa sp)	184	239	234	3	0	3	239
none	34 Intermediate wheatgrass (Elymus intermedium)	162	167	163	3	0	0	167
none	35 Crested wheatgrass (Agropyron cristatum)	109	46	40	3	2	0	43

none	36 Meadow brome	31	27	26	1	0	0	27
yes	4 Sedge-Rush (Carex-Juncus)	28	77	76	1	0	0	77
yes	5 Subirrigated bluegrass (Poa sp.)	180	266	243	23	0	0	266
yes	6 Native wheatgrass-Native bluegrass on flats	1306	774	714	34	25	0	749
yes	7 Native wheatgrass-Native needlegrass Gros Ventre Hills and slopes	10	6	5	0	0	0	6
yes	9 Mountain big sagebrush-Native bluegrass on flats	12	7	7	0	0	0	7
yes	10 Mountain big sagebrush-Threetip sagebrush on slopes	3	2	1	0	1	0	1
yes	11 Shrubby cinquefoil-Sedge (Potentilla fruticosa-Carex)	4	5	4	0	1	0	4
yes	12 Willow-Sedge (Salix sp.-Carex sp)	1	1	1	0	0	0	1
yes	14 Snowberry-Rose sp. (Symphoricarpus-rosa sp)	1	1	0	0	0	0	1
yes	26 Smooth brome-alfalfa	330	332	279	53	0	0	332
yes	27 Smooth brome-mixed grass	190	219	190	29	0	0	219
yes	28 Russian wildrye (Elymus junceus)	12	17	17	0	0	0	17
yes	30 Kentucky bluegrass on upland sites (Poa pratensis)	75	83	81	1	0	0	83
yes	31 Quackgrass-mixed grass (Elymus repens-mixed grass)	81	333	332	1	0	0	333
yes	32 Foxtail species (Alopecurus sp.)	16	37	32	3	0	2	37
yes	33 Timothy-bluegrass (Phleum pratensis-Poa sp)	43	99	85	8	0	6	99
yes	34 Intermediate wheatgrass (Elymus intermedium)	145	330	323	7	0	0	330
yes	35 Crested wheatgrass (Agropyron cristatum)	694	726	717	9	0	0	726
yes	36 Meadow brome	150	185	185	0	0	0	185
	TOTAL	**24234**	**20802**	**15073**	**2330**	**3057**	**343**	**17746**

Appendix G. Predicted of tons of forage by plant community type and forage class if no irrigation had occurred on the National Elk Refuge in 2015.

IRRIGATION	Community	2015 ACRES	TOTAL	GRASS	FORB	WOODY	WEED	HERBACEOUS
none	3 Cattail-Bulrush (Typha-Scirpus)	134	262	262	0	0	0	262
none	4 Sedge-Rush (Carex-Juncus)	1130	3089	3059	30	0	0	3089
none	5 Subirrigated bluegrass	965	1564	1428	135	0	0	1564

	(Poa sp.)							
none	6 Native wheatgrass-Native bluegrass on flats	2155	616	492	91	33	0	583
none	7 Native wheatgrass-Native needlegrass Gros Ventre Hills and slopes	3719	2231	818	167	1246	0	986
none	8 Native wheatgrass-Native bluegrass Miller Butte	491	109	58	20	30	0	78
none	9 Mountain big sagebrush-Native bluegrass on flats	1202	538	346	71	121	0	417
none	10 Mountain big sagebrush-Threetip sagebrush on slopes	3992	2269	1405	158	707	0	1563
none	11 Shrubby cinquefoil-Sedge (Potentilla fruticosa-Carex)	1092	937	602	164	171	0	766
none	12 Willow-Sedge (Salix sp.-Carex sp)	220	259	199	21	33	6	227
none	13 Willow-Smooth brome (Salix sp.-Bromus inermis)	75	128	77	11	31	9	96
none	14 Snowberry-Rose sp. (Symphoricarpus-rosa sp)	2736	2361	1040	1008	313	0	2048
none	15 Mountain big sagebush-Smooth brome (Artemesia tridentata-Bromus inermis)	74	61	50	4	7	0	54
none	16 Aspen-Pinegrass (Populus tremuloides-Calamagrostis rubescens)	468	396	329	22	45	0	351
none	17 Aspen-Snowberry (Populus tremuloides-Symphoricarpus)	727	601	410	75	116	0	485
none	18 Aspen-Willow	185	155	67	37	52	0	103
none	19 Aspen-Douglas fir	468	592	234	27	14	316	578
none	20 Rocky mountain juniper-Native wheatgrass (Juniperus scopulorum)	30	7	3	1	2	0	5
none	21 Douglas fir-Lodgepole pine	131	25	5	14	5	0	20
none	22 Narrow-leaf cottonwood-Bluegrass sp. (Populus angustifolia-Poa sp.)	56	16	10	6	0	0	16
none	23 Narrow-leaf cottonwood-Mountain big sagebrush	240	126	31	25	70	0	56
none	24 Narrow-leaf cottonwood-mixed shrub	699	315	183	91	40	0	275
none	25 Narrow-leaf cotonwood-deciduous shrub	89	130	112	1	17	0	113
none	26 Smooth brome-alfalfa	604	436	347	90	0	0	436
none	27 Smooth brome-mixed grass	522	502	492	9	0	1	502
none	28 Russian wildrye (Elymus junceus)	102	39	36	4	0	0	39
none	29 Great Basin wildrye (Elymus cinereus)	21	19	19	0	0	0	19
none	30 Kentucky bluegrass on upland sites (Poa pratensis)	105	111	109	2	0	0	111

none	31 Quackgrass-mixed grass (Elymus repens-mixed grass)	247	250	247	3	0	0	250
none	32 Foxtail species (Alopecurus sp.)	37	48	47	1	0	1	48
none	33 Timothy-bluegrass (Phleum pratensis-Poa sp)	227	295	289	3	0	3	295
none	34 Intermediate wheatgrass (Elymus intermedium)	307	316	310	6	0	0	316
none	35 Crested wheatgrass (Agropyron cristatum)	803	336	297	22	18	0	319
none	36 Meadow brome	181	156	152	4	0	0	156
	TOTAL	**24234**	**19298**	**13566**	**2325**	**3071**	**336**	**16227**

From:	Steve Kallin
To:	Brad Hovinga
Cc:	Doug Brimeyer; Cris Dippel; Eric Cole; Mike Blenden
Subject:	Bison & Elk Mangement Plan Court Opinions
Date:	Friday, November 13, 2015 3:25:44 PM
Attachments:	DistrictCourtFeedgroundOpinion3-26-10.pdf CircuitCourtFeedgroundOpinion8-3-11.pdf

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Brad:

Per our discussion this afternoon. Attached are the District and Circuit Court opinions concerning litigation over the Bison and Elk Management Plan. The last three pages of the Circuit Court Opinion are the points I discussed today during our meeting.

Thanks for the meeting and discussion today,

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UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

DEFENDERS OF WILDLIFE, *et al.*,	)	
	)	
Plaintiffs,	)	
	)	
v.	)	**Civil Case No. 08-0945 (RJL)**
	)	
KENNETH L. SALAZAR, in his official capacity as Secretary of the Interior, *et al.*,[1]	)	
	)	
Defendants,	)	
	)	
and	)	
	)	
STATE OF WYOMING,	)	
	)	
Defendant-Intervenor.	)	

MEMORANDUM OPINION
(March 26, 2010) [#24, 26, and 27]

Before the Court are dueling Motions for Summary Judgment arising from a dispute over the management of the National Elk Refuge in Jackson Hole, Wyoming. Defenders of Wildlife and their fellow plaintiffs challenge the comprehensive Bison and Elk Management Plan adopted jointly by the United States Fish and Wildlife Service ("FWS") and the National Park Service ("Park Service") (collectively, "the agencies"). The plaintiffs ask that the plan be set aside because it permits the indefinite feeding of elk on the Refuge despite

[1] Former Secretary of the Interior, Dirk Kempthorne, and former Director of the United States Fish and Wildlife Service, H. Dale Hall, were originally named as defendants in this case. Pursuant to Federal Rule of Civil Procedure 25(d), if a public officer named as a party to an action in his official capacity ceases to hold office, the court will automatically substitute that officer's successor. Accordingly, the Court substitutes Kenneth L. Salazar for Kempthorne and Sam D. Hamilton for Hall.

what they regard as overwhelming evidence that continued artificial feeding will lead to the catastrophic spread of disease and will disrupt the biological integrity of the Refuge, in violation of the National Wildlife Refuge System Improvement Act ("the Improvement Act"). The plaintiffs also contend that the plan and the accompanying environmental impact statement ("EIS") violate the National Environmental Policy Act ("NEPA") because they are insufficiently detailed to allow a reasonably complete discussion of mitigation. The defendants include the federal officials charged with administering the Refuge and the intervenor State of Wyoming. Together they contend that the plan constitutes a valid exercise of discretion and that it and the EIS are sufficiently detailed to satisfy the requirements of NEPA. Based on a review of the record and pleadings, the plaintiffs' Motion for Summary Judgment is DENIED, and the defendants' respective Cross Motions for Summary Judgment are GRANTED.

BACKGROUND

About a decade ago, the FWS and the Park Service initiated a process to develop a comprehensive plan for the management of bison and elk on the National Elk Refuge ("the Refuge") and other federal land. (*See* Final Bison and Elk Management Plan and Environmental Impact Statement (AR FR017a) ("FEIS Vol. 1") at 3).[2] The agencies considered a wide range of issues in formulating the plan, one of which was the wintertime practice of feeding the bison and elk. (*Id.* at 20-22). Supplemental feeding of elk began about a century ago as a means to reduce elk mortality during the winter and to minimize

[2] The Park Service joined the planning process because, in addition to the Refuge, the plan also addresses the management of bison and elk in the Grand Teton National Park. (*See* FEIS Vol. 1 at 3).

the likelihood of elk feeding on hay meant for livestock. (*Id.* at 6). More recently, bison also began eating the supplemental elk feed provided on the Refuge. (*Id.* at 7). Over the years, this practice has had the salutary effect of reducing elk winter mortality, sustaining a larger elk population than would have otherwise survived on the region's winter range, and reducing elk contact with haystacks and pastures for livestock. (*Id.* at 10).

Notwithstanding these benefits, the winter feeding program is not without potential costs. For instance, artificial feeding attracts more bison and elk than the Refuge can support, thus damaging the native habitat. (*Id.* at 9). The large concentration of elk and bison along the feedlines also contributes to the spread of disease. (*Id.* at 9-10; Smith Report (AR S007) at 3-4, 15-19). Of particular concern is the threat of Chronic Wasting Disease ("CWD"), the equivalent of "mad cow disease." (FEIS Vol. 1 at 136). Although CWD has not yet been detected on the Refuge, experts believe that it will eventually infect the elk and bison population. (*Id.* at 137; FEIS Vol. 2 at 200). The disease is generally fatal, and because it is difficult to eradicate, it could lead to population decline and possibly to the extinction of bison and elk on the Refuge. (FEIS Vol. 1 at 274, 514; Peterson CWD Report (AR S008) at 3). CWD is not the only disease that could spread as a result of artificial feeding practices; there are a host of other debilitating diseases as well. (*See, e.g.*, FEIS Vol. 1 at 129-33; *id.* at 133 (footrot); *id.* at 134-35 (bovine tuberculosis); *id.* at 133-34 (scabies); *id.* at 135 (bovine paratuberculosis)).

During the planning process, the agencies developed six alternatives to address the effects of the winter feeding program. The agencies' preferred alternative—Alternative 4—aims over a fifteen-year period to "decrease reliance on intensive supplemental winter

feeding, including complete transition to free-standing forage if and when several established criteria are met, including support from the Wyoming Game and Fish Department and the public." (FEIS Vol. 1 at 67). This alternative is predicated on the view that the agencies must improve the natural habitat supporting the bison and elk before they can discontinue supplemental feeding. Lest there be any doubt that the agencies intend to eliminate the feeding program, they rejected Alternative 5, which proposed the indefinite continuation of the program. (*Id.* at 50). In contrast to the conditions-based approach preferred by the agencies, Alternative 6, which the plaintiffs prefer, sets a time-sensitive goal of phasing out the winter feeding program within five years. (*Id.* at 52, 68).

To implement Alternative 4, the agencies developed and approved the Bison and Elk Management Plan now under review. The plan establishes four goals: (1) conserving the native habitat, (2) promoting sustainable populations of bison and elk, (3) helping the Wyoming Game and Fish Department ("WGFD") maintain its herd objectives, and (4) preventing the spread of disease. (Final Bison and Elk Management Plan (AF FR018a) ("FBEMP") at 129-39). To achieve these goals, the plan provides for the adaptive management of the bison and elk herds and their habitat with an "emphasis on improving winter, summer, and transitional range on refuge and park lands, while at the same time ensuring that the biotic integrity and environmental health of the resources will be sustained over the long term." (*Id.* at 125). More specifically, the plan directs the agencies to initiate habitat conservation projects for the improvement of forage and to work with adjacent landowners and the WGFD to minimize bison and elk feeding on private land. (*Id.*). Under the plan, the agencies will also coordinate with the WGFD to maintain an elk herd

population of approximately 11,000—almost half of which will be expected to winter on the Refuge—and to sustain a genetically viable bison herd of about 500. (*Id.* at 126). As these measures are implemented, the agencies will gradually transition away from supplemental feeding based on yet-to-be-determined triggers derived from some or all of the following factors: (1) the "level of forage production and availability" on the Refuge; (2) the "desired herd sizes and sex and age ratios"; (3) the "effective mitigation of bison and elk co-mingling with livestock on private lands"; (4) the "winter distribution patterns of elk and bison"; (5) the "prevalence of brucellosis, chronic wasting disease, and other wildlife diseases"; and (6) "public support." (*Id.* at 125-26). In short, the plan is designed "for progressively transitioning from intensive supplemental winter feeding to greater reliance on free-standing forage." (*Id.*).

DISCUSSION

I. Standard of Review

The plaintiffs seek to set aside the agencies' comprehensive Bison and Elk Management Plan and the accompanying Final Environmental Impact Statement on grounds that the agencies violated the Improvement Act and NEPA. The plaintiffs bring their challenge under the Administrative Procedure Act ("APA"), which requires this Court to set aside agency action found to be "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). "The scope of review under the 'arbitrary and capricious' standard is narrow and a court is not to substitute its judgment for that of the agency." *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983). To satisfy that standard, an agency need only "examine the

relevant data and articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made." *Id.* (internal quotation marks omitted). Because this case involves judicial review of final agency action, the normal summary judgment standard under Federal Rule of Civil Procedure 56(c) does not apply. *N.C. Fisheries Ass'n, Inc. v. Gutierrez*, 518 F. Supp. 2d 62, 79 (D.D.C. 2007).

II. Improvement Act Claim

The crux of the plaintiffs' claim is that the Bison and Elk Management Plan does not commit to a date-certain termination of the winter feeding program. Instead of phasing out the program in five years, as the plaintiffs think is necessary, the agencies have decided to phase out the program over time as certain conditions are met. Because this conditions-based approach leaves open the possibility that supplemental feeding will continue indefinitely, the plaintiffs contend that the plan adopted by the agencies is contrary to the Improvement Act or is—at a minimum—arbitrary, capricious, or an abuse of discretion. I disagree.

The Improvement Act established the National Wildlife Refuge System, the mission of which "is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." 16 U.S.C. § 668dd(a)(2). To carry out this mission, the Act directs the Secretary of the Interior to perform a wide range of duties. For instance, the Secretary must "provide for the conservation of fish, wildlife, and plants, and their habitats within the System." *Id.* § 668dd(a)(4)(A). Under the Act, "conservation" means "to sustain and,

where appropriate, restore and enhance, healthy populations of fish, wildlife, and plants utilizing . . . methods and procedures associated with modern scientific resource programs." *Id.* § 668ee(4). The Secretary must also "ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans." *Id.* § 668dd(a)(4)(B). In addition to these conservation duties, the Secretary must, among many others things, "ensure effective coordination, interaction, and cooperation with owners of land adjoining refuges," *id.* § 668dd(a)(4)(E); "ensure that opportunities are provided within the System for compatible wildlife-dependent recreational uses," *id.* § 668dd(a)(4)(I); and "ensure timely and effective cooperation and collaboration with Federal agencies and State fish and wildlife agencies," *id.* § 668dd(a)(4)(M).

The plaintiffs contend that the Bison and Elk Management Plan defeats the overarching mission of the Refuge and violates specific mandates of the Improvement Act concerning conservation. In particular, they claim that the plan fails to provide for the conservation of bison and elk, as well as their habitats, *see id.* § 668dd(a)(4)(A), and to ensure that the biological integrity, diversity, and environmental health of the Refuge are maintained, *see id.* § 668dd(a)(4)(B). Central to this claim is the presumably indefinite continuation of the winter feeding program, the adverse effects of which the plaintiffs take great care to detail. They explain how the unnaturally large density of bison and elk caused by supplemental feeding damages the surrounding habitat and facilitates the transmission of debilitating and deadly diseases that could lead to the decline, if not extinction, of bison and elk on the Refuge. Because the plan does not mitigate these adverse effects by requiring the elimination of the feeding program within at least five years, the plaintiffs contend that the

plan fails its clear statutory obligations to sustain a healthy population of bison and elk, to conserve the Refuge's habitat, and to ensure the biological integrity, diversity, and environmental health of the Refuge. Furthermore, the plaintiffs contend that the Improvement Act's conservation mandates "trump" whatever other duties the agencies have under the statute. (Pl. Reply [#30] at 8). Therefore, because the plan elevates the agencies' duties to coordinate with private landowners, to ensure recreational opportunities, and to work with the WGFD all at the expense of its conservation duties, the plaintiffs assert that the plan is contrary to the Improvement Act and must be set aside. Not so.

As an initial matter, at least one thing is clear: The Improvement Act does not mandate that any *particular* plan be adopted. The statute gives broad direction, not precise instruction. *Wyoming v. United States*, 279 F.3d 1214, 1239-40 (10th Cir. 2002) (noting the "broad language and general directives" of the Improvement Act). It requires, for instance, that agencies "provide for the conservation" of wildlife, "ensure . . . the biological integrity, diversity, and environmental health" of the Refuge, and "plan and direct the continued growth of the [Refuge] System in a manner that is best designed to accomplish the mission of the System." 16 U.S.C. § 668dd(a)(4)(A)-(C). How the agencies carry out these sweeping directives is a matter of considerable, though not unlimited, discretion. The statute says nothing about whether supplemental feeding should be phased out based on an established timeline or based on specific conditions. Indeed, it says nothing at all about supplemental feeding. The question before the Court, therefore, is not whether the Bison and Elk Management Plan violates any specific statutory provision (it does not), but whether the plan is arbitrary, capricious, or an abuse of discretion. It is not.

In making that determination, this Court, of course, does not stand in the agencies' shoes. Rather, its task is limited to determining whether the agencies have, at a minimum, articulated a "satisfactory explanation" that establishes a "rational connection between the facts found and the choice made." *Motor Vehicle Mfrs. Ass'n*, 463 U.S. at 43 (internal quotation marks omitted). In particular, I must consider whether the agencies' explanation "was based on a consideration of the relevant factors and whether there has been a clear error of judgment." *Id.* (internal quotation marks omitted). Simply stated, the Court has no legal authority to disturb the agencies' plan so long as it takes account of all the relevant factors set forth in the Improvement Act (and no others) and is reasonable based on the facts.

Having examined the administrative record and considered the rationale for the agencies' chosen course of action, I cannot say that the Bison and Elk Management Plan either fails to account for relevant factors or is unreasonable for phasing out the winter feeding program over a fifteen-year time horizon as conditions for doing so are met. Indeed, the plaintiffs themselves acknowledge that an immediate cessation of supplemental feeding would have "significant adverse environmental consequences." (Pl. Mot. for Summ. J. [#24-2] at 37). Instead, their chief complaint is that the adopted plan does not commit to certain elimination of the feeding program within an established timeline. The agencies' decision, however, is a reasonable one in light of the provisions and purposes of the Improvement Act. As the plaintiffs concede, supplemental feeding is necessary, for now, to maintain natural population levels during the winter. According to the agencies' environmental impact statement, "the wintering of unnaturally high densities of elk on the

refuge helps sustain a more natural population level at the larger landscape level by mitigating the loss of winter range." (FEIS Vol. 1 at 13). Because the pace at which the feeding program can be phased out depends upon the pace at which winter forage on the Refuge can be improved, the "[p]remature termination of feeding, while elk and bison numbers exceed winter habitat capacity, could result in unacceptable winter losses." (Smith Report (AR S007) at 9). For this reason, the agencies' decision to discontinue the program based on conditions on the ground, as opposed to a fixed timeline, makes considerable sense.[3]

That the agencies seek to avoid losses of bison and elk caused by the lack of winter habitat is hardly contrary to the conservationist provisions of the Improvement Act or the overarching purposes of the Refuge. After all, the point of a "refuge" is to shelter wildlife displaced by human development. *See* 16 U.S.C. § 673a (providing that Refuge land is to be used "for the grazing of, and as a refuge for, American elk and other big game animals").

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[3] The plaintiffs' argument that the plan gives the WGFD an effective veto over any decision to terminate the winter feeding program is overblown. To be sure, the plan provides that a "complete transition to free-standing forage" will occur "when several established criteria are met, *including support from the Wyoming Game and Fish Department and the public*." (FBEMP at 137 (emphasis added)). But this requirement to gain the support of the WGFD and the public is consistent with, if not required by, the Improvement Act itself, which directs the agencies "to increase support for the [Refuge] and participation from conservation partners and the public," 16 U.S.C. § 668dd(a)(4)(C), and to "ensure effective coordination, interaction, and cooperation with . . . the fish and wildlife agency" of the state in which the Refuge is located, *id.* § 668dd(a)(4)(E). Of course, if the WGFD and the public refuse to support termination of the feeding program even once the conditions are ripe for doing so, then nothing would prohibit the agencies from discontinuing the program without WGFD or public support. *See Wyoming*, 279 F.3d at 1234 ("[F]ederal management and regulation of federal wildlife refuges preempts state management and regulation of such refuges . . . where state management and regulation stand as an obstacle to the accomplishment of the full purposes and objectives of the Federal Government.").

And while the threat of disease is real and must be addressed, it makes little sense to avert population decline caused by disease only to bring about population decline caused by starvation. Thus, the agencies did not err by defining "healthy populations," which the Improvement Act does not specifically define, as including "a stable and continuing population (i.e., the population returns to an initial equilibrium after being disturbed) and a minimized likelihood of irreversible long-term effects." (FEIS Vol. 1 at 12). This interpretation of the Improvement Act, which the agencies administer, is entitled to deference. *See Chevron, U.S.A., Inc. v. Natural Res. Def. Council, Inc.*, 467 U.S. 837, 844 (1984) (stating that the Supreme Court has "long recognized that considerable weight should be accorded to an executive department's construction of a statutory scheme it is entrusted to administer").

Of course, the Bison and Elk Management Plan might well have been unreasonable had the agencies categorically refused to phase out the winter feeding program in spite of all the evidence in the record about the dangers of supplemental feeding. But the agencies did not do that. Far from mandating a continuation of the feeding program in perpetuity, the agencies have adopted a plan that takes measures to improve the Refuge so that the bison and elk that winter there can survive without supplemental feeding. The rate at which the program should be discontinued is necessarily a fact-dependent determination. Thus, by making the termination of winter feeding contingent, not on an arbitrary timeline, but on the Refuge's ability to support the bison and elk herd, the plan strikes a reasonable balance between maintaining population levels and mitigating disease, both of which are necessary to achieve the overarching conservationist purpose of the Refuge as a natural shelter for

displaced bison and elk. It matters not whether this Court believes it to be the right balance. The Court's sole task is to determine whether the agencies have articulated a satisfactory explanation for the balance they have struck given the factual record. They have!

III. NEPA Claim

The plaintiffs also seek to set aside the Bison and Elk Management Plan on the ground that the environmental impact statement, which accompanies the plan, violates NEPA. Under that statute, agencies proposing a major federal action must include a "detailed statement" of, among other things, "the environmental impact of the proposed action" and "any adverse environmental effects which cannot be avoided should the proposal be implemented." 42 U.S.C. § 4332(2)(C)(i), (ii). To satisfy the latter requirement, the EIS must contain "a reasonably complete discussion of possible mitigation measures." *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 351-52 (1989). The plaintiffs do not contend that the EIS lacks a detailed statement of the environmental impacts; instead, they contend that the adaptive management plan, which they regard as a "plan to make a plan," (Pl. Mot. for Summ. J. [#24-2] at 21), is insufficiently detailed to allow for a reasonably complete discussion of mitigation measures. I disagree.

This Court has rejected that kind of argument once before and will do so again in this case. In *Theodore Roosevelt Conservation Partnership v. Salazar*, I disagreed with TRCP's argument—nearly identical to the one here—that an "adaptive-management-mitigation plan [was] 'so amorphous and ill-defined' that the agency was unable to determine the environmental consequences of the project and thus unable to take the requisite 'hard look' at the project's effect on the environment." 605 F. Supp. 2d 263, 279 (D.D.C. 2009) (Leon,

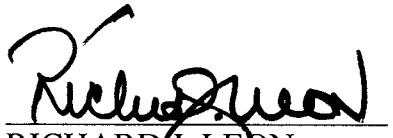
J.). In rejecting that argument, I noted that the agency's plan incorporated numerous specific mitigation techniques. *Id.* I also rejected TRCP's characterization of the plan as "equivalent to a decision to 'act now and deal with environmental consequences later,'" and I emphasized that "NEPA does not prevent agencies from adopting mitigation techniques and acknowledging they may be adjusted later depending on their effectiveness." *Id.* at 280.

Even though the agencies have yet to fill in every detail (which is to be expected of an adaptive management plan), the Bison and Elk Management Plan and EIS incorporate enough mitigation measures to provide a reasonably complete discussion of mitigation. For instance, the plan aims to mitigate the adverse effects of supplemental feeding by dispersing the feeding areas, (*see* FBEMP at 139); changing feed sites daily, (*id.*); spreading feed along meandering lines, (*id.*); delaying the onset of feeding each year, (FEIS Vol. 1 at 67); reducing the average daily ration of feed per elk or bison, (*id.*); decreasing the number of days each year of supplemental feeding, (*id.*); increasing harvest levels, (*id.*); vaccinating the bison and elk for brucellosis, (FEIS Vol. 1 at 73; FBEMP at 139); and increasing surveillance for CWD, (FEIS Vol. 1 at 40, 73; FBEMP at 126-27, 139). Again, the Court's role is a limited one—"to determine whether the EIS was compiled with objective good faith and whether the resulting statement would permit a decisionmaker to fully consider and balance the environmental factors." *Sierra Club v. Adams*, 578 F.2d 389, 393 (D.C. Cir. 1978) (internal quotation marks omitted). Having reviewed the administrative record, which includes a thorough two-volume EIS, I am confident that the agencies' preferred alternative and the plan based upon it are sufficiently detailed to provide a reasonably complete discussion of mitigation. In short, I conclude that the agencies have satisfied their

obligations under NEPA and that they have adequately addressed the possible environmental impacts and mitigation measures relating to their Bison and Elk Management Plan.

CONCLUSION

This case is an excellent example of how policy disputes too often end up in federal courts. Although the plaintiffs prefer a plan that would phase out the winter feeding program within five years, other stakeholders, including other environmental groups, prefer plans that would phase out the program over longer periods.[4] Fearing that premature termination of the program would adversely affect population levels, the agencies ultimately rejected the rigid five-year deadline that the plaintiffs advocate and opted instead for a plan that would phase out supplemental feeding as conditions for doing so were achieved. Unhappy with that result, the plaintiffs—quite predictably—turned to the courts. Unfortunately for the plaintiffs, this Court will not insinuate itself into the business of managing a wildlife refuge—a task that is well beyond its competence. Content that the agencies have articulated a satisfactory explanation for their chosen course of action and have adequately addressed mitigation for purposes of NEPA, I DENY the plaintiffs' Motion for Summary Judgment and GRANT the defendants' respective Cross Motions for Summary Judgment.



RICHARD J. LEON
United States District Judge

[4] The National Wildlife Federation, for instance, supported the agencies' preferred alternative, stating that "it is in the best interest of wildlife to discontinue winter feeding, however, a strategic, methodical approach to reducing feeding is preferable than eliminating feeding too quickly." (FEIS Vol. 2 at 150).

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT

Argued May 12, 2011 Decided August 3, 2011

No. 10-5144

DEFENDERS OF WILDLIFE, ET AL.,
APPELLANTS

v.

KENNETH LEE SALAZAR, IN HIS OFFICIAL CAPACITY AS SECRETARY OF THE INTERIOR, ET AL.,
APPELLEES

Appeal from the United States District Court
for the District of Columbia
(No. 1:08-cv-00945)

Timothy J. Preso argued the cause for appellants. With him on the briefs were *Douglas L. Honnold* and *Sean M. Helle. Sierra B. Weaver* entered an appearance.

Mark R. Haag, Attorney, U.S. Department of Justice, argued the cause for federal appellees. With him on the brief was *Robert H. Oakley*, Attorney.

James Kaste, Senior Assistant Attorney General, Office of the Attorney General for the State of Wyoming, was on the brief for intervenor State of Wyoming in support of federal

appellees. *R. Craig Lawrence*, Assistant U.S. Attorney, entered an appearance.

Before: ROGERS, TATEL, and GRIFFITH, *Circuit Judges*.

Opinion for the Court filed by *Circuit Judge* GRIFFITH.

GRIFFITH, *Circuit Judge*: As required by the National Wildlife Refuge System Improvement Act, the U.S. Fish and Wildlife Service and the National Park Service devised a plan to manage the elk and bison populations in the National Elk Refuge and Grand Teton National Park. Part of this plan includes ending the longstanding agency practice of feeding these animals during the winter. The Defenders of Wildlife challenge the plan because it fails to include a time certain for ending the practice. The district court rejected the challenge, and, for the reasons set forth below, we affirm its judgment.

I

The National Wildlife Refuge System includes over 550 refuges and 150 million acres of protected land. The Department of the Interior, acting through the U.S. Fish and Wildlife Service, manages these properties pursuant to the National Wildlife Refuge Administration Act, Pub. L. No. 89-669, 80 Stat. 926 (1966), as amended by the National Wildlife Refuge System Improvement Act ("Improvement Act"), Pub L. No. 105-57, 111 Stat. 1252 (1997) (codified at 16 U.S.C. §§ 668dd-668ee).

The National Elk Refuge is part of that system. Located just north of Jackson, Wyoming, and adjacent to Grand Teton National Park, the Refuge was established in 1912 when Congress designated 2000 acres in Jackson Hole as a "winter game (elk) reserve." Act of Aug. 10, 1912, Pub. L. No. 62-261, 37 Stat. 293 (codified as amended at 16 U.S.C. § 673). The Refuge is now a 24,700-acre expanse that the Secretary

holds "for the grazing of, and as a refuge for, American elk and other big game animals." 16 U.S.C. § 673a. Its landscape consists of meadows, marshes, streams, ponds, and open fields across a valley floor that includes sagebrush and rock outcroppings, all set against the majestic backdrop of the Teton and Gros Ventre mountain ranges. Lucky wayfarers may spot wolves, grizzly bears, trumpeter swans, and any number of the area's magnificent ungulates, including bison, bighorn sheep, pronghorn, mule deer, and, of course, elk. The National Elk Refuge's eponymous herd comprises one of the largest concentrations of elk in North America. It goes without saying that these elk are of considerable ecological, economic, and cultural value.

Around the turn of the last century, a series of severe winters in Wyoming strained the elk populations and spurred the good people of Jackson to save the elk by feeding them. When Congress created the Refuge in 1912, the federal government continued this practice, which the parties refer to as supplemental feeding. For roughly seventy days each winter, approximately 7000 elk and 1000 bison are drawn daily to the federal trough.

In recent years, it has become apparent that this practice, though born of benevolence, causes significant problems. According to the Department of the Interior, supplemental feeding leads to a seasonal concentration of elk and bison that is "an unnatural situation that has contributed to . . . an increased risk of potentially major outbreaks of exotic diseases . . . [and] damage to and loss of habitat." Final Bison and Elk Management Plan and Environmental Impact Statement for the National Elk Refuge / Grand Teton National Park / John D. Rockefeller, Jr., Memorial Parkway 9 (Feb. 1, 2007) [hereinafter February 2007 Management Plan and EIS]. This risk poses an existential threat to the elk and bison and puts the very purpose of the Refuge at jeopardy. *See id.*

(noting that the risk of diseases posed by increased concentrations of the animals has "the greatest potential to hinder . . . [the] purposes . . . [of] the National Elk Refuge").

One major problem is brucellosis—also known as "Bangs disease, undulant fever, and contagious abortion," *id.* at 564—which causes an infected female to abort her first calf, leaving behind contaminated fetal tissue on the ground capable of transmitting the disease to other animals, *id.* at 129. Brucellosis rates within normal Wyoming elk herds are approximately two percent, but rates among elk that frequent the Refuge feeding lines have averaged around seventeen percent in recent years. *Id.* at 130. Another major problem, chronic wasting disease (CWD), is the elk version of mad cow disease: Like its bovine counterpart, CWD assaults the central nervous system, causing brain lesions, behavioral changes, a loss of body condition, and ultimately death. CWD is caused by abnormal, non-living proteins known as prions that persist in the soil where infected animals graze, even after intensive efforts to remove them. *Id.* at 136-40. Statistical sampling suggests that in open, elk-hunt areas in Wyoming, the prevalence of CWD in elk averages around four percent. *Id.* at 137. But in confined areas—like those created by the feed lines—the prevalence can exceed ninety percent. *Id.* CWD is not yet prevalent in the Refuge, but if that changes, "environmental contamination will become a major concern due to the disease's ability to persist in the environment for a long period of time." *Id.*

All agree that supplemental feeding increases the risk of such diseases. Without supplemental feeding, the elk would gather in smaller groups, meaning that one sick elk would infect only the handful of others around it. But because the feeding lines bring so many together, the disease of one can quickly become that of many, if not all.

Spurred by a district court order requiring reassessment of the winter feeding operation, *see Fund for Animals v. Clark*, 27 F. Supp. 2d 8, 12-15 (D.D.C. 1998), the Fish and Wildlife Service teamed with the National Park Service,[*] also part of the Department of the Interior, to prepare a management plan for the elk and bison populations. The agencies analyzed six alternatives for managing the herds over the next fifteen years. These plans ran the gamut from maintaining the status quo to ending the practice of supplemental feeding within five years.

In April 2007, the agencies settled on an approach that would, over time, create conditions that would allow the elk and bison to survive the winter without supplemental feeding and, in the meantime, manage the risk of contagion until the practice ended. In essence, their plan seeks to restore natural forage that will allow the animals to sustain themselves during wintertime without the help of supplemental feeding. Bison and Elk Management Plan: National Elk Refuge and Grand Teton National Park 129-34 (Apr. 2007) [hereinafter April 2007 Management Plan]. For example, it provides for substantial reductions in the numbers of elk and bison, primarily through short-term increases in hunting, so that their populations will be closer to levels that would have existed had there never been a practice of supplemental feeding. *Id.* at 134-37. The plan also seeks to reduce disease transmission by rotating feed sites, spreading feed in long lines, separating elk and bison from neighboring livestock, providing increased CWD monitoring, and allowing Wyoming to vaccinate the herds. *Id.* at 138-39. Ultimately, over a fifteen-year period, "[a]s habitat and population objectives are achieved, [the agencies will aim to] decrease reliance on intensive

[*] Because the plan in this case also addresses management of elk and bison populations in nearby Grand Teton National Park, the National Park Service, which manages the park, joined in the effort.

supplemental winter feeding, including complete transition to free-standing forage if and when several established criteria are met, including support from the Wyoming Game and Fish Department and the public." *Id.* at 137.

Before adopting this approach, the agencies considered and rejected the petitioners' preferred alternative, which would have committed the Secretary to ending supplemental feeding within five years. As described in their brief, the agencies recognized that this alternative "would provide some advantages in terms of habitat benefits, a lower prevalence of brucellosis over the long term, and a lower risk for the spread of chronic wasting disease." Appellees' Br. 19 (citing Record of Decision, Final Bison and Elk Management Plan and Environmental Impact Statement: National Elk Refuge and Grand Teton National Park 10 (Apr. 2007) [hereinafter Record of Decision]). But they also found that "[this alternative] would likely result in an increase in elk mortality from starvation, predation, and disease related to poor body condition, particularly in severe winters." *Id.* (citing Record of Decision 10). This in turn would lead to a "long-term decrease in elk hunting and viewing opportunities in the Refuge, with attendant impacts on the area economy, and could cause elk herd numbers to fall below [the Wyoming Game and Fish Department's] statewide objective in some years." *Id.* at 19-20 (citing Record of Decision 10).

The agencies concluded that their preferred plan "[is more] consistent with regional herd management objectives, better balances divergent stakeholder interests, builds upon success on the ground, and enables managers to adapt to new information and changing conditions," all while preparing the animals for the eventual cessation of supplemental feeding and providing most of the benefits offered by the petitioners' preferred alternative. *Id.* at 20 (citing Record of Decision 14). On the issue of when to end supplemental feeding, the

agencies stressed that although they are committed to abandoning the practice, they would "not preclude the use of supplemental feeding or other management tools as [they] work to resolve the bison and elk management issues . . . . [N]or [would they] make predictions about how fast [they could] implement the phased approach for improving forage, reducing the [elk and bison populations], and reducing the need for supplemental feed . . . . When the biological, social, and political conditions enable [them] to consider a phase-out of feeding, [the plan's] adaptive framework provides [the agencies] with that flexibility." Record of Decision 13. In essence, the agencies determined that a deadline for ceasing supplemental feeding would be unduly restrictive in light of the many variables and concerns that need to be accounted for in managing the Refuge.

The Defenders of Wildlife, the Jackson Hole Conservation Alliance, the National Wildlife Refuge Association, the Greater Yellowstone Coalition, and the Wyoming Outdoor Council (collectively, the Defenders) filed suit in the district court, challenging the Secretary's plan under the Administrative Procedure Act. They argue the plan's failure to commit to a deadline for ending supplemental feeding was arbitrary and capricious given the Secretary's duty under the Improvement Act to "provide for the conservation of . . . wildlife" and "ensure that the biological integrity, diversity, and environmental health of the [wildlife refuge system] are maintained." 16 U.S.C. § 668dd(a)(4)(A)-(B). The district court granted summary judgment for the agencies, reasoning that the plan accounted for and managed the dangers of supplemental feeding and also created a program for phasing out the practice over a fifteen-year period. *Defenders of Wildlife v. Salazar*, 698 F. Supp. 2d 141, 147-48 (D.D.C. 2010). The Defenders of Wildlife filed a timely appeal, and we take jurisdiction pursuant to 28 U.S.C. § 1291.

We review the district court's grant of summary judgment de novo. *Castlewood Prods., LLC v. Norton*, 365 F.3d 1076, 1082 (D.C. Cir. 2004). Under the Administrative Procedure Act, we set aside agency action that is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). Our review focuses on whether the agency examined the relevant data, articulated a satisfactory explanation for its action, based its decision on the relevant factors, and committed no clear error of judgment. *Bluewater Network v. EPA*, 370 F.3d 1, 11 (D.C. Cir. 2004).

II

The parties agree that supplemental feeding poses serious risks for the elk and bison in the Refuge. The only question this case presents is whether it was arbitrary and capricious for the Secretary to transition away from supplemental feeding without committing himself to ending the practice on a particular date.

The Defenders argue it was, inasmuch as the very purpose of the National Wildlife Refuge System, as set out in the Improvement Act, "is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." 16 U.S.C. § 668dd(a)(2). To that end, the Defenders point out, the Act mandates that the Secretary manage refuges to "provide for the *conservation* of fish, wildlife, and plants, and their habitats within the System" and to "ensure that the *biological integrity, diversity, and environmental health* of the System are maintained for the benefit of present and future generations of Americans." *Id.* § 668dd(a)(4)(A), (B) (emphases added). The Act also instructs the Secretary to

"sustain and, where appropriate, restore and enhance, healthy populations of fish, wildlife, and plants utilizing . . . methods and procedures associated with modern scientific resource programs." *Id.* § 668ee(4). The Defenders argue that the Secretary's plan is unlawful because it does not fix a definite time for ending supplemental feeding, even though the agencies have acknowledged that the dangers posed by this practice imperil explicit statutory objectives. *See* February 2007 Management Plan and EIS 9. Underlying this statutory argument is some common sense: the whole point of a National Elk *Refuge* is to provide a sanctuary in which populations of healthy, reproducing elk can be sustained. *See* 16 U.S.C. § 673a (creating a "refuge" for the elk). The Refuge can hardly provide such a sanctuary if, every winter, elk and bison are drawn by the siren song of human-provided food to what becomes, through the act of gathering, a miasmic zone of life-threatening diseases.

The Defenders acknowledge that the Improvement Act also requires the Secretary to consider other factors such as the importance of recreation on refuge lands and cooperation with state officials in pursuing the objectives of the Act. *See id.* § 668dd(4)(I), (M). They argue, however, that such considerations may be pursued only when "compatible" or "consistent with" the conservation mission of the System and the purposes of each refuge. *See id.* § 668dd(a)(3)(B), (e)(3). Reading the several provisions of the Act that emphasize the importance of wildlife conservation together with the general purpose of the National Wildlife Refuge System, the Defenders contend that the agencies' top priority in managing the Refuge must be conservation, and other considerations must not hinder that objective.

For their part, the Secretary and Wyoming (intervening as a defendant-appellee in this case) argue that the Improvement Act confers upon the Secretary broad managerial discretion in

how to pursue the Act's objectives. They concede that conservation is the overarching objective, but argue that it cannot be the sole consideration. After all, the Act lists fourteen factors that the Secretary "shall" consider in administering the System, including, among others, "ensur[ing] effective coordination, interaction, and cooperation" with adjoining landowners and State fish and wildlife agencies in pursuit of the objectives of the Act. *Id.* § 668dd(a)(4)(E).

Given the discretion afforded him, the Secretary argues that the agencies reasonably determined that the plan is consistent with the objectives of the Act and the purposes of the Refuge. The plan addresses the risk of diseases by (1) increasing natural forage and decreasing the herd sizes, which will work in tandem to create conditions under which supplemental feeding can be stopped without unduly increasing the risk of starvation, (2) monitoring and managing the diseases that accompany gathering at the feed lines, and (3) progressively reducing reliance on supplemental feeding when certain criteria have been met.

There is no doubt that unmitigated continuation of supplemental feeding would undermine the conservation purpose of the National Wildlife Refuge System. But we cannot conclude that the agencies acted unlawfully by adopting a plan that contained no deadline for ending the practice, and that is the only issue before us. The record amply demonstrates that the agencies collected the relevant data, identified the dangers posed by supplemental feeding, and adopted a plan to mitigate those dangers. That they also determined that the many objectives of the Act, including conservation, could best be met without implementation of a fixed deadline for stopping supplemental feeding was not arbitrary or capricious.

The district court was right that the plan "might well have been unreasonable had the agencies categorically refused to phase out the winter feeding program in spite of all the evidence in the record about the dangers of supplemental feeding." *Defenders of Wildlife*, 698 F. Supp. 2d at 148. But they did no such thing. Instead, they selected an approach that is geared toward ending the practice over time while maintaining the flexibility needed to respond to facts on the ground. The Defenders are understandably concerned that this flexibility could be used to continue the practice indefinitely. But the agencies must proceed in a manner that is consistent with the science and accounts for the risks posed by supplemental feeding. There is nothing the agencies have said or done that causes us to doubt that they will. It is highly significant and indeed dispositive to us, as it was to the district court, that the agencies are committed to ending supplemental feeding. We do not know precisely how they will proceed, and that makes it impossible, at this stage, to declare that their plan is arbitrary and capricious simply because it does not specify a particular date by which the practice will cease. Should the agencies act unreasonably in establishing criteria for the transition or in otherwise carrying out the plan, that will be a different issue for another panel.

III

The Defenders also argue that the plan unlawfully gives the Wyoming Fish and Game Department a veto over whether supplemental feeding will end. They point to language in the plan stating that the agencies will seek to "decrease reliance on intensive supplemental winter feeding, including complete transition to free-standing forage *if and when several established criteria are met, including support from the Wyoming Game and Fish Department* and the public." April 2007 Management Plan 137 (emphasis added).

Regardless of how we might have read this language in the first instance, the Secretary has assured us in his briefs and at oral argument that the language confers no veto. *See* Appellees' Br. 34 (characterizing the disputed provision as "aspirational" rather than a grant of any power to Wyoming); Wyoming's Br. 28 n.6 (also agreeing that Wyoming does not have a veto); *cf. Wyoming v. United States*, 279 F.3d 1214, 1234 (10th Cir. 2002) ("[F]ederal management and regulation of federal wildlife refuges preempts state management and regulation of such refuges . . . where state management and regulation stand as an obstacle to the accomplishment of the full purposes and objectives of the Federal Government."). We take the Secretary at his word that Wyoming has no veto over the Secretary's duty to end a practice that is concededly at odds with the long-term health of the elk and bison in the Refuge.

IV

For the foregoing reasons, the district court's judgment is

Affirmed.

From: Steve Kallin
To: Brad Hovinga
Subject: RE: Meet Again??
Date: Tuesday, November 17, 2015 8:04:02 AM

Hi Brad:

Does 11:00 AM work for you? If it doesn't, I am available between 10:00 AM and 2:00 PM. We'd be happy to provide coffee here, or we can meet at your office; your choice.

I look forward meeting with you.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Brad Hovinga [mailto:brad.hovinga@wyo.gov]
Sent: Tuesday, November 17, 2015 7:36 AM
To: Steve Kallin
Cc: Doug Brimeyer
Subject: Meet Again??

Hi Steve,

Doug and I had another discussion with our Administration this morning. We feel that there maybe some wiggle room to work together on the Step-Down Plan. Is there a time that we could meet with you tomorrow (11/18) to discuss?

Thanks,
Brad

--

Brad Hovinga
Wyoming Game and Fish Department
Regional Wildlife Supervisor
Jackson Region
Jackson, WY
(307) 733-2321

E-Mail to and from me, in connection with the transaction of public business, is subject to the Wyoming Public Records Act and may be disclosed to third parties.

From: Steve Kallin
To: Brad Hovinga
Subject: RE: Meet Again??
Date: Tuesday, November 17, 2015 8:51:15 AM

Looking forward to it.

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Brad Hovinga [mailto:brad.hovinga@wyo.gov]
Sent: Tuesday, November 17, 2015 8:07 AM
To: Steve Kallin
Cc: Doug Brimeyer
Subject: Re: Meet Again??

We will meet you at your office at 11 a.m. Thanks for working us into your schedule. See you tomorrow.

Brad

On Tue, Nov 17, 2015 at 8:04 AM, Steve Kallin <steve_kallin@fws.gov> wrote:
Hi Brad:

Does 11:00 AM work for you? If it doesn't, I am available between 10:00 AM and 2:00 PM. We'd be happy to provide coffee here, or we can meet at your office; your choice.

I look forward meeting with you.

Take care,

Steve Kallin
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Jackson, WY 83001
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--
Brad Hovinga
Wyoming Game and Fish Department
Regional Wildlife Supervisor
Jackson Region
Jackson, WY
(307) 733-2321

E-Mail to and from me, in connection with the transaction of public business, is subject to the Wyoming Public Records Act and may be disclosed to third parties.

From: Blenden, Mike
To: Steve Kallin
Subject: December 3 call on feeding
Date: Friday, November 20, 2015 3:50:34 PM

Steve,

Will accepted the invitation to talk about Wyoming/feeding/step down plan for 9:00 a.m. December 3. I haven't heard from Maureen but I think we should plan on that time.

Mike

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

From: Steve Kallin
To: Brad Hovinga
Subject: Scheduled discussion with regional office
Date: Monday, November 23, 2015 8:50:46 PM

Hi Brad:

I have tentatively set up a conference call with our regional office the first week in December, to discuss the concerns you raised on behalf of the WGFD about the draft bison/elk step down plan.

I will update you after that conversation.

Take care, Steve

From: Cole, Eric
To: Steve Kallin; Cris Dippel
Subject: NER elk collar cost estimate and order
Date: Tuesday, November 24, 2015 11:55:45 AM
Attachments: 2016 telonics collaring cost estimate.xlsx

Steve and Cris,

To ensure that we have elk GPS collars available for deployment this winter, I must place an order by 15 December. Although I will likely develop alternative sources of funding in the future, I will have no commitments for other sources of money by the 15 December order deadline.

Because there is hunting and other mortality in the collared elk population, I think that 25 elk collars would be a bare minimum to meet our monitoring goals associated with the step down plan, and 50 would be ideal. Cost estimates for 1 year of Telonics Iridium GPS collars operation are $58,055 for 25 collars and $115,455 for 50 collars (see attached spreadsheet).

Non-government is really the only option for us given the contracting delays that would be associated with and order using government funds.

Please let me know how you would like to proceed.

Thanks,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

Collar cost estimate for Telonics Irridium collars
Note that 3 year life calculation from Telonics was based on a 90 minute fix interval with the VHF beacon C

Initial purchase costs per unit

Item	Unit Cost	Interval	Comments
Telonics TGW-4670-3 Irridium collar	1800	once	
CR2A collar release mechanism	300	once	
collar activation fee	40	once	
software and downloading cable	655	once	
Iridium Data Costs (joubeh) per collar	13	monthly	per collar monthly
Collar refurb cost including new relea	1400	once	

Initial Cost Estimate for 50 collars and 1 year operation

Item	Unit Cost	Number	InitialCost	PerYear	Total Cost Per Year
Telonics TGW-4670-3 Irridium collar	1800	50	90000	0	90000
CR2A collar release mechanism	300	50	15000	0	15000
collar activation fee	40	50	2000	0	2000
software and downloading cable	655	1	655	0	655
Iridium Data Costs (joubeh) per collar	13	50	0	7800	7800
TOTAL					**115455**

Initial Cost Estimate for 25 collars and 1 year operation

Item	Unit Cost	Number	InitialCost	PerYear	Total Cost Per Year
Telonics TGW-4670-3 Irridium collar	1800	25	45000	0	45000
CR2A collar release mechanism	300	25	7500	0	7500
collar activation fee	40	25	1000	0	1000
software and downloading cable	655	1	655	0	655
Iridium Data Costs (joubeh) per collar	13	25	0	3900	3900
TOTAL					**58055**

Initial Cost Estimate for 15 collars and 1 year operation

Item	Unit Cost	Number	InitialCost	PerYear	Total Cost Per Year
Telonics TGW-4670-3 Irridium collar	1800	15	27000	0	27000
CR2A collar release mechanism	300	15	4500	0	4500
collar activation fee	40	15	600	0	600
software and downloading cable	655	1	655	0	655
Iridium Data Costs (joubeh) per collar	13	15	0	2340	2340
TOTAL					**35095**

OFF

From: Steve Kallin
To: Eric Cole; Cris Dippel
Subject: RE: NER elk collar cost estimate and order
Date: Wednesday, November 25, 2015 11:17:39 AM

Eric:

I will be discussing the status of the Step Down Plan with the RO on Dec. 3 and hopefully will have a better feel for the direction we will be taking.

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Cole, Eric [mailto:eric_cole@fws.gov]
Sent: Tuesday, November 24, 2015 11:56 AM
To: Steve Kallin; Cris Dippel
Subject: NER elk collar cost estimate and order

Steve and Cris,

To ensure that we have elk GPS collars available for deployment this winter, I must place an order by 15 December. Although I will likely develop alternative sources of funding in the future, I will have no commitments for other sources of money by the 15 December order deadline.

Because there is hunting and other mortality in the collared elk population, I think that 25 elk collars would be a bare minimum to meet our monitoring goals associated with the step down plan, and 50 would be ideal. Cost estimates for 1 year of Telonics Iridium GPS collars operation are $58,055 for 25 collars and $115,455 for 50 collars (see attached spreadsheet).

Non-government is really the only option for us given the contracting delays that would be associated with and order using government funds.

Please let me know how you would like to proceed.

Thanks,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable

amount is amassed." Aristotle

From: Steve Kallin
To: Mike Blenden
Subject: Draft NER Step Down Plan update for WY Congressional Delegation Aids
Date: Monday, November 30, 2015 2:46:28 PM

Hi Mike:

Just letting you know I received a call and request from Senator Barrasso's Aid concerning the Bison/Elk Step Down Plan. She was in attendance at the Governor's Brucellosis Task Force meeting last week when the WGFD mentioned they were working with the NER on a plan that may include redistribution of elk from the NER in the winter. She requested an update which is scheduled for tomorrow afternoon at 2:00 PM. No need for your involvement; just giving you a heads-up on what is happening out here.

I still have a Step Down Plan update call with you and Will on Thursday, Dec. 3 at 9:00 AM.

Let me know if you need additional info.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

Summary of Fall Elk Count/Migration Trends on National Elk Refuge

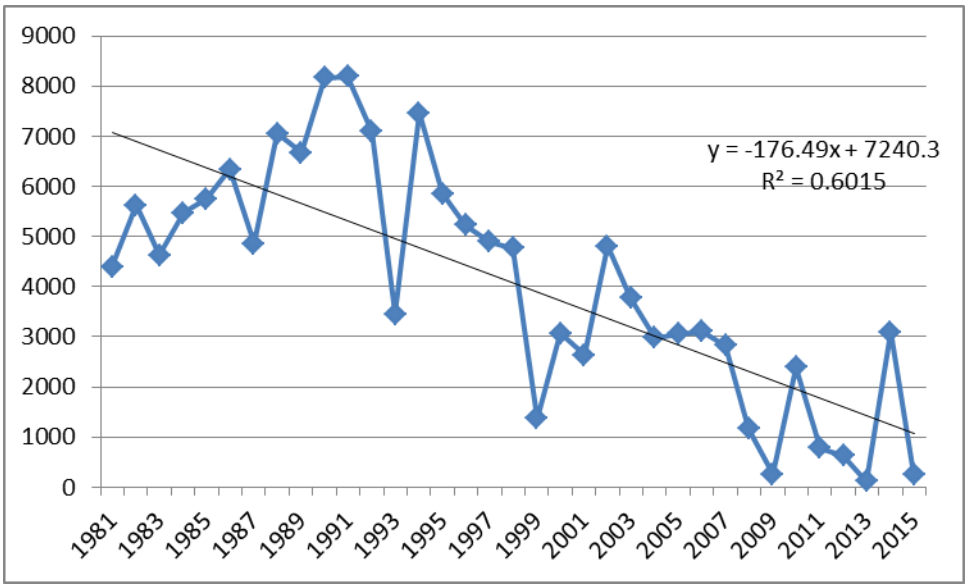


Figure 1. The number of elk counted on December 1 on the southern portion of the National Elk Refuge, 1981-2015.

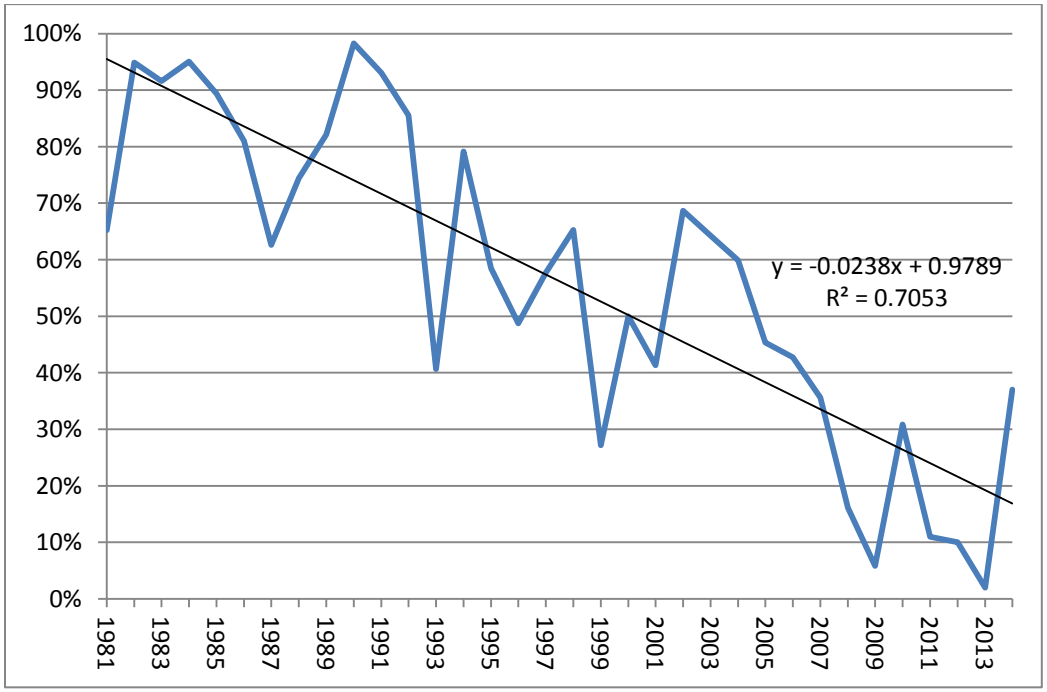


Figure 2. The number of elk counted on December 1 on the southern portion of NER expressed as a percentage of the elk that were subsequently counted during the annual classification count in February. This accounts for annual variation associated with changes in population size. Note the time series is 1981-2014 because we do not yet know the results of the 2016 classification count.

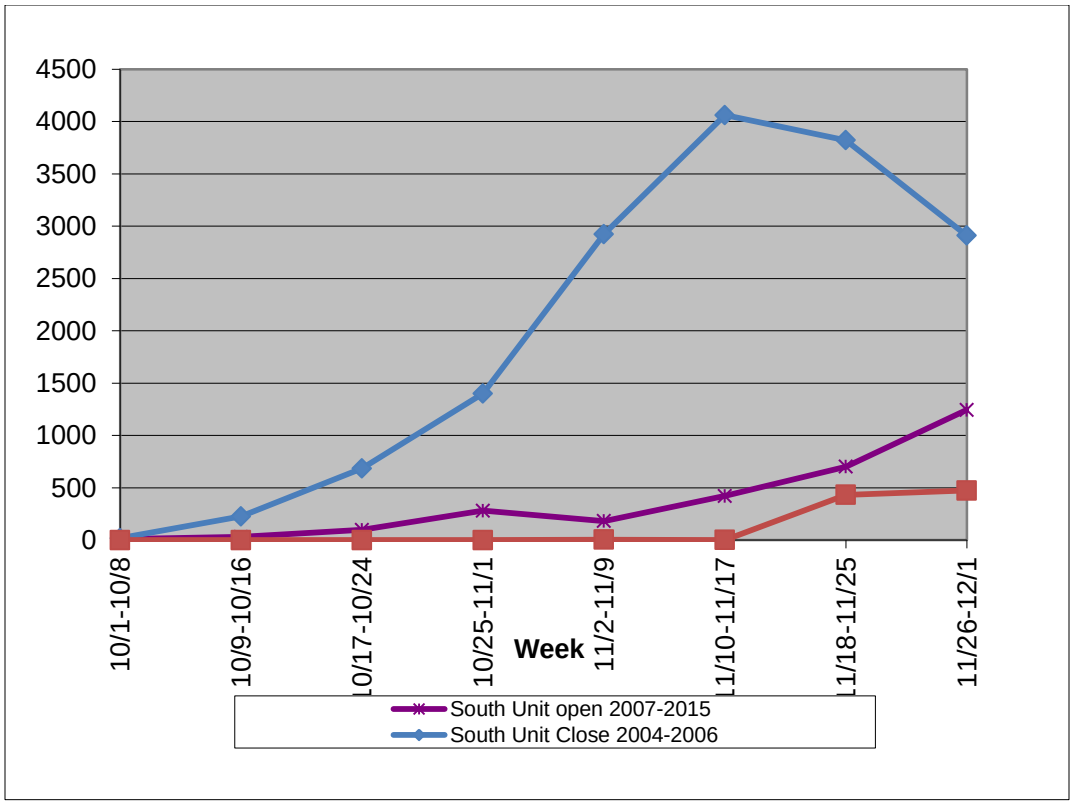


Figure 3. The average number of elk counted on southern NER by week for time periods when there was no south unit hunt (2004-2006); when the south unit hunt was open (2007-2015); and for 2015.

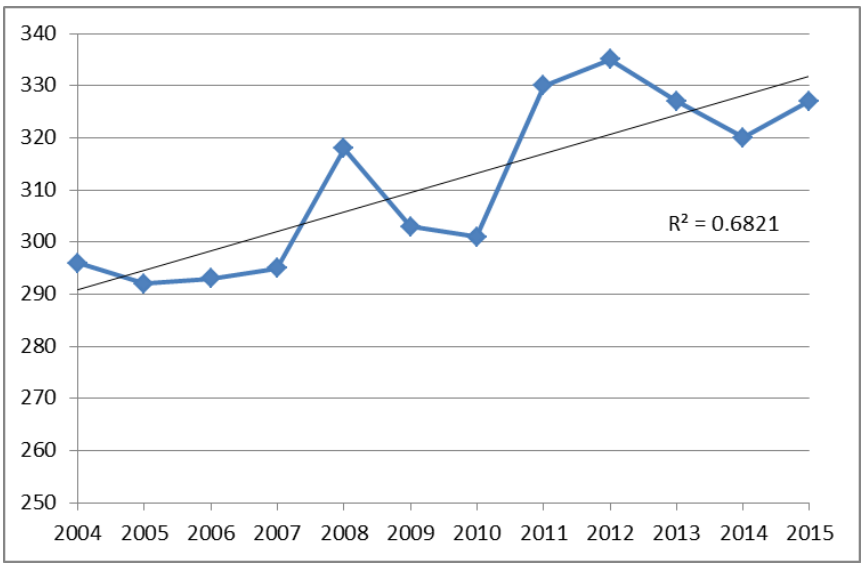


Figure 4. First day of year that 500 or more elk were observed on southern NER, 2004-2015. For reference, day of year 290=October 17 and 340=December 6.

From:	Cole, Eric
To:	Bryan Yetter; troffe@exchange.montana.edu; Aly Courtemanch; Amanda Soliday; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Corinna Reginos; Cris Dippel; Daniel Huckel; Dave Gustine; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Nick Dobric; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Siva Sundaresan; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan G. Clark; Susan Patla; Terry Roper; Tim Pratt; Tom Reed; Ture Schoultz
Subject:	2 December 2015 National Elk Refuge Biological Update
Date:	Wednesday, December 02, 2015 12:47:13 PM
Attachments:	Summary of Elk Migration Trends to National Elk Refuge.pdf

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2 December 2015 National Elk Refuge Biological Update

Note: Unless otherwise indicated all ungulate counts are conducted in an 11,400 acre standardized survey area, which roughly corresponds to the southern half of the Refuge.

Elk

The number of elk observed in the survey area from 26 Nov through 1 Dec ranged from 250-700 (mean 475). Almost all elk were observed in the 1/2 mile non hunting zone adjacent to highway 89. Collar data and other observations suggest that approximately 500-1,000 additional elk have passed through NER to the Bridger Teton National Forest east of the refuge. With Hunt Area 80 closed and the BTNF winter range closure in effect as of December 1, there will be little incentive for elk to leave the Forest for the hunt areas that remain open (NER and Grand Teton National Park). However, relatively low elk numbers on and immediately adjacent to NER suggests that most elk have not migrated to/through the refuge, and that there is still ample opportunity to harvest elk on NER and GTNP for the remainder of those seasons.

Low elk numbers on NER at this time of year is part of a long term trend of later elk migration to NER and also disturbance of elk off the south end of the refuge associated with the refuge's south unit hunt, which has been in effect since 2007 (See attached figures).

Bison

No significant numbers of bison have been observed on NER since early August, but there were approximately 200 bison on Antelope Flats southwest of Shadow Mountain on 1 Dec 2015. This suggests that bison movement to NER is possible.

Bighorn Sheep

The seasonal high count for bighorn sheep in the vicinity of Miller Butte was 83, observed on 23 November 2015.

