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

Teton County, Wyoming

Type of Action:	Administrative
Co-Lead Agencies:	U.S. Department of the Interior, United States Fish and Wildlife Service and National Park Service
Responsible Officials:	Mitch King, Director, Region 6, U.S. Fish and Wildlife Service Michael D. Snyder, Director, Intermountain Region, National Park Service

Abstract: This *Final Bison and Elk Management Plan and Environmental Impact Statement* identifies the purpose and need for a management plan, outlines the legal foundation of elk and bison management on the National Elk Refuge and in Grand Teton National Park / John D. Rockefeller, Jr., Memorial Parkway, and describes and evaluates six alternative plans for managing elk and bison in these areas. The heart of this planning process has involved the development of goals, objectives, and strategies that meet legal directives, that are consistent with wildlife management principles and scientific information, and that consider stakeholder input. Because there is an abundance of summer and fall habitat of suitable condition for elk and bison in Grand Teton National Park and throughout the Jackson elk herd unit, the planning process focused on winter and transitional habitat. Alternatives outline different ways of contributing to the resolution of the problem of an insufficient amount of winter range to support present numbers of elk in Jackson Hole and the growing number of bison.

The No-Action Alternative (Alternative 1) would maintain the maximum of 7,500 elk on the refuge (average of about 5,600 elk), and roughly 2,500 elk would inhabit the park in the summer; bison numbers would increase well beyond 1,000 animals; and winter feeding would be conducted nearly every winter. Alternative 2 would result in elk numbers on the refuge fluctuating between about 1,200 and 6,000 and between 600 and 3,000 in the park; bison would number between 250 and 500; and winter feeding would be phased out within 10–15 years. Alternative 3 would reduce elk numbers to 1,000–2,000 on the refuge and 500–1,000 in the park; bison numbers would be maintained at about 1,000; and winter feeding on the refuge would be reduced to severe winters. Alternative 4 (the Preferred Alternative) would reduce elk numbers to approximately 5,000 on the refuge and to 1,600 in the park; bison numbers would be adaptively reduced to approximately 500; and winter feeding would be reduced. Alternative 5 would be similar to Alternative 1, except that it would reduce bison numbers to 400 through a hunt. Alternative 6 would result in elk numbers declining to 2,400–3,200 on the refuge and 1,200–1,600 in the park; bison numbers would decline to about 500; and winter feeding would be phased out within five years.

The *Draft Bison and Elk Management Plan and Environmental Impact Statement* was on public review from July 21 to November 7, 2005. The agencies received over 11,900 written comments and public testimony from 241 individuals, 37 governmental agencies and organizations, and 1,751 form letters or petitions. The *Final Bison and Elk Management Plan and Environmental Impact Statement* is presented in two volumes: Volume 1 is the *Final Environmental Impact Statement*, and Volume 2 includes comments on the draft statement along with the agencies' responses to substantive comments. *The Final Environmental Impact Statement* is available for review at <http://www.fws.gov/bisonandelkplan>. The U.S. Fish and Wildlife Service and the National Park Service will issue a Record of Decision no sooner than 30 days after the notice of availability for the *Final Environmental Impact Statement* is published in the *Federal Register*.

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Cooperating Agencies and Partners

U.S. Department of Agriculture — Animal and Plant Health Inspection Service and U.S. Forest Service (Bridger-Teton National Forest)

U.S. Department of the Interior — Bureau of Land Management

Wyoming Game and Fish Department

All photographs are courtesy of the U.S. Fish and Wildlife Service or the National Park Service unless otherwise noted.

Summary

INTRODUCTION

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 about 1,000 bison. The elk migrate across several jurisdictional boundaries in northwestern Wyoming, including the National Elk Refuge, which is managed by the U.S. Fish and Wildlife Service (USFWS), and Grand Teton National Park and John D. Rockefeller, Jr., Memorial Parkway, which are managed by the National Park Service (NPS). Ranges also extend into Yellowstone National Park, Bridger-Teton National Forest, Bureau of Land Management (BLM) resource areas, and state and private lands.

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.

Both species contribute significantly to the ecology of the southern greater Yellowstone ecosystem because of their large numbers, wide distribution, effects on vegetation, and their importance to the area's predators and scavengers.

The *Final Bison and Elk Management Plan and Environmental Impact Statement* identifies and evaluates six alternative approaches, including a preferred alternative, for managing bison and elk on the National Elk Refuge and in Grand Teton National Park and John D. Rockefeller, Jr., Memorial Parkway for a 15-year period. The alternatives are a result of extensive public input and working closely with several cooperative agencies and partners. These agencies include

- the Wyoming Game and Fish Department (WGFD), which manages resident wildlife species throughout most of the state
- the U.S. Forest Service, which administers Bridger-Teton National Forest
- the Bureau of Land Management, which administers BLM resource areas in Jackson Hole
- the U.S. Department of Agriculture's Animal and Plant Health Inspection Service, which is in part responsible for preventing the introduction and spread of significant livestock diseases

Photo courtesy of Diana L. Stratton

Sleigh ride on the National Elk Refuge, with the Teton Range in Grand Teton National Park as a backdrop.

Bison and elk on the National Elk Refuge.

Extensive opportunities for input were also provided to local governmental agencies, tribal governments and organizations, nongovernmental organizations, and private citizens.

BACKGROUND

The Role of Elk

Elk figure prominently in Jackson Hole's history and culture. In the late 1800s, when elk populations all over North America were being extirpated, the residents of Jackson Hole protected elk from "tusk hunters" and from large-scale commercial hunting operations. At the same time changes in land use and development reduced access to significant parts of elk native winter range. Before Euro-American settlement, elk had wintered to some degree in the southern portion of Jackson Hole (the location of the National Elk Refuge and the town of Jackson), as well as the Green River, Wind River, and Snake River basins.

By the end of the 19th century the Jackson elk herd was largely confined to Jackson Hole and the immediately surrounding area, and it was at the mercy of severe winter weather when snow accumulation and subzero temperatures made foraging difficult. Substantial numbers of elk died during several severe winters in the late 1800s and early 1900s. This prompted local citizens and organizations in Jackson Hole, as well as state and federal officials, to begin feeding in the winter of 1910–11. On August 10, 1912, Congress appropriated $45,000 for the purchase of lands and maintenance of a "winter game (elk) reserve," which subsequently became the National Elk Refuge.

The Role of Bison

Bison in the Jackson Hole area are popular with visitors and residents as a symbol of the West, and they are central to the culture and traditions of many American Indian tribes. Because there are so few opportunities to see bison in the wild, viewing and photographing bison in Grand Teton National Park is a unique opportunity for many of the valley's visitors, especially with the Teton Range serving as a backdrop.

The presence of prehistoric bison remains indicates that bison had long inhabited the Jackson Hole area. But by the mid-1880s they were extirpated outside Yellowstone National Park. In 1948, 20 bison from Yellowstone were reintroduced to the 1,500-acre Jackson Hole Wildlife Park near Moran. Over the next two decades bison were maintained in a large exclosure. In 1968 the herd (down to 11 animals) escaped from the wildlife park, and a year later the decision was made to allow them to range freely. In 1975 the small bison herd (then 18 animals) began wintering on the National Elk Refuge. The use of standing forage by bison on this natural winter range was viewed as natural behavior and was not discouraged by managers. In 1980, however, the bison began eating supplemental feed that was being provided for elk.

Since discovering this supplemental food source, the Jackson bison herd has grown to approximately 1,000 animals, increasing by 10%–14% each year. Bison on the elk feedlines have at times disrupted feeding operations and displaced and injured elk. In order to minimize conflicts between bison and elk, managers have provided separate feedlines for bison since 1984, but this has become increasingly difficult as the bison population has grown. It is not clear how large the population could become in the absence of human control measures.

