

Proposed Revisions to the Demographic Recovery Criteria for the Grizzly Bear Population in the Greater Yellowstone Area

Summary

We propose to update portions of Demographic Recovery Criteria 1 and 3 for the Yellowstone grizzly bear population based on new scientific analyses and information. Since the last criteria were updated, new approaches and scientific protocols have been developed. These proposed updates are:

1. Update Criterion 1 to reflect the demographic goal of maintaining a minimum population size of 500 animals without tying it to a specific method to estimate total population size (e.g., Chao2) so we can rapidly implement improved scientific methods as they become available in the peer reviewed literature.
2. Update Demographic Criterion 3 that establishes sustainable mortality limits to allow for the incorporation and application of new demographic data, as they are developed.
3. Designate a Monitoring Area (Figure 1), within which all demographic criteria are assessed. This requires us to revise the area within which mortalities are counted against the mortality limits for independent females and males and dependent young so the area where population size is estimated is the same area where mortalities are counted. This means we would no longer count mortalities of bears in areas outside this Monitoring Area against sustainable mortality limits, and, conversely, we would not count bears observed outside this Monitoring Area toward our estimates of population size.

Background

In 2007, we supplemented the 1993 Grizzly Bear Recovery Plan with revised demographic criteria for the Greater Yellowstone Area (GYA) population (72 FR 11376, March 13, 2007). Since that time, new information relevant to these demographic criteria has become available. Consistent with Task Y11 of the Grizzly Bear Recovery Plan (U.S. Fish and Wildlife Service 1993, p. 44) that directs the Service to “Reevaluate and refine population criteria as new information becomes available,” we are proposing revisions to the demographic criteria, based on updated demographic analyses and the best available science.

In 2000, we began a process to reevaluate and update methods to determine the status of the GYA grizzly bear population, estimate population size, and determine the sustainable level of mortality in the GYA. The Wildlife Monograph: “Temporal, Spatial, and Environmental Influences on The Demographics of Grizzly Bears in The Greater Yellowstone Ecosystem” (Schwartz et al. 2006); the report: “Reassessing Methods to Estimate Population Size and Sustainable Mortality Limits for the Yellowstone Grizzly Bear” (hereafter referred to as the Reassessing Methods Document) (Interagency Grizzly Bear Study Team 2005); and the report: “Reassessing Methods to Estimate Population Size and Sustainable Mortality Limits for the Yellowstone Grizzly Bear Workshop Document Supplement 19-21 June, 2006” (hereafter referred to as the Supplement to the Reassessing Methods Document) (Interagency Grizzly Bear Study Team 2006) provided

Comment [FTvM1]: 2 points:

1.
It seems there may be somewhat of a mismatch between this document and the application protocol. The way the application protocol is currently written, the # of Fcoy remains the basis for population estimation (I reworded that section so other techniques for estimating Fcoy may be applied in the future; e.g., mark-resight or other techniques). Either way, the **protocol** remains based on Fcoy, and would not provide the flexibility to use other techniques (e.g., estimate overall population size directly using DNA sampling).

2.
The criterion of 500 bears is OK and defensible but we should about POTENTIAL consequences: there are reasonable scenarios in which we may have well over 500 bears but **fewer** than 48 Fcoy. Case in point: with the 1983-2001 rates and ratios, 48 Fcoy translated into about 500 bears overall. Now, 48 Fcoy translate into around 600 bears, the difference primarily because there are more males in the population.

The overall population estimate is based on several rates and ratios, each time adding more uncertainty to the estimate. Thus, the total annual estimate is a less sensitive measure than the annual Chao2 estimate for Fcoy. This is recognized later in this document. However, given a choice of these 2 related criteria, I'm more comfortable with 48 Fcoy.

So my question is: if Fcoy remain the basis for the application protocol, how essential is it that we change this criterion to 500 overall, rather than 48 Fcoys?

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the scientific basis for revising the demographic recovery criteria in the GYA in 2007. Similarly, the revisions we propose now are based on updated demographic analyses using the same methods as before (Schwartz et al. 2006), as reported in the Interagency Grizzly Bear Study Team's 2012 report: "Updating and Evaluating Approaches to Estimate Population Size and Sustainable Mortality Limits for Grizzly Bears in the Greater Yellowstone Ecosystem." This 2012 Study Team report provides the scientific basis for the changes proposed below.