Pronghorn

35 total pronghorn were observed on southern NER on 30 Nov 2015. 9 were in the Ben Goe area northeast of Miller Butte and 26 were in the Peterson Area southeast of North Gap.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge

Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

Summary of Fall Elk Count/Migration Trends on National Elk Refuge

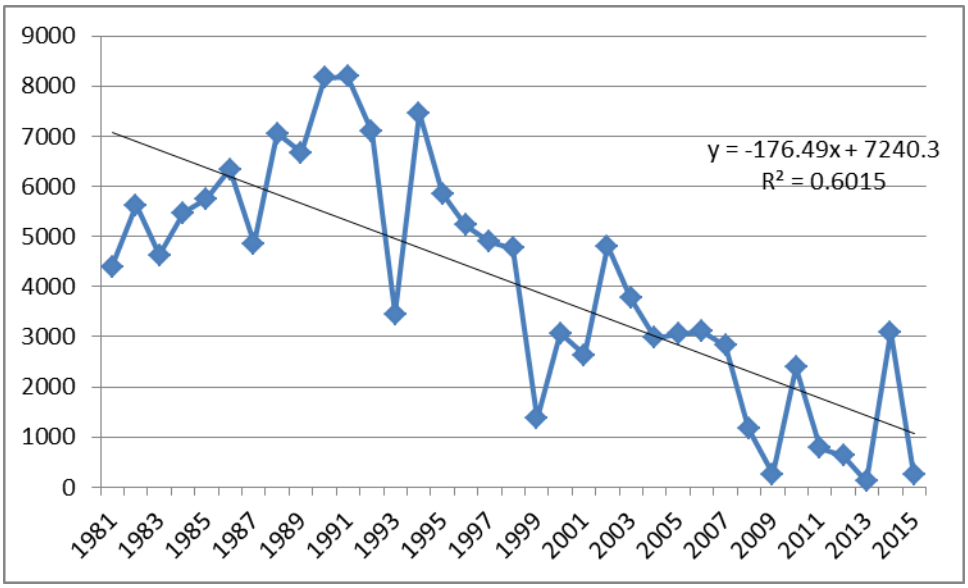


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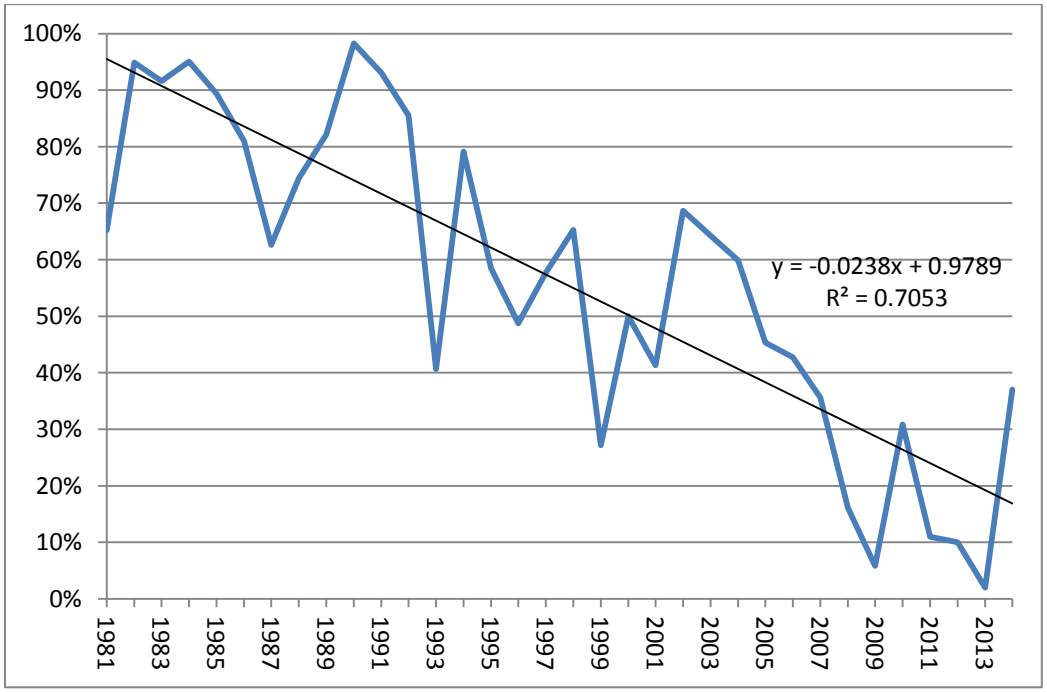


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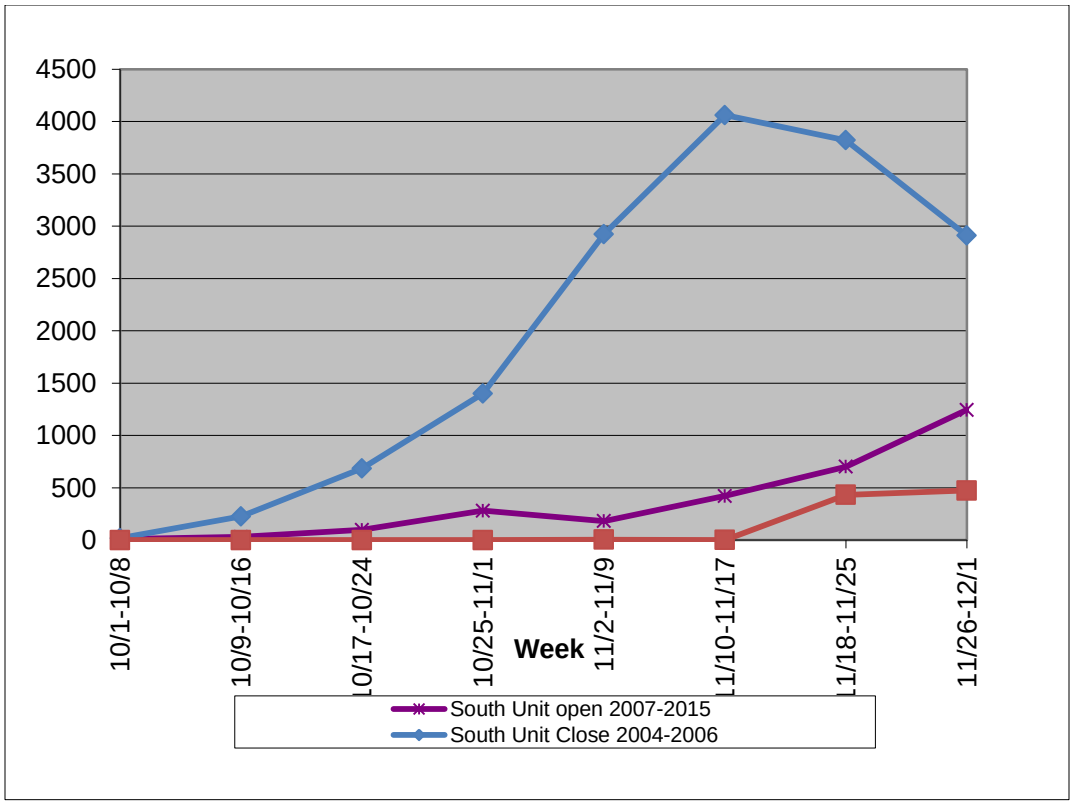


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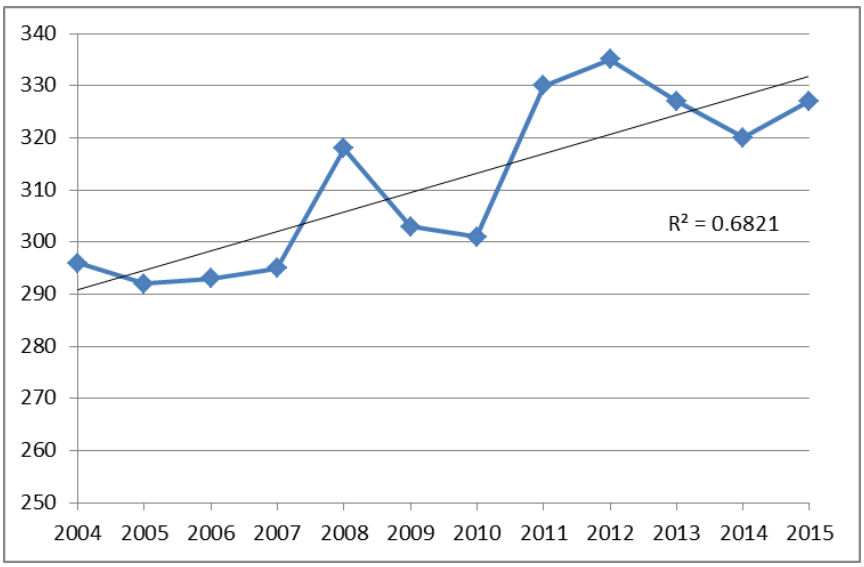


Figure 4. First day of year that 500 or more elk were observed on southern NER, 2004-2015. For reference, day of year 290=October 17 and 340=December 6.

From: Noreen Walsh
To: will_meeks@fws.gov
Cc: Matt Hogan
Subject: WY CWD plan
Date: Thursday, December 03, 2015 9:32:14 AM

Hi Will,

Not urgent, but let's schedule a conversation with NER about
1. Status of our AM plan - where is it, what's in it
2. Our perspective on WY new CWD plan - does it Change or clarify anything?
3. The future

NLT January would be good.
Thanks
Noreen

Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service

Begin forwarded message:

From: <editor@mountainwestnews.org>
Date: December 2, 2015 at 11:56:23 AM PST
To: <noreen_walsh@fws.gov>
Subject: Mountain West News Daily Newsletter

Flathead Lake *Photo courtesy of Rick and Susie Graetz*

Go to web site

Mountain West News is a
program of the
O'Connor Center for the Rocky Mountain West at
The University of Montana

Wednesday,
Dec. 2, 2015

Produced by Shellie Nelson, MW News Editor

Editor's notes:

In the **Rockies today,** another community in the West raises concerns about oil trains passing through its neighborhoods, Wyoming releases a plan to address an always-fatal wildlife disease, and three Western states led the nation in job growth between October of 2014 and October of this year.

Redevelopment of the area around Denver's Union Station has brought thousands of new residents to that area of the Colorado city, and new concerns about the increase in trains carrying oil through that neighborhood as well as others in the city.

Residents weren't placated by city officials' explanation that, should an oil train disaster occur in a neighborhood, they would "bring in foam from DIA." In Wyoming, the state wildlife agency released its plan to confront the spread of chronic-wasting disease that includes a component on the state's elk feedgrounds.

Mountain West Voices
On the Bookshelf
Mountain West Perspectives
A Look Ahead

A Look Ahead

Dec. 4-5: Western Governors' Association's Winter Meeting, Las Vegas, Nevada

On the Bookshelf

Barbara Theroux suggests some books for the readers on your Christmas list

Mountain West Perspectives

Montana's two-year colleges revamp education to meet changing workplace demands

And a report from the U.S. Bureau of Labor Statistics ranks Idaho first in the nation in job growth in the year between October of 2014 and this October.

Utah came in second and Nevada third, while North Dakota and West Virginia were the only two states that reported a decline in jobs.

In our On the Bookshelf column today, Barbara Theroux has some gift suggestions for those readers on your Christmas list.

In this editor's opinion, you can never have too many books -- on your shelves or under your tree!

Quote of the day:

"It's high time Wyoming communities had these discussions, and so I am guardedly optimistic. It's good to see the draft plan encourages informed discussions and comments based on recent science involved in chronic wasting disease."

Lloyd Dorsey, the Sierra Club's conservation director for Wyoming, discussing the Wyoming Game and Fish Department's draft management plan for chronic wasting disease released this week.
- Jackson Hole News & Guide

Rockies today

Increase in oil trains spark demands for safety reviews in Denver

Residents in the gleaming new condos in Denver's Riverside Park aren't bothered by the sound the trains of tankcars carrying oil and other flammable liquids make as they rumble beside their homes, but they are concerned about what they believe is an underwhelming response from the Colorado city's officials about their concerns about those trains passing through the city, including in areas where there is only one way in and out and near the city's major sports venues.

Denver Post; December 2

Send this to a friend

Wyoming releases draft of plan to address chronic-wasting disease

The always fatal chronic-wasting disease has yet to be found in elk west of the Continental Divide in Wyoming, although it has been moving west in the state since the 1980s. Wyoming Fish and Game is taking public comment on its draft management plan for the disease through Jan. 5.

Jackson Hole News & Guide; December 2

Send this to a friend

- Wyoming's Chronic Wasting Disease Draft Plan

  Wyoming Fish and Game; December 2

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Utah objects to board, venue of Mexican gray wolf reintroduction meeting

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Flathead Lake *Photo courtesy of Rick and Susie Graetz*

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Mountain West News is a
program of the
O'Connor Center for the Rocky Mountain West at
The University of Montana

Wednesday,
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To: Mike Blenden
Subject: Fwd: WY CWD plan
Date: Thursday, December 03, 2015 11:25:08 AM

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303 (w)
720-541-0310 (c)

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From: Noreen Walsh <noreen_walsh@fws.gov>
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Date: December 2, 2015 at 11:56:23 AM PST
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Subject: Mountain West News Daily Newsletter

Flathead Lake

Photo courtesy of Rick and Susie Graetz

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> > **From:** <editor@mountainwestnews.org>
> > **Date:** December 2, 2015 at 11:56:23 AM PST
> > **To:** <noreen_walsh@fws.gov>
> > **Subject: Mountain West News Daily Newsletter**
> >
> > *Flathead Lake* *Photo courtesy of Rick and Susie Graetz*
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> > *Go to web site*
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Jackson Hole News & Guide; December 2

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From:	Steve Kallin
To:	Will Meeks
Cc:	Mike Blenden
Subject:	RE: Google Alert - National Elk Refuge
Date:	Thursday, December 03, 2015 3:35:01 PM
Attachments:	Disease has cattle industry on edge_JHnews and guide_12-3-2015.pdf

Will:

Thank you for the feed ground article.

I have attached for your reading pleasure another article in today's Jackson Hole News and Guide; "Disease has cattle industry on edge." Comingling between domestic livestock and elk is touted as the cause of the brucellosis outbreak in cattle; could be.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Will Meeks [mailto:will_meeks@fws.gov]
Sent: Thursday, December 03, 2015 2:28 PM
To: Mike Blenden; Steve Kallin
Subject: Fwd: Google Alert - National Elk Refuge

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303 (w)
720-541-0310 (c)

Begin forwarded message:

> **From:** Google Alerts <googlealerts-noreply@google.com>
> **Date:** December 3, 2015 at 2:00:23 PM MST
> **To:** <will_meeks@fws.gov>
> **Subject: Google Alert - National Elk Refuge**



National Elk Refuge

Daily update · December 3, 2015

NEWS

Forest Service OK's continued use of Alkali Creek **Elk** Feedground

Jackson Hole News&Guide

The Gros Ventre feedgrounds are also thought to keep some elk in the drainage from migrating each winter to the **National Elk Refuge**, just north of ...

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■ Wyoming

Disease has cattle industry on edge

CHEYENNE (AP) — State livestock officials are encouraging ranchers to keep their cattle away from elk to avoid getting brucellosis, a bacterial disease that can cause cows to abort their calves.

But abundant elk might make separation difficult in parts of northwest Wyoming where the disease keeps reappearing in cattle, State Veterinarian Jim Logan said.

Wyoming went four years without a case of brucellosis in cattle until laboratory tests confirmed the disease in a cow in Park County in November. Test results on a second suspected case in Sublette County are pending and should come back later this week or early next week, Logan said.

Analysis is underway at the Wyoming State Veterinary Laboratory in Laramie and the federal National Veterinary Services Laboratory in Ames, Iowa.

"We're waiting on tissue culture and that just takes time," Logan said Tuesday. "There's nothing you can do to hurry it up. Just give it time to grow."

The other cattle in the Park County herd have tested negative, and test results are pending for the others in the Sublette County herd. Livestock officials have quarantined both herds and five others — one in Park County and four in Sublette County — that came in contact with the two herds.

People can get brucellosis by drinking unpasteurized milk, but human cases are rare in the U.S.

A major outbreak in cattle could impede Wyoming ranchers' ability to do business

*See **LIVESTOCK** on page 6*

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LIVESTOCK

Continued from cover

outside the state, causing major economic damage.

Yellowstone National Park has gone so far as to slaughter thousands of bison, which also can carry brucellosis, to keep them away from cattle in Montana in winter. Montana, unlike Wyoming, hasn't had brucellosis in cattle recently. Cattle in Wyoming typically catch brucellosis from elk.

Ranchers can put up fences to separate their cattle from elk or make sure cattle don't graze areas where infected elk have recently given birth, Wyoming Stock Growers Association Executive Vice President Jim Magagna said Wednesday.

"As long as we have it in the wildlife, these occasional transfers — in spite of a lot of good efforts both by the game and fish managers and by the ranchers — they're just somewhat inevitable," said Magagna.

The good news — if there is any with brucellosis — is testing apparently caught the cattle brucellosis cases early. That shows Wyoming's testing program works, Magagna said.

The Wyoming Stock Growers Association supports ongoing research into developing more effective brucellosis vaccines for both cattle and wildlife, he said.

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From: Blenden, Mike
To: Steve Kallin
Subject: Fwd: National Elk Refuge briefing
Date: Thursday, December 03, 2015 4:25:29 PM

Are you available to meet with Noreen, Will and me on December 9, next week?

Mike
---------- Forwarded message ----------
From: **Blenden, Mike** <mike_blenden@fws.gov>
Date: Thu, Dec 3, 2015 at 4:23 PM
Subject: National Elk Refuge briefing
To: Denise Sanchez <denise_sanchez@fws.gov>

Denise,

Please put us down for 3:00 p.m. on December 9 to brief Noreen on elk feeding program at the National Elk Refuge. In attendance will be Will, Steve Kallin and me. I haven't determined if Keenan Adams will join us but will tomorrow.

Thanks,

Mike

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

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Subject: Jake Nichol"s article
Date: Wednesday, December 09, 2015 10:01:19 AM

I thought I'd send this link from the *Planet JH* to you since you're in the RO this week talking about some of our controversial issues. I think it's important our leadership understand how often our topics are debated, analyzed, covered by the media, etc.

http://planetjh.com/2015/12/08/feature-wapiti-welfare/

It was 40 degrees at my house this morning at 6:00 am. Yuck! No powder day for me today ...

Lori

Lori Iverson
Outreach & Visitor Services
U.S. Fish & Wildlife Service
National Elk Refuge
PO Box 510 / 675 East Broadway
Jackson, WY 83001
Phone: 307.201.5433
Cell: 307.690.4375
Fax: 307.733.9729
lori_iverson@fws.gov
National Elk Refuge photo gallery
National Elk Refuge web site
Twitter: @NatlElkRefuge

"The only thing that isn't worthless: to live this life out truthfully and rightly. And be patient with those who don't." - Marcus Aurelius

From:	Steve Kallin
To:	Mike Blenden
Cc:	Will Meeks; Maureen Gallagher
Subject:	"Wapiti Welfare", Planet Jackson Hole
Date:	Wednesday, December 09, 2015 11:39:03 AM

Hi Mike:

The link below is to an extensive article published today concerning the complexities of elk management in the Jackson Hole Area. It's a pretty good article in outlining different factors which complicate elk management for the NER. Although it doesn't include any quotes or opinions from Guides, Outfitters or Ranchers. I thought the statement by John Baughman (WGFD Retired) was interesting; ". . . the supplemental feeding program in Jackson Hole is perhaps the most complicated wildlife management issue in North America."

Looking forward to discussing this "complicated" issue this afternoon.

http://planetjh.com/2015/12/08/feature-wapiti-welfare/

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Steve Kallin
To: Mike Blenden
Cc: Maureen Gallagher; Cris Dippel; Eric Cole
Subject: Elk Collars
Date: Thursday, December 10, 2015 6:23:35 AM

Mike:

I spoke very briefly with Eric Cole about elk collars yesterday after our meeting (I interrupted his birthday celebration).

GPS collars will answer the question, "When elk leave the NER under the new feeding regime, are they going to desirable or undesirable locations?" This was my focus because I will deal with the public relations aspect of the change in supplemental feeding.

These collars will also answer the question, "Are elk leaving the NER due to a change in feeding initiation." Eric estimated the number of collars needed to answer this question, based on making comparisons to our existing elk movement database. We have invested in approximately 20 collars per year since 2007. Our existing database of GPS locations demonstrates elk behavior under the existing feeding protocol. Data from collars placed on elk prior to changing the feeding protocol will be compared to our existing database. That data will be used to analyze differences between "elk leaving the refuge after the end of the hunting season, but before the initiation of supplemental feeding" under the status quo and under the new feeding protocol. I have asked Eric to write up a brief (less than one page) description of the use of GPS collars for this purpose, the statistics involved, the minimum and ideal number of collars needed to be deployed before we change the initiation of feeding.

Eric is off work until next week. I will send his write up next week.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Blenden, Mike
To: Steve Kallin
Cc: Maureen Gallagher; Cris Dippel; Eric Cole
Subject: Re: Elk Collars
Date: Thursday, December 10, 2015 7:45:34 AM

Thanks Steve. That will be very helpful.

On Thu, Dec 10, 2015 at 6:23 AM, Steve Kallin <steve_kallin@fws.gov> wrote:

> Mike:
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> Project Leader
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> National Elk Refuge

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675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

From:	Gallagher, Maureen
To:	Mike Blenden; Will Meeks
Subject:	Fwd: Elk Collars
Date:	Thursday, December 10, 2015 8:33:46 AM

We need to talk further about Noreen's concerns. She and I talked further after we concluded the briefing. I will be in next week.
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From: **Steve Kallin** <steve_kallin@fws.gov>
Date: Thursday, December 10, 2015
Subject: Elk Collars
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Maureen Gallagher <maureen_gallagher@fws.gov>, Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>

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steve_kallin@fws.gov

--

Maureen Gallagher
Deputy Assistant Regional Director
Refuges and Partners for Fish and Wildlife
Mountain Prairie Region
134 Union Blvd
Lakewood, CO
303/236/4304
303/236/4792 fax

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Maureen Gallagher
Deputy Assistant Regional Director
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134 Union Blvd
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From: Blenden, Mike
To: Will Meeks; Maureen Gallagher
Subject: Re: WY CWD plan
Date: Wednesday, December 16, 2015 4:09:49 PM

Will and Maureen,

We focused on NER step down plan and didn't discuss Wyoming CWD with Noreen when Kallin was in last week. One question is should FWS prepare send comments on the state's draft CWD plan and if so, who? I suggest we ask Lee Jones to prepare a comments for our review. But this is a pretty sensitive topic. Thoughts?

Mike

On Thu, Dec 3, 2015 at 11:25 AM, Will Meeks <will_meeks@fws.gov> wrote:

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303 (w)
720-541-0310 (c)

Begin forwarded message:

From: Noreen Walsh <noreen_walsh@fws.gov>
Date: December 3, 2015 at 9:32:13 AM MST
To: will_meeks@fws.gov
Cc: Matt Hogan <matt_hogan@fws.gov>
Subject: WY CWD plan

Hi Will,

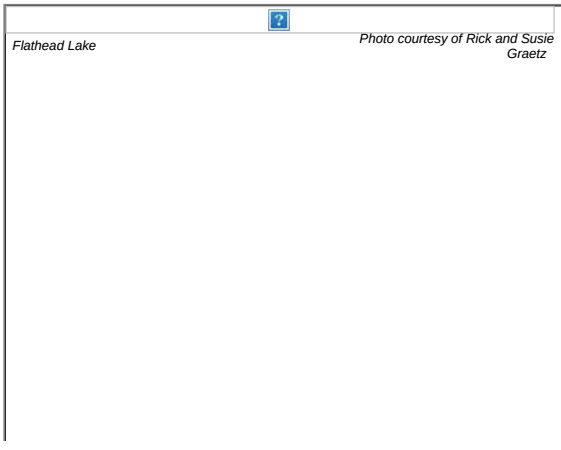
Not urgent, but let's schedule a conversation with NER about
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NLT January would be good.
Thanks
Noreen

Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service

Begin forwarded message:

From: <editor@mountainwestnews.org>
Date: December 2, 2015 at 11:56:23 AM PST
To: <noreen_walsh@fws.gov>
Subject: Mountain West News Daily Newsletter



Flathead Lake *Photo courtesy of Rick and Susie Graetz*

Go to web site

Mountain West News is a
program of the
O'Connor Center for the Rocky Mountain West at
The University of Montana

Wednesday,
Dec. 2, 2015

Produced by Shellie Nelson, MW News Editor

Editor's notes:

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Residents weren't placated by city officials' explanation that, should an oil train disaster occur in a neighborhood, they would "bring in foam from DIA." In Wyoming, the state wildlife agency released its plan to confront the spread of chronic-wasting disease that includes a component on the state's elk feedgrounds.

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Utah came in second and Nevada third, while North Dakota and West Virginia were the only two states that reported a decline in jobs.

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In this editor's opinion, you can never have too many books -- on your shelves or under your tree!

Quote of the day:

"It's high time Wyoming communities had these discussions, and so I am guardedly optimistic. It's good to see the draft plan encourages informed discussions and comments based on recent science involved in chronic wasting disease."

Lloyd Dorsey, the Sierra Club's conservation director for Wyoming, discussing the Wyoming Game and Fish Department's draft management plan for chronic wasting disease released this week.
- Jackson Hole News & Guide

Rockies today

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Denver Post; December 2

Send this to a friend

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The always fatal chronic-wasting disease has yet to be found in elk west of the Continental Divide in Wyoming, although it has been moving west in the state since the 1980s. Wyoming Fish and Game is taking public comment on its draft management plan for the disease through Jan. 5.

Jackson Hole News & Guide; December 2

Send this to a friend

- Wyoming's Chronic Wasting Disease Draft Plan

  Wyoming Fish and Game; December 2

Send this to a friend

Utah objects to board, venue of Mexican gray wolf reintroduction meeting

In November, Utah Gov. Gary Herbert, Colorado Gov. John Hickenlooper, Arizona Gov. Doug

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Major Funders:

Support MW News

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Salt Lake Tribune; December 2

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Missoulian (Great Falls Tribune); December 2

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Idaho Mountain Express (Sun Valley); December 2

Send this to a friend

Investors poured $3.6B into Idaho companies in 2014

A new report released by Idaho Technology Council provides details of the $3.6 billion in investments in Idaho businesses in 2014, including that 56 percent of those funds were directed to technology companies.

Idaho Statesman (Business Insider); December 2

Send this to a friend

USFS considers permit system for hot spots in Colorado wilderness area

The U.S. Forest Service is moving through the necessary processes to implement a permit system for some of the most heavily used areas of the Maroon Bells-Snowmass Wilderness in Colorado, with Conundrum Hot Springs and the Four Pass Loop at the top of the list of areas where such a permit system should be put in place.

Aspen Times; December 2

Send this to a friend

Agriculture engineer: B.C. residents can't garden way into food security

Ted van der Gulik, a former senior engineer in the Ministry of Agriculture, and who now heads the Partnership for Water Sustainability in British Columbia, said residents of the province are fooling themselves if they think their backyard gardens can ensure an adequate supply of food, and said that what residents should be focusing on is the protection of farmland, making irrigation more efficient, and finding ways to get water to lands that will need irrigation to produce food.

Vancouver Sun; December 2

Send this to a friend

With a week to go, 11 have filed to be on ballot for Idaho's presidential primary

The deadline for candidates to file to be on the ballot for Idaho's March 8 presidential primary is Dec. 9, and thus far 10 Republican candidates and 1 Constitution Party candidate have submitted the paperwork and paid the $1,000 filing fee. Republicans Rick Santorum, Jeb Bush, Ben Carson, Chris Christie, Ted Cruz, John Kasich, Rand Paul, Marco Rubio and Donald Trump, and newcomer Peter Messina have filed. Scott Copeland, a Texas pastor, is the Constitution Party candidate.

Twin Falls Times-News; December 2

Send this to a friend

Water

U.S. Senate committee to vote on Montana, Blackfeet water pact

The U.S. Senate Committee Indian Affairs Committee will hear legislation to ratify Montana's agreement to settle water rights on the Blackfeet Nation's lands in Montana. The agreement took nearly three decades to negotiate and was approved by the Montana Legislature in 2009. An earlier version of the measure introduced two years ago failed in part due to the $420 million cost.

San Francisco Chronicle (AP); December 2

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Opinion

Report details ecological importance of Yellowstone-area wilderness area

Lance Craighead's analysis of the Hyalite Porcupine Buffalo Horn Wilderness Study Area, which stretches across 150,000 acres along the roadless high country from the northwestern corner of Yellowstone National Park to the foothills south of Bozeman, Montana, is a must read for Custer-Gallatin National Forest officials, who are working on a new forest management plan. *A column by Todd Wilkinson.*

Jackson Hole News & Guide; December 2

Send this to a friend

- Wilderness, Wildlife, and Ecological Values of the Hyalite-

[Porcupine-Buffalo Horn Wilderness Study Area]

Download the entire Wilderness, Wildlife, and Ecological Values of the Hyalite-Porcupine-Buffalo Horn Wilderness Study Area from the Craighead Institute website.

Craighead Research; December 2

Send this to a friend

[Residents of Wyoming county need to get on the bus they voted for]

The Southern Teton Area Rapid Transit system, started in 1987, has been a huge success in Wyoming's Teton County, and its integrated transit plan passed earlier this year includes a new direct route across Jackson that's also free, and now residents need to get on those buses as Wyoming, which makes transportation decisions, is watching.

Jackson Hole News & Guide; December 2

Send this to a friend

Beyond the region

[Independent oil companies predict price slump will continue until 2017]

Two days before members of the Organization of Petroleum Exporting Countries meet, where it is widely believed they will maintain output levels, and with Iran expected to enter the oil export market, international independent oil traders said they expect a glut of supply will keep prices low until well into 2017.

Calgary Herald (Bloomberg News); December 2

Send this to a friend

[Senate Republicans rally the troops for vote to repeal ACA]

On Wednesday, Republican lawmakers rolled out a measure to repeal nearly all provisions of the 2010 Affordable Care Act and cuts federal funding for Planned Parenthood.

Durango Herald (AP); December 2

Send this to a friend

[U.S. House passes resolutions to block EPA rules on power plants]

On Tuesday, as President Obama was traveling home from the international climate change talks in Paris, the U.S. House voted to pass resolutions blocking the Environmental Protection Agency's rules on limiting emissions from existing and future power plants. The U.S. Senate passed similar resolutions and now the measures move to President Obama's desk, where they face almost-certain vetoes.

Portland Oregonian (AP); December 2

Send this to a friend

Community:

Wyoming road dispute costs Jackson Hole man his volunteer post

Economy:

Seneca to close one processing plant in Idaho

Economy:

Colorado pot recall due to pesticides the 10th in 3 months

Environment:

Montana FWP approves $26.2M plan to protect areas of NW Montana

Environment:

Land closures to protect wildlife take effect in W. Wyoming

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
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303-236-4306

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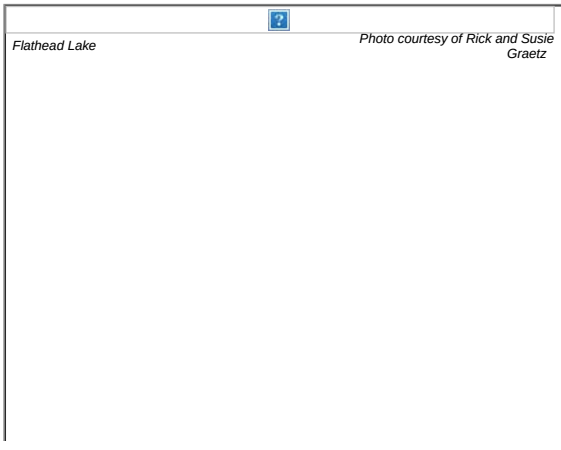
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Flathead Lake *Photo courtesy of Rick and Susie Graetz*

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Wednesday,
Dec. 2, 2015

Produced by Shellie Nelson, MW News Editor

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Jackson Hole News & Guide; December 2

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303-236-4306

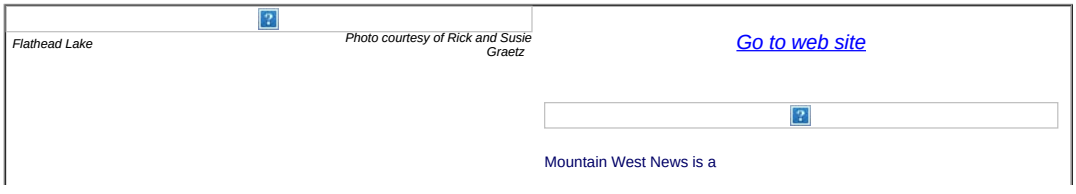
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> **From:** <editor@mountainwestnews.org>
> **Date:** December 2, 2015 at 11:56:23 AM PST
> **To:** <noreen_walsh@fws.gov>
> **Subject: Mountain West News Daily Newsletter**
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program of the
O'Connor Center for the Rocky Mountain West at
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Produced by Shellie Nelson, MW News Editor

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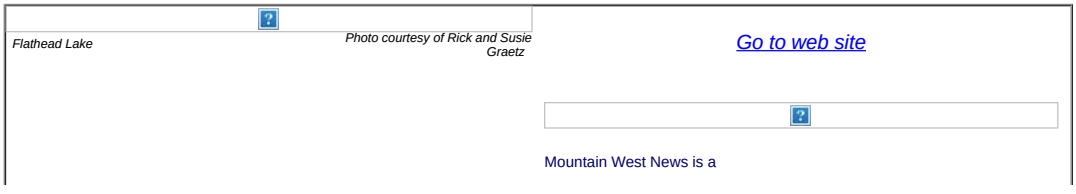
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Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

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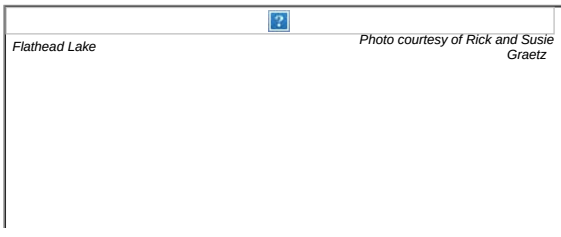
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Flathead Lake *Photo courtesy of Rick and Susie Graetz*

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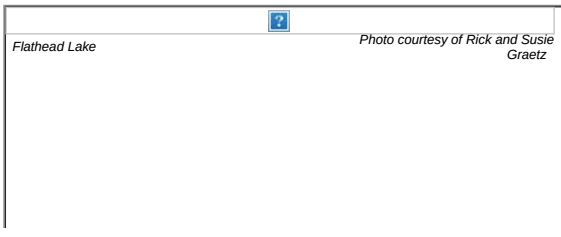

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Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
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303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

--
Maureen Gallagher
Deputy Assistant Regional Director
Refuges and Partners for Fish and Wildlife
Mountain Prairie Region
134 Union Blvd
Lakewood, CO
303/236/4304
303/236/4792 fax

From: Will Meeks
To: Gallagher, Maureen
Subject: Re: WY CWD plan
Date: Thursday, December 17, 2015 5:58:31 AM

I did.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303(w)
720-541-0319 (c)

On Dec 16, 2015, at 10:55 PM, Gallagher, Maureen <maureen_gallagher@fws.gov> wrote:

> My content knowledge is nil. Can you respond pls.
>
> ---------- Forwarded message ----------
> From: **Blenden, Mike** <mike_blenden@fws.gov>
> Date: Wednesday, December 16, 2015
> Subject: Re: WY CWD plan
> To: Will Meeks <will_meeks@fws.gov>, Maureen Gallagher <maureen_gallagher@fws.gov>
>
> Will and Maureen,
>
> We focused on NER step down plan and didn't discuss Wyoming CWD with Noreen when Kallin was in last week. One question is should FWS prepare send comments on the state's draft CWD plan and if so, who? I suggest we ask Lee Jones to prepare a comments for our review. But this is a pretty sensitive topic. Thoughts?
>
> Mike
>
> On Thu, Dec 3, 2015 at 11:25 AM, Will Meeks <will_meeks@fws.gov> wrote:
>
> Will Meeks
> U.S. Fish and Wildlife Service
> Mountain-Prairie Region
> Assistant Regional Director
> National Wildlife Refuge System
> 303-236-4303 (w)
> 720-541-0310 (c)
>
> Begin forwarded message:
>
> **From:** Noreen Walsh <noreen_walsh@fws.gov>
> **Date:** December 3, 2015 at 9:32:13 AM MST
> **To:** will_meeks@fws.gov
> **Cc:** Matt Hogan <matt_hogan@fws.gov>
> **Subject: WY CWD plan**
>
> Hi Will,
>
> Not urgent, but let's schedule a conversation with NER about
> 1. Status of our AM plan - where is it, what's in it
> 2. Our perspective on WY new CWD plan - does it Change or clarify anything?
> 3. The future
>
> NLT January would be good.
> Thanks
> Noreen
>
> Noreen Walsh
> Regional Director
> Mountain-Prairie Region
> U. S. Fish and Wildlife Service
>
> Begin forwarded message:
>
> **From:** <editor@mountainwestnews.org>
> **Date:** December 2, 2015 at 11:56:23 AM PST
> **To:** <noreen_walsh@fws.gov>
> **Subject: Mountain West News Daily Newsletter**



Flathead Lake *Photo courtesy of Rick and Susie Graetz*

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Mountain West News is a
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O'Connor Center for the Rocky Mountain West at
The University of Montana

Wednesday,
Dec. 2, 2015

Produced by Shellie Nelson, MW News Editor

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Conservation Biology

Essay

Judging adaptive management practices of U.S. agencies

Robert L. Fischman* and J.B. Ruhl†

*Maurer School of Law, Indiana University, 211 S. Indiana Avenue, Bloomington, IN 47405, U.S.A., email rfischma@indiana.edu
†Vanderbilt University Law School Nashville, TN 37203, U.S.A.

Abstract: *All U.S. federal agencies administering environmental laws purport to practice adaptive management (AM), but little is known about how they actually implement this conservation tool. A gap between the theory and practice of AM is revealed in judicial decisions reviewing agency adaptive management plans. We analyzed all U.S. federal court opinions published through 1 January 2015 to identify the agency AM practices courts found most deficient. The shortcomings included lack of clear objectives and processes, monitoring thresholds, and defined actions triggered by thresholds. This trio of agency shortcuts around critical, iterative steps characterizes what we call AM-lite. Passive AM differs from active AM in its relative lack of management interventions through experimental strategies. In contrast, AM-lite is a distinctive form of passive AM that fails to provide for the iterative steps necessary to learn from management. Courts have developed a sophisticated understanding of AM and often offer instructive rather than merely critical opinions. The role of the judiciary is limited by agency discretion under U.S. administrative law. But courts have overturned some agency AM-lite practices and insisted on more rigorous analyses to ensure that the promised benefits of structured learning and fine-tuned management have a reasonable likelihood of occurring. Nonetheless, there remains a mismatch in U.S. administrative law between the flexibility demanded by adaptive management and the legal objectives of transparency, public participation, and finality.*

Keywords: conservation planning, law, North America, politics and policy

Evaluación de las Prácticas de Manejo Adaptativo de las Agencias de los EUA

Resumen: *Todas las agencias federales de los EUA que administran las leyes ambientales afirman practicar el manejo adaptativo (MA), pero se conoce poco sobre cómo implementan realmente esta herramienta de la conservación. Se ha revelado un vacío entre la teoría y la práctica del MA en las decisiones judiciales que revisan los planes de manejo adaptativo de las agencias. Analizamos todas las opiniones de las cortes federales de los EUA, publicadas hasta el 1 de enero de 2015, para identificar las prácticas de MA de las agencias que las cortes encontraron más deficientes. Las limitaciones incluyeron la carencia de objetivos y procesos claros, el monitoreo de los umbrales y las acciones definidas activadas por los umbrales. Esta triada de atajos tomados por las agencias para evitar pasos críticos e iterativos caracteriza a los que nosotros llamamos MA ligero. El MA pasivo difiere del activo en su carencia relativa de intervenciones de manejo a través de estrategias experimentales. En contraste, el MA-ligero es una forma distintiva de MA pasivo que falla en proporcionar los pasos iterativos necesarios para aprender del manejo. Las cortes han desarrollado un entendimiento sofisticado del MA y continuamente ofrecen opiniones instructivas en lugar de opiniones críticas. El papel del poder judicial es limitado por la discreción de las agencias bajo la ley administrativo de los EUA, pero las cortes han anulado algunas prácticas de MA ligero de las agencias y han insistido en análisis más rigurosos para asegurar que los beneficios prometidos del aprendizaje estructurado y el manejo bien calibrado tengan una probabilidad razonable de ocurrir. Sin embargo, todavía persiste una desigualdad en la ley administrativa de los EUA entre la flexibilidad exigida por el manejo adaptativo y los objetivos legales de la transparencia, la participación pública y la finalidad.*

Palabras Clave: leyes, Norte América, planeación de la conservación, políticas y normas

Paper submitted April 23, 2015; revised manuscript accepted August 17, 2015.

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Introduction

Adaptive management (AM) is an almost universally acclaimed conservation tool. Uncertain climate-change effects, ignorance about the causes of imperiled species declines, and the stochastic behavior of ecosystems are common justifications for using AM. In the 1990s, U.S. federal agencies began adopting AM in their plans and permitting processes. It is now standard practice (Williams et al. 2009; 36 C.F.R. § 219.12[d][2]), as are lawsuits challenging agency decisions. Although few other nations subject public decisions to as much judicial scrutiny as the United States, AM is now widely incorporated in statutes and rules around the world (Schramm & Fishman 2010).

We surveyed all U.S. judicial opinions that resolved legal disputes involving federal government AM. The court decisions highlight especially controversial projects but also unveil a cross section of agency practice. In particular, they show how agencies facing resource, political, and legal constraints respond by pulling together AM plans that often neglect key steps in the process. We call this kind of adaptive management AM-lite, a watered-down version of the structured-learning-based theory that "resembles ad hoc contingency planning" (Ruhl & Fischman 2010:426). Understanding this pragmatic approach of agencies offers important lessons for improved conservation. Specifically, AM-lite falls largely outside the framework in the literature that distinguishes passive from active AM. Instead, it represents a different version of AM that raises questions about whether the tool's theoretical advantages may be realized in the various forms of practice that diverge from the process described in the literature. This analysis of judicial opinions reveals AM examples that might spur researchers to recalibrate their thinking to better match what actually happens in natural resources administration.

Forms of Adaptive Management

Adaptive management is supposed to be an iterative process in which decision outcomes are continually monitored and evaluated to determine whether they are achieving objectives. The feedback loops rely on goal establishment, model building, performance standard setting, outcome monitoring, and recalibration. Over time, feedback and adjustments provide flexibility in the face of uncertainty while simultaneously reducing uncertainty through systematic learning (Nie & Schultz 2012). Although the basic theme of learning by doing pervades all forms of AM, there is wide variation in practice. The most common distinction in the literature separates active from passive AM along a continuum of management interventions, particularly the use of experimental strategies (Walters & Hilborn 1978; McCarthy & Possingham 2007; Williams 2011; Williams & Brown 2012). The disparate literature includes a more mathematical framework that focuses on whether anticipated learning is considered when making each decision as a basis for distinguishing the two approaches (Williams et al. 2002). The algorithmic framework for quantitative optimization has practical application in waterfowl management and other tasks for which substantial data are available (Williams & Johnson 1995). But the conflicts courts have evaluated involve decisions for which biostatistical models gain little traction.

In the active form of AM, managers deliberately probe for information to evaluate testable hypotheses about the effects of intervention. For example, managers might evaluate the effects that a chosen habitat alteration and its alternatives have on invasive species by running small-scale test plot experiments. Active AM can identify optimal budget allocations to achieve the maximum area of successful revegetation, as defined by a certain density of vegetation present 20 years after planting (McCarthy & Possingham 2007). The normative ideal for strong inferences from experiments is closely associated with active AM involving replication, controls, and randomization (Prato 2005; Grantham et al. 2009). However, resource management, particularly over small areas, often involves a single system where replication and controls are infeasible. In that situation, active AM would provide structured decision-making tools that seek to optimize both management success and learning (Nichols & Williams 2012).

Passive AM can be any variation of AM that falls along a decreasing continuum of scientific rigor for hypothesis testing. It has thus been characterized as "nonexperimental" and "nonscientific" (Aldridge et al. 2004), "incomplete" and "haphazard" (Gregory et al. 2006), "unreliable" (Prato 2005), and "nonlearning based" (Williams 2011). Typically, managers make a decision based on the known historical behavior of the system and "a single best estimate or model for response" (Walters & Holling 1990). They then monitor the system to gather information for future learning but treat learning as a byproduct rather than an essential component of the management decision (Gregory et al. 2006; Nichols & Williams 2012; Williams & Brown 2012). Although passive AM is often described as incremental or sequential (Halbert 1993; Bormann et al. 1999), it is not experimental. Over enough iterations, and with enough monitoring, the passive approach may produce the same level of rigor as active AM (Williams 2011), as illustrated by the decades-long annual adjustments of Mallard (*Anas platyrhynchos*) hunting regulations (Nichols & Williams 2012).

Federal resource management agencies in the United States have all adopted policies that promise implementation of AM (Ruhl & Fischman 2010). Many of the agencies have led the way in developing the theory of AM, building on earlier scholarly work (e.g., Williams et al. 2009). Because the agency policies promise implementation of AM theory (e.g., 33 C.F.R. §332.2), the conflicts between agency implementation and agency promise reflect the tension between practice and theory.

Adaptive Management in U.S. Courts

Seminal scholarship characterized most examples of AM in practice as passive (Walters & Hilborn 1978), particularly because the complexity of dynamic optimization frustrates decision makers seeking to reduce uncertainty while also achieving management objectives. We find that the practice of many U.S. agencies, while generally a form of passive AM, diverges from the theoretical literature in other, seldom-noted dimensions revealed in the litigation. Although it is feasible to build into final agency actions some AM flexibility, it remains a challenge many agencies struggle with, particularly in circumstances of high uncertainty and little prior information. This has been the focus of the judicial decisions criticizing agency AM and recent agency initiatives to better mold adaptive plans to legal constraints.

Public agencies must operate within the structure of administrative law, built on a model of comprehensive rationality: all factors influencing a decision and its consequences must be considered before making a final decision. Once made, an agency must stick with final decisions until it reengages the administrative process to alter them. Adaptive management, in theory, is more open-ended and considers no decisions beyond revision to improve outcomes or learning. If the decision is adopting a long-term plan, the agency cannot adjust it without going through the arduous administrative process of amendment. Also, substantive laws (e.g., the Endangered Species Act [ESA]) require findings (e.g., that an action authorized by an agency will not jeopardize the continued existence of an imperiled species [16 U.S.C. § 1536(a)(2)]) before federal actions (e.g., an oil and gas leasing plan) may proceed and each time a plan is revised.

Fiscal and political constraints also complicate AM implementation by public agencies. Both generally encourage agencies to defer determining whatever is not absolutely necessary for a final agency action. They lead agencies to employ AM-lite, which frequently fails even to structure a learning procedure, whether through experimentation, historical research, or modeling (NRC 2004; Nie & Schultz 2012). It lacks a priori hypotheses. It is similar to "evolutionary adaptive management," defined as trial and error, or learning from management without purposeful direction (Walters & Holling 1990). Trial and error might lead to learning, but it is not the structured learning promised in AM. In its most extreme form, AM-lite is essentially open-ended contingency planning or on-the-fly management that promises some loosely described response to whatever circumstances arise. Implementation of AM-lite may be suitable where the range of possible variations in actions and outcomes is small and where the system is not experiencing novel stressors. But many of the AM decisions reviewed by courts consist of "basic trial and error learning in which explicit hypotheses are absent or vague" (Gregory et al. 2006:2412). The upshot is that AM remains largely an aspiration—achieving even passive AM has proven challenging enough.

Judicial Decisions

To gain a deeper understanding of how courts treat instances of AM-lite and what can be learned from the judicial commentary, we examined all federal court opinions containing the phrase *adaptive management* as of 1 January 2015 (Supporting Information). Of the 216 opinions with this term, 102 separate opinions (47%) involved a challenge to an agency's AM of environmental or natural resources. In most (75%) opinions overall, and almost half (48%) of the opinions in cases directly challenging an AM element of an agency record, courts used the phrase *adaptive management* merely to describe some aspect of the administrative record not relevant to the judgment.

However, 53 judicial opinions applied relevant law directly to some aspect of AM. These are the cases we evaluated in our examination of U.S. agency practice of AM-lite (Supporting Information). In this group of 53 opinions, 45% of decisions overturned the agency decision as "arbitrary and capricious," a legal standard deferring to any permissible agency interpretation. In U.S. administrative law, if a court overturns an agency record as failing to rationally support a decision (arbitrary and capricious) or finds some violation of a specific legal standard (e.g., failing to avoid jeopardy to the continued existence of an endangered species), then it generally will suspend and remand the agency decision (send the decision back to the agency for a new determination). Procedural violations of law (e.g., failure to complete an adequate environmental impact analysis) may result in remands under which an agency cures the defects in its record but reaffirms the substantive decision. A court upholding an AM approach does not necessarily endorse the practice as effective conservation. It merely finds that the approach did not violate any specific legal mandate. Additionally, an opinion upholding a particular AM approach does not necessarily resolve the overall legal dispute in favor of the agency.

We focused mostly on cases overturning AM-lite because the resulting opinions identify friction points in

the administrative process, where AM implementation often falls short of theory and effectiveness. An arbitrary-and-capricious finding is not a direct comment on the rigor of the AM process. A court may reject an agency decision that is a paragon of active AM because of an unrelated violation of law. But, when an agency relied on AM to meet a legal standard (e.g., ensure no jeopardy to an endangered species) and a court finds fault in that line of reasoning, the judicial opinion may reveal AM-lite shortcomings.

We extracted lessons from the cases in which the adversarial process unveiled problems with translating AM into practice. The court decisions paint a troubling picture of agencies cloaking their desire to defer decisions or dodge difficult calls under the AM label. This conclusion stems from a close reading of the 53 judicial opinions. Here, we present example cases in which judges clearly evaluated some aspect of adaptive management in an agency's record of decision. In many cases, judicial evaluation of AM is murky. A thorough canvass of agency AM practice is beyond the scope of this article. The difficulty of funding and litigating cases filters out disputes with low stakes. Agencies lose litigation only if they perform particularly poorly in justifying their decisions. Court decisions overturning agency actions are a useful window into the problems associated with translating AM theory into administrative practice. But, they cannot reveal the full extent or frequency of the shortcomings.

AM-lite

Courts that rejected agency AM plans cite a number of problems that correspond to commonly defined steps in the iterative process. Although courts evaluated the plans against legal standards and not AM theory, they often cited problems in the AM process as reasons to believe AM-lite will not deliver on its promise. These weak links in the chain of activities implementing AM roughly correspond with some of the barriers to successful AM discussed in the literature (Moser & Eckstrom 2010; Nie & Schultz 2012; Lindenmayer et al. 2013; Meretsky & Fischman 2014). Passive AM is distinctive in its relative lack of experiments or other structured forms of management intervention for hypothesis testing. In contrast, AM-lite is a particular form of passive AM that skips some iterative steps necessary to learn from management.

Although pathologies—including lack of stakeholder engagement, procrastination, and weak leadership—have been identified as impeding the progress of AM (Allen & Gunderson 2011), 3 shortcomings in AM implementation recur in judicial cases overturning agency decisions: failure to establish objectives or failure to describe monitoring protocols for a plan or project; failure to define decision thresholds in monitoring; and failure to identify specific actions that will be triggered when thresholds are crossed. We characterized AM-lite along this chain of failures in the order in which iterative decision making should engage these steps. In practice, many public decisions involve weaknesses in these categories rather than total failures. But courts grant agencies the benefit of the doubt in judicial review. Agencies have discretion to craft poor AM approaches—a court will overturn only those that have glaring problems.

Clear Objectives and Process

The first and most critical decisions in devising AM strategies are formulating specific objectives and a process for monitoring (Stein et al. 2013; Fischman et al. 2014). Although they are separate steps in AM, establishing objectives and describing monitoring programs are two decisions that agencies now usually make to the satisfaction of courts. Without specific objectives and monitoring, goals may slip and actions designed to achieve one aim ultimately drift toward different outcomes. Objectives establish benchmarks against which to measure progress or indicate when program revision is necessary (Williams et al. 2009). Although AM-lite generally calls for monitoring, some applications avoid defining objectives or the means of monitoring them (Nie & Schultz 2012).

Litigation over grazing on the North Sheep allotments of the Sawtooth National Forest and Recreation Area illustrates how courts both uncover and shape agency implementation of AM-lite. A conservation organization challenged the agency's sheep and goat grazing allotment plans as contravening the mandates of the National Forest Management Act and the National Environmental Policy Act (NEPA). The Forest Service lost the first round of litigation when a court found that the plans' AM strategy failed to explain how they would achieve the Forest Service's objectives to allow grazing only on lands suitable for and capable of sustaining grazing. They also did not explain how the agency would monitor conditions. The environmental analysis in the administrative record stated that a monitoring plan "will be developed and implemented through an iterative process" but did not describe the process (Western Watersheds Project 2006:10). The agency responded with a supplemental analysis the court subsequently upheld as aligning grazing with forest plan goals by committing to monitoring "annual indicators" of range conditions at designated sites. The indicators for the suitability and capability objectives included numerical criteria (e.g., >4 inches of stubble height and $<30\%$ sagebrush cover at the end of the grazing season) (Western Watersheds Project 2011). Failure to meet the criteria under the supplemental commitments triggers specific actions, such as closing areas and reducing numbers of livestock.

Decision Thresholds in Monitoring

Thresholds are signals that something must change (warnings of problems) or can change (confirmations of achievements) in the management regime. But AM-lite often neglects to define these decision thresholds that trigger mitigation actions or reevaluation (Martin et al. 2009). The AM literature emphasizes the importance of activating intervention in response to observations (Lindenmayer et al. 2013), but thresholds are often absent in public plans (Meretsky & Fischman 2014). In contrast, decisions that contain quantitative standards for the deployment of review, mitigation, or some other adaption action harness the benefits of AM and help prioritize the key monitoring tasks (Gregory et al. 2006; Nie & Schultz 2012).

The same court that upheld the supplemental North Sheep allotment plan invited further litigation if the promised benefits of AM amount only to "a burst of monitoring" with no consequences for grazing practices that do not meet the numerical objectives (Western Watersheds Project 2011:1124). The following year it overturned a different agency's renewal of grazing permits for failure to meet a regulatory requirement that noncompliance with rangeland health standards result in "appropriate action" to make "significant progress toward fulfillment" of the standards (43 C.F.R. § 4180.2[c][2]). The agency set goals and committed to monitoring, but, if the goals were not met "over time," then the agency merely promised adaptive adjustment of grazing restrictions (Western Watersheds Project 2012:1129). The court found that "the amorphous definition" of "over time" afforded the agency "a nearly unreviewable discretion to wave off failures to comply for an unspecified number of years" (Western Watersheds Project 2012:1129). Specific triggers for changes in management practices (the decision thresholds) would have improved AM and secured legal compliance.

In contrast, a court allowed a coal mine fill permit employing an AM plan with "specific timelines for corrective actions if monitoring reveals noncompliant scores" (Ohio Valley Environmental Coalition 2012:637). Similarly a court upheld a decision not to designate the dunes sagebrush lizard (*Sceloporus arenicolus*) for protection under the ESA based, in part, on a plan that bound developments in the lizard's habitat to minimize and mitigate impacts. The agreement required monthly reports to track habitat and established a threshold to trigger adaptive reevaluation if habitat loss came "within 7.5% of the allowed 1% loss in total habitat" (Defenders of Wildlife 2014:8).

An unusual comparative AM evaluation illustrates the role of AM thresholds in meeting substantive legal standards. In a series of decisions, Judge Wanger reviewed ESA compliance in the operation of California's Central Valley irrigation system regularly between 2006 and 2011. One issue in the litigation was how agencies may rely on AM to ensure that water operations will not "jeopardize the continued existence" of any listed species (16 U.S.C. § 1535[a][2]). Judge Wanger's decisions compared the conservation approaches of the Interior Department's Fish and Wildlife Service (FWS) (responsible for the Delta smelt [*Hypomesus transpacificus*]) with the Commerce Department's National Marine Fisheries Service (NMFS) (responsible for anadromous fishes). Both agencies employed AM, but Judge Wanger upheld the NMFS approach and remanded the FWS plan. The NMFS AM protocol contained definite, substantive criteria (e.g., temperature thresholds) that triggered revision of the water system operations to avoid jeopardy (Pacific Coast Federation of Fishermen's Associations 2008). In contrast, the FWS approach failed to provide enforceable, precise criteria to serve as thresholds (NRDC 2007).

Specific Actions Triggered by Thresholds

Thresholds identify when action is necessary to adjust management practices or mitigation. But, AM-lite often neglects to specify just what that action should be. This may be because an agency wants to retain its future discretion or because an effective response is not yet known. In either event, failure to specify actions triggered by thresholds can lead to dead ends in what should be the continuing adaptive iteration cycle.

Courts have identified this missing element in AM-lite as a basis for remanding inadequate agency decisions. In Judge Wanger's ESA review of California Central Valley water management, he overturned the FWS decision to adopt a procedurally elaborate AM protocol identifying danger thresholds for the Delta smelt. The triggered action would be convening a working group to "consider" a range of operational changes in the water system (NRDC 2007:341). Judge Wanger found the mandatory protocol failed to identify what changes to the system could improve conditions for the smelt. In contrast, the NFMS approach identified the enforceable requirements to be imposed if the system crossed thresholds for the anadromous fish. In remanding the FWS approach, Judge Wanger distinguished the Central Valley plan from an ESA permit for land development in California's Natomas Basin that employed "well-defined mitigation measures" such as conservation land purchases, adjustment of conservation reserve size, and modification of agricultural practices (NRDC 2007). The Central Valley plan lacked such specificity of responsive actions, even though the protocol was much more elaborate. Complexity and detail in AM design does not necessarily assure substantive legal criteria will be met by triggering mitigating actions.

Another court set aside an FWS decision to remove the grizzly bear (*Ursus arctos horribilis*) from the list of species receiving ESA protection. The delisting decision

relied on AM-lite to respond to the decline in whitebark pine (*Pinus albicaulis*), an important food source for the bear. While the agency identified specific monitoring criteria (i.e., thresholds) to detect changes in mortality, litter size, and cub survival, the action triggered would be a study team effort to "recommend appropriate management responses" (Greater Yellowstone Coalition 2011:1029). Without explanation of what the responses might be or their effectiveness in the face of whitebark loss, the administrative record did not meet the ESA requirements for finding that the grizzly bear is not threatened by the decline in its whitebark food source.

Courts have interpreted mitigation mandates under several environmental laws to require a showing that conservation actions be "reasonably specific, certain to occur, and capable of implementation" (Center for Biological Diversity 2002:1152). Plans employing AM-lite often fail to meet this standard even when agencies commit to achieve "specific, numerical improvements in habitat quality and survival" (NWF 2011:1126). Promises to achieve specific goals are not self-executing, and expressing numerical thresholds in monitoring does not alone advance goals. Successful AM depends on a plan for what to do when thresholds are crossed. In remanding an agency's no-jeopardy finding for operation of the Pacific Northwest's Columbia River dams, a court criticized the common AM-lite approach of neglecting specific actions triggered by monitoring in favor of "vague" promises to act in an unspecified manner when thresholds are crossed (NWF 2011:1128):

> It is one thing to identify a list of actions, or combination of potential actions, to produce an expected survival improvement and then modify those actions through adaptive management to reflect changed circumstances. It is another to simply promise to figure it all out in the future.

Even laws with weaker substantive requirements, such as NEPA, present courts with questions about triggered responses. One case overturned an agency environmental analysis under NEPA for failing to provide enough detail in its AM plan about mitigation actions for expansion of a gold mine (South Fork Band Council 2009). The agency's AM-lite approach to the plan described a water monitoring regime with thresholds that would trigger a "detailed, site-specific plan to enhance or replace the impacted perennial water resources" (USDOI 2008, § 3.2). The court found that this mitigation approach, which specified no particular action or technology, did not provide enough evaluation about the ability to avoid adverse impacts from the mine.

But other courts reviewing NEPA analysis have upheld similarly vague mitigation promises. For instance, the first large-scale use of AM to manage oil and gas lease development deferred both the establishment of quantitative criteria for thresholds and the selection of mitigation measures (Theodore Roosevelt Conservation Partnership 2010). Nonetheless, a court upheld the plan against a NEPA challenge, in part because subsequent approvals of individual drilling permits would be subject to environmental analysis and could adopt site-specific criteria and mitigation. The court relied on the AM-lite approach in concluding that the agency took the required "hard look" at environmental impacts. This look-before-you-leap requirement distills NEPA's comprehensive rationality approach. But the court responded that "allowing adaptable mitigation measures is a responsible decision in light of the inherent uncertainty of environmental impacts, not a violation of NEPA" (Theodore Roosevelt Conservation Partnership 2010:517).

Learning from AM-lite

Although federal agencies commit to AM, litigation reveals approaches that fail to produce a structured learning process. Practicing passive AM more effectively is a practical improvement that is within reach of U.S. agencies, and courts sometimes insist on it. Otherwise, AM-lite will lead to iterative dead ends and possibly discredit AM as an approach with a poor stewardship record.

Courts grasp the aims and elements of AM. They seek to impose the constraints of administrative law, which emphasizes finality and comprehensive rationality. But courts also appear eager to accommodate the conservation imperatives of AM (Ruhl & Fischman 2010). The perception that lawsuits are an impediment to AM (Koontz & Bodine 2008) is unsupported by our review. One court has even suggested that AM may be necessary where an agency will likely have to respond to unforeseen circumstances (Southwest Center for Biological Diversity 2006). Courts have rejected arguments that plans built around AM are mere "untested" hypotheses that cannot satisfy the rational-basis test of judicial review (SLDMWA 2011:913). But, courts sometimes reject agency rationales based on hypotheses when the proposed action is not accompanied by a plan to collect data to evaluate the accuracy of the hypotheses (Lands Council 2008). Courts aid AM when they insist on a plan to learn through management.

As agencies have established quantitative objectives in their AM plans, courts have dived deeper into the structure of the decisions to ensure that the promised benefits of structured learning and fine-tuned management have a reasonable likelihood of occurring. Federal courts are now unpacking AM-lite to reveal where agencies stumble along the way to successful iteration and learning. This dynamic provides agencies an opportunity and incentive to learn how to improve their practice of AM. Courts are most likely to reject AM plans that fail to specify clear objectives and processes, establish monitoring thresholds, and define actions triggered by thresholds,

thus suggesting how agencies can most effectively improve their AM practices. Agencies have learned from their past litigation losses; today they seldom stumble over the first steps of establishing specific objectives and processes.

But the courts and agencies working together can advance the practice of AM only so far. No major federal statute explicitly authorizes agencies to practice AM, much less spells out its requirements. Agencies have compiled detailed manuals for practicing AM (Williams et al. 2009; Williams & Brown 2012), but courts accord the manuals only moderate deference. This leaves agencies uncertain about whether their prescriptions for AM, even when met, satisfy judicial review when weighed against the requirements of environmental and administrative law (Benson & Stone 2013). Legislative standards for AM would provide agencies and courts more guidance and certainty.

Beyond providing substantive authority and standards, some AM scholars have suggested that the iterative decision-making process can also be promoted through administrative law reform (Karkkainen 2002; Craig & Ruhl 2014). Conventional administrative process requirements impose extensive front-end requirements on agency decisions, including impact analysis and public participation, and subject final agency decisions to judicial review. Although these requirements are meant to promote agency transparency, public participation, and legitimacy, they do not necessarily facilitate iterative decision making. This mismatch has prompted proposals for alternative procedural tracks for agencies to follow when they are authorized to employ AM, designed primarily to change the ways and times when public participation and judicial review are available in the AM process. For example, one proposal would allow agencies to adopt AM plans after public participation, impact assessment, and judicial review processes based on special, statutorily prescribed criteria designed to avoid the AM-lite shortcomings. If the plan fulfills the criteria, its implementation, including adjustments to actions called for under the plan, would not be subject to additional rounds of administrative process (Craig & Ruhl 2014). This latitude to practice AM would ameliorate the legal requirements many agency practitioners of AM identify as barriers (Benson & Stone 2013) but would retain the basic procedural safeguards of administrative law. Implementing such a procedural regime has thus far been untested.

Consistent funding is also necessary to support AM in practice, particularly its nerve center—monitoring. This does not necessarily mean that AM costs more than conventional management regimes, which also need monitoring to be effective. But conventional management seldom follows through with much monitoring (Karkkainen 2002). The judicial acceptance of AM should come at the price of more durable monitoring strategies. Courts may spur legislatures and agencies to better match funding to the continual needs of AM. Appropriations for AM projects could establish endowments or annuities to assure that the back-end activities (especially monitoring, triggered actions, and reevaluation) deliver on the promise of reducing uncertainty. In the long run, the promise of AM practiced at its fullest—not the AM-lite version that has prevailed thus far—should be worth the investment.

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Supporting Information

Methods and results of our examination of cases (Appendix S1) and a spreadsheet of coding (Appendix S2) are available online. The authors are solely responsible for the content and functionality of these materials. Queries (other than absence of the material) should be directed to the corresponding author.