Concerns about the rapidly increasing bison herd include greater damage to habitats, competition with elk, risk of disease transmission to elk and domestic livestock, risk to human safety, damage to private property, and costs of providing supplemental feed for bison. Many of the management

issues surrounding the bison herd are controversial. Because of its distribution, the herd falls under the wildlife management jurisdictions of Grand Teton National Park, the National Elk Refuge, and the Wyoming Game and Fish Department. In addition, the Wyoming Livestock Board has authority to remove bison from some public and private lands if there are conflicts with landowners.

Purpose of and Need for Action

Purpose of the Plan

The purpose of the *Final Bison and Elk Management Plan and Environmental Impact Statement* is to analyze options for managing the two herds for the next 15 years. Once finalized by a Record of Decision, the plan will provide managers with goals, objectives, and strategies for managing bison and elk on the National Elk Refuge and in Grand Teton National Park, and it will contribute to the missions and management policies of the U.S. Fish and Wildlife Service and the National Park Service. Given the substantial contributions that the refuge and the park make to 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 Wyoming Game and Fish Department, as well as to several goals and objectives established by the U.S. Forest Service related to elk, bison, and their habitat in Bridger-Teton National Forest.

The identification of current issues does not discount the highly successful past and present efforts to conserve elk and bison in Jackson Hole. In fact, this analysis may help ensure that management actions remain successful. The success of the management program over the long history of the refuge and the park is due in large part to issues being identified and resolved, a process that is and should be ongoing.

Need for Action

This planning effort considers changes in how the bison and elk herds are currently managed on the National Elk Refuge and in Grand Teton National Park in order to meet legal obligations, to address problems related to high animal concentrations and effects on habitat, and to take advantage of unmet opportunities. The need for action comes from many directions, as described below.

1998 Lawsuit to Stop Bison Hunting — In 1996 a *Jackson Bison Herd Long-term Management Plan and Environmental Assessment* was completed by the National Park Service and the U.S. Fish and Wildlife Service, with the Wyoming Game and Fish Department and the U.S. Forest Service participating as cooperating agencies. The selected alternative called for public hunting on the refuge and in Bridger-Teton National Forest to control the rapidly growing bison population and the artificial concentration of bison during the winter. Both of these factors were contributing to the increased

Elk migration on the National Elk Refuge.

Neotropical migratory birds nest on the refuge and in the park.

risk of disease transmission, competition with elk and other wildlife, property damage, erosion, and overgrazing.

Before the plan was implemented, the Fund for Animals successfully sued in 1998 to prevent any "destructive management" of bison for population control until the effects of the refuge's winter feeding program on bison were more fully analyzed. The court enjoined the culling of bison for population control purposes and required a full analysis of the refuge's elk winter feeding program in accordance with the National Environmental Policy Act.

Following the lawsuit, the U.S. Fish and Wildlife Service and the National Park Service decided to broaden the management planning process to include all aspects of elk management, in addition to bison management.

Issues Related to Elk/Bison Concentrations — 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 of potentially major outbreaks of exotic diseases, including bovine tuberculosis and chronic wasting disease, neither of which has yet been documented in the Jackson herds
- damage to and loss of habitat due to browsing of willow, cottonwood, and aspen stands, with resultant reductions in wildlife associated with healthy stands
- unusually low winter mortality of bison and elk, which affects predators, scavengers, and detritivores and which necessitates intensive hunting programs
- a high level of brucellosis in the elk and bison herds

Winter Feeding as a Response to Insufficient Winter Range — All of the biological issues identified above stem from the winter feeding program on the National Elk Refuge. Even though winter feeding was started to mitigate the loss of former winter range to other land uses, it has benefited the elk population by reducing winter mortality and allowing the herd to grow. At the same time local ranchers' haystacks and livestock pastures have been protected from depredation by foraging elk. As previously discussed, supplemental feeding has also contributed to a growing bison population.

> The need for winter feeding remains much the same as it was in 1912 — there is an insufficient amount of winter range to support the numbers of elk that occupy the Jackson Hole area, and this has been true for more than 100 years. Supplemental feeding to make up the deficit in native forage has also contributed to an expanding bison population, adding to the overall problem.

FACTORS CONSIDERED IN DEVELOPING THE PLAN

Many factors were considered in formulating management goals and alternatives to address the purpose of and need for action.

Legal Directives

National Elk Refuge

The National Elk Refuge is part of the National Wildlife Refuge System. The *fundamental* mission of this system, according to Congress, is the conservation of fish, wildlife, and plants, where conservation is defined as sustaining healthy populations of these organisms. Characteristics of a healthy wildlife population include a stable and continuing population (i.e., the population returns to an initial equilibrium after being disturbed) and

a minimized likelihood of irreversible or long-term effects.

While the National Elk Refuge was established in 1912 as a "winter game (elk) reserve," over the years its purpose has been broadened to include "refuges and breeding grounds for birds, other big game animals, the conservation of fish and wildlife, the protection of natural resources, and the conservation of threatened or endangered species."

USFWS policy directs that wildlife population levels on national wildlife refuges be maintained at levels consistent with sound wildlife management principles, that populations be managed for natural densities and levels of variation, and that population management activities contribute to the widest possible natural diversity of indigenous fish and wildlife, even when population management activities are implemented for a single species.

However, USFWS policy also requires that wildlife densities do not reach excessive levels that would result in adverse effects on habitat and other wildlife species, including increased disease risks.

Grand Teton National Park / John D. Rockefeller, Jr., Memorial Parkway

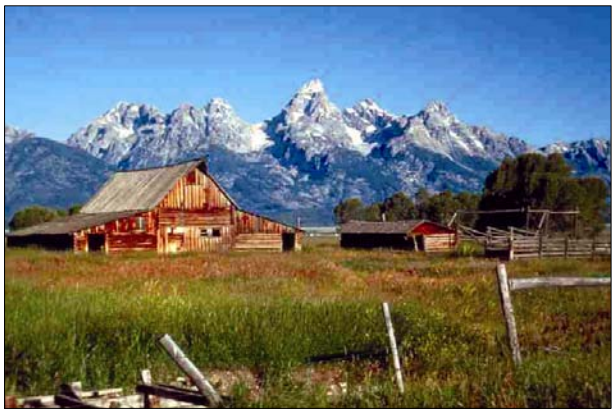
The purpose of national parks, as stated in the NPS Organic Act, is "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

Grand Teton National Park is dedicated to the preservation and protection of the Teton Range and its surrounding landscapes, ecosystems, and cultural and historic resources. The singular geologic setting makes the area and its features unique. Human interaction with the landscape and ecosystem has resulted in an area that is rich in natural, cultural, and historic resources and that represents the natural processes of the Rocky Mountains and the cultures of the American West. The purpose of Grand Teton National Park is to protect the area's native plant and animal life, its cultural and historic resources, and its spectacular scenic values, as characterized by the geologic features of the Teton Range and Jackson Hole.

John D. Rockefeller, Jr., Memorial Parkway was established to commemorate the contributions to the cause of conservation made by John D. Rockefeller, Jr. The purpose of the parkway is to conserve the scenery and natural and historic resources and to provide for their use while leaving them unimpaired for future generations.

In accordance with NPS *Management Policies 2006*, the focus of natural resource conservation in all National Park System units will be at an ecosystem level, emphasizing natural abundance, diversity, and genetic and ecological integrity of native species in an ecosystem. Normally, the Park Service will not intervene in natural biological or physical processes except when an ecosystem's functioning has been disrupted by human activities or when park-specific legislation authorizes particular activities (such as livestock grazing and elk herd reductions in Grand Teton National Park).

