U.S. Fish & Wildlife Service

# Grizzly Bear Recovery Program

*2019 Annual Report*

**Grizzly Bear Recovery Program**
U.S. Fish and Wildlife Service
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https://www.fws.gov/mountain-prairie/es/grizzlybear.php

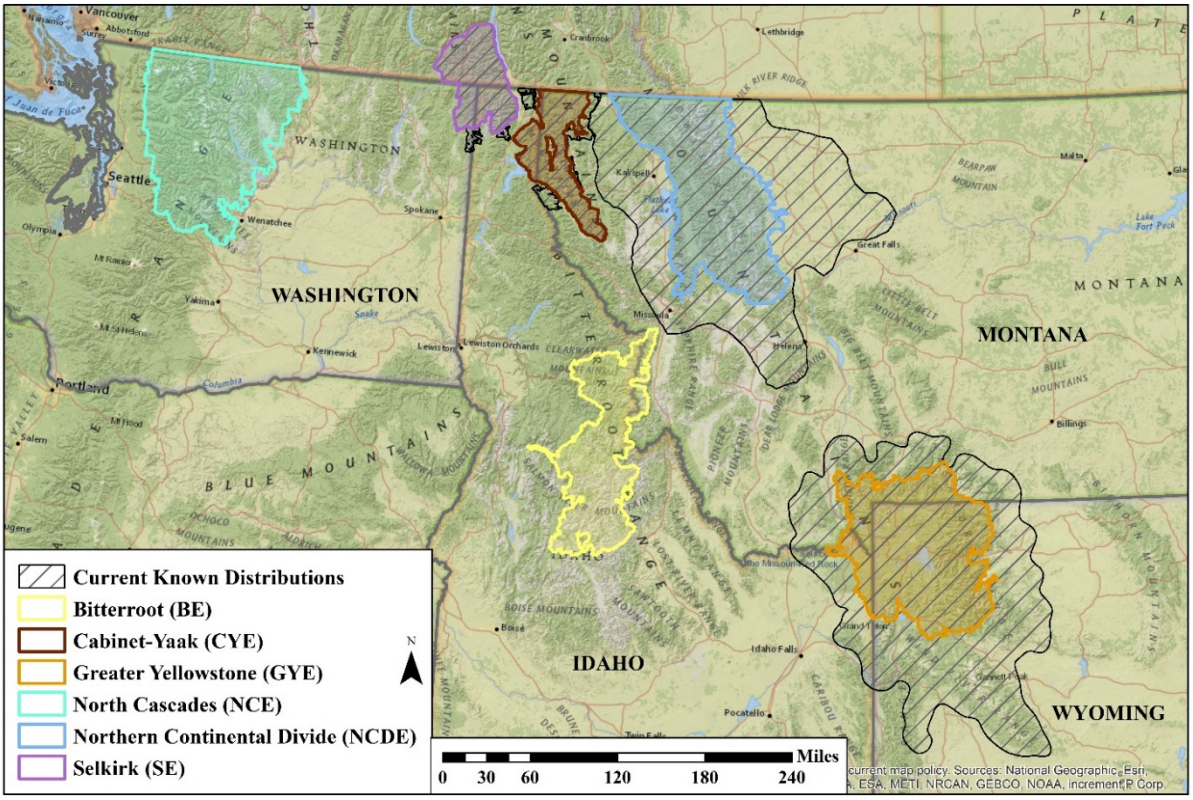
## GRIZZLY BEAR RECOVERY PROGRAM MISSION

The mission of the Grizzly Bear Recovery Program (GBRP) is to recover grizzly bears in the lower-48 States by implementing the 1993 Grizzly Bear Recovery Plan (USFWS 1993) and coordinating research, management, and recovery efforts. To accomplish this mission, we collaborate with the Interagency Grizzly Bear Committee (IGBC), Federal, State, and Tribal agencies, the provinces of British Columbia and Alberta, as well as non-governmental organizations (NGOs).

In 1975, the U.S. Fish and Wildlife Service (Service) listed the grizzly bear as a threatened species in the lower-48 States under the Endangered Species Act. The Grizzly Bear Recovery Plan outlines six recovery areas, including the Greater Yellowstone Ecosystem (GYE), Northern Continental Divide Ecosystem (NCDE), Cabinet-Yaak Ecosystem (CYE), Selkirk Ecosystem (SE), North Cascades Ecosystem (NCE), and Bitterroot Ecosystem (BE). Principle recovery efforts focus on conflict reduction, information and education, establishment of habitat protections, and other efforts to prevent and reduce human-caused mortality.

In this report, we describe recovery efforts and program accomplishments during 2019 and the current status of grizzly bear populations. In several cases, 2019 data is not available to report and we provide the most recent estimates available.

**Grizzly Bear Recovery Zones and Distributions**

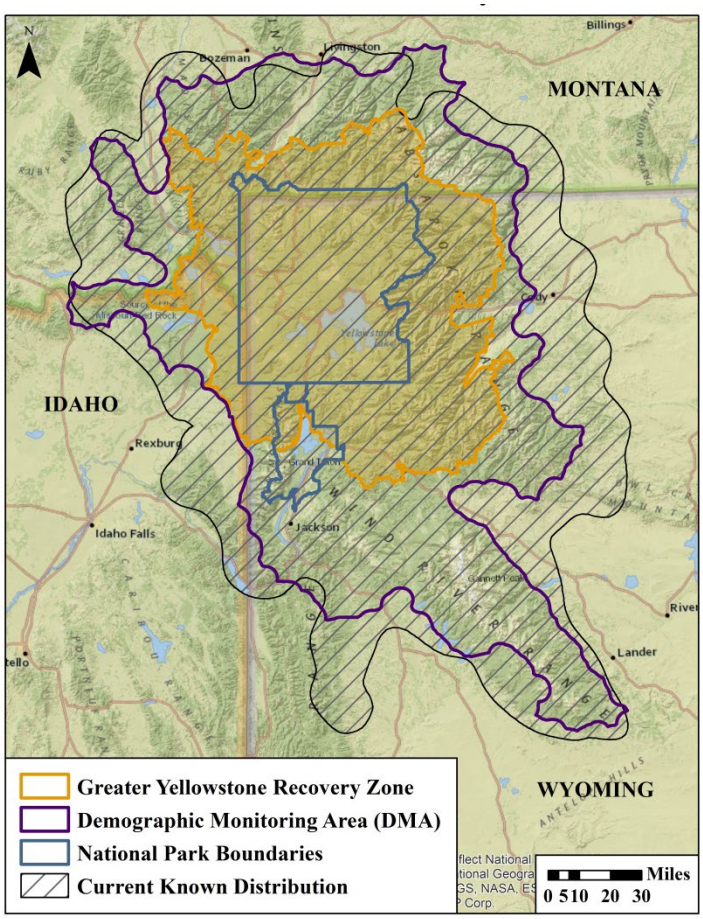



Estimated distributions are current as of 2018 for the GYE and the NCDE and are current as of 2017 for the CYE and the SE. The distribution for the NCE is currently unknown and a draft EIS was released in early 2017 to examine recovery options. The BE is currently unoccupied with a reintroduction proposal and a non-essential experimental population status.