Literature Cited

Aldridge CL, Boyce MS, Baydack RK. 2004. Adaptive management of prairie grouse: How do we get there? Wildlife Society Bulletin **32:** 92–103.

Allen CR, Gunderson LH. 2011. Pathology and failure in the design and implementation of adaptive management. Journal of Environmental Management **92:**1379–1384.

Benson MH, Stone AB. 2013. Practitioner perceptions of adaptive management implementation in the United States. Ecology and Society **18** DOI: 10.5751/ES-05613-180332.

Bormann BT, et al. 1999. Adaptive management. Pages 505–533 in Johnson NC, Malk AJ, Sexton W, Szaro RC, editors. Ecological stewardship: a common reference for ecosystem management. Elsevier, Amsterdam.

Center for Biological Diversity v. Rumsfeld. 2002. 198 F. Supp.2d 1139 (D. Ariz.).

Craig RK, Ruhl JB. 2014. Designing administrative law for adaptive management. Vanderbilt Law Review **67:**1–87.

Defenders of Wildlife v. Jewell. 2014. 2014 WL 4829089, — F. Supp.3d — (D.D.C.).

Fischman RL, Meretsky VJ, Babko A, Kennedy M, Liu L, Robinson M, Wambugu S. 2014. Planning for adaptation to climate change. BioScience **64:**993–1005.

Grantham HS, Bode M, McDonald-Madden E, Game ET, Knight AT, Possingham HP. 2009. Effective conservation planning requires learning and adaptation. Frontiers in Ecology and the Environment **8:** 431–437.

Greater Yellowstone Coalition v. Servheen. 2011. 665 F.3d 1015 (9th Cir.).

Gregory R, Ohlson D, Arvai J. 2006. Deconstructing adaptive management: criteria for applications to environmental management. Ecological Applications **16:**2411–2425.

Halbert CL. 1993. How adaptive is adaptive management? Reviews in Fisheries Science **1:**261–283.

Karkkainen B. 2002. Toward a smarter NEPA: monitoring and managing government's environmental performance. Columbia Law Review **102:**903–972.

Koontz TM, Bodine J. 2008. Implementing ecosystem management in public agencies: lessons from the U.S. Bureau of Land Management and the Forest Service. Conservation Biology **22:**60–69.

Lands Council v. McNair. 2008. 537 F.3d 981 (9th Cir.).

Lindenmayer DB, Piggott MP, Wintle BA. 2013. Counting the books while the library burns: why conservation monitoring programs need a plan for action. Frontiers in Ecology and the Environment **11:**549–555.

Martin J, Runge MC, Nichols JD, Lubow BC, Kendall WL. 2009. Structured decision making as a conceptual framework to identify thresholds for conservation and management. Ecological Applications **19:**1079–1090.

McCarthy MA, Possingham HP. 2007. Active adaptive management for conservation. Conservation Biology **21:**956–963.

Meretsky VJ, Fischman RL. 2014. Learning from conservation planning for the U.S. national wildlife refuges. Conservation Biology **28:** 1415–1427.

Moser SC, Eckstrom JA. 2010. A framework to diagnose barriers to climate change adaptation. Proceedings of the National Academy of Sciences USA **107:**22026–22031.

Nichols JD, Williams BK. 2012. Adaptive management. Pages 20–25 in El-Shaarawi AH, Piegorsch WW, editors. Encyclopedia of environmetrics. 2nd edition. John Wiley & Sons, West Sussex.

Nie M, Schultz C. 2012. Decision-making triggers in adaptive management. Conservation Biology **26:**1137–1144.

NRC (National Research Council). 2004. U.S. Army Corps of Engineers water resources planning: a new opportunity for service. National Academies Press, Washington, D.C.

NRDC (Natural Resources Defense Council) v. Kempthorne. 2007. 506 F.Supp.2d 322 (E.D. Cal.).

NWF (National Wildlife Federation) v. National Marine Fisheries Service. 2011. 839 F.Supp.2d 1117 (D. Or.).

Ohio Valley Environmental Coalition v. U.S. Army Corps of Engineers. 2012. 883 F.Supp.2d 627 (S.D. W.V.).

Pacific Coast Federation of Fishermen's Associations v. Gutierrez. 2008. 606 F.Supp.2d 1122 (E.D. Cal.).

Prato T. 2005. Accounting for uncertainty in making species protection decisions. Conservation Biology **19:**806–814.

Ruhl JB, Fischman RL. 2010. Adaptive management in the courts. Minnesota Law Review **95:**424–484.

Schramm D, Fishman A. 2010. Legal frameworks for adaptive natural resource management in a changing climate. Georgetown International Environmental Law Review **22:**492–520.

SLDMWA (San Luis & Delta-Mendota Water Authority) v. Salazar. 2011. 760 F.Supp.2d 855 (E.D. Cal.), affirmed in part, reversed in part San Luis & Delta-Mendota Water Authority v. Jewell, 747 F.3d 581 (9th Cir. 2014).

South Fork Band Council v. U.S. Dept. of the Interior. 2009. 588 F.3d 718 (9th Cir.).

Southwest Center for Biological Diversity v. Bartel. 2006. 470 F.Supp.2d 1118 (S.D. Cal.).

Stein BA, et al. 2013. Preparing for and managing change: climate adaptation for biodiversity and ecosystems. Frontiers in Ecology and the Environment **11:**502–510.

Theodore Roosevelt Conservation Partnership v. Salazar. 2010. 616 F.3d 497 (D.C. Cir.).

USDOI (U.S. Dept. of the Interior). 2008. Bureau of Land Management Cortez Hills Expansion Project: final environmental impact statement. Available from www.blm.gov/nv/st/en/fo/battle_mountain_field/blm_information/national_environmental/cortez_hills_expansion.html (accessed February 2014).

Walters CJ, Hilborn R. 1978. Ecological optimization and adaptive management. Annual Review of Ecology and Systematics **9:** 157–188.

Walters CJ, Holling CS. 1990. Large-scale management experiments and learning by doing. Ecology **71:**2060–2068.

Western Watersheds Project v. U.S. Forest Service. 2006. 2006 WL 292010 (D. Idaho).

Western Watersheds Project v. U.S. Forest Service. 2011. 780 F.Supp.2d 1115 (D. Idaho).

Western Watersheds Project v. Salazar. 2012. 843 F.Supp.2d 1105 (D. Idaho).

Williams BK. 2011. Passive and active adaptive management: approaches and an example. Journal of Environmental Management **92:**1371–1378.

Williams BK, Brown ED. 2012. Adaptive management: the U.S. Department of the Interior applications guide. USDOI, Washington, D.C.

Williams BK, Johnson FA. 1995. Adaptive management and the regulation of waterfowl harvests. Wildlife Society Bulletin **23:** 430–436.

Williams BK, Nichols JD, Conroy MJ. 2002. Analysis and management of animal populations. San Diego, Academic Press.

Williams BK, Szaro, RC, Shapiro CD. 2009. Adaptive management: the U.S. Department of the Interior technical guide. USDOI, Washington, D.C. Available from www.doi.gov/initiatives/AdaptiveManagement/TechGuide.pdf.) (accessed July 2015).

Conservation Biology

Essay

Judging adaptive management practices of U.S. agencies

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Abstract: *All U.S. federal agencies administering environmental laws purport to practice adaptive management (AM), but little is known about how they actually implement this conservation tool. A gap between the theory and practice of AM is revealed in judicial decisions reviewing agency adaptive management plans. We analyzed all U.S. federal court opinions published through 1 January 2015 to identify the agency AM practices courts found most deficient. The shortcomings included lack of clear objectives and processes, monitoring thresholds, and defined actions triggered by thresholds. This trio of agency shortcuts around critical, iterative steps characterizes what we call AM-lite. Passive AM differs from active AM in its relative lack of management interventions through experimental strategies. In contrast, AM-lite is a distinctive form of passive AM that fails to provide for the iterative steps necessary to learn from management. Courts have developed a sophisticated understanding of AM and often offer instructive rather than merely critical opinions. The role of the judiciary is limited by agency discretion under U.S. administrative law. But courts have overturned some agency AM-lite practices and insisted on more rigorous analyses to ensure that the promised benefits of structured learning and fine-tuned management have a reasonable likelihood of occurring. Nonetheless, there remains a mismatch in U.S. administrative law between the flexibility demanded by adaptive management and the legal objectives of transparency, public participation, and finality.*

Keywords: conservation planning, law, North America, politics and policy

Evaluación de las Prácticas de Manejo Adaptativo de las Agencias de los EUA

Resumen: *Todas las agencias federales de los EUA que administran las leyes ambientales afirman practicar el manejo adaptativo (MA), pero se conoce poco sobre cómo implementan realmente esta herramienta de la conservación. Se ha revelado un vacío entre la teoría y la práctica del MA en las decisiones judiciales que revisan los planes de manejo adaptativo de las agencias. Analizamos todas las opiniones de las cortes federales de los EUA, publicadas hasta el 1 de enero de 2015, para identificar las prácticas de MA de las agencias que las cortes encontraron más deficientes. Las limitaciones incluyeron la carencia de objetivos y procesos claros, el monitoreo de los umbrales y las acciones definidas activadas por los umbrales. Esta triada de atajos tomados por las agencias para evitar pasos críticos e iterativos caracteriza a los que nosotros llamamos MA ligero. El MA pasivo difiere del activo en su carencia relativa de intervenciones de manejo a través de estrategias experimentales. En contraste, el MA-ligero es una forma distintiva de MA pasivo que falla en proporcionar los pasos iterativos necesarios para aprender del manejo. Las cortes han desarrollado un entendimiento sofisticado del MA y continuamente ofrecen opiniones instructivas en lugar de opiniones críticas. El papel del poder judicial es limitado por la discreción de las agencias bajo la ley administrativo de los EUA, pero las cortes han anulado algunas prácticas de MA ligero de las agencias y han insistido en análisis más rigurosos para asegurar que los beneficios prometidos del aprendizaje estructurado y el manejo bien calibrado tengan una probabilidad razonable de ocurrir. Sin embargo, todavía persiste una desigualdad en la ley administrativa de los EUA entre la flexibilidad exigida por el manejo adaptativo y los objetivos legales de la transparencia, la participación pública y la finalidad.*

Palabras Clave: leyes, Norte América, planeación de la conservación, políticas y normas

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Introduction

Adaptive management (AM) is an almost universally acclaimed conservation tool. Uncertain climate-change effects, ignorance about the causes of imperiled species declines, and the stochastic behavior of ecosystems are common justifications for using AM. In the 1990s, U.S. federal agencies began adopting AM in their plans and permitting processes. It is now standard practice (Williams et al. 2009; 36 C.F.R. § 219.12[d][2]), as are lawsuits challenging agency decisions. Although few other nations subject public decisions to as much judicial scrutiny as the United States, AM is now widely incorporated in statutes and rules around the world (Schramm & Fishman 2010).

We surveyed all U.S. judicial opinions that resolved legal disputes involving federal government AM. The court decisions highlight especially controversial projects but also unveil a cross section of agency practice. In particular, they show how agencies facing resource, political, and legal constraints respond by pulling together AM plans that often neglect key steps in the process. We call this kind of adaptive management AM-lite, a watered-down version of the structured-learning-based theory that "resembles ad hoc contingency planning" (Ruhl & Fischman 2010:426). Understanding this pragmatic approach of agencies offers important lessons for improved conservation. Specifically, AM-lite falls largely outside the framework in the literature that distinguishes passive from active AM. Instead, it represents a different version of AM that raises questions about whether the tool's theoretical advantages may be realized in the various forms of practice that diverge from the process described in the literature. This analysis of judicial opinions reveals AM examples that might spur researchers to recalibrate their thinking to better match what actually happens in natural resources administration.

Forms of Adaptive Management

Adaptive management is supposed to be an iterative process in which decision outcomes are continually monitored and evaluated to determine whether they are achieving objectives. The feedback loops rely on goal establishment, model building, performance standard setting, outcome monitoring, and recalibration. Over time, feedback and adjustments provide flexibility in the face of uncertainty while simultaneously reducing uncertainty through systematic learning (Nie & Schultz 2012). Although the basic theme of learning by doing pervades all forms of AM, there is wide variation in practice. The most common distinction in the literature separates active from passive AM along a continuum of management interventions, particularly the use of experimental strategies (Walters & Hilborn 1978; McCarthy & Possingham 2007; Williams 2011; Williams & Brown 2012). The disparate literature includes a more mathematical framework that focuses on whether anticipated learning is considered when making each decision as a basis for distinguishing the two approaches (Williams et al. 2002). The algorithmic framework for quantitative optimization has practical application in waterfowl management and other tasks for which substantial data are available (Williams & Johnson 1995). But the conflicts courts have evaluated involve decisions for which biostatistical models gain little traction.

In the active form of AM, managers deliberately probe for information to evaluate testable hypotheses about the effects of intervention. For example, managers might evaluate the effects that a chosen habitat alteration and its alternatives have on invasive species by running small-scale test plot experiments. Active AM can identify optimal budget allocations to achieve the maximum area of successful revegetation, as defined by a certain density of vegetation present 20 years after planting (McCarthy & Possingham 2007). The normative ideal for strong inferences from experiments is closely associated with active AM involving replication, controls, and randomization (Prato 2005; Grantham et al. 2009). However, resource management, particularly over small areas, often involves a single system where replication and controls are infeasible. In that situation, active AM would provide structured decision-making tools that seek to optimize both management success and learning (Nichols & Williams 2012).

Passive AM can be any variation of AM that falls along a decreasing continuum of scientific rigor for hypothesis testing. It has thus been characterized as "nonexperimental" and "nonscientific" (Aldridge et al. 2004), "incomplete" and "haphazard" (Gregory et al. 2006), "unreliable" (Prato 2005), and "nonlearning based" (Williams 2011). Typically, managers make a decision based on the known historical behavior of the system and "a single best estimate or model for response" (Walters & Holling 1990). They then monitor the system to gather information for future learning but treat learning as a byproduct rather than an essential component of the management decision (Gregory et al. 2006; Nichols & Williams 2012; Williams & Brown 2012). Although passive AM is often described as incremental or sequential (Halbert 1993; Bormann et al. 1999), it is not experimental. Over enough iterations, and with enough monitoring, the passive approach may produce the same level of rigor as active AM (Williams 2011), as illustrated by the decades-long annual adjustments of Mallard (*Anas platyrhynchos*) hunting regulations (Nichols & Williams 2012).

Federal resource management agencies in the United States have all adopted policies that promise implementation of AM (Ruhl & Fischman 2010). Many of the agencies have led the way in developing the theory of AM, building on earlier scholarly work (e.g., Williams et al. 2009). Because the agency policies promise implementation of AM theory (e.g., 33 C.F.R. §332.2), the conflicts between agency implementation and agency promise reflect the tension between practice and theory.

Adaptive Management in U.S. Courts

Seminal scholarship characterized most examples of AM in practice as passive (Walters & Hilborn 1978), particularly because the complexity of dynamic optimization frustrates decision makers seeking to reduce uncertainty while also achieving management objectives. We find that the practice of many U.S. agencies, while generally a form of passive AM, diverges from the theoretical literature in other, seldom-noted dimensions revealed in the litigation. Although it is feasible to build into final agency actions some AM flexibility, it remains a challenge many agencies struggle with, particularly in circumstances of high uncertainty and little prior information. This has been the focus of the judicial decisions criticizing agency AM and recent agency initiatives to better mold adaptive plans to legal constraints.

Public agencies must operate within the structure of administrative law, built on a model of comprehensive rationality: all factors influencing a decision and its consequences must be considered before making a final decision. Once made, an agency must stick with final decisions until it reengages the administrative process to alter them. Adaptive management, in theory, is more open-ended and considers no decisions beyond revision to improve outcomes or learning. If the decision is adopting a long-term plan, the agency cannot adjust it without going through the arduous administrative process of amendment. Also, substantive laws (e.g., the Endangered Species Act [ESA]) require findings (e.g., that an action authorized by an agency will not jeopardize the continued existence of an imperiled species [16 U.S.C. § 1536(a)(2)]) before federal actions (e.g., an oil and gas leasing plan) may proceed and each time a plan is revised.

Fiscal and political constraints also complicate AM implementation by public agencies. Both generally encourage agencies to defer determining whatever is not absolutely necessary for a final agency action. They lead agencies to employ AM-lite, which frequently fails even to structure a learning procedure, whether through experimentation, historical research, or modeling (NRC 2004; Nie & Schultz 2012). It lacks a priori hypotheses. It is similar to "evolutionary adaptive management," defined as trial and error, or learning from management without purposeful direction (Walters & Holling 1990). Trial and error might lead to learning, but it is not the structured learning promised in AM. In its most extreme form, AM-lite is essentially open-ended contingency planning or on-the-fly management that promises some loosely described response to whatever circumstances arise. Implementation of AM-lite may be suitable where the range of possible variations in actions and outcomes is small and where the system is not experiencing novel stressors. But many of the AM decisions reviewed by courts consist of "basic trial and error learning in which explicit hypotheses are absent or vague" (Gregory et al. 2006:2412). The upshot is that AM remains largely an aspiration—achieving even passive AM has proven challenging enough.

Judicial Decisions

To gain a deeper understanding of how courts treat instances of AM-lite and what can be learned from the judicial commentary, we examined all federal court opinions containing the phrase *adaptive management* as of 1 January 2015 (Supporting Information). Of the 216 opinions with this term, 102 separate opinions (47%) involved a challenge to an agency's AM of environmental or natural resources. In most (75%) opinions overall, and almost half (48%) of the opinions in cases directly challenging an AM element of an agency record, courts used the phrase *adaptive management* merely to describe some aspect of the administrative record not relevant to the judgment.

However, 53 judicial opinions applied relevant law directly to some aspect of AM. These are the cases we evaluated in our examination of U.S. agency practice of AM-lite (Supporting Information). In this group of 53 opinions, 45% of decisions overturned the agency decision as "arbitrary and capricious," a legal standard deferring to any permissible agency interpretation. In U.S. administrative law, if a court overturns an agency record as failing to rationally support a decision (arbitrary and capricious) or finds some violation of a specific legal standard (e.g., failing to avoid jeopardy to the continued existence of an endangered species), then it generally will suspend and remand the agency decision (send the decision back to the agency for a new determination). Procedural violations of law (e.g., failure to complete an adequate environmental impact analysis) may result in remands under which an agency cures the defects in its record but reaffirms the substantive decision. A court upholding an AM approach does not necessarily endorse the practice as effective conservation. It merely finds that the approach did not violate any specific legal mandate. Additionally, an opinion upholding a particular AM approach does not necessarily resolve the overall legal dispute in favor of the agency.

We focused mostly on cases overturning AM-lite because the resulting opinions identify friction points in

the administrative process, where AM implementation often falls short of theory and effectiveness. An arbitrary-and-capricious finding is not a direct comment on the rigor of the AM process. A court may reject an agency decision that is a paragon of active AM because of an unrelated violation of law. But, when an agency relied on AM to meet a legal standard (e.g., ensure no jeopardy to an endangered species) and a court finds fault in that line of reasoning, the judicial opinion may reveal AM-lite shortcomings.

We extracted lessons from the cases in which the adversarial process unveiled problems with translating AM into practice. The court decisions paint a troubling picture of agencies cloaking their desire to defer decisions or dodge difficult calls under the AM label. This conclusion stems from a close reading of the 53 judicial opinions. Here, we present example cases in which judges clearly evaluated some aspect of adaptive management in an agency's record of decision. In many cases, judicial evaluation of AM is murky. A thorough canvass of agency AM practice is beyond the scope of this article. The difficulty of funding and litigating cases filters out disputes with low stakes. Agencies lose litigation only if they perform particularly poorly in justifying their decisions. Court decisions overturning agency actions are a useful window into the problems associated with translating AM theory into administrative practice. But, they cannot reveal the full extent or frequency of the shortcomings.

AM-lite

Courts that rejected agency AM plans cite a number of problems that correspond to commonly defined steps in the iterative process. Although courts evaluated the plans against legal standards and not AM theory, they often cited problems in the AM process as reasons to believe AM-lite will not deliver on its promise. These weak links in the chain of activities implementing AM roughly correspond with some of the barriers to successful AM discussed in the literature (Moser & Eckstrom 2010; Nie & Schultz 2012; Lindenmayer et al. 2013; Meretsky & Fischman 2014). Passive AM is distinctive in its relative lack of experiments or other structured forms of management intervention for hypothesis testing. In contrast, AM-lite is a particular form of passive AM that skips some iterative steps necessary to learn from management.

Although pathologies—including lack of stakeholder engagement, procrastination, and weak leadership—have been identified as impeding the progress of AM (Allen & Gunderson 2011), 3 shortcomings in AM implementation recur in judicial cases overturning agency decisions: failure to establish objectives or failure to describe monitoring protocols for a plan or project; failure to define decision thresholds in monitoring; and failure to identify specific actions that will be triggered when thresholds are crossed. We characterized AM-lite along this chain of failures in the order in which iterative decision making should engage these steps. In practice, many public decisions involve weaknesses in these categories rather than total failures. But courts grant agencies the benefit of the doubt in judicial review. Agencies have discretion to craft poor AM approaches—a court will overturn only those that have glaring problems.

Clear Objectives and Process

The first and most critical decisions in devising AM strategies are formulating specific objectives and a process for monitoring (Stein et al. 2013; Fischman et al. 2014). Although they are separate steps in AM, establishing objectives and describing monitoring programs are two decisions that agencies now usually make to the satisfaction of courts. Without specific objectives and monitoring, goals may slip and actions designed to achieve one aim ultimately drift toward different outcomes. Objectives establish benchmarks against which to measure progress or indicate when program revision is necessary (Williams et al. 2009). Although AM-lite generally calls for monitoring, some applications avoid defining objectives or the means of monitoring them (Nie & Schultz 2012).

Litigation over grazing on the North Sheep allotments of the Sawtooth National Forest and Recreation Area illustrates how courts both uncover and shape agency implementation of AM-lite. A conservation organization challenged the agency's sheep and goat grazing allotment plans as contravening the mandates of the National Forest Management Act and the National Environmental Policy Act (NEPA). The Forest Service lost the first round of litigation when a court found that the plans' AM strategy failed to explain how they would achieve the Forest Service's objectives to allow grazing only on lands suitable for and capable of sustaining grazing. They also did not explain how the agency would monitor conditions. The environmental analysis in the administrative record stated that a monitoring plan "will be developed and implemented through an iterative process" but did not describe the process (Western Watersheds Project 2006:10). The agency responded with a supplemental analysis the court subsequently upheld as aligning grazing with forest plan goals by committing to monitoring "annual indicators" of range conditions at designated sites. The indicators for the suitability and capability objectives included numerical criteria (e.g., >4 inches of stubble height and $<30\%$ sagebrush cover at the end of the grazing season) (Western Watersheds Project 2011). Failure to meet the criteria under the supplemental commitments triggers specific actions, such as closing areas and reducing numbers of livestock.

Decision Thresholds in Monitoring

Thresholds are signals that something must change (warnings of problems) or can change (confirmations of achievements) in the management regime. But AM-lite often neglects to define these decision thresholds that trigger mitigation actions or reevaluation (Martin et al. 2009). The AM literature emphasizes the importance of activating intervention in response to observations (Lindenmayer et al. 2013), but thresholds are often absent in public plans (Meretsky & Fischman 2014). In contrast, decisions that contain quantitative standards for the deployment of review, mitigation, or some other adaption action harness the benefits of AM and help prioritize the key monitoring tasks (Gregory et al. 2006; Nie & Schultz 2012).

The same court that upheld the supplemental North Sheep allotment plan invited further litigation if the promised benefits of AM amount only to "a burst of monitoring" with no consequences for grazing practices that do not meet the numerical objectives (Western Watersheds Project 2011:1124). The following year it overturned a different agency's renewal of grazing permits for failure to meet a regulatory requirement that noncompliance with rangeland health standards result in "appropriate action" to make "significant progress toward fulfillment" of the standards (43 C.F.R. § 4180.2[c][2]). The agency set goals and committed to monitoring, but, if the goals were not met "over time," then the agency merely promised adaptive adjustment of grazing restrictions (Western Watersheds Project 2012:1129). The court found that "the amorphous definition" of "over time" afforded the agency "a nearly unreviewable discretion to wave off failures to comply for an unspecified number of years" (Western Watersheds Project 2012:1129). Specific triggers for changes in management practices (the decision thresholds) would have improved AM and secured legal compliance.

In contrast, a court allowed a coal mine fill permit employing an AM plan with "specific timelines for corrective actions if monitoring reveals noncompliant scores" (Ohio Valley Environmental Coalition 2012:637). Similarly a court upheld a decision not to designate the dunes sagebrush lizard (*Sceloporus arenicolus*) for protection under the ESA based, in part, on a plan that bound developments in the lizard's habitat to minimize and mitigate impacts. The agreement required monthly reports to track habitat and established a threshold to trigger adaptive reevaluation if habitat loss came "within 7.5% of the allowed 1% loss in total habitat" (Defenders of Wildlife 2014:8).

An unusual comparative AM evaluation illustrates the role of AM thresholds in meeting substantive legal standards. In a series of decisions, Judge Wanger reviewed ESA compliance in the operation of California's Central Valley irrigation system regularly between 2006 and 2011. One issue in the litigation was how agencies may rely on AM to ensure that water operations will not "jeopardize the continued existence" of any listed species (16 U.S.C. § 1535[a][2]). Judge Wanger's decisions compared the conservation approaches of the Interior Department's Fish and Wildlife Service (FWS) (responsible for the Delta smelt [*Hypomesus transpacificus*]) with the Commerce Department's National Marine Fisheries Service (NMFS) (responsible for anadromous fishes). Both agencies employed AM, but Judge Wanger upheld the NMFS approach and remanded the FWS plan. The NMFS AM protocol contained definite, substantive criteria (e.g., temperature thresholds) that triggered revision of the water system operations to avoid jeopardy (Pacific Coast Federation of Fishermen's Associations 2008). In contrast, the FWS approach failed to provide enforceable, precise criteria to serve as thresholds (NRDC 2007).

Specific Actions Triggered by Thresholds

Thresholds identify when action is necessary to adjust management practices or mitigation. But, AM-lite often neglects to specify just what that action should be. This may be because an agency wants to retain its future discretion or because an effective response is not yet known. In either event, failure to specify actions triggered by thresholds can lead to dead ends in what should be the continuing adaptive iteration cycle.

Courts have identified this missing element in AM-lite as a basis for remanding inadequate agency decisions. In Judge Wanger's ESA review of California Central Valley water management, he overturned the FWS decision to adopt a procedurally elaborate AM protocol identifying danger thresholds for the Delta smelt. The triggered action would be convening a working group to "consider" a range of operational changes in the water system (NRDC 2007:341). Judge Wanger found the mandatory protocol failed to identify what changes to the system could improve conditions for the smelt. In contrast, the NFMS approach identified the enforceable requirements to be imposed if the system crossed thresholds for the anadromous fish. In remanding the FWS approach, Judge Wanger distinguished the Central Valley plan from an ESA permit for land development in California's Natomas Basin that employed "well-defined mitigation measures" such as conservation land purchases, adjustment of conservation reserve size, and modification of agricultural practices (NRDC 2007). The Central Valley plan lacked such specificity of responsive actions, even though the protocol was much more elaborate. Complexity and detail in AM design does not necessarily assure substantive legal criteria will be met by triggering mitigating actions.

Another court set aside an FWS decision to remove the grizzly bear (*Ursus arctos horribilis*) from the list of species receiving ESA protection. The delisting decision

relied on AM-lite to respond to the decline in whitebark pine (*Pinus albicaulis*), an important food source for the bear. While the agency identified specific monitoring criteria (i.e., thresholds) to detect changes in mortality, litter size, and cub survival, the action triggered would be a study team effort to "recommend appropriate management responses" (Greater Yellowstone Coalition 2011:1029). Without explanation of what the responses might be or their effectiveness in the face of whitebark loss, the administrative record did not meet the ESA requirements for finding that the grizzly bear is not threatened by the decline in its whitebark food source.

Courts have interpreted mitigation mandates under several environmental laws to require a showing that conservation actions be "reasonably specific, certain to occur, and capable of implementation" (Center for Biological Diversity 2002:1152). Plans employing AM-lite often fail to meet this standard even when agencies commit to achieve "specific, numerical improvements in habitat quality and survival" (NWF 2011:1126). Promises to achieve specific goals are not self-executing, and expressing numerical thresholds in monitoring does not alone advance goals. Successful AM depends on a plan for what to do when thresholds are crossed. In remanding an agency's no-jeopardy finding for operation of the Pacific Northwest's Columbia River dams, a court criticized the common AM-lite approach of neglecting specific actions triggered by monitoring in favor of "vague" promises to act in an unspecified manner when thresholds are crossed (NWF 2011:1128):

> It is one thing to identify a list of actions, or combination of potential actions, to produce an expected survival improvement and then modify those actions through adaptive management to reflect changed circumstances. It is another to simply promise to figure it all out in the future.

Even laws with weaker substantive requirements, such as NEPA, present courts with questions about triggered responses. One case overturned an agency environmental analysis under NEPA for failing to provide enough detail in its AM plan about mitigation actions for expansion of a gold mine (South Fork Band Council 2009). The agency's AM-lite approach to the plan described a water monitoring regime with thresholds that would trigger a "detailed, site-specific plan to enhance or replace the impacted perennial water resources" (USDOI 2008, § 3.2). The court found that this mitigation approach, which specified no particular action or technology, did not provide enough evaluation about the ability to avoid adverse impacts from the mine.

But other courts reviewing NEPA analysis have upheld similarly vague mitigation promises. For instance, the first large-scale use of AM to manage oil and gas lease development deferred both the establishment of quantitative criteria for thresholds and the selection of mitigation measures (Theodore Roosevelt Conservation Partnership 2010). Nonetheless, a court upheld the plan against a NEPA challenge, in part because subsequent approvals of individual drilling permits would be subject to environmental analysis and could adopt site-specific criteria and mitigation. The court relied on the AM-lite approach in concluding that the agency took the required "hard look" at environmental impacts. This look-before-you-leap requirement distills NEPA's comprehensive rationality approach. But the court responded that "allowing adaptable mitigation measures is a responsible decision in light of the inherent uncertainty of environmental impacts, not a violation of NEPA" (Theodore Roosevelt Conservation Partnership 2010:517).

Learning from AM-lite

Although federal agencies commit to AM, litigation reveals approaches that fail to produce a structured learning process. Practicing passive AM more effectively is a practical improvement that is within reach of U.S. agencies, and courts sometimes insist on it. Otherwise, AM-lite will lead to iterative dead ends and possibly discredit AM as an approach with a poor stewardship record.

Courts grasp the aims and elements of AM. They seek to impose the constraints of administrative law, which emphasizes finality and comprehensive rationality. But courts also appear eager to accommodate the conservation imperatives of AM (Ruhl & Fischman 2010). The perception that lawsuits are an impediment to AM (Koontz & Bodine 2008) is unsupported by our review. One court has even suggested that AM may be necessary where an agency will likely have to respond to unforeseen circumstances (Southwest Center for Biological Diversity 2006). Courts have rejected arguments that plans built around AM are mere "untested" hypotheses that cannot satisfy the rational-basis test of judicial review (SLDMWA 2011:913). But, courts sometimes reject agency rationales based on hypotheses when the proposed action is not accompanied by a plan to collect data to evaluate the accuracy of the hypotheses (Lands Council 2008). Courts aid AM when they insist on a plan to learn through management.

As agencies have established quantitative objectives in their AM plans, courts have dived deeper into the structure of the decisions to ensure that the promised benefits of structured learning and fine-tuned management have a reasonable likelihood of occurring. Federal courts are now unpacking AM-lite to reveal where agencies stumble along the way to successful iteration and learning. This dynamic provides agencies an opportunity and incentive to learn how to improve their practice of AM. Courts are most likely to reject AM plans that fail to specify clear objectives and processes, establish monitoring thresholds, and define actions triggered by thresholds,

thus suggesting how agencies can most effectively improve their AM practices. Agencies have learned from their past litigation losses; today they seldom stumble over the first steps of establishing specific objectives and processes.

But the courts and agencies working together can advance the practice of AM only so far. No major federal statute explicitly authorizes agencies to practice AM, much less spells out its requirements. Agencies have compiled detailed manuals for practicing AM (Williams et al. 2009; Williams & Brown 2012), but courts accord the manuals only moderate deference. This leaves agencies uncertain about whether their prescriptions for AM, even when met, satisfy judicial review when weighed against the requirements of environmental and administrative law (Benson & Stone 2013). Legislative standards for AM would provide agencies and courts more guidance and certainty.

Beyond providing substantive authority and standards, some AM scholars have suggested that the iterative decision-making process can also be promoted through administrative law reform (Karkkainen 2002; Craig & Ruhl 2014). Conventional administrative process requirements impose extensive front-end requirements on agency decisions, including impact analysis and public participation, and subject final agency decisions to judicial review. Although these requirements are meant to promote agency transparency, public participation, and legitimacy, they do not necessarily facilitate iterative decision making. This mismatch has prompted proposals for alternative procedural tracks for agencies to follow when they are authorized to employ AM, designed primarily to change the ways and times when public participation and judicial review are available in the AM process. For example, one proposal would allow agencies to adopt AM plans after public participation, impact assessment, and judicial review processes based on special, statutorily prescribed criteria designed to avoid the AM-lite shortcomings. If the plan fulfills the criteria, its implementation, including adjustments to actions called for under the plan, would not be subject to additional rounds of administrative process (Craig & Ruhl 2014). This latitude to practice AM would ameliorate the legal requirements many agency practitioners of AM identify as barriers (Benson & Stone 2013) but would retain the basic procedural safeguards of administrative law. Implementing such a procedural regime has thus far been untested.

Consistent funding is also necessary to support AM in practice, particularly its nerve center—monitoring. This does not necessarily mean that AM costs more than conventional management regimes, which also need monitoring to be effective. But conventional management seldom follows through with much monitoring (Karkkainen 2002). The judicial acceptance of AM should come at the price of more durable monitoring strategies. Courts may spur legislatures and agencies to better match funding to the continual needs of AM. Appropriations for AM projects could establish endowments or annuities to assure that the back-end activities (especially monitoring, triggered actions, and reevaluation) deliver on the promise of reducing uncertainty. In the long run, the promise of AM practiced at its fullest—not the AM-lite version that has prevailed thus far—should be worth the investment.

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Supporting Information

Methods and results of our examination of cases (Appendix S1) and a spreadsheet of coding (Appendix S2) are available online. The authors are solely responsible for the content and functionality of these materials. Queries (other than absence of the material) should be directed to the corresponding author.

Literature Cited

Aldridge CL, Boyce MS, Baydack RK. 2004. Adaptive management of prairie grouse: How do we get there? Wildlife Society Bulletin **32:** 92–103.

Allen CR, Gunderson LH. 2011. Pathology and failure in the design and implementation of adaptive management. Journal of Environmental Management **92:**1379–1384.

Benson MH, Stone AB. 2013. Practitioner perceptions of adaptive management implementation in the United States. Ecology and Society **18** DOI: 10.5751/ES-05613-180332.

Bormann BT, et al. 1999. Adaptive management. Pages 505–533 in Johnson NC, Malk AJ, Sexton W, Szaro RC, editors. Ecological stewardship: a common reference for ecosystem management. Elsevier, Amsterdam.

Center for Biological Diversity v. Rumsfeld. 2002. 198 F. Supp.2d 1139 (D. Ariz.).

Craig RK, Ruhl JB. 2014. Designing administrative law for adaptive management. Vanderbilt Law Review **67:**1–87.

Defenders of Wildlife v. Jewell. 2014. 2014 WL 4829089, — F. Supp.3d — (D.D.C.).

Fischman RL, Meretsky VJ, Babko A, Kennedy M, Liu L, Robinson M, Wambugu S. 2014. Planning for adaptation to climate change. BioScience **64:**993–1005.

Grantham HS, Bode M, McDonald-Madden E, Game ET, Knight AT, Possingham HP. 2009. Effective conservation planning requires learning and adaptation. Frontiers in Ecology and the Environment **8:** 431–437.

Greater Yellowstone Coalition v. Servheen. 2011. 665 F.3d 1015 (9th Cir.).

Gregory R, Ohlson D, Arvai J. 2006. Deconstructing adaptive management: criteria for applications to environmental management. Ecological Applications **16:**2411–2425.

Halbert CL. 1993. How adaptive is adaptive management? Reviews in Fisheries Science **1:**261–283.

Karkkainen B. 2002. Toward a smarter NEPA: monitoring and managing government's environmental performance. Columbia Law Review **102:**903–972.

Koontz TM, Bodine J. 2008. Implementing ecosystem management in public agencies: lessons from the U.S. Bureau of Land Management and the Forest Service. Conservation Biology **22:**60–69.

Lands Council v. McNair. 2008. 537 F.3d 981 (9th Cir.).

Lindenmayer DB, Piggott MP, Wintle BA. 2013. Counting the books while the library burns: why conservation monitoring programs need a plan for action. Frontiers in Ecology and the Environment **11:**549–555.

Martin J, Runge MC, Nichols JD, Lubow BC, Kendall WL. 2009. Structured decision making as a conceptual framework to identify thresholds for conservation and management. Ecological Applications **19:**1079–1090.

McCarthy MA, Possingham HP. 2007. Active adaptive management for conservation. Conservation Biology **21:**956–963.

Meretsky VJ, Fischman RL. 2014. Learning from conservation planning for the U.S. national wildlife refuges. Conservation Biology **28:** 1415–1427.

Moser SC, Eckstrom JA. 2010. A framework to diagnose barriers to climate change adaptation. Proceedings of the National Academy of Sciences USA **107:**22026–22031.

Nichols JD, Williams BK. 2012. Adaptive management. Pages 20–25 in El-Shaarawi AH, Piegorsch WW, editors. Encyclopedia of environmetrics. 2nd edition. John Wiley & Sons, West Sussex.

Nie M, Schultz C. 2012. Decision-making triggers in adaptive management. Conservation Biology **26:**1137–1144.

NRC (National Research Council). 2004. U.S. Army Corps of Engineers water resources planning: a new opportunity for service. National Academies Press, Washington, D.C.

NRDC (Natural Resources Defense Council) v. Kempthorne. 2007. 506 F.Supp.2d 322 (E.D. Cal.).

NWF (National Wildlife Federation) v. National Marine Fisheries Service. 2011. 839 F.Supp.2d 1117 (D. Or.).

Ohio Valley Environmental Coalition v. U.S. Army Corps of Engineers. 2012. 883 F.Supp.2d 627 (S.D. W.V.).

Pacific Coast Federation of Fishermen's Associations v. Gutierrez. 2008. 606 F.Supp.2d 1122 (E.D. Cal.).

Prato T. 2005. Accounting for uncertainty in making species protection decisions. Conservation Biology **19:**806–814.

Ruhl JB, Fischman RL. 2010. Adaptive management in the courts. Minnesota Law Review **95:**424–484.

Schramm D, Fishman A. 2010. Legal frameworks for adaptive natural resource management in a changing climate. Georgetown International Environmental Law Review **22:**492–520.

SLDMWA (San Luis & Delta-Mendota Water Authority) v. Salazar. 2011. 760 F.Supp.2d 855 (E.D. Cal.), affirmed in part, reversed in part San Luis & Delta-Mendota Water Authority v. Jewell, 747 F.3d 581 (9th Cir. 2014).

South Fork Band Council v. U.S. Dept. of the Interior. 2009. 588 F.3d 718 (9th Cir.).

Southwest Center for Biological Diversity v. Bartel. 2006. 470 F.Supp.2d 1118 (S.D. Cal.).

Stein BA, et al. 2013. Preparing for and managing change: climate adaptation for biodiversity and ecosystems. Frontiers in Ecology and the Environment **11:**502–510.

Theodore Roosevelt Conservation Partnership v. Salazar. 2010. 616 F.3d 497 (D.C. Cir.).

USDOI (U.S. Dept. of the Interior). 2008. Bureau of Land Management Cortez Hills Expansion Project: final environmental impact statement. Available from www.blm.gov/nv/st/en/fo/battle_mountain_field/blm_information/national_environmental/cortez_hills_expansion.html (accessed February 2014).

Walters CJ, Hilborn R. 1978. Ecological optimization and adaptive management. Annual Review of Ecology and Systematics **9:** 157–188.

Walters CJ, Holling CS. 1990. Large-scale management experiments and learning by doing. Ecology **71:**2060–2068.

Western Watersheds Project v. U.S. Forest Service. 2006. 2006 WL 292010 (D. Idaho).

Western Watersheds Project v. U.S. Forest Service. 2011. 780 F.Supp.2d 1115 (D. Idaho).

Western Watersheds Project v. Salazar. 2012. 843 F.Supp.2d 1105 (D. Idaho).

Williams BK. 2011. Passive and active adaptive management: approaches and an example. Journal of Environmental Management **92:**1371–1378.

Williams BK, Brown ED. 2012. Adaptive management: the U.S. Department of the Interior applications guide. USDOI, Washington, D.C.

Williams BK, Johnson FA. 1995. Adaptive management and the regulation of waterfowl harvests. Wildlife Society Bulletin **23:** 430–436.

Williams BK, Nichols JD, Conroy MJ. 2002. Analysis and management of animal populations. San Diego, Academic Press.

Williams BK, Szaro, RC, Shapiro CD. 2009. Adaptive management: the U.S. Department of the Interior technical guide. USDOI, Washington, D.C. Available from www.doi.gov/initiatives/AdaptiveManagement/TechGuide.pdf.) (accessed July 2015).

From: Cole, Eric
To: Steve Kallin; Cris Dippel; Lori Iverson; Michael Nordell
Subject: 12/29/2015 NER forage availability
Date: Tuesday, December 29, 2015 4:03:36 PM

Aly Courtemanch of WGFD and conducted our first forage availability sampling of the season and found the following:

Overall average available forage was 1,295 lbs/acre and average snow depth was 7 inches Feeding is not necessary at this time. The next scheduled forage evaluation is Wednesday January 6.

Source data:

Site 18, irrigated meadow brome/agronomic mix north of wellhouse=8 inch average snow depth, snow powdery but considerable previous elk foraging activity, average forage available 500 lbs/acre

Site 1, Dike Road sub-irrigated carex= 6 inches average snow depth with some ground ice but otherwise powdery. average available forage=1860 lbs/acre

Site 7, McBride irrigated intermediate wheatgrass/mixed agronomic grass irrigated. Average snow depth 7 inches with considerable elk foraging activity. average available forage=2,020 lbs/acre

Site 17 Poverty flats crested wheatgrass with late season irrigation. Average snow depth 8 inches of powder. Considerable green vegetation under snow with only minor elk foraging activity. average available forage = 800 lbs/acre

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

From:	Cole, Eric
To:	Bryan Yetter; Aly Courtemanch; Amanda Soliday; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Corinna Reginos; Cris Dippel; Daniel Huckel; Dave Gustine; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Nick Dobric; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Siva Sundaresan; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan G. Clark; Susan Patla; Terry Roper; Tim Pratt; Tom Reed; Ture Schoultz
Subject:	7 January 2016 National Elk Refuge Biological Update
Date:	Thursday, January 07, 2016 11:26:02 AM

7 January 2016 National Elk Refuge Biological Update

Ungulate Numbers

I counted 3,635 elk on 28 Dec 2015 and 7,225 elk on 2 Jan 2016 in the standardized observation area that roughly corresponds to the southern half of the elk refuge. 7,225 elk is an unusually high number of elk compared to recent years for the first week of January (average 4,500 from 2005-2016).

Although no bison were observed during the scheduled surveys Approximately 300 bison were in the open hunt area the last week of December and another significant group of bison was in the open hunt area on 6 January 2016. Harvest totals are not immediately available, but approximately 40 bison were likely harvested on NER during these 2 movement events.

I observed 32 pronghorn northeast of Miller Butte on 2 Jan 2016. This was the first observation of this group since 13 December. It appears that this group did not migrate out of Jackson Hole and will be here for the winter.

The number of bighorn sheep observed in recent days has ranged from 46 to 60, but sheep are using the top of Miller Butte, are not always easy to observe, and total numbers are likely higher.

Feeding Initiation

WGFD biologist Aly Courtemanch and I monitored snow and forage conditions on NER on 6 January 2016. Average available forage at 4 key index sites was 870 lbs./acre and average snow depth was 7.2 inches. Snow was low density powder, which is not a barrier to elk foraging activities. Based on this monitoring we do not recommend that supplemental feeding is necessary at this time. We will continue to monitor conditions at least weekly.

Given higher than typical interest by the public this year, I will reiterate that for comparison, the average feeding start date on NER is January 28, but feeding start date varies widely based on conditions (start date range from December 31 to February 28 since 1995). There have been 9 years when NER did not feed at all, the most recent being 1981. In summary feeding initiation in late December to early January is unusual on NER and certainly is not warranted at this time based on current conditions.

Wolves

In cooperation with Grand Teton National Park a contract capture crew deployed collars on 4 Pinnacle Peak Pack wolves on the north end of the refuge in late December. Collars allow us to monitor Pinnacle Peak Pack movements.

Pinnacle wolves have been back on the refuge since mid December and if past patterns

continue, they will likely den on NER this year.

Happy New Year,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

From: Blenden, Mike
To: Will Meeks; Maureen Gallagher
Subject: Heads up, potential NER complaint
Date: Monday, January 11, 2016 12:52:44 PM

FYI - Steve Kallin just called to describe a tour and conversation he had last week with Joanna Johnson and Ken Griggs (retired DVM). They represent "Friends of the Elk" a small, pro feeding and pro hunting group. Dr. Griggs thinks NER is currently starving elk. They asked for the RD's address and have inquired about Steve's job description and qualifications for determining adequate elk diet. We may hear from one of them. I'm glad to field the call if happens.

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

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John F. Kennedy

From:	Will Meeks
To:	Noreen Walsh
Cc:	Matt Hogan; Maureen Gallagher
Subject:	Fwd: Heads up, potential NER complaint
Date:	Monday, January 11, 2016 6:05:26 PM

Kris,

If you receive an inquiry about this, I will be more than happy to address it. Thanks.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303(w)
720-541-0319 (c)

Begin forwarded message:

> **From:** "Blenden, Mike" <mike_blenden@fws.gov>
> **Date:** January 11, 2016 at 12:52:41 PM MST
> **To:** Will Meeks <will_meeks@fws.gov>, Maureen Gallagher <maureen_gallagher@fws.gov>
> **Subject: Heads up, potential NER complaint**
>
> FYI - Steve Kallin just called to describe a tour and conversation he had last week with Joanna Johnson and Ken Griggs (retired DVM). They represent "Friends of the Elk" a small, pro feeding and pro hunting group. Dr. Griggs thinks NER is currently starving elk. They asked for the RD's address and have inquired about Steve's job description and qualifications for determining adequate elk diet. We may hear from one of them. I'm glad to field the call if happens.
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Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303(w)
720-541-0319 (c)

Begin forwarded message:

> **From:** "Blenden, Mike" <mike_blenden@fws.gov>
> **Date:** January 11, 2016 at 12:52:41 PM MST
> **To:** Will Meeks <will_meeks@fws.gov>, Maureen Gallagher <maureen_gallagher@fws.gov>
> **Subject: Heads up, potential NER complaint**
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> Refuge Supervisor - Montana, Wyoming and Utah
> 134 Union Boulevard
> Lakewood, CO 80228
> 303-236-4306
>
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> John F. Kennedy

From: Matt Hogan
To: Will Meeks
Cc: Noreen Walsh; Maureen Gallagher
Subject: Re: Heads up, potential NER complaint
Date: Monday, January 11, 2016 6:09:05 PM

Thanks for the heads up. Will let you know if we hear anything.

On Jan 11, 2016, at 6:05 PM, Will Meeks <will_meeks@fws.gov> wrote:

> Kris,
>
> If you receive an inquiry about this, I will be more than happy to address it. Thanks.
>
> Will Meeks
> U.S. Fish and Wildlife Service
> Mountain-Prairie Region
> Assistant Regional Director
> National Wildlife Refuge System
> 303-236-4303(w)
> 720-541-0319 (c)
>
> Begin forwarded message:
>
> > **From:** "Blenden, Mike" <mike_blenden@fws.gov>
> > **Date:** January 11, 2016 at 12:52:41 PM MST
> > **To:** Will Meeks <will_meeks@fws.gov>, Maureen Gallagher <maureen_gallagher@fws.gov>
> > **Subject: Heads up, potential NER complaint**
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> > Michael Blenden
> > Refuge Supervisor - Montana, Wyoming and Utah
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John F. Kennedy

From: Matt Hogan
To: Will Meeks
Cc: Noreen Walsh; Maureen Gallagher
Subject: Re: Heads up, potential NER complaint
Date: Monday, January 11, 2016 6:09:05 PM

Thanks for the heads up. Will let you know if we hear anything.

On Jan 11, 2016, at 6:05 PM, Will Meeks <will_meeks@fws.gov> wrote:

> Kris,
>
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> Will Meeks
> U.S. Fish and Wildlife Service
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> > **Date:** January 11, 2016 at 12:52:41 PM MST
> > **To:** Will Meeks <will_meeks@fws.gov>, Maureen Gallagher <maureen_gallagher@fws.gov>
> > **Subject: Heads up, potential NER complaint**
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> > --
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> > 134 Union Boulevard
> > Lakewood, CO 80228
> > 303-236-4306
> >
> > *Too often we...enjoy the comfort of opinion without the discomfort of thought.*

John F. Kennedy

From:	Cole, Eric
To:	Steve Kallin
Subject:	Fwd: ELK OFF FEED Excel Data
Date:	Tuesday, January 12, 2016 2:51:52 PM
Attachments:	2015 Feed Season Elk Distribution Data Off Feed EXCEL.xlsx

---

Steve,

This might not be relevant anymore given that the tour with "Concerned Citizens for the Elk" is over, but Tim worked up our weekly elk count data from last winter to account for elk that were likely off feed and on or immediately adjacent to NER (see attached). The Total number off feed column is the important number to look at. The key number is probably the off feed total for 2/18/15 of 264. This was approximately 1 month post feeding initiation, was concurrent with the elk classification count, and is a good indication of the number of elk that were off feed, but were also likely to die on us. I believe that this is part of the reason (combined with a high incidence of foot rot) that calf mortality was relatively high last year (9% compared to 3.6% average).

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

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---------- Forwarded message ----------
From: **Pratt, Timothy** <timothy_pratt@fws.gov>
Date: Tue, Jan 12, 2016 at 11:36 AM
Subject: ELK OFF FEED Excel Data
To: Eric Cole <eric_cole@fws.gov>

--
Timothy D. Pratt
Biological Science Technician (Wildlife)
National Elk Refuge
U.S. Fish & Wildlife Service
Timothy_Pratt@fws.gov

Date	S. of Miller Butte, on Headquarters Feedground	S. of Miller Butte, East of Refuge Road	S. of Refuge Road Adjacent to Miller Butte
1/22/2015	33	53	267
1/23/2015	0	57	192
1/26/2015	0	3	109
1/27/2015	0	18	137
1/28/2015	0	89	121
1/29/2015	14	68	159
2/3/2015	4	84	71
2/5/2015	6	19	79
2/6/2015	7	58	22
2/8/2015	0	20	61
2/11/2015	0	41	1
2/17/2015	1	17	0
2/18/2015	35	18	175
2/22/2015	0	32	1
2/23/2015	0	1	3
2/26/2015	0	5	15
3/2/2015	0	0	18
3/9/2015	0	3	0
3/12/2015	0	1	3
3/20/2015	1	0	0

N. of Miller Butte, S. of Refuge Road	NE of Miller Butte to Chambers	On Miller Butte	N. of Chambers	Total Number Off Feed (all locations)
0	38	51	0	442
16	112	55	0	432
26	124	118	103	483
104	0	110	0	369
0	165	32		407
0	0	30	0	271
0	30	4	0	193
		16	0	120
0	0	2	0	89
0	0	0	0	81
0	64	3	0	109
6	0	0	0	24
25	4	2	5	264
0	0	0	0	33
0	13	0	0	17
9	0	0	0	29
7	0	0	0	25
0	0	0	0	3
0	37	0	1	42
0	12	0	0	13
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0

Notes	Survey completed by:
First Day of feeding was 1/19/15. Animals not classified but easily apparent that many are calves.	Eric Cole
	T. Pratt
21 Bison Calves not on feed.	T. Pratt
Fog lifting but visibility limited on upper forest slopes	T. Pratt
	T. Pratt
	T. Pratt
	T. Pratt
	T. Pratt
	T. Pratt
	T. Pratt
Suspect numerous additional elk off feed on Forest slopes as warm weather has opened up ground higher up. Difficult	T. Pratt
	T. Pratt
Day of classification count. 173 elk in one herd were counted south of the Refuge Road in line with the middle part of I	T. Pratt
	T. Pratt
	T. Pratt
Counted 41 Lame on feed at Nowlin. 25 near Flat Creek off feed "walking dead." -Tim	T. Pratt
	T. Pratt
	T. Pratt
	T. Pratt
3/21/15 Last day of feeding for the season.	T. Pratt

From:	Cole, Eric
To:	Bryan Yetter; Aly Courtemanch; Amanda Soliday; Barbara Long; Benjamin Wise; Bert Raynes; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Corinna Reginos; Cris Dippel; Daniel Huckel; Dave Gustine; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Nick Dobric; Patty Ewing; Paul Hood; Paul Santavy; Renee Seidler; samantha gibbs; Sarah Dewey; Scolnick, Claire; Siva Sundaresan; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan G. Clark; Susan Patla; Terry Roper; Tim Pratt; Todd Stiles; Tom Reed; Ture Schoultz
Subject:	18 January 2016 National Elk Refuge Biological Update
Date:	Monday, January 18, 2016 4:29:03 PM

18 January 2016 National Elk Refuge Biological Update

Snow and Forage Conditions

Aly Courtemanch of WGFD and I evaluated snow and forage conditions on Monday 18 January 2016. We found average snow depth of 10 inches and average available forage of 754 lbs. per acre. This is still above the threshold level of 300 lbs. per acre when we typically recommend that feeding is necessary, and therefore supplemental feeding is not necessary at this time. We will evaluate conditions again on Sunday, 24 January.

Ungulate Numbers

Average elk numbers observed in the standard survey area on the south end of NER from 8 January to 17 January 2016 were 6,300 (range 5,225-6,975). The lowest estimate was on 17 January, which suggests that elk have begun to spread out into the north end of the Refuge since the closure of the bison season. This behavior is expected due to lack of human disturbance in those areas.

The last day of the NER bison season was 15 January 2016. There was a significant bison movement to NER on the last day of the season with approximately 10 bison harvested. Total bison harvest numbers are not immediately available, but preliminary estimates are approximately 190 total bison harvested for the season. This harvest level will likely be sufficient to compensate for annual recruitment, and predicted post harvest bison numbers are around 650-700. We will have better estimates of bison numbers following the annual classification count in February. Only 3 bison were observed on NER on 17 January 2016. Most bison remain in Grand Teton National Park.

43 to 84 bighorn sheep have been observed in the Miller Butte area since last week

29 pronghorn were observed on 17 January 2016.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

From:	Stephen Smith
To:	Eric Cole
Cc:	Cris Dippel; Steve Kallin; Lisa Abercrombie
Subject:	RE: Approval for elk GPS collar Iridium platform and related issues
Date:	Wednesday, January 20, 2016 7:15:09 AM

You can create a shared email account for your purposes, but you will only be able to access it from within the DOI network. These are accessed by user name and passwords. Someone will be the "Owner" and can delegate access to others if needed. You will still need to maintain passwords as you do any other.

Hope this helps.

Thanks,

Steve

Steve Smith
Region 6 Chief Technology Officer
Chief, Information Resource and Technology Management
U.S. Fish and Wildlife Services
134 Union Blvd
Lakewood, CO 80228-1807
Phone: 303-236-4583
Stephen_A_Smith@fws.gov

From: Cole, Eric [mailto:eric_cole@fws.gov]
Sent: Tuesday, January 19, 2016 12:10 PM
To: Stephen Smith
Cc: Cris Dippel; Steve Kallin
Subject: Approval for elk GPS collar Iridium platform and related issues

Hello Stephen,

As part of an inter-agency effort to monitor the Jackson Elk Herd we are planning to deploy 30 Telonics Iridium platform GPS collars on elk in late February.

The collars have already been ordered by one of the cooperators on the project using non government money. VHF frequencies have been assigned from an approved list of available frequencies (project ID 1507910). Caroll Alexander was the liaison that assigned the VHF frequencies.

Our plan is for the National Elk Refuge to manage the GPS data associated with these collars. In order for NER to manage the GPS collar data it requires 1) Establishing and account with JouBeh (the company that manages the Iridium satellite platform) and 2)Creating a dedicated email account to download the data from the Iridium platform.

Although we have satellite service costs included in our IT spend plan, it is unclear to me how to proceed given recent concerns about internet and email security. Please advise on how to

proceed with establishing an account with JouBeh and establishing an email account to manage the data. Telonics and JouBeh have written descriptions about how this process works that I can provide if it would be helpful.

Thanks,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

From:	Steve Kallin
To:	lizlong@jhlandtrust.org
Subject:	Easement/Lease Program Proposal
Date:	Friday, January 22, 2016 2:20:32 PM
Attachments:	DRAFT Easement Proposal to NWRA 1-20-2016.docx

Liz:

I would like to continue our conversation about a winter easement/lease program for ranchers in the Jackson Hole Area. Please see the attached updated draft and let me know when you may be available for a short meeting to continue moving this proposal forward.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT

Private Lands Easement/Lease Program to Improve Management of Elk and Bison Herds in the Jackson Hole Area of Wyoming

January 21, 2016

EXECUTIVE SUMMARY

The National Elk Refuge (NER) and Grand Teton National Park (GTNP) proposes to establish a voluntary, private lands domestic livestock management easement and lease program to help achieve the goals of the Bison and Elk Management Plan for the National Elk Refuge and Grand Teton National Park.

This Program is designed to encourage the prevention of brucellosis disease transmission between bison/elk herds and domestic livestock. It will allow for the dispersal of bison and elk off of the NER, reduce reliance on the NER supplemental feeding program and the corresponding herd concentrations which increase the danger of catastrophic wildlife disease outbreaks.

The easements/leases will be held and administered by a local, non-profit land trust. Funding will be provided through a mix of private and government sources.

STATEMENT OF NEED

Elk have received supplemental feed on the National Elk Refuge (NER) every winter since it was established in 1912 except for nine years. Bison have also received winter supplemental feed since the early 1980's when they discovered the NER feeding program. Supplemental feeding has been highly successful in preventing winter starvation and supporting larger elk and bison populations than could be sustained by the natural forage produced on the NER. During the winter of 2014-2015, approximately 8,400 elk and 700 bison were fed on the NER.

The supplemental feeding program concentrates high numbers of elk and bison on the NER which has increased disease transmission and prevalence in these herds compared to unfed, unconcentrated populations. For example, the seroprevalence of bovine brucellosis (*Brucella abortus*) in the Jackson Elk Herd averages 17% where an average prevalence of 2.3% occurs in unfed Wyoming elk herds (1997-2005, excluding 1999; WGFD unpubl. Data). (Eric – Other examples?).

Other diseases which can infect elk and bison which are believed to have density dependent transmission include psoroptic scabies, lungworm (*Dictyocaulus viviparous*), bovine tuberculosis (*Mycobacterium bovis*), malignant catarrhal fever (virus) (BEMP 20017, p. 70-77). Chronic wasting

disease (CWD), a transmissible spongiform encephalopathy similar to mad cow disease, is transmitted through infectious proteins (prions) by animal-to-animal contact or through contact with a contaminated environment (Williams, Miller, et al. 2002). The density of animal populations would likely play a role through faster and greater seeding of the environment with prions and more animal-to-animal contact (BEMP 2017, p. 73).

The concentration of elk and bison on the NER poses an elevated risk of a significant disease outbreak which could have a catastrophic impact on these herds. The Bison and Elk Management Plan, 2007 (BEMP) includes the strategy of reducing reliance on supplemental feeding to redistribute these populations, reduce concentrations and encourage the use of native winter range. Management actions to redistribute elk and bison from the NER to native winter range will also increase the potential of elk/bison comingling with domestic livestock on private ranches and elevate the risk of brucellosis transmission to livestock.

The purpose of this proposal is to develop a perpetual easement or shorter-duration lease program to encourage the management of domestic livestock in the Jackson Hole Area in a manner which eliminates the potential of comingling with elk and bison herds during the brucellosis transmission months of February through April 30. This program would encourage the conversion of cow/calf operations to steer operations and encourage the relocation of domestic livestock to locations outside of the Jackson Hole Area during the brucellosis transmission season.

The successful implementation of this livestock easement/lease program will significantly contribute to the achievement of goals outlined in the 2007 Bison and Elk Management Plan (Habitat Conservation; Sustainable Populations; Numbers of Elk and Bison; Disease Management). This program will:

1. Reduce comingling and the potential for brucellosis transmission between elk/bison and domestic livestock.
2. Allow winter dispersal of elk and bison from the NER to other winter range and significantly contribute toward the BEMP strategy of reducing reliance on supplemental feeding.
3. Reduce potential for animal to animal disease transmission by decreasing the duration and intensity of elk and bison concentrations on the NER.
4. Decrease the potential for catastrophic disease outbreaks in elk and bison on the NER.
5. Diminish the possibility of significant zoonotic disease outbreaks on the NER and the risk they would present to humans.
6. Reduce the potential for CWD prion amplification and concentration on the NER and the corresponding risk of increased CWD infections.

DRAFT

PROJECT DESCRIPTION

Objectives:

1. To enable the winter redistribution of elk and bison from the NER to native winter range without increasing comingling with domestic livestock in the Jackson Hole Area.

2. Provide financial incentives for area ranchers to modify winter livestock management to eliminate the potential of bison and elk comingling with domestic livestock.

Methods:

The WGFD in Jackson, WY was consulted and provided comments on a draft Comingling Easement Proposal. They also assisted in identifying potential comingling ranches in the Jackson Hole Area and prioritizing them based on the possible redistribution of elk from the NER.

An initial inventory of ranches with comingling potential was completed using the Teton County GIS Landownership Layer. This preliminary analysis identified up to 12,669 acres that may benefit from a Comingling Easement.

The NER will work in partnership with the Jackson Hole Land Trust to contact ranchers and discuss their possible interest in a perpetual comingling easement or a short-term (5-10 years) lease to prevent comingling. The easement document will be processed, held and enforced by the JH Land Trust.

LIVESTOCK MANAGEMENT EASEMENT/LEASE OPTIONS:

- Length of time: Short Term = 5-10 years; Long Term = 25 years to perpetual
- Livestock Management: Livestock (a domestic female cow or horse) would be prohibited on identified lands from January 1 through April 30.
- Livestock Management Exemption: Livestock could occupy lands covered by easement if confined within a high fence (minimum 7' tall) designed to exclude elk and bison from January 1 through April 30. Fencing for this exemption would be consistent with Teton County guidelines and limited in scope to prevent an impediment to wildlife movement.
- Hay storage sites would be protected by a high fence (minimum 7' tall) designed to exclude elk and bison from January 1 through April 30.
- The prohibition of intensive agricultural practices that attract elk (extensive irrigation, fertilization, production of high quality introduced grass or alfalfa) are optional and would increase payment(s).
- Hunting is allowed during State of Wyoming hunting seasons and managed public access is encouraged. A limited range weapons restriction may be included for public safety when appropriate. Landowners may charge fees for hunting.

DRAFT

Staffing/Administration:

The JH Land Trust will take the lead in scheduling contacts with area ranchers but will coordinate with the NER, who will provide support as needed. This support will be primarily during landowner contacts for the purpose of answering questions about the easement or issues related to bison and elk management.

The JH Land Trust will provide the staff to process the easements, which includes drafting official documents, satisfying recording requirements, issuing payments, conducting annual compliance inspections and enforcement activities.

The NER will provide a list of eligible tracts ranked by priority and assist in the initial landowner meeting and follow-up discussions as needed.

Evaluation:

This program will receive an annual review jointly conducted by the JH Land Trust, the National Wildlife Refuge Association and the NER to determine effectiveness, landowner acceptance and opportunities to adjust and improve the program.

Sustainability:

Resolution to the winter feeding controversy on the NER has been a high priority aspiration for the U.S. FWS, the U.S. NPS and private conservation organizations. Additional funding to support this program is anticipated from a mix of private conservation organizations and government funding.

Budget:

The cost of this program to cover existing ranch land in the Jackson Hole Area is anticipated to be significant. The conversion of existing non-ranch land to and active ranch operation is anticipated to be insignificant.

