Monitoring and Assessment of Wolf-Ungulate Interactions and Population Trends within the Greater Yellowstone Area, Southwestern Montana, and Montana Statewide
Final Report
2009

Kenneth L. Hamlin and Julie A. Cunningham

EXECUTIVE SUMMARY

The first section of this report presents summaries and results from data collected at intensive study sites in the Greater Yellowstone Area (GYA) and southwestern Montana during 2001-2008. Hamlin et al. (2008) summarizes much of the knowledge gained via comparisons between data collected at the intensive study sites through 2007. This section updates these comparisons with more recent data, with a more in-depth focus on wolf-elk interactions in the Northern Yellowstone elk herd, and with data concerning ungulates other than elk. Major findings from this section can be characterized as follows.

1. Wolf numbers have increased rapidly in all of western Montana since wolf restoration began in 1995, at rates of approximately 10% to 34% annually. In the range of the Northern Yellowstone elk herd, wolf numbers increased by an average of approximately 13% annually during 1995-2007.

2. Elk are the primary prey species for wolves in southwest Montana and the GYA, though there is limited evidence that the portion of elk in wolf diets may decline during summer months. Most data indicate that wolves preferentially select for elk calves and against adult female elk. Some data indicate that wolves preferentially select for adult male elk, and the degree to which this happens appears to be influenced by the number of adult male elk that reside within the territory of a particular pack or population of wolves.

3. Winter elk kill rates of wolves have varied widely across southwest Montana and the GYA, from approximately 7 to 23 elk killed per wolf during November through April. There are few data on summer elk kill rates of wolves, but it appears that wolves kill fewer elk during summer than during winter.

4. The number of grizzly bears in southwest Montana and the GYA has increased more than 3-fold since 1987, concurrently with the increase in wolf numbers, affecting the total elk predation rate.

5. Most data that have directly measured elk pregnancy rates since wolf restoration began indicate that elk pregnancy rates are unaffected by wolves, in contrast to some indirect evidence from average hormone concentrations in elk feces. Indirect evidence from hunter-collected samples also indicates that elk pregnancy rates have been unaffected by wolves.

6. In most of southwest Montana and the GYA, calf survival rates following wolf restoration have been similar to rates prior to wolf restoration. Declines in calf per 100 cow ratios have occurred in the Northern Yellowstone, Gallatin- Madison, and Madison-Firehole elk herds, where both wolf and grizzly bear densities have been high. In the Northern Yellowstone and Gallatin- Madison elk herds, calf per 100 cow ratios have recently been approximately half or less than levels recorded prior to wolf restoration.

7. Adult female elk survival rates have remained high in most areas during the wolf population increase. In the Northern Yellowstone elk herd, adult female survival has ranged from approximately 75% to 85% since the mid-1980s. In earlier years, most adult female mortality in this herd was due to hunting. During 2000-2004, major mortality sources included hunting and predation. Since 2005, hunter harvest has been minimal and adult female survival rates appear to have remained in the low 80% range.

8. In areas with high predator (grizzly bear and wolf) to prey ratios, including the Northern Yellowstone, Gallatin Canyon, and Madison-Firehole winter ranges, elk numbers have declined substantially since wolf reintroduction. In most areas with lower predator to prey ratios, elk numbers have remained stable or have increased since wolf restoration began.

9. In the Northern Yellowstone elk herd, we estimate that since 2004 wolves have killed more elk than hunters, since 2005 wolves have killed more adult female elk than hunters, and in all but one year since 2002 wolves have killed more bull elk than hunters.

10. Our analyses of elk vital rates in the Northern Yellowstone elk herd indicate that a continued decline in elk numbers in coming years is likely until predator to prey ratios decline, even if hunting pressure remains low or is decreased further.

11. Most data collected during winter indicate that wolves have small-scale effects on elk distribution (displacement of up to approximately 1 km upon contact) and movement rates (increased movement rates of approximately 1.23 km per every 4 hours). Wolves may also affect elk habitat selection and group sizes, but the magnitude and direction of these effects is widely variable among wintering areas and even among habitats in the same wintering area. Where the impacts of hunting, hunter access, and wolves have been studied simultaneously, the impacts of hunting and hunter access on elk distribution, movements, group sizes, and habitat selection have been larger than the effects of wolves.

12. Data concerning the effect of wolves on large-scale elk distribution are equivocal. Based on research data collected during this project, there is little or no indication that wolves affect larger-scale elk seasonal distribution or the timing of migration in some areas in southwest Montana. Anecdotal information suggests that this may occur in some other areas in southwest Montana, however. Additionally, research data from the Madison-Firehole elk herd suggest that wolf predation pressure affects large-scale migration patterns or seasonal range selection for some elk.

13. In the areas of southwest Montana and the GYA that have shown declines in elk calf survival, recruitment, and population size since the wolf reintroduction, mule deer recruitment and numbers have increased.