The current demographic recovery criteria in the GYA are:

- Demographic Recovery Criterion 1 — Maintain a minimum of 48 females with cubs of the year in the GYA (Figure 1), as indicated by the model-averaged Chao2 estimate for that year. The number of females with cubs of the year cannot drop below 48 for any 2 consecutive years.
- Demographic Recovery Criterion 2 — Sixteen of 18 bear management units within the Recovery Zone (Figure 2) must be occupied by females with young, with no two adjacent bear management units unoccupied, during a 6-year sum of observations. This criterion is important as it ensures that reproductive females occupy the majority of the Recovery Zone and are not concentrated in one portion of the ecosystem.
- Demographic Recovery Criterion 3 — For independent females (at least 2 years old), the current annual mortality limit, not to be exceeded in 2 consecutive years and including all sources of mortality, is 9 percent of the total number of independent females. For independent males (at least 2 years old), the current annual mortality limit not to be exceeded in 3 consecutive years and including all sources of mortality, is 15 percent of the total number of independent males. For dependent young (less than 2 years old), the current annual mortality limit, not to be exceeded in 3 consecutive years and including only known and probable human caused mortalities, is 9 percent of the total number of dependent young.

The second criterion pertaining to the distribution of females with offspring will remain unchanged. We propose to revise the first and third criteria to reflect updated demographic analyses and facilitate implementation of the best available science, as it becomes available. We propose the following demographic recovery criteria to supplement the 1993 Recovery Plan:

- Proposed Demographic Recovery Criterion 1 — Maintain a minimum population size of 500 animals, as indicated by methods established in published, peer-reviewed scientific literature and calculated by the Study Team using the most updated Protocol, as posted on their website. The estimate of total population size cannot drop below 500 in any single year.
- Demographic Recovery Criterion 2 (NO CHANGE) — Sixteen of 18 bear management units within the Recovery Zone (Figure 2) must be occupied by females with young, with no 2 adjacent bear management units unoccupied, during a 6-year sum of observations. This criterion is important as it ensures that reproductive females occupy the majority of the Recovery Zone and are not

Comment [FTvM2]: See comment above.

concentrated in one portion of the ecosystem.

- **Proposed Demographic Recovery Criterion 3** — Annual mortality limits will be established based on calculations by the Study Team of how much mortality independent females (↔(at least 2 years old), males, and dependent young (<2 years old) can sustain without making the population decline (i.e., the “sustainable mortality rate”), as described in the Protocol Document on their website. This sustainable mortality rate will be calculated and reported by the Study Team using peer reviewed scientific methods such as known-fate analyses (see Harris et al. 2006). If mortality limits for independent females are exceeded in any 2 consecutive years, this will trigger a Biology and Monitoring Review by the Study Team. Similarly, if mortality limits for independent males or dependent young are exceeded in any 3 consecutive years, it will trigger a Biology and Monitoring Review.

Comment [FTvM3]: Should there be mention here that the area within which mortalities are counted is to be changed to match the population monitoring area? (i.e., point 2 in next paragraph)

We are proposing to change the first and third criteria because they no longer represent the best scientific data nor the best technique to assess recovery of the Yellowstone grizzly bear population because – (1) There are updated demographic analyses for 2002-2011 indicating that the rate of growth seen during the 1983–2001 period has slowed and sex ratios have changed; (2) there is consensus among scientists and statisticians that the area within which we apply mortality limits should be the same area we use to estimate population size; and (3) the need exists to make the demographic criteria dynamic so the Study Team can incorporate results from updated demographic analyses and implement new scientific methods based on peer-reviewed, scientific literature as they become available. These proposed criteria would replace the current Demographic Criteria and would be appended to the Yellowstone chapter of the Grizzly Bear Recovery Plan (U.S. Fish and Wildlife Service 1993, p. 44) and the Final Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Area.