The value of land in the Jackson Hole area is high with the primary valuation coming from the real estate market. These easements or leases will not restrict future development of structures for housing or ranching operations. The easement/lease valuation will be determined by restrictions placed on winter cattle management operations for specific tracts of land. The valuation of these easements/leases are anticipated to be a fraction of what an easement would cost if construction of buildings and other structures was restricted.

The total cost of these easements/leases or the individual per acre costs have not been calculated.

A minimum of $15,000,000 should be obtained to initiate this program. Additional future costs have not been estimated.

DRAFT

Organizational Information:

The National Elk Refuge is one of 564 refuges in the National Wildlife Refuge System. An Act of Congress established the refuge in 1912, for "the establishment of a winter game (elk) reserve." In 1927 Congress expanded the purpose of the NER to include, "for the grazing of, and as a refuge for, American elk and other big game animals." NER responsibilities were also expanded to include endangered species and wildlife dependent recreation as outlined in the Refuge Administration Act (1966) and the Refuge Improvement Act (1997).

Management of the NER is guided by the Bison and Elk Management Plan (2007) and its Comprehensive Conservation Plan (2015).

Conclusion:

The NER plays a significant role in the management of the Jackson Elk Herd. Controversy over how the NER is managed, especially concerning the winter supplemental feeding program, has occurred since the establishment of the Refuge.

The introduction of diseases like brucellosis and the future threat of CWD requires changes to management strategies to preserve the health of the elk and bison herds and the ecological integrity of the NER.

This proposed private lands easement program will significantly contribute toward the future management of healthy bison and elk populations which are more closely balanced with and can be supported by habitat on the NER and surrounding native winter range.

DRAFT

ADD:
-NER Location Map
-Map of potential easement/lease tracts
-Table Summarizing potential easements/lease opportunities and priorities

From:	Will Meeks
To:	Noreen Walsh
Cc:	Matt Hogan; Anna Munoz; Noreen Walsh
Subject:	Fwd: Ad Calling for Emergency Elk Feeding
Date:	Wednesday, January 27, 2016 1:59:28 PM
Attachments:	Untitled attachment 02198.htm Call For Emergency Elk Feeding Ad JH News & Guide 1-27-2016.pdf

---

Noreen,

For your awareness.

I've cc'd Kris as well to send calls/inquiry my way.

Thanks.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303 (w)
720-541-0310 (c)

Begin forwarded message:

> **From:** "Blenden, Mike" <mike_blenden@fws.gov>
> **Date:** January 27, 2016 at 1:48:45 PM MST
> **To:** Will Meeks <will_meeks@fws.gov>, Maureen Gallagher <maureen_gallagher@fws.gov>
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> Date: Wed, Jan 27, 2016 at 11:26 AM
> Subject: Ad Calling for Emergency Elk Feeding
> To: Mike Blenden <mike_blenden@fws.gov>
> Cc: Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>
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Also, I was again asked for and provided Noreen's contact information by someone interested in the NER feeding program.

Take care,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

THE MAIN PURPOSE FOR THE NATIONAL ELK REFUGE HAS NOT CHANGED

Historically:
The National Elk Refuge, administered by the Bureau of Sport Fisheries and Wildlife, U.S. Fish and Wildlife Service, was established by an Act of Congress 50 years ago on August 10, 1912. This 23,790 acre refuge provides a winter feeding area for 7,000 to 11,000 elk that migrate to the lower elevations of Jackson Hole from their high mountain summer ranges.

The primary purpose of the National Elk Refuge is to feed and maintain the animals that come onto the refuge during the winter months. To attain this goal, the refuge provides grazing lands and maintains large stock piles of baled hay which are fed out when deep or crusted snow prevents the elk from normal grazing.

Emergency feeding of elk within the refuge, usually during **January**, February and March, provides a spectacular wildlife display as thousands of animals-bulls, cows, calves and yearlings-follow the hay.

EMERGENCY ALERT
ELK ARE NOW STARVING

Why is current management withholding necessary feeing? They have the feed-they say money is not an issue. Their necrology report of March 14, 2015 reported 100 elk died of malnutrition; 70 of them calves (they were still dying). The cow/calf ratio is at a critical low of 21 calves per 100 cows. Biologists agree that 25/100 is necessary to sustain a population.

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The Northern Jackson Hole herd count last spring was below the objective of 11,000.

Refuge Manager Steve Kallin says the Refuge was not created to feed elk-Refuge biologist Eric Cole says the public needs to be more tolerant of winter elk mortality through starvation!
Please help stop this purposely abusive destruction of our animals.

JOIN US NOW: www.savetheelk.org

Information provided by:
Concerned Citizens For The Elk:
ccelkjhwy@gmail.com • 307-733-5105
Directors, Charlie Petersen, Art Andersen, George Johnson, Joanna Johnson

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Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
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720-541-0310 (c)

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Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

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Refuge Supervisor - Montana, Wyoming and Utah
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Directors, Charlie Petersen, Art Andersen, George Johnson, Joanna Johnson

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From:	Noreen Walsh
To:	Will Meeks
Subject:	RE: Ad Calling for Emergency Elk Feeding
Date:	Thursday, January 28, 2016 8:44:01 AM

Thanks very much

Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service
303 236 7920

From: Will Meeks [mailto:will_meeks@fws.gov]
Sent: Wednesday, January 27, 2016 1:59 PM
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Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

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Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
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Lakewood, CO 80228
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Mountain-Prairie Region
Assistant Regional Director
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303-236-4303 (w)
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Lakewood, CO 80228
303-236-4306

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John F. Kennedy

From: Steve Kallin
To: Mike Blenden
Subject: RE: Meeting with Talbot WY
Date: Monday, February 01, 2016 11:35:49 AM

Mike:

Let's look at schedules and try to pick a time when both you and Will can attend.

Thanks,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

-----Original Message-----
From: Mike Blenden [mailto:mike_blenden@fws.gov]
Sent: Saturday, January 30, 2016 4:24 PM
To: Steve Kallin
Subject: Meeting with Talbot WY

Steve,

We've discussed a number of times but I don't know that we have clearly understood that you should go ahead with scheduling a meeting with Scott Talbot. I will definitely plan to attend and Will will do the same if available. Let me know if there are questions and maybe we can coordinate our available times next week when you are here.

Thanks,

Mike

Sent from my iPad

From:	Steve Kallin
To:	Mike Blenden
Cc:	Will Meeks; Maureen Gallagher; Cris Dippel; Eric Cole; Lori Iverson
Subject:	FW: Elk Feeding Letter to WY Congressional Delegation
Date:	Wednesday, February 03, 2016 4:49:43 AM
Attachments:	NER Starving the Elk - Lutz 1-29-2016.pdf

Mike:

Just a heads-up, this letter was published in the Jackson Hole News and Guide today.

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Friday, January 29, 2016 12:31 PM
To: Mike Blenden
Subject: Elk Feeding Letter to WY Congressional Delegation

Hi Mike:

Just a heads up. The attached letter was/is being sent to the Wyoming Congressional Delegation. The basic message: the elk are starving; replace the staff.

For your information, I have talked to all of the Field Reps for the three congressional members since Tuesday. We have a good relationship with these Field Reps. I meet with them 2-4 times a year, often while taking them on a tour of the NER. They are knowledgeable about NER operations and local pressures/politics.

Take care,

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National Elk Refuge
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Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

January 28, 2016

Senator John Barrasso
Senator Mike B. Enzi
Representative Cynthia Lummia

Dear Senator Barrasso, Senator Enzi and Representative Cynthia Lummis:

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Refuge Manager Steve Kallin says the refuge was not created to feed the elk.

Refuge Biologist Eric Cole made the comment that the public needs to be more tolerant of winter elk mortality through starvation.

Do they think the refuge was created for the tax payer to watch them starve the elk while they put a paycheck in their pockets so they can fill their bellies.

Every year it is a fight to get these government employees to do their jobs. We the Concerned Citizens for the Elk want these people replaced with somebody more humane and competent.

Sincerely,

Earl L. Lutz
Concerned Citizens for the Elk

cc: Steve Kallin
Eric Cole

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cc: Steve Kallin
Eric Cole

From:	Will Meeks
To:	Noreen Walsh; Matt Hogan; Anna Munoz
Subject:	Fwd: Elk Feeding Letter to WY Congressional Delegation
Date:	Wednesday, February 03, 2016 5:11:46 AM
Attachments:	Untitled attachment 04144.htm NER Starving the Elk - Lutz _ 1-29-2016.pdf

---

See attached.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303(w)
720-541-0319 (c)

Begin forwarded message:

From: Steve Kallin <steve_kallin@fws.gov>
Date: February 3, 2016 at 4:49:39 AM MST
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Will Meeks <will_meeks@fws.gov>, Maureen Gallagher <maureen_gallagher@fws.gov>, Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>, Lori Iverson <lori_iverson@fws.gov>
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The Elk on the National Elk Refuge need your help. Elk Refuge Manager Steve Kallin is starving them to death. That is his way of lowering the population of the elk herd.

On January 6, 2016 Ken Griggs D.V.M. who has 56 years of observational experience with ruminates, evaluated the condition of the elk and stated that they need nutrition ASAP (evidently the dead grass the elk are digging through the snow for, lacks protein).

Refuge Manager Steve Kallin says the refuge was not created to feed the elk.

Refuge Biologist Eric Cole made the comment that the public needs to be more tolerant of winter elk mortality through starvation.

Do they think the refuge was created for the tax payer to watch them starve the elk while they put a paycheck in their pockets so they can fill their bellies.

Every year it is a fight to get these government employees to do their jobs. We the Concerned Citizens for the Elk want these people replaced with somebody more humane and competent.

Sincerely,

Earl L. Lutz
Concerned Citizens for the Elk

cc: Steve Kallin
Eric Cole

From:	Will Meeks
To:	Noreen Walsh; Matt Hogan; Anna Munoz
Subject:	Fwd: Elk Feeding Letter to WY Congressional Delegation
Date:	Wednesday, February 03, 2016 5:11:46 AM
Attachments:	Untitled attachment 04144.htm NER Starving the Elk - Lutz _ 1-29-2016.pdf

---

See attached.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303(w)
720-541-0319 (c)

Begin forwarded message:

From: Steve Kallin <steve_kallin@fws.gov>
Date: February 3, 2016 at 4:49:39 AM MST
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Will Meeks <will_meeks@fws.gov>, Maureen Gallagher <maureen_gallagher@fws.gov>, Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>, Lori Iverson <lori_iverson@fws.gov>
Subject: FW: Elk Feeding Letter to WY Congressional Delegation

Mike:

Just a heads-up, this letter was published in the Jackson Hole News and Guide today.

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Steve Kallin [mailto:steve_kallin@fws.gov]
Sent: Friday, January 29, 2016 12:31 PM
To: Mike Blenden
Subject: Elk Feeding Letter to WY Congressional Delegation

Hi Mike:

Just a heads up. The attached letter was/is being sent to the Wyoming Congressional Delegation. The basic message: the elk are starving; replace the staff.

For your information, I have talked to all of the Field Reps for the three congressional members since Tuesday. We have a good relationship with these Field Reps. I meet with them 2-4 times a year, often while taking them on a tour of the NER. They are knowledgeable about NER operations and local pressures/politics.

Take care,

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National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

January 28, 2016

Senator John Barrasso
Senator Mike B. Enzi
Representative Cynthia Lummia

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Sincerely,

Earl L. Lutz
Concerned Citizens for the Elk

cc: Steve Kallin
Eric Cole

From: Noreen Walsh
To: Will Meeks; Matt Hogan; Anna Munoz
Subject: RE: Elk Feeding Letter to WY Congressional Delegation
Date: Wednesday, February 03, 2016 7:44:37 AM

Thanks Will. Will Refuges put an update in the HQ report this week please?

Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service
303 236 7920

From: Will Meeks [mailto:will_meeks@fws.gov]
Sent: Wednesday, February 03, 2016 5:12 AM
To: Noreen Walsh; Matt Hogan; Anna Munoz
Subject: Fwd: Elk Feeding Letter to WY Congressional Delegation

See attached.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
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From: Will Meeks
To: Steve Kallin; Mike Blenden
Subject: Fwd: Elk Feeding Letter to WY Congressional Delegation
Date: Wednesday, February 03, 2016 7:46:17 AM

Can you prepare a HQ report submission.

Will Meeks
U.S. Fish and Wildlife Service
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720-541-0319 (c)

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Take care,

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Project Leader
National Elk Refuge
PO Box 510

675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Steve Kallin
To: Mike Blenden
Subject: FW: Step-Down Plan Meeting
Date: Monday, February 08, 2016 1:50:42 PM

Mike:

Let's discuss this as a possible date. Looks like the WGFD does not have an interest in a feed ground tour. So if traveling from the RO to the NER for a March 11 date is an issue for your or Will, perhaps another date with a meeting in Cheyenne would be possible.

Call to discuss at your earliest convenience,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Brad Hovinga [mailto:brad.hovinga@wyo.gov]
Sent: Friday, February 05, 2016 9:06 AM
To: Steve Kallin
Subject: Step-Down Plan Meeting

Steve,

It appears that Friday March 11th would work for some of our administration. The two deputy chiefs of the Wildlife Division can likely attend, as well as possibly the Director. Early afternoon would probably work best. A feedground tour will not be necessary as most of our administration has spent a considerable amount of time on the Refuge.

Please let me know if this works.

Thanks,
Brad

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From:	Steve Kallin
To:	Lee Jones; Cris Dippel
Cc:	Lori Iverson; Eric Cole; Brad Hovinga
Subject:	RE: Elk Starvation on the National Elk Refuge
Date:	Tuesday, February 09, 2016 9:08:14 AM

The 1941 "Report on Carrying Capacity of the National Elk Refuge" by Almer P. Nelson and O.J. Murie, looked at carrying capacity several different ways. In the end, the recommendation was for 5,000 elk, although they predicted that number would not be supported by the community. The 5,000 elk recommendation was pre-bison and pre-irrigation system upgrade, which impact carrying capacity in both a negative and positive manner.

The best science we have is Tom Hobbs model completed for the Bison and Elk Management Plan (5,000 elk & 500 bison), which is what we need to follow.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Jones, Lee [mailto:lee_c_jones@fws.gov]
Sent: Thursday, February 04, 2016 1:41 PM
To: Cris Dippel
Cc: Iverson, Lori; Cole, Eric; Steve Kallin; Brad Hovinga
Subject: Re: Elk Starvation on the National Elk Refuge

Would NER feel comfortable with 4,500 as a current biologically, scientifically supported, appropriate number? Playing a bit of devil's advocate here, you would have to be careful with this number for several reasons, including setting a numeric precedent for future management planning, plus inviting criticism that "of course the elk are starving since we have had more than 4000 on the Refuge most years". Just some food for thought.... Thanks, Lee

Lee C. Jones
USFWS-Wildlife Health office
10 E. Babcock, Rm 105
Bozeman, MT 59715
Office: 406.587.2169
Cell: 406.600.8405
Fax: 406.587.9098
lee_c_jones@fws.gov

On Thu, Feb 4, 2016 at 1:22 PM, Cris Dippel <cris_dippel@fws.gov> wrote:
That is a cool article. Would the paper publish the whole thing with his signature?

Cris Dippel, USFWS
Sent from my iPhone

On Feb 4, 2016, at 12:44, Iverson, Lori <lori_iverson@fws.gov> wrote:

> If I can throw my two cents in the mix:
>
> Because there have been references to our lack of science, accurate numbers, etc., I wanted to reference cite a document I found in our archives and showed Cris and Steve last year. It was a letter referencing the suggested number of elk the refuge could support, written by Olaus Murie. I can't remember the date, but he recommended somewhere between 4,000 to 4,500 elk wintering here. I find it interesting that all these years later, we came up with roughly the same number (5,000) when the BEMP was completed in 2007.
>
> Lori
>
> Lori Iverson
> Outreach & Visitor Services
> U.S. Fish & Wildlife Service
> National Elk Refuge
> PO Box 510 / 675 East Broadway
> Jackson, WY 83001
> Phone: 307.201.5433
> Cell: 307.690.4375
> Fax: 307.733.9729
> lori_iverson@fws.gov
> National Elk Refuge photo gallery
> National Elk Refuge web site
> Twitter: @NatlElkRefuge
>
> "The only thing that isn't worthless: to live this life out truthfully and rightly. And be patient with those who don't." - Marcus Aurelius
>
> On Thu, Feb 4, 2016 at 8:23 AM, Cole, Eric <eric_cole@fws.gov> wrote:
> Steve,
>
> Although I understand that you might not want to get into a tit for tat with Griggs in the paper about this because it will give him too much attention, it might be wise to develop a fact sheet that we can distribute to sleigh ride personnel, visitor center staff etc to refute these allegations. A brief list might include:
>
> 98% of elk in North America are not fed and many unfed elk successfully survive and reproduce while subsisting on winter forage of the same quality as NER.
>
> We initiate forage because we run out of forage due to too many animals for the range to support, not because they could not survive on the type of forage that NER produces.
>
> Our feeding intiation criteria is 300 pounds per acre, not 300 tons per acre as Griggs alleges.

His claim that poor nutrition on NER is contributing to low calf recruitment in the NER is not supported by summer calf classification data. If his allegation was true, you would suspect uniformly low summer calf ratios across the various summer ranges of the Jackson Elk Herd, but we see very low calf ratios for the long distance migrants and very high calf ratios for the elk that summer close to the refuge. Because most of these elk participate in the NER feeding program this suggests that something else is driving low calf ratios over all. Predation is the most likely explanation.

His claims that we can feed our way out of disease issues be making the elk healthier will be easily refuted by the refuge's own herd health study, and more literature than I can mention here. He is particularly on shaky ground with CWD.

I can easily refine all of these for a fact sheet if you would like. Although I am off for the next few days, this whole thing has pissed me off suficiently that I would be happy to donate some time to the cause.

Take care,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

On Wed, Feb 3, 2016 at 5:58 AM, Steve Kallin <steve_kallin@fws.gov> wrote:
Brad:

Be aware of two ads placed in today's Jackson Hole News and Guide (p. 7 & 19) by Citizens Concerned for the Elk. I have attached copies for readability rather than a link to the News & Guide.

I am in meetings in Denver this week but will try to call you to discuss these allegations.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Will Meeks
To: Blenden, Mike
Cc: Steve Kallin
Subject: Re: Meeting with WY Game and Fish
Date: Tuesday, February 09, 2016 10:18:12 AM

Get it on the calendar

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303 (w)
720-541-0310 (c)

On Feb 9, 2016, at 10:11 AM, Blenden, Mike <mike_blenden@fws.gov> wrote:

> Will,
>
> Steve has been trying to schedule a meeting with Scott Talbot at Noreen's request regarding the Step Down Plan. Next opportunity appears to be March 11. During that afternoon two of his deputies and possibly Scott will be in Jackson. They aren't interested in a tour of the feedgrounds but would be able to meet that afternoon. Are you interested in meeting with them, Steve and me that afternoon, and possibly a morning feeding ground tour? Would require skipping out early on LE in service.
>
> --
> Michael Blenden
> Refuge Supervisor - Montana, Wyoming and Utah
> 134 Union Boulevard
> Lakewood, CO 80228
> 303-236-4306
> 303-710-7934 cell
>
> *Too often we...enjoy the comfort of opinion without the discomfort of thought.*
> John F. Kennedy

From: Steve Kallin
To: Brad Hovinga
Subject: RE: Step-Down Plan Meeting
Date: Tuesday, February 09, 2016 3:50:23 PM

Hi Brad:

The afternoon of March 11 should work. Let me invite you to meet here at the Refuge. If that works, does 1:00 PM or 2:00 PM work better.

Thanks,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Brad Hovinga [mailto:brad.hovinga@wyo.gov]
Sent: Friday, February 05, 2016 9:06 AM
To: Steve Kallin
Subject: Step-Down Plan Meeting

Steve,

It appears that Friday March 11th would work for some of our administration. The two deputy chiefs of the Wildlife Division can likely attend, as well as possibly the Director. Early afternoon would probably work best. A feedground tour will not be necessary as most of our administration has spent a considerable amount of time on the Refuge.

Please let me know if this works.

Thanks,
Brad

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From:	Steve Kallin
To:	Brad Hovinga
Cc:	Will Meeks; Mike Blenden
Subject:	RE: Step-Down Plan Meeting
Date:	Tuesday, February 09, 2016 4:01:59 PM

Hi Brad:

Sounds good! We have it on the calendar.

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Brad Hovinga [mailto:brad.hovinga@wyo.gov]
Sent: Tuesday, February 09, 2016 3:53 PM
To: Steve Kallin
Subject: Re: Step-Down Plan Meeting

Great! Let's plan on 1:00 pm.

Thanks,
Brad

On Tue, Feb 9, 2016 at 3:50 PM, Steve Kallin <steve_kallin@fws.gov> wrote:
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Regional Wildlife Supervisor
Jackson Region
Jackson, WY
(307) 733-2321

E-Mail to and from me, in connection with the transaction
of public business, is subject to the Wyoming Public Records
Act and may be disclosed to third parties.

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To: Mike Blenden
Subject: RE: Response to NER feeding inquiries
Date: Tuesday, February 09, 2016 4:35:30 PM

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Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

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Subject:	16 February 2016 National Elk Refuge Biological Update
Date:	Tuesday, February 16, 2016 2:28:01 PM

16 February 2016 National Elk Refuge Biological Update

Feeding Initiation

Feeding initiation on NER is based on criteria that have been mutually developed by the refuge and Wyoming Game and Fish Department. These feeding initiation criteria are broadly designed to keep elk using standing natural forage and native winter range as late in the season as possible to reduce disease risk, while also minimizing co-mingling of elk with livestock on surrounding private land, and also minimizing winter mortality in the Jackson Elk Herd. When average available forage declines below 300 pounds per acre at key index sites on NER, I and WGFD biologist Aly Courtemanch typically recommend that feeding commence. Past observations suggest that when average available forage declines below 300 pounds per acre at key index sites, some elk start leaving the refuge for adjacent private land.

The first day of supplemental feeding for this season was 30 January 2016. For perspective this was slightly later than the long-term average feeding initiation date of 28 January. This season, WGFD biologist Aly Courtemanch and I began sampling available forage on 29 December 2015 and found average available forage of 1,295 pounds per acre. We measured available forage at least weekly and found that available forage had declined to 540 pounds per acre on our last sampling day on 26 January 2016.

Around 28 January 2016 WGFD staff observed sign that some elk had started to leave NER for Spring Gulch in the vicinity of the Gros Ventre Bridge and that there were 1,000-2,000 other elk still on the refuge in the vicinity of the bridge. There was a significant winter storm forecast for 29-30 January, and to prevent more elk from leaving NER for Spring Gulch, refuge and WGFD managers decided to initiate winter feeding on 30 January 2016.

The 30 January feeding start date was close to the long term average due to the combined effects of 1) Above average forage production during the growing season, 2) Relatively late arrival of large numbers of elk and bison to the refuge and therefore minimal forage consumption during the fall period, and 3) Slightly above average snow depth on NER starting in December and remaining above average until the feeding start date.

Elk Classification Count

A team of NER, WGFD, NPS and USFS staff counted and classified elk on refuge feedgrounds on 9 February 2016 (see NER on Feed results in the first line of the table below). WGFD also counted elk on State feedgrounds in the Gros Ventre, and conducted concurrent flights on native winter range (NWR) on the north end of NER, National Forest east of NER, and native winter range in the Gros Ventre drainage and elsewhere, to generate a count for the entire Jackson Elk Herd. (see table below)

Area	Cow	Calf	Mbull	Spike	Total	Calf:Cow	Mbull:Cow	Spike:Cow
NER on feed	4912	786	1242	350	7290	16.0	25.3	7.1
Gros Ventre on feed	1114	236	25	39	1414	21.2	2.2	3.5
NWR - Gros Ventre	168	48	49	2	267	28.6	29.2	1.2
NWR - NER vicinity	699	245	337	108	1389	35.1	48.2	15.5
NWR - Spread Creek/BV	214	34	32	8	288	15.9	15.0	3.7
NWR - Other	10	2	18	0	30			
	7117	**1351**	**1703**	**507**	**10678**	**19.0**	**23.9**	**7.1**

The visual count of the Jackson Elk Herd this year was 10,678 animals and the population estimate is 11,200 (estimate by WGFD). The overall population objective for the Jackson Elk Herd is 11,000 animals. Because classification counts represent a snap shot in time, and movements from native winter range to elk feedgrounds are common as the feed season progresses, it is important to look at the aggregate numbers for the entire Jackson Elk Herd when interpreting total elk on NER as well as Calf:Cow, Mature Bull:Cow, and Spike Bull:Cow ratios. This is particularly true in a year like this one when the classification count occurs relatively early in the season and close to the supplemental feeding start date. For the refuge specifically, it is useful to look at the NER on Feed and NWR-NER vicinity results from the above table combined to get a feel for potential elk numbers on the refuge by the end of the feed season:

<u>NER elk on feed combined with native winter range on and adjacent to NER results</u>:

Cow: 5,611

Calf: 1,031 (ratio 18.4 calves per 100 cows)

Mature bull: 1,579 (ratio 28.1 mature bulls per 100 cows)

Spike: 458 (ratio 8.2 spike bulls per 100 cows)

Total: 8,679

Bison Class Count

NER, WGFD and Grand Teton National Park staff counted and classified bison on NER feedgrounds on 10 February 2016. 618 total bison were counted on feed, all of which were located on the northernmost NER feedground at McBride. When 48 additional bison counted off feed (primarily in the Spread Creek area) are included, totals and ratios for the Jackson Bison Herd were:

Total: 666 bison

Cows (including yearlings): 273

Calves: 139

Yearling bulls: 42

Mature bulls: 212

Calf:cow ratio 51:00

Mature bull:cow ratio 78:100

Wolves

14 wolves were observed in Poverty Flats/Chambers area on 13 February 16. These are all likely members of the Pinnacle Peak Pack. Wolves have regularly been in the Poverty Flats area and the area northeast of Miller Butte for the past week and in the McBride area in the week before that.

Winter Elk Mortality to Date:

As of 9 February 2016 the total number of winter elk mortalities documented on NER this season was 43 (0.6% of the classified total). Of these 16 were calves (2% of the calves classified on feed). Wolf predation was confirmed in 4 of the mortalities to date and predation by coyotes was confirmed in 1 of the mortalities to date. 4 out of the 5 elk subject to predation were calves. 20 of the total mortalities were mature bulls (at least 16 of which had severe scabies). This level of mortality is not consistent with the mass die off and starvation

event alleged by some members of the public, and we appear to be on track for average winter mortality rates this year.

Allegations Concerning NER Feeding Program/Starving Elk

There have been several unfounded allegations in the newspaper and on social media suggesting that the elk on the refuge are starving and that this is part of deliberate management strategy to reduce the number of elk on the refuge and in the Jackson Elk Herd. These allegations are without merit and inconsistent with the facts. During the 18 years I have been involved with feeding elk on NER, including the last 12 when I have supervised this program, the approach to feeding has always been to feed in a manner and at a rate that ensures that the weakest component of the herd (elk calves) receive an adequate ration. This direction is consistent with the current goals of the NER supplemental feeding program, which includes minimizing winter elk mortality.

The long term average for elk winter mortality since 1982 is 1.5% for all age/sex classes combined and 3.6% for calves. Since the Bison and Elk Management Plan was released in 2007 and the current feeding initiation protocols were developed by the refuge and WGFD, average winter mortality for all age/sex classes combined has been 1.2% and 3.3% for calves. This level of mortality is amazingly low for a wintering elk population, particularly given the presence of density dependent diseases that are common on feedgrounds, but are rare to non-existent in unfed elk populations.

Although feeding is an expensive exercise, our broad goal to keep elk on native forage as long as possible is not about saving money (as some have alleged). The goal to minimize feed season length is about reducing disease risk associated with artificially concentrating elk on feed grounds. The research, including data specific to the Jackson Elk Herd and NER is clear; there are density dependent elk diseases that are much rarer or non-existent in free ranging elk, but that are common on elk feedgrounds. These diseases include brucellosis, septicemic pasteurellosis, necrobacillosis (both necrotic stomatitis and footrot), scabies, and high parasite loads. Although these diseases appear to have had only minor negative population level effects in recent years, their presence and prevalence are indications that a more serious disease such as bovine tuberculosis or chronic wasting disease could have significant population level effects at the elk densities common on NER (approximately 370 elk per square km). Although intensive monitoring for CWD over the last decade indicates that CWD is not currently present in the Jackson Elk Herd, evidence shows that the CWD endemic area is expanding in Wyoming, and that the disease will eventually reach the elk feedgrounds in western Wyoming. Whether CWD arrives in the Jackson Elk Herd next year or decades from now is unclear, but hoping that CWD never arrives is not a prudent management strategy, particularly in light of results by Monello et al. (2014), which suggest 13% CWD prevalence for elk in Rocky Mountain National Park at elk densities much lower than what we observe on NER feedgrounds.

It has been alleged that the standing winter forage on NER is of such poor quality, that it cannot sustain elk and that poor winter nutrition on NER leads to low calf recruitment in the Jackson Elk Herd. This allegation is also inconsistent with the data. On the summer ranges of the Jackson Elk Herd we observed the highest elk calf ratios in the areas closest to NER in the area between Wilson and Moose (47 calves per 100 cows) and the lowest in the northern portions of the Jackson Elk Herd Summer Range (23 calves per 100 cows) (Cole and Foley et al. 2015). The majority of these elk spend the winter on the NER. This disparity in elk calf ratios on the different summer range suggests predator density effects rather than poor winter range nutrition as the most likely explanation for the observed winter calf ratios on the NER. Previous testing suggests that standing winter forage on NER has an average protein level of 5% and an average metabolizable energy level of 1.6 Kcal per gram. (Bailey 1999). These forage nutrition values are comparable to other elk winter ranges. 97% of the elk in North America are not fed, including most elk in the Northern Rocky Mountains (Smith 2001), yet these unfed elk manage to survive and reproduce without supplemental feeding. In short, we feed on NER because we have too many elk and bison for the native winter range to support, not because the forage is of poor quality.

Literature Cited

Bailey, J.R. 1999. A working model to assist in determining initiation of supplemental feeding of elk and a carrying capacity model for the National Elk Refuge, Jackson, WY. M.S. Thesis, University of Wyoming. Laramie. 83pp.

Cole, E. K., Foley, A. M., Warren, J. M., Smith, B. L., Dewey, S. R., Brimeyer, D. G., Fairbanks. W. S., Sawyer, H. and Cross, P. C. 2015. Changing migratory patterns in the Jackson elk herd. Journal of Wildlife Management, 79: 877–886.

Monello, R.J., J.G. Powers, N.T. Hobbs, T.R. Spraker, M.K. Watry, T.L. Johnson, and M.A. Wild. 2014. Survival and Population Growth of an Elk Population with a Long History of Exposure to Chronic Wasting Disease. Journal of Wildlife Management 78: 214-223.

Smith, B.L. 2001. Winter feeding of elk in western North America. Journal of Wildlife Management, 65:173-190.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

From: Ryan Moehring
To: Will Meeks; Mike Blenden
Subject: NER Messages
Date: Tuesday, February 16, 2016 4:38:18 PM

Will/Mike,

Today Anna told me that Noreen has been receiving a number of inquiries from the public about NER supplemental feeding. Apparently Noreen has tasked Refuges with developing some language to help her respond to these inquiries. Anna asked me to connect with you so we could work on the messaging together, so please let me know how I can best plug into this effort.

Thanks,
Ryan

Ryan Moehring
Public Affairs (ND, SD, WY, MT)
U.S. Fish and Wildlife Service
Mountain-Prairie Region
303-236-0345
Ryan_Moehring@fws.gov

Web |Facebook | Twitter | Flickr | YouTube

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From:	Will Meeks
To:	Mike Blenden; Steve Kallin; Maureen Gallagher
Subject:	Fwd: NER Messages
Date:	Tuesday, February 16, 2016 8:17:13 PM

What's the status of Noreen's request?

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303(w)
720-541-0310 (c)

Begin forwarded message:

> **From:** Ryan Moehring <ryan_moehring@fws.gov>
> **Date:** February 16, 2016 at 4:38:16 PM MST
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From: Maureen Gallagher
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Subject: Re: NER Messages
Date: Tuesday, February 16, 2016 8:18:50 PM

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Sent from my iPad

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From:	Will Meeks
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Subject:	Re: NER Messages
Date:	Tuesday, February 16, 2016 8:20:04 PM

Noreen asked Mike to do this while we were in MT.

Will Meeks
U.S. Fish and Wildlife Service
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From: Will Meeks
To: Mike Blenden
Subject: Re: Response to NER feeding inquiries
Date: Wednesday, February 17, 2016 7:58:44 AM

Go with these and see if Ryan edits them.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303(w)
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On Feb 9, 2016, at 5:25 PM, Mike Blenden <mike_blenden@fws.gov> wrote:

> I thought you should see this before I give to Noreen. I wonder if this is more than she asked for. Thoughts?
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> Sent from my iPhone
>
> Begin forwarded message:
>
> **From:** Steve Kallin <steve_kallin@fws.gov>
> **Date:** February 9, 2016 at 4:35:30 PM MST
> **To:** Mike Blenden <mike_blenden@fws.gov>
> **Subject: RE: Response to NER feeding inquiries**
>
> Mike:
>
> I added several minor suggestions below in red.
>
> Thank you for your support and for sharing this draft,
>
> **Steve Kallin**
> Project Leader
> National Elk Refuge
> PO Box 510
> 675 East Broadway
> Jackson, WY 83001
> Phone: (307) 201-5409
> Fax: (307) 733-9729
> steve_kallin@fws.gov
>
> **From:** Blenden, Mike [mailto:mike_blenden@fws.gov]
> **Sent:** Tuesday, February 09, 2016 11:07 AM
> **To:** Steve Kallin
> **Subject:** Response to NER feeding inquiries

Steve, Here's the draft I spoke of, giving Noreen something in response to critics of the elk feeding program. Suggestions are appreciated.

Thank you for your interest in the supplemental elk and bison feeding program at the National Elk Refuge. Here are some facts regarding initiation of feeding this year:

Every year the National Elk Refuge and Wyoming Game & Fish Department biologists collaborate on when to initiate supplemental feeding of elk and bison on the refuge. Each week, and often more frequently, they intensely monitor environmental conditions to measure and assess the quantity and accessibility of remaining forage. Since 2007, this approach has resulted in an average elk mortality of only 1.5% for the six months elk are on the Refuge (hunting excluded). Results from an assessment on Monday, January 25 indicated forage levels would reach the threshold to begin feeding within the following week. Based on the established criteria for initiation of the supplemental feeding program, along with a predicted winter storm that could bring several inches of new snow to the valley floor, wildlife managers agreed to start the seasonal feeding program on January 30. Since 1995, the average start date for initiating supplemental feeding has been January 28. The start date, ranging from December 31 to February 28, varies widely depending on winter severity and available forage.

Additional statements to consider:

Despite some opinions expressed publicly, there is no evidence of chronic elk "starvation." However based on long term observation 1.5% of the elk present on the National Elk Refuge will die from a variety of causes.

Wildlife managers continue to consider strategies to minimize feeding activities in order to reduce elk/bison concentrations and risk of disease transmission.

Thanks,

Mike

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306

303-710-7934 cell

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

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Subject: Re: Response to NER feeding inquiries
Date: Wednesday, February 17, 2016 7:58:44 AM

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Will:

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Cc: Mike Blenden; Maureen Gallagher
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Yeah, that was my bad. I asked Mike to forward the work you did to Ryan earlier this morning. Unless you hear otherwise, consider your good work on this done - at least until the next request :)

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> Today Anna told me that Noreen has been receiving a number of inquiries from the public about NER supplemental feeding. Apparently Noreen has tasked Refuges with developing some language to help her respond to these inquiries. Anna asked me to connect with you so we could work on the messaging together, so please let me know how I can best plug into this effort.
>
> Thanks,
> Ryan
>
> Ryan Moehring
> Public Affairs (ND, SD, WY, MT)
> U.S. Fish and Wildlife Service
> Mountain-Prairie Region
> 303-236-0345
> Ryan_Moehring@fws.gov
>
> Web |Facebook | Twitter | Flickr | YouTube

From: Will Meeks
To: Steve Kallin
Cc: Mike Blenden; Maureen Gallagher
Subject: Re: NER Messages
Date: Wednesday, February 17, 2016 11:50:53 AM

Yeah, that was my bad. I asked Mike to forward the work you did to Ryan earlier this morning. Unless you hear otherwise, consider your good work on this done - at least until the next request :)

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303 (w)
720-541-0310 (c)

On Feb 17, 2016, at 11:47 AM, Steve Kallin <steve_kallin@fws.gov> wrote:

> Will:
>
> Mike drafted a reply and I reviewed. I thought it had already been shared with Noreen.
>
> Take care,
>
> **Steve Kallin**
> Project Leader
> National Elk Refuge
> PO Box 510
> 675 East Broadway
> Jackson, WY 83001
> Phone: (307) 201-5409
> Fax: (307) 733-9729
> steve_kallin@fws.gov
>
> ---
>
> **From:** Will Meeks [mailto:will_meeks@fws.gov]
> **Sent:** Tuesday, February 16, 2016 8:17 PM
> **To:** Mike Blenden; Steve Kallin; Maureen Gallagher
> **Subject:** Fwd: NER Messages
>
> What's the status of Noreen's request?
>
> Will Meeks
> U.S. Fish and Wildlife Service
> Mountain-Prairie Region
> Assistant Regional Director
> National Wildlife Refuge System
> 303-236-4303(w)

720-541-0310 (c)

Begin forwarded message:

> **From:** Ryan Moehring <ryan_moehring@fws.gov>
> **Date:** February 16, 2016 at 4:38:16 PM MST
> **To:** Will Meeks <will_meeks@fws.gov>, Mike Blenden <mike_blenden@fws.gov>
> **Subject: NER Messages**
>
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From: Mike Blenden
To: will_meeks@fws.gov; anna_munoz@fws.gov
Cc: ryan_moehring@fws.gov
Subject: Fwd: Response to NER feeding inquiries
Date: Wednesday, February 17, 2016 3:29:30 PM

Anna and Will,

Below is a statement about elk feeding at NER. I like it after Ryan edited. I think it's ready for Noreen's use unless you see needs. Let me know if I should forward to her. Mike
Sent from my iPhone
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From: Ryan Moehring <ryan_moehring@fws.gov>
Date: February 17, 2016 at 1:56:53 PM MST
To: Mike Blenden <mike_blenden@fws.gov>
Subject: RE: Response to NER feeding inquiries

Hi Mike,

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-Ryan

Dear Interested Party,

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Thanks again for your interest.

Best Regards,

Noreen Walsh

Thanks,
Ryan

Ryan Moehring
Public Affairs
303-236-0345
Ryan_Moehring@fws.gov

From: Mike Blenden [mailto:mike_blenden@fws.gov]
Sent: Wednesday, February 17, 2016 9:56 AM
To: ryan_moehring@fws.gov
Subject: Fwd: Response to NER feeding inquiries

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Date: February 9, 2016 at 4:35:30 PM MST
To: Mike Blenden <mike_blenden@fws.gov>
Subject: RE: Response to NER feeding inquiries

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I added several minor suggestions below in red.

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Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

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Sent: Tuesday, February 09, 2016 11:07 AM
To: Steve Kallin
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Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306
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John F. Kennedy

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Thanks again for your interest.

Best Regards,

Noreen Walsh

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Ryan Moehring
Public Affairs
303-236-0345
Ryan_Moehring@fws.gov

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Michael Blenden
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134 Union Boulevard
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303-236-4306
303-710-7934 cell

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John F. Kennedy

From: Munoz, Anna
To: Mike Blenden
Cc: Will Meeks; Ryan Moehring
Subject: Re: Response to NER feeding inquiries
Date: Wednesday, February 17, 2016 4:00:38 PM

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Anna Muñoz
Assistant Regional Director - External Affairs
U.S. Fish and Wildlife Service, Mountain-Prairie Region
Office: 303-236-4510
Cell: 720-648-2542

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Ryan

Ryan Moehring
Public Affairs

303-236-0345

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Public Affairs

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Cc: Mike Blenden; Ryan Moehring
Subject: Re: Response to NER feeding inquiries
Date: Wednesday, February 17, 2016 4:37:56 PM

Who will forward it to Noreen?

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303(w)
720-541-0310 (c)

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Public Affairs

303-236-0345

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Subject: Re: Response to NER feeding inquiries
Date: Wednesday, February 17, 2016 4:37:56 PM

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U.S. Fish and Wildlife Service
Mountain-Prairie Region
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720-541-0310 (c)

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Since 1995, the average start date for initiating supplemental feeding has been January 28. The exact start date, ranging from December 31 to February 28, varies from year to year depending on winter severity and available forage. This year, after studying available forage levels and weather forecasts that predicted considerable snowfall, our wildlife managers decided that starting the seasonal feeding program on January 30 was in the best interest of the herd. This date is well within our historical average start date.

Elk and bison are thriving on the National Elk Refuge. I would like to personally invite you to enjoy a close-up view of these animals through our very popular sleigh ride program. This unique experience allows visitors to photograph and observe elk and other wintering animals in their native habitats, and to learn about our efforts to maintain their health.

Thanks again for your interest.

Best Regards,

Noreen Walsh

Anna Muñoz
Assistant Regional Director - External Affairs
U.S. Fish and Wildlife Service, Mountain-Prairie Region
Office: 303-236-4510
Cell: 720-648-2542

From:	Noreen Walsh
To:	Anna Munoz
Cc:	Will Meeks; Mike Blenden; Ryan Moehring; Kenneth Ostrand
Subject:	RE: Response to National Elk Refuge Inquiries
Date:	Wednesday, February 17, 2016 6:59:47 PM

Thanks very much.

Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service
303 236 7920

From: Munoz, Anna [mailto:anna_munoz@fws.gov]
Sent: Wednesday, February 17, 2016 5:12 PM
To: Noreen Walsh
Cc: Will Meeks; Mike Blenden; Ryan Moehring; Kenneth Ostrand
Subject: Response to National Elk Refuge Inquiries

Hi Noreen,

Below is our proposed response to the NER e-mails you have been receiving. Please let me know if you have any questions, edits, or other comments.

> *Thank you for your interest in the supplemental elk and bison feeding program at the National Elk Refuge. I wanted to share some facts with you regarding our feeding operation this year and in the past.*
>
> *The health of elk, bison, and the other wildlife that rely on the National Elk Refuge is incredibly important to the U.S. Fish and Wildlife Service and our partners. Accordingly, one aspect of our management strategy includes limiting the time elk and bison rely on supplemental feed in order to minimize the time they are concentrated in high numbers. This approach is designed to reduce the potential for disease transmission, which can occur when large numbers of animals concentrate for extended periods of time.*
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Best Regards,

Noreen Walsh

Anna Muñoz
Assistant Regional Director - External Affairs
U.S. Fish and Wildlife Service, Mountain-Prairie Region
Office: 303-236-4510
Cell: 720-648-2542

From:	Noreen Walsh
To:	Anna Munoz
Cc:	Will Meeks; Mike Blenden; Ryan Moehring; Kenneth Ostrand
Subject:	RE: Response to National Elk Refuge Inquiries
Date:	Wednesday, February 17, 2016 6:59:47 PM

Thanks very much.

Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service
303 236 7920

From: Munoz, Anna [mailto:anna_munoz@fws.gov]
Sent: Wednesday, February 17, 2016 5:12 PM
To: Noreen Walsh
Cc: Will Meeks; Mike Blenden; Ryan Moehring; Kenneth Ostrand
Subject: Response to National Elk Refuge Inquiries

Hi Noreen,

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> *The health of elk, bison, and the other wildlife that rely on the National Elk Refuge is incredibly important to the U.S. Fish and Wildlife Service and our partners. Accordingly, one aspect of our management strategy includes limiting the time elk and bison rely on supplemental feed in order to minimize the time they are concentrated in high numbers. This approach is designed to reduce the potential for disease transmission, which can occur when large numbers of animals concentrate for extended periods of time.*
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> *With this in mind, every year biologists from the National Elk Refuge and Wyoming Game & Fish Department work together to determine both the ideal time to initiate the supplemental feeding program and how long the feeding should last. This process requires intense monitoring of environmental conditions to assess the quantity and accessibility of forage on the refuge. Since 2007, this practice has resulted in a 98.5% survival rate for elk during the approximate six month period the herd uses the refuge (hunting excluded).*
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Thanks again for your interest.

Best Regards,

Noreen Walsh

Anna Muñoz
Assistant Regional Director - External Affairs
U.S. Fish and Wildlife Service, Mountain-Prairie Region
Office: 303-236-4510
Cell: 720-648-2542

From: Steve Kallin
To: Aullman, Pat
Subject: RE: Go without me sorry
Date: Friday, February 19, 2016 4:00:55 PM
Attachments: Handout_02_18_16_FeedingHerdHealth.pdf

Hi Pat:

Sorry you were unable to make it today. We had a really enjoyable tour. The elk and bison look great.

Attached is a handout that I gave Travis, Pam and Nikki to answer questions the public may have about some recent allegations concerning the National Elk Refuge. Please do not hesitate to call if you have any questions.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Aullman, Pat [mailto:Pat.Aullman@mail.house.gov]
Sent: Friday, February 19, 2016 8:04 AM
To: Steve Kallin
Subject: Go without me sorry

Sent from my BlackBerry 10 smartphone on the Verizon Wireless 4G LTE network.

National Elk Refuge

Herd Health and Supplemental Feeding Update

National Elk Refuge Elk Herd Status

- The elk herd is in healthy winter condition. There is no evidence that a starvation event is occurring.

Supplemental Feeding

- Starvation is not, and has not been, a management strategy for the Refuge; nor will it be in the future.
- The Refuge supplemental feeding program, including determining start and end dates, is closely coordinated with the Wyoming Game & Fish Department.
- Like the Wyoming Game & Fish Department feed program, Refuge elk are fed an average of 8 pounds of alfalfa per day.
- This year, supplemental feeding began on January 30, or only two days later than the long–term average start date of January 28.

Elk Survival

- Despite Jackson's harsh climate, the long–term (33–year) average winter survival rate on the Refuge is 98.5% for all elk sex/age classes combined and 96.4% for calves (excluding hunting).
- Since adopting the Bison and Elk Management Plan in 2007, the average winter survival rate on the Refuge is 98.8% for all elk sex/age classes combined and 96.7% for calves (excluding hunting).
- This winter season (November 2015 to present), the combined elk survival rate on the Refuge is 99.4%, with a 99.8% survival rate for calves (excluding hunting).
- For perspective, mortality rates for domestic cattle feedlots can range from 1% to 5%.

Forage Monitoring

- Forage production on the Refuge was 15% higher than average in 2015.
- Previous testing indicates that standing winter forage on the Refuge has forage nutrition values comparable to other elk winter ranges, where 97% of North America's elk winter without supplemental feed.

Disease Prevention

- When elk are concentrated on feed lines, the potential for disease transmission increases dramatically.
- Wildlife managers reduce the risk of disease by keeping the herd dispersed on natural forage until feeding is necessary.

Come Enjoy the Elk

Sleigh rides are offered through a private contractor from 10:00 am to 4:00 pm daily.

Consider taking part in this popular winter program to closely observe the elk and learn from the sleigh drivers who observe the elk and Refuge management operations daily throughout the winter.



From: Steve Kallin
To: Mike Blenden
Subject: DRAFT Step Down Plan Meeting Agenda
Date: Wednesday, February 24, 2016 8:59:25 AM
Attachments: DRAFT BEMP Mtg Agenda_Step Down Plan 3-11-2016 .doc

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Mike:

Please see the attached draft for your review. The WGFD requested that we send them an agenda. I would like to discuss this meeting, including strategy with you at your convenience.

Also consider, do we want to invite the Grand Teton National Park to attend? The BEMP is their document as well; let's discuss.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

United States Department of the Interior

FISH AND WILDLIFE SERVICE
NATIONAL ELK REFUGE
675 E. Broadway
Jackson, WY 83001
(307) 201-5409
FAX (307) 733-9729

March 11, 2016

DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT

DRAFT

Meeting between the U.S. Fish and Wildlife Service and the Wyoming Game and Fish Department to discuss Step Down Planning as required by the National Elk Refuge and Grand Teton National Park Bison and Elk Management Plan (BEMP)

Agenda:

1. Bison Elk Management Plan (BEMP), 2007
    a. Call for additional planning; p. 209

2. Court Challenges to BEMP
    a. District Court
    b. Circuit Court
    c. WGFD – Intervener status?

3. BEMP Step Down Plan
    a. Agency coordination meeting
    b. Draft strategy for distribution change
    c. Private lands conflict mitigation

4. WGFD Concerns and suggestions

From:	Steve Kallin
To:	Alyson Courtemanch
Cc:	Eric Cole; Cris Dippel
Subject:	FW: 2014 Jackson Hole Wildlife Symposium Abstract
Date:	Friday, March 04, 2016 2:45:12 PM
Attachments:	JHWSymposium Eric Cole abstract.pdf

Aly:

Please see Eric's note and attached abstract. I sent the email below to Herb Hazen to clarify the allegation that Eric was NOT advocating "starving elk" during his 10 minute presentation. Despite Eric's explanation below, and the fact that no one else attending the symposium came away with this message, the Citizens Concerned for the Elk continue to distort his presentation message and allege he advocates the starvation of elk. This couldn't be further from the truth, as supported by the 98.8% elk survival on the NER since 2007.

The Citizens Concerned for the Elk took Eric's attached abstract and modified it by changing "starvation" to bold text and then placed this modified document on their web site. Apparently they hope to convince the public their distortion of Eric's message is true.

Please call if you would like any additional clarification.

Hang in there,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Cole, Eric [mailto:eric_cole@fws.gov]
Sent: Tuesday, January 26, 2016 3:52 PM
To: Steve Kallin
Cc: Cris Dippel; Lori Iverson
Subject: 2014 Jackson Hole Wildlife Symposium Abstract

Steve,

The abstract from my talk at the Jackson Hole Wildlife Symposium held in December 2014 is attached. At the time, calls for ending the elk reduction program in the Grand Teton National Park were getting considerable press, and my 10 minute presentation was mainly designed to address the challenges of meeting NER population objectives of 5,000 elk on NER when people are opposed to hunting. My main point was that increased tolerance of hunting in currently closed areas or areas with limited access to hunters such as Hunt Area 78 would be necessary to meet our population objectives and subsequently reduce our reliance on supplemental feeding. If people don't like hunting and yet they want to end supplemental feeding, the only other option would be accept greater winter starvation of elk. That does not

mean that I was advocating starving elk to meet NER population objectives.

Deidre Bainbridge was in the audience, and in various email correspondence and a recent letter to the editor in the Jackson Hole News and Guide, she has quoted me out of context from the talk claiming that I advocate starving elk to meet our population objectives. I certainly do not advocate this approach. I advocate reducing elk and bison populations to objective levels using hunting so that animals are more in balance with available habitat and **then** making efforts to reduce our reliance on supplemental feeding. Although I apologize for the confusion, there were many other prominent scientists, wildlife managers, and representatives from NGO's attending my talk that did not draw the same conclusion from my talk as Miss Bainbridge.

Please feel free to forward this message as you see fit.

Kind regards,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

Abstract for the 2014 Jackson Hole Wildlife Symposium:

Challenges and Opportunities to Reduce Supplemental Feeding on the National Elk Refuge

Eric Cole, National Elk Refuge wildlife biologist

Introduction of chronic wasting disease or other novel density dependent diseases are a significant long-term threat to the Jackson Elk Herd. The 2007 Bison and Elk Management Plan (BEMP) for the National Elk Refuge (NER) and Grand Teton National Park (GTNP) calls for limiting reliance on supplemental feeding on NER to reduce the risk of density dependent disease transmission. This will be achieved by: 1) Increasing standing forage on NER through enhanced irrigation. 2) Reducing the number of bison in the Jackson population to 500 through hunting; and 3) Reducing the number of elk wintering on NER to 5,000 through hunting. However, 7 years since the implementation of the BEMP there has been no significant change in the average length of the NER supplemental feed season. Although average forage production has increased by 16% and exponential growth of the bison population has been halted, there are still approximately 850 bison that winter on NER, and the average number of elk wintering on NER has increased from 5,800 to 7,000. Challenges to meet BEMP objectives include seasonal bison and elk use of areas closed to hunting, a discrepancy between herd-wide and NER-specific elk population objectives, and high calf recruitment for elk that summer in the area between Wilson, WY and Beaver Creek in southern GTNP. Opportunities to achieve BEMP objectives include increasing areas open to hunting, lengthening hunting seasons, and modifying the criteria used to determine when supplemental feeding is necessary. Implementation of these strategies will require greater public acceptance of increased hunting opportunity, greater tolerance of elk and bison conflicts on private lands, and/or greater tolerance for elk winter mortality through starvation than currently exists.

From:	Steve Kallin
To:	Brad Hovinga
Cc:	Mike Blenden
Subject:	March 11 meeting agenda; letter of appreciation
Date:	Monday, March 07, 2016 3:46:05 PM
Attachments:	BEMP Mtg Agenda_Step Down Plan 3-11-2016 .doc WGFD Appreciation Letter 3-3-2016.doc

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Hi Brad:

Attached is an agenda for the Bison & Elk Management Plan meeting on March 11. Please let me know if you have any additions or questions.

Also attached is a copy of the Letter of Appreciation that we discussed which will be mailed today.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

United States Department of the Interior

FISH AND WILDLIFE SERVICE
NATIONAL ELK REFUGE
675 E. Broadway
Jackson, WY 83001
(307) 201-5409
FAX (307) 733-9729

March 11, 2016

Meeting between the U.S. Fish and Wildlife Service and the Wyoming Game and Fish Department to discuss Step Down Planning as required by the National Elk Refuge and Grand Teton National Park Bison and Elk Management Plan (BEMP)

DRAFT

Agenda:

1. Bison Elk Management Plan (BEMP), 2007
    a. Call for additional planning; p. 209

2. Court Challenges to BEMP
    a. District Court
    b. Circuit Court
    c. State of Wyoming Intervenor Defendant-Appellee

3. BEMP Step Down Plan
    a. Agency coordination meetings
    b. Draft strategy for distribution change
    c. Private lands conflict mitigation

4. WGFD Concerns and suggestions

United States Department of the Interior

FISH AND WILDLIFE SERVICE
NATIONAL ELK REFUGE
675 E. Broadway
Jackson, WY 83001
(307) 201-5409
FAX (307) 733-9729

March 7, 2016

Brian Nesvik
Wyoming Game and Fish Department
Division Chief
5400 Bishop Blvd.
Cheyenne, WY 82006

Dear Mr. Nesvik:

I want to extend a special thank you to the Wyoming Game and Fish Department for the outstanding assistance the National Elk Refuge received from your Jackson and Pinedale staff during the process of immobilizing and collaring elk on March 1 & 2, 2016. Thanks to their efforts, we were able to place GPS collars on 30 cow elk which will provide information vital to our elk monitoring and management efforts.

I would like to specifically acknowledge the following WGFD employees for their assistance:

-Aly Courtemanch
-Barb Long
-Ben Wise
-Branden Scurlock
-Cheynne Burnett
-Eric Maichak
-Jared Rogerson
-Mark Gocke

The National Elk Refuge and the Wyoming Game and Fish Department regularly cooperate in partnership on a variety of projects. The recent elk collaring project is just the latest example of how this valuable partnership leverages resources for the benefit of wildlife resources which are of mutual importance to our agencies. Annually, our agencies also work in partnership with Jackson Area CWD monitoring, hunting and

fishing law enforcement, elk/bison classification surveys, alfalfa pellet funding and the exchange of biological data.

We appreciate this valued partnership between our agencies and thank you again for the assistance with the recent collaring effort and other cooperative projects

Thank you.

Sincerely,

Steven W. Kallin
National Elk Refuge

cc: Brad Hovinga, Jackson Regional Wildlife Supervisor
Mike Blenden, Refuge Supervisor, Mountain Zone

From:	Steve Kallin
To:	Claire Scolnick
Cc:	Eric Cole
Subject:	RE: drug costs
Date:	Tuesday, March 08, 2016 2:24:25 PM

Claire:

What is the easiest way to pay? What would you suggest?

Check with Eric for the WGFD contact for paying this amount if you have questions.

Thank you,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Scolnick, Claire [mailto:claire_scolnick@fws.gov]
Sent: Monday, March 07, 2016 10:21 AM
To: Cole, Eric
Cc: Steve Kallin
Subject: Re: drug costs

Eric and Steve,
We can certainly do a modification to the agreement and add funds. Please let me know if that is the route you'd like to take. We could also process a payment to WYGF by either direct deposit or charge card if they can process them. Since it is a "good" that they provided to us, it falls below the micro purchase of $3500.00. Let me know how you'd like to proceed.

Best,
Claire Scolnick
Budget Analyst
National Elk Refuge
Seedskadee/Cokeville Wildlife Refuge
Bear River Migratory Bird Refuge
307-201-5402
claire_scolnick@fws.gov

Click Here for Station Budget Google Drive

On Wed, Mar 2, 2016 at 3:34 PM, Cole, Eric <eric_cole@fws.gov> wrote:
Steve and Claire,

Because WGFD assisted us on short notice immobilizing elk to deploy our 30 collars, we need to reimburse them for drug costs ($3,040). I'm not sure what the best mechanism to do this might be, but one possibility is to add money to our agreement with WGFD for CWD. This is a related project. Let me know what you think.

Thanks,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

---------- Forwarded message ----------
From: **Brandon Scurlock** <brandon.scurlock@wyo.gov>
Date: Wed, Mar 2, 2016 at 10:17 AM
Subject: Re: drug costs
To: "Cole, Eric" <eric_cole@fws.gov>

Hi Eric,
Just got off the phone with Mary Wood, our vet. Carfentanil and xylazine reversed with naltrexone and tolazoline comes to about $125 per elk. BAM (butorphanol, azaperone, medetomidine) reversed with atipamezole and naltrexone comes to about $54 per elk. If we say 20 doses of carf and 10 doses of BAM, that's about $2,500 + $540 = **$3,040** in drug costs.

Thanks and hope everything went well (is going well) today!
Brandon

On Tue, Mar 1, 2016 at 5:10 PM, Cole, Eric <eric_cole@fws.gov> wrote:
Hi Brandon,

I talked to Steve and he is good to reimburse you for 30 doses. Just let me know what the cost was and we will figure out a way to get it done. Thanks for all of your help!
Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

--
Brandon Scurlock
Brucellosis Program Supervisor
Wyoming Game and Fish Dept.
PO Box 850 Pinedale, WY 82941
307-367-4347 x224 (office)
307-231-1671 (cell)

E-Mail to and from me, in connection with the transaction of public business, is subject to the Wyoming Public Records Act and may be disclosed to third parties.

From: Cole, Eric
To: Steve Kallin; Cris Dippel; Claire Scolnick
Subject: Projected feed usage 2016 and future feed purchases.
Date: Friday, March 11, 2016 3:22:10 PM

Although this is only an estimate, I project that we will feed approximately 1700 tons this winter (assuming that we end feeding around 20 March 2016). We started with approximately 2800 tons on hand, which means that we will have approximately 1,100 tons remaining at the end of the season. Therefore I would recommend the purchase of 2,000 tons in 2016 to ensure adequate supplies for an above average winter in 2016-2017.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

From:	Steve Kallin
To:	Alyson Courtemanch
Subject:	Harvest Availability Report
Date:	Wednesday, March 16, 2016 4:28:37 PM
Attachments:	Harvest Availability Report 2015.docx

Hi Aly:

Not sure this is the entire report but it was all I could find at this time. There could be a more complete report that includes methods, etc.

Take care,

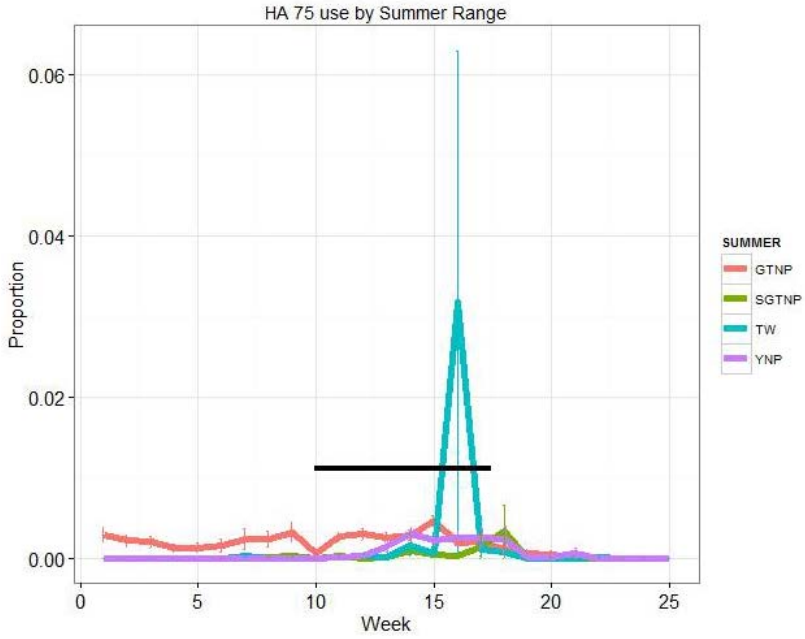
Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

GENERAL ELK USE OF HUNT AREAS

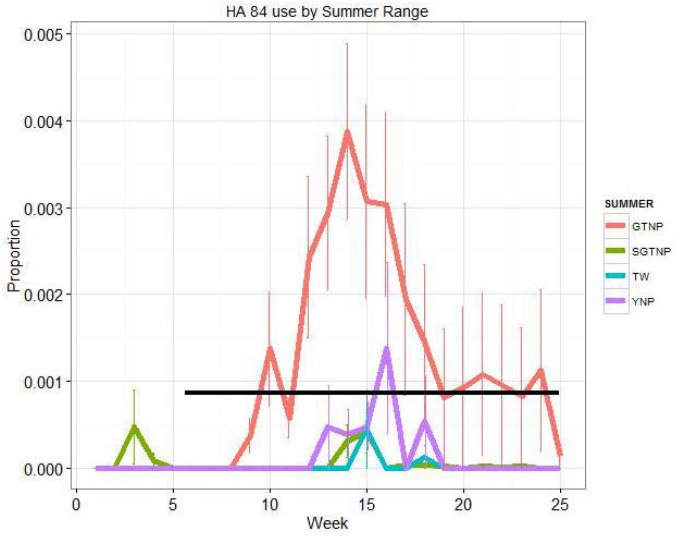
The following 6 plots show average proportional use of individual elk in select Hunt Areas during 2007-2014. These plots indicate which HA elk were within during weekly periods of August 16 – January 31 regardless of whether HA was open or closed for legal hunting. Essentially, these following plots show where these elk were during the autumn-winter. Our sample size was 124 GTNP, 72 SGTNP, 18 TW and 36 YNP elk-years. Below is a reference table to interpret the x-axis. The horizontal line indicates the most recent hunting season dates. The vertical lines represent standard errors (SE).

Week	Dates
1	8/16-8/22
2	8/23-8/29
3	8/30-9/5
4	9/6-9/12
5	9/13-9/19
6	9/20-9/26
7	9/27-10/3
8	10/4-10/10
9	10/11-10/17
10	10/18-10/24
11	10/25-10/31
12	11/1-11/7
13	11/8-11/14
14	11/15-11/21
15	11/22-11/28
16	11/29-12/5
17	12/6-12/12
18	12/13-12/19
19	12/20-12/26
20	12/27-1/2
21	1/3-1/9
22	1/10-1/16
23	1/17-1/23
24	1/24-1/30
25	1/31 (only 1 day)

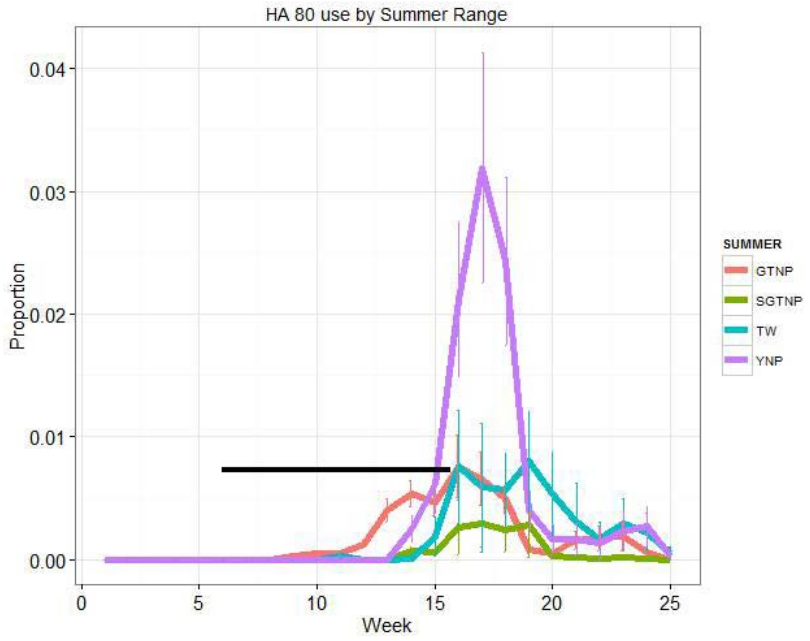
HA 75: Dominated by GTNP elk until approximately week 13 (early November) then elk from different summer ranges are present until approximately week 22 (early January). Strategy to protect YNP and TW may be an earlier hunting season (weeks 1-12, 8/16-11/1) which should make GTNP the only vulnerable summer segment. Alternatively, there may be sufficient spatial segregation in HA75 to warrant modification of subHA 75 boundaries (see next section).