## GRIZZLY BEAR ECOSYSTEM UPDATES

### Greater Yellowstone Ecosystem

The Yellowstone Recovery Zone (23,853 km$^2$) is located in northwest Wyoming, eastern Idaho, and southwest Montana. Ninety-eight percent of the Recovery Zone is federally-managed land, including all of Yellowstone National Park, as well as portions of Grand Teton National Park, the Shoshone, Beaverhead-Deer Lodge, Bridger-Teton, Caribou-Targhee, and Custer National Forests (including 7 Wilderness Areas). The Demographic Monitoring Area (DMA) encompasses an additional 23,131 km$^2$ of suitable habitat around the Recovery Zone. Monitoring of population size and mortality limits occurs within the DMA (USFWS 2017). Monitoring of distribution of females with young and secure habitat occurs within the Recovery Zone (USFWS 2007, USFWS 2017).




**Population Status**

As of 2018, bears occupied 68,736 km$^2$, which includes 49,931 km$^2$ inside the DMA (98 percent of the DMA) and 18,805 km$^2$ outside the DMA. Distribution for the GYE is updated only every 2 years.

Recovery Criterion 1: Maintain a minimum population size of 500 animals and at least 48 females with cubs-of-the-year within the DMA. Progress: There were an estimated 728 bears and 58 unique females with cubs in the DMA in 2019. This criterion has been met.

Recovery Criterion 2: 16 of 18 BMUs within the Recovery Zone must be occupied by females with young, with no 2 adjacent BMUs unoccupied, during a 6-year sum of observations. Progress: 18 of 18 Bear Management Units occupied by females with young in 2019. This criterion has been met.

Recovery Criterion 3: Maintain the population within the DMA around the 2002–2014 model-averaged Chao 2 estimate (average = 674; 95% CI = 600–747; 90% CI = 612–735) by maintaining annual mortality limits for independent females, independent males, and dependent young. The 2019 mortality limits were 9% for independent females and dependent young, and 20% for independent males. Progress: 2019 mortality rates were 3.6% for independent females, 11.8% for independent males, and 0.0% for independent young; all of which are under current recovery criteria thresholds.

Secure habitat levels have been maintained since 1998. The GYE grizzly bear population is currently isolated from other grizzly bear populations, with no documented genetic interchange between the GYE and NCDE. Despite this isolation, the genetic health of the GYE population has not declined over the last several decades (Miller and Waits 2003, Kamath *et al*. 2015). Additionally, natural connectivity is expected to occur in the near future as both the GYE and NCDE populations expand in distribution. Based on 2018 distributions, the two populations are now only 75 km apart, with additional verified locations between the two distributions. This distance has steadily and significantly decreased in the last decade as they were approximately 122 km apart in 2006.

The Interagency Grizzly Bear Study Team (IGBST) is an interdisciplinary group of State, Tribal, and Federal scientists responsible for long-term monitoring and research on grizzly bears in the GYE. Detailed monitoring information, including annual reports and research results, can be found on the IGBST website.

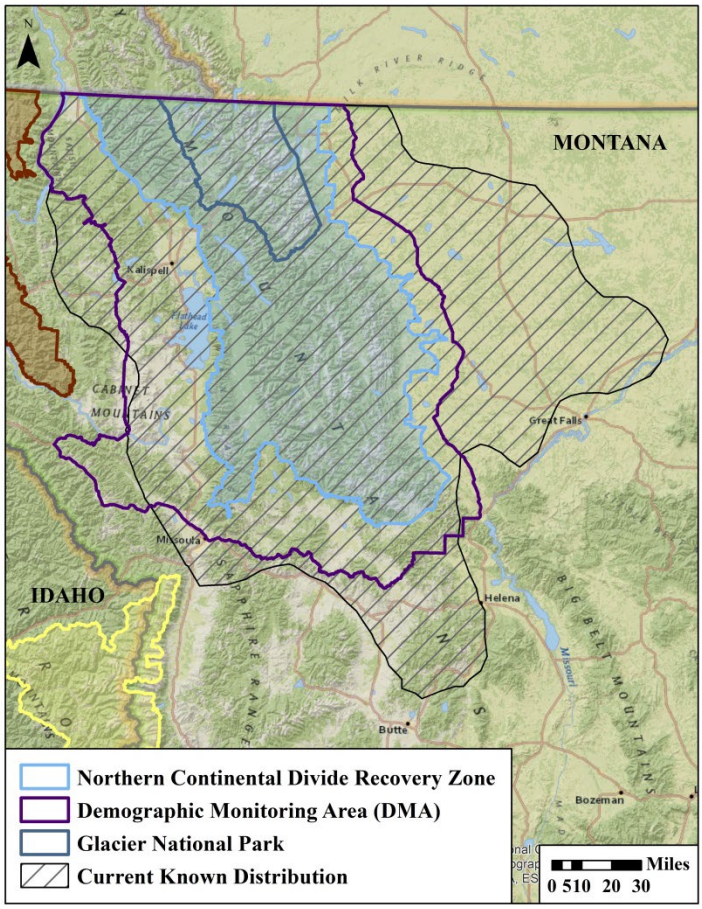
**Delisting Status**

On June 30, 2017, the Service announced that the GYE grizzly bear population had met recovery targets and then designated and delisted the GYE grizzly bear Distinct Population Segment (DPS), returning management to the States and Tribes. Six lawsuits were filed challenging this action. On September 24, 2018, the U.S. District Court of Montana vacated and remanded our 2017 delisting rule, putting the GYE grizzly population back on the Endangered Species List (as Threatened) as part of the lower-48 States listed entity. This decision is currently in appeal in the U.S. Court of Appeals.

Mike @ onesandzerosphoto.com

## Northern Continental Divide Ecosystem

The Northern Continental Divide Recovery Zone (23,135 km$^2$) is located in northwest Montana and is well connected to large populations in Canada. It includes all of Glacier National Park (GNP), as well as portions of the Flathead, Helena-Lewis and Clark, Kootenai, and Lolo National Forests (including 4 Wilderness Areas), and the Flathead and Blackfeet Indian Reservations. The Demographic Monitoring Area (DMA) encompasses the Recovery Zone and a 19,444 km$^2$ buffer (Zone 1). Monitoring of population size and mortality limits occurs within the DMA (USFWS 1993). Monitoring of distribution of females with young and secure habitat occurs within the Recovery Zone (USFWS 1993, USFWS 2018). Due to its connectivity to large populations in Canada, the NCDE has the potential to serve as an important genetic corridor between Canadian grizzly bear populations and the GYE, the BE, and the CYE, and is a potential source population for the BE, which is currently unoccupied.




