

Demographic Recovery Criterion 3—Within the DMA, maintain annual mortality limits for independent females (at least 2 years old), independent males (at least 2 years old), and dependent young (less than 2 years old) to maintain the population at approximately the average model-averaged Chao2 estimate 2002–2014 of 674¹. Ensure the following annual total mortality rates (Table 2) are not exceeded within the DMA for independent males, independent females and dependent young, as set forth in Table 2, and based on the 2002-2014 Chao2 average point estimate for the total population (with 95% confidence intervals of 600-747).

Table 2. Total mortality rates used to establish annual mortality limits for independent females, independent males, and dependent young inside the DMA using the model-averaged Chao2 population estimate method. These mortality limits are on a sliding scale to achieve the population goal inside the DMA of the average population size 2002–2014 of 674 using the Chao2 method inside the DMA. For populations less than 600, there will be no discretionary mortality unless necessary for public safety

Mortality limit % for independent FEMALES (using model-averaged Chao2 method)	Pop. Size using Chao2	<600	601–673	674	675–747	>747
	Mort. %	No discretionary	<7.6%	7.6%	9%	10%
Mortality limit % for independent MALES (using model-averaged Chao2 method)	Pop. Size using Chao2	<600	601–673	674	675–747	>747
	Mort. %	No discretionary	15%	15%	20%	22%
Mortality limit for % of DEPENDENT YOUNG (using model-averaged Chao2 method)	Pop. Size using Chao2	<600	601–673	674	675–747	>747
	Mort. %	No discretionary	<7.6%	7.6%	9%	10%

¹ 95% CI = 600 - 747.

Justification and Methodology

Each year the IGBST will calculate the model-averaged Chao2 population estimate for the DMA. This population estimate will be used to set the mortality limits for the following year. These mortality rates will be on a sliding scale with the population objective being to maintain the population within the DMA at the 2002–2014 average size of 674. To achieve this recovery criterion the mortality rate will be 7.6% for independent females, 7.6% for dependent young, and 15% for independent males. The higher rate for independent males is biologically sound since population growth is less sensitive to independent male mortality than to independent female mortality. In order to maintain the population goal at the 2002–2014 average size of 674 and associated confidence intervals inside the DMA, a sliding scale of mortality rates will be applied to the model-averaged Chao2 population estimate from the year before as per Table 2. Mortalities are tracked and reported annually using data obtained within the DMA shown in Figure 1.

Wording in the Conservation Strategy:

Monitoring Protocol

The management of human-caused mortality of grizzly bears is key to successful maintenance of the grizzly bear population in the GYE. Mortality limits are a necessary tool for managers in regulating human impacts to any wildlife population, including grizzly bears. Managing mortality is necessary to avoid the unregulated killing that occurred as the Yellowstone area was settled and to build support for long-term survival of the population. Higher numbers of mortalities can be expected in areas outside the DMA as the grizzly bear population expands, particularly in areas on the edge of the range when bears move on to private lands or in areas with higher levels of human development. Mortality management recognizes the need for some

bears to be removed to address recurring conflicts to meet management needs for nuisance bears, human safety issues, etc.

The state wildlife agencies (Montana, Wyoming, and Idaho) have signed a Memorandum of Agreement (Appendix P) setting forth how they will coordinate bear management actions and limit discretionary mortality to ensure it will not jeopardize the recovery and survival of the GYE bear population. This MOA document also summarizes each state's regulatory mechanisms for regulating discretionary mortality, including harvest. The states may use regulated harvest as a management tool when and where appropriate. All known and probable mortalities due to regulated harvest will be limited by the overall mortality limits within the DMA. Mortality limits will be monitored and managed within the mortality limits described in Table 2 and Table 4 to ensure mortality will stay within the recovery criteria and therefore will not jeopardize the health and survival of the GYE grizzly bear population.

Table 4. Framework to manage inside the DMA for the population goal of the average population 2002–2014 using the model-averaged Chao2 method.