More information about Proposed Revisions to Demographic Criterion 1:

Because the GYA grizzly bear population is currently isolated from other grizzly bear populations, to adequately mitigate the potential effects of genetic drift and inbreeding depression, Miller and Waits (2003) recommended that the total population size for the GYA grizzly bear population be at least 400 bears. To assure that this goal is met and in order to adopt a conservative approach, the total population will be maintained at or above 500 grizzly bears in the GYA. The biological intent of this proposed revision is identical to the current criterion. The current criterion to maintain an annual estimate of at least 48 females with cubs of the year using the model averaged Chao2 value was chosen because that number corresponds to a total population size of approximately 500 individuals. The proposed revision to Demographic Criterion 1 simply removes the reference to the specific method to be used, thus allowing the USFWS to implement the best available science, as it becomes available.

Comment [FTvM4]: If this was the reason, it is not apparent in the protocol, which is still based on estimating Fcoy as the basis for population estimation (as opposed to, for example, estimating total population based on DNA sampling).

Due to the increased level of uncertainty surrounding this estimate of population size as it becomes more removed from the raw data (i.e., number of females with cubs of the year), a Biology and Monitoring Review by the Study Team would be triggered if this

criterion was not met in any single year. This is different than the current criterion that requires the number of females with cubs of the year to drop below 48 for two consecutive years before a Review is triggered.

More information about Proposed Revisions to Demographic Criterion 3:

The sustainable mortality limits established in the 2007 Demographic Criteria were based on data obtained between 1983 and 2002 from radio-collared bears and the modeling results of Harris et al. (2006). When these Demographic Criteria triggered a demographic review by the Study Team in 2011, they examined more recent data from 2002-2011 and compared the results of these new analyses with those from the previous time period. Between 2002 and 2011, population growth slowed and sex ratios changed, with more independent males in the population than previously documented ([Interagency Grizzly Bear Study Team 2012](#)). When sustainable mortality rates were re-calculated with this more recent data, the Study Team found that these rates had changed for some age and sex classes. Specifically, the sustainable mortality rate for independent females from all sources changed from 9.0% to 7.6% and the sustainable mortality rate for dependent young from human causes only also changed from 9.0% to 7.6% (Study Team 2012). Because these rates represent the best available science, we must revise Demographic Criterion 3 to reflect these new demographic analyses. To allow results from demographic analyses to be implemented as they become available and sustainable mortality rates adjusted accordingly, we are proposing to make the language in Demographic Criterion 3 more general without changing the overall intent to prevent population decline.

While the general biological intent of this proposed revision is identical to the current criterion (i.e., to establish mortality limits that prevent population decline), there is one important difference. The new rates were calculated based on a goal of population stability instead of population growth. No population can grow forever, since the resources it requires are finite. When a population grows too large for its environment to support continued growth, it is said to be at “carrying capacity.” Carrying capacity in wild species that are habitat generalists like grizzly bears varies from year to year and even from day to day, which makes it more appropriate to regard carrying capacity as a band covering a range of population sizes, rather than a clearly defined, constant value. Accordingly, population growth may be positive or negative in any given year but over a longer time series, it will be [roughly approximately](#) zero. Although carrying capacity varies widely in natural environments, there are several indications that the GYA grizzly bear population is at or near carrying capacity inside suitable habitat (see Schwartz et al. 2006; [Interagency Grizzly Bear Study Team 2012](#)). Therefore, the agencies accepted the Study Team’s recommended strategy –to manage this grizzly bear population with a goal of stability instead of indefinite growth ([Interagency Grizzly Bear Study Team 2012](#)).

Like the methods adopted in 2007, the proposed revision to Demographic Criterion 3 would continue to count deaths of independent (at least 2 years old) male and female grizzly bears from all sources against annual mortality limits while counting only known and probable human-caused mortalities against annual mortality limits for dependent young (less than 2 years old). For independent females and males, counted

Comment [FTvM5]: For the same reason as my point 2 in the first comment, this is a valid argument. So, although I understand Mark Bruscino’s comment regarding this issue, we cannot ignore the substantially greater uncertainty associated with applying the 500 criterion. Thus, I am more comfortable with a single-year threshold for a review trigger for the 500 criterion.