**Population Status**

As of 2018, bears occupy 63,924 km$^2$, which includes 41,051 km$^2$ inside the DMA (96 percent of the DMA), and 22,873 km$^2$ outside the DMA.

Recovery Criterion 1: 10 females with cubs inside GNP and 12 females with cubs outside GNP over a running 6-year average both inside the Recovery Zone and within a 10 mile area surrounding the Recovery Zone. This equates to a minimum of 391 grizzly bears. Progress: Sightings of females with cubs have not been consistently collected since 2004 because of poor sightability in forested habitat. Instead, we use DNA data in combination with radio-telemetry data to project population size. There were approximately 1,068 (95% CI: 890–1,283) bears in the NCDE in 2019. This recovery target has been met.

Recovery Criterion 2: 21 of 23 BMUs within the Recovery Zone must be occupied by females with young, with no two adjacent BMUs unoccupied, during a 6-year sum of observations. Progress: For the 6-year period 2014 –2019, 22 of 23 BMUs were occupied by females with young. This recovery target has been met.

Courtney McBean

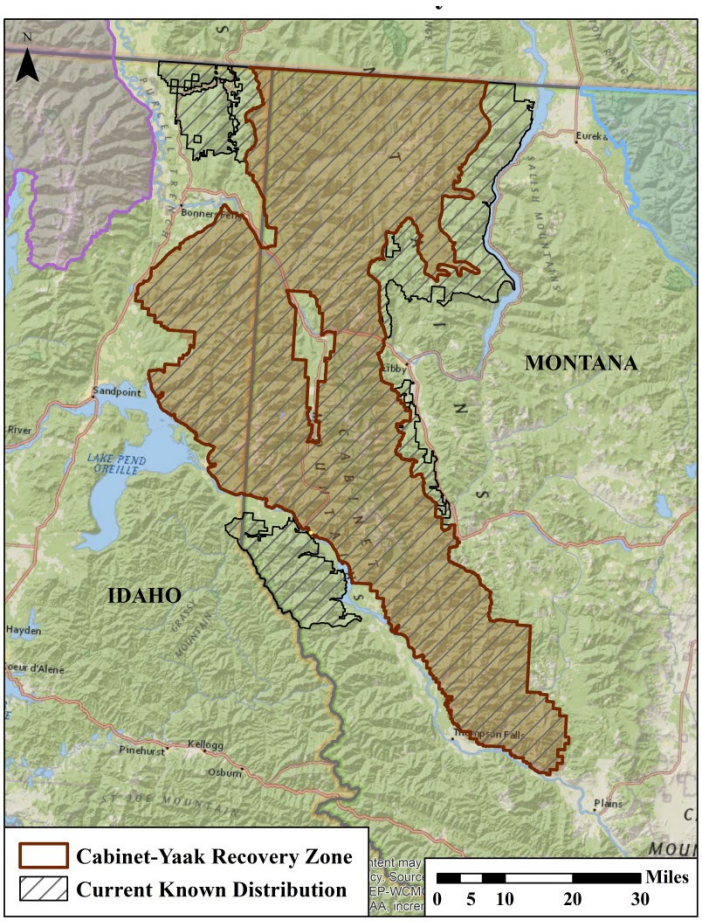
Recovery Criterion 3: The running 6-year average of known, human-caused mortality shall be ≤ 4% of the population estimate; and ≤ 30% shall be females. The mortality limit for 2019 was 35.7 bears and 10.7 females/year. Progress: Average human caused mortality for 2014–2019 was 25.3 bears/year and 10.2 females/year. This recovery target has been met.

All habitat recovery criteria have been met and secure habitat levels have been maintained since 2011. Work towards a delisting rule is on hold pending litigation in the GYE.

Montana Fish, Wildlife and Parks (MFWP), in collaboration with Glacier National Park, the Confederated Salish & Kootenai Tribes, and the Blackfeet Nation are the primary agencies responsible for monitoring of the NCDE grizzly bear population. Additional details, annual reports, and select publications are available on the MFWP website.

## Cabinet-Yaak Ecosystem

The Cabinet-Yaak Recovery Zone (6,705 km$^2$) is located in northwest Montana and northeast Idaho. Blocks of contiguous habitat extend into British Columbia, making this an international population. The Recovery Zone includes portions of the Kootenai, Idaho Panhandle, and Lolo National Forests (including 1 Wilderness Area). The Kootenai River bisects the CYE, with the Cabinet Mountains to the south and the Yaak River drainage to the north. The degree of grizzly bear movement between the Cabinet Mountains and Yaak River drainage is believed to be minimal but several movements by males into the Cabinet Mountains from the Yaak River and the Selkirk Mountains have occurred since 2012.




**Population Status**

In 2017, a minimum of 54 grizzly bears were detected in the Cabinet-Yaak Ecosystem, with approximately half of these in the Cabinet Mountains and half in the Yaak River portions of the recovery area. This minimum population estimate was derived from capture and collaring individuals, rub tree DNA, corral DNA, opportunistic DNA sampling, photos, and credible observations. The actual population is probably larger by an unknown amount. Genetic results from the laboratory are not completed until the year after collection. The population is growing at approximately 1.2% per year.

Recovery target 1: 6 females with cubs over a running 6-year average both inside the Recovery Zone and within a 10 mile area immediately surrounding the Recovery Zone. Progress: Unduplicated females with cubs averaged 3.0 per year from 2013–2018. This target has not been met.

Recovery target 2: 18 of 22 BMU's occupied by females with young from a running 6-year sum of verified evidence. Progress: 11 of 22 BMUs were occupied from 2013–2018. This recovery target has not been met.

Recovery target 3: The running 6-year average of known, human-caused mortality shall be ≤ 4% of the population estimate; and ≤ 30% shall be females. The mortality limit for 2018 was 2.3 bears/year and 0.7 females/year. Progress: Average human caused mortality for 2013–2018 was 1.3 bears/year and 0.3 females/year. These mortality levels were less than the limit. This recovery target was met in 2013–2018. Four known human-caused mortalities occurred during 2018. A subadult male was killed during May. A female with two cubs was killed in September. Though the carcasses of the cubs were not

located, these bears were treated as probable mortalities. Both cases are under investigation.