For migratory species, such as the elk and bison in Grand Teton, NPS policies encourage the adoption of resource preservation and use strategies to maintain natural population fluctuations and processes. The survival of the species in national parks also depends on the existence and quality of habitats outside the parks. Thus, the Park Service must work with other land managers to encourage the conservation of the populations and habitats of these species outside parks whenever possible.



Moulton barn in Grand Teton National Park.

PRINCIPLES AND SCIENTIFIC INFORMATION

Wildlife management principles and scientific information are critical in the development of goals, objectives, and strategies for managing wildlife. The U.S. Fish and Wildlife Service must base decisions on sound wildlife management principles and available scientific information.

Similarly, planning for national parks must be guided by high-quality, scientifically acceptable information, data, and impact assessment. The National Park Service is required to integrate the best available science into management plans.

Public, Tribal Governments, and Other Stakeholder Issues

Seven significant issues were identified during the public involvement process and tribal government consultation. These issues were considered in the formulation of alternative sets of objectives and strategies.

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.

Elk feedline on the refuge.

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 viewing opportunities.
6. *Cultural Opportunities, 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. 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.

DESIRED CONDITIONS

By the end of the 15-year implementation period, the National Elk Refuge and Grand Teton National Park provide winter, summer, and transitional range for large portions of the Jackson bison and elk herds. The environment supports a full complement of native plant, wildlife, and breeding bird species. Refuge and park staffs, working with others, 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 bison and elk management plan were developed based on the purposes of the National Elk Refuge and Grand Teton National Park, the missions of the National Wildlife Refuge System and the National Park System, and other legal and policy directives. The goals also consider input from stakeholders.

The alternatives developed and considered in the *Final Environmental Impact Statement* respond to these four goals. Each alternative is based on specific objectives and strategies to achieve them.

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 natural ecosystem functioning in Grand Teton National Park and the parkway, 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 that are influenced by fire, vegetation succession, weather, predation, and competition. At the same time support public

Riparian habitat along Pilgrim Creek in Grand Teton National Park.

elk reductions in Grand Teton National Park, when necessary, to achieve elk population objectives that have been jointly developed by the Wyoming Game and Fish Department, Grand Teton National Park, and the National Elk 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 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 elk and bison populations in order to protect the economic interest and viability of the livestock industry, and reduce the risk of adverse effects for other non-endemic diseases not currently found in the Jackson elk and bison populations.

ALTERNATIVE MANAGEMENT PLANS

The six alternatives considered in the *Final Bison and Elk Management and Environmental Impact Statement* are:

- *Alternative 1* — No action

- *Alternative 2* — Minimal management of habitat and populations, with support for migrations
- *Alternative 3* — Restore habitat, support migrations, and phase back supplemental feeding
- *Alternative 4* — Adaptively manage habitat and populations (Preferred Alternative)
- *Alternative 5* — Restore habitat, improve forage, and continue supplemental feeding
- *Alternative 6* — Restore habitat, adaptively manage populations, and phase out supplemental feeding

Each alternative is made up of a number of different measurable objectives and strategies that distinguish one alternative from another. Objectives state "what you are going to do," and strategies tell "how you are going to get there."

ACTIONS INDEPENDENT OF THE ALTERNATIVES

The following ongoing activities are independent of the alternatives and would occur under all:

- *Invasive Weed Control, Nonnative Plant Species Control, and Integrated Pest Management* — The control of invasive weeds and integrated pest management for both the refuge and the park would continue. The U.S. Fish and Wildlife Service and the National Park Service would continue working together and with the Teton County Weed and Pest Control District, the U.S. Forest Service, the Wyoming Game and Fish Department, and private landowners to manage invasive species. Efforts to eradicate cheatgrass and crested wheatgrass would continue on the refuge, much as they have in the recent past.
- *Jackson Hole Interagency Habitat Initiative* — The U.S. Fish and Wildlife Service and the National Park Service would continue to work cooperatively with other agencies in identifying opportunities to improve habitat for elk and bison.
- *Jackson Elk Studies Group and Greater Yellowstone Interagency Brucellosis Committee* — The U.S. Fish and Wildlife Service and the National Park Service would continue to participate in these groups to assess the risk for brucellosis transmission from elk or bison to livestock.
- *Livestock Grazing* — None of the alternatives would change livestock grazing practices in the park, nor would any alternatives mandate that such use continue.

ELEMENTS COMMON TO ALL ALTERNATIVES

The following elements would be common to all alternatives (except where noted):

- *Chronic Wasting Disease* — Efforts would be coordinated with the Wyoming Game and Fish Department to increase the surveillance of elk for chronic wasting disease. If infection was found, WGFD strategies for state feedgrounds would be used to reduce the transmission risk. These strategies include removing infected elk, removing 50 animals within 5 miles when an infected animal is found, and removing an additional 50 animals within 10 miles if another infected animal is found during collection of the initial 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. Plans to follow the state CWD management plan have been made in deference to the state and could change if the National Park Service and/or the U.S. Fish and Wildlife Service adopted servicewide management requirements that differed from what is currently being done. Potential changes would be communicated to the state.

Photo courtesy of Terry J. Kreeger, WGFD

Elk with chronic wasting disease.

- *Winter Severity* — Although various factors affect winter severity, snow-water equivalent (how much water is contained in snow) was considered the best measure for predicting how ungulates would respond to winter conditions. Based on rankings of snow severity using 50 years of data, the winter of 1996 was designated as average, 1982 as above average, and 1997 as severe.
- *Strategies for Hunting/Reduction Programs (all alternatives except Alternative 2)* — The U.S. Fish and Wildlife Service and the National Park Service would work cooperatively with the Wyoming Game and Fish Department to achieve population objectives (including herd ratios and elk herd segment sizes), to develop hunting or reduction seasons, and to evaluate hunting or elk reduction areas. The Wyoming Game and Fish Department would formally establish objectives and strategies after public review and approval by the Wyoming Game and Fish Commission.

Alternative 1: No Action

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 all of the 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 2: Minimal Management of Habitat and Populations, with Support for Migrations

Over time efforts to actively manage the elk and bison herds and their habitat would be greatly reduced on the refuge and in the park. The Jackson elk and bison herds 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 U.S. Fish and Wildlife Service and the National Park Service 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.

Moose in Grand Teton National Park.

* It is recognized that the U.S. Fish and Wildlife Service and the National Park Service do not have jurisdiction to implement this option. This effort could only happen if the agencies responsible for the management of ungulates and their habitat outside the National Elk Refuge and Grand Teton National Park pursued such measures.

ALTERNATIVE 3: RESTORE HABITAT, SUPPORT MIGRATION, 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 1,000) 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 U.S. Fish and Wildlife Service and the National Park Service 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.

The Preferred Alternative

The National Environmental Policy Act requires agencies to identify their preferred alternative in the final environmental impact statement. Alternative 4 is the preferred alternative for bison and elk management because it would adaptively manage habitat and populations to achieve desired conditions over 15 years. This alternative strives to balance the significant management issues with the purposes, missions, and management policies of the U.S. Fish and Wildlife Service and the National Park Service, as well as with the interests of other agencies and stakeholders.

ALTERNATIVE 4: ADAPTIVELY MANAGE HABITAT AND POPULATIONS (PREFERRED ALTERNATIVE)

The Jackson bison and elk herds and their habitat would be adaptively managed on the refuge and in the park, with an emphasis on improving winter, summer, and transitional range in the park and on the refuge and on ensuring that the biotic integrity and environmental health of the resources would be sustained over the long term. A dynamic framework for decreasing the need for supplemental feeding on the refuge would be developed and implemented in close cooperation with the Wyoming Game and Fish Department and would be based on existing conditions, trends, new research findings, and other changing circumstances. Population management, vegetation restoration, ongoing monitoring, and public education would be integral components of this framework.