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mortalities include: (1) known and probable human-caused mortalities; (2) reported deaths due to natural and undetermined causes; and (3) calculated unreported human-caused mortalities. The Study Team would continue to use the methods of Cherry et al. (2002) to calculate and estimate unknown/unreported mortalities each year based on the number of known, reported deaths (Cherry et al. 2002, p. 179; Interagency Grizzly Bear Study Team 2005, pp. 39-41).

Unlike the methods adopted in 2007, the proposed revision to Demographic Criterion 3 would apply only within the Monitoring Area shown in Figure 1. The Study Team developed this Monitoring Area using USFWS suitable habitat (see 72 FR 14866, March 29, 2007) and adding areas which ~~may~~ could serve as mortality sinks (Interagency Grizzly Bear Study Team 2012). Mortalities outside of the Monitoring Area would continue to be recorded and reported but would not count against the sustainable mortality limits for that year. Grizzly bear occupancy would not be actively discouraged outside the Monitoring Area but management emphasis would be on conflict response. Grizzly bears would not be removed from the population just because they ~~occur~~ are outside the Monitoring Area but, as is the case within the Monitoring Area boundary, they may be removed from the population or relocated if there are conflicts. Grizzly bears may also be preemptively relocated to avoid conflicts but their potential contribution to connectivity with other grizzly bear populations would be considered in any such moves. Preemptive moves would not be classified as conflicts.

Application of the proposed revisions to Demographic Criteria 1 and 3.

The application protocols to evaluate and measure these updated Demographic Criteria are available at the Study Team's website and will be updated as necessary to assure the use of the best available science. See: <http://nrmssc.usgs.gov/research/igbst-home.htm>

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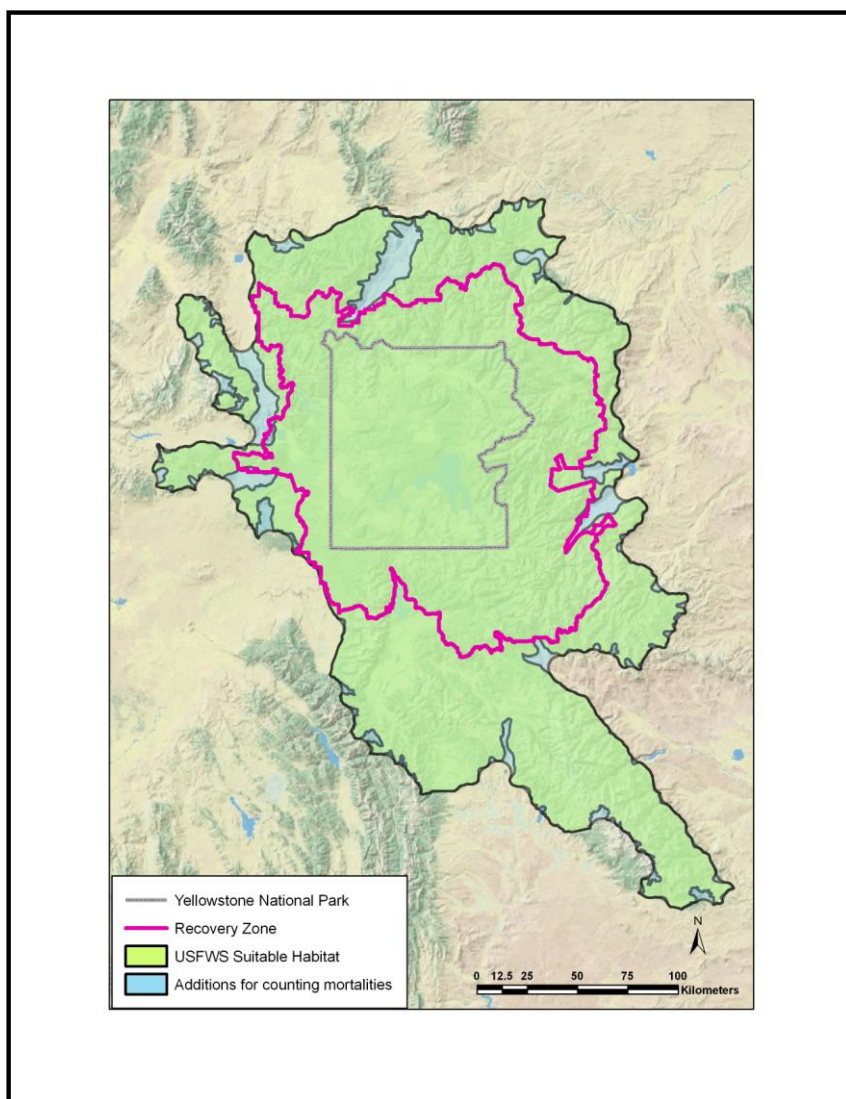