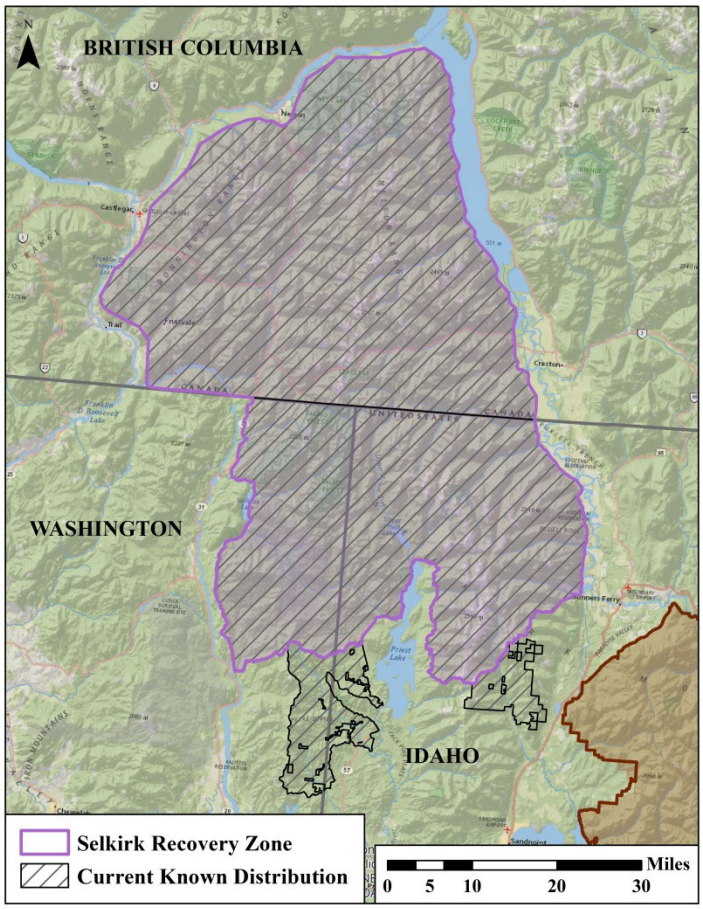
Population linkage (and more importantly, gene flow) is needed to achieve and maintain long-term genetic health. We have documented gene flow from sources unrelated to the augmentation program (see below); two migrants, all originating from the Purcell Mountains north of HWY 3 in BC, have produced 3 offspring south of HWY 3. We have yet to document gene flow from other populations.

The Service has been leading research and monitoring in the CYE since 1988. Key research partners include Idaho Department of Fish and Game, Montana Fish, Wildlife and Parks, Kootenai Tribe of Idaho, Idaho Panhandle National Forest, Kootenai National Forest, and Lolo National Forest. Further monitoring and research details can be found in the 2018 Cabinet-Yaak Grizzly Bear Recovery Area Research and Monitoring Progress Report.

**Augmentation Program**

An augmentation program in the Cabinet Mountains portion of the population began in 1990 after research estimated fewer than 15 animals in the area. Primary objectives of the program are to bolster reproduction through the addition of female bears, and improve overall genetic diversity through the addition of female and male bears. Twenty bears have been added in the Cabinet Mountains since 1990. All bears have no history of conflicts with people and were moved in the summer to take advantage of developing food supplies in the form of huckleberries. Initial augmentation consisted of females but in recent years males have also been added. Of 20 bears released through 2018, 6 are known to have left the target area, 4 were killed by humans, and one died of unknown causes. Reproduction has been identified by at least 3 of the transplanted bears, with 2 females and 1 male that are known to have produced at least 14 first generation offspring, 18 second generation offspring, and one third generation offspring. In 2018, 1 male was moved from the NCDE into the Cabinet Mountains as part of the augmentation program.

## Selkirk Ecosystem




The Selkirk Mountains Grizzly Bear Recovery Zone (6,575 km$^2$) is located in northwest Idaho, northeast Washington, and southeast British Columbia (BC). It includes portions of the Idaho Panhandle and Colville National Forests (including 1 Wilderness Area) and the South Selkirk unit in BC.

**Population Status**

In 2017, a minimum of 51 individual grizzly bears were detected in the U.S. portion of the Selkirk Ecosystem. The population is growing at approximately 2.2% per year. The minimum population estimate was derived from capture and collaring individuals, rub tree DNA, corral DNA, opportune DNA sampling photos, and credible observations.

Recovery target 1: 6 females with cubs over a running 6-year average both inside the Recovery Zone and within a 10 mile area immediately surrounding the Recovery Zone. Progress: Unduplicated females with cubs averaged 3.5 per year from 2013–2018. This target has not been met.

Recovery target 2: 7 of 10 BMUs occupied by females with young from a running 6-year sum of verified evidence. Progress: 7 of 10 BMUs were occupied during 2013–2018. This recovery target has been met.

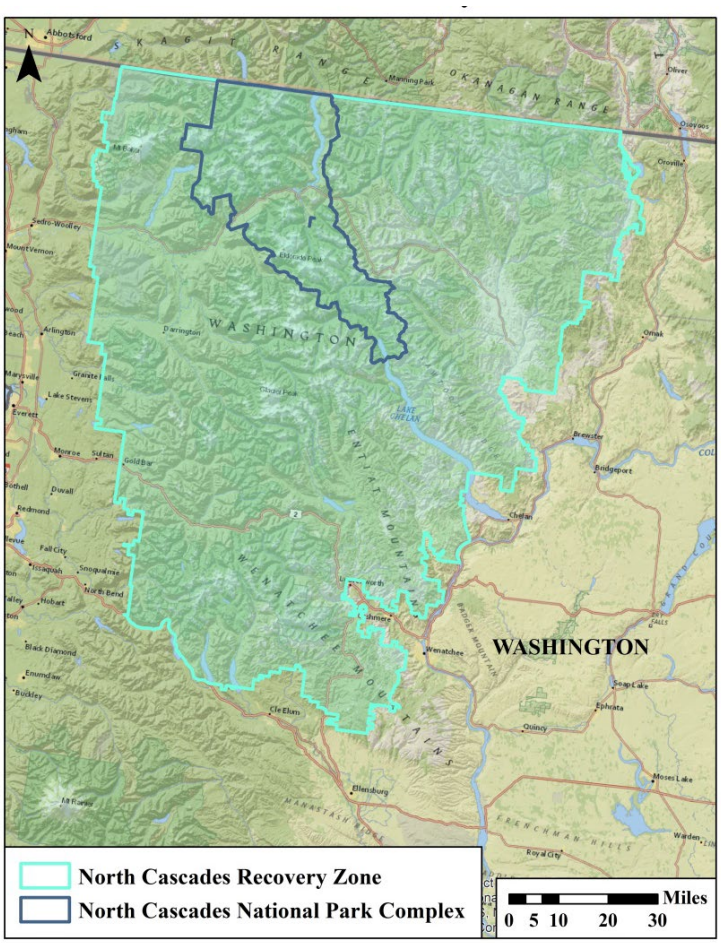
Recovery target 3: The running 6-year average of known, human-caused mortality shall be ≤ 4% of the population estimate; and ≤ 30% shall be females. The 2018 mortality limit was 2.4 bears/year and 0.7 females/year. Progress: Average human caused mortality for 2013–2018 was 1.5 bears/year and 0.7 females/year. Total mortality numbers for this period came in under the limit; female mortalities met the limit. There was no known human-caused mortality during 2018.