The U.S. Fish and Wildlife Service and the National Park Service would collaborate with the Wyoming Game and Fish Department to maintain the Jackson elk herd at the state's objective of approximately 11,000 animals. Following the initial implementation of a phased approach, approximately 5,000 elk would be expected to winter on the refuge. As herd sizes and habitat objectives were achieved, further reductions in feeding or elk numbers could occur based on established criteria and changing social, political, or biological conditions. Bison and elk hunting on the refuge, and when necessary, the elk herd reduction program in the park, would be used to assist the state in managing herd sizes, sex and age ratios, and summer distributions.

The park and refuge would work with the Wyoming Game and Fish Department to maintain and ensure a genetically viable population of approximately 500 bison.

The Wyoming Game and Fish Department would be permitted to vaccinate elk and bison for brucellosis on the refuge as long as it was logistically feasible. Management actions would not be designed to specifically facilitate vaccination.

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 culti-

vated 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 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, a bison hunt would be used on the refuge to eventually manage a herd averaging 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.

Environmental Consequences

Environmental consequences of the alternatives were analyzed for several different geographic areas, as defined below:

- *Primary analysis area* — The primary analysis area includes the National Elk Refuge, Grand Teton National Park, John D. Rockefeller, Jr., Memorial Parkway, a portion of Yellowstone National Park south of Yellowstone Lake, the portion of Bridger-Teton National Forest west of the Continental Divide and north of Jackson, and private land along the Snake River north of Jackson. This area also encompasses the year-round movements of the bison herd.
- *Secondary analysis area* — Several alternatives could result in the migration of elk south into the upper Green River valley and the Red Desert as a result of reduced winter feeding on the refuge. This area is believed by some to be within the historical range of the Jackson elk herd. Neither the U.S. Fish and Wildlife Service nor the National Park Service has management jurisdiction of lands in these areas. Federal lands are managed by the U.S. Forest Service as part of Bridger-Teton National Forest or by the Bureau of Land Management.
- *Social and economic analysis area* — The management of elk and bison may have social and economic effects. The socioeconomic analysis area includes the town of Jackson, Teton County in both Wyoming and Idaho, and the state of Wyoming.

Impacts are generally described below. Under Alternative 1, the No-Action Alternative, all impacts are compared to baseline conditions. Under Alternatives 2–6 impacts are compared to what would happen under Alternative 1. Impacts are summarized for the National Elk Refuge and Grand Teton National Park; potential impacts in adjacent areas are more fully described in the *Final Environmental Impact Statement.*

No resources or values in Grand Teton National Park or John D. Rockefeller, Jr., Memorial Parkway would be impaired under any alternative, although an outbreak of a non-endemic infectious disease could cause major adverse impacts to both the elk and bison populations.

Impacts on the Physical Environment

National Elk Refuge. Soils under all alternatives would be affected primarily by continued agricultural activities on the National Elk Refuge or the restoration of native vegetation on the refuge

and in the park. Impacts on the refuge would be adverse and would range from negligible to minor over the short and long terms. Impacts in the park would be adverse in the near term but beneficial in the long term.

Impacts on water resources would result primarily from irrigation practices on the National Elk Refuge to provide additional forage for elk and bison. Water diversions from July through September could adversely affect stream flows, with impacts ranging from major adverse under Alternative 1, to major beneficial under Alternative 2 due to stopping forage cultivation. Converting to a more efficient sprinkler irrigation system under Alternatives 4, 5, and 6 would allow larger areas to be cultivated, but stream flows would still be adversely affected in July and August.

Water quality would continue to be affected by large concentrations of elk and bison on the refuge in the winter, as well as farming practices. Alternatives that would continue large winter animal concentrations on the refuge would generally have minor, adverse impacts, while alternatives that reduced wintering concentrations of elk and bison would have beneficial impacts on water quality.

Visual resources could be affected by irrigation systems on the refuge, maintenance of large structures for storing supplemental food, and the construction of vegetation exclosures. Impacts would range from negligible and adverse under alternatives that continued these activities to negligible and beneficial under alternatives that resulted in a more natural landscape.

Grand Teton National Park. In Grand Teton National Park restoring former agricultural lands to native plant species would have negligible adverse impacts on soils and water resources in the short term, with long-term beneficial impacts. Large numbers of elk and bison under Alternative 1 would add to park visual resources; fluctuating numbers under other alternatives could affect visual resources, although changes might not be noticeable to visitors. Overall impacts on visual resources would be negligible.

IMPACTS ON HABITAT

National Elk Refuge. Impacts on marshlands would be negligible under all alternatives.

Continued grazing in wet meadows would cause habitat conditions to decline to fair or poor condition under alternatives with relatively high numbers of elk and bison. Under alternatives with fewer elk and bison, wet meadow habitats that contain suppressed willows would convert to willow habitat.

Native grasslands would likely increase as a result of continued heavy browsing by elk and bison in cottonwood and sagebrush shrubland habitats under Alternative 1. Under Alternatives 2, 3, and 6 fewer elk and bison would allow small areas of grasslands to gradually convert to sagebrush shrubland habitat. Under Alternatives 4 and 5 native grassland would increase slightly due to a decline in cottonwood communities.

Sagebrush shrublands would experience minor declines in some areas due to browsing by elk and bison, with some areas converting to native grassland. Over the long term sagebrush shrubland would generally increase under all alternatives due to the conversion of other plant communities, with the greatest increase under Alternatives 2, 3, and 6.

Aspen habitat would continue to decline under all alternatives except Alternative 6 due to elk and bison grazing, and it could be permanently lost

An exclosure on the refuge used to prevent browsing by elk and bison.

under Alternatives 1, 2, and 3 as conifer forest habitat and sagebrush habitat encroached on aspen communities. Willow habitat would be adversely affected by heavy browsing by elk under Alternatives 1 and 2, although elk migrations to other wintering areas under Alternative 2 could allow aspen, willow, and cottonwood stands to recover. Lower numbers of elk and bison under Alternative 3 could allow willow communities to increase. Cottonwood communities would generally decline under all alternatives except Alternative 3 (because there would be fewer elk and less browsing pressure). Several factors under Alternative 6, including lower elk densities, would promote a major improvement in woody vegetation. Exclosures under Alternatives 4, 5, and 6 would allow protected aspen, willow, and cottonwood habitat to improve.

No significant change in conifer forest on the National Elk Refuge is expected under any alternative. Natural succession in aspen stands would lead to a slight increase in conifer forest.

Forage production for elk and bison would continue on about 2,400 acres on the National Elk Refuge under all alternatives except 2 (and one option under Alternative 3). Under Alternative 2 cultivated fields would be restored to native vegetation, with forage similar to native grasslands.

Grand Teton National Park. No change in acreages of marshlands or wet meadows are expected under any alternative. Approximately 4,500 acres of former agricultural lands would be restored to native plant communities (native grasslands and sagebrush shrubland) under Alternatives 2–6. Riparian and aspen woodlands would decrease slightly under Alternative 1 due to elk browsing but would increase under Alternatives 2–6 because of decreased browsing pressure, with the least potential increase under Alternative 5 due to large numbers of elk summering in the park. Conifer forests could increase to a negligible degree under Alternative 1 due to conversion of aspen stands; no changes in conifer forests are expected under Alternatives 2–6.

Impacts on the Jackson Elk Herd

Impacts on the Jackson elk herd are described for both the National Elk Refuge and Grand Teton National Park because herd movements are fluid and not restricted to a particular geographic area.