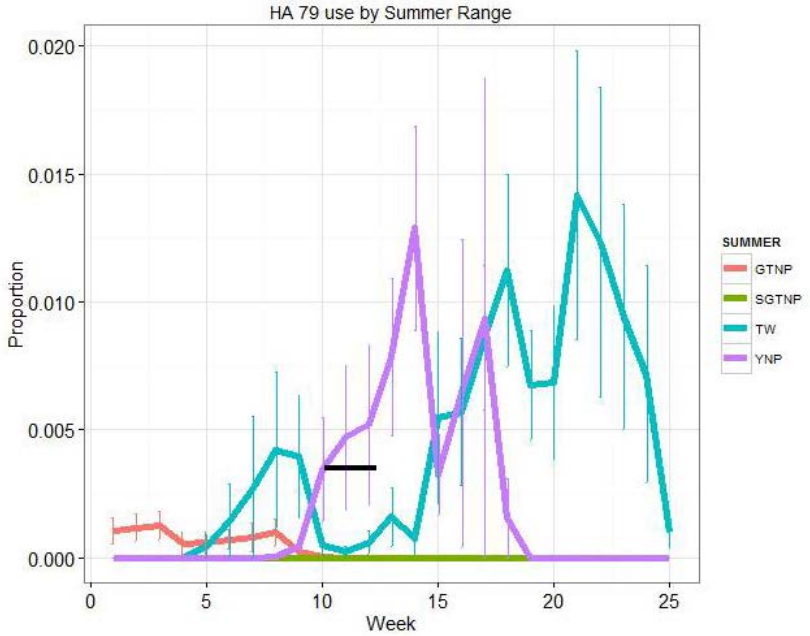
HA 84: Low elk use during early season (Aug. and Sept.) then is occupied primarily by GTNP elk for the remainder year. All other summer ranges are present during late November. Strategy to protect TW and YNP elk may be to have early (9/20 – 11/1) and late (12/27 – 1/31) season prior to and after presence of TW and YNP elk. Note: elk from other areas (e.g., state feedgrounds) are found in this HA.



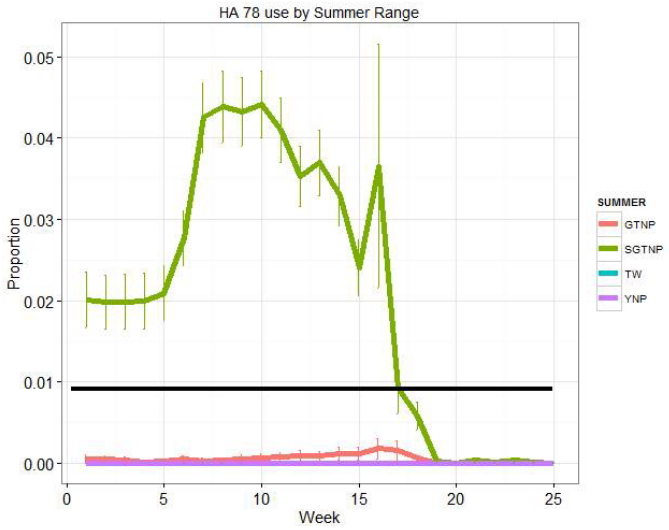
HA80: Low elk use until week 10 (mid-October) then is dominated by TW but elk from other summer ranges are present until the end of January. Relatively low proportional use by SGTNP elk. Strategy to protect TW and YNP elk may be to close the current season 2 weeks earlier.



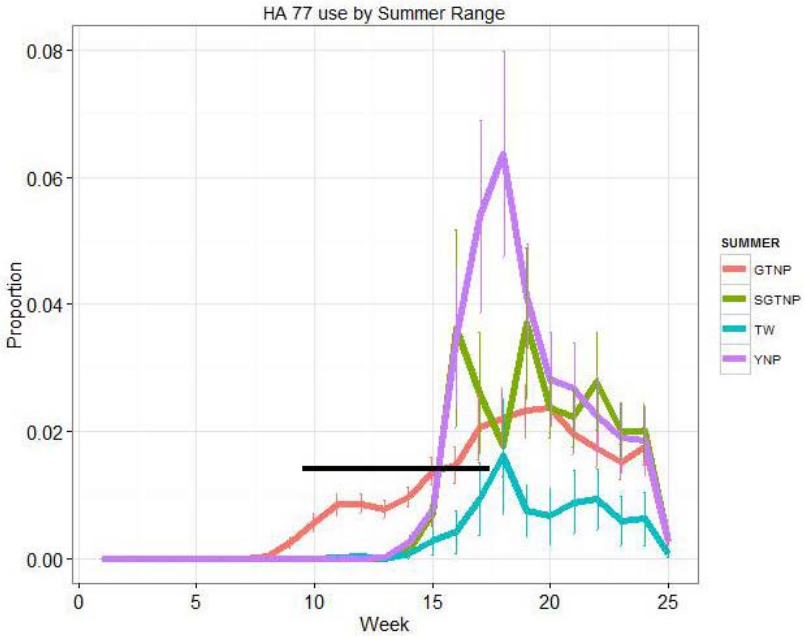
HA79: Relatively low proportional use by GTNP and SGTNP elk during early portion (August to mid-October) then an increase in both YNP and TW elk. TW elk appear to migrate through prior to YNP elk but there is high variation among individual proportions. Strategy to protect TW and YNP elk may be an earlier season when only GTNP elk are present.



HA78: Dominated by SGTNP elk with low proportional use by GTNP elk. Strategy is currently appropriate to protect TW and YNP elk.

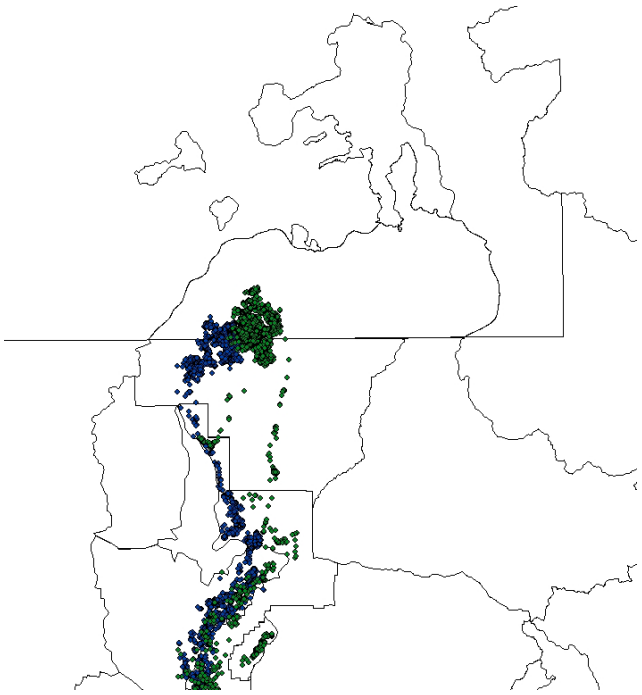


HA77: GTNP elk appear to arrive on NER prior to all other summer ranges (week 8, approximately early October) followed by identical arrival dates for YNP and SGTNP. TW had the latest arrival dates and had the least proportional use relative to other elk groups. Strategy to protect YNP and TW elk may be to have an earlier season when GTNP are present. Downside is that SGTNP and YNP presence dates are identical which would limit opportunities to harvest SGTNP.



PROPORTIONAL USE OF HUNT AREAS DURING LEGAL HUNT SEASONS

In terms of proportional use of HAs during legal season, there were different harvest vulnerabilities among elk groups for each HA. Compared to the 2013 Report, there were several changes in proportional use. In HA 84, GTNP elk had the highest proportional use relative to other summer segments (the 2013 Report indicated a roughly equal distribution among GTNP, YNP and TW elk). In HA 75 and 77, proportional use increased for YNP elk which may be attributed to the increase in sample size (the 2013 report indicated majority users were TW and GTNP elk in HA 75). In HA 79, proportional use flip-flopped between TW and YNP. However, there are several TW and YNP elk that summer on the boundary of TW and YNP (see below figure for example); therefore, if these elk were considered to be combined as "TW and YNP", proportional use would be cumulative among HAs which has implications for harvest availability relative to other summer segments.

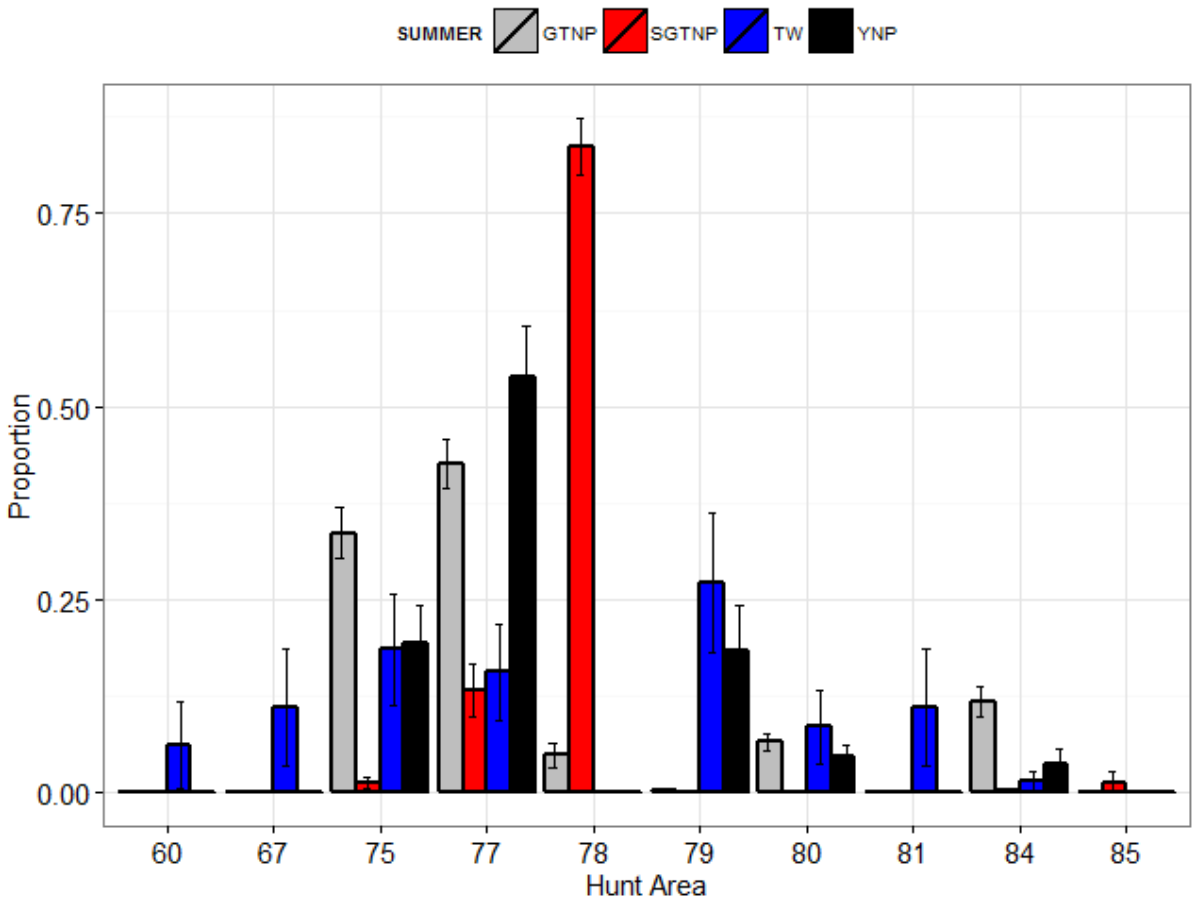


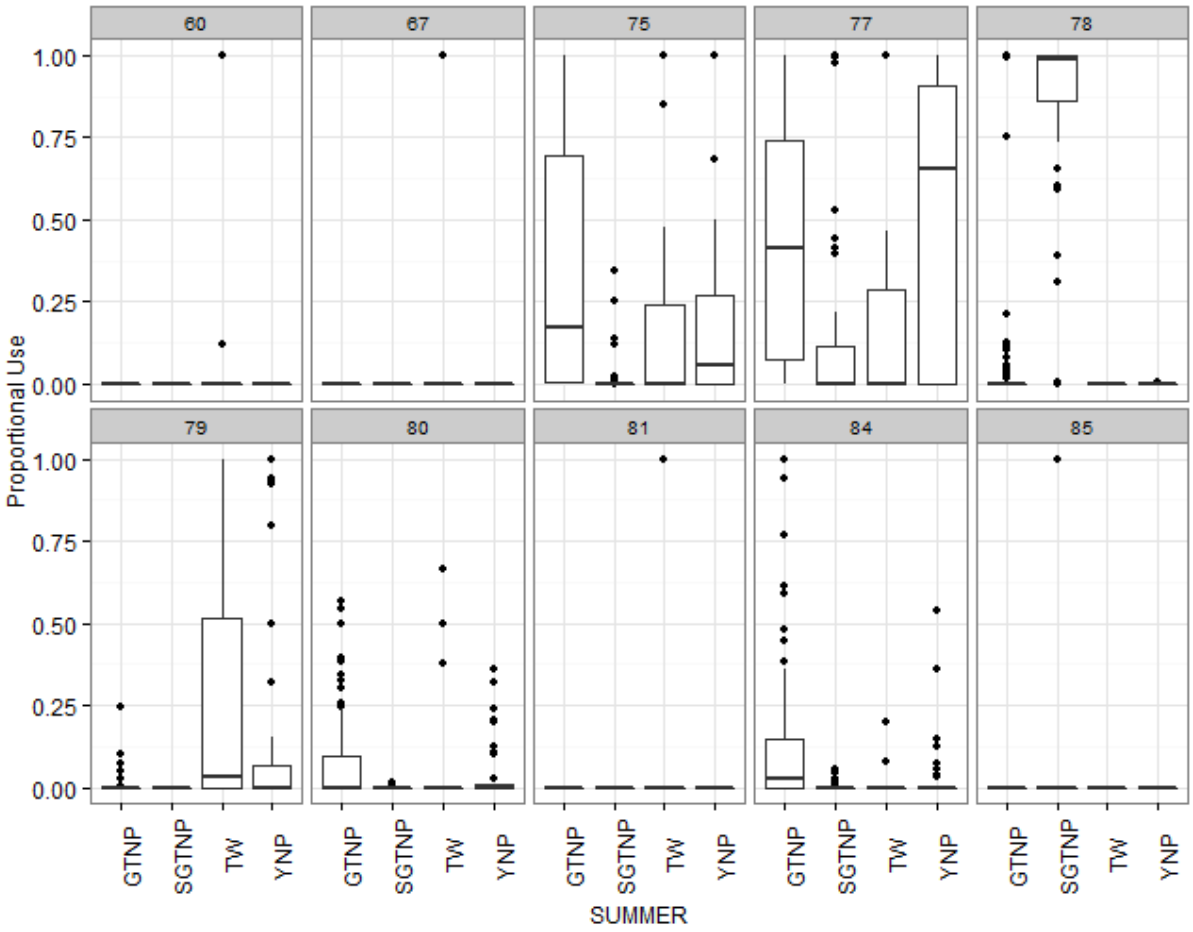
TW elk appeared to be the most vulnerable in the most HAs (60, 67, 79, 80, and 81) but overall proportional use was relatively low (spread out among these HAs).

YNP elk were most vulnerable in HA 77 relative to other HAs. Relative to other summer segments, YNP elk are also vulnerable in HA 80 and HA 75.

SGTNP elk were obviously most vulnerable in HA 78 and to a lesser extent, in HA 77.

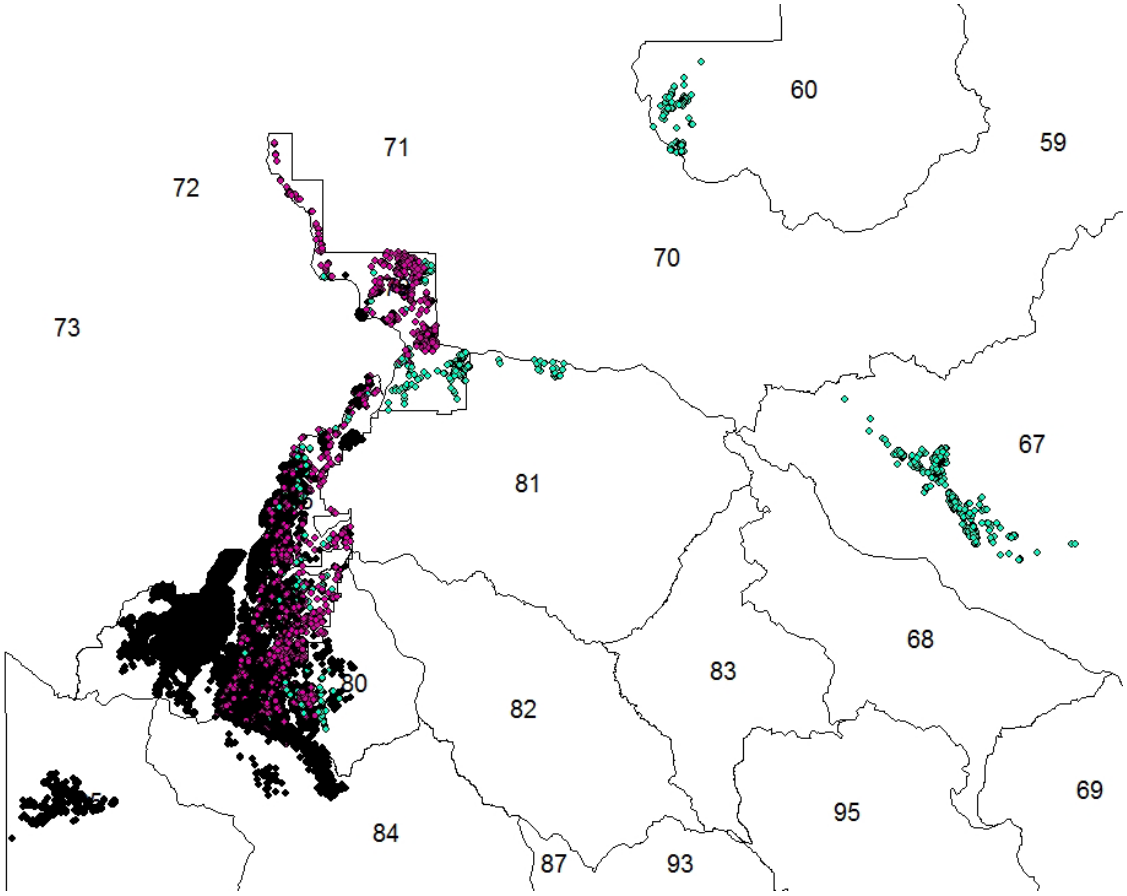
GTNP were mostly found in HAs 75, 77, 84 and to a lesser extent, 80. GTNP was most vulnerable in HA 75 and 77 and were statistically more vulnerable relative to other summer groups in HA 75 and 84.


SUMMER
GTNP
SGTNP
TW
YNP
Proportion
0.00
0.25
0.50
0.75
60
67
75
77
78
79
80
81
84
85
Hunt Area

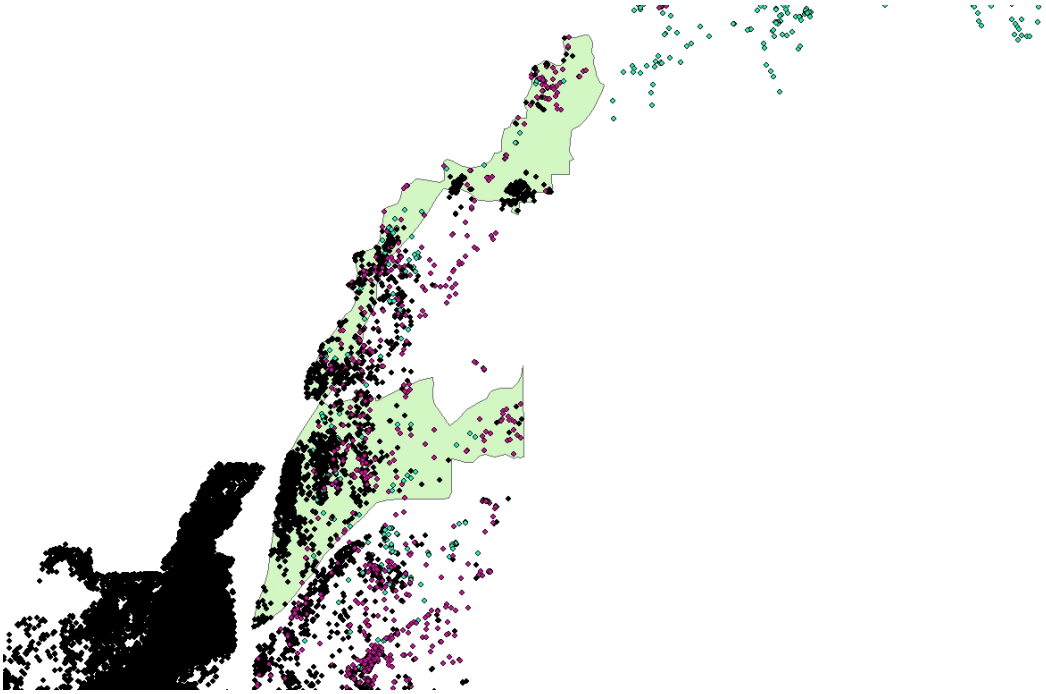

60
67
75
77
78
79
80
81
84
85
Proportional Use
1.00
0.75
0.50
0.25
0.00
GTNP
SGTNP
TW
YNP
SUMMER

SPATIAL DISTRIBUTION OF SUMMER GROUPS DURING LEGAL SEASONS

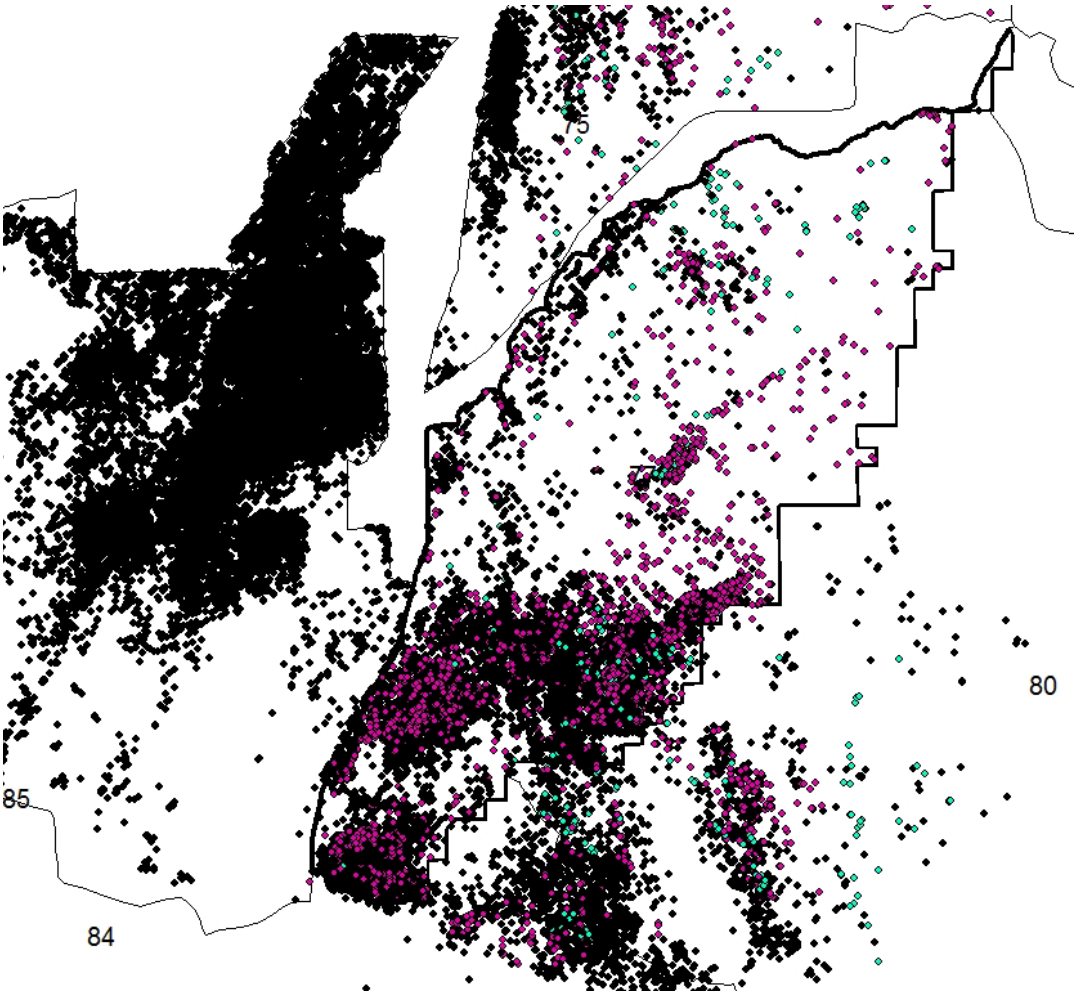
Locations of elk that was eligible to be harvested. Black = SGTNP and GTNP, Teal = TW, and Red = YNP. There was no apparent spatial segregation in any of the HAs with the exception of HA 77 and the subunits of HA 75 and HA 80.

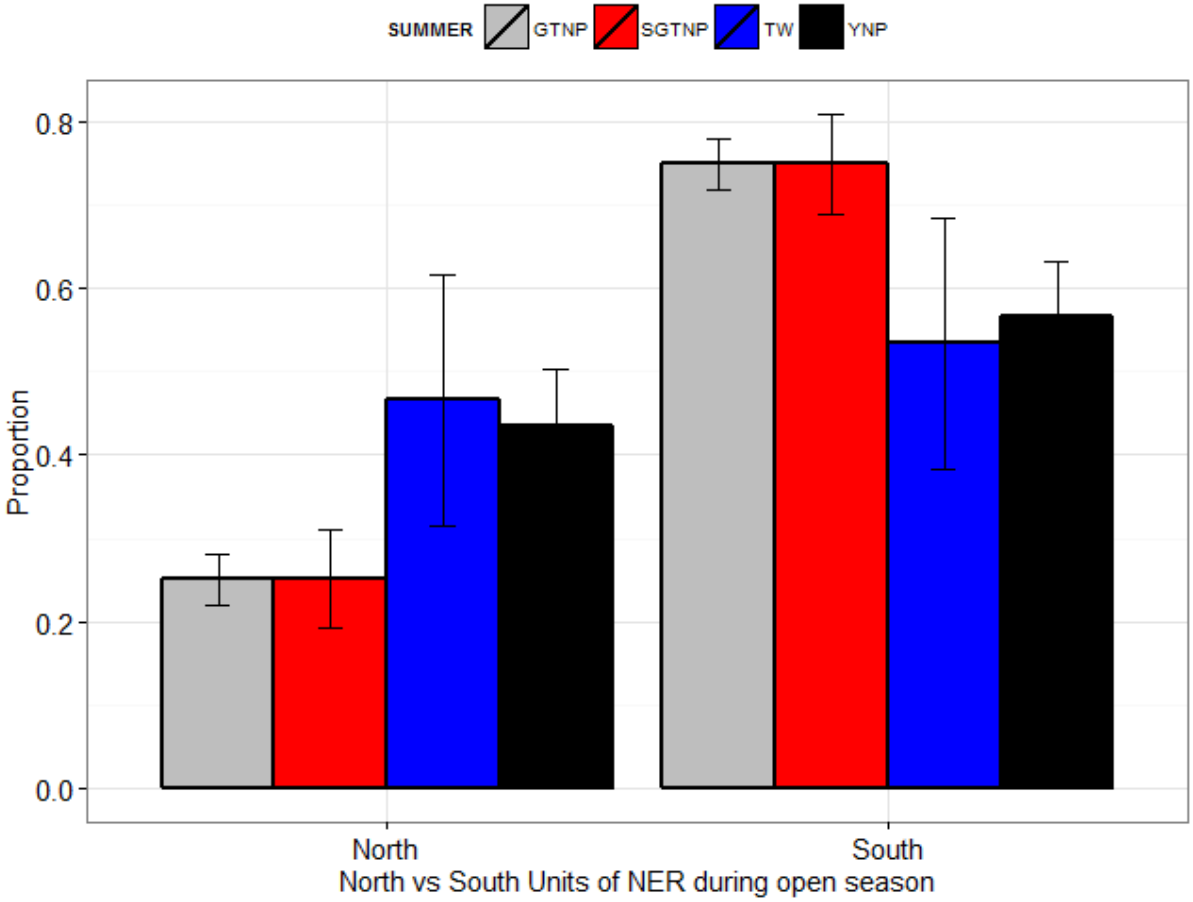


Note that TW and YNP (teal and red) open-season locations increases as one moves north or east in the legal hunting area outside of Antelope Flats of HA 75 (green polygon). Potential strategy to protect TW and YNP elk would be to limit harvest to the southwestern portion of the subunit within HA 75.

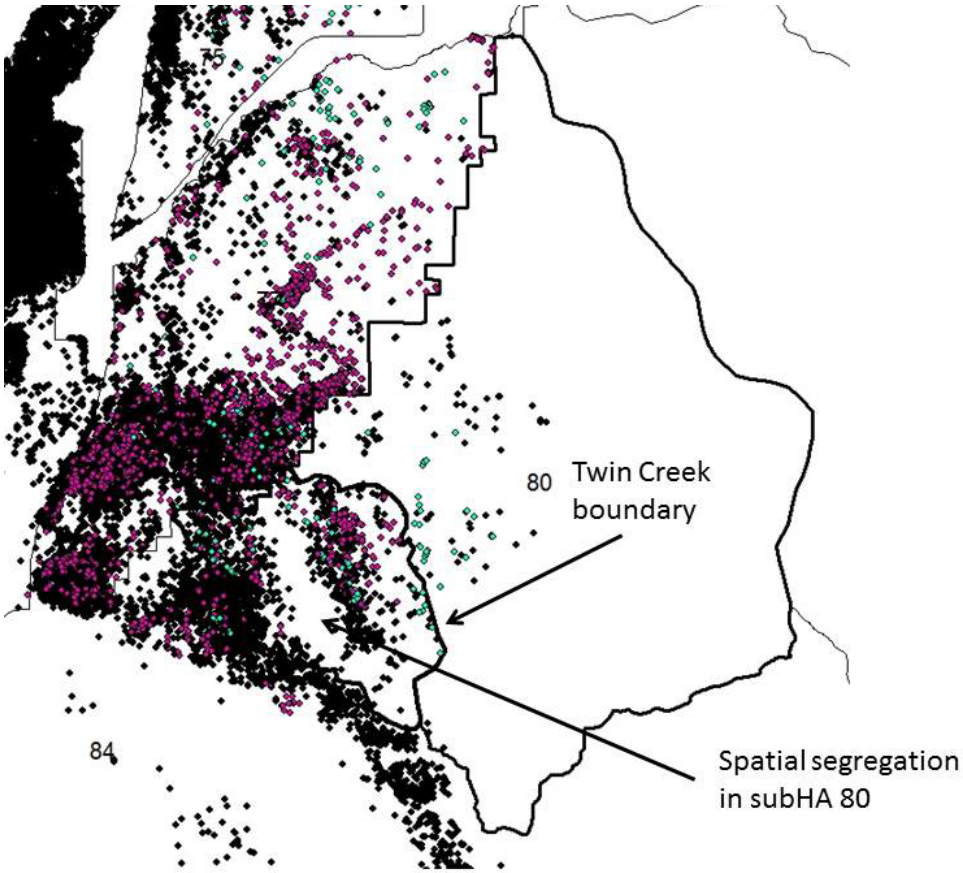


In HA 77 (bold boundary), TW and YNP appeared to be more likely to be found in the northern portion relative to the other summer range elk. Potential strategy to protect TW and YNP elk would be to close the northern portion of the National Elk Refuge.

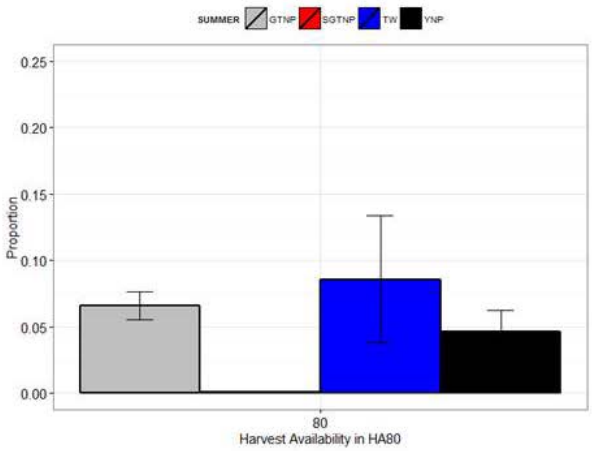


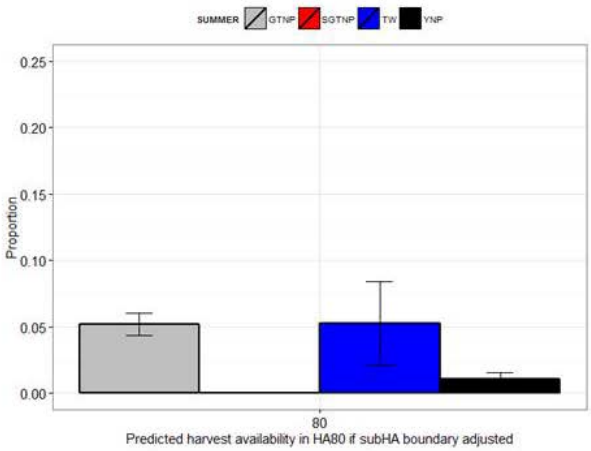

SUMMER
GTNP
SGTNP
TW
YNP
Proportion
0.0
0.2
0.4
0.6
0.8
North
South
North vs South Units of NER during open season

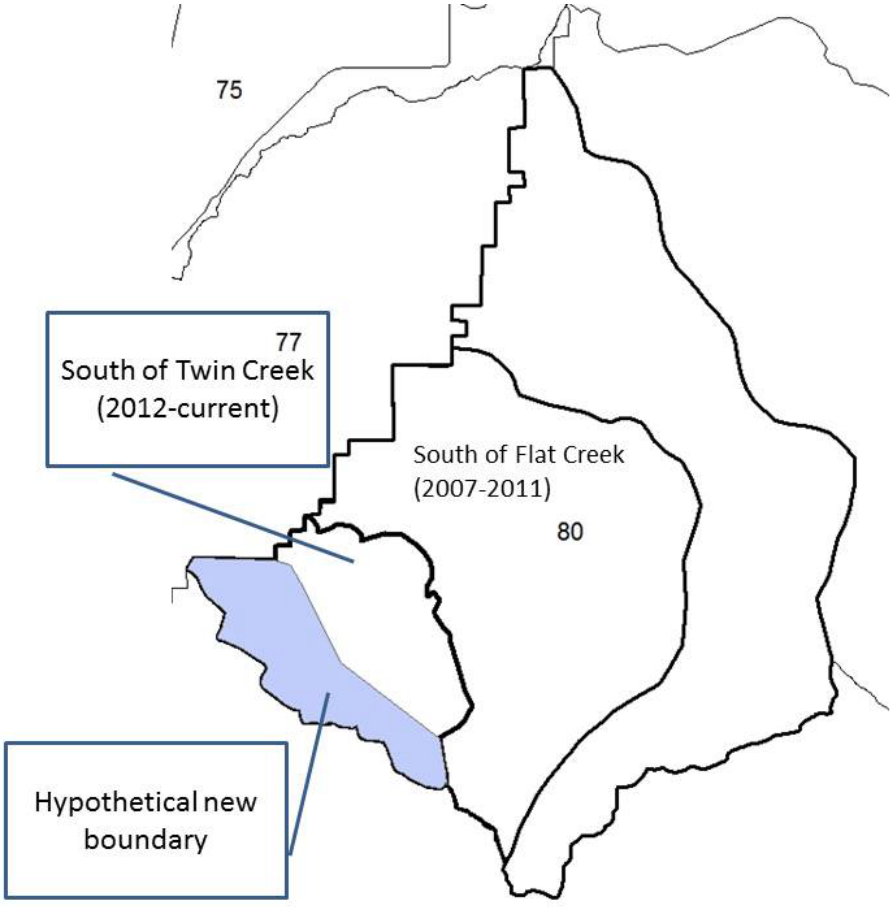
In HA 80, specifically south of Twin Creek, there appears to be two areas where elk are found during open hunt dates. The eastern portion appears to have more TW and YNP elk than SGTNP and GTNP which could improve fine-scale management opportunities by modifying the boundary.



If the northern portion of the current Twin Creek subunit of HA 80 was moved south, predicted vulnerability would decrease for the YNP segment, but not the TW segment. This particular predicted use analysis assumed that the first 2 subareas (south of Flat Creek and south of Twin Creek) did not exist. In other words, the predicted use assumed the modified boundary was in place from 2007-2014.


SUMMER
GTNP
SGTNP
TW
YNP
Proportion
0.25
0.20
0.15
0.10
0.05
0.00
80
Harvest Availability in HA80

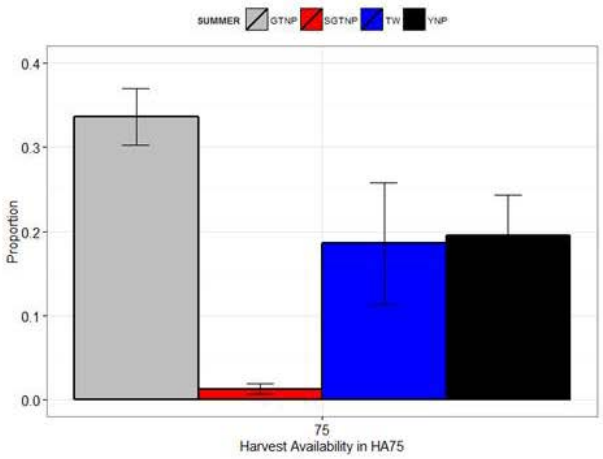

SUMMER
GTNP
SGTNP
TW
YNP
Proportion
0.25
0.20
0.15
0.10
0.05
0.00
80
Predicted harvest availability in HA80 if subHA boundary adjusted

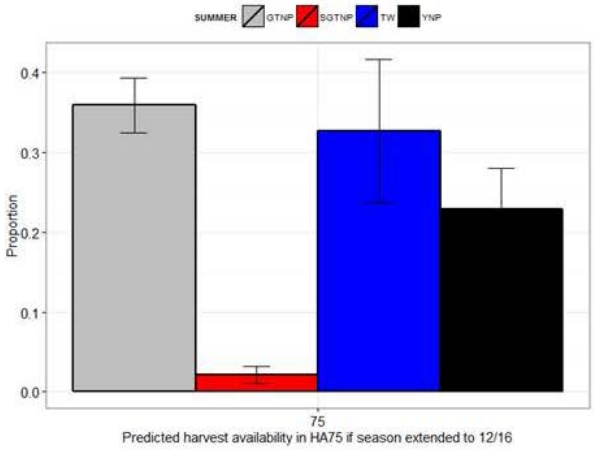

75
77
South of Twin Creek
(2012-current)
South of Flat Creek
(2007-2011)
80
Hypothetical new
boundary

PREDICTED HUNT AREA USE IF HUNT SEASONS EXTENDED

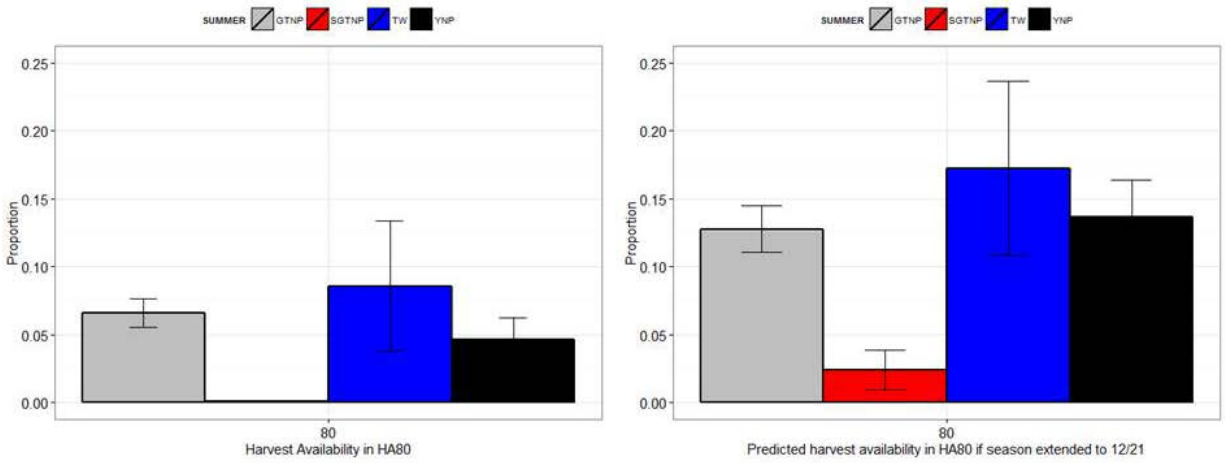
Extending the hunting seasons in HA 75 and 80 has been considered. We predicted harvest availability by appending vulnerable elk locations during existing hunt seasons with elk locations within legal areas during the proposed extended hunt dates. Specifically, for HA 75, elk locations outside of Antelope Flats (legal area) during the proposed extended season dates were considered to be vulnerable to harvest. Likewise, for HA 80, locations south of Twin Creek (legal area) during proposed extended season dates were considered to be vulnerable.

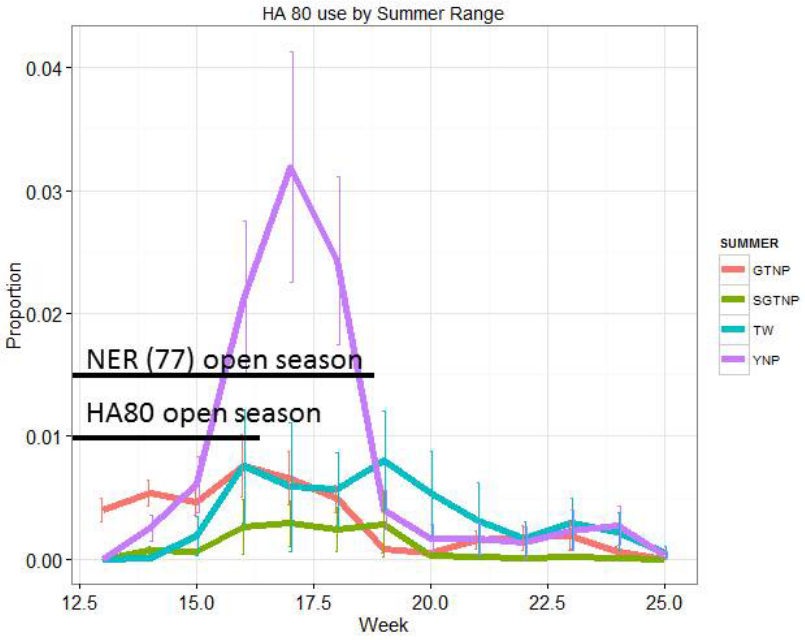
Extending the hunt season outside of Antelope Flats in HA 75 from ~12/7 to 12/16 indicates an increase in proportional use by TW elk. The 2013 Report indicated no changes due to relatively low elk use of HA 75. Because harvest availability increased for TW elk, it is not recommended to extend the season outside of Antelope Flats in HA 75.



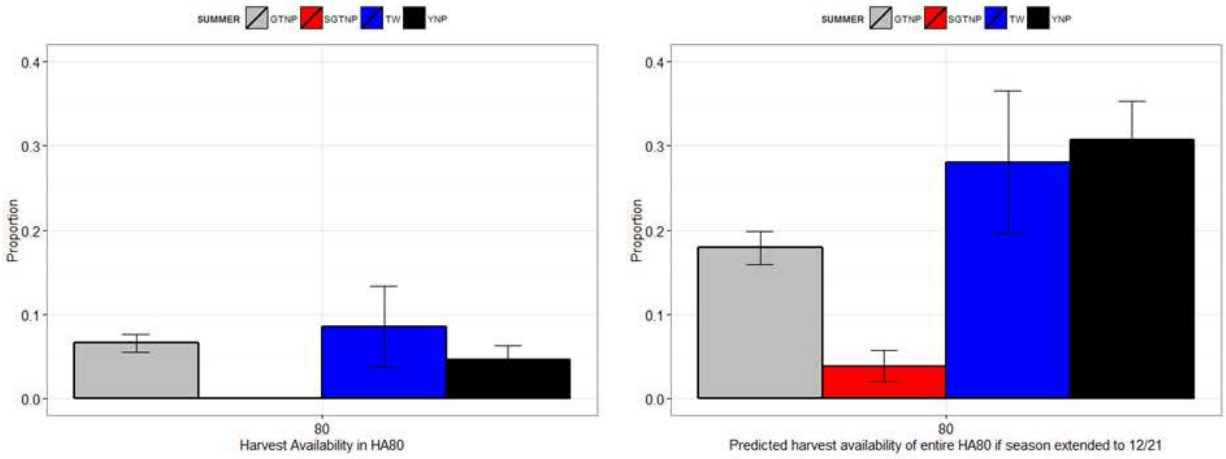


Extending the hunting season south of Twin Creek in HA 80 from 12/1 to 12/21 would increase harvest vulnerability of TW and YNP elk. **This is counter to the findings from the 2013 Report which predicted harvest availability until 12/15.** It appears that TW and YNP elk may be using HA 80 after the current hunting season closes in HA 80 (12/1) and at the same time, potentially avoiding hunting activities in HA 77 (NER, open until 12/14). This reasoning is attributed to the decrease in HA80 use after HA 77 season closed.





Similarly, if the hunting season in the entire HA80 was extended to 12/21, harvest vulnerability would increase for all summer groups, especially TW and YNP elk. Elk may be occupying HA 80 until hunting activities cease in HA 77 (open until 12/14).



From:	Munoz, Anna
To:	Will Meeks
Subject:	Fwd: FW: NER news release: Supplemental Feeding Program to Adjust for Conditions
Date:	Thursday, March 17, 2016 2:38:07 PM
Attachments:	03_17_16_Feeding.pdf

Hey Will,

Is there any way we can be made aware of any press releases that are going out before they go out? Optimally, we would like to be involved in any press releases that are being posted, particularly as it relates to supplemental feeding, to ensure that what we're all in alignment regarding our messaging. But at a minimum, it would be helpful for us to be aware of these releases ahead of time so we can prepare for any media or Congressional inquiries that may come our way.

Thanks,
Anna

Anna Muñoz
Assistant Regional Director - External Affairs
U.S. Fish and Wildlife Service, Mountain-Prairie Region
Office: 303-236-4510
Cell: 720-648-2542

---------- Forwarded message ----------
From: **Ryan Moehring** <ryan_moehring@fws.gov>
Date: Thu, Mar 17, 2016 at 2:12 PM
Subject: FW: NER news release: Supplemental Feeding Program to Adjust for Conditions
To: Anna Munoz <anna_munoz@fws.gov>

Ryan Moehring

Public Affairs (ND, SD, WY, MT)

U.S. Fish and Wildlife Service

Mountain-Prairie Region

303-236-0345

From: Iverson, Lori [mailto:lori_iverson@fws.gov]
Sent: Thursday, March 17, 2016 1:56 PM
Subject: NER news release: Supplemental Feeding Program to Adjust for Conditions

National Elk Refuge News Release

US Fish & Wildlife Service

Department of the Interior

National Elk Refuge

PO Box 510

Jackson, Wyoming 83001

Lori Iverson / 307.201.5433

FOR IMMEDIATE RELEASE

March 17, 2016 16-08

Supplemental Feeding Program to Adjust for Conditions

National Elk Refuge wildlife managers have initiated a change in the supplemental feeding program this week to adjust for spring feedground conditions. As part of a disease management strategy, Refuge staff will use the supplemental feeding program as a tool to redistribute elk to areas of cleaner ground with more residual forage.

Biologists assess a variety of conditions throughout the winter season, including snow depth and density as well as current and predicted weather. As fresh snow on the valley floor becomes less abundant and spring melt progresses, wildlife managers strive to continue providing alfalfa pellets on the cleanest, driest ground within the supplemental feeding areas. In addition to visual surveys, feeders use GPS equipment to specifically record where they have fed over the course of the season to determine where the cleanest ground may be found. “Our goal is to maximize distribution of the elk over the landscape during the course of the season to minimize the risk of disease,” explained Refuge Biologist Eric Cole.

Beginning Thursday, March 17, feeders will discontinue providing supplemental feed in the Headquarters management area near the very southern end of the Refuge, encouraging elk to move to other feedgrounds over the next few days. Considerable clean ground still remains in the Peterson management area (northeast of the Jackson National Fish Hatchery) and McBride management area (north of Flat Creek) where elk may not be as visible to the public. Plans include supporting up to 1,500 elk in the Nowlin management area, which can be seen from Highway 26/89/191 north of Jackson. As a result, the Refuge’s winter sleigh ride program, which runs through April 2, will

continue to offer views of the herd for people interested in photographing or viewing elk at closer range.

-FWS-

Lori Iverson

Outreach & Visitor Services

U.S. Fish & Wildlife Service

National Elk Refuge

PO Box 510 / 675 East Broadway

Jackson, WY 83001

Phone: 307.201.5433

Cell: 307.690.4375

Fax: 307.733.9729

lori_iverson@fws.gov

National Elk Refuge photo gallery

National Elk Refuge web site

Twitter: @NatlElkRefuge

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(307) 201.5433

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Thanks,
Anna

Anna Muñoz
Assistant Regional Director - External Affairs
U.S. Fish and Wildlife Service, Mountain-Prairie Region
Office: 303-236-4510
Cell: 720-648-2542

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From: **Ryan Moehring** <ryan_moehring@fws.gov>
Date: Thu, Mar 17, 2016 at 2:12 PM
Subject: FW: NER news release: Supplemental Feeding Program to Adjust for Conditions
To: Anna Munoz <anna_munoz@fws.gov>

Ryan Moehring

Public Affairs (ND, SD, WY, MT)

U.S. Fish and Wildlife Service

Mountain-Prairie Region

303-236-0345

From: Iverson, Lori [mailto:lori_iverson@fws.gov]
Sent: Thursday, March 17, 2016 1:56 PM
Subject: NER news release: Supplemental Feeding Program to Adjust for Conditions

National Elk Refuge News Release

US Fish & Wildlife Service

Department of the Interior

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Lori Iverson / 307.201.5433

FOR IMMEDIATE RELEASE

March 17, 2016 16-08

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-FWS-

Lori Iverson

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U.S. Fish & Wildlife Service

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– FWS –

From: Will Meeks
To: Munoz, Anna
Subject: Re: NER news release: Supplemental Feeding Program to Adjust for Conditions
Date: Thursday, March 17, 2016 2:50:11 PM

I'm trying. NER has a history of just releasing these and telling us they did it. I'll be sure to bring this up at my management team meeting.

Once you implement your changes and Ryan begins to attend weekly meetings, I think it will help.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303 (w)
720-541-0310 (c)

On Mar 17, 2016, at 4:38 PM, Munoz, Anna <anna_munoz@fws.gov> wrote:

> Hey Will,
>
> Is there any way we can be made aware of any press releases that are going out before they go out? Optimally, we would like to be involved in any press releases that are being posted, particularly as it relates to supplemental feeding, to ensure that what we're all in alignment regarding our messaging. But at a minimum, it would be helpful for us to be aware of these releases ahead of time so we can prepare for any media or Congressional inquiries that may come our way.
>
> Thanks,
> Anna
>
> Anna Muñoz
> Assistant Regional Director - External Affairs
> U.S. Fish and Wildlife Service, Mountain-Prairie Region
> Office: 303-236-4510
> Cell: 720-648-2542
>
> ---------- Forwarded message ----------
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> Date: Thu, Mar 17, 2016 at 2:12 PM
> Subject: FW: NER news release: Supplemental Feeding Program to Adjust for Conditions
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Ryan Moehring

Public Affairs (ND, SD, WY, MT)

U.S. Fish and Wildlife Service

Mountain-Prairie Region

303-236-0345

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Sent: Thursday, March 17, 2016 1:56 PM
Subject: NER news release: Supplemental Feeding Program to Adjust for Conditions

National Elk Refuge News Release

US Fish & Wildlife Service

Department of the Interior

National Elk Refuge

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Lori Iverson / 307.201.5433

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Beginning Thursday, March 17, feeders will discontinue providing supplemental feed in the Headquarters management area near the very southern end of the Refuge, encouraging elk to move to other feedgrounds over the next few days. Considerable clean ground still remains in the Peterson management area (northeast of the Jackson National Fish Hatchery) and McBride management area (north of Flat Creek) where elk may not be as visible to the public. Plans include supporting up to 1,500 elk in the Nowlin management area, which can be seen from Highway 26/89/191 north of Jackson. As a result, the Refuge’s winter sleigh ride program, which runs through April 2, will continue to offer views of the herd for people interested in photographing or viewing elk at closer range.

-FWS-

Lori Iverson

Outreach & Visitor Services

U.S. Fish & Wildlife Service

National Elk Refuge

PO Box 510 / 675 East Broadway

Jackson, WY 83001

Phone: 307.201.5433

Cell: 307.690.4375

Fax: 307.733.9729

lori_iverson@fws.gov

National Elk Refuge photo gallery

National Elk Refuge web site

Twitter: @NatlElkRefuge

"If you could only sense how important you are to the lives of those you meet ... There is something of yourself that you leave at every meeting with another person." - Fred ("Mr.") Rogers

<03_17_16_Feeding.pdf>

From: Will Meeks
To: Munoz, Anna
Subject: Re: NER news release: Supplemental Feeding Program to Adjust for Conditions
Date: Thursday, March 17, 2016 2:50:11 PM

I'm trying. NER has a history of just releasing these and telling us they did it. I'll be sure to bring this up at my management team meeting.

Once you implement your changes and Ryan begins to attend weekly meetings, I think it will help.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303 (w)
720-541-0310 (c)

On Mar 17, 2016, at 4:38 PM, Munoz, Anna <anna_munoz@fws.gov> wrote:

> Hey Will,
>
> Is there any way we can be made aware of any press releases that are going out before they go out? Optimally, we would like to be involved in any press releases that are being posted, particularly as it relates to supplemental feeding, to ensure that what we're all in alignment regarding our messaging. But at a minimum, it would be helpful for us to be aware of these releases ahead of time so we can prepare for any media or Congressional inquiries that may come our way.
>
> Thanks,
> Anna
>
> Anna Muñoz
> Assistant Regional Director - External Affairs
> U.S. Fish and Wildlife Service, Mountain-Prairie Region
> Office: 303-236-4510
> Cell: 720-648-2542
>
> ---------- Forwarded message ----------
> From: **Ryan Moehring** <ryan_moehring@fws.gov>
> Date: Thu, Mar 17, 2016 at 2:12 PM
> Subject: FW: NER news release: Supplemental Feeding Program to Adjust for Conditions
> To: Anna Munoz <anna_munoz@fws.gov>

Ryan Moehring

Public Affairs (ND, SD, WY, MT)

U.S. Fish and Wildlife Service

Mountain-Prairie Region

303-236-0345

From: Iverson, Lori [mailto:lori_iverson@fws.gov]
Sent: Thursday, March 17, 2016 1:56 PM
Subject: NER news release: Supplemental Feeding Program to Adjust for Conditions

National Elk Refuge News Release

US Fish & Wildlife Service

Department of the Interior

National Elk Refuge

PO Box 510

Jackson, Wyoming 83001

Lori Iverson / 307.201.5433

FOR IMMEDIATE RELEASE

March 17, 2016 16-08

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<03_17_16_Feeding.pdf>

From: Munoz, Anna
To: Will Meeks
Subject: Re: NER news release: Supplemental Feeding Program to Adjust for Conditions
Date: Thursday, March 17, 2016 2:53:20 PM

Thanks. Next week is likely the go-week for making changes, with everything going into effect the week of April 4.

Anna

Anna Muñoz
Assistant Regional Director - External Affairs
U.S. Fish and Wildlife Service, Mountain-Prairie Region
Office: 303-236-4510
Cell: 720-648-2542

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> Will Meeks
> U.S. Fish and Wildlife Service
> Mountain-Prairie Region
> Assistant Regional Director
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> 303-236-4303 (w)
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Cell: 720-648-2542

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To: Anna Munoz <anna_munoz@fws.gov>

Ryan Moehring

Public Affairs (ND, SD, WY, MT)

U.S. Fish and Wildlife Service

Mountain-Prairie Region

303-236-0345

From: Iverson, Lori [mailto:lori_iverson@fws.gov]
Sent: Thursday, March 17, 2016 1:56 PM
Subject: NER news release: Supplemental Feeding Program to Adjust for Conditions

National Elk Refuge News Release

US Fish & Wildlife Service

Department of the Interior

National Elk Refuge

PO Box 510

Jackson, Wyoming 83001

Lori Iverson / 307.201.5433

FOR IMMEDIATE RELEASE

March 17, 2016 16-08

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Anna Muñoz
Assistant Regional Director - External Affairs
U.S. Fish and Wildlife Service, Mountain-Prairie Region
Office: 303-236-4510
Cell: 720-648-2542

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Ryan Moehring

Public Affairs (ND, SD, WY, MT)

U.S. Fish and Wildlife Service

Mountain-Prairie Region

303-236-0345

From: Iverson, Lori [mailto:lori_iverson@fws.gov]
Sent: Thursday, March 17, 2016 1:56 PM
Subject: NER news release: Supplemental Feeding Program to Adjust for Conditions

National Elk Refuge News Release

US Fish & Wildlife Service

Department of the Interior

National Elk Refuge

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<03_17_16_Feeding.pdf>

From:	Will Meeks
To:	Steve Kallin
Cc:	Ryan Moehring; Mike Blenden; Maureen Gallagher; Anna Munoz
Subject:	Re: feeding
Date:	Wednesday, March 30, 2016 7:32:14 PM

Thanks Steve.

Even in the absence of this, please continue planning on a communications front.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303 (w)
720-541-0310 (c)

On Mar 30, 2016, at 12:42 PM, Steve Kallin <steve_kallin@fws.gov> wrote:

> Hi All:
>
> Mike accurately summarized the direction and steps we were taking. The key is a response we are still waiting on from the WGFD.
>
> I just had an abbreviated phone conversation with the Jackson Regional Wildlife Manger (poor cell phone connection). The WGFD administration in Cheyenne still wants to discuss the matter internally and has not authorized the Jackson staff to move forward. Couldn't get a timeframe for this conversation because of the poor connection. Hopefully later today I will get a better idea of when the WGFD Wildlife Administration will meet to discuss.
>
> Also, I am unaware of any FWS presence at the Wyoming Wildlife Commission meeting on March 22.
>
> Take care,
>
> **Steve Kallin**
> Project Leader
> National Elk Refuge
> PO Box 510
> 675 East Broadway
> Jackson, WY 83001
> Phone: (307) 201-5409
> Fax: (307) 733-9729
> steve_kallin@fws.gov
>
> ---
>
> **From:** Will Meeks [mailto:will_meeks@fws.gov]
> **Sent:** Wednesday, March 30, 2016 10:27 AM
> **To:** Ryan Moehring

Cc: Mike Blenden; Steve Kallin; Maureen Gallagher; Anna Munoz
Subject: Re: feeding

I appreciate all of this.

I believe the RD would like a briefing and we need to move forward.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303 (w)
720-541-0310 (c)

On Mar 30, 2016, at 10:25 AM, Ryan Moehring <ryan_moehring@fws.gov> wrote:

> Thanks, Mike. That is my recollection as well. Also, see Jackson Hole News and Guide's poll for the week, below:
>
> http://www.jhnewsandguide.com/is-the-elk-herd-on-the-national-elk-refuge-underfed/poll_12b03a36-f626-11e5-8dd2-e7b28147ece2.html
>
> <image001.png>
>
> Thanks,
> Ryan
>
> Ryan Moehring
> Public Affairs (ND, SD, WY, MT)
> U.S. Fish and Wildlife Service
> Mountain-Prairie Region
> 303-236-0345
>
> **From:** Blenden, Mike [mailto:mike_blenden@fws.gov]
> **Sent:** Wednesday, March 30, 2016 9:50 AM
> **To:** Will Meeks
> **Cc:** Steve Kallin; Ryan Moehring; Maureen Gallagher; Anna Munoz
> **Subject:** Re: feeding
>
> Others can chime in but I recall we were to launch in to more detailed communication plan after we got a sense from Noreen about the direction we wanted to take on implementing the step down plan, which was going to happen after we had the meeting with WG&F leadership in Jackson on March 11. Since the WG&F meeting we are waiting for feedback from them on our offer to exercise flexibility when implementing the step down plan. Steve was going to check with them yesterday or today on the status of that feedback. With that feedback we can circle back to Noreen, adjust our

implementation strategy accordingly and start on communication plan in earnest.

I think was to be some recent discussion at Noreen's level with WG&F, but I don't know if that really happened or the outcome if it did.

On Wed, Mar 30, 2016 at 9:02 AM, Will Meeks <will_meeks@fws.gov> wrote:
See Noreen's note below. Two things -

1. Steve, do you know if any FWS attended?

2. What's the status of the comms plan/strategy? I'd like an update and also a deadline for completion. I'd like us to brief the RD/DRD and begin implementation soon.

Thanks.

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303(w)
720-541-0310 (c)

Begin forwarded message:

> **From:** Noreen Walsh <noreen_walsh@fws.gov>
> **Date:** March 30, 2016 at 8:47:33 AM MDT
> **To:** Will Meeks <will_meeks@fws.gov>
> **Cc:** Matt Hogan <matt_hogan@fws.gov>, Anna Munoz <anna_munoz@fws.gov>
> **Subject: feeding**
>
> http://www.wyofile.com/state-vet-combat-cwd-reducing-elk-feeding/
>
> > *"If we want to really look at proactive management, the single most proactive thing we can do for feedgrounds in the face of CWD is to find ways to reduce reliance on feed before CWD ever hits," Dr. Mary Wood told Game and Fish commissioners at their meeting last week in Rawlins.*

There's not going to be any more of this control business," board member Richard Klouda said. Commissioner Mark Anselmi agreed, saying "you've got a commission that's desperate to be proactive in the CWD field."

"Let's send that message to the world," commissioner Pat Crank said. "As far as the commission – we want to be proactive and combat chronic wasting disease."

Will, do you know if we had anyone attend this commission meeting? I would like to talk a little more about where our communication strategy stands.

Thanks,
Noreen

Noreen Walsh
Regional Director
Mountain-Prairie Region
U. S. Fish and Wildlife Service
303 236 7920

--
Michael Blenden
Refuge Supervisor - Montana, Wyoming and Utah
134 Union Boulevard
Lakewood, CO 80228
303-236-4306
303-710-7934 cell

Too often we...enjoy the comfort of opinion without the discomfort of thought.
John F. Kennedy

From:	Cole, Eric
To:	Bryan Yetter; Aly Courtemanch; Amanda Soliday; Barbara Long; Benjamin Wise; Bert Raynes; Brad Hovinga; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Corinna Reginos; Cris Dippel; Daniel Huckel; Dave Gustine; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Erika Edmiston; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jennifer Ballard; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Patty Ewing; Paul Hood; Paul Santavy; Phil Hocker (i5); Renee Seidler; roger hayden; samantha gibbs; Sarah Dewey; Scolnick, Claire; Siva Sundaresan; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan G. Clark; Susan Patla; Terry Roper; Timothy Pratt; Todd Stiles; Tom Reed; Ture Schoultz
Subject:	4 April 2016 National Elk Refuge Biological Update
Date:	Wednesday, April 06, 2016 3:00:56 PM

4 April 2016 National Elk Refuge Biological Update

Feeding End Date

Due to greening conditions, lack of snow in the forecast, and declining elk interest in alfalfa pellets, the last day of the NER feed season was Saturday, 2 April 2016. The 2016 feed season began on 30 January and was 64 days long. For perspective 2016 feed season length was close to the long term average of 65 days.