The SE is a historically isolated population, having among the lowest documented genetic diversity of interior North American populations (*H*=0.54, Proctor et al. 2012). Recently, we have documented movement between the Selkirk population and the Purcell Mountains population north of HWY 3 in BC. Perhaps more importantly, we have detected gene flow into the Selkirks from two migrant males from the Purcells. These two males have produced nine known offspring in the Selkirks (median birth year 2015). Recent genetic monitoring has detected increased genetic variability since monitoring began in 1983 through greater heterozygosity and number of alleles in the population (Proctor et al. 2018).

The Service has been leading a grizzly bear monitoring and research program in the SE since 2012. Key research and funding cooperators include Idaho Department of Fish and Game, the Panhandle National Forest, the Colville National Forest, Idaho Department of Lands, the Kalispel Tribe, the Kootenai Tribe of Idaho, and Washington Department of Fish and Wildlife. The BC effort was led by Dr. Michael Proctor with key funding provided by BC Habitat Conservation Trust Fund and BC Fish and Wildlife Compensation Fund. Further monitoring and research details can be found in the [Selkirk Mountains Grizzly Bear Recovery Area 2018 Research and Monitoring Progress Report.]

## North Cascades Ecosystem

The North Cascades Recovery Zone (25,305 km$^2$) is located in northcentral Washington. It includes all of North Cascades National Park and portions of the Mount Baker-Snoqualmie, Wenatchee, and Okanogan National Forests (including 9 Wilderness Areas). The ecosystem extends north of the border into BC; however it is isolated from grizzly bear populations in other parts of the US and Canada.




**Population Status**

The overall population status of grizzly bears in the greater NCE is unknown; however, it is highly unlikely that the NCE contains a grizzly bear population (defined as two or more reproductive females or one female reproducing during two separate years). There have been only four confirmed detections of grizzly bears in the greater NCE in the past 10 years, all of which occurred in BC and may comprise only two individuals. There has been no confirmed evidence of grizzly bears within the US portion of the NCE since 1996.

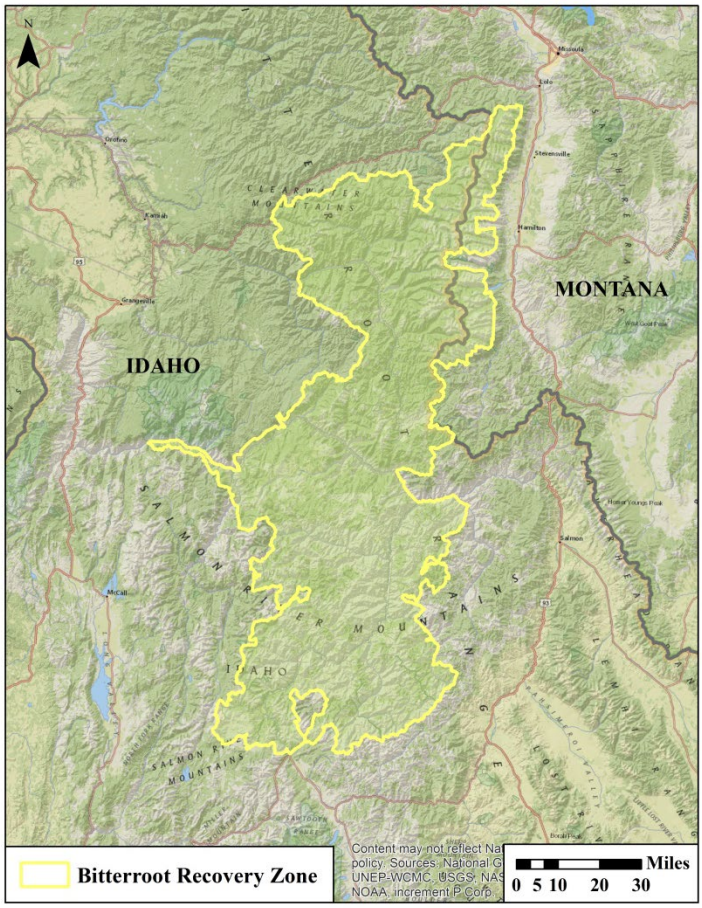
**Recovery Efforts**

The Service has been working with North Cascades National Park to finalize an Environmental Impact Statement (EIS) evaluating restoration options for grizzly bears in the unoccupied NCE. A draft EIS with proposed alternatives was released for public comment in 2017 and again in 2019. Work on this effort has been paused indefinitely.

Although final recovery criteria have not yet been established for the NCE, the recovery plan states that the population will be considered recovered when monitoring indicates: 1) that the population is large enough to offset some level of human-induced mortality and be self-sustaining despite foreseeable influences of demographic and environmental variation; and 2) reproducing bears are distributed throughout the recovery area.

## Bitterroot Ecosystem

The Bitterroot Recovery Zone (15,100 km$^2$), located in central Idaho and western Montana, is one of the largest contiguous blocks of Federal land in the lower-48 States. Ninety-eight percent of the Recovery Zone is contained within two Wilderness Areas in the Nez Perce-Clearwater, Bitterroot, and Salmon-Challis National Forests.