Under Alternative 1 elk numbers would remain similar to baseline conditions, with an estimated 11,000 elk in the Jackson herd, and 5,600 to 7,500 elk annually wintering on the National Elk Refuge and around 2,500 elk summering in the park. Large concentrations of elk in winter would continue to focus on supplemental feedgrounds on the refuge. This alternative would have the highest risk for a non-endemic infectious disease to quickly spread through the elk population, with the potential for a major, adverse impact on survival, population size, and sustainability of the herd. The prevalence of brucellosis in the herd would remain similar to baseline levels and could increase with a larger bison population and more interactions between elk and bison.

Under Alternative 2 the number of elk in the Jackson elk herd would fluctuate from 8,100 to 11,000, and between 1,200 and 6,000 elk could winter on the refuge and 600 to 3,000 could summer in the park. In the long term this alternative would lower the number of elk that winter on the refuge and summer in the park. Wintering elk would disperse in search of natural forage as supplemental feeding was phased out over time, with more elk ranging in areas outside the refuge and the park. Without supplemental feeding the herd would be more responsive to natural conditions, and winter mortality would fluctuate with winter severity, precipitation regimes, and standing forage. Harvest mortality could decrease without the refuge elk hunt and the park reduction program. In the long term the risk of a non-endemic infectious disease quickly spreading through the elk population would be lowest under Alternative 2 (along with Alternative 6) due to the elimination of nearly annual supplemental feeding and reduced bison and elk numbers. The prevalence of brucellosis in the Jackson elk herd would be moderately lower than under Alternative 1.

Under Alternative 3 the Jackson elk herd would have an estimated 7,900–11,000 animals over the long term, and fewer elk would winter on the refuge (1,000–2,000). Hunting and decreased supplemental feeding would result in approximately 500–1,000 elk summering in the park. The elk herd would increase its movements and distribution due to reductions in the supplemental feeding

program, and similar to Alternative 2 the herd would be more heavily influenced by natural conditions. The risk of a non-endemic infectious disease quickly spreading through the elk population would be lower than under Alternatives 1, 4, and 5, and higher than under Alternatives 2 and 6. The prevalence of brucellosis in the Jackson elk herd would be moderately lower.

Compared to Alternative 1, Alternative 4 would emphasize a phased approach and the flexibility of adaptive management after the initial phase to reduce the number of elk on feed on the refuge. By the end of this phase, there would be an estimated 11,000 elk in the Jackson herd and enhanced forage production on the refuge, compared to Alternative 1, and approximately 5,000 elk would winter on the refuge by the end of the initial phase. About 1,600 elk would summer in the park. Reducing supplemental feeding would decrease refuge elk numbers and densities, although approximately 1,600 acres of exclosures on the refuge to protect woody vegetation would alter distribution and could increase elk densities outside the fences. More elk in the Jackson herd would increase their movements and distribution and respond in a more natural way to winter forage availability. Negligibly increased winter mortality could occur in some years. The risk of a non-endemic infectious disease quickly spreading through the elk population would be intermediate among the alternatives. The risk would be lower due to reduction of winter feeding and fewer bison and elk, but higher than under Alternatives 2, 3, and 6. The prevalence of brucellosis in the Jackson elk herd would be moderately lower than under Alternative 1. Vaccines would be administered to elk and bison on the refuge during supplemental feeding periods, and more efficacious vaccines would be used when they become available. Vaccines would not be used when administering them would be logistically infeasible. After the initial phase, adaptive management would be emphasized to better reach desired conditions and goals concerning habitat, disease, and conflict prevention. Brucellosis prevalence and other disease risks would be further reduced through this management strategy.

Under Alternative 5 there would be at least 11,000 elk in the Jackson elk herd in the long term, similar to Alternative 1. The number of elk wintering on the refuge (5,000–7,500) would also be similar to baseline conditions and Alternative 1, as would elk summering in the park (less than 2,500). Under Alternative 5 a brucellosis vaccination program could lower disease prevalence by a minor degree. Movements and distribution would be similar to baseline conditions and Alternative 1 in the long term due to nearly annual winter supplemental feeding on the refuge. Large concentrations of elk would continue to focus in winter on feedgrounds and nearby areas. The risk of a non-endemic infectious disease quickly spreading through the elk population would be high due to the near-annual winter feeding program (higher than Alternatives 2, 3, 4, and 6, but slightly lower than Alternative 1).

Elk in Grand Teton National Park.

Under Alternative 6 there would be an estimated 9,300–11,000 elk in the Jackson elk herd in the long term and fewer elk (2,400–3,200) wintering on the refuge and summering (1,200–1,600) in the park. The elk herd would increase its movements and distribution, and increased winter mortality would occur. After supplemental feeding was phased out, the herd would be more responsive to natural conditions, similar to Alternative 2. The risk of a non-endemic infectious disease quickly spreading through the population would be among the lowest of the alternatives because contact associated with the feedlines would be eliminated, numbers would be reduced, and animals would be more widely dispersed. The prevalence of brucellosis in the Jackson elk herd would be moderately lower than under Alternative 1.

Impacts on the Jackson Bison Herd

As described for the Jackson elk herd, impacts on the bison herd are described for both the National Elk Refuge and Grand Teton National Park.

Under Alternative 1 no objective would be set for the Jackson bison herd, which could grow to as many as 2,000 bison by 2014. A larger bison population would increase its movements and distribution, likely increasing competition for forage and displacing elk and possibly making greater use of the national forest and private lands in Jackson Hole and Buffalo Valley. The risk of a non-endemic infectious disease quickly spreading through the bison population would be the highest of any alternative due primarily to the near-annual winter feeding program and growing bison numbers. The prevalence of brucellosis in the bison herd would remain high (58%–84%) and could increase somewhat due to higher bison numbers. Of all alternatives, Alternative 1 would result in the lowest level of long-term health, sustainability, and naturalness in the bison herd.

Under Alternative 2 the Jackson bison herd would number between an estimated 250 and 500 animals in the long term. After supplemental feeding and forage production on the refuge were phased out, bison would disperse onto native range and become more subject to climate, predation, and natural forage conditions. Mortality would increase during more severe winters. Although genetic viability could be threatened if the herd decreased below 400 animals, periodic introduction of unrelated bison would be used to counter this threat to herd health. The risk of a non-endemic infectious disease quickly spreading through the herd would be the lowest (along with Alternative 6) of any alternative. The prevalence of brucellosis in the bison herd would be moderately lower than under Alternative 1. Fertility control under Alternative 2 would initially impact population numbers. Alternative 2 (along with Alternative 6) would result in higher levels of long-term health, sustainability, and naturalness in the bison herd than what would occur under Alternatives 1, 3, 4, and 5.

Under Alternative 3 there would be approximately 1,000 bison in the Jackson herd. The bison herd would increase its movements and distribution due to reductions in supplemental feeding to severe winters only (approximately 2 years of 10). The herd would be more responsive to natural conditions, and winter mortality would increase. Reductions in elk and bison density would lower the risk of a non-endemic infectious disease quickly spreading through the herd. A minor to moderate decrease in brucellosis prevalence in the bison herd related to increased dispersion and reductions in the frequency of supplemental feeding would occur. Using an effective vaccine on a large portion of bison calves each year could result in moderate reductions. Long-term health, sustainability and naturalness in the bison herd would be lower than under Alternatives 2 and 6 and higher than under Alternatives 1, 4, and 5.

Under Alternative 4 the agencies would recommend an objective of approximately 500 bison in the Jackson herd. The bison herd would increase its movements, distribution, and reliance on native winter range in some years due to reduced winter feeding, and winter mortality could increase negligibly. The herd would be more responsive to natural conditions. Genetic viability could be sustained in a herd of 500 bison, and the agencies would adaptively manage the herd based on genetic science to ensure long-term retention of heterozygosity. Reduced supplemental feeding and a bison hunt on the refuge would reduce bison numbers, increase distribution, and reduce potential disease transmission.