Figure 1. The Proposed Monitoring Area within which all demographic criteria would be assessed consists of the combined green and light blue areas.

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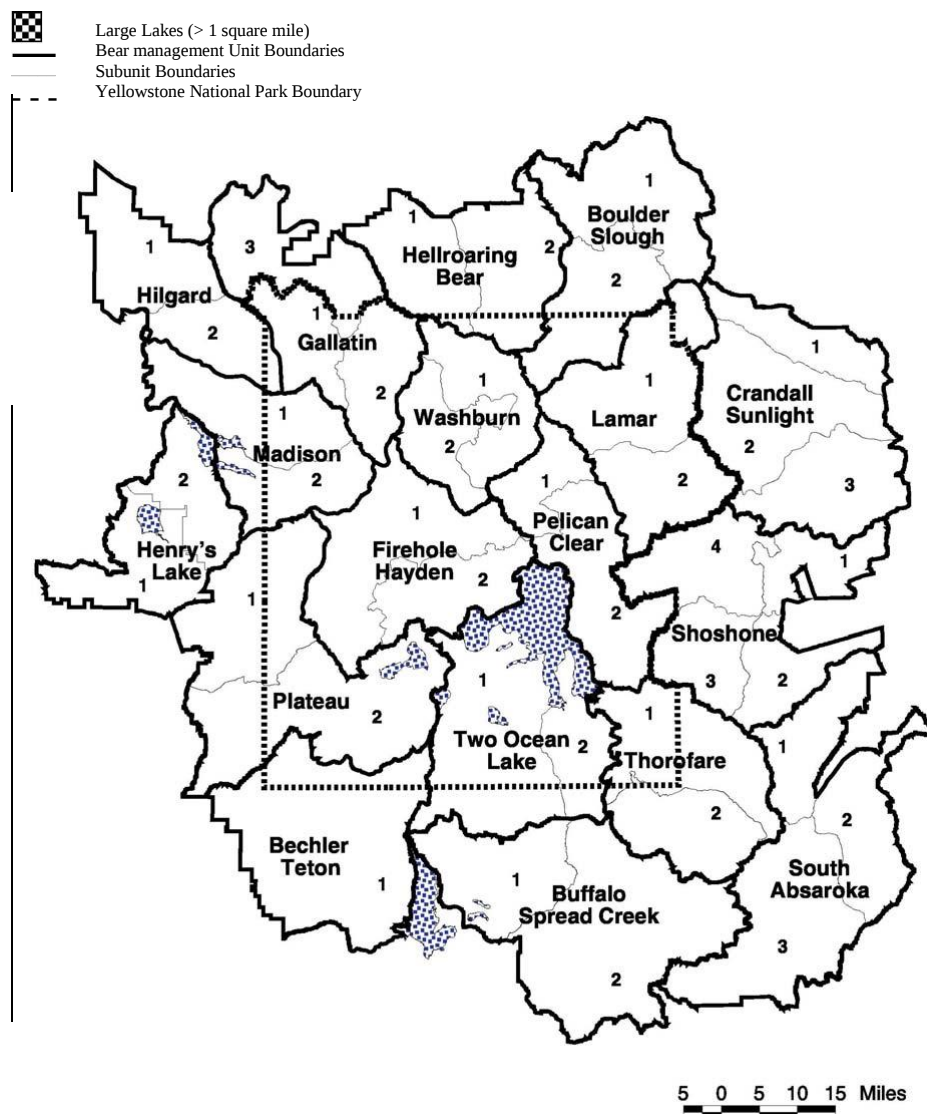


Figure 2. Yellowstone grizzly bear recovery zone boundary showing bear management unit (BMU) and subunit boundaries for application of Demographic Criterion 2.