Management Framework	Background and Application Protocol
1. Area within which mortality limits apply.	49,928 sq km (19,279 sq mi) Demographic Monitoring Area (DMA) (Figure 2).
2. Management objective.	To maintain the population at the average estimate for 2002–2014, a period of population stability (674 using the model-averaged Chao2 methodology (Keating <i>et al.</i> 2002; Cherry <i>et al.</i> 2007; Harris <i>et al.</i> 2007) (average lower 95% CI = 600; average upper 95% CI = 747)).
3. Population estimator.	The model-averaged Chao2 population estimator will be used as the population measurement tool unless another scientifically sound method becomes available. The model-averaged Chao2 population estimate for 2002–2014 was 674 (average lower 95% CI = 600; average upper 95% CI = 747).
4. Mortality limit setting protocol.	Each fall the IGBST will annually produce a model-averaged Chao2 population estimate for the DMA. That population estimate will be used to establish the mortality limit percentages for each age/sex class for the following year as per #7, #8, and #9 (below).
5. Allocation process for managed mortalities	The States will coordinate to manage within the mortality limits per age/sex class outside National Parks and the Wind River Reservation (WRR). The WRR will receive a portion of the available mortality limit based on the % of the WRR geographic area within the DMA. Mortalities outside the DMA are the responsibility of each State and do not count against mortality limits.
6. Management of hunting mortalities.	Hunting seasons will be closed within 24 hours of meeting mortality limits for that age/sex class as per this table. Any mortality exceeding mortality limits in any year will be subtracted from that age/sex class

	mortality limit for the following year.				
7. Management review by the IGBST every 5–10 years to assure that management actions are achieving the objective of maintaining the population at the 2002-2014 average of 674 based on the model-averaged Chao2 population estimate.	This management review will assess if the management system is achieving the desired objective to maintain a stable population at the 2002–2014 average estimated population size based on the model-averaged Chao2. The management review is a science-based process that will be led by the IGBST (which includes all State and Federal agencies and the WRR Tribes) using all recent available scientific data to assess population numbers and trend against the management objective. Vital rates such as age/sex-specific survival and reproductive rates will also be reevaluated using the most recent data to adjust mortality levels as necessary.				
8. Mortality limit % for independent FEMALES based on the results of the model-averaged Chao2 method.	Pop. size	<674	674	675–747	>747
	Mort. %	<7.6%	7.6%	9%	10%
9. Mortality limit % for independent MALES based on the results of the model-averaged Chao2 method.	Pop. size	<674	674	675–747	>747
	Mort. %	15%	15%	20%	22%
10. Mortality limit for % of dependent young based on the results of the model-averaged Chao2 method.	Pop. size	<674	674	675–747	>747
	Mort. %	<7.6%	7.6%	9%	10%
11. <u>Example</u> of background level of annual mortalities from management and other causes – Using average yearly total mortality of independent bears (≥2 years) from all causes including unknown/unreported estimates, this example uses the average 2011 to 2014.	38 expected independent bear deaths/year due to management, illegals, and other deaths (17 F, 21 M). (This includes dead bears from inside the DMA only.) Note that this is only an example of the expected background level of annual mortalities. This number may vary from 38/year and will have to be factored into the numbers presented in items #11 and #12 below. The average number of background mortalities inside the DMA for the previous four years will be used to estimate the expected number of animals available for discretionary mortality allocation.				
12. <u>Total annual mortality limit</u> from all causes for independent FEMALES (≥2 years).	< 600 (as an example of <7.6% mortality)	600–673 <7.6% mortality	674 at 7.6% mortality	675–747 at 9% mortality	>747 at 10% mortality
	<16	16 to 17	18	21 to 23	>26
13. <u>Total annual mortality limit</u> from all causes for independent MALES (≥2 years).	<600 at <15% mortality	600–673 15% mortality	674 at 15% mortality	675–747 at 20% mortality	>747 at 22% mortality
	<31	31 to 34	35	47 to 52	>57