Under Alternative 5 there would be about 400 bison in the Jackson herd in the long term. Nutritional status would remain high due to nearly annual supplemental winter feeding, and annual survival would remain high as compared to a non-fed population. The risk of a non-endemic infectious disease quickly spreading through the bison population would be similar to Alternative 1 due primarily to near annual winter feeding. However, the risk would be somewhat reduced because the herd would be smaller. The use of RB51 could reduce brucellosis prevalence by up to a minor degree. Alternative 5 would result in levels of long-term health, sustainability, and naturalness that would be somewhat higher than Alternative 1 and lower than Alternatives 2, 3, 4, and 6.

Under Alternative 6 the bison herd would average about 500 animals. Phasing out supplemental winter feeding would cause the herd to disperse more widely in search of native forage. The herd would

become more responsive to environmental conditions, and winter mortality would fluctuate. Although intensive age-biased harvest in the short term would temporarily alter age and sex ratios, harvest would be adjusted in the long term to maintain more natural ratios. The risk of a non-endemic infectious disease quickly spreading through the bison population would be the lowest (along with Alternative 2) of any alternative due to eliminating the nearly annual winter supplemental feeding program and fewer bison and elk. The prevalence of brucellosis in the bison herd would be moderately lower than under Alternative 1. Alternative 6 (along with Alternative 2 and Alternative 4 as adaptive management measures were implemented) would result in higher levels of long-term health, sustainability, and naturalness in the bison herd than would Alternative 3 or 5.

IMPACTS ON OTHER WILDLIFE

Threatened, Endangered, or Special Concern Species. The following species would not be affected by any of the alternatives considered in this document: lynx, wolverines, river otters, fishers, American martens, and whooping cranes.

Under all alternatives if disease substantially reduced the number of elk and bison, then wolves, grizzly bears, and bald eagles could be positively affected in the short term due to an increase in carcasses, but over the long term their prey base and scavenging opportunities would be reduced.

Under Alternative 1 impacts on wolves, grizzly bears, and bald eagles on the refuge and in the park would be similar to baseline conditions, and species could benefit due to natural mortality of a growing number of bison. Under Alternatives 3, 4, 5, and 6 scavenging wolves, grizzly bears, and bald eagles would benefit in the short term from gut piles left by hunters as bison numbers were reduced. Under these alternatives the bison hunt would be highly managed, and the risk of any increased conflicts between hunters and grizzly bears, while already low, would be minimized as necessary during the hunt. In the long term benefits would be reduced because fewer animals would be harvested.

Under Alternatives 2, 3, 4, and 6 wolves, grizzly bears, and bald eagles would benefit in years of increased elk and bison mortality compared to Alternative 1. Grizzly bears could benefit from elk and bison being more distributed over the landscape and having higher winter mortality.

Yellow-billed cuckoos on the refuge and in the park could be negatively affected by a decline in woody riparian habitat under Alternative 1. Under Alternative 2 yellow-billed cuckoos could benefit to a negligible degree from less habitat loss and a smaller decline in the condition of woody riparian habitat. Under Alternatives 3, 4, 5, and 6 the improved condition and increased acreage of woody riparian habitat compared to Alternative 1 could positively affect cuckoos.

Other Ungulates. Alternative 1 would continue to limit the ability of the Jackson mule deer population to recover due to (1) continued degradation and loss of key habitats on the refuge and in the park, (2) a high level of competition for forage on the refuge, and (3) potential disease risks associated with the high concentrations of elk and bison. Moose habitat would continue to decline to a minor degree due to the degradation and loss of riparian and aspen woodland habitat on the refuge and in the park. Elk would compete directly with bighorn sheep for forage on the refuge, and bison could begin competing with bighorn sheep in the long term. Large concentrations of elk on refuge feedlines and growing numbers of bison on the feedlines would increase the potential for mule deer and moose populations to be infected by a non-endemic infectious disease transmitted from elk or bison.

Alternatives 2, 3, and 6 would have the least adverse impacts to other ungulates on the refuge because of increased habitat, except that competition between bighorn sheep, elk, and bison could increase. In the park aspen habitat under Alternatives 2, 3, and 6 would improve in many areas that are now being heavily grazed by elk. In areas where winter use by elk increased, competition with moose for browse could increase during some winters. Alternatives 2 and 6, followed by Alternative 3, would have the lowest risk of a non-endemic infectious disease in elk or bison herds adversely impacting the population health of other ungulates.

Alternatives 4 and 5 would be more detrimental to mule deer, moose, and bighorn sheep on the refuge than Alternative 1 because of exclosures to

Coyote and magpies scavenging on an elk carcass.

protect aspen habitat from browsing. Adverse impacts would be less under Alternative 5 because supplemental feeding would continue in most winters. Alternative 4 impacts could be reduced after the initial phase due to adaptive changes in exclosure design.

Predators and Scavengers. Impacts on predators and scavengers (including black bears, cougars, coyotes, badgers, magpies, and ravens) would be similar to those described for threatened and endangered species.

Small Mammals. Impacts on small mammals would depend on the degree of increase or decrease in specific habitats. Under Alternative 1 overall diversity of small mammal species on the refuge could decline negligibly. Under Alternative 2 and Alternative 3 (Option B) small mammals associated with sagebrush shrubland and riparian and aspen woodlands would benefit, while those associated with cultivated fields and native grasslands would be adversely affected. If large numbers of elk migrated outside the Jackson Hole area under Alternative 2, small mammal diversity could increase because of more natural conditions. There would likely be a greater diversity of small mammals under Alternative 3 (Option A), as well as Alternatives 4, 5, and 6, because of improved riparian and aspen woodland habitats, but small mammals associated with wet meadows and native grasslands would be reduced due to a change to sprinkler irrigation and drier conditions.

Overall small mammal diversity in the park could decline under Alternative 1 because some riparian and aspen woodlands would convert to conifer forest and sagebrush shrubland. Under Alternatives 2–6 small mammal communities would more closely approximate a natural level of diversity due to the conversion of agricultural lands to native vegetation and a potential increase in the health of riparian and aspen woodlands.

Beavers and Porcupines. Under Alternative 1 beavers and porcupines would continue to experience negative impacts because of the loss of willow, cottonwood, and aspen habitat on the refuge. Under Alternative 2 they would benefit by a negligible to minor degree if elk migrated out of Jackson Hole, allowing minor improvements in woody habitat. Under Alternatives 3–6 beavers and porcupines could benefit by a moderate to major degree depending on the amount and quality of riparian and aspen woodland habitat.

In Grand Teton National Park beavers and porcupines under Alternative 1 could be negatively impacted by the decline in the condition of riparian and aspen woodlands due to elk browsing. Under Alternatives 2–6 they could benefit from a negligible to minor increase in riparian and aspen woodland habitats and improved habitat conditions.

Neotropical Migratory Birds. Impacts on Neotropical birds would depend on the condition of various habitats. Under Alternative 1 there would be a moderate decrease in bird diversity in riparian areas and aspen woodlands, while there would be a negligible increase under Alternative 2. If large numbers of elk migrated out of Jackson Hole under Alternatives 2, 3, and 6, bird habitat would be enhanced by a major increase in willow habitat and improved aspen communities. There would be a moderate increase under Alternatives 4 and 5.

Neotropical migratory bird diversity in the park would likely decline in small, localized areas under Alternative 1 due to a long-term decrease in aspen habitats as a result of elk browsing. Under Alternatives 2–6 restoring 4,500 acres of agricultural lands in the park to native plant communities would likely increase habitat and bird diversity, more closely approximating natural conditions compared to Alternative 1. The benefits would be less under Alternative 5 due to relatively high numbers of elk browsing on woody vegetation.