Elk Collaring

On 1 to 2 March 2016, NER and WGFD personnel deployed GPS collars on 30 adult cow elk on NER feedgrounds. This collaring effort is part of long term inter-agency monitoring of the Jackson Elk Herd migration patterns and use of feedgrounds.

Elk and other Ungulate Distribution

As of 25 March 2016 all 30 GPS collared elk were on the south end of NER associated with NER feedgrounds, but as of 2 April 2016, there was a significant elk movement off NER across the Gros Ventre River near the Kelly Road/Highway 89 intersection. As of 2 April 2016, 22 out of 30 (73%) of collared elk were still located on the south half of NER. These movement patterns off the refuge are consistent with declining elk interest in supplemental feed and movement to summer ranges. People should be cautious driving on highway 89 and watch for elk crossing the road.

As of 5 April 2016, 5,810 elk, 432 bison, 77 bighorn sheep, and 15 pronghorn were observed in the standardized observation area, which roughly corresponds to the southern half of NER. The number of elk and bison on southern NER has declined from peak winter levels in mid-March of approximately 7,600 elk and 620 bison.

Elk Mortality Summary

As of 20 March 2016 we had documented 61 winter elk mortalities (0.8% of 7,390 classified total). 25 of these were calves (3.2% of 786 classified calves). As mentioned in an earlier update, these mortality levels are remarkably low for a wintering elk herd and are inconsistent with allegations by some members of the public that the elk on the refuge are starving. We will continue to monitor elk mortalities on NER through April and update this information accordingly, but I do not anticipate a large increase in these numbers.

Wolves

The Pinnacle Peak Pack continues to be active on NER, with 13 members of the pack commonly observed on the north end of NER and in the Poverty Flats area northeast of Miller Butte. Through 20 March at least 10 out of 61 winter elk deaths on NER were associated

with wolf predation.

Signs of Spring/First Observations of the Season
First horned larks observed on NER: 15 Feb 2016
First Canada geese observed on NER: 23 Feb 2016
First Mountain bluebirds observed on NER: 5 March 2016
First Western meadowlark observed on NER 10 March 2016
First Uinta ground squirrels observed out of hibernation on NER: 26 March 2016
First Red-tailed hawk observed on NER: 2 April 2016

Happy Spring and thanks for your interest,

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

From:	Steve Kallin
To:	Ryan Moehring; Lori Iverson
Cc:	Mike Blenden
Subject:	RE: Elk Management Communications Plan
Date:	Wednesday, April 27, 2016 10:39:05 AM

Ryan:

We are still awaiting a reply from one of our agency partners before we finalize the step-down plan. Hopefully we will receive a response by the second week in May and will be able to better predict its completion.

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Ryan Moehring [mailto:ryan_moehring@fws.gov]
Sent: Wednesday, April 27, 2016 10:31 AM
To: Lori Iverson
Cc: Mike Blenden; Steve Kallin
Subject: RE: Elk Management Communications Plan

Thanks, Lori. This is very helpful.

Is it possible to get a copy of the draft step-down plan?

Also, a question for the group: do we have an ETA on when that plan is going to be finalized?

Thanks,
Ryan

Ryan Moehring
Public Affairs (ND, SD, WY, MT)
U.S. Fish and Wildlife Service
Mountain-Prairie Region
303-236-0345

From: Iverson, Lori [mailto:lori_iverson@fws.gov]
Sent: Tuesday, April 26, 2016 1:37 PM
To: Ryan Moehring
Cc: Mike Blenden; Steve Kallin
Subject: Re: Elk Management Communications Plan

I had started a comm plan for the Bison & Elk Management Step Down Plan several months ago but also was in a holding pattern until I had more details. I've attached the draft I had

roughed out.

Lori

Lori Iverson
Outreach & Visitor Services
U.S. Fish & Wildlife Service
National Elk Refuge
PO Box 510 / 675 East Broadway
Jackson, WY 83001
Phone: 307.201.5433
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If I ever go looking for my heart's desire again, I won't look any further than my own back yard. Because if it isn't there, then I never really lost it to begin with." - Dorothy Gale, *The Wizard of Oz*

On Tue, Apr 26, 2016 at 12:26 PM, Ryan Moehring <ryan_moehring@fws.gov> wrote:
Hi Mike,

As discussed, Will has requested that we develop a communications plan for the NER's new management strategy for supplemental feeding. I'm happy to take the lead on this, working closely with you, Steve and Lori, but before we can move forward I'll need to know just what that strategy entails. You mentioned a draft plan. How may I acquire a copy of that? My very basic understanding of our proposed management change is that we are going to reduce feeding – starting later and ending later in the year, increasing monitoring, and hiring seasonals to assist surrounding private landowners with fence repairs and other activities to reduce and prevent conflicts. But that is all I know. If you or Steve could please provide me with as much specific detail as possible, including proposed timeframes, that would be very helpful.

Once I have a better handle on all of that, perhaps we can have a call to discuss various approaches?

Thank you!
Ryan

Ryan Moehring
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From:	Steve Kallin
To:	Mike Blenden
Cc:	Brad Hovinga; Cris Dippel; Eric Cole
Subject:	WGFD Jackson Elk Herd Population Objectives
Date:	Monday, May 02, 2016 3:34:18 PM

Hi Mike:

I met this morning with Brad Hovenga, Jackson WGFD Regional Wildlife Supervisor. Two updates.

First, the meeting by the WGFD Wildlife Administrators to discuss the BEMP Step Down Plan has been scheduled for May 19. I again offered to provide written information or meet with them in person if they believed it would be helpful.

Second, we discussed the WGFD proposal to drop winter sub-herd objectives for the Jackson Elk Herd. I believe the WGFD has legitimate management reasons for wanting to drop these objectives. I expressed the concern that to the public, or to future WGFD/FWS staff, it may appear the WGFD has purposely decided not to support the BEMP objective of 5,000 elk for the NER supplemental feeding program. They responded that was not their intent and committed to continue to work with us to meet the goals and objectives of the BEMP. I asked if a specific statement emphasizing continued WGFD support of the BEMP goals and objectives could be added to their proposal and incorporated into the Wyoming Game and Fish Commission's action. They agreed to include this language in a draft proposal, have it reviewed by the WGFD Administration, and if approved, provide us a draft for our review prior to the WGF Commissioner's Meeting. We also agreed to support this approach by submitting a letter of support to the WGF Commission from the FWS and NPS.

Call if you have any questions,

Steve Kallin
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From: Brad Hovinga
To: Steve Kallin
Subject: Fwd: Re: Elk Objective
Date: Saturday, May 14, 2016 11:56:00 AM
Attachments: Jackson Elk Objective Review_5.14.16.docx

FYI,

I got your message. Call anytime.

Brad

---------- Forwarded message ----------
From: "Alyson Courtemanch" <alyson.courtemanch@wyo.gov>
Date: May 14, 2016 11:15 AM
Subject: Re: Elk Objective
To: "Doug Brimeyer" <doug.brimeyer@wyo.gov>
Cc: "Brad Hovinga" <brad.hovinga@wyo.gov>

Thanks! Please use this version, since I cleaned up some of the citations and also made some updates to the numbers in to the brucellosis/CWD sections with input from BFH. I pasted in the BEMP sentence in the same place.

Aly

On Fri, May 13, 2016 at 11:54 AM, Doug Brimeyer <doug.brimeyer@wyo.gov> wrote:

> I added the following language on page 13 for the proposed objective: Let me know if this works. Thanks.
>
> ....In addition, the WGFD will continue working with the NER and GTNP to achieve the goals outlined in the BEMP (2007).
>
> --
> Doug Brimeyer
> Jackson/Pinedale Wildlife Management Coordinator
> Wyoming Game and Fish Department
> doug.brimeyer@wyo.gov
> 307-733-2321 ext. 230
>
> E-Mail to and from me, in connection with the transaction of public business, is subject to the Wyoming Public Records Act and may be disclosed to third parties.

--
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JACKSON ELK HERD UNIT
POPULATION OBJECTIVE REVIEW
2016

Prepared by: Alyson Courtemanch, North Jackson Wildlife Biologist

Management Evaluation

Current Post-Season Population Objective: 11,000
Proposed Mid-Winter Trend Count Objective: 11,000
Management Strategy: Recreational

The Jackson Elk Herd covers 2,100 square miles north of the Town of Jackson, and resides on Bridger-Teton National Forest (BTNF), Grand Teton National Park (GTNP), the National Elk Refuge (NER), and private lands (Fig. 1). Approximately 200 square miles of the area is considered winter range. This herd unit includes Hunt Areas 70 – 72, 75, and 77-83. The herd unit is comprised of approximately 97% public land, including the Gros Ventre Wilderness and Teton Wilderness. The herd includes long-distance migratory segments that travel up to 60 miles between their winter and summer ranges and more resident segments that travel 5-10 miles between seasonal ranges. Management of this herd is complicated and involves a high degree of interagency coordination.

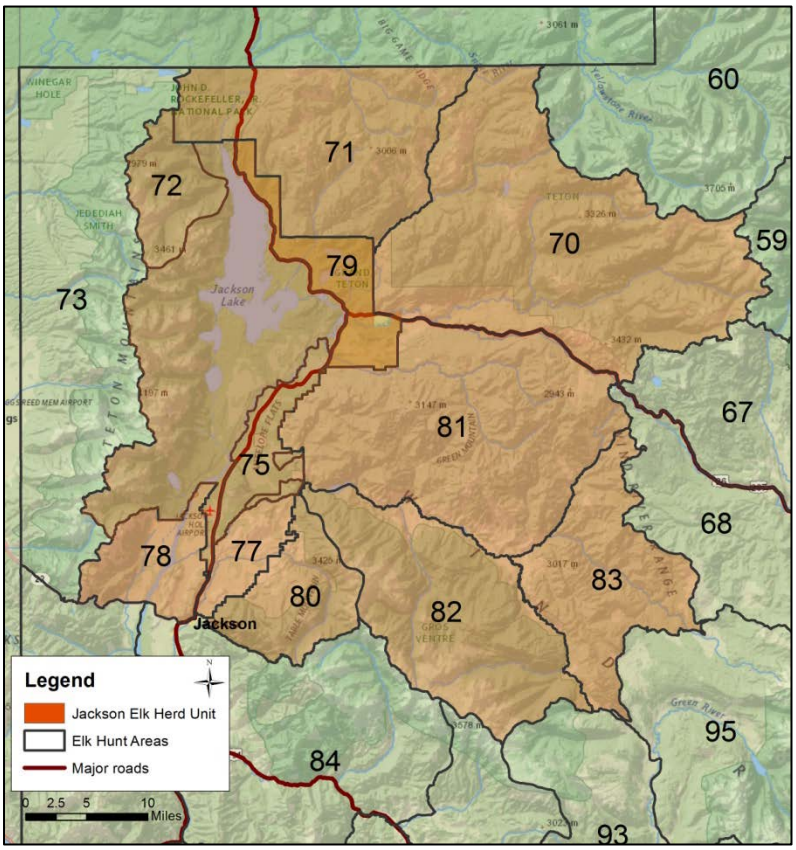


Fig. 1. Map of the Jackson Elk Herd Unit (orange shading) with hunt areas.

Population Objective Review

Background

For over 100 years, elk management and the number of elk in Jackson Hole have been controversial topics and attracted a high level of public interest. The first settlers arrived in Jackson Hole in the 1880s. At that time, it was estimated there were 15,000-25,000 elk in the Jackson Herd, which included the Hoback River drainage that is part of the Fall Creek Herd today (Cole 1969). Preble (1911) estimated that 20,000 elk summered north of Jackson, including 8,000 between the Gros Ventre and Buffalo Fork River and another 12,000 north of the Buffalo Fork and into southern Yellowstone National Park. Others speculated that the majority of the elk migrated out of Jackson Hole and wintered in the Green River Basin, Little Colorado Desert, and Red Desert (Murie 1945, Craighead 1952, Casebeer 1960, Cromley 2000). While it is likely that a segment of the herd spent the winter in Jackson Hole, wintering numbers were undocumented (Murie 1951). By 1895, market and "tusk" hunting (for elk upper canine "ivory" teeth), barbed wire fences, and retaliation for livestock conflicts had decimated elk migrations out of Jackson Hole (Smith et al. 2004). It was thought that by 1917, the majority of long-distance elk migrations out of Jackson Hole had disappeared (Allred 1950).

Permanent settlement in Jackson Hole was relatively rapid; the human population grew from 638 in 1900 to 1,500 by 1909 (Smith et al. 2004). With increasing settlement came livestock, buildings, extensive barbed wire fences, and the conversion of elk winter ranges to livestock pasture and hayfields. Homesteaders replaced native grasses and shrubs with smooth brome, timothy, and alfalfa grasses for hay and cultivated barley and oats for grain (Smith et al. 2004). Much of the limited elk winter range was converted to non-native grasses and either consumed by livestock in the summer or cut and stored as hay. At the same time, large scale reduction of large carnivores and improved law enforcement and hunting regulations bolstered the elk population. The Teton Game Preserve (covering most of today's Teton Wilderness) was established by the State of Wyoming in 1905 and closed to hunting to increase elk numbers (Smith et al. 2004). These changes, coupled with diminished winter ranges, loss of migration routes out of Jackson Hole, and periodic, severe winters caused high winter elk mortality in the late 1800s and early 1990s (Craighead 1952). The recognition of this emerging problem led the early residents of Jackson Hole to petition Congress for a solution. In 1912, Congress appropriated $50,000 for purchase of private lands to start the "Winter Elk Refuge" (Smith et al. 2004). Private lands were slowly purchased and incorporated into the Elk Refuge and by 1949, it totaled 23,000 acres. Winter feeding on the NER stabilized elk population numbers by reducing winter mortality (Smith & Robbins 1994).

Population goals for the Jackson Elk Herd were as high as 20,000 from 1927-1944 (Smith et al. 2004). However, by the 1940s and 1950s, multiple people expressed concern that too many elk were causing habitat degradation (Murie 1945, Craighead 1952). In 1942, approximately 11,000 elk were wintering on or adjacent to the NER. At that time, the Wyoming Game and Fish Department (WGFD) and U.S. Fish and Wildlife Service (USFWS) agreed to reduce winter elk numbers on the NER to 6,000-7,000 through legal hunting (Smith et al. 2004). In 1950, a U.S. Forest Service survey found that 75% of winter ranges in Jackson Hole and 67% in the Gros Ventre drainage were in poor or depleted condition (Craighead 1952, Casebeer 1960). Craighead

(1952) found that the current population of 17,000 elk was twice as large as what winter habitat could support and recommended the herd be reduced to 8,000-9,000 elk.

In 1929, GTNP was established but only included lands west of the Snake River. At this time, NER staff were cutting and baling hay on the Kelly Hayfields and Elk Ranch to feed elk in the winter, along with hay produced on the NER. In 1950, GTNP was expanded to include most of the sagebrush-grassland areas and livestock pasture/hayfields east of the Snake River, which was known as the Central Valley. This appears to have resulted in a surge in the elk population as grasslands that were formerly fenced and hayed now provided spring, summer, and fall forage for elk and other wildlife (Cole 1969, Boyce 1989). The expansion of GTNP was surrounded by much public debate and opposition from the WGFD, which centered on the management of the Jackson Elk Herd (Boyce 1989). The WGFD was concerned that without hunting in that area, management of the Jackson Elk Herd would become untenable. As a compromise, Public Law 81-787 was created by Congress, which allows controlled elk hunting in a portion of GTNP by hunters licensed by the State of Wyoming and deputized by the Secretary of the Interior.

A great deal of disagreement arose between the WGFD, National Park Service (NPS), and USFWS by the early 1970s with regard to the management of the elk herd. As a result, a Cooperative Agreement between the WGFD and USFWS was developed in 1974 which described and delineated various responsibilities regarding management of elk on the NER. This agreement set a maximum of 7,500 elk wintering on the NER (68% of herd). By the next winter, numbers rose to 8,373 elk on and adjacent to the NER and again the agencies disagreed on the number in the Cooperative Agreement. Agency personnel then proposed the number be changed from a maximum to a five-year average. This was never officially adopted but was mutually understood that we were using an average of 7,500 elk (Wilbrecht 1984).

Up until 1978, elk numbers were managed around feedground quotas in the herd unit including 7,500 on the NER, 2,400 on the Gros Ventre feedgrounds, and 2,000 on native winter ranges for a total of 11,900 elk. From 1978-1980 the population objective was decreased to 11,250 because elk numbers were low on the NER. Prior to 1987, elk were counted from the ground on the feedgrounds and from fixed-wing aircraft on native winter ranges. After 1987, helicopter surveys were implemented on native winter ranges. From 1981-1982, the population objective for the herd was 12,000 elk (WGFD 1981, WGFD 1982). In 1983, a new objective was set at 11,250. At the time only 5,000 elk wintered on the NER and the population was estimated at 8,000 elk based on a fixed wing aircraft survey that counted 7,665 elk.

A formal Herd Unit objective was set in 1986 at 11,029 elk. The new objective included quotas of 800 elk on the Alkali Feedground, 1,000 elk on the Fish Creek Feedground, 620 elk on the Patrol Cabin Feedground, 7,500 elk on the NER, and 10% or 1,109 on native winter ranges. In 1986, personnel counted 11,276 elk and estimated the population at 11,800 elk. The public still perceived elk numbers to be too low and wanted conservative hunting seasons. As a result, conservative seasons were in place through 1988. By 1988, 14,919 elk were counted on feedgrounds and with a helicopter and the population was estimated at 15,500 elk.

Herd segments and seasonal migrations

Management of the Jackson Elk Herd is complicated and challenging because various herd segments utilize GTNP, BTNF, the NER, and private lands over the course of a year. The Jackson Elk Herd is comprised of three major summer segments: 1) Yellowstone/Teton Wilderness, 2) Gros Ventre, and 3) Grand Teton National Park/Snake River Bottom. The majority of elk that summer in Yellowstone/Teton Wilderness migrate long distances (up to 60 miles) to the NER to spend the winter (Fig. 2), but a small percentage also remains on native winter ranges in the Buffalo Valley/Spread Creek area. Elk that summer in the high elevations of the Gros Ventre drainage generally migrate to Gros Ventre feedgrounds and native winter ranges (Fig. 2), although it has become increasingly common for some Gros Ventre elk to spend the winter on the NER. Elk that summer in GTNP and on private lands in the Snake River Bottom close to the Town of Jackson migrate shorter distances to the NER to winter.

Smith & Robbins (1994) found that of 85 adult elk captured and radio-collared on the NER from 1978-1982, 40% summered in Yellowstone/Teton Wilderness, 12% in the Gros Ventre drainage, and 48% in GTNP (with 10% migrating to southern GTNP). Fidelity to summer ranges was extremely high at 98%. More recent work by Cole et al. (2015) found that now only 10% of radio-collared elk migrate to Yellowstone/Teton Wilderness, while 40% migrate to southern GTNP/Snake River Bottom. These findings indicate that the proportion of short-distance migrants in the herd has increased while long-distance migrants have declined. Differences in calf recruitment is the driving factor behind these recent changes, likely caused by varying elk calf predator densities and habitat conditions (Barber-Meyer et al. 2008, Middleton et al. 2013, Cole et al. 2015). In addition, elk from Yellowstone/Teton Wilderness that winter in the Buffalo Valley and northern GTNP experience winter wolf predation (Stephenson et al. 2012). Stephenson et al. (2012) found that over three winters (2010-2012), wolves preyed primarily on elk (66%) and moose (32%) in this area. In winter 2012, adult bulls comprised 45% of elk kills along with 23% cows, 14% yearlings, and 18% calves (Stephenson et al. 2012). Hunting seasons in recent years have been structured to reduce harvest pressure on cows and calves in the Yellowstone/Teton Wilderness and Gros Ventre herd segments while maintaining pressure on the growing herd segment of short-distance migrants in southern GTNP/Snake River Bottom.

Habitat

As evidenced by relatively high winter elk mortality during some years prior to the establishment of feedgrounds, Jackson Hole is a difficult place for elk to spend the winter. While some winters can be mild with little snowfall, other winters can produce deep, crusted snow that persists for much of the season. Snow crust or hardness affect forage availability to elk based on a function of snow depth (Bailey 1999). With no crust and low density, snow depth begins to affect elk foraging efficiency at 10 cm, but elk have been observed using areas with snow depths of 60-115 cm (Bailey 1999). Several studies have attempted to evaluate winter carrying capacities under different habitat and weather conditions for all or portions of the Jackson Elk Herd (Bailey 1999, Hobbs et al. 2003, WGFD 2006). Bailey (1999) estimated that the winter carrying capacity on the NER ranged from 4,500-8,300 elk based on average winters and least and most productive forage years. Hobbs et al. (2003) estimated the equilibrium point between forage supply and

demand for the entire Jackson Elk Herd, instead of carrying capacity. During normal winters following average growing seasons, approximately 16,000 elk could be sustained, with 5,000 on the NER. However, during severe winters following average growing seasons, only approximately 1,000 elk could be sustained. These numbers are not starvation thresholds, but instead an indication of how many elk could be supported without a high potential for conflict such as elk raiding livestock feedlines, hay stacks, and/or private landscaping.

The WGFD has partnered with BTNF, GTNP, and multiple funding partners such as the Rocky Mountain Elk Foundation and Wyoming Wildlife and Natural Resources Trust to implement elk habitat improvement projects. Since the 1970s, thousands of acres of elk winter, transitional, and summer ranges have been improved through prescribed burning. Managers have spent considerable effort and funds treating aspen stands in the Gros Ventre drainage and in the Buffalo Valley area to improve elk winter range. In addition, the WGFD supports BTNF in managing natural wildfires in Wilderness areas to improve forest structural and age class diversity on the landscape.

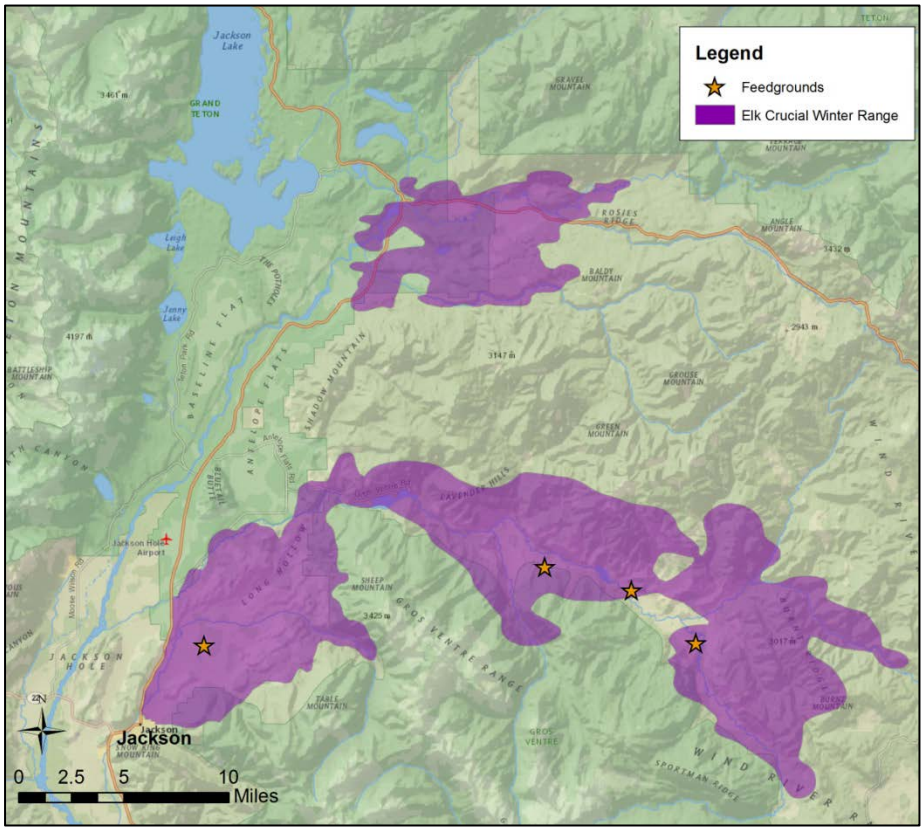


Fig. 2. Crucial winter ranges (purple polygons) in the Jackson Elk Herd. Feedgrounds (orange stars) are located in the Gros Ventre drainage and NER.

Feedgrounds

Winter elk feeding was initiated on the NER in 1912. Winter feeding in the Gros Ventre drainage was done on an emergency basis by local ranchers or the WGFD until the 1950s when the state-operated Alkali, Patrol Cabin, and Fish Creek feedgrounds were established (Anderson 1958) (Fig. 2). Few details are known about the actual feeding of elk in the Gros Ventre prior to 1949. It appears that efforts to prevent starvation were mostly "token" and were not always successful. Anderson (1958) stated that feeding in the Gros Ventre was done on an emergency basis and the number fed remained small until 1956. Elk have also been fed in various temporary locations over the years to address comingling with livestock and damage concerns, including many years in the Buffalo Valley. Historically, the Blackrock feedground, located in the Buffalo Valley, was used on an annual basis beginning in the early 1930s. It was moved several times and was finally terminated in 1971 (North 1990, WGFD 1991). Feeding was discontinued in an effort to compel the elk into using the larger feedgrounds of the Gros Ventre and NER instead. However, chronic elk and livestock comingling issues persist in the Buffalo Valley and have resulted in emergency elk feeding taking place during many years.

The State of Wyoming passed a crop damage law in 1937 that allowed landowners to submit claims for reimbursement from big game damage on their property. In addition, WGFD is committed to preventing elk/livestock comingling, particularly during winter and early spring when the majority of brucellosis-induced abortion events occur and the risk of interspecific transmission is highest. Feedgrounds act as a tool to keep elk spatially segregated from livestock, hay, and private property during the winter. In addition, feedgrounds lower winter elk mortality rates. However, feedgrounds create high densities of elk in relatively small areas, which can result in increased transmission of disease and habitat degradation both on and adjacent to feedgrounds.

Annually, WGFD personnel employ a variety of damage control techniques to maintain spatial and temporal separation of elk and livestock. The WGFD has a long-standing practice of providing game-proof stackyard fencing to private producers to prevent elk from depredating privately owned stored hay crops and to discourage elk from frequenting cattle feeding areas. Other techniques include hazing animals away with pickup trucks, snowmobiles, helicopters, WGFD personnel on snowshoes, and/or noise-making devices, and in some areas setting extended hunting seasons on private lands in areas of chronic damage. By preventing elk from establishing feeding patterns in livestock wintering areas, the potential for interspecific brucellosis transmission can be reduced.

Bison and Elk Management Plan

The NPS and USFWS initiated the Bison and Elk Management Plan and Environmental Impact Statement in 2000, with the WGFD and U.S. Forest Service as cooperating agencies. The final plan, completed in 2007, guides the portions of Jackson Elk Herd management that GTNP and the NER are responsible for (National Elk Refuge and Grand Teton National Park 2007). The 15 year plan calls for interagency coordination between the federal agencies and the WGFD to achieve population objectives (including herd ratios and herd segment sizes). Following the

initial implementation of a phased approach, approximately 5,000 elk are expected to winter on the NER. Bison and elk hunting on the NER, and when necessary, the elk reduction program in GTNP, are used to assist the state in managing herd sizes, sex and age ratios, and summer distributions. The plan also calls for improvements to winter and yearlong habitat on the NER, GTNP, and BTNF to reduce elk reliance on supplemental feeding.

Current Herd Unit Objective and Management Strategies

Population trend

The Jackson Elk Herd increased in the late 1980s and early 1990s due to public demand for conservative hunting seasons (Fig. 3). At its peak in 1996, managers counted over 15,000 elk during the mid-winter trend count. Since then, hunting seasons have been structured to reduce the herd toward its 11,000 objective. The 2015 classification totaled 10,668 elk, with 81% on feedgrounds and 19% on native winter ranges. Calf:cow ratios have decreased since the late 1980s when they averaged 30 calves:100 cows (Fig. 4). The average for the past 3 years (2013-2015) is 20 calves:100 cows. This reduction in calf recruitment is likely due to a combination of increasing grizzly bear densities (Barber-Meyer et al. 2008, Foley et al. 2015), increasing wolf densities, and long-term drought impacts to habitat conditions and pregnancy rates (Middleton et al. 2013). Wolves expanded from Yellowstone National Park and began re-colonizing the Jackson Hole area beginning in about 1998. Grizzly bear populations also rebounded and expanded into much of the Jackson Elk Herd by 2000 (Pyare et al. 2004). Despite this decrease in calf:cow ratios compared to 30 years ago, the current population trend appears stable (Fig. 3), following a more conservative hunt season structure.

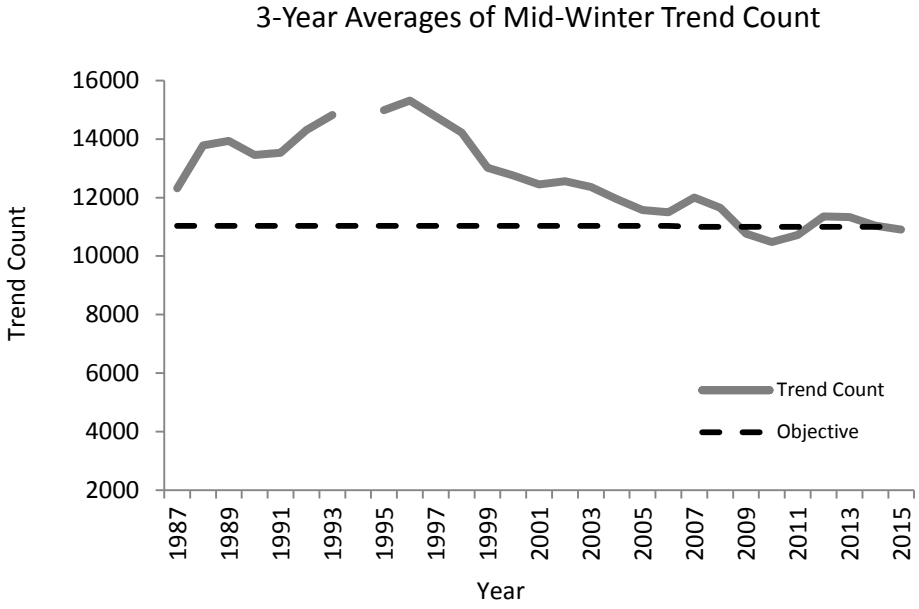


Fig. 3. Three-year running average of Jackson Elk Herd mid-winter trend counts, 1987-2015. Prior to 1987, elk were classified on native winter ranges using fixed-wing aircraft instead of helicopters.

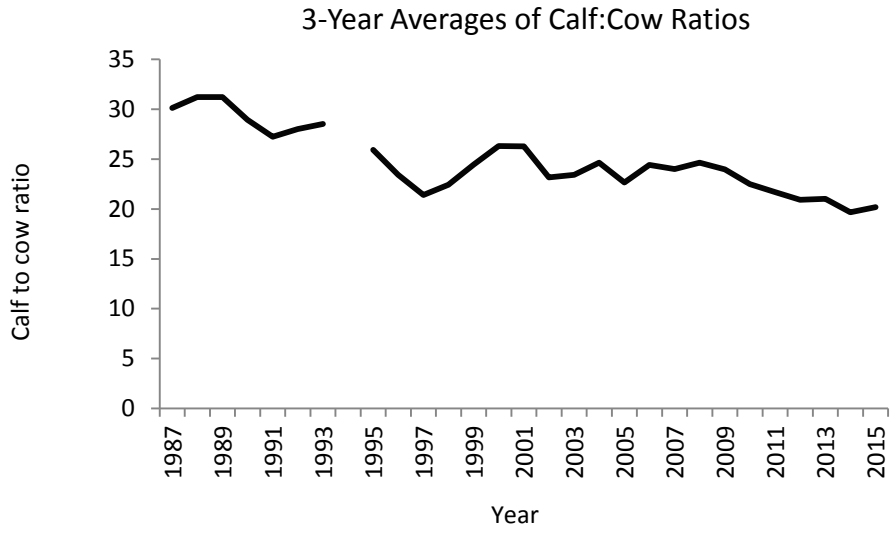


Fig. 4. Three-year running average of Jackson Elk Herd calf:cow ratios, 1987-2015.

Hunting seasons

The Jackson Elk Herd attracts hunters due to 1) having several general elk license hunt areas, 2) a diversity of hunting experiences ranging from multi-day backcountry hunts to private lands hunts close to town, and 3) a well-known reputation for bull quality. The local economy and culture in Jackson have developed around elk hunting and elk viewing for over 100 years, and many local businesses are centered on elk hunting. Elk harvest in the Jackson Herd has been as high as 4,200 animals in the past (Fig. 5). Harvest levels peaked in the late 1970s/early 1980s and in the early 1990s. Harvest levels have been steadily decreasing since 1995 and in recent years, harvest is in the range of 1,000 – 1,700 animals (Fig. 5). The number of hunters follows a similar trend with numbers peaking in the late 1970s/early 1980s and to a lesser extent in the early 1990s (Fig. 6). At its peak in 1978, there were over 14,000 active hunters in the Jackson Elk Herd. In 2015, there were 3,211 hunters which included 2,281 residents and 930 nonresidents (Fig. 6). Although the total harvest and number of hunters have decreased since the mid-1990s, harvest success has increased (Fig. 7). Harvest success over the past 3 years has averaged 46%, which is higher than the average 26% success rate during peak hunting from 1975-1982 (Fig. 7).

In recent years, hunting seasons have been structured to address relatively low calf:cow ratios in backcountry areas by restricting general seasons to antlered elk only in most areas (Hunt Areas 70, 71, 81, 82, and 83). Meanwhile, more liberal seasons with either general or limited quota licenses valid for both bulls and cow/calf elk take place in the southern portion of the herd unit to address high calf:cow ratios of elk that summer in southern GTNP and private lands close to Jackson. The goal of this hunting season structure is to minimize harvest pressure on the reproductive portions of the herd (cows) in the backcountry segments while maintaining harvest levels on the southern herd segments to keep the population near the 11,000 objective.

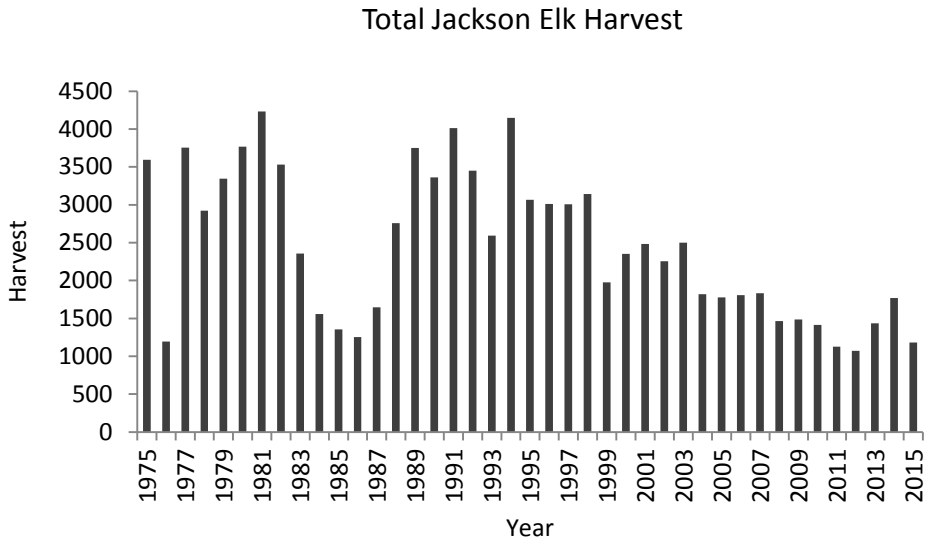


Fig. 5. Total annual elk harvest in the Jackson Elk Herd, 1975-2015.

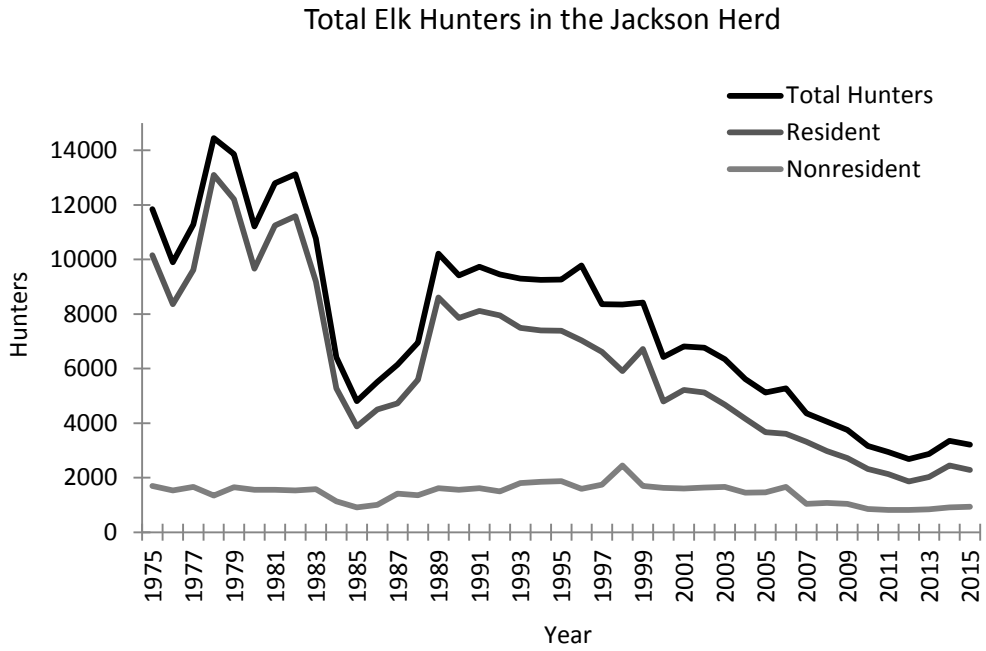


Fig. 6. Total annual elk hunters in the Jackson Elk Herd, 1975-2015.

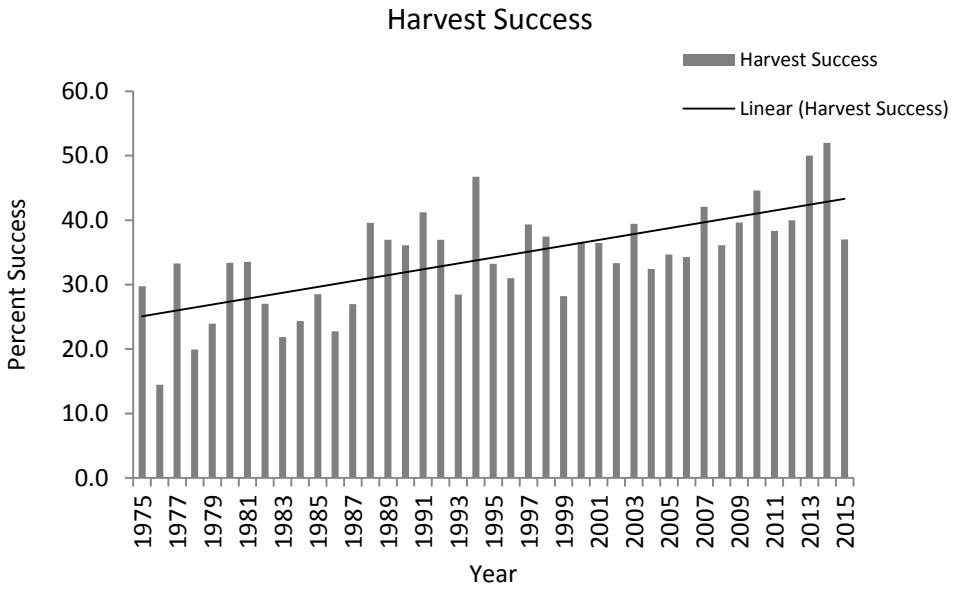


Fig. 7. Percent annual harvest success in the Jackson Elk Herd, 1975-2015. Trend line (black line) shows general increase in harvest success.

Current research

Since 1998, over 150 elk have been GPS-collared in the Jackson Herd by the Jackson Cooperative Elk Studies Group, which is comprised of the WGFD, GTNP, NER, and BTNF (Fig. 8). This collaborative research is aimed at monitoring elk movements, seasonal range use, survival, pregnancy, and vulnerability to harvest over time. Currently, the group is tracking approximately 80 collared elk in various herd segments. In winter 2016, seven elk were darted at the Fish Creek feedground and outfitted with GPS collars and 30 elk were darted on the NER and outfitted with Iridium satellite collars. Plans are in place to capture and collar an additional 12 elk during summer 2016 in southern Yellowstone National Park and northern GTNP. This ongoing research is crucial to understanding the timing of elk migration and formulating hunting seasons that afford more protection for elk this segment of the population.

Brucellosis

Brucellosis, caused by infection with the bacterium *Brucella abortus*, has sparked controversy because of its persistence in elk and bison of the Greater Yellowstone Ecosystem in Wyoming, Montana, and Idaho and the threat of disease spillover to domestic livestock (Thorne et al. 1978). Presumably, *B. abortus* was transmitted from domestic livestock to free-ranging bison and elk just prior to 1917 after repetitive comingling and subsequent contact with aborted fetuses contaminated with brucellosis (Meagher & Meyer 1994). *Brucella* transmission usually occurs via the oral route, with ingestion of bacteria that are shed by infected females in high numbers in aborted fetuses, fetal membranes and fluids, or uterine discharges (Thorne et al. 1982, Cheville et al. 1998). The WGFD has monitored brucellosis seroprevalence in elk in western Wyoming for many years. Seroprevalence levels in elk average 29.6% on state-operated feedgrounds in the

Gros Ventre (1990-2015) and 29.4% on the NER (1985-2015) (Scurlock and Edwards 2010, WGFD 2014).

WGFD is committed to preventing elk/livestock comingling, particularly during winter and early spring when the majority of brucellosis-induced abortion events occur. The WGFD produced the Jackson Elk Herd Brucellosis Management Action Plan (BMAP) in 2007, and is updating the plan in 2016. This plan lays out brucellosis management options and best management practices. The WGFD currently employs several methods to minimize interspecific transmission of brucellosis from elk to livestock and intraspecific transmission of brucellosis from elk to elk on feedgrounds (WGFD 2007). Elk feeders are encouraged to feed hay on clean snow when

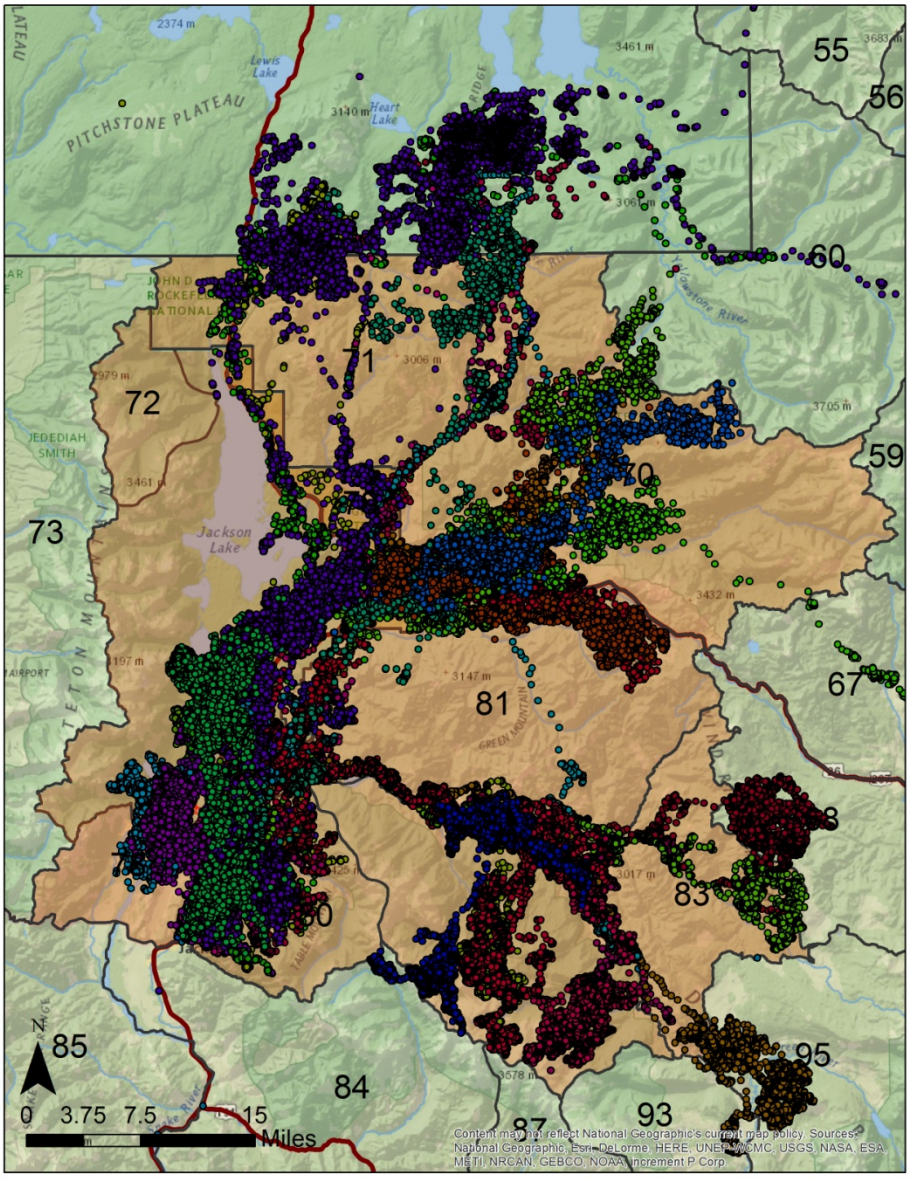


Fig. 8. A subset of GPS-collared elk movements between winter and summer ranges in the Jackson Elk Herd. Individual elk are represented by different colored dots. The Jackson Elk Herd Unit area is shown as orange shading.

possible and recover aborted fetuses to reduce inadvertent ingestion of contaminated feed and exudates. Attempts have been made to increase the dispersal of hay and reduce the duration of the feeding season on each feedground on a case-by-case basis. However, damage and elk/livestock comingling concerns typically determine the duration of supplemental feeding on most feedgrounds.

Damage and elk/livestock comingling contribute to increased risk of intraspecific disease transmission among elk. In most circumstances, elk are not tolerated consuming private crops and comingling with cattle. Strategies to hold elk on artificial feed longer and hazing elk to feedgrounds are often employed to minimize these conflicts. These practices increase the chance that an aborted fetus contaminated with *Brucella* will be contacted by elk wintering on feedgrounds, thus increasing exposure rates among elk.

Chronic wasting disease

Chronic wasting disease (CWD) is a member of a group of diseases termed transmissible spongiform encephalopathies (TSEs) and is a fatal disease of cervids (deer, elk, and moose). The WGFD conducts extensive surveillance for CWD in the Jackson Elk Herd annually, with funding support from the NER. The highest yielding method of collecting elk samples (lymph nodes) for subsequent CWD testing in the Jackson region comes from hunter contacts in the field, especially those within GTNP and the NER. Successful hunters whose animals are not sampled in the field are requested to deposit heads with attached harvest information in bear-proof containers placed at various locations. Also, many samples are obtained though the cooperation of local game meat processors. CWD samples are also collected from road-killed and “targeted” animals (euthanized due to illness) throughout the year. Test results are reported to hunters typically within three weeks of sample submission. Hunters can obtain results by accessing the Department’s website, and hunters that submit a positive sample are notified via phone and letter. The WGFD also notifies other state wildlife agencies if a hunter from their state harvests a CWD test-positive animal in Wyoming. During calendar year 2015, 301 samples were collected from the Jackson Elk Herd, which all tested as negative. At this time, no animal has tested positive for CWD from the Jackson Elk Herd Unit area, including elk, deer, or moose.

Early mathematical models predicted CWD would drive affected cervid populations to extinction (Gross & Miller 2001). More recent modeling suggests CWD may have a population level impact in Rocky Mountain National Park elk (Monello et al. 2013, Monello et al. 2014), while other research suggests certain populations may be able to survive through disease-driven genetic selection (Robinson et al. 2012, Williams et al. 2014). The WGF Commission adopted a Chronic Wasting Disease Management Plan in 2016 that outlines an adaptive management strategy allowing flexibility to alter disease management activities depending on future research findings, CWD distribution, prevalence, funding, and level of concern (from publics, WGFD and other governmental agencies).

Recommended Herd Unit Objective

Jackson Region wildlife personnel recommend changing the objective for the Jackson Elk Herd from a Post-Season Population Objective to a Mid-Winter Trend Count Objective. New spreadsheet models initiated in 2012 do not adequately simulate population trends for the Jackson Herd. The approach of using a mid-winter trend count will allow regional personnel to monitor population trends, while recognizing that no working spreadsheet model exists for the population. The objective is scheduled to be reviewed again in 2021.

We propose the following objective for the Jackson Elk Herd:

Manage for a mid-winter trend count of 11,000 elk, which will be estimated using ground classifications on feedgrounds and aerial surveys on native winter ranges. Mid-winter trend counts will be analyzed using a 3-year running average. The population will be managed for ± 20% of the objective (range of 8,800 to 13,200). This population is Recreational Management, meaning management for a post-season ratio of 15 - 29 bulls: 100 cows. In addition, the WGFD will continue working with the NER and GTNP to achieve the goals outlined in the BEMP (2007).

Justification

Since 1978, the population objective has been set between 11,000 and 11,250 elk. Trend counts for the Jackson Elk Herd have been within 11,000 ± 20% since 1998. The most recent trend count in February 2016 was 10,668 elk. Currently, most of the Jackson Elk Herd spends the winter on either state-operated feedgrounds or the NER, which makes mid-winter classifications relatively accurate for the majority of the herd. Therefore, it is reasonable to expect that mid-winter trend counts using ground and aerial classifications will accurately represent herd changes over time. In addition, the recreational management goal of 15 - 29 bulls:100 cows has been achieved or surpassed since at least 1970 in the Jackson Herd. The last 5-year average was 31.9 bulls:100 cows.

Reducing the Jackson Elk Herd objective is not proposed and it is anticipated that the general public would not support a population goal with fewer elk. Reducing the herd objective would likely require extending hunting seasons and would increase the vulnerability of the Yellowstone/Teton Wilderness and Gros Ventre herd segments to harvest. The relatively low calf:cow ratios in these herd segments make them sensitive to over-harvest and potential loss of traditional migrations over time. The population objective could be reevaluated within five years if major management changes occurred in the Jackson Elk Herd within the next 5 years.

Public/Agency Involvement

The Bridger-Teton National Forest Supervisor and District Rangers were notified of the objective changes in the Jackson Region during the annual BTNF/WGFD Coordination meeting

on March 17, 2016 in Jackson. Additionally, the proposal will be discussed at the Interagency Elk Studies Group Meeting on May 3, 2016. This proposal was forwarded to Grand Teton National Park, National Elk Refuge, and Bridger-Teton National Forest staff for review on April 21, 2016.

Management data and the schedule to review the herd objective were discussed during the public season setting meeting in Jackson March 17, 2016 and at a Jackson Hole Outfitters and Guides Association meeting on March 2, 2016.

The proposal will be presented at a public meeting in Jackson on April 25, 2016. A news release was distributed on April 19, 2016 to the Jackson Hole News and Guide and over 7,000 personal subscribers to the Department's Jackson Region email list. An article featuring the proposed Jackson Elk Herd Objective changes appeared on the front page of the April, 25, 2016 edition of the Jackson Hole News and Guide.

References

Allred, W.J. 1950. Re-establishment of seasonal elk migration through transplanting. Transactions of the North American Wildlife Conference 15:597-611.

Anderson, C.C. 1958. The elk of Jackson Hole. Bull. 10. Wyoming Game and Fish Commission. 184 pp.

Bailey, J. R. 1999. A working model to assist in determining initiation of supplemental feeding of elk and a carrying capacity model for the National Elk Refuge, Jackson, Wyoming. M.S. Thesis. University of Wyoming. Laramie, Wyoming. 83pp.

Barber-Meyer, S.M., L.D. Mech, and P.J. White. 2008. Elk calf survival and mortality following wolf restoration to Yellowstone National Park. Wildlife Monographs 169:1-30.

Barbknecht, A.E., W.S. Fairbanks, E.J. Maichak, J.D. Rogerson, and B. Scurlock. 2008. Elk parturition site selection at local and landscape scale in western Wyoming. M. S. Thesis, Iowa State University, Ames, IA. 97pp

Boyce, M.S. 1989. The Jackson herd: intensive wildlife management in North America. Cambridge University Press, Cambridge, United Kingdom.

Casebeer, R.L. 1960. A preliminary chronology and bibliography on the Jackson Hole elk herd and closely related materials. Special Report by USFS, Jackson WY.16pp.

Cheville, N.F., D.R. McCullough, and L.R. Paulson. 1998. Brucellosis in the Greater Yellowstone area. National Research Council, Washington, D.C., USA.

Cole, G.F. 1969. The elk of Grand Teton and southern Yellowstone National Parks. National Park Service Res. Rpt. GRTE – N – 1. Washington, D. C. 80pp.

Cole, E.K., A.M. Foley, J.M. Warren, B.L. Smith, S.R. Dewey, D.G. Brimeyer, W.S. Fairbanks, H. Sawyer, and P.C. Cross. 2015. Changing migratory patterns in the Jackson Elk Herd. Journal of Wildlife Management 79:877-886.

Coughenour, M.B. and F.J. Singer. 1996. Elk population processes in Yellowstone National Park under the policy of natural regulation. Ecological Applications 6: 573-593.

Craighead, J .J. 1952. A biological and economic appraisal of the Jackson Hole elk herd. New York Zoological Society, New York, NY.

Cromley, C.M. 2000. Historical Elk Migrations Around Jackson Hole, Wyoming. *In* "Developing Sustainable Management Policy for the National Elk Refuge, Wyoming. Yale School of Forestry and Environmental Studies. Bull. No. 104. pp. 53-65.

Cross, P. C., W. H. Edwards, B. M. Scurlock, E. J. Maichak, and J. D. Rogerson. 2007. Effects of management and climate on elk brucellosis in the Greater Yellowstone Ecosystem. Ecological Applications 17: 957-964.

Foley, A.M., P.C. Cross, D.A. Christianson, B.M. Scurlock, and S. Creel. 2015. Influences of supplemental feeding on winter elk calf:cow ratios in the southern Greater Yellowstone Ecosystem. Journal of Wildlife Management 79:887-897.

Gross, J.E. and M.W. Miller. 2001. Chronic wasting disease in mule deer: disease dynamics and control. Journal of Wildlife Diseases 65:205-215.

Hobbs, N. T., G. Wockner, and F. J. Singer. 2003. Assessing management Alternatives for ungulates in the Greater Teton Ecosystem using simulation modeling. Natural Resources Ecology Laboratory, Fort Collins, CO., 63pp.

Houston, D.B. 1982. The Northern Yellowstone elk. Macmillan Publishing, New York, New York, USA.

Meagher, M. and M.E. Meyer. 1994. On the origin of brucellosis in bison of Yellowstone National Park: a review. Conservation Biology 8:645-653.

Middleton, A.D., Morrison, T.A., Fortin, J.K., Robbins, C.T., Proffitt, K.M., White, P.J., McWhirter, D.E., Koel, T.M., Brimeyer, D.G., Fairbanks, W.S., and M.J. Kauffman. 2013. Grizzly bear predation links the loss of native trout to the demography of migratory elk in Yellowstone. Proc R Soc B 280: 20130870. http://dx.doi.org/10.1098/rspb.2013.0870

Monello, R.J., J.G. Powers, N.T. Hobbs, T.R. Spraker, K.I. O'Rourke, and M.A. Wild. 2013. Efficacy of antemortem rectal biopsies to diagnose and estimate prevalence of chronic wasting disease in free-ranging cow elk (Cervus elaphus nelsoni). Journal of Wildlife Diseases 49(2):270-278.

Monello, R.J., J.G. Powers, N.T. Hobbs, T.R. Spraker, M.K. Watry, and M.A. Wild. 2014 Survival and population growth of a free-ranging elk population with a long history of exposure to chronic wasting disease. Journal of Wildlife Management 78(2):214-223.

Murie, O.J. 1945. Our big game in winter. Transactions of the North America Wildlife Conference 9:173-176.

Murie, O.J. 1951. The Elk of North America. Stackpole Books, Harrisburg, PA.

National Elk Refuge and Grand Teton National Park. 2007. Final Bison and Elk Management Plan and Environmental Impact Statement for the National Elk Refuge/Grand Teton National Park/John D. Rockefeller, Jr., Memorial Parkway. U.S. Fish and Wildlife Service, Region 6, Denver, CO. 605 pp. http://www.fws.gov/bisonandelkplan

North, D. 1990. The Buffalo Valley elk enhancement project, 1990 annual report. Wyoming Game and Fish Department. Cheyenne, Wyoming, USA.

Preble, E.A. 1911. Report on Conditions of elk in Jackson Hole, Wyoming, in 1911. U.S.D.A. Biol. Bull. 40, 23 pp.

Pyare, S., S. Cain, D. Moody, C. Schwartz, and J. Berger. 2004. Carnivore re-colonisation: reality, possibility and a non-equilibrium century for grizzly bears in the Southern Yellowstone Ecosystem. Animal Conservation 7:1-7.

Scurlock, B.M. and H.E. Edwards. 2010. Status of Brucellosis in Free-Ranging Elk and Bison in Wyoming. Journal of Wildlife Diseases. 46 (2): 442-449.

Sheldon, C. 1927. The conservation of the elk of Jackson Hole, Wyoming. A report to Honorable Dwight F. Davis, Secretary of War, Chairman of the President's Committee on Outdoor Recreation, and Honorable Frank C. Emerson, Governor of Wyoming. Washington, D.C. 36 pp.

Singer, F.J. and L.C. Zeigenfuss. 2003. A survey of willow communities, willow stature and production, and correlations to ungulate consumption and density in the Jackson valley and the National Elk Refuge. USDI, Geological Survey, Biological Resources Division, Fort Collins, CO. Unpublished report.

Smith, B.L. and R.L. Robbins. 1994. Migrations and management of the Jackson elk herd. National Biological Survey Resource Publication 199, Washington, D.C., USA.

Smith, B.L. and S.H. Anderson. 1996. Patterns of neonatal mortality of elk in northwestern Wyoming. Canadian Journal of Zoology. 74:1229–1237.

Smith, B.L., R.L. Robbins, and S.H. Anderson. 1997. Early development of supplementally fed, free-ranging elk. Journal of Wildlife Management. 61:26–38.

Smith, B.L. 2001. Winter feeding of elk in western North America. Journal of Wildlife Management 65: 173-190.

Smith, B., E. Cole, and D. Dobkin. 2004. Imperfect pasture: a century of change at the National Elk Refuge in Jackson Hole, Wyoming. Grand Teton Natural History Association, Moose, WY. 156 pp.

Stephenson, J., M. Jimenez, S. Dewey, and S. Cain. 2012. Wildlife research: wolf predation. *In* Wildlife Conservation, Management, and Research 2012. *Ed*. Steve Cain, Division of Science and Resource Management, Grand Teton National Park, pp. 56-57.

Robinson, S.J., M.D. Samuel, C.J. Johnson, M. Adams, and D.I. McKenzie. 2012. Emerging prion disease drives host selection in a wildlife population. Ecological Applications 22(3):1050-1059.

Thorne, E.T., J.K. Morton, F.M. Blunt, and H.A. Dawson. 1978. Brucellosis in elk. II. Clinical effects and means of transmission as determined through artificial infections. Journal of Wildlife Diseases 14:280-291.

Thorne, E.T. 1982. Brucellosis. Pages 54-63 *in* E.T. Thorne, N. Kingston, W.R. Jolley, and R.C. Bergstrom, editors. Diseases of wildlife in Wyoming. Second edition. Wyoming Game and Fish Department, Cheyenne, Wyoming, USA.

Wachob, D. and C. Smith 2003. Elk migration through a human dominated landscape in Jackson Hole, Wyoming. Final report.

Wilbrecht, J. 1984. How the objective of an average of 7,500 winter elk on the National Elk Refuge was arrived at. Unpublished report. April 20, 1984.

Williams, A.L., T.J. Kreeger, and B.A. Schumaker. 2014. Chronic wasting disease model of genetic selection favoring prolonged survival in Rocky Mountain elk (Cervus elaphus). Ecosphere 5(5):1-10.

Wyoming Game and Fish Department. 2006. Evaluation of a proposal from the Wyoming Outdoor Council, Greater Yellowstone Coalition, and Jackson Hole Conservation Alliance for a phase out of elk feeding in the Gros Ventre. Unpublished report. 37 pp.

Wyoming Game and Fish Department. 2007. Jackson Elk Herd Unit Brucellosis Management Action Plan. https://wgfd.wyo.gov/Wildlife-in-Wyoming/More-Wildlife/Wildlife-Disease/Brucellosis/Brucellosis-Reports. 118 pp.

Wyoming Game and Fish Department. 1981. Jackson Elk Herd. Big Game Job Completion Reports. Cheyenne, Wyoming, USA.

Wyoming Game and Fish Department. 1982. Jackson Elk Herd. Big Game Job Completion Reports. Cheyenne, Wyoming, USA.

Wyoming Game and Fish Department. 1991. Jackson Elk Herd. Big Game Job Completion Reports. Cheyenne, Wyoming, USA.

Wyoming Game and Fish Department. 2014. Jackson Elk Herd. Job Completion Report. Cheyenne, Wyoming, USA. https://wgfd.wyo.gov/Hunting/Job-Completion-Reports.

From:	Cole, Eric
To:	Bryan Yetter; Aly Courtemanch; Amanda Soliday; Barbara Long; Benjamin Wise; Bert Raynes; Brad Hovinga; Brandon Scurlock; Brian Smith; Bruce Smith; Carl Brown; Carol Clarke; Carol Cunningham; Center Visitor; Chris Colligan; Chuck Harris; Chuck Schneebeck; Corinna Reginos; Cris Dippel; Daniel Huckel; Dave Gustine; Deb Patla; Dispatch GTNP; Doug Brimeyer; Elizabeth Schooner; Elizabeth Sunshine; Eric Cole; Erika Edmiston; Fernando Escobedo; Franz Camenzind; Geneva Chong; Jeffrey Warren; Jennifer Ballard; Jill Randall; Jim Griffin; Joe Bohne; Joe Lozar; John Stephenson; jonathan stephens; Julie Godfrey; Justin Walters; Katherine Spomer; Keith Aune; Kerry Murphy; Kim Booher; Kurt Johnson; Lee Jones; Lloyd Dorsey; Lori Iverson; Lori Johnson; Mark Gocke; Michael Nordell; Mike Jimenez; Mike Koshmrl; Millie Parks; Natalie Fath; Patty Ewing; Paul Hood; Paul Santavy; Phil Hocker (i5); Renee Seidler; roger hayden; samantha gibbs; Sarah Dewey; Scolnick, Claire; Siva Sundaresan; Steve Cain; Steve Kallin; Steve Kilpatrick; Steve Koob; Susan G. Clark; Susan Patla; Terry Roper; Timothy Pratt; Todd Stiles; Tom Reed; Ture Schoultz
Subject:	16 May 2016 National Elk Refuge Biological Update
Date:	Monday, May 16, 2016 11:47:30 AM

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16 May 2016 National Elk Refuge Biological Update

Brucellosis Genetics Research Relevant to National Elk Refuge Published

"Genomics reveals historic and contemporary transmission dynamics of a bacterial disease among wildlife and livestock" by Pauline L. Kamath, Jeffrey T. Foster, Kevin P. Drees, Gordon Luikart, Christine Quance, Neil J. Anderson, P. Ryan Clarke, Eric K. Cole, Mark L. Drew, William H. Edwards, Jack C. Rhyan, John J. Treanor, Rick L. Wallen, Patrick J. White, Suelee Robbe-Austerman & Paul C. Cross

was published in the journal Nature Communications on 11 May 2016; DOI: 10.1038/ncomms11448

Background

Brucellosis is a bacterial disease of wildlife, livestock, and humans caused by the bacterium *Brucella abortus* and is important because it causes abortions in elk, bison and cattle. The disease has been largely extirpated in the U.S with the exception of the Greater Yellowstone Ecosystem (GYE) and some surrounding areas. We used genetic sequencing on the bacterium *Brucella abortus from* samples collected from elk, bison and livestock throughout the GYE. Much like how genetic testing is now used in human genealogy research to identify common ancestors and provide evidence for the branches in a family tree, the technique was used to identify the major recent branches in the *Brucella abortus* family tree to determine the origins of Brucellosis infection and how it has been transmitted among elk, bison and livestock.