Literature Cited

- Cherry, S., M.A. Haroldson, J. Robison-Cox, and C.C. Schwartz. 2002. Estimating total human-caused mortality from reported mortality using data from radio-instrumented grizzly bears. *Ursus* 13:175-184.
- Harris, R.B., C.C. Schwartz, M.A. Haroldson, and G.C. White. 2006. Trajectory of the Yellowstone grizzly bear population under alternative survival rates. Pages 44-55 in C.C. Schwartz, M.A. Haroldson, G.C. White, R.B. Harris, S. Cherry, K.A. Keating, D. Moody, and C. Servheen, eds. Temporal, spatial, and environmental influences on the demographics of grizzly bears in the Greater Yellowstone Ecosystem. Wildlife Monographs 161.
- Interagency Grizzly Bear Study Team. 2005. Reassessing sustainable mortality limits for the Greater Yellowstone Ecosystem grizzly bear. Interagency Grizzly Bear Study Team, USGS Northern Rocky Mountain Science Center, Montana State University, Bozeman, Montana, USA.
- Interagency Grizzly Bear Study Team. 2006. Reassessing sustainable mortality limits for the Greater Yellowstone Ecosystem grizzly bear workshop document supplement 19-21 June 2006. Interagency Grizzly Bear Study Team, USGS Northern Rocky Mountain Science Center, Montana State University, Bozeman, Montana, USA.
- Interagency Grizzly Bear Study Team. 2012. Updating and Evaluating Approaches to Estimate Population Size and Sustainable Mortality Limits for Grizzly Bears in the Greater Yellowstone Ecosystem. Interagency Grizzly Bear Study Team, USGS Northern Rocky Mountain Science Center, Montana State University, Bozeman, Montana, USA. 62 pp.
- 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.
- Schwartz, C.C., M.A. Haroldson, G.C. White, R.B. Harris, S. Cherry, K.A. Keating, D. Moody, and C. Servheen. 2006. Temporal, spatial, and environmental influences on the demographics of grizzly bears in the Greater Yellowstone Ecosystem. Wildlife Monographs 161.
- U.S. Fish and Wildlife Service. 1993. Grizzly bear recovery plan. Missoula, Montana, USA.

Appendix A.

Implementation Schedule

The following Implementation Schedule outlines actions and estimated costs for the grizzly bear (*Ursus arctos horribilis*) recovery program over the next 5 years. Functioning as a practical guide for meeting the species' recovery goals, this schedule indicates action priorities, action numbers, action descriptions, duration of actions, and estimated costs. In addition, parties with authority, responsibility, or expressed interest in implementing a specific recovery action are identified; however, this neither obligates nor implies a requirement for the identified party to implement the action(s) or secure funding for implementing the action(s). However, parties willing to participate may benefit by being able to show in their own budgets that their funding request is for a recovery action identified in an approved recovery plan and, therefore, is considered a necessary action for the overall coordinated effort to recover the grizzly bear. Also, section 7(a)(1) of the ESA, as amended, directs all Federal agencies to utilize their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation threatened and endangered species.

Key to Implementation Schedule Priorities (column 1)

PRIORITY 1: An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.

PRIORITY 2: An action that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.

PRIORITY 3: All other actions necessary to provide for full recovery of the species.

Key to responsible parties in column 6:

USFS = U.S. Forest Service
YNP = Yellowstone National Park
USGS = U.S. Geological Survey
MT = Montana Fish Wildlife and Parks Department
ID = Idaho Fish and Game Department
WY = Wyoming Game and Fish Department
GTNP = Grand Teton National Park

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Action Priority	Action Number	Action Description	Action Duration	Responsible Parties	USFWS Lead	Total (annual) Costs	2007	2008	2009	2010	2011	Comments
3	Y11	Monitor total population size by counting females with cubs. Monitor mortality and set annual mortality limits.	Annual	USGS, MT, WY, ID, YNP, GTNP, USFS	N	678,193 ¹	339,097 ¹	0	0	0	0	

¹ The same funding applies to both monitoring population size and mortality management as they are interrelated.

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