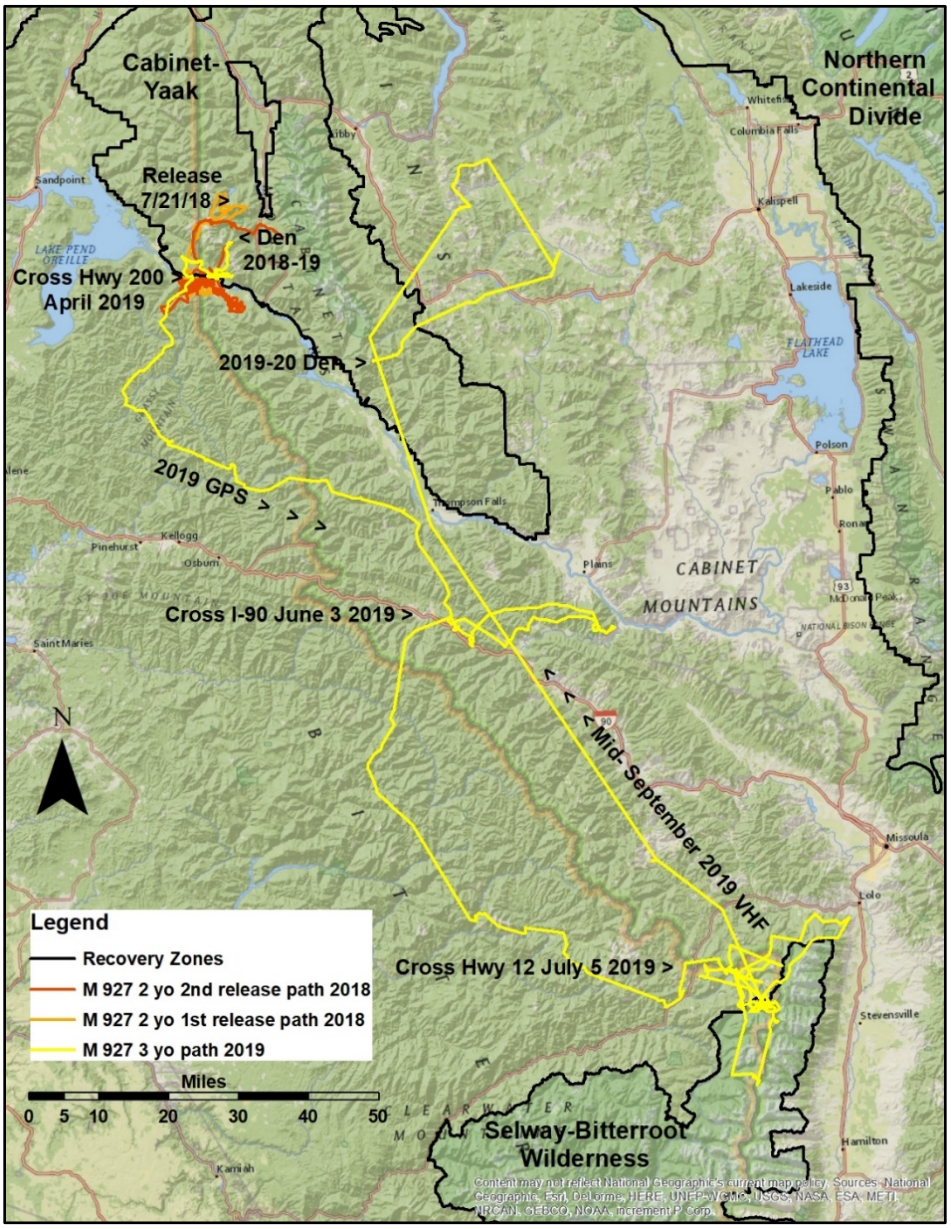



**Population Status**

The BE ecosystem is thought to be unoccupied by a grizzly bear population (two or more reproductive females or one female reproducing during two separate years). However, as the GYE and NCDE populations continue to expand, grizzly bears have increasingly been confirmed nearby, including a grizzly bear captured in Stevensville, MT in October 2018.

In 2019, the Service confirmed the first grizzly bear inside the Recovery Zone since 2005, when a grizzly was killed by mistaken ID. Prior to these two instances, grizzly bears had not been verified in the Bitterroot since the 1940s. In June 2019, male bear number 927, traveled south of I-90, spending two months moving around the Bitterroot Ecosystem before heading back north into the Cabinet Mountains to den in October (see map below). There were unconfirmed reports of grizzly bears in two additional areas in the BE. Samples were collected and sent to a lab for DNA analysis by Idaho Department of Fish and Game. Results are currently pending. It is possible that additional undetected individuals are currently in the area. The ecosystem is within maximum dispersal distance of three ecosystems, including the GYE, CYE, and NCDE, and we expect grizzly bears to recolonize the BE, albeit slowly.

Figure 1. Path of male augmentation grizzly bear 927 in the Cabinet and Bitterroot mountains during 2018-19.




In 2000, the Service issued a rule designating the Bitterroot Grizzly Bear Experimental Area as a nonessential experimental (10(j)) population and authorized reintroduction of grizzly bears under certain conditions. Reintroduction has not occurred and there are currently no plans to do so. With the recent occurrence of bears naturally dispersing to the Experimental Area, the Service clarified that the section 10(j) regulation does not apply to grizzly bears that have dispersed into the area on their own, and that grizzly bears present in the Experimental Area are considered threatened under the Endangered Species Act.

## GRIZZLY BEAR PROGRAM OUTREACH & EDUCATION

The Service regularly gives informational and educational presentations to community groups, schools, and professional meetings beyond our regular management meetings with governmental organizations. In 2019, the Recovery Program gave presentations to the following organizations:

University of Montana
Montana Stockgrowers Association
The Montana Chapter of the Wildlife Society
The Wildlife Society, University of Montana student chapter
The Wildlife Society Annual Conference
Girl Scouts
Avista Terrestrial Mitigation Committee
Kootenai Valley Resource Initiative
Pathways: Human Dimensions of Wildlife
Yaak Valley Forest Council
Environmental Quality Council of the Montana Legislature Idaho Farm Bureau

## GRIZZLY BEAR PROGRAM RESEARCH

**Grizzly Bear Integrated Population Modeling and Interface Development**

We are collaborating with Montana Fish, Wildlife and Parks, Wyoming Game and Fish Department, Idaho Department of Fish and Game, the USGS, and researchers at the University of Montana to develop integrated population models (IPMs) to improve the reliability and precision of estimates of population size and trend. IPMs provide a statistical framework for combining multiple sources of data into a single model (Schaub and Abadi 2011), and will allow us to take advantage of the full suite of data collected on an annual basis. For more information, contact Hilary Cooley (see staff contact info on p.20).

**Huckleberry Habitat Modeling**

The GBRP is working on a project to model high quality huckleberry habitat in the Cabinet-Yaak and Selkirk recovery areas. The project is using habitat use patterns from collared bears to identify additional areas of expected use and examine the human or natural actions that may have created or maintained these sites (e.g. wildfire, prescribed fire, or timber harvest). For more information, contact Wayne Kasworm.

**Assimilated Diets of NCDE Grizzly Bears**

Since 2010, the GBRP has directed research quantifying assimilated diets (i.e., diet digestively absorbed) of grizzly bears in the NCDE. Because of the wide variation in diets of NCDE grizzly bears and the spatial breadth of the ecosystem, on-the-ground monitoring of availability of major foods is infeasible. Instead, stable isotope analysis of hair and blood samples allows us to integrate knowledge of foods available on

the landscape by estimating actual assimilated diets of bears — essentially letting the bear "sample" the landscape. For instance, ratios of nitrogen isotope ($\delta^{15}N$) become higher with increasing trophic level (indexed by percent animal matter in diet), allowing distinction between a plant-based, animal-based, or mixed diets.

Results from hundreds of hair and blood samples from captured bears in the NCDE indicate that trophic level varies widely across the ecosystem. Bears on the eastern, southern, and southwest periphery of the ecosystem have assimilated diets containing 3 times as much meat, proportionally, than those in the northwest of the ecosystem. We are currently researching whether these disparate trophic diets lead to differences in reproductive rates and influence population productivity. For more information, contact Justin Teisberg.