Sage Grouse. Sage grouse could benefit under Alternatives 1, 3 (Option A), 4, and 5 from a minor,

long-term increase in sagebrush shrubland, but increased browsing and grazing in sagebrush could negatively affect sage grouse populations. Under Alternatives 2, 3 (Option B), and 6 sage grouse would benefit from a major increase in sagebrush shrubland.

Sage grouse in the park could be adversely affected under Alternative 1 by growing numbers of bison in sagebrush shrubland habitat. Sage grouse could benefit in the long term from additional sagebrush shrubland habitat in the park under Alternatives 2–6.

Waterbirds, Shorebirds, Rails, and Cranes. Heavy grazing by elk in nesting areas and more bison grazing in the southern part of the refuge over the long term could increase adverse effects on nesting waterfowl under Alternative 1, and the condition of wet meadow habitat could decline. Waterfowl and rails could benefit under Alternative 2 from a possible increase in nesting cover; shorebirds would likely not be affected. Sandhill cranes could decrease on the refuge with the cessation of irrigation. The conversion of wet meadow habitat to willow habitat under Alternatives 3–6, combined with a change from flood irrigation to sprinkler irrigation under Alternatives 4, 5, and 6, would likely result in adverse impacts; however, the resulting bird community would more closely approximate a native diversity of birds.

High levels of bison and elk grazing on wet meadow habitats in the park under Alternatives 1 and 5 could cause a shift from native to nonnative plant communities in some areas, reduce residual vegetation, and limit cover and nesting habitat in localized areas. Waterfowl, shorebirds, rails, and cranes in the park could benefit under Alternatives 2 and 3 from fewer elk and bison grazing in wet meadow habitats, as well as under Alternatives 4 and 6, but not to the same extent. Residual vegetation might remain high enough to provide cover for nesting birds. In addition, the condition of wet meadow habitats might not decline to the same degree that they would under Alternative 1.

Amphibians. Amphibians on the refuge could be negatively impacted by the continued loss of riparian and aspen woodland habitat and possible trampling of streambanks by elk and bison under Alternative 1. Eliminating flood irrigation (Alternative 2, Option B of Alternative 3) or changing to a more efficient sprinkler system (Alternatives 4, 5, and 6) could negatively affect amphibians. Improved willow habitat would be beneficial.

Amphibians in the park could experience adverse impacts under Alternative 1 due to a loss of woody riparian habitat in localized areas from heavy elk browsing and trampling. Under Alternatives 2–6 more woody riparian habitat due to less intensive browsing and trampling of woody vegetation would have a negligible benefit.

IMPACTS ON ARCHEOLOGICAL AND ETHNOGRAPHIC RESOURCES

Archeological Resources. Alternative 1 could result in a negligible adverse effect on archeological resources due to more bison. Option A of Alternative 3 would have beneficial effects as compared to Alternative 1, while Alternative 2 and Option B of Alternative 3 would have negligible adverse impacts due to restoring cultivated fields to native vegetation. Constructing a sprinkler irrigation system on the refuge under Alternatives 4, 5, and 6 could result in negligible adverse effects.

Ethnographic Resources. Hunting was a tradition practiced by American Indian tribes, who are believed to have traditionally used the lands within

Trumpeter swan nesting on the National Elk Refuge.

Grand Teton National Park and the National Elk Refuge. Alternative 1 would not allow for hunting bison on the National Elk Refuge, and no hunting would be allowed under Alternative 2. Alternatives 3 and 6, and potentially Alternative 4, would provide for a ceremonial taking of bison by Native Americans on the refuge, in recognition of the cultural significance of bison to various tribes. In Alternatives 2 and 3, efforts to support elk migration to winter range outside Jackson Hole would be consistent with tribal views to let the herds behave naturally.

Impacts on Human Health and Safety

Under all alternatives the number of traffic accidents potentially caused by elk and bison are expected to remain low, but could increase negligibly in winter under Alternatives 2, 3, and 6, which would reduce supplemental feeding and foster greater reliance on native forage, causing animals to spread themselves throughout the Jackson Hole area. At the same time smaller herd sizes in the long term would reduce the risk. The risk for elk hunting accidents would remain similar to existing conditions under all alternatives except Alternative 2, where hunting on the refuge and the elk reduction program in the park would be eliminated. The potential for encounters with elk would generally be similar to baseline conditions or could decrease with smaller herds. The potential risk of disease transmission from elk or bison to humans, and primarily to hunters because they would have direct contact with animal tissues, would remain low on the refuge and in the park.

Social and Economic Impacts

Impacts on Recreational Opportunities. *Sleigh Rides and Wildlife Viewing Opportunities* — Under Alternatives 1 and 5 about the same number of people (about 24,000 people per year) would continue to participate in sleigh rides on the refuge each year. Abundant elk would be observable throughout the winter due to continued supplemental feeding. Bison would not be seen by most visitors on the refuge because they occur in areas out of public view. Under alternatives that would reduce the size of the elk herd, the number of people participating in sleigh rides could decline from 29% (Alternative 4) to 41% (Alternatives 2, 3, and 6), and elk viewing opportunities could become much more variable, with no elk within view on some days to well over 2,000 on other days. Sleigh ride operations could be discontinued due to the unpredictability of viewing opportunities. Bison would likely be more visible during winter under Alternatives 2, 3, and 6 as they expanded their search for forage, particularly in the southern portion of the refuge.

In Grand Teton National Park elk would continue to be seen in some areas during the fall rut and spring migration under all alternatives. Under alternatives where fewer elk would summer in the park, viewing opportunities could decline, but relatively few park visitors currently see elk in the summer, so only a small percentage would be adversely affected. Eliminating the elk reduction program under Alternative 2, in the Blacktail Butte / Kelly hayfields area under Alternative 3, and potentially under Alternative 6 could in the long term increase viewing opportunities in these areas. There would be abundant bison viewing opportunities in the park, especially under Alternative 1. Fewer bison under Alternatives 2–6 would mean that viewing opportunities would be similar to what they were in the late 1990s. Most visitors would not notice a change in the herd size. No changes to park visitation numbers are expected under any alternative.

Elk Hunting — Assuming that the Jackson elk herd was reduced to the Wyoming Game and Fish Department's objective of about 11,000 animals, hunting opportunities on the refuge in the long term under Alternatives 1 and 5 would be available for an estimated 700 hunters (an average of 733 under Alternative 1 and 670 under Alternative 5). Under Alternative 2 hunting on the refuge would be eliminated; however, hunting opportunities in adjacent areas could increase. Under Alternatives 3, 4, and 6 the number of hunters in the long term on the refuge would decline due to a smaller herd size: 100–525 hunters under Alternative 3, 420–487 hunters under Alternative 4, and 120–403 hunters under Alternative 6.

An estimated annual average of 1,600 hunters under Alternative 1 would participate in the elk herd reduction program in the park when needed for proper management and 1,494 hunters under Alternative 5. The elk reduction program would be eliminated under Alternative 2. As described for the refuge, under Alternatives 3, 4, and 6 the

number of elk hunters participating in the reduction program would decline as a result of a smaller herd: under Alternative 3 an estimated 215–895 hunters annually could participate in the reduction program; Alternative 4, 773–957 hunters; and Alternative 6, 260–897 hunters.

Bison Hunting — No bison hunting in Grand Teton National Park would be allowed under any alternative. No bison hunting would be allowed on the National Elk Refuge under Alternatives 1 and 2. Under Alternatives 3–6 bison hunting would be initiated on the refuge to help control the size of the herd. The number of bison hunters in the entire Jackson Hole area in the long term would range from 150 under Alternative 3, to about 90 under Alternatives 4 and 6, to about 75 under Alternative 5.

Economic Impacts. The economic impacts of recreational activities (sleigh rides, wildlife viewing, and hunting) could decrease by 1% to 7%, with a 7% reduction being the worst case scenario.