Some key points from the paper relevant to NER:

Elk was the predicted source in 4 out of 5 of current *Brucella* lineages. An analysis of spatial spread suggested that the Jackson Hole area including NER was the common ancestor for all recent (past 3 decades) brucellosis infections in the GYE, that 4 out of 5 *Brucella* lineages originated on Wyoming feedgrounds, and that 2 lineages originated on NER specifically. The data also support the idea that elk are the dominant source of brucellosis infection in livestock, and brucellosis is now self sustaining in some free ranging elk herds in the GYE despite its origin on feedgrounds.

Interestingly there is evidence for significant transmission of brucellosis between elk and bison, with transmission from bison to elk twice as likely as from elk to bison. 2-way transmission between elk and bison was detected at NER but not in Yellowstone National Park, suggesting that high densities of elk and bison associated with feeding operations on NER might increase the likelihood of elk to bison transmission.

Although every disease is different in terms of transmission and persistence in a host

population, an important management implication from this brucellosis case study is that high densities of elk and bison associated with NER feeding operations are potential sources of disease transmission throughout the GYE and beyond. This should serve as a cautionary tale regarding the amplification of other density dependent elk diseases on NER and the potential spread of diseases from feedgrounds to other areas.

Spring Elk and Bison Migration from NER to Other Areas

Elk numbers in the standard NER survey area south of the Gros Ventre Hills have declined to near zero since the end of the 2016 supplemental feed season on April 2. Elk counts by date: 4/10/16=3,828; 4/12/16=4,351; 4/17/16=2,050; 4/26/16=1,581; 5/3/16=0; 5/11/16=2.

Data from the 30 GPS collars deployed on NER this March corroborate this migration timing with gradual elk movements away from NER occurring throughout the month of April. As of May 8, 1 collar (3%) were in southern Yellowstone NP, 2 collars (7%) were in Teton Wilderness, 3 collars (10%) were in the Gros Ventre, 9 collars (30%) were in the Short Distance Migrant Area between Wilson and Moose, and 15 collars (50%) were in Grand Teton National Park. These percentages are likely to change somewhat as summer progresses, but so far there do not appear to be any major changes in elk distribution compared to the findings "Changing migratory patterns in the Jackson Elk Herd" published in the Journal of Wildlife Management (Cole et al.2015).

Similarly bison numbers in the standard survey area have declined since the end of feeding Bison counts by date: 4/10/16=306; 4/12/16=543; 4/17/16=21; 4/26/16=13; 5/3/16=18; 5/11/16=0.

Although hazing has been used in some years to move elk and bison off the refuge in May, this year's migration occurred without hazing. With the assistance of Geneva Chong and Colin Talbert of USGS and others, we are exploring the use of remote camera and satellite imagery to track spring green-up on and around NER. Hopefully over time we will be able to examine green-up patterns relative to the timing of elk and bison migration in the spring, which will be helpful in designing criteria to determine the last day of the supplemental feed season each year.

Eric Cole
Refuge Biologist
U.S. Fish & Wildlife Service, National Elk Refuge
Jackson, WY
307.201.5432

From: Doodle
To: Steve Kallin
Subject: Doodle: BEMP Step Down Plan Meeting
Date: Monday, May 23, 2016 10:58:39 AM

View this poll on your dashboard

Do not forward this e-mail.*

Hi Steve Kallin,

You have created your Doodle poll

"BEMP Step Down Plan Meeting"

You should keep this e-mail in case you want to edit your poll or invite more participants later on.

Administer poll **Invite participants**

* You should not forward this e-mail in order to prevent others from modifying or deleting your poll. If you do not want to use the administrative functions, you can simply ignore or delete this e-mail.

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

From: Doodle
To: Steve Kallin
Subject: Doodle: Link for poll "BEMP Step Down Plan Meeting"
Date: Monday, May 23, 2016 10:58:28 AM

Hi Steve Kallin,

You have initiated a poll "BEMP Step Down Plan Meeting" at Doodle. The link to your poll is:

http://doodle.com/poll/7ywxn4t9q79s8739

Share this link with all those who should cast their votes. Do not forget to cast your vote, too.

(If you did not initiate this poll, somebody must accidentally have used your e-mail address; simply ignore this e-mail, please.)

- Your Doodle Team

Doodle AG, Werdstrasse 21, 8021 Zürich

From:	Steve Kallin
To:	Dale Deiter; Murphy, Kerry M -FS; sarah_dewey@nps.gov; David Gustine; Brad Hovinga; doug.brimeyer@wyo.gov; Steve Cain; Cris Dippel; Eric Cole; Steve Kallin
Subject:	Bison & Elk Management Plan (BEMP) Step Down Plan Meeting
Date:	Monday, May 23, 2016 11:48:52 AM

Hello Everyone:

We are ready to resume the agency planning effort for the BEMP Step Down Plan. Please provide your availability through the doodle poll link below and complete at your earliest opportunity. We hope to schedule this meeting early next month, so it would be very helpful to complete the poll in the next several days.

http://doodle.com/poll/7ywxn4t9q79s8739

Attached is a copy of the latest DRAFT Step Down Plan (August 24, 2015) in case you would like to refresh your memory after our long hiatus. I will be sending out a meeting agenda later this week.

Thank you for your continued support and contribution to this planning effort. I am optimistic a draft ready for agency review can be completed in several meetings.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From:	Baaske, Kandi
To:	brad.hovinga@wyo.gov
Cc:	Maureen Gallagher; Mike Blenden; Steve Kallin
Subject:	Comments on Jackson Elk Herd Objective
Date:	Wednesday, May 25, 2016 10:38:53 AM
Attachments:	Wyoming Fish and Game Jackson Elk Herd Objective.pdf

---

Please see attached document.

Kandi Baaske
HR/Payroll Liaison
NWRS Region 6 RO
134 Union Blvd. Ste. 300
Lakewood, CO 80228
(303) 236-4385 phone
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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Mountain-Prairie Region

IN REPLY REFER TO:
FWS/R6/NWRS
Mail Stop 60130

MAILING ADDRESS:
Post Office Box 25486
Denver Federal Center
Denver, Colorado 80225-0486

STREET LOCATION:
134 Union Boulevard
Lakewood, Colorado 80228-1807

May 25, 2016

To: Wyoming Game and Fish Commission

From: Will Meeks, Assistant Regional Director, Region 6, National Wildlife Refuge System

Re: Comments on Jackson Elk Herd Objective

Thank you for the opportunity to provide comments during the Jackson Elk Herd objective setting process. The U.S. Fish and Wildlife Service (Service) appreciates our continued partnership with the Wyoming Game and Fish Department (Department) and consider it vital to meeting our wildlife management goals.

The Service supports the Department's proposal to maintain the Jackson Elk Herd population objective of 11,000 animals with the following considerations:

- The herd will be managed for a mid-winter trend count of 11,000 elk, which will be estimated using ground classifications on feed grounds and aerial surveys across native winter ranges.
- Mid-winter trend counts will be analyzed using a 3-year running average.
- The population will be managed for 20% (plus or minus) of the objective (range of 8,800 to 13,200).
- The Service would not support an objective greater than 11,000 elk.

The Service does not oppose the Department's proposal to discontinue use of winter subherd objectives, although in 2007 the Wyoming Game and Fish Commission set an objective of 5,000 animals to winter on the National Elk Refuge. This is similar to the wintering objective stated in the Bison and Elk Management Plan (BEMP) also approved in 2007 through a signed Record of Decision. In order to prevent any unintended misunderstanding by the public regarding that the Department may have changed it's support of the BEMP, the Service recommends including a statement in the final document that reaffirms that the Department will continue working with NER and Grand Teton National Park to achieve goals outlined in the 2007 Bison and Elk Management Plan.

The Service also encourages and will support the Department's efforts to develop a "sightability index" to survey elk off feed grounds to improve survey accuracy. We think this will decrease the likelihood of underestimating population size which may result if the Department changes its method of population estimation from modelling to one based upon raw count data.

Again, the Service appreciates the opportunity to comment during this population objective review. If you have any questions or concerns please contact Refuge Manager, Steve Kallin (307)733-9212 or Refuge Supervisor for Wyoming, Montana and Utah, Michael Blenden (303)236-4306.

From:	Ryan Moehring
To:	Mike Blenden; Steve Kallin
Cc:	Will Meeks; Maureen Gallagher; Toni Griffin; Keenan Adams; Lori Iverson; Anna Munoz
Subject:	NER CCP
Date:	Wednesday, June 01, 2016 5:01:16 PM

All,

Anna told me today that Noreen is in receipt of the NER Final CCP FR notice. It seems that Noreen had some concerns that releasing the notice at this time might fan the supplemental feeding flames we experienced this winter.

We have not made much progress on the engagement strategy Noreen requested for the BEMP, primarily because we have been waiting on WGFD to signal how/if it would support the plan. To my knowledge, we are still waiting on that information.

My intent is to 1) ensure that all of us copied here are in the loop and that we have an ongoing dialogue before and as we move forward; 2) provide us with enough time to adequately plan our outreach and engagement activities to ensure both the CCP and BEMP are well-received; 3) keep leadership informed of our plans and activities along the way.

I'm open to others' thoughts re: next steps, though it seems to me that one of them should be for Steve to share with us the latest from WGFD and their Elk Herd Objective Meetings and how those items are likely to affect the content of the final step down plan. Once we know what our final plan is going to look like, we can begin working in earnest on the engagement/outreach plan and how that relates to the CCP rollout.

Full disclosure: I am almost fully committed for the month of June, so my availability to work on this is going to be limited in the short term. It may take us some time to work through the above details, so hopefully if we start talking now, by the time my schedule frees up we'll be a in a good place to move forward.

Please share your thoughts when you have a moment.

Thanks,
Ryan

Ryan Moehring
Public Affairs (ND, SD, WY, MT)
U.S. Fish and Wildlife Service
Mountain-Prairie Region
303-236-0345

Web |Facebook | Twitter | Flickr | YouTube

From:	Ryan Moehring
To:	Mike Blenden; Steve Kallin
Cc:	Will Meeks; Maureen Gallagher; Toni Griffin; Keenan Adams; Lori Iverson; Anna Munoz
Subject:	NER CCP
Date:	Wednesday, June 01, 2016 5:01:16 PM

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Please share your thoughts when you have a moment.

Thanks,
Ryan

Ryan Moehring
Public Affairs (ND, SD, WY, MT)
U.S. Fish and Wildlife Service
Mountain-Prairie Region
303-236-0345

Web |Facebook | Twitter | Flickr | YouTube

From: Will Meeks
To: Ryan Moehring
Subject: Re: NER CCP
Date: Saturday, June 04, 2016 11:02:39 AM

I've been out this week. I didn't see that anyone commented. Did they?

Will Meeks
U.S. Fish and Wildlife Service
Mountain-Prairie Region
Assistant Regional Director
National Wildlife Refuge System
303-236-4303 (w)
720-541-0310 (c)

On Jun 1, 2016, at 6:01 PM, Ryan Moehring <ryan_moehring@fws.gov> wrote:

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Web |Facebook | Twitter | Flickr | YouTube

From: Ryan Moehring
To: Will Meeks
Subject: RE: NER CCP
Date: Saturday, June 04, 2016 3:57:43 PM

No, though I did speak with Toni about it at length and she and I briefly discussed w/ Keenan. Toni is concerned because the FR notice has a clearance window through July 26. If we do not publish the notice by July 26, we will need to re-initiate the clearance process. My sense is that getting the engagement piece right is more important to Noreen than making the FR deadline, though you probably have a better read.

My take: If Kallin can tell us (and I'm not sure he knows yet) what is going to be in the final BEMP and how we expect WGFD is going to publicly support that plan (or not), then we will have enough information to begin working on outreach/engagement. Until that happens, we're flying blind and I agree w/ Noreen that we should hold off on publishing the CCP, irrespective of the FR deadline, because doing so will raise questions we are not yet prepared to answer.

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Public Affairs (ND, SD, WY, MT)
U.S. Fish and Wildlife Service
Mountain-Prairie Region
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From: Will Meeks [mailto:will_meeks@fws.gov]
Sent: Saturday, June 04, 2016 11:03 AM
To: Ryan Moehring
Subject: Re: NER CCP

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U.S. Fish and Wildlife Service
Mountain-Prairie Region
303-236-0345

Web |Facebook | Twitter | Flickr | YouTube

From:	Steve Kallin
To:	Dale Deiter; Murphy, Kerry M -FS; Sarah Dewey; David Gustine; Brad Hovinga; doug.brimeyer@wyo.gov; Steve Cain; Cris Dippel; Eric Cole
Subject:	SAVE THE DATE - Next BEMP Step Down Planning Meeting, August 12, 2016 at 8:00 AM
Date:	Wednesday, July 20, 2016 3:47:33 PM

Hi All:

Please save this date for the next BEMP Step Down Planning Meeting. This date above works for everyone who attended the BEMP Step Down Planning meeting on Monday (July 18).

I hope to email you an updated Step Down Plan by tomorrow or Friday.

Take care,

Steve Kallin
Project Leader
National Elk Refuge
PO Box 510
675 East Broadway
Jackson, WY 83001
Phone: (307) 201-5409
Fax: (307) 733-9729
steve_kallin@fws.gov

From: Doodle
To: Steve Kallin
Subject: Doodle: "BEMP Adaptive Management Meeting" Update
Date: Monday, October 13, 2014 4:58:50 PM

View this poll on your dashboard

Hi Steve Kallin,

"Tim Fuchs" just provided information to the poll "BEMP Adaptive Management Meeting."

Go to poll **Close poll**

If you did not initiate this poll, somebody must have used your e-mail address by accident. Please ignore this e-mail. Unsubscribe from this poll

Doodle AG, Werdstrasse 21, 8021 Zürich

Cole, Eric <eric_cole@fws.gov>

RE: UREGENT:National Elk Refuge/Jackson WY/Elk Starving Now/NO CREW AT THE REFUGE TO FEED

1 message

Jeffrey Warren <jeffrey_warren@fws.gov> Fri, Jan 29, 2016 at 3:28 PM
To: Eric Cole <eric_cole@fws.gov>

Ouch. The ending of swan feeding was certainly contentious, but I doubt it hit this level because feeding occurred in an area closed to the public (and birds can fly when they get hungry J).

Good luck!

Jeff Warren
406 276-3536 ext. 106

"I believe that a scientist looking at nonscientific problems is just as dumb as the next guy." Richard Feynman

"A great many people think they are thinking when they are merely rearranging their prejudices." William James

From: Cole, Eric [mailto:eric_cole@fws.gov]
Sent: Friday, January 29, 2016 1:17 PM
To: Jeffrey Warren
Subject: Fwd: UREGENT:National Elk Refuge/Jackson WY/Elk Starving Now/NO CREW AT THE REFUGE TO FEED

Did RRL ever deal with this sort of thing back when they were feeding swans?

Eric Cole

Refuge Biologist

U.S. Fish & Wildlife Service, National Elk Refuge

Jackson, WY

307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

---------- Forwarded message ----------
From: **Jones, Lee** <lee_c_jones@fws.gov>
Date: Thu, Jan 28, 2016 at 4:53 PM

Subject: Re: UREGENT:National Elk Refuge/Jackson WY/Elk Starving Now/NO CREW AT THE REFUGE TO FEED
To: "Cole, Eric" <eric_cole@fws.gov>
Cc: Samantha Gibbs <samantha_gibbs@fws.gov>, Steve Kallin <steve_kallin@fws.gov>, Mark Chase <mark_chase@fws.gov>, Jennifer Ballard <jennifer_ballard@fws.gov>

Thanks Eric for providing a quick reference for some background! NER receives these types of comments most years when conditions suggest that feeding is not necessary early in the winter. I suggest that we prioritize getting the official NER elk health surveillance reports done as additional, more recent documentation of the disease status as related to feeding. I'll be back in the office next week if helpful to discuss. Thanks! Lee

Lee C. Jones

USFWS-Wildlife Health office

10 E. Babcock, Rm 105

Bozeman, MT 59715

Office: 406.587.2169

Cell: 406.600.8405

Fax: 406.587.9098

lee_c_jones@fws.gov

On Thu, Jan 28, 2016 at 11:15 AM, Cole, Eric <eric_cole@fws.gov> wrote:

Samantha,

I urge you to read Chapter 5 in Bruce Smith's book "Where Elk Roam". It provides some good background on the historical context regarding the refuge's relationship with Ken Griggs and this group. A quick look at the group's website suggests a serious disconnect between the facts on the ground and their perceptions, (as well as serious need for a proofreader/science writer).

Regarding Bainbridge's claim in her letter to the editor: I emailed Steve a copy of my presentation and abstract at the 2014 Jackson Hole Wildlife Symposium with some background information. At no time did I advocate starving elk to meet our population objectives.

Good luck and feel free to contact me if you have further questions.

Eric Cole

Refuge Biologist

U.S. Fish & Wildlife Service, National Elk Refuge

Jackson, WY

307.201.5432

"...individually we contribute little or nothing to the truth, by the union of all a considerable amount is amassed." Aristotle

On Thu, Jan 28, 2016 at 10:55 AM, Samantha Gibbs <samantha_gibbs@fws.gov> wrote:

Hi Steve and Eric,

Just FYI below, I'll work with Mark to see if and how we need to respond.

Kind regards,

Sam

Samantha Gibbs

Wildlife veterinarian

National Wildlife Refuge System

U.S. Fish & Wildlife Service

Samantha_Gibbs@fws.gov

571-216-5776

Begin forwarded message:

From: Deidre Bainbridge <deidre@tennbain.com>
Date: January 28, 2016 at 11:31:20 AM EST
To: <mark_chase@fws.gov>, <lindsay_brady@fws.gov>
Cc: <samantha_gibbs@fws.gov>, <jennifer_ballard@fws.gov>, Michael Bean <michael_bean@ios.doi.gov>
Subject: UREGENT:National Elk Refuge/Jackson WY/Elk Starving Now/NO CREW AT THE REFUGE TO FEED

Dear Mr. Chase et al,

Right now, this is a plea for help. The National Elk Refuge, enacted by Congress in 1912 to prevent the Jackson Elk Herd from starvation due to the loss of winter habitat, following a harsh winter with massive deaths by starvation, is not feeding the elk. Many elk are suffering from malnutrition on the Refuge right now. Many dead elk are visible from the road. I have elk today in my yard very malnourished. This is the first time in 27 years the elk are here in January. They should be on the refuge being fed, but no. The refuge has no crew! That is what I was informed yesterday. WYG&F has concluded that it is time to feed however the refuge on January 27, 2016, a time when feeding should be geared up and ready for action, has no staff and no intention to feed anytime soon.

I was informed by Doug Brimeyer of WG&F that he is doing his best to get the feeding process started on the refuge soon but they have no crew because of the incident in Oregon. I asked if the crew is in Oregon assisting. The answer, " No

they are just concerned for their safety" so no crew available on the National Elk Refuge when it is time to feed. This is illegal and it is not tolerated.

The truth is and this shall all be FOI'ed by me on behalf of the 501 c 3, Concerned Citizens for the Elk, there are no service contracts to start feeding now or the seasonal staff would be out there, they need to work, the budget shall be fully exposed and reviewed and the mismanagement of funds not spent on elk feed shall also be reviewed, exposed and those accountable for this mismanagement shall be be held accountable. Ultimately this is your responsibility.

You state on your website you are concerned for climate change. You are under executive order to be mindful of climate change. The climate is changing you cannot have service contracts far out into the winter when the climate is changing here so drastically. The contracts must have staff available to feed as the changing climate dictates. The elk refuge is a refuge to prevent elk from starvation. Malnourished elk are immune compromised and subject to the disease you fear from the climate. Your current management of withholding feed is the disease vector not climate change or density. Regardless of your continued Mantra that you are following the BEMP, the enacting legislation, you are mandated to uphold, has not changed. You have no authority to starve the elk even assuming for the sake of argument the elk herd needs to be culled. You have no science or legal authority to cull the herd. Refusing to feed the elk is a violation of NEPA, 2007 ROD and the BEMP. I will not spend my time right now informing you of the laws and regulations you violate. That shall also be exposed in a public forum. You have to know that the BEMP allows for 5,000 wintering elk on the refuge only as conditions allow and only as the Jackson Herd is maintained at 11,000. The management is all or nothing, not peace meal to meet your separate goals or budget. If you need money tell us.

You should know that the NER in 1982 hired Ken Griggs, DVM to necropsy dead calves. Many had died, He determined they died of starvation. Ken Griggs, DVM visited the refuge with Kallin on January 6, 2016, following a long period of 20 plus below zero. He determined the forage useless only roughage and pointed out many malnourished elk at that time. He said these elk need to be fed. Kallin said they looked fine to him. I advise your veterinarians Samantha and Jennifer to contact Dr. Griggs immediately at 307 733 4662.

The National Elk Refuge needs assistance dealing with the needs of the Elk in this evolving situation, the current management plan is a public relations disaster.

Get some staff out there now to feed the elk. Many concerned citizens are watching, taking photos and offering their trucks to feed. We cannot and will not continue to watch this illegal and inhumane treatment of our natural

resource, the elk. Their starvation is on your watch. Nor shall we allow the destruction of a national treasure, the NER.

I have attached recent correspondence to the Governor as well.

Thank you for your consideration and action in this regard. Deidre J. Bainbridge

Deidre J. Bainbridge

Attorney at Law

Respond to:

P.O. Box 747

Jackson, WY 83001

(307) 739-0748

Dear Jerimiah,

Please share the information in this letter with the Governor. I realize that Brad Mead has changed his tune in the last 18 mos. about the value of the Elk Refuge in preventing elk depredation and the commingling of elk with cattle on Spring Gulch Ranches. He now claims there are too many elk and supplemental feed should be reduced. I can only presume this is the Governor's new policy to reduce the Jackson Herd to the point of no need to feed and no possibility of commingling because the herd is so drastically diminished. This decision is not the Governor's, but one endowed to the public, and I pray he is not making this decision due to finances. Certainly it is not a decision which considers the entire ecosystem dependent upon a viable elk population. The people of the State of Wyoming value the elk for numerous and varied reasons and many are economic. However to a Jackson Hole native, one who grew up amongst abundant wildlife, perhaps with some respect and appreciation, I plead for decency. There is no humanity or decency in the State of Wyoming complicit in the intended starvation of animals essentially corralled behind high fences not free to range for feed in the bitter cold of this winter. Dr. Ken Griggs, DVM toured the NER with Kallin on January 6, 2016. He examined the forage and found it only roughage and suggested it be sent to the University of WY for a free protein analysis. This was rejected. He observed many elk in need of feed. That was two weeks ago. Please implore the NER and WG&F to feed the elk now. In the event of a fatality or serious injury to human life in a collision with the elk roaming the highways, particularly at night in search of forage, the State of Wyoming is not without fault. Please feel free to contact me with any questions or concerns. Thank you very much for your courtesy in this regard. Sincerely, Deidre J. Bainbridge (307) 739-0748

Letter to Editor

No Public Tolerance for Starving Elk on the NER

On December 4, 2014, Eric Cole, National Elk Refuge (NER) Wildlife Biologist spoke at the Jackson Hole Wildlife Symposium about the *Challenges and Opportunities to Reduce Supplemental Feeding on the (NER)*. He concluded the 2007 Bison Elk Management Plan (BEMP) calls for limiting supplemental feed on the NER. He said this "**will require greater public acceptance… and or greater tolerance for elk winter mortality through starvation than currently exists."**

Congress appropriated $20,000 in 1911 to feed the elk after a harsh winter caused thousands to die of starvation. Last winter's conditions were similar, it snowed and rained repeatedly; ice covered the earth. In 2015, 8300 elk wintered on the refuge. The frozen

ground left no choice. The late bison hunt ending January 18, 2015 delayed feed. A necrology report of March 2015 indicated many elk died from joint disorders, 67 were calves. According to veterinarians this is caused by malnutrition. Eric Cole won, the starvation death of many elk on the NER. Is the public tolerant of this inhumane mismanagement of the Jackson Elk Herd? They are corralled with no hope of adequate sustenance unless we require it.

This year the bison hunt again delays feeding, indefinitely. The BEMP calls for a genetically viable bison herd when culled to 500 with a sex ratio of one bull to one cow. This science and the ratio are ignored by WG&F. The January bison hunt jeopardizes the viability of both elk and bison herds. The BEMP calls for 5,000 elk on the refuge only as conditions allow and only while the Jackson Elk Herd population is maintained at 11,000. Recently, the Wyoming Game and Fish Commission changed the rules; an elk population is at objective at plus or minus 20%. Where is the public comment? They changed the rules in the BEMP to 9,000 elk. The herd is now below 11,000 animals. Our right to a meaningful public process as the herd is reduced below the 11,000 objective is now changed to a 9,000 objective. Who Knew?

The delayed feeding guarantees bull elk on feed lines on Spring Gulch Road where they are slaughtered in January, no fair chase and often for a hefty trophy fee. On October 16, 2013, Brian Nesvik, WG&F Wildlife Division, advised the Casper Star Tribune, the Department spent $1.5 million in 2013 on feed grounds. As Game and Fish tightens its belt in response to failed license fee increases, the department is looking for ways to cut back on feed ground costs, including delayed feed. “None of us, if we could go back 100 years, would have gone down this road.” Nesvik said. Inform the public. Obviously this is about money. Let us help. Please protect us from the agony of watching starving elk on the refuge. It is not tolerated.

Deidre J. Bainbridge

Jackson, WY

739-0748

Cole, Eric <eric_cole@fws.gov>

The Need to Feed! FW: Elk Feeding with Cattle on Spring Gulch Ranches Daily/CWD in humans and animals/ immune deficiency vector

1 message

Steve Kallin <steve_kallin@fws.gov> Mon, Jan 4, 2016 at 3:48 PM
To: Mike Blenden <mike_blenden@fws.gov>
Cc: Cris Dippel <cris_dippel@fws.gov>, Eric Cole <eric_cole@fws.gov>, Lori Iverson <lori_iverson@fws.gov>

Mike:

Just wanted to let you know we are again receiving pressure to begin supplemental feeding well before it is necessary based on our established feeding protocol. The NER and WGFD have been contacted by a handful of people passionate about the need to start feeding. Below is an email from Deidre Bainbridge with her reasons why we should start feeding. It's a bit hard to follow, but it appears she wants us to start feeding so the elk will not catch CWD and "Sleepy Sickness." Yet, she also seems to indicate that elk will not transmit CWD in their saliva because her Grandmother died of CWD and with all her drooling, didn't infect the rest of the family. Interesting?

I was also contacted by Joanna Johnson who demanded we start feeding and allow her to "inspect" the forage on the NER. She also demanded the name and mailing address of our Regional Director which I provided.

Take care,

Steve Kallin

Project Leader

National Elk Refuge

PO Box 510

675 East Broadway

Jackson, WY 83001

Phone: (307) 201-5409

Fax: (307) 733-9729

steve_kallin@fws.gov

From: Deidre Bainbridge [mailto:deidre@tennbain.com]
Sent: Thursday, December 31, 2015 11:59 AM
To: Doug Brimeyer
Cc: Michael Bean; Steve Kallin

Subject: Re: Elk Feeding with Cattle on Spring Gulch Ranches Daily/CWD in humans and animals/ immune deficiency vector

Doug, I am really concerned about the elk on the National Elk Refuge and in Alpine. They are all over the highway at both locations. This never happened when the animals were fed on time. And now we are over one week into 20 below at night. Please advise what is Wyoming Game and Fish policy on feeding the elk on the feed grounds from a timely, humane and public safety stand point? Last year the state feed grounds commenced feeding the end of December. Have they and if so why not Alpine where the elk are everywhere on the road? What is the position of Wyoming Game and Fish in regard to feeding on the National Elk Refuge? The elk do belong to the State of Wyoming. I do not want to watch elk starving on the refuge again this year. What is the position of Wyoming Game and Fish in this regard? Last night the elk were surrounding a small paddock of horses feeding on the hillside above the highway and above the Gallery directly across the highway from the refuge at town entrance. They are really hungry and I am very concerned that this is proof that they cannot winter out. They need to be fed on the refuge to protect them and the public and for them to be treated according to the enacting legislation of the refuge and according to the Public Trust in terms of the Wyoming Game and Fish and particularly the BEMP. I know this from my research and experience, my maternal grandmother died of CWD, encephalitis. My grandmother had the disease when my mother was born. Mom did not contract it. Her mother died when she was seven. She recalls being held on her mothers lap as she, mom, drooled all over herself. My mother did not contract CWD or any form of encephalitis, my grand mother's family who cared for her for over 8 years of illness did not contract the illness and lived well into their 90's. It is not likely spread through saliva and that goes for CWD research in elk. That is speculative and lab induced at best. What is remarkable about the encephalitis in the early decades of CA is that did not spread throughout the population, it did affect many but then it just mysteriously stopped spreading. That mystery exists today. Any CWD in our elk herd is not likely spread in vitro or by saliva and will likely run its course so long as the animals are healthy.

Was it a prion disease or spongi form encephalitis in CA, no one knows. There is certainly no proof it was a virus. Mom said she was told it was related to chicken pox. What I know is it affected the young and women and it was immune related it came at the end of the Spanish Flu which killed my grandmother's father. Was her immune system weakened from the flu? That is likely it killed her dad and she had already given birth to one child which can weaken the immune system. What do we know about all of this, a healthy immune system is much less likely to contract the disease. If it is from a prion in the soil a well fed animal is not digging in the soil for more. Right now the conditions on the refuge for CWD if it should arise are created by mismanagement of the refuge in violation of the BEMP, NEPA, and the refuge enacting statutes. This cannot be your partnership. Feed the elk. They are much less likely to suffer from an immune disorder and to fight any disease vector afoot. I am now begging you, it has been 20 below at night for over a week that weakens the immune system. Please feed the elk and protect them from CWD. Deidre J. Bainbridge (307) 739-0748

THE SLEEPY SICKNESS

ARTICLE #205 • WRITTEN BY ALAN BELLOWS



pgs. 3-28 removed - nonresponsive

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DO NOT PRES .

On Dec 30, 2015, at 4:15 PM, Doug Brimeyer <doug.brimeyer@wyo.gov> wrote:

Deidre,
Thanks for your comments.

On Dec 28, 2015 11:13 AM, "Deidre Bainbridge" <deidre@tennbain.com> wrote:

Doug, As you know I have lived on the Hansen ranch for 27 years. I have never had elk in this area feeding with cattle at the end of December. I saw five elk feeding with Cattle on a Spring Gulch Ranch again last night. They no longer migrate to the refuge while the late hunt is at play. That is a management issue in terms of cattle and elk commingling. However, my point right now, at 22 below with elk feeding with cattle out of desperation, is that It is time to feed the elk on the refuge to prevent commingling, to prevent slather without a fair chase and to prevent starvation again this year. And to manage the Elk in the public trust and at the number of 11,000 in the Jackson Herd. Please feed the elk on the NER it is time.
Deidre J. Bainbridge

E-Mail to and from me, in connection with the transaction
of public business, is subject to the Wyoming Public Records
Act and may be disclosed to third parties.

NOTE refuge counts and ground telemetry summary.xls also contains elk and bison count and elk telemetry summary data from 2004-2014
given the changes in collar technology to GPS collars and low sample sizes for most elk summer ranges, fine scale ground telemetry is no longer warranted.

Monitoring empahsis has shifted to concerns about when and how many of all ungulate species are occupying NER. As long as the survey area is well documented,
these information can be used to determine animal density by species, grazing effects on forage resources, and migration timing.

Beginning in late summer 2014, all relevent ugulate species will be surveyed. Unless otherwise noted the survey area is the south end of NER including southern aspects of
the gros Ventre hills. See photo based survey areas for more detail. Unless otherwise noted, the survey area encompasses approx. 11,400 acres.
and entails oberving and counting ungualtes from several locations. Common observation locations include Museum, Spring Creek Ranch (East Gros Ventre Butte), North end of Miller Butte,
Vistor Center Observation Deck, Forest Access, Points along Refuge Road south of Miller Butte, North Gap, McBride Ridge, Botcher Hill Above Hatchery

In many years separate ground counts for elk and bison were not conducted during the the time feeding was taking place. See feeding related data or classification count data for these estimates.

Prior to late summer 2014, surveys for species other than elk and bison were opportunistic and the dates of data collection do not necessarily coincide with when elk and bison counts took place.

Although we experimented with photo based estimates of elk and bison numbers, in general this approach is far to time consuming to facilitate frequent observation and in the future
photo based estimates will be limited to times when higher precision is needed. Unless otherwise noted estimates of ungualte numbers are based on field counts using a spotting scope and tally counter.

Trends and management actions that have affected the number of ungulates on NER: 1)

BIOYEAR	DATE	PERIOD	COUNTSI	SURVEYA	ELK	BISON	PRONGHORN	BIGHORN	DEER	MOOSE	NOTES
2004-2005	9/30/2004	1	museum	11400	1	0	not sampled	not sampled	not sampled	not sampled	
2004-2005	10/4/2004	1	museum	11400	2	0	not sampled	not sampled	not sampled	not sampled	
2004-2005	10/6/2004	1	museum	11400	8	80	not sampled	not sampled	not sampled	not sampled	
2004-2005	10/8/2004	1	museum	11400	10	50	not sampled	not sampled	not sampled	not sampled	
2004-2005	10/15/2004	1	museum	11400	131	0	not sampled	not sampled	not sampled	not sampled	
2004-2005	10/19/2004	1	museum	11400	270	0	not sampled	not sampled	not sampled	not sampled	
2004-2005	10/22/2004	1	museum	11400	761	83	not sampled	not sampled	not sampled	not sampled	
2004-2005	10/25/2004	1	museum	11400	1690	10	not sampled	not sampled	not sampled	not sampled	
2004-2005	10/29/2004	1	museum	11400	1560	10	not sampled	not sampled	not sampled	not sampled	
2004-2005	11/2/2004	1	museum	11400	2817	13	not sampled	not sampled	not sampled	not sampled	
2004-2005	11/5/2004	1	museum	11400	3513	14	not sampled	not sampled	not sampled	not sampled	
2004-2005	11/9/2004	1	museum	11400	3500	424	not sampled	not sampled	not sampled	not sampled	
2004-2005	11/12/2004	1	museum	11400	3613	8	not sampled	not sampled	not sampled	not sampled	
2004-2005	11/16/2004	2	museum	11400	3828	0	not sampled	not sampled	not sampled	not sampled	
2004-2005	11/19/2004	2	museum	11400	3737	14	not sampled	not sampled	not sampled	not sampled	
2004-2005	11/23/2004	2	museum	11400	4294	3	not sampled	not sampled	not sampled	not sampled	
2004-2005	12/1/2004	2	museum	11400	2976	275	not sampled	not sampled	not sampled	not sampled	
2004-2005	12/9/2004	3	museum	11400	1970	313	not sampled	not sampled	not sampled	not sampled	
2004-2005	12/13/2004	3	museum	11400	3651	306	not sampled	not sampled	not sampled	not sampled	
2004-2005	12/21/2004	3	museum	11400	5198	600	not sampled	not sampled	not sampled	not sampled	
2004-2005	12/27/2004	3	museum	11400	5722	332	not sampled	not sampled	not sampled	not sampled	
2004-2005	1/10/2005	3	museum	11400	3056	397	not sampled	not sampled	not sampled	not sampled	
2004-2005	1/21/2005	3	museum	11400	6312	516	not sampled	not sampled	not sampled	not sampled	
2004-2005	1/25/2005	3	museum	11400	4758	457	not sampled	not sampled	not sampled	not sampled	
2004-2005	1/31/2005	3	museum	11400	5172	428	not sampled	not sampled	not sampled	not sampled	
2005-2006	9/29/2005	1	museum	11400	0	73	not sampled	not sampled	not sampled	not sampled	
2005-2006	10/6/2005	1	museum	11400	51	45	not sampled	not sampled	not sampled	not sampled	
2005-2006	10/14/2005	1	museum	11400	355	235	not sampled	not sampled	not sampled	not sampled	
2005-2006	10/19/2005	1	museum	11400	530	124	not sampled	not sampled	not sampled	not sampled	
2005-2006	10/21/2005	1	museum	11400	570	132	not sampled	not sampled	not sampled	not sampled	
2005-2006	10/25/2005	1	museum	11400	652	143	not sampled	not sampled	not sampled	not sampled	
2005-2006	10/28/2005	1	museum	11400	699	135	not sampled	not sampled	not sampled	not sampled	
2005-2006	11/1/2005	1	museum	11400	1530	21	not sampled	not sampled	not sampled	not sampled	
2005-2006	11/7/2005	1	museum	11400	2940	320	not sampled	not sampled	not sampled	not sampled	
2005-2006	11/15/2005	1	museum	11400	4241	483	not sampled	not sampled	not sampled	not sampled	
2005-2006	11/18/2005	2	museum	11400	5051	442	not sampled	not sampled	not sampled	not sampled	
2005-2006	11/25/2005	2	museum	11400	4260	365	not sampled	not sampled	not sampled	not sampled	
2005-2006	12/2/2005	2	museum	11400	3053	220	not sampled	not sampled	not sampled	not sampled	
2005-2006	12/8/2005	3	museum	11400	4171	546	not sampled	not sampled	not sampled	not sampled	
2005-2006	12/16/2005	3	museum	11400	2930	471	not sampled	not sampled	not sampled	not sampled	
2005-2006	12/22/2005	3	museum	11400	3480	397	not sampled	not sampled	not sampled	not sampled	
2005-2006	12/28/2005	3	museum	11400	3608	610	not sampled	not sampled	not sampled	not sampled	
2005-2006	1/3/2006	3	museum	11400	4000	645	not sampled	not sampled	not sampled	not sampled	
2005-2006	1/5/2006	3	museum	11400	4779	718	not sampled	not sampled	not sampled	not sampled	
2005-2006	1/10/2006	3	museum-k	11400	4916	965	not sampled	not sampled	not sampled	not sampled	
2005-2006	1/13/2006	3	museum-p	11400	4057	726	not sampled	not sampled	not sampled	not sampled	
2006-2007	9/28/2006	1	museum	11400	1	6	not sampled	not sampled	not sampled	not sampled	
2006-2007	10/10/2006	1	museum	11400	49	209	not sampled	not sampled	not sampled	not sampled	
2006-2007	10/14/2006	1	museum	11400	342	523	not sampled	not sampled	not sampled	not sampled	
2006-2007	10/20/2006	1	museum	11400	929	42	not sampled	not sampled	not sampled	not sampled	
2006-2007	10/24/2006	1	museum	11400	1058	14	not sampled	not sampled	not sampled	not sampled	
2006-2007	10/27/2006	1	museum	11400	1468	21	not sampled	not sampled	not sampled	not sampled	
2006-2007	10/31/2006	1	museum	11400	1765	18	not sampled	not sampled	not sampled	not sampled	
2006-2007	11/3/2006	1	museum	11400	2149	25	not sampled	not sampled	not sampled	not sampled	
2006-2007	11/6/2006	1	museum	11400	2330	133	not sampled	not sampled	not sampled	not sampled	
2006-2007	11/9/2006	1	museum	11400	3192	683	not sampled	not sampled	not sampled	not sampled	
2006-2007	11/14/2006	1	museum	11400	3392	757	not sampled	not sampled	not sampled	not sampled	
2006-2007	11/17/2006	2	museum-n	11400	5057	546	not sampled	not sampled	not sampled	not sampled	
2006-2007	11/22/2006	2	museum	11400	2398	807	not sampled	not sampled	not sampled	not sampled	
2006-2007	11/27/2006	2	museum	11400	1497	128	not sampled	not sampled	not sampled	not sampled	
2006-2007	12/4/2006	3	museum	11400	3109	46	not sampled	not sampled	not sampled	not sampled	Bison hazing concurrent, Elk hazing evening of 12/4 and early morning 12/7
2006-2007	12/7/2006	3	museum	11400	1028	139	not sampled	not sampled	not sampled	not sampled	
2006-2007	12/12/2006	3	museum	11400	1258	200	not sampled	not sampled	not sampled	not sampled	Large group of elk just off refuge east of vandeveer
2006-2007	12/20/2006	3	museum-p	11400	3924	312	not sampled	not sampled	not sampled	not sampled	
2006-2007	1/3/2007	3	museum	11400	3199	190	not sampled	not sampled	not sampled	not sampled	
2006-2007	1/10/2007	3	museum	11400	4317	658	not sampled	not sampled	not sampled	not sampled	602 might be adjacent to refuge as of 1/10/07
2007-2008	9/14/2007	1	museum-n	11400	0	4	not sampled	not sampled	not sampled	not sampled	
2007-2008	9/27/2007	1	miller butte	11400	0	3	not sampled	not sampled	not sampled	not sampled	
2007-2008	10/8/2007	1	museum	11400	100	150	not sampled	not sampled	not sampled	not sampled	
2007-2008	10/10/2007	1	museum	11400	200	0	not sampled	not sampled	not sampled	not sampled	
2007-2008	10/12/2007	1	museum	11400	405	0	not sampled	not sampled	not sampled	not sampled	
2007-2008	10/13/2007	1	museum	11400	396	0	not sampled	not sampled	not sampled	not sampled	
2007-2008	10/14/2007	1	museum	11400	100	0	not sampled	not sampled	not sampled	not sampled	
2007-2008	10/15/2007	1	museum	11400	213	0	not sampled	not sampled	not sampled	not sampled	
2007-2008	10/17/2007	1	museum	11400	229	0	not sampled	not sampled	not sampled	not sampled	
2007-2008	10/18/2007	1	museum	11400	465	1	not sampled	not sampled	not sampled	not sampled	
2007-2008	10/22/2007	1	museum	11400	1122	0	not sampled	not sampled	not sampled	not sampled	
2007-2008	10/23/2007	1	museum	11400	1028	0	not sampled	not sampled	not sampled	not sampled	
2007-2008	10/26/2007	1	museum	11400	2145	0	not sampled	not sampled	not sampled	not sampled	
2007-2008	10/29/2007	1	museum	11400	1538	0	not sampled	not sampled	not sampled	not sampled	
2007-2008	10/31/2007	1	museum	11400	952	4	not sampled	not sampled	not sampled	not sampled	
2007-2008	11/2/2007	1	museum	11400	1706	24	not sampled	not sampled	not sampled	not sampled	
2007-2008	11/5/2007	1	museum	11400	670	16	not sampled	not sampled	not sampled	not sampled	
2007-2008	11/7/2007	1	museum	11400	705	0	not sampled	not sampled	not sampled	not sampled	
2007-2008	11/9/2007	1	museum	11400	1188	22	not sampled	not sampled	not sampled	not sampled	
2007-2008	11/13/2007	1	museum	11400	550	37	not sampled	not sampled	not sampled	not sampled	
2007-2008	11/14/2007	1	SpringCk-s	9700	1443	15	not sampled	not sampled	not sampled	not sampled	
2007-2008	11/15/2007	1	museum-n	11400	2966	31	not sampled	not sampled	not sampled	not sampled	
2007-2008	11/19/2007	1	museum-n	11400	1485	24	not sampled	not sampled	not sampled	not sampled	
2007-2008	11/20/2007	1	museum-n	11400	462	26	not sampled	not sampled	not sampled	not sampled	

2007-2008	11/23/2007	1	museum-n	11400	2432	20	not sampled	not sampled	not sampled	not sampled
2007-2008	11/27/2007	1	museum-n	11400	1623	234	not sampled	not sampled	not sampled	not sampled
2007-2008	11/28/2007	1	museum-n	11400	2831	112	not sampled	not sampled	not sampled	not sampled
2007-2008	12/4/2007	3	museum-n	11400	4204	204	not sampled	not sampled	not sampled	not sampled
2007-2008	12/6/2007	3	museum-n	11400	5483	600	not sampled	not sampled	not sampled	not sampled
2007-2008	12/11/2007	3	museum-n	11400	4369	236	not sampled	not sampled	not sampled	not sampled
2007-2008	12/18/2007	3	museum	11400	2997	577	not sampled	not sampled	not sampled	not sampled
2007-2008	12/26/2007	3	museum	11400	4591	1	not sampled	not sampled	not sampled	not sampled
2007-2008	1/3/2008	3	museum-n	11400	4638	46	not sampled	not sampled	not sampled	not sampled
2007-2008	1/11/2008	3	museum-n	11400	5056	130	not sampled	not sampled	not sampled	not sampled
2008-2009	8/22/2008	1	museum-n	11400	0	510	not sampled	not sampled	not sampled	not sampled
2008-2009	8/28/2008	1	museum-n	11400	0	758	not sampled	not sampled	not sampled	not sampled
2008-2009	9/2/2008	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	~20 bison killed on first day of hunt 9/1/08 on refuge. The rest of bison fled to GTNP across the GV river
2008-2009	9/9/2008	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2008-2009	9/18/2008	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2008-2009	9/25/2008	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2008-2009	10/5/2008	1	museum	11400	0	0	not sampled	not sampled	not sampled	not sampled
2008-2009	10/10/2008	1	museum	11400	9	1	not sampled	not sampled	not sampled	not sampled
2008-2009	10/13/2008	1	museum	11400	30	0	not sampled	not sampled	not sampled	Counting 900 series elk as likely to winter on NER, but actually unknown
2008-2009	10/17/2008	1	museum	11400	272	0	not sampled	not sampled	not sampled	not sampled
2008-2009	10/22/2008	1	museum	11400	29	0	not sampled	not sampled	not sampled	2 elk killed Nowlin/south unit earlier in day disturbed 100-200 elk out of south unit prior to count
2008-2009	10/28/2008	1	museum	11400	167	0	not sampled	not sampled	not sampled	not sampled
2008-2009	11/3/2008	1	museum	11400	25	0	not sampled	not sampled	not sampled	South unit hunter disturbance moved ~200 elk onto HA 80. I observed at least 1 elk killed by hunter in Area 80 on grassy slope east of refuge
2008-2009	11/6/2008	1	museum	11400	350	4	not sampled	not sampled	not sampled	South unit hunters moved at least 200 elk to area 80 previous days
2008-2009	11/13/2008	1	museum	11400	855	1	not sampled	not sampled	not sampled	9 out of 11 were newly arrived collars between 11/6/08 anf 11/13/08
2008-2009	11/16/2008	1	museum	11400	681	0	not sampled	not sampled	not sampled	4 out of 7 were newly arrived collars between 11/13 and 11/16/08
2008-2009	11/18/2008	1	museum	11400	744	0	not sampled	not sampled	not sampled	not sampled
2008-2009	11/19/2008	1	museum	11400	580	0	not sampled	not sampled	not sampled	not sampled
2008-2009	11/20/2008	1	museum	11400	595	0	not sampled	not sampled	not sampled	after count ~450 elk pushed from south hunt area east to hunt area 80
2008-2009	11/23/2008	1	museum	11400	294	0	not sampled	not sampled	not sampled	At least 1 elk killed in south unit prior to count with some disturbance into Area 80
2008-2009	11/25/2008	1	museum	11400	671	0	not sampled	not sampled	not sampled	not sampled
2008-2009	11/26/2008	1	museum	11400	949	0	not sampled	not sampled	not sampled	not sampled
2008-2009	11/30/2008	1	museum	11400	1172	0	not sampled	not sampled	not sampled	580 elk in open area south unit at 15:00, unmolested
2008-2009	12/4/2008	2	museum	11400	811	0	not sampled	not sampled	not sampled	GPS download elk#634 suggests many of the se radio collars in area 80 on slopes east of refuge
2008-2009	12/7/2008	3	museum	11400	1088	0	not sampled	not sampled	not sampled	not sampled
2008-2009	12/9/2008	3	museum-n	11400	1921	0	not sampled	not sampled	not sampled	not sampled
2008-2009	12/11/2008	3	museum-n	11400	2032	0	not sampled	not sampled	not sampled	not sampled
2008-2009	12/16/2008	3	museum-n	11400	3829	0	not sampled	not sampled	not sampled	not sampled
2008-2009	12/18/2008	3	museum-n	11400	3567	0	not sampled	not sampled	not sampled	unexpected elk#240 arrival changes sample sizes
2008-2009	12/23/2008	3	museum-n	11400	3042	0	not sampled	not sampled	not sampled	not sampled
2008-2009	12/29/2008	3	museum-n	11400	4823	94	not sampled	not sampled	not sampled	not sampled
2008-2009	12/30/2008	3	museum-n	11400	5000	238	not sampled	not sampled	not sampled	not sampled
2008-2009	1/6/2009	3	museum-n	11400	5744	155	not sampled	not sampled	not sampled	not sampled
2008-2009	1/8/2009	3	museum-n	11400	3703	413	not sampled	not sampled	not sampled	unexpected elk#762 arrival changes sample size
2008-2009	1/13/2009	3	museum-lo	11400	3613	600	not sampled	not sampled	not sampled	unexpected arrival #766 changes sample size, at least 1300 counted on adjacent forest service slopes to east, many more likely
2008-2009	1/15/2009	3	museum-lo	11400	3886	105	not sampled	not sampled	not sampled	not sampled
2008-2009	1/18/2009	3	museum-n	11400	4661	655	not sampled	not sampled	not sampled	not sampled
2008-2009	1/20/2009	3	museum-n	11400	5137	437	not sampled	not sampled	not sampled	not sampled
2008-2009	1/22/2009	3	museum-n	11400	5437	388	not sampled	not sampled	not sampled	not sampled
2009-2010	8/31/2009	1	museum-n	11400	0	31	not sampled	not sampled	not sampled	First day of bison hunt 9/1 31 had already moved north perhaps because of pre-dawn activity by bison hunters
2009-2010	9/2/2009	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2009-2010	9/7/2009	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2009-2010	9/9/2009	1	museum-n	11400	0	50	not sampled	not sampled	not sampled	not sampled
2009-2010	9/23/2009	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2009-2010	9/29/2009	1	museum	11400	1	0	not sampled	not sampled	not sampled	1 scabie bull
2009-2010	10/4/2009	1	museum	11400	0	0	not sampled	not sampled	not sampled	not sampled
2009-2010	10/6/2009	1	museum	11400	2	0	not sampled	not sampled	not sampled	not sampled
2009-2010	10/8/2009	1	museum-n	11400	3	0	not sampled	not sampled	not sampled	not sampled
2009-2010	10/10/2009	1	museum-n	11400	2	0	not sampled	not sampled	not sampled	not sampled
2009-2010	10/13/2009	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2009-2010	10/15/2009	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2009-2010	10/17/2009	1	museum-n	11400	70	0	not sampled	not sampled	not sampled	not sampled
2009-2010	10/18/2009	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2009-2010	10/19/2009	1	museum	11400	0	0	not sampled	not sampled	not sampled	not sampled
2009-2010	10/21/2009	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2009-2010	10/23/2009	1	museum	11400	25	0	not sampled	not sampled	not sampled	not sampled
2009-2010	10/25/2009	1	museum-n	11400	199	0	not sampled	not sampled	not sampled	not sampled
2009-2010	10/27/2009	1	museum-n	11400	194	0	not sampled	not sampled	not sampled	not sampled
2009-2010	10/28/2009	1	museum-n	11400	120	0	not sampled	not sampled	not sampled	not sampled
2009-2010	10/30/2009	1	museum-n	11400	745	0	not sampled	not sampled	not sampled	700 of these moved to area 80 by 11:00. Although percent of collars on and adjacent to NER similar to 10/27, they are all different collared elk than 10/27. Note inlcude elk #645 which GPS download indicated was on sleeping indian in hunt area 80, but line of sight VHF signal was very strong.
2009-2010	11/1/2009	1	museum-n	11400	300	0	not sampled	not sampled	not sampled	not sampled
2009-2010	11/4/2009	1	museum	11400	412	0	not sampled	not sampled	not sampled	not sampled
2009-2010	11/6/2009	1	museum-n	11400	147	0	not sampled	not sampled	not sampled	Low elk numbers suggests some of these collars immediately east of NER on forest
2009-2010	11/9/2009	1	museum-n	11400	52	0	not sampled	not sampled	not sampled	not sampled
2009-2010	11/12/2009	1	museum-n	11400	51	0	not sampled	not sampled	not sampled	Low elk numbers suggests some of these collars immediately east of NER on forest
2009-2010	11/14/2009	1	museum-n	11400	50	0	not sampled	not sampled	not sampled	not sampled
2009-2010	11/15/2009	1	museum-n	11400	750	0	not sampled	not sampled	not sampled	not sampled
2009-2010	11/17/2009	1	museum-n	11400	175	0	not sampled	not sampled	not sampled	not sampled
2009-2010	11/21/2009	1	museum-n	11400	71	0	not sampled	not sampled	not sampled	not sampled
2009-2010	11/23/2009	1	museum-n	11400	200	65	not sampled	not sampled	not sampled	not sampled
2009-2010	11/24/2009	1	museum-n	11400	255	0	not sampled	not sampled	not sampled	not sampled
2009-2010	11/28/2009	1	museum-n	11400	234	0	not sampled	not sampled	not sampled	not sampled
2009-2010	12/1/2009	2	museum-n	11400	254	0	not sampled	not sampled	not sampled	not sampled
2009-2010	12/2/2009	2	museum-n	11400	281	0	not sampled	not sampled	not sampled	not sampled
2009-2010	12/3/2009	2	museum-n	11400	204	0	not sampled	not sampled	not sampled	not sampled
2009-2010	12/7/2009	2	museum-n	11400	15	0	not sampled	not sampled	not sampled	Low elk numbers suggests some of these collars immediately east of NER on forest
2009-2010	12/8/2009	2	museum-n	11400	18	0	not sampled	not sampled	not sampled	Low elk numbers suggests some of these collars immediately east of NER on forest
2009-2010	12/10/2009	2	museum-n	11400	70	0	not sampled	not sampled	not sampled	not sampled
2009-2010	12/11/2009	2	museum-n	11400	111	0	not sampled	not sampled	not sampled	Low elk numbers suggests some of these collars immediately east of NER on forest
2009-2010	12/15/2009	3	museum-n	11400	18	0	not sampled	not sampled	not sampled	Low elk numbers suggests some of these collars immediately east of NER on forest
2009-2010	12/18/2009	3	museum-n	11400	940	0	not sampled	not sampled	not sampled	not sampled
2009-2010	12/22/2009	3	museum-n	11400	2345	0	not sampled	not sampled	not sampled	not sampled
2009-2010	12/26/2009	3	museum-n	11400	3203	0	not sampled	not sampled	not sampled	not sampled
2009-2010	12/29/2009	3	museum-n	11400	3595	0	not sampled	not sampled	not sampled	not sampled
2009-2010	1/5/2010	3	Museum-L	11400	2346	0	not sampled	not sampled	not sampled	Low elk numbers suggests some of these collars immediately east of NER on forest
2009-2010	1/12/2010	3	Museum-L	11400	3926	110	not sampled	not sampled	not sampled	Approximately 2000 elk were observed on Kelly Hayfields in Grand Teton National Park. Bison have been at Chambers center pivot since 1/10/2010
2009-2010	1/19/2010	3	Museum-L	11400	3199	390	not sampled	not sampled	not sampled	There were 390 bison at McBride the next day (1/20/2010), and since McBride, Long Hollow, upper flat creek and the Kelly hayfields were surveyed on 1/19/2010, we assume that these bison were somewhere on the north end of NER on 1/19/2010
2009-2010	1/27/2010	3	Museum-L	11400	2665	354	not sampled	not sampled	not sampled	At least another 500 on forest east of chambers. North end NER and forest certainly undercounted
2009-2010	2/2/2010	3	Museum-L	11400	3242	218	not sampled	not sampled	not sampled	not sampled
2009-2010	2/3/2010	3	Museum-L	11400	2896	14	not sampled	not sampled	not sampled	not sampled
2009-2010	2/8/2010	3	museum-n	11400	3183	441	not sampled	not sampled	not sampled	Based on photo count by Kurt Johnson, and concurrent ground count by eric cole. 85% of elk counted using photo method
2009-2010	2/9/2010	3	museum-n	11400	3560	200	not sampled	not sampled	not sampled	Still missing Gros Ventre elk 512 and 514. Seems unlikely that they will show up this year
2009-2010	3/31/2010	5	museum-n	11400	6213	608	not sampled	not sampled	not sampled	Last Day of Feeding was 3/24/10, unexpected TW elk #717 and #752 arrived
2009-2010	4/13/2010	5	museum-n	11400	3061	319	not sampled	not sampled	not sampled	minumum elk estimate for count. #753 killed by wolves,
2009-2010	4/16/2010	5	museum-n	11400	2741	435	not sampled	not sampled	not sampled	not sampled
2009-2010	4/20/2010	5	museum-n	11400	2185	600	not sampled	not sampled	not sampled	Note ~600 bison were hazed off NER today using 4-wheelers prior to count
2009-2010	4/27/2010	5	museum-n	11400	725	39	not sampled	not sampled	not sampled	not sampled
2009-2010	4/30/2010	5	museum-n	11400	3184	521	not sampled	not sampled	not sampled	Cold wintery weather possibly caused return of bison and elk to NER
2009-2010	5/5/2010	5	museum-n	11400	3538	196	not sampled	not sampled	not sampled	Note ~450 bison were hazed off NER on 5/3/10
2009-2010	5/7/2010	5	museum-n	11400	3257	206	not sampled	not sampled	not sampled	Record below average temps in late April early may
2009-2010	5/11/2010	5	museum-n	11400	5	0	not sampled	not sampled	not sampled	Bison and elk hazing past 2 days along with strong north wind facilitated movement of elk off refuge to north.