**Assimilated diets of CYE and SE grizzly bears**

Similar to work in the NCDE, our program is producing and analyzing a hair and blood isotope dataset for the CYE and SE, including samples dating back to the early 1980s (N = 426). Using known isotopic ratios of plant and animal food items common to bears, we estimate assimilated diets of CYE grizzly bears include 10-22% animal meat on average, differing by age-class and sex. Diets of sampled SE bears have even lower proportions of animal meat (12%, on average). In comparison to other ecosystems, summer diets of grizzly bears in the NCDE and GYE consist of 47% and 42% animal matter, respectively. The low use of meat by CYE and SE grizzlies is more spatially uniform across the two Ecosystems, especially when compared with the NCDE where grizzly bears have plant-based diets in northwestern part of ecosystem and animal-based diets in southern and eastern areas.

Through collecting and analyzing many food items in the CYE and SE, we discovered that berries (huckleberries in particular) carry a unique isotope signature, allowing us to estimate proportion of grizzly bear diets composed of berries. More importantly, we aim to assess the nutritional importance of huckleberries to CYE and SE grizzly bears. Preliminary results suggest grizzly bear diets, on average, are composed of at least 20% berries during the summer months. At that rate, we estimate an adult female grizzly bear typically consumes at least four quarts of berries a day during the peak of an average berry season, though the number could be as large as fifteen quarts at higher observed levels of consumption. Upcoming objectives include: incorporating most recent field sampling, expanding modeling framework to tighten uncertainty, and assessing whether these diet estimates predict or align with patterns of habitat use, body condition, or individual reproductive fitness. For more information, contact Justin Teisberg.

**Army Cutworm Moths in the GYE**

Army cutworm moths occur in remote, high-elevation alpine sites dominated by talus and scree slopes in parts of the GYE and NCDE. When available, they are an important food source for grizzly bears because of their high caloric and nutrient content. Moth sites in the GYE have been well mapped and grizzly bear use of moth sites is monitored annually. Stable isotope analysis has previously been used to estimate assimilated meat and plant matter for GYE grizzly bear diets but intake of army cutworm moths by grizzly bears has not previously been quantified. We are investigating the feasibility of using stable isotope analysis to quantify the intake of army cutworm moths by grizzly bears in the GYE. For more information, contact Jennifer Fortin-Noreus.

**Grizzly Bear Attacks Database**

The GBRP worked with a student at the University of Montana to develop a database of grizzly bear attacks on humans in the lower-48 States. Using newspaper articles and agency data requests, we identified 239 grizzly bear attacks on humans from 1975 through 2018, with 219 resulting in injury and 20 resulting in human fatality. Attacks have increased over time, likely because of increased numbers of both bears and humans on the landscape. For more information, contact Hilary Cooley.

**NCDE Grizzly Bear Conflict Database**

The GBRP worked with State, National Park Service, and Tribal bear specialists throughout the NCDE to develop a conflict database for the NCDE using the app Survey123. As identified in the Conservation Strategy, the conflict database "will provide managers with a way to identify and compare trends in the frequency, location, case, land ownership, and type of conflicts so that conflict prevention efforts can be prioritized and directed at areas and user-groups more effectively" (NCDE Subcommittee 2018). In addition, this database will promote efficient identification of marked grizzly bears and previous history. For more information, contact Jennifer Fortin-Noreus.

**Grizzly Bear Outlier Database**

The GBRP has developed a central database to keep track of grizzly bear "outliers". The database will compile grizzly bear sightings, conflicts, and mortalities outside of current distributions for the NCDE, GYE, CYE, and SE. The purpose of the database is to monitor potential linkage between ecosystems and natural recolonization of the BE, and to inform "may be present" maps for Endangered Species Act Section 7 consultation purposes. Beginning over the winter of 2019-2020, we will put out an annual call to our partner agencies to collect information on any outliers that have not already been reported to State, Federal, or Tribal agencies. For more information, contact Jennifer Fortin-Noreus.

## GRIZZLY BEAR PROGRAM FUNDING

The GBRP supports a number of programs and projects to promote grizzly bear conservation in the lower-48 States. Population status assessment and science-based management are integral to conservation and recovery; the majority of our support goes towards these efforts (monitoring, management, research). Maintaining grizzly bears on the landscape requires tolerance. We fund various NGOs, groups, landowners, and projects that promote awareness and understanding of grizzly bears, and work to prevent or reduce conflicts. The Service funds additional grizzly bear projects not mentioned here through other programs, including Tribal Wildlife Grants, Section 6 Agreements, and the Refuges program.

| **MANAGEMENT + MONITORING** | **TOTAL $726,000** |
|---|---|

Montana Fish, Wildlife & Parks
Wyoming Game & Fish Department
Idaho Fish & Game Department
US Geological Survey: Interagency Grizzly Bear Study Team
Forest Service: Interagency Grizzly Bear Committee
USDS APHIS Wildlife Services - Montana
National Park Service: Grand Teton and Yellowstone

| **INFORMATION, EDUCATION + OUTREACH** | **TOTAL $25,000** |
|---|---|

Be Bear Aware Campaign
Swan Valley Connections: Outreach and educational events in the NCDE
Annual Bear Handling Workshop
27th International Conference on Bear Research and Management Support

| **PREVENTATIVE PROJECTS** | **TOTAL $58,000** |
|---|---|

Landowner Electric Fencing Projects: NCDE, SE and CYE
Transfer Station Fencing Project: NCDE
Bear Proof Cans: NCDE
Blackfoot Challenge: Preventative Funding NCDE
Swan Valley Connections: Conflict prevention projects in the NCDE
Defenders of Wildlife: Electric Fencing Incentive Program
Blackfoot Challenge: Bear Range Rider

| **RESEARCH** | **TOTAL $198,000** |
|---|---|

CYE and SE Monitoring & Research
Washington State University: Isotope Analyses
Washington State University Bear Center
USDA Agricultural Research Service: Develop Serum Antibody Test
University of Montana Masters Student Project: Habitat Modeling

| **2019 TOTAL** | **$1,007,000** |
|---|---|

## RECENT PUBLICATIONS


Proctor, M. F., W. F. Kasworm, J. E. Teisberg, C. Servheen, T. G. Radandt, C. T. Lamb, K. C. Kendall, R. D. Mace, D. Paetkau, and M. S. Boyce. 2019. American black bear population fragmentation detected with pedigrees in the trans-border Canada-United States region. Ursus *in press.*

Lyons, A. L., W. L. Gaines, P. H. Singleton, W. F. Kasworm, M. F. Proctor, and J. Begley. 2018. Spatially explicit carrying capacity estimates to inform species specific recovery objectives: Grizzly bear (*Ursus arctos*) recovery in the North Cascades. Biological Conservation 222:21–32.

Proctor, M. F., W. F. Kasworm, K. M. Annis, A. G. Machutchon, J. E. Teisberg, T. G. Radandt, and C. Servheen. 2018. Conservation of threatened Canada-USA trans-border grizzly bears linked to comprehensive conflict reduction. Human Wildlife Interactions 12:348-372.