Wildlife Viewing — Direct and secondary impacts of spending by sleigh ride visitors under Alternatives 1 and 5 would generate an estimated $1.01 million dollars in personal income and 49 jobs annually in the Jackson Hole economy. Under Alternatives 2, 3, and 6 fewer elk could reduce sleigh ride operations by up to 41%, resulting in a decline in personal income by $450,000 per year compared to Alternative 1 and a loss of 22 jobs. If sleigh rides were discontinued because of the variable viewing opportunities (and assuming no other viewing opportunities compensated for the loss), all of the related personal income and jobs generated in Jackson Hole under existing conditions would be lost. Under Alternative 4 anticipated changes to sleigh ride visitation could be reduced by up to 29%, resulting in personal income falling by an estimated $334,200 per year and a loss of 16 jobs.

Visitation to Grand Teton National Park from May through October would continue to generate an estimated $306.5 million in personal income and 14,265 jobs annually in the Jackson Hole economy under Alternatives 1 and 5. If reductions in elk numbers under Alternatives 2, 3, and 6 caused park visitation during this period to decline by as much as 7%, annual personal income in Jackson Hole would decrease by an estimated $20.1 million and employment by 936 jobs. Under Alternative 4 if park visitation declined by as much as 3%, annual personal income in Jackson Hole would decrease by $9.17 million and employment by 426 jobs. However, reductions in elk numbers under Alternatives 2, 3, 4, and 6 would likely have a negligible impact on park visitation.

Hunters on the National Elk Refuge.

Elk Hunting — Elk hunting in Jackson Hole would continue to contribute a negligible amount to the local economy under all alternatives. The direct and secondary effects of spending by nonlocal Wyoming residents and out-of-state hunters under Alternative 1 would range from an estimated low of $1.62 million (Alternatives 2 and 6) to a high of $3.83 million (Alternative 3). The estimated number of jobs created would range from a low of 97 (Alternative 2, with no hunting on the refuge or elk reduction in the park) to a high of 220 (Alternative 3).

Bison Hunting — The local economic impacts of bison hunting would be negligible. Annual spending by 50 to 150 bison hunters would generate from $8,105 in personal income under Alternative 2 to $24,315 under Alternative 3. Employment would range from 0.64 job under Alternative 2 to 1.9 jobs under Alternative 3.

Impacts on Livestock Operations. *Risk of Brucellosis Transmission* — The risk of elk and bison transmitting brucellosis to livestock would remain low under Alternatives 1 and 5 due primarily to near annual winter feeding that helps maintain separation between elk/bison and livestock during high transmission periods. Under Alternative 5 the risk would be lower than under Alternative 1 because of vaccination. Of all of the alternatives considered, Alternative 1 would result in the highest level of long-term risk, although continued sup-

plemental feeding would reduce the risk in the short term. Over the long term Alternatives 2, 3, 4, and 6 would reduce the already low risk of brucellosis being transmitted from elk/bison to livestock. However, until disease prevalence in elk was reduced, there could be an increased risk of transmission in the short term due to more elk and bison using private lands.

Depredation of Stored Hay and Damage to Crops — Under Alternatives 1 and 5 property damage and depredation of stored hay caused by elk and bison would be negligible in the short term because of continued winter feeding. The growing bison population under Alternative 1 could result in bison and elk eventually moving off the refuge during winter, potentially increasing property damage and depredation of stored hay in Jackson Hole, but impacts are expected to be negligible. Impacts could increase under Alternatives 2, 3, and 6 with reduction to or the phaseout of supplemental feeding. Under Alternative 4 reduced supplemental feeding would likely not result in increased damage to crops in the Jackson Hole area, although during mild winters elk and bison could increase their use of private lands in the Jackson Hole area. Impacts would likely be less than what could occur under Alternatives 2, 3, and 6. (Note: Alternatives 4 and 6 emphasize consultation and collaboration with the Wyoming Game and Fish Department and private landowners adjacent to the refuge to minimize conflicts. They also include additional funds to provide staff or other resources to assist with these efforts.)

Competition for Forage — Competition for spring and summer forage between elk, bison, and livestock would continue to be minimal, with the possible exception of Alternative 1. Although studies have documented an aversion of wild ungulates to the presence of livestock (Wisdom and Thomas 1996, citing four supporting studies) and bison might avoid livestock grazing areas, the bison herd under Alternative 1 would continue to grow beyond 1,000 animals and might be less affected by the presence of cattle. The amount of cattle grazing within Grand Teton National Park is low and continues to decline; overall grazing within the primary analysis area is on a downward trend. Some areas of critical elk habitat in Bridger-Teton National Forest are closed to cattle grazing. In 2005 and 2006 only 160 cow-calf pairs grazed in Grand Teton National Park, and some permitted allotments were not used.

COMMENTS AND RESPONSES ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

The *Draft Bison and Elk Management Plan and Environmental Impact Statement* was available for public review from July 21, 2005, to November 7, 2005. In late August 2005 the U.S. Fish and Wildlife Service and the National Park Service held a series of public open houses and formal hearings in Bozeman, Montana; Jackson, Wyoming; and Riverton, Wyoming. In addition to the public hearing testimony, public comments were also received in the form of letters, e-mails, form letters, and petitions.

During the comment period, the agencies received over 11,900 written comments and public testimony from 241 individuals, 37 governmental agencies and organizations, and 1,751 form letters or petitions. The most common comment topic was alternative preference. About 65% of the commenters expressed a preference for Alternative 6, while about 12% preferred Alternative 5 (fewer than 1% expressed support for Alternative 4). Many of the commenters, however, did not express a preference for any particular alternative.

While many issues were raised, most of the concerns focused on the following topics:

- Population management
- Habitat management
- Supplemental feeding
- Disease
- Public use and economics
- Legal mandates and jurisdiction
- Native American tradition and history

Besides alternative preferences, the most common concerns or issues expressed in individual comments (including form letters) were:

1. Support for protecting and restoring wildlife migration routes
2. Opposition to the use of existing vaccines

3. Suggestion that bison should be managed like other big game species
4. Suggestion that supplemental feeding should be phased out
5. Suggestion that populations should be managed with hunting and habitat protection
6. General concerns about disease
7. Concern that a disease outbreak could jeopardize local outfitting and ranching opportunities
8. Support for supplemental feeding
9. Concern about impacts to other species if elk and bison feeding was reduced
10. Support for reducing the size of the bison herd

This list does not include issues in letters from agencies or organizations, which were responded to separately.

The responses of the U.S. Fish and Wildlife Service and the National Park Service to all substantive comments (including individual comments, agency comments, and form letters) on the *Draft Bison and Elk Management Plan and Environmental Impact Statement* are included in Volume 2, along with a listing by topic of the range of individual comments, and the number and content of form letters and petitions. A list of the significant changes made from the *Draft Bison and Elk Management Plan and Environmental Impact Statement* can be found in the *Final Bison and Elk Management Plan and Environmental Impact Statement*, Chapter 5, "Consultation and Coordination." Information was updated or clarified as necessary and wherever practical, and typographical errors were corrected.

WHAT HAPPENS NEXT

No sooner than 30 days following publication of the *Final Bison and Elk Management Plan and Environmental Impact Statement*, a Record of Decision will be signed identifying which alternative has been selected as the final plan. The Regional Directors of the U.S. Fish and Wildlife Service and the National Park Service will select their preferred alternative, based primarily on legal responsibilities of the two agencies with respect to bison and elk conservation and management in their units, WGFD herd objectives, and public input. The selected alternative's goals, objectives, and strategies will become the primary components of a stand-alone bison and elk management plan that will be implemented by the agencies.

Selected management activities and projects would be implemented as funds became available. This document does not constitute a commitment for funding, and future budgets could influence implementation priorities.