2009-2010	5/26/2010	5	Miller-north	11400	200	170	not sampled	not sampled	not sampled	Bison were hazed of NER today. Unusual that so many elk and bison returned so late in the spring.
2010-2011	7/29/2010	1	North Gap	11400	0	104	not sampled	not sampled	not sampled	
2010-2011	7/30/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	8/2/2010	1	North Gap	11400	0	180	not sampled	not sampled	not sampled	
2010-2011	8/3/2010	1	North Gap	11400	0	454	not sampled	not sampled	not sampled	
2010-2011	8/4/2010	1	North Gap	11400	0	290	not sampled	not sampled	not sampled	
2010-2011	8/6/2010	1	North Gap	11400	0	1	not sampled	not sampled	not sampled	Note bison hazed off refuge 8/5/10
2010-2011	8/9/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	8/10/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	8/11/2010	1	North Gap	11400	0	383	not sampled	not sampled	not sampled	
2010-2011	8/12/2010	1	North Gap	11400	0	4	not sampled	not sampled	not sampled	Note bison hazed off refuge 8/12/10
2010-2011	8/13/2010	1	North Gap	11400	0	40	not sampled	not sampled	not sampled	
2010-2011	8/16/2010	1	North Gap	11400	0	176	not sampled	not sampled	not sampled	
2010-2011	8/17/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	Note bison hazed off refuge 8/17/10
2010-2011	8/18/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	8/19/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	8/20/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	8/22/2010	1	North Gap	11400	0	335	not sampled	not sampled	not sampled	
2010-2011	8/23/2010	1	North Gap	11400	0	198	not sampled	not sampled	not sampled	Note bison hazed off refuge 8/23/10 soon after this count was made
2010-2011	8/26/2010	1	North Gap	11400	0	50	not sampled	not sampled	not sampled	
2010-2011	8/29/2010	1	North Gap	11400	0	260	not sampled	not sampled	not sampled	
2010-2011	8/30/2010	1	North Gap	11400	0	250	not sampled	not sampled	not sampled	Note bison hazed off refuge 8/30/10 soon after this count was made
2010-2011	9/1/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	9/3/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	9/7/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	9/13/2010	1	North Gap	11400	0	250	not sampled	not sampled	not sampled	
2010-2011	9/17/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	Bison season starts 9/18/10
2010-2011	9/21/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	9/28/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	9/29/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	10/4/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	10/6/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	10/8/2010	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	Elk hunt starts tomorrow and bison hunt resumes after 1 week closure
2010-2011	10/13/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	10/14/2010	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	10/19/2010	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	10/20/2010	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	1 cow and 1 bull bison harvested in Pedersen area. Remaining ~30 bison crossed back into GTNP across the GV River.
2010-2011	10/21/2010	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	10/27/2010	1	museum-n	11400	431	0	not sampled	not sampled	not sampled	Likely ~100 bison on north end in Pedersen according to reports, but this area was not surveyed
2010-2011	10/28/2010	1	museum-n	11400	736	55	not sampled	not sampled	not sampled	
2010-2011	10/29/2010	1	museum-n	11400	77	61	not sampled	not sampled	not sampled	~700 elk disturbed by south unit hunters over north gap just prior to count
2010-2011	11/3/2010	1	Miller Butte	11400	450	0	not sampled	not sampled	not sampled	
2010-2011	11/4/2010	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	sample size reduced due to 800 series collar drop off and elk #644 death
2010-2011	11/5/2010	1	museum-n	11400	158	0	not sampled	not sampled	not sampled	
2010-2011	11/9/2010	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	
2010-2011	11/10/2010	1	museum-n	11400	60	0	not sampled	not sampled	not sampled	
2010-2011	11/12/2010	1	museum-n	11400	20	0	not sampled	not sampled	not sampled	
2010-2011	11/15/2010	1	museum-n	11400	5	50	not sampled	not sampled	not sampled	LE reported ~50 bison on McBride ridge, but not visible from museum
2010-2011	11/17/2010	1	museum-n	11400	1620	0	not sampled	not sampled	not sampled	1600 elk in open south unit hunt area from 8:00-11:00
2010-2011	11/18/2010	1	museum-n	11400	261	0	not sampled	not sampled	not sampled	1,000 to 2,000 elk were disturbed out of Nowlin by hunter across Ben Goe and into area 80 prior to count.
2010-2011	11/23/2010	1	museum-n	11400	841	0	not sampled	not sampled	not sampled	
2010-2011	11/24/2010	1	museum-n	11400	2574	0	not sampled	not sampled	not sampled	Several 100 elk likely in area 80 near Flat creek, but not observed
2010-2011	11/30/2010	1	museum-n	11400	3024	0	not sampled	not sampled	not sampled	~1500 of these within open south unit hunt area, but under no hunting presure
2010-2011	12/1/2010	2	museum-n	11400	2388	32	not sampled	not sampled	not sampled	
2010-2011	12/2/2010	2	museum-n	11400	3138	396	not sampled	not sampled	not sampled	
2010-2011	12/10/2010	2	museum-n	11400	2206	400	not sampled	not sampled	not sampled	Percentages seem high based on on count? Kelsey telemetry interpreting bounce as south NER or 80, but actually HA 78 or south GTNP?
2010-2011	12/14/2010	3	museum-n	11400	3365	642	not sampled	not sampled	not sampled	Elk hunt last day was 12/12/10, bison hunt continues. 700-800 elk observed in Hunt area 80 from Curtis Canyon to Flat Creek.
2010-2011	12/16/2010	3	museum-n	11400	4130	619	not sampled	not sampled	not sampled	Kelsey Griffin counted and telemetry. Also ~2000 elk on forest east of Chambers= ~6000 total elk in vicinity. High count for year.
2010-2011	12/21/2010	3	museum-n	11400	6320	627	not sampled	not sampled	not sampled	
2010-2011	12/30/2010	3	museum-n	11400	5897	607	not sampled	not sampled	not sampled	
2010-2011	4/20/2011	5	Museum	11400	5809	499	not sampled	not sampled	not sampled	Telemetry data collected at National Wildlife Art Museum, Gros Ventre Road, and Zenith Bridge. Additionally, an elk count was taken at the Museum. 5,809 elk were counted and 499 Bison.
2010-2011	4/26/2011	5	New Shop	11400	4697	82	not sampled	not sampled	not sampled	
2010-2011	5/3/2011	5	New Shop	11400	6128	307	not sampled	not sampled	not sampled	
2010-2011	5/11/2011	5	New Shop	11400	5450	177	not sampled	not sampled	not sampled	
2010-2011	5/16/2011	5	Museum a	11400	2180	380	not sampled	not sampled	not sampled	No hazing has been conducted to date because forest closure remained in effect until 4/16/11 due to late winter conditions. Large numbers of elk appear to have left on their own between 5/11/11 and 5/16/11.
2010-2011	5/18/2011	5	museum-n	11400	662	3	not sampled	not sampled	not sampled	Note: Hazed 400 elk and 450 bison off south end of NER on 5/17/11
2010-2011	5/19/2011	5	North Gap	11400	550	0	not sampled	not sampled	not sampled	Note count and telemetry followed hazing ~550 elk from HQ and Nowlin to Gros Ventre River early in morning
2010-2011	5/23/2011	5	Museum a	11400	100	4	not sampled	not sampled	not sampled	
2011-2012	7/26/2011	1	North Gap	11400	0	4	not sampled	not sampled	not sampled	
2011-2012	7/27/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	7/28/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	7/29/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	8/1/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	8/3/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	8/4/2011	1	North Gap	11400	0	160	not sampled	not sampled	not sampled	no hazing of bison given that bison hunt begins on 8/15/11
2011-2012	8/5/2011	1	North Gap	11400	0	140	not sampled	not sampled	not sampled	
2011-2012	8/6/2011	1	North Gap	11400	0	550	not sampled	not sampled	not sampled	
2011-2012	8/7/2011	1	North Gap	11400	0	550	not sampled	not sampled	not sampled	
2011-2012	8/8/2011	1	North Gap	11400	0	224	not sampled	not sampled	not sampled	
2011-2012	8/9/2011	1	Miller/North	11400	0	359	not sampled	not sampled	not sampled	
2011-2012	8/10/2011	1	North Gap	11400	0	495	not sampled	not sampled	not sampled	
2011-2012	8/11/2011	1	North Gap	11400	0	500	not sampled	not sampled	not sampled	
2011-2012	8/13/2011	1	North Gap	11400	0	75	not sampled	not sampled	not sampled	
2011-2012	8/14/2011	1	North Gap	11400	0	163	not sampled	not sampled	not sampled	
2011-2012	8/15/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	Bison hunting began today with 19 killed, ~200 bison left refuge prior to count
2011-2012	8/16/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	hunt (bison) open
2011-2012	8/17/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	hunt (bison) open
2011-2012	8/18/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	hunt (bison) open
2011-2012	8/20/2011	1	North Gap	11400	0	18	not sampled	not sampled	not sampled	hunt (bison) open
2011-2012	8/21/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	hunt (bison) open
2011-2012	8/22/2011	1	North Gap	11400	0	157	not sampled	not sampled	not sampled	bison hunt closed period
2011-2012	8/23/2011	1	North Gap	11400	0	194	not sampled	not sampled	not sampled	bison hunt closed period
2011-2012	8/24/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	bison hunt closed period, bison appear to have left without any human disturbance
2011-2012	8/25/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	bison hunt closed period
2011-2012	8/27/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	hunt (bison) open
2011-2012	8/28/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	hunt (bison) open
2011-2012	8/29/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	hunt (bison) open
2011-2012	8/31/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	9/1/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	9/2/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	9/3/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	9/4/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	9/5/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	9/8/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	9/10/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	9/11/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	9/12/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	9/13/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	9/14/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	9/15/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	
2011-2012	9/17/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	

2011-2012	9/18/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	9/19/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	9/20/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	9/21/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	9/22/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	9/23/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	9/27/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	9/28/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	9/29/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	10/1/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	10/3/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	10/4/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	10/5/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	10/7/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	last day before elk hunt opens
2011-2012	10/9/2011	1	museum-n	11400	1	0	not sampled	not sampled	not sampled	single bull elk in Ben Goe Management unit moved south onto forest service hunt area 80
2011-2012	10/11/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	10/12/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	10/13/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	10/14/2011	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	10/18/2011	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	10/21/2011	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	10/24/2011	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	10/26/2011	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	10/28/2011	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	10/31/2011	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	small elk cow calf group reported on forsest boundary earlier in day but not detected during survey
2011-2012	11/1/2011	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	11/2/2011	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	11/3/2011	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	11/6/2009	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	11/9/2011	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2011-2012	11/14/2011	1	museum-n	11400	19	0	not sampled	not sampled	not sampled	A group of approx 200 elk was observed early in am in south unit, but they had already moved to HA 80 prior to my observation at 8:30 am. Group of 19 still bedded in HQ management unit all day
2011-2012	11/15/2011	1	museum-n	11400	5	0	not sampled	not sampled	not sampled	all bull elk
2011-2012	11/17/2011	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	20 elk had been observed in Nowlin earlier in am bu not observed during count
2011-2012	11/19/2011	1	museum-n	11400	234	0	not sampled	not sampled	not sampled	Likely at least 500 elk in vicinity with some on forest service east of refuge
2011-2012	11/22/2011	1	museum-n	11400	484	179	not sampled	not sampled	not sampled	not sampled
2011-2012	11/26/2011	1	museum-n	11400	720	0	not sampled	not sampled	not sampled	not sampled
2011-2012	11/29/2011	1	museum-n	11400	947	0	not sampled	not sampled	not sampled	not sampled
2011-2012	12/1/2011	2	museum-n	11400	781	0	not sampled	not sampled	not sampled	not sampled
2011-2012	12/5/2011	2	museum-n	11400	1683	0	not sampled	not sampled	not sampled	not sampled
2011-2012	12/8/2011	2	museum-n	11400	1933	0	not sampled	not sampled	not sampled	bison were on refuge earlier in am, but subsequently moved east of NER onto forest and were not counted
2011-2012	12/13/2011	3	museum-n	11400	1917	0	not sampled	not sampled	not sampled	not sampled
2011-2012	12/16/2011	3	museum-n	11400	3181	0	not sampled	not sampled	not sampled	not sampled
2011-2012	12/23/2011	3	miller butte	11400	2646	0	not sampled	not sampled	not sampled	used snow cat to access miller butte observation points. Concurrently tested photographic count methods with david clarke
2011-2012	12/29/2011	3	museum-n	11400	3363	0	not sampled	not sampled	not sampled	not sampled
2011-2012	12/31/2011	3	New Shop	11400	3400	100	not sampled	not sampled	not sampled	not sampled
2011-2012	1/3/2012	3	museum-n	11400	4082	204	not sampled	not sampled	not sampled	Yellowstone 906 using NER despite wintering near Dubois last year
2011-2012	1/11/2012	3	museum-k	11400	4628	97	not sampled	not sampled	not sampled	not sampled
2011-2012	1/22/2012	3	museum-n	11400	5735	203	not sampled	not sampled	not sampled	not sampled
2011-2012	1/29/2012	3	museum-n	11400	6027	594	not sampled	not sampled	not sampled	not sampled
2011-2012	4/1/2012	5	museum-k	11400	3637	550	not sampled	not sampled	not sampled	Buff valley elk 705 and 708 unexpected arrival, poor elk count
2011-2012	4/8/2012	5	museum-n	11400	5670	486	not sampled	not sampled	not sampled	Elk counting conditions excellent
2011-2012	4/11/2012	5	North Gap	11400	3422	462	not sampled	not sampled	not sampled	Count by Eric Cole, telemetry by Mike Nordell. Some elk observed moving off refuge Pedersen/north of Hatchery
2011-2012	4/19/2012	5	museum-n	11400	46	497	not sampled	not sampled	not sampled	not sampled
2011-2012	4/22/2012	5	museum-n	11400	15	20	not sampled	not sampled	not sampled	Mass elk and bison exodus ocurred 1-2 days prior. No hazing was conducted but temps were in the 70's and I suspenct leaving was heat related
2011-2012	4/29/2012	5	museum-n	11400	15	5	not sampled	not sampled	not sampled	elk#364 is only collared elk remaining.
2011-2012	5/3/2012	5	North Gap	11400	5	0	not sampled	not sampled	not sampled	all elk and bison gone from south NER without any hazing this year
2012-2013	7/2/2012	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	7/7/2012	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	7/8/2012	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	7/10/2012	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	7/12/2012	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	7/13/2012	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	7/14/2012	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	7/17/2012	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	Bison group at Pedersen. Disturbed across river by weed sprayer activity without any active hazing
2012-2013	7/18/2012	1	North Gap	11400	0	1	not sampled	not sampled	not sampled	not sampled
2012-2013	7/21/2012	1	North Gap	11400	0	6	not sampled	not sampled	not sampled	not sampled
2012-2013	7/22/2012	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	7/24/2012	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	Pedersen bison; 3 cows, 3 calves, 2 bulls
2012-2013	7/26/2012	1	North Gap	11400	0	5	not sampled	not sampled	not sampled	bison unclassified, moving south towards Peterson area
2012-2013	7/28/2012	1	North Gap	11400	0	130	not sampled	not sampled	not sampled	Jim Crabb observer
2012-2013	7/29/2012	1	North Gap	11400	0	83	not sampled	not sampled	not sampled	Jim Crabb observer
2012-2013	8/2/2012	1	North Gap	11400	0	332	not sampled	not sampled	not sampled	Eric Cole observer
2012-2013	8/3/2012	1	North Gap	11400	0	710	not sampled	not sampled	not sampled	Bison categorized as "North" are in GV hills just north of McBride with high potential to come south
2012-2013	8/6/2012	1	North Gap	11400	0	729	not sampled	not sampled	not sampled	not sampled
2012-2013	8/9/2012	1	North Gap	11400	0	753	not sampled	not sampled	not sampled	not sampled
2012-2013	8/11/2012	1	North Gap	11400	0	700	not sampled	not sampled	not sampled	not sampled
2012-2013	8/12/2012	1	North Gap	11400	0	700	not sampled	not sampled	not sampled	not sampled
2012-2013	8/14/2012	1	North Gap	11400	0	625	not sampled	not sampled	not sampled	Last day prior to bison hunt
2012-2013	8/15/2012	1	Miller Butte	11400	0	24	not sampled	not sampled	not sampled	First day of bison hunt. 1 group of 24 bison still milling around as of 8:30 am despite hunter and retrieval activity
2012-2013	8/16/2012	1	North Gap	11400	0	18	not sampled	not sampled	not sampled	Bison hunting open, but no hunters observed.
2012-2013	8/17/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	Bison hunting open
2012-2013	8/18/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	Bison hunting open
2012-2013	8/19/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	Bison hunting open
2012-2013	8/20/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	Closed bison hunting period 8/20/12-8/24/12
2012-2013	8/21/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	Closed bison hunting period 8/20/12-8/24/12
2012-2013	8/23/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	Closed bison hunting period 8/20/12-8/24/12
2012-2013	8/24/2012	1	N. Gap ana	11400	0	25	not sampled	not sampled	not sampled	Closed bison hunting period 8/20/12-8/24/12
2012-2013	8/25/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	Bison hunting open
2012-2013	8/27/2012	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	Bison hunting open
2012-2013	8/28/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	Bison hunting open
2012-2013	8/30/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	Bison hunting open
2012-2013	9/1/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	Bison hunting open
2012-2013	9/2/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	Bison hunting open
2012-2013	9/4/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	closed bison hunting period 9/3/12-9/7/12
2012-2013	9/6/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	closed bison hunting period 9/3/12-9/7/13
2012-2013	9/8/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	Bison hunting now open until end of season
2012-2013	9/9/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	9/10/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	9/11/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	9/12/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	9/15/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	9/16/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	9/21/2012	1	North Gap	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	9/22/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	9/23/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	9/24/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	9/27/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	10/1/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	10/4/2012	1	N. Gap ana	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	10/5/2012	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	10/9/2012	1	museum-n	11400	1	0	not sampled	not sampled	not sampled	single branch antlered bull bedded near Flat Creek south of sleigh shack

2012-2013	10/11/2012	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	10/15/2012	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	10/18/2012	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	10/22/2012	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	10/24/2012	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	10/29/1930	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	10/30/2012	1	museum-n	11400	80	0	not sampled	not sampled	not sampled	no telemetry detections on 10/30/12 despite 80 elk observed
2012-2013	11/2/2012	1	museum-n	11400	1	0	not sampled	not sampled	not sampled	not sampled
2012-2013	11/6/2012	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	11/9/2012	1	museum-n	11400	1	0	not sampled	not sampled	not sampled	not sampled
2012-2013	11/14/2012	1	museum-n	11400	1	0	not sampled	not sampled	not sampled	only 1 scabie bull observed moving on NW base of Miller Butte
2012-2013	11/17/2012	1	museum-n	11400	17	0	not sampled	not sampled	not sampled	approx half of these mature bulls segregated
2012-2013	11/21/2012	1	museum-n	11400	78	0	not sampled	not sampled	not sampled	about half of these remained in safe zone northwest of HQ, but half moved to area 80 by 9:15 am
2012-2013	11/26/2012	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	not sampled
2012-2013	11/30/2012	1	museum-n	11400	628	0	not sampled	not sampled	not sampled	not sampled
2012-2013	12/4/2012	2	museum-n	11400	995	0	not sampled	not sampled	not sampled	not sampled
2012-2013	12/7/2012	2	museum-n	11400	0	0	not sampled	not sampled	not sampled	all detected collared elk in HA 80
2012-2013	12/10/2012	2	museum-n	11400	255	0	not sampled	not sampled	not sampled	12/9/12 ~2500 elk on south end , but not part of official survey. Unexpected arrival of elk 704
2012-2013	12/14/2012	2	museum-n	11400	203	0	not sampled	not sampled	not sampled	~25 bison reported on north end but none observed during survey
2012-2013	12/19/2012	3	museum-n	11400	3505	0	not sampled	not sampled	not sampled	as expected elk moved to refueg post hunt
2012-2013	12/27/2012	3	museum-n	11400	3664	0	not sampled	not sampled	not sampled	unexpected arrival of elk#702 and #705
2012-2013	1/3/2013	3	museum-n	11400	4231	0	not sampled	not sampled	not sampled	30-50 bison harvested this week, but they have been getting pushed back into GTNP quickly and not observed during surveys. Likely at least 1,000 elk outside survey area on north NER and forest service slopes
2012-2013	1/11/2012	3	Note visibil	8800	3785	600	not sampled	not sampled	not sampled	definitely more elk and bison at McBride, but not counted
2012-2013	1/18/2013	3	Spring Cre	11400	4953	580	not sampled	not sampled	not sampled	many elk in Mcbride and gros ventre hills but mcbride outside of survey area to prevent disturbance
2012-2013	1/25/2013	3	Spring Cre	11400	3731	694	not sampled	not sampled	not sampled	confrimed death of 673 and unexpected arrival of 538
2012-2013	1/31/2013	4	Spring Cre	11400	3166	455	not sampled	not sampled	not sampled	mcbride areas excluded from survey but there were definitely large numbers of elk and bison theere
2012-2013	2/7/2013	4	Spring Cre	11400	5212	432	not sampled	not sampled	not sampled	unexpected arrival of YNP elk 706. Count based on photos but part of Mcbride not visible
2013-2014	7/1/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	not sampled
2013-2014	7/7/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	not sampled
2013-2014	7/11/2013	1	N. Gap an	11400	0	225	not sampled	not sampled	not sampled	first major bison movement of season, ~ 50 north gap and 100 Peterson. Hazed off NER later that day
2013-2014	7/12/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	bison left ner on their own
2013-2014	7/16/2013	1	N. Gap an	11400	0	250	not sampled	not sampled	not sampled	hazed off NER the next day
2013-2014	7/17/2013	1	N. Gap an	11400	0	7	not sampled	not sampled	not sampled	not sampled
2013-2014	7/19/2013	1	N. Gap an	11400	0	126	not sampled	not sampled	not sampled	approxiamtely 350 bison subsequently hazed off Ner from McBride area on 7/23/13
2013-2014	7/23/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	not sampled
2013-2014	7/24/2013	1	N. Gap an	11400	0	51	not sampled	not sampled	not sampled	not sampled
2013-2014	7/26/2013	1	museum-n	11400	0	0	not sampled	not sampled	not sampled	50-100 bison in McBirde area yesterday appear to have left NER without hazing
2013-2014	7/31/2013	1	N. Gap an	11400	0	50	not sampled	not sampled	not sampled	not sampled
2013-2014	8/1/2013	1	N. Gap an	11400	0	245	not sampled	not sampled	not sampled	not sampled
2013-2014	8/2/2013	1	N. Gap an	11400	0	1	not sampled	not sampled	not sampled	approx 400 bison hazed off Ner early in am. 1 bull with swollen right hindquarter left behind
2013-2014	8/5/2013	1	ben goe	3200	0	575	not sampled	not sampled	not sampled	at least 300 bison had returned to NER by Saturday 8/3
2013-2014	8/6/2013	1	N. Gap an	11400	0	3	not sampled	not sampled	not sampled	bison hazed the day before
2013-2014	8/8/2013	1	N. Gap an	11400	0	275	not sampled	not sampled	not sampled	not sampled
2013-2014	8/13/2013	1	N. Gap an	11400	0	83	not sampled	not sampled	not sampled	not sampled
2013-2014	8/16/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	bison hunt started on 8/15, 8 killed and ~80 fled back to GTNP
2013-2014	8/20/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	note although 0 bison on NER they are just across the river in the park off the kelly road
2013-2014	8/21/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	bison hunt open, no hunters observed
2013-2014	8/22/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	note there were 400 bison, 2 harvested near Peterson earlier in the day, but these remaining moved slowly back to GTNP
2013-2014	8/23/2013	1	N. Gap an	11400	0	100	not sampled	not sampled	not sampled	bison near flat creek/marsh intersection at Peterson. 2 bison hunters just south of north gap
2013-2014	8/24/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	first day of bison season wekly closure
2013-2014	8/27/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	bison hunting closed
2013-2014	9/3/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	bison hunting open as of August 31
2013-2014	9/5/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	bison hunting open as of August 31
2013-2014	9/10/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	bison hunting closed as of September 7
2013-2014	9/11/2013	1	N. Gap an	11400	0	270	not sampled	not sampled	not sampled	bison hunting closed as of September 7
2013-2014	9/12/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	bison hunting closed as of September 7, bison left NER without any disturbance by hunters
2013-2014	9/14/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	bison hunting open again as of today September 14. Only 2 hunters observed in north gap area
2013-2014	9/16/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	bison hunting open again as of today September 14.
2013-2014	9/17/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	bison hunting open again as of today September 14.
2013-2014	9/18/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	bison hunting open again as of today September 14.
2013-2014	9/26/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	bison hunting closed as of September 21
2013-2014	10/3/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	bison hunting open as of September 28
2013-2014	10/6/2013	1	N. Gap an	11400	0	1	not sampled	not sampled	not sampled	single bull bison near McBride. No hunting due to Government shutdown Oct 1-October 16
2013-2014	10/8/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	single bull bison near McBride. No hunting due to Government shutdown Oct 1-October 16
2013-2014	10/11/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	No hunting due to Government shutdown Oct 1-October 16
2013-2014	10/14/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	No hunting due to Government shutdown Oct 1-October 16
2013-2014	10/17/2013	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	bison hunting open as of October 14. elk hunting open
2013-2014	10/23/2013	1	South NEF	11400	0	0	not sampled	not sampled	not sampled	bison hunting closed as of October 21
2013-2014	10/30/2013	1	South NEF	11400	0	0	not sampled	not sampled	not sampled	bison hunting closed as of October 22
2013-2014	10/31/2013	1	refuge roac	500	120	0	not sampled	not sampled	not sampled	first significant elk movement to NER of the season. Elk went over Miller Butte and into HA 80
2013-2014	11/2/2013	1	South NEF	11400	0	0	not sampled	not sampled	not sampled	bison hunting open
2013-2014	11/5/2013	1	South NEF	11400	0	0	not sampled	not sampled	not sampled	not sampled
2013-2014	11/9/2013	1	South NEF	11400	75	0	not sampled	not sampled	not sampled	surprising no telemetry detections given report by B. Yetter that ~1,000 elk moved through south NER into area 80 earlier in morning
2013-2014	11/14/2013	1	South NEF	11400	0	0	not sampled	not sampled	not sampled	not sampled
2013-2014	11/18/2013	1	South NEF	11400	8	0	not sampled	not sampled	not sampled	not sampled
2013-2014	11/23/2013	1	South NEF	11400	281	0	not sampled	not sampled	not sampled	note more elk moved onto forest early in am but were missed by survey (likely 600 total including 281 accounted for)
2013-2014	11/26/2013	1	South NEF	11400	412	0	not sampled	not sampled	not sampled	hunters moving elk around made count difficult
2013-2014	12/1/2013	2	museum	11400	120	0	not sampled	not sampled	not sampled	informal count by Byan Yetter. Included as December 1 refrence for historic migration comparison
2013-2014	12/3/2013	2	South NEF	11400	344	0	not sampled	not sampled	not sampled	not sampled
2013-2014	12/11/2013	2	South NEF	11400	1235	0	not sampled	not sampled	not sampled	unexpected arrival TW elk 758. Likely 3000-4000 elk in vicinity. Many are using NER during night and moving to forest during the day
2013-2014	12/18/2013	3	South NEF	11400	1361	154	not sampled	not sampled	not sampled	Elk Telemetry observations seem low (first day conducted by Dave Dunlap). 150 bison reported in Long Hollow, but not observed
2013-2014	12/28/2013	3	South NEF	11400	4860	0	not sampled	not sampled	not sampled	unexpected arrival of YNP elk 706 and 742
2013-2014	1/4/2014	3	South NEF	11400	5698	0	not sampled	not sampled	not sampled	not sampled
2013-2014	1/10/2014	3	South NEF	11400	6196	0	not sampled	not sampled	not sampled	Approx 500 elk north of standard observation area bedded in gros Ventre Hills
2013-2014	1/24/2014	3	South NEF	11400	5091	220	not sampled	not sampled	not sampled	not sampled
2013-2014	1/31/2014	3	South NEF	11400	5846	584	not sampled	not sampled	not sampled	not sampled
2013-2014	2/18/2014	4	South NEF	11400	5646	604	not sampled	not sampled	not sampled	field estimate by tim pratt substantially lower than feedground elk clasification count the next day
2013-2014	2/19/2014	4	class coun	5000	8596	790	not sampled	not sampled	not sampled	elk count results form feedground classification concurrent with telemetry
2013-2014	3/25/2014	4	South NEF	11400	6753	206	not sampled	not sampled	not sampled	field estimate by tim pratt substantially lower for both elk and bison than feedground esimates
2013-2014	4/3/2014	5	South NEF	11400	6328	642	not sampled	not sampled	not sampled	not sampled
2013-2014	4/8/2014	5	museum	11400	6850	496	not sampled	not sampled	not sampled	not sampled
2013-2014	4/14/2014	5	South NEF	11400	3850	432	not sampled	not sampled	not sampled	no photos taken. Estimate of elk numbers only for pathway monitoring
2013-2014	4/19/2014	5	South NEF	11400	5004	590	not sampled	not sampled	not sampled	no photos taken. Estimate of elk numbers only for pathway monitoring
2013-2014	4/21/2014	5	South NEF	11400	1438	552	not sampled	not sampled	not sampled	no photos taken. Estimate of elk numbers only for pathway monitoring
2013-2014	4/29/2014	5	South NEF	11400	1249	143	not sampled	not sampled	not sampled	note bison were hazed in am prior to count. Several hundred elk left concurrent to hazing
2013-2014	5/1/2014	5	South NEF	11400	380	99	not sampled	not sampled	not sampled	not sampled
2013-2014	5/4/2014	5	South NEF	11400	0	115	not sampled	not sampled	not sampled	no elk observed on south NER. #364 could be east of NER, 200 elk were in Pedersen/GV river bottom on north end of NER.
2013-2014	5/12/2014	5	South NEF	11400	0	0	not sampled	not sampled	not sampled	elk 799 (unexpected northern Gros Ventre elk appears to be adjacent toNER in HA 80
2013-2014	5/14/2014	5	South NEF	11400	0	80	not sampled	not sampled	not sampled	elk were in Pedersen/Gros Ventre river ottom. Bison were hazed off NER into GTNP today using ATVs
2014-2015	7/21/2014	1	N. Gap an	11400	0	205	not sampled	not sampled	not sampled	informal report of 50 in Peterson on 7/20/14
2014-2015	7/28/2014	1	N. Gap an	11400	0	175	not sampled	not sampled	not sampled	not sampled
2014-2015	8/6/2014	1	N. Gap an	11400	0	40	not sampled	not sampled	not sampled	not sampled
2014-2015	8/7/2014	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	not sampled
2014-2015	8/11/2014	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	not sampled
2014-2015	8/12/2014	1	N. Gap an	11400	0	72	not sampled	not sampled	not sampled	not sampled
2014-2015	8/13/2014	1	N. Gap an	11400	0	280	not sampled	not sampled	not sampled	not sampled
2014-2015	8/14/2014	1	N. Gap an	11400	0	185	not sampled	not sampled	not sampled	NER bison season opens 8/15/14. Bison fled refuge with ~8 harvested
2014-2015	8/19/2014	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	not sampled
2014-2015	8/20/2014	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	not sampled
2014-2015	8/21/2014	1	N. Gap an	11400	0	0	not sampled	not sampled	not sampled	not sampled
2014-2015	8/26/2014	1	Standard S	11400	0	0	not sampled	not sampled	not sampled	not sampled

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FIELD	TYPE	DEFINITION
YEAR	Character	Fall-winter-spring period that ground telemetry occurred (
DATE	Date	Date that count and or ground telemetry occured
PERIOD	Character	1 = time period from late september until time period whe
COUNT?	Character	yes = a count was conducted on that date, no = a count w
COUNTSITE	Character	Where was the count conducted from: Museum = from m
ELKSOUTH	Numeric	Number of elk counted on south end of refuge (managem
ELKNORTH	Numeric	Number of elk counted in management units 9 and 10 (P
BISONSOUTH	Numeric	Number of bison counted on south end of refuge (manag
BISONNORTH	Numeric	Number of bison counted in management units 9 and 10
ELKAUMSOUTH	Numeric	Estimated forage effect in AUMs caused by elk for the so
BISONAUMSOUTH	Numeric	Estimated forage effect in AUMs caused by bison for the
TOTALAUMSOUTH	Numeric	Estimated forage effect in AUMs caused by both elk and
TELEMETRY?	Character	yes = ground tracking of elk radio collars was conducted
ALLCOLLAR	Numeric	Number of radio collared elk located on the south end of
LIKELYALLCOLLAR	Numeric	Total Number of radio collared elk likely to winter on NER
PERCENTALLCOLLAR	Numeric	Percent of radio collars on south end of refuge (managem
GTNPCOLLAR	Numeric	Number of radio collared elk that summered in Grand Tet
LIKELYGNTPCOLLAR	Numeric	Total Number of radio collared elk that summered in GTN
PERCENTGTNPCOLLAR	Numeric	Percent of radio collars that summered in GTNP on south
TWCOLLAR	Numeric	Number of radio collared elk that summered in Teton Wil
LIKELYTWCOLLAR	Numeric	Total Number of radio collared elk that summered in TW
PERCENTTWCOLLAR	Numeric	Percent of radio collars that summered in TW on south en
YELLOWSTONECOLLAR	Numeric	Number of radio collared elk that summered in Yellowstor
LIKELYYELLOWSTCOLLAR	Numeric	Total Number of radio collared elk that summered in Yello
PERCENTYELLOWSTCOLLAR	Numeric	Percent of radio collars that summered in Yellowstone on
OTHERCOLLAR	Numeric	Number of radio collared elk that summered in and area o
LIKELYOTHERCOLLAR	Numeric	Total Number of radio collared elk that summered in an a
PERCENTOTHERCOLLAR	Numeric	Percent of radio collars that summered in an area other th
UNEXPECTED COLLARS	Numeric	Number of radio collars that had wintered in an area othe

Note, the 11,400 acre standard survey area generally refers to the southern half of the refuge from McB

ie 2006-2007 indicates fall 2006 to winter and spring 2007)

n hunt area 80 closes (typically 11/15, but in 2007 area 80 south of flat creek open through 11/30); 2 = F
vas not conducted on that date
useum of wildlife art parking lot and other highway locations which provides excellent count for all of sou
nent units 1-8) Note does not include Gros Ventre Hills or adjacent forest
edersen and North End). Note this information is dependent on COUNTSITE
ement units 1-8) Note does not include Gros Ventre Hills or adjacent forest
(Pedersen and North End). Note this information is dependent on COUNTSITE
uth end of the refuge (Man units 1-8) based on # of elk counted on the south end/2.1
south end of the refuge (Man units 1-8) based on # of bison counted in south end *1.25
bison on the south end of the refuge (sum of ELKAUMSOUTH and BISONAUMSOUTH)
on that day, no = no ground tracking of elk radio collars conducted
the refuge (management units 1-8) or immediately adjacent such as area 80
for that time period based on where radio collared elk wintered the previous winter and removing elk wh
nent units 1-8) or immediately adjacent on that survey day
ton National Park located on the south end of the refuge (management units 1-8) or immediately adjacer
NP likely to winter on NER for that time period based on where radio collared elk wintered the previous w
n end of refuge (management units 1-8) or imediately adjacent on that survey day
derness located on the south end of the refuge (management units 1-8) or immediately adjacent
likely to winter on NER for that time period based on where radio collared elk wintered the previous wint
nd of refuge (management units 1-8) or immediately adjacent on that survey day
ne located on the south end of the refuge (management units 1-8) or immediately adjacent
owstone likely to winter on NER for that time period based on where radio collared elk wintered the previ
south end of refuge (management units 1-8) or immediately adjacent on that survey day
other than GTNP, TW or Yellowstone located on the south end of the refuge (management units 1-8) or
rea other than GTNP, TW, or Yellowstone likely to winter on NER for that time period based on where ra
han GTNP, TW, or Yellowstone on south end of refuge (management units 1-8) or immediatley adjacent
r than NER in previous winter but now on refuge

Bride and Simpson south and south slopes of the Gros Ventre hills.

Period between when area 80 closes and the elk hunt on the refuge ends (11/15-early deceember in ear

uth end with limited visibility at McBride, and some coverage of south facing aspects in the Gros Ventre

hen mortlalites ocurr or adding elk if they show up unexpectedly

nt
winter and removing elk when mortlalites ocurr or adding elk if they show up unexpectedly

er and removing elk when mortlalites ocurr or adding elk if they show up unexpectedly

ious winter and removing elk when mortlalites ocurr or adding elk if they show up unexpectedly

immediately adjacent
adio collared elk wintered the previous winter and removing elk when mortlalites ocurr or adding elk if th
t on that survey day

ly years but more recently december 1); 3 = period between end of refuge elk hunt and the start of feedi

Hills. Museum-Long = Museum and Long Hollow; museum-pedersen = museum and gros ventre river b

ey show up unexpectedly

ing; 4 = during feeding (begin 2009 only); 5 = post feeding (begin 2010 only)

ottom using snow cat; museum-miller = museum and north end of Miller Butte; museum-north loop=mu

seum and driving thorugh north end of refuge on main retrieval road loop (long hollow to north of main a

.spen stands to bills bayou to pedersen road and back over north gap; Miller Butte = miller butte only, Sp

ɹringCk-Ben Goe = Top of East Gros Ventre Butte from Spring Creek Ranch Property and Bne Goe area

a northeast of miller butte; North Gap =route typically used in summer and early fall to monitor bison use

of refuge, includes north gap and Pedesen areas.

Average number of elk counted on the south end of NER by week

WEEK	2004elk	2005elk	2006elk	2007elk	2008elk	2009elk	2010elk	2011elk
10/1-10/8	7	51	1	100	0	2	0	0
10/9-10/16	131	355	196	263	19	1	0	0
10/17-10/24	515	550	994	711	151	19	0	0
10/25-11/1	1625	960	1617	1545	167	312	415	0
11/2-11/9	3276	2940	2557	1067	188	204	152	0
11/10-11/17	3721	4241	4225	1653	855	257	421	8
11/18-11/25	4015	5051	2398	1460	577	175	1225	359
11/26-12/1	2976	4260	1497	2227	1061	244	2706	816
12/2-12/8	missing	3595	2069	4844	950	130	3008	1808
12/9-12/15	2806	missing	1258	4262	1977	66	2736	1917
12/16-12/22	5198	2863	2886	2997	3698	1642	5029	3181
12/23-12/29	5647	3484	missing	4591	3932	3399	missing	3005
12/30-1/5	missing	4381	3199	3713	5000	2346	5897	3741

AVERAGE OF AVERAGE #ELK 3 years prior to south unit hunt on south NER compared to 3 years during (2004-2006 versus 2007-2009)

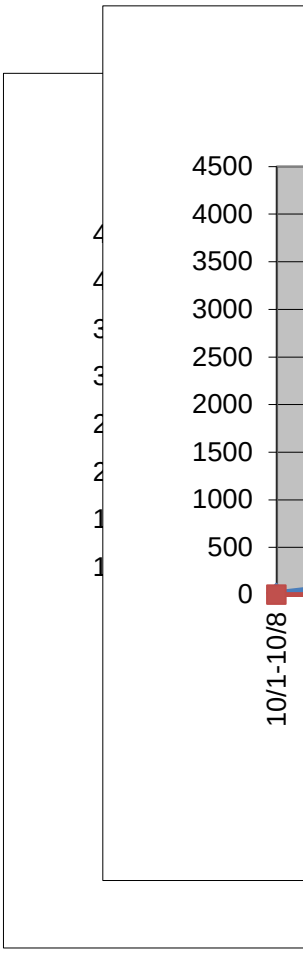
WEEK	PRE	DURING
10/1-10/8	20	34
10/9-10/16	227	94
10/17-10/24	686	294
10/25-11/1	1401	675
11/2-11/9	2924	486
11/10-11/17	4062	922
11/18-11/25	3821	737
11/26-12/1	2911	1177

AVERAGE OF AVERAGE #ELK 3 years prior to south unit hunt on south NER compared to 4 years during (2004-2006 versus 2007-2010)

WEEK	PRE	DURING
10/1-10/8	20	26
10/9-10/16	227	71
10/17-10/24	686	220
10/25-11/1	1401	610
11/2-11/9	2924	403
11/10-11/17	4062	797
11/18-11/25	3821	859
11/26-12/1	2911	1560

AVERAGE OF AVERAGE #ELK 3 years prior to south unit hunt on south NER compared to 5 years during (2004-2006 versus 2007-2011)

WEEK	PRE	DURING
10/1-10/8	20	20
10/9-10/16	227	57
10/17-10/24	686	176



10/25-11/1	1401	488
11/2-11/9	2924	322
11/10-11/17	4062	639
11/18-11/25	3821	759
11/26-12/1	2911	1411

AVERAGE OF AVERAGE #ELK 3 years prior to south unit hunt on south NER compared to 6 years during (2004-2006 versus 2007-2012)

WEEK	PRE	DURING
10/1-10/8	20	17
10/9-10/16	227	47
10/17-10/24	686	147
10/25-11/1	1401	413
11/2-11/9	2924	269
11/10-11/17	4062	534
11/18-11/25	3821	646
11/26-12/1	2911	1228

AVERAGE OF AVERAGE #ELK 3 years prior to south unit hunt on south NER compared to 7 years during (2004-2006 versus 2007-2013)

WEEK	PRE	DURING
10/1-10/8	20	15
10/9-10/16	227	40
10/17-10/24	686	126
10/25-11/1	1401	363
11/2-11/9	2924	234
11/10-11/17	4062	463
11/18-11/25	3821	574
11/26-12/1	2911	1091

AVERAGE OF AVERAGE #ELK 3 years prior to south unit hunt on south NER compared to 8 years during (2004-2006 versus 2007-2014)

WEEK	PRE	DURING
10/1-10/8	20	13
10/9-10/16	227	35
10/17-10/24	686	110
10/25-11/1	1401	317
11/2-11/9	2924	204
11/10-11/17	4062	476
11/18-11/25	3821	737
11/26-12/1	2911	1342

AVERAGE OF AVERAGE #ELK 3 years prior to south unit hunt on south NER compared to 9 years during (2004-2006 versus 2007-2015)

WEEK	PRE	DURING	2015
10/1-10/8	20	11	0
10/9-10/16	227	31	0
10/17-10/24	686	98	0
10/25-11/1	1401	282	0
11/2-11/9	2924	182	5
11/10-11/17	4062	423	2
11/18-11/25	3821	702	434

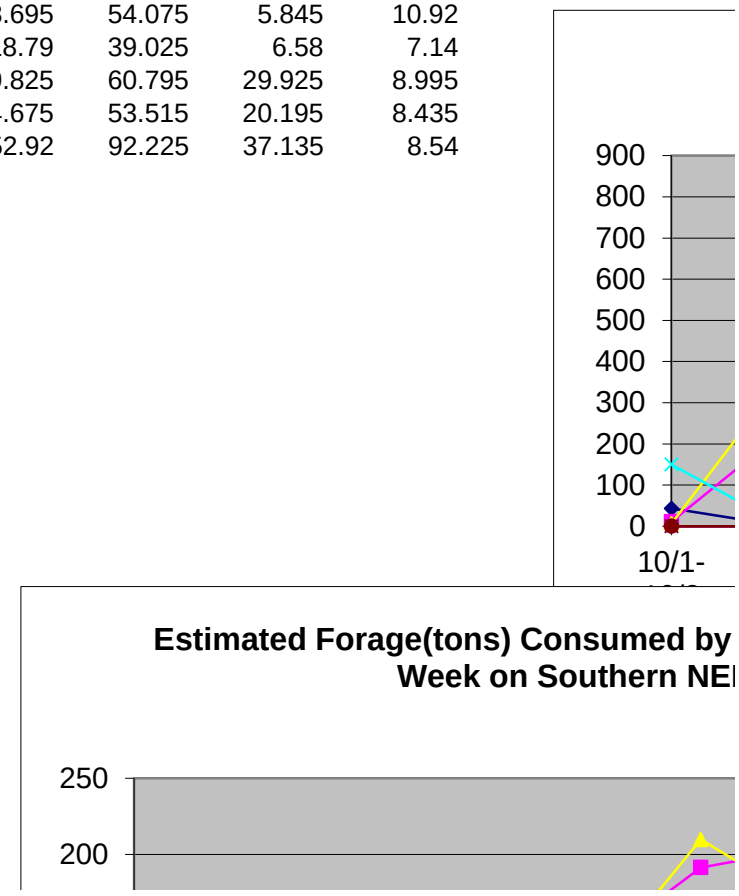
11/26-12/1	2911	1245	475					

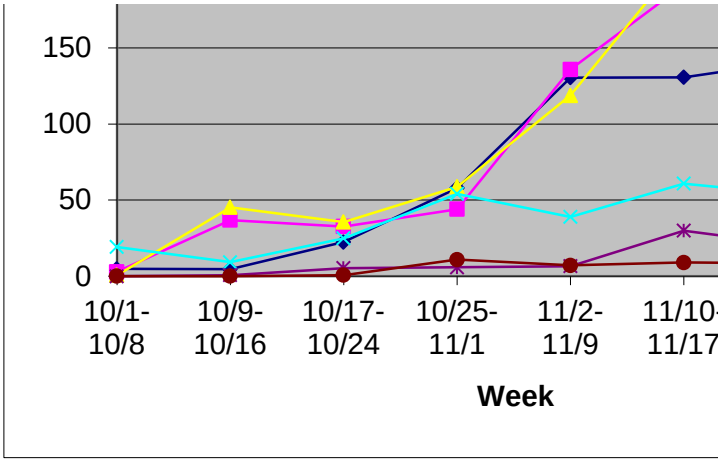
average number of bison counted on the south end of NER

WEEK	2004bison	2005bison	2006bison	2007bison	2008bison	2009bison	2010bison	2011bison
10/1-10/8	43	11	6	150	0	0		
10/9-10/16	0	233	366	0	0	0		
10/17-10/24	42	128	8	0	0	0		
10/25-11/1	10	99	20	0	0	0		
11/2-11/9	150	313	279	16	0	0		
11/10-11/17	4	409	590	28	0	0		
11/18-11/25	9	269	769	23	0	22		
11/26-12/1	0	269	5	136	0	0		
12/2-12/8						0		
12/9-12/15						0		
12/16-12/22								
12/23-12/29								
12/30-1/5								

Estimated Number of Tons Consumed that Week Elk and Bison Combined

	2004	2005	2006	2007	2008	2009	2010	2011
10/1-10/8	4.76	2.94	0.665	19.25	0	0.07		
10/9-10/16	4.585	36.89	45.29	9.205	0.665	0.035		
10/17-10/24	22.435	32.69	35.63	24.885	5.285	0.665		
10/25-11/1	57.925	43.995	58.695	54.075	5.845	10.92		
11/2-11/9	130.41	135.765	118.79	39.025	6.58	7.14		
11/10-11/17	130.655	191.38	209.825	60.795	29.925	8.995		
11/18-11/25	141.47	205.03	164.675	53.515	20.195	8.435		
11/26-12/1	104.16	177.345	52.92	92.225	37.135	8.54		
12/2-12/8								
12/9-12/15								
12/16-12/22								
12/23-12/29								
12/30-1/5								

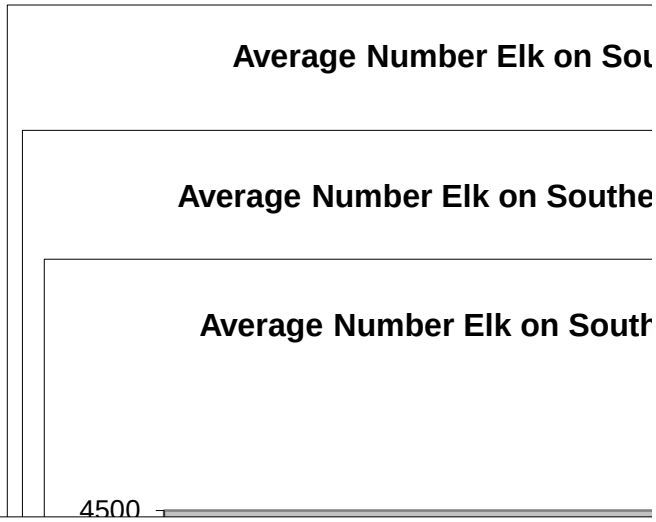


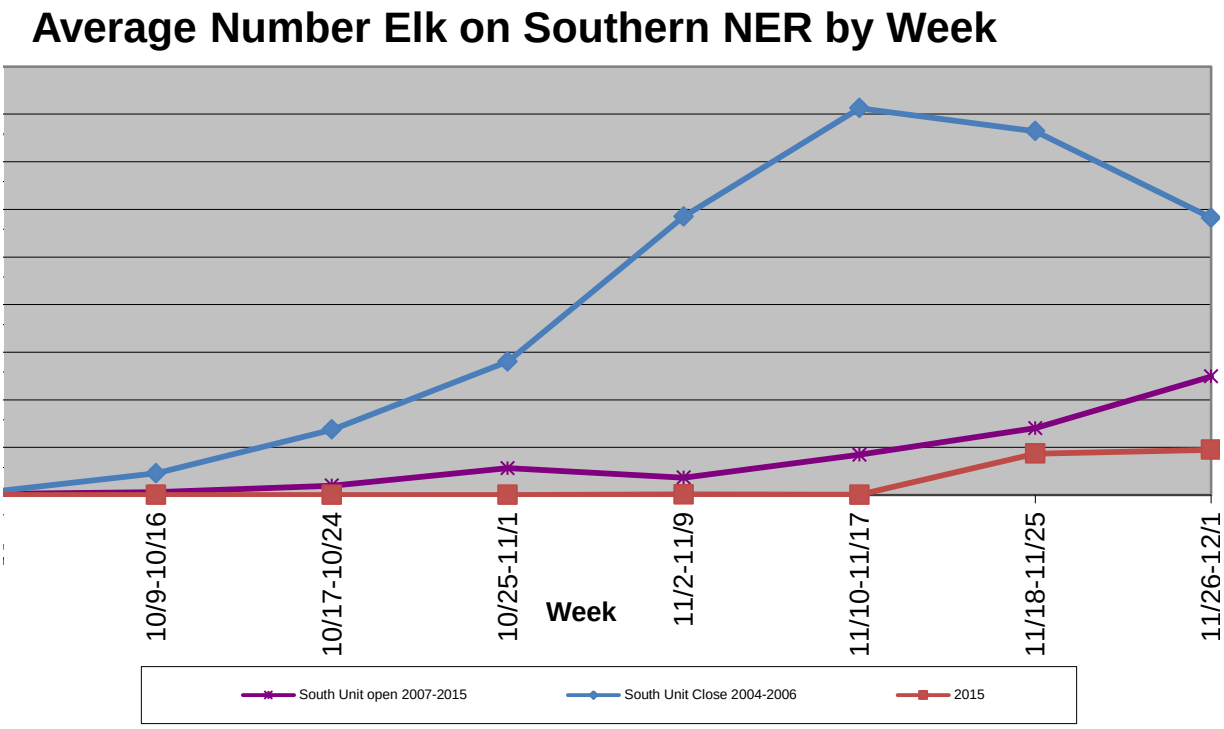


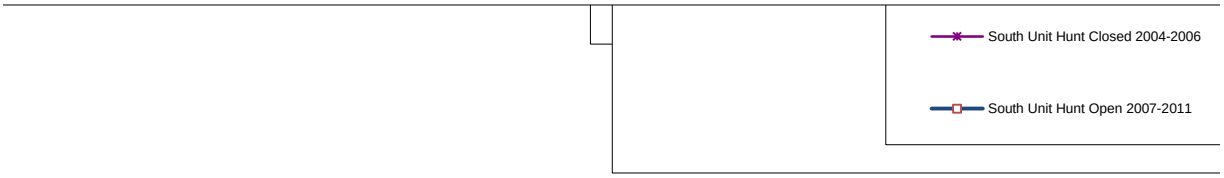
Average Number of Elk counted on NER from Mid-April through May by week by year

Week	2010	2011	2012	2013	MEAN
Apr 15-Apr 21	2162	5809	3527	4220	3930
Apr 22-Apr 28	725	4629	46	4110	2378
Apr 29-May 5	3236	6018	15	310	2394
May 6-May 12	1443	5325	0	255	1756
May 13-May 19	200	1072	0	0	318
May 20-May 26	200	33	0	0	58
May 27-Jun 1	0	0	0	0	0

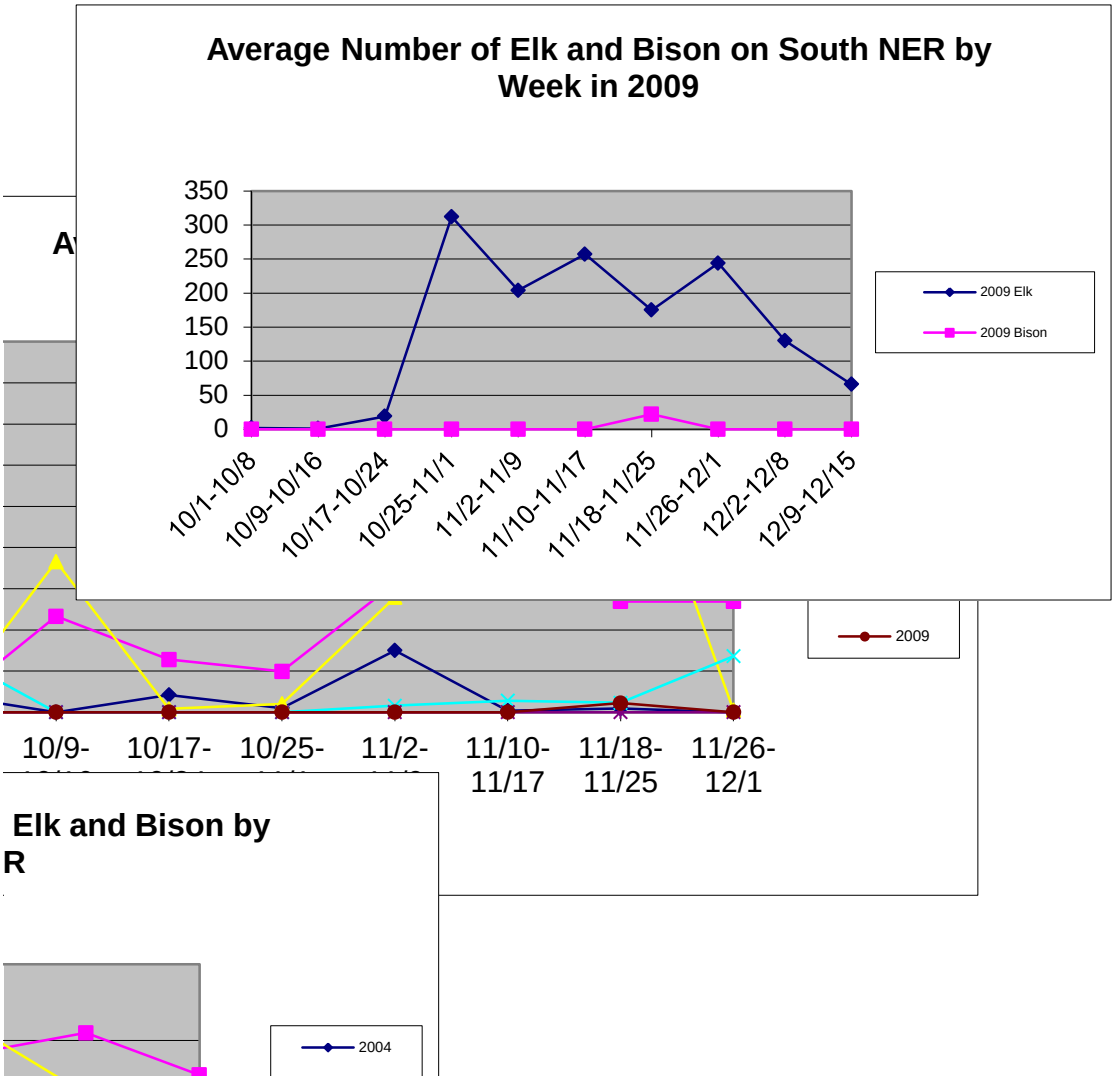
2012elk	2013elk	2014elk	2015elk
0	0	0	0
0	0	0	0
0	0	0	0
40	60	0	0
1	25	0	5
9	38	563	2
78	145	1873	434
314	266	3100	475
498	344	3192	890
229	1235	2558	820
3505	1361	4840	1614
3664	4860	4855	3626
3731	5578	missing	7228

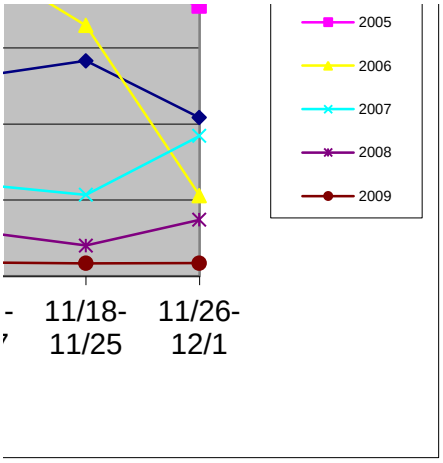






2012bison

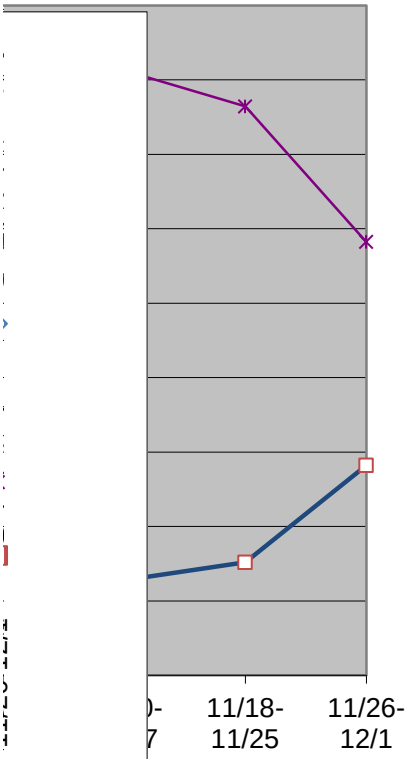

Average Number of Elk and Bison on South NER by Week in 2009
350
300
250
200
150
100
50
0
10/1-10/8
10/9-10/16
10/17-10/24
10/25-11/1
11/2-11/9
11/10-11/17
11/18-11/25
11/26-12/1
12/2-12/8
12/9-12/15
2009 Elk
2009 Bison
2009
10/9-
10/17-
10/25-
11/2-
11/10-11/17
11/18-11/25
11/26-12/1
Elk and Bison by
R
2004


2005
2006
2007
2008
2009
11/18-
11/25
11/26-
12/1

uthern NER

ern NER by Week

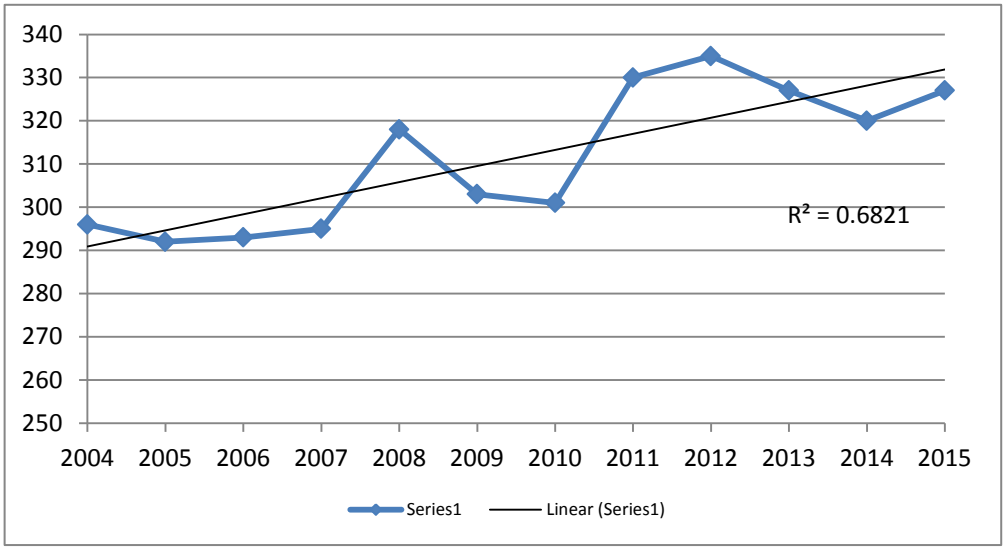
hern NER by Week



YEAR	First Date Elk Observed South NER	First Date >25 Elk Observed South NER
2004	9/30/2004	10/15/2004
2005	10/6/2005	10/6/2005
2006	9/28/2006	10/10/2006
2007	10/8/2007	10/8/2007
2008	10/13/2008	10/13/2008
2009	9/29/2009	10/17/2009
2010	10/27/2010	10/27/2010
2011	10/9/2011	11/12/2011
2012	10/9/2012	10/30/2012
2013	10/31/2013	10/31/2013
2014	10/15/2014	11/13/2014
2015	10/15/2015	11/7/2015

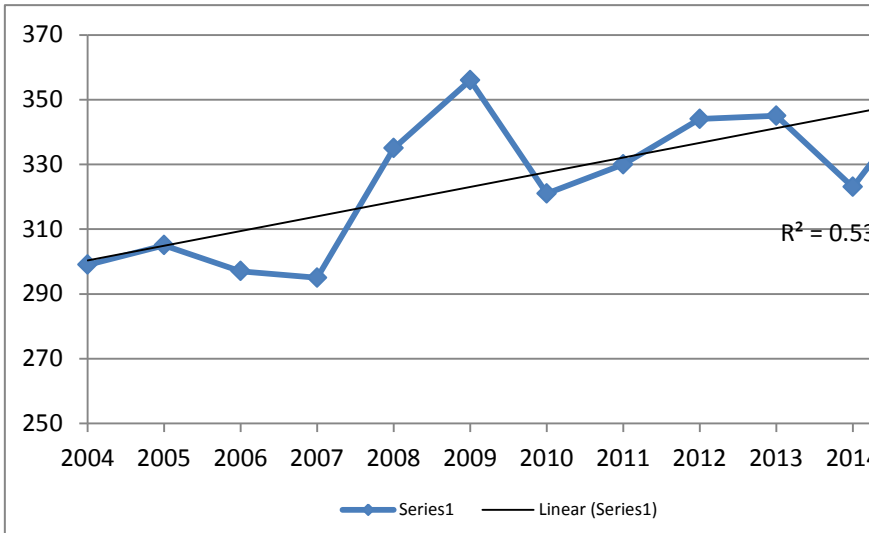
EXPRESSED AS DAY OF YEAR

YEAR	First Date Elk Observed South NER	First Date >25 Elk Observed South NER
2004	274	289
2005	279	279
2006	271	283
2007	281	281
2008	287	287
2009	272	290
2010	300	300
2011	282	316
2012	283	304
2013	304	304
2014	288	317
2015	288	311



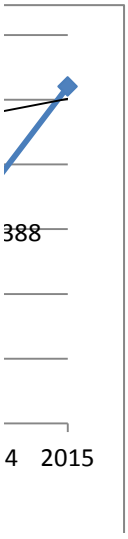
First Date >100 Elk Observed South NER	First Date >500 Elk Observed South NER
10/15/2004	10/22/2004
10/14/2005	10/19/2005
10/14/2006	10/20/2006
10/10/2007	10/22/2007
10/17/2008	11/13/2008
10/25/2009	10/30/2009
10/27/2010	10/28/2010
11/14/2011	11/26/2011
11/23/2012	11/30/2012
10/31/2013	11/23/2013
11/13/2014	11/16/2014
11/19/2015	11/23/2015

First Date >100 Elk Observed South NER	First Date >500 Elk Observed South NER
289	296
287	292
287	293
283	295
291	318
298	303
300	301
318	330
328	335
304	327
317	320
323	327



First Date >1000 Elk Observed South NER	Comment
10/25/2004	
11/1/2005	
10/24/2006	
10/22/2007	
11/30/2008	
12/22/2009	
11/17/2010	
11/26/2011	>25 and >100 dates ocurred outside of formal observation periods
12/9/2012	>100 and >1000 dates ocurred outside of formal observation period
12/11/2013	600 seen early in am by Cole prior to formal observation
11/19/2014	
12/20/2015	

First Date >1000 Elk Observed South NER
299
305
297
295
335
356
321
330
344
345
323
354



ERROR ESTIMATES FOR STANDARD SURVEY AREA

Concurrent observations of the standard NER survey area 11,400 acres (southern NER) by Eric Cole and

		ELK	BISON	PRONGHC	BIGHORN	DEER	MOOSE	
1/14/2015	Cole	6587	605	51	69	0	0	
1/14/2015	Pratt	5493	579	55	60	0	0	
		6040	592	53	65	0	0	MEAN
		547	13	2	4.5	0	0	SD
		758	18	3	6			Confidence
		5282	574	50	59			95% lower
		6798	610	56	71			95% upper

Tim Pratt

using alpha .05, calculated SD and sample size 2
confidence interval
confidence interval

Wolves, weather trigger whole-herd plan

By Mike Koshmrl | Posted: Wednesday, April 27, 2016 4:30 am

Fewer and fewer elk using the Gros Ventre River drainage and grazing natural winter ranges has led to a Wyoming plan to do away with managing the Jackson Elk Herd as a segmented wintertime population.



Elk Herd

A young bull elk pauses while grazing Tuesday along Gros Ventre Road in Grand Teton National Park.

Factors like wolf predation and unpredictable winter storms take the seasonal movements of elk out of wildlife managers' hands, Wyoming Game and Fish Department officials say, making long-standing herd segment goals unattainable. Those goals — managing for 5,000 on the National Elk Refuge, 3,500 in the Gros Ventre area and 2,500 on natural winter range — have been in place since 2007, but a plan on the table would manage the herd as a whole.

"Because of the redistribution of elk that's occurred over the last six years, it's almost untenable to have those goals when there's nothing within our management to achieve those goals," Game and Fish Regional Wildlife Management Coordinator Doug Brimeyer said.

Recent efforts to manage the herd by segment have been futile: The last two winters refuge numbers have been 68 and 46 percent over objective. For two years running numbers in the Gros Ventre drainage have been less than half the desired levels. On natural winter ranges there's also been a steady long-term reduction in numbers.

Meanwhile, summertime distribution is out of whack as well — a trend driven by the proliferation of subdivision elk that don't venture far from the refuge and poor elk calf crops depressing portions of the herd that migrate far to the north.

The whole-herd approach, Brimeyer said, does not mean the state is turning its back on a federal plan to drive down elk numbers on the refuge.

"Everybody locks in on this goal of 5,000 elk on the refuge," Brimeyer said. "Well, that wasn't the only goal within the [record of decision] and final bison and elk management plan. It was also for 11,000 elk, and that's always been the state's objective.

"Five thousand [refuge elk] would have been achievable given herd reductions seen since 2008, 2010," he said, "but since then this dramatic shift in distribution has made that goal difficult to

achieve. We still want to work with the refuge in achieving their goals, but the overall goal to us that drives management is going to be the 11,000."

Brimeyer said the shift, still just a proposal, wouldn't be a sea change in how elk would be managed. Hunting seasons would still be structured to put pressure on southerly, growing parts of the Jackson Herd while backcountry elk that are less reproductively successful would still be hunted lightly, he said.

Game and Fish's proposal for Jackson Elk Herd numbers, not reviewed in a decade, is now open to comment.

The plan is to maintain an 11,000-elk objective but move away from using a computer model to estimate the population. Department biologists would rely instead on animal-by-animal counts conducted on feedgrounds and during aerial surveys.

Herd segment goals were added to the Jackson elk management plan in 2007 at the request of former Game and Fish Commissioner Clark Allan. The objectives, other than the 5,000-elk refuge goal, are not written into the 2007 bison and elk management plan.

Allan's intent at the time, he said, was to strive for a geographically balanced herd that wasn't concentrated in places where there's no hunting, like portions of Grand Teton National Park or subdivisions to the south.

"The idea was to separate them so we have an idea of what's going on in those separate areas," Allan said.

Unaware of Game and Fish's recent proposal, the former commissioner declined to comment on the change.

But at a public meeting held Monday hunting outfitter and Gros Ventre-area landowner Brian Taylor supported the whole-herd approach to management.

"I hope that we do not adopt the hard- and-fast numbers to any specific area with the current condition of these elk being forced off of winter range," Taylor said. "It is a crapshoot as to where they are going to be and when they are going to be there.

"Until we can manage the wolf," he said, "we are not going to actually manage these elk."

Conservation biologist Franz Camenzind had a dimmer view of Game and Fish's proposal.

"We're slowly walking way from the 2007 plan, and I guess that's what bothers me the most," Camenzind said. "If they're just going to lump the whole herd of 11,000 and say 'that's it,' then what's the plan to get the refuge down to 5,000?"

Refuge manager Steve Kallin said an adaptive management plan that will propose methods for

trimming elk numbers has been held up.

"We're still trying to work out some of the details between the different agencies," he said.

Having just learned of Game and Fish's proposal for the Jackson Elk Herd, Kallin declined to comment.

Field Code Changed

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Mountain-Prairie Region

IN REPLY REFER TO:
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Post Office Box 25486
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134 Union Boulevard
Lakewood, Colorado 80228-1807

May 25, 2016

To: Wyoming Game and Fish Commission

From: Will Meeks, Assistant Regional Director, Region 6, National Wildlife Refuge System

Re: Comments on Jackson Elk Herd Objective

Thank you for the opportunity to provide comments during ~~on~~ the Jackson Elk Herd objective setting process. The U.S. Fish and Wildlife Service (Service) appreciates our continued partnership with the Wyoming Game and Fish Department (Department) and consider it vital to meeting our wildlife management goals.

The Service supports the Department's proposal to maintain the Jackson Elk Herd population objective of 11,000 animals with the following considerations:

- The herd will be managed for a mid-winter trend count of 11,000 elk, which will be estimated using ground classifications on feed grounds and aerial surveys ~~on~~across native winter ranges.
- Mid-winter trend counts will be analyzed using a 3-year running average.
- The population will be managed for 20% (plus or minus) of the objective (range of 8,800 to 13,200).
- The Service would not support an object greater than 11,000 elk.

The Service does not oppose the Department's proposal to discontinue use of winter subherd objectives, although in 2007 the Wyoming Game and Fish Commission set an objective of 5,000 animals to winter on the National Elk Refuge. This is similar to the wintering objective stated in the Bison and Elk Management Plan (BEMP) also approved in 2007 through a signed Record of Decision. In order to prevent any unintended misunderstanding by the public regarding that the Department~~'s~~ may have changed it's support of the BEMP, ~~is diminished~~ the Service recommends including a statement in the final document that reaffirms that the Department will continue working with NER and Grand Teton National Park to achieve goals outlined in the 2007 Bison and Elk Management Plan.

The Service also encourages and will support the Department's efforts to develop a "sightability

index" to survey elk off feedgrounds to improve survey accuracy. We think this will decrease the likelihood of underestimating population size which may result if the Department changes its method of population estimation from modelling to one based upon raw count data.

Again, the Service appreciates the opportunity to comment during this population objective review. ~~We also recognize that successful implementation of the BEMP, the prevention of disease transmission, reduction in supplemental feeding and public acceptance of any management changes relies on a strong partnership between the Department and Service.~~

If you have any questions or concerns please contact Refuge Manager, ~~-~~Steve Kallin (307)733-9212 or Refuge Supervisor for Wyoming, Montana and Utah, Michael Blenden (303)236-4306.