Robbins, C.T., and J. K. Fortin-Noreus. 2017. Nutritional Ecology. Pages 46–61 *in* P.J. White, K. A. Gunther, and F. T. van Manen, eds. Yellowstone Grizzly Bears: ecology and conservation of an icon of wilderness. Yellowstone Forever, Yellowstone National Park, Wyoming.

Fortin, J. K., K. D. Rode, G. V. Hilderbrand, J. Wilder, S. Farley, C. Jorgensen, and B. G. Marcot. 2016. Impacts of human recreation on brown bear (*Ursus arctos*): A review and new management tool. Plos One 11: e0141983.

Jansen, H. T., T. Leise, G. Stenhouse, K. Pigeon, W. Kasworm, J. Teisberg, T. Radandt, R. Dallmann, S. Brown, and C. T. Robbins. 2016. The bear circadian clock doesn't 'sleep' during winter dormancy. Frontiers in Zoology 13:42–56.

Kendall, K. C., A. C. Macleod, K. L. Boyd, J. Boulanger, J. A. Royle, W. F. Kasworm, D. Paetkau, M. F. Proctor, K. Annis, and T. A. Graves. 2016. Density, distribution, and genetic structure of grizzly bears in the Cabinet-Yaak ecosystem. Journal of Wildlife Management. 80:314-331.

Ebinger, M. R., M. A. Haroldson, F. T. van Manen, C. M. Costello, D. D. Bjornlie, D. J. Thompson, K. A. Gunther, J. K. Fortin, J. E. Teisberg, S. R. Pils, P. J. White, S. L. Cain, and P. C. Cross. 2016. Detecting grizzly bear use of ungulate carcasses using global positioning system telemetry and activity data. 181:695–708.

Coltrane, J. A., S. Farley, D. Saalfeld, D. Battle, T. Carnahan, and J. Teisberg. 2015. Evaluation of dexmedetomidine, tiletamine, and zolazepam for the immobilization of black bears. Wildlife Society Bulletin 39:378–382.

Proctor, M. P., Nielson, S. E., W. F. Kasworm, C. Servheen, T. G. Radandt, A. G. Machutchon, and M. S. Boyce. 2015. Grizzly bear connectivity mapping in the Canada–United States trans-border region. Journal of Wildlife Management 79:544-558

Barta, J. L., C. Monroe, J. E. Teisberg, M. Winters, K. Flanigan, and B. M. Kemp. 2014. One of the key

characteristics of ancient DNA, low copy number, may be a product of its extraction. Journal of Archaeological Science 46:281–289.

Schwartz, C. C., J. K. Fortin, J. E. Teisberg, M. A. Haroldson, C. Servheen, C. T. Robbins, and F. T. van Manen. 2014. Body and diet composition of sympatric black and grizzly bears in the Greater Yellowstone Ecosystem. Journal of Wildlife Management 78:68–78.

Schwartz, C. C., J. E. Teisberg, J. K. Fortin, M. A. Haroldson, C. Servheen, C. T. Robbins, and F. T. van Manen. 2014. Use of isotopic sulfur to determine whitebark pine consumption by Yellowstone bears: A reassessment. Wildlife Society Bulletin 38:664–670.

Teisberg, J. E., S. D. Farley, O. L. Nelson, G. V. Hilderbrand, M. J. Madel, P. A. Owen, J. A. Erlenbach, and C. T. Robbins. 2014. Immobilization of grizzly bears (*Ursus arctos*) with dexmedetomidine, tiletamine, and zolazepam. Journal of Wildlife Diseases 50:74–83.

Teisberg, J. E., M. A. Haroldson, C. C. Schwartz, K. A. Gunther, J. K. Fortin, and C. T. Robbins. 2014. Contrasting past and current numbers of bears visiting Yellowstone cutthroat trout streams. Journal of Wildlife Management 78:369–378.

Fortin, J. K., C. C. Schwartz, K. A. Gunther, J. E. Teisberg, M. A. Haroldson, M. A. Evans, and C. T. Robbins. 2013. Dietary adjustability of grizzly bears and American black bears in Yellowstone National Park. Journal of Wildlife Management 77:270–281.

Fortin, J. K., J. V. Ware, H. T. Jansen, C. C. Schwartz, and C. T. Robbins. 2013. Temporal niche switching by grizzly bears but not American black bears in Yellowstone National Park. Journal of Wildlife Management 94:833–844.

## LITERATURE CITED

Kamath, P.L., M.A. Haroldson, G. Luikart, D. Paetkau, C. Whitman, and F.T. van Manen. 2015. Multiple estimates of effective population size for monitoring a long-lived vertebrate: an application of Yellowstone grizzly bears. Molecular Ecology 24:5507–5521.

Miller, C. R. and L. P. Waits. 2003. The history of effective population size and genetic diversity in the Yellowstone grizzly (*Ursus arctos*): Implications for conservation. Proceedings of the National Academy of Sciences 100:4334–4339.

Proctor, M. F., D. Paetkau, B. N. McLellan, B. B. Stenhouse, K. C. Kendall, R. D. Mace, W. F. Kasworm, C. Servheen, C. L. Lausen, M. L. Gibeau, W. L. Wakkinen, M. A. Haroldosn, G. Mowat, C. D. Apps, L. M. Ciarniello, R. M. R. Barclay, M. S. Boyce, C. C. Schwartz, and C. Strobeck. 2012. Population fragmentation and inter-ecosystem movements of grizzly bears in western Canada and the northern United States. Wildlife Monographs 180.

Proctor M. F., W. F. Kasworm, K. M. Annis, A. G. MacHutchon, J. E. Teisberg, T. G. Radandt, and C. Servheen. 2018. Conservation of threatened Canada-USA trans-border grizzly bears linked to comprehensive conflict reduction. Human-Wildlife Interactions 12(3):348-372.Schaub, M. and F. Abadi. 2010. Integrated population models: a novel analysis framework for deeper insights into population dynamics. Journal of Ornithology 152:227-237.

U.S. Fish and Wildlife Service. 1993. Grizzly bear recovery plan. Missoula, Montana, USA.

U.S. Fish and Wildlife Service. 2007. Grizzly Bear Recovery Plan Supplement: Habitat-based Recovery Criteria for the Yellowstone Ecosystem. Missoula, Montana, USA.

U.S. Fish and Wildlife Service. 2017. Grizzly Bear Recovery Plan Supplement: Revised Demographic Recovery Criteria for the Greater Yellowstone Ecosystem. Missoula, Montana, USA.

U.S. Fish and Wildlife Service. 2018. Grizzly Bear Recovery Plan Supplement: Habitat-based Recovery Criteria for the Northern Continental Divide Ecosystem. Missoula, Montana, USA.

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