14. Little data exist on moose populations in southwest Montana and the GYA due to inconsistent monitoring. Recruitment and population sizes appear to have declined in some areas, while numbers have increased in other areas. We can currently provide little insight into the causes of these disparities, and increased monitoring efforts or research efforts might provide more insight.

The second section of this report provides summaries of data from routine MFWP statewide monitoring programs, including aerial survey, harvest survey, and species management programs, which have been absent from previous publications and reports. Conclusions in this section are more general and can be characterized as follows.

1. Elk populations in MFWP Administrative Region 1 appear to be stable or increasing, and all areas with consistent, long-term aerial counts have few wolves at present.

2. Moose numbers appear to be stable in the sole hunting district of Region 1 that has consistent, long-term data on moose population trend.

3. In most of northwestern Montana, including Administrative Region 1 and the northern portion of Administrative Region 2, white-tailed deer are likely the major prey of wolves, rather than elk.

4. Using buck harvest as an index of population trend for white-tailed deer, in most hunting districts numbers appeared to increase steadily until 2006 following the large decline in 1996-97. Recent highs were slightly lower than previous highs despite relatively smaller anterless harvests, and the entire increase occurred during a phase of increasing wolf numbers.

5. Since 2006, and beginning as early as 2004 in some areas of Region 1, white-tailed deer population sizes, indexed by buck harvest, have been decreasing. The decrease has coincided with record high antlerless deer harvests in most hunting districts.

6. It appears that factors other than predation have played major roles in recent white-tailed deer population declines in Administrative Region 1. However, predation may have

played a role in initiating the declines, prolonging the recovery periods, and/ or limiting total deer numbers below the previous highs. In much of Region 1, it appears to be possible that predator and prey fluctuations or cycles may develop, rather than more consistent, low numbers of white-tailed deer in the presence of wolves, because white-tailed deer numbers were able to increase following major declines in 1996-97.

7. In MFWP Administrative Region 2, white-tailed deer numbers, as indexed by buck harvest, increased through 2006 following the major declines in 1996-97. However, in HDs 201 and 202 where wolves have been present longest, buck harvest has remained below historic pre-wolf levels.

8. Since 2006, white-tailed deer numbers have decreased concurrently with record or near-record high antlerless harvest, following a pattern very similar to the pattern in Administrative Region 1. The declines in Region 2 have been also influenced by factors other than predation, and most populations recovered following the major declines in 1996-97. This again leads to the possibility that predator and white-tailed numbers will fluctuate in Region 2, rather than white-tailed deer persisting at continually low numbers in the presence of wolves.

9. In some areas of Region 2, there have been some elk population declines with limited evidence that wolves may have played a role in limiting numbers or affecting elk distribution. In other areas aerial counts of elk have increased while harvest has decreased, with little apparent influence of wolves.

10. Consistent, long-term survey data indicate that elk in the Bitteroot Valley increased steadily until 2006, when planned reductions in elk numbers resulted from increases in harvest. The environment and conditions in the western portion of this valley suggest that wolves may affect elk numbers at some point, so close monitoring of this elk herd should continue.

11. At this time, there is little wolf presence in Administrative Regions 4 and 5, so chances of wolf impacts on ungulate populations in these areas are minimal at present.

12. It appears that some areas in Montana are unsuitable to wolves because livestock depredations continually lead to wolf removals, preventing wolves from increasing to densities that are seen in protected areas. In these areas, wolves are probably less likely to limit ungulate populations than in areas where depredation removals do not limit wolf survival and population growth.

13. The federally funded budget for wolf monitoring and management has increased by 8% since 2005, while the MFWP budget for all big game monitoring, including but not limited to all of the ungulate species, has declined by 15% since 2006. Currently, the wolf program budget is approximately 2/3 the size of the budget for the big game program. If wolves are removed from the endangered species list, and federal funding for the wolf program declines or is eliminated, our knowledge of either wolf or ungulate populations, or both, will decline under the current budget scenario.

14. Routine ungulate monitoring programs in Montana may only be powerful enough to detect large changes in ungulate numbers over a series of years, and power will be even lower in areas where harvest indices are used to monitor populations instead of aerial surveys. No routine surveys of ungulates in Montana are likely to be powerful enough to assign causes to declines in every case. This is apparently not always possible even in areas with intensive monitoring and research projects, because substantial debates concerning causes of declines and the role that predation plays in declines still persist in many of these areas.

LITERATURE CITED

Hamlin, K. L., R. A. Garrott, P. J. White, and J. A. Cunningham. 2008. Contrasting wolf-ungulate interactions in the Greater Yellowstone ecosystem. Chapter 25 *in* R. A. Garrott, P. J. White, and F. G.Watson, eds. The Ecology of Large Mammals in Central Yellowstone. Elsevier, Inc.