2008 DRAFT REVISION
WYOMING GRAY WOLF MANAGEMENT PLAN

WYOMING GAME AND FISH COMMISSION

~~**November 16, 2007**~~

Draft Revision, October 28, 2008

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

The Wyoming Game and Fish Commission/Department (Commission/Department) will implement the following management plan for gray wolves upon delisting by the Federal government. The purpose of this plan is to establish guidelines for wolf management in Wyoming that will provide for a sustainable wolf population, while minimizing wolf/human conflicts. This plan, although it varies in specific circumstances, is compatible with management plans in Idaho and Montana. Population objectives are similar for all three States and, as such, should guarantee that the Federal recovery criteria established by the U.S. Fish and Wildlife Service (USFWS) are met and maintained after delisting. The Department is the appropriate agency to assume management authority of wolves following delisting. The Commission is the appropriate authority to determine the classification of gray wolves. Both willingly recognize and will assume that responsibility. Key elements of this management plan include the following:

- ~~According to Wyoming Statute (W.S.) 23-1-304 and interpretation of said statute by the Wyoming Attorney General's Office,~~ Wyoming will commit to ~~maintaining~~ manage for at least fifteen (15) breeding pairs consisting of at least 150 wolves ~~Statewide~~ within the Wolf Trophy Game Management Area (WTGMA) including the National Parks, John D. Rockefeller Memorial Parkway (Parkway), and National Elk Refuge (NER)~~, and potentially the Wind River Indian Reservation (WRIR)~~. Of these fifteen (15) breeding pairs, at least seven (7) breeding pairs will be maintained in the area of the WTGMA located outside the National Parks and Parkway. ~~However, the State of Wyoming working with the USFWS and the National Park Service will assure that Wyoming's wolf population never drops below 10 breeding pairs and 100 wolves.~~ If the Commission determines there are less than eight (8) breeding pairs inside the National Parks for 2 consecutive years, the Department shall manage for a sufficient number of breeding pairs and wolves in the area of the WTGMA located outside of the National Parks to assure at least 15 breeding pairs consisting of at least 150 wolves are maintained within the WTGMA. These management commitments are consistent with Wyoming Statute (WS) 23-1-304.

- Wolves will be managed under dual classification of trophy game animal and predatory animal. Wolves will be trophy game animals within the area of northwestern Wyoming identified as the Wolf Trophy Game Management Area (WTGMA) and depicted in Figure 1. They will be classified as predatory animals in the remainder of the State. The Commission shall not diminish the WTGMA unless, based on the best scientific data and information available, the Commission determines that the diminished area will sustain at least fifteen (15) breeding pairs consisting of at least 150 wolves, with at least seven (7) of those breeding pairs primarily outside of the National Parks. The Department will be responsible for monitoring wolves Statewide regardless of classification.

- Appropriate population data and management objectives will be assessed at the Northwest Wyoming Wolf Data Analysis Unit (DAU) level (see Figure 3). Wolf Management Units (WMUs) will be established that encompass known packs and they will be used to regulate public take on specific packs to assure that DAU objectives are maintained. The Department also commits to implementing an appropriate monitoring program to assure that management objectives can be met.

- Because management protocols hinge on the number of packs outside the National Parks ~~and Parkway~~, the Department must have the capability to collect important biological information from wolves that are taken by the public. Simple location of kill information is not adequate. Age, sex, and other information must be obtained if the Department is to accurately assess the impact of take upon management objectives. Any~~s a result,~~ licensed person who legally takes a wolf during any established season within the WTGMA must notify the Department within 24 hours and must present ~~all~~ the skull~~s~~ and pelt~~s of wolves that are taken by the public, regardless of their classification, must be presented~~ to a Department ~~employee~~ representative within ~~10~~5 days so that necessary data can be obtained. Wolves that are taken in defense of property within the WTGMA must be reported within 72 hours. Wolves that are killed outside the WTGMA must be reported to the Department within 10 days.

- Nuisance wolves will be managed using a variety of techniques designed to minimize conflicts between wolves and humans. The Department will enter into a cooperative agreement with USDA/Wildlife Services (USDA/WS), which will assist the Department in managing conflicts between wolves and livestock. The Department will only address conflicts and compensate for lost livestock in the area where wolves are classified as trophy game animals. Property owners within the WTGMA will be allowed to take wolves in the act of ~~causing~~ "doing damage to private property" as defined in Chapter 21, Section 3(b).

- Interactions between wolves and wildlife will be closely monitored, especially on State elk feedgrounds. As needed, management actions will be taken to minimize impacts while ensuring at least fifteen (15) breeding pairs consisting of at least 150 wolves are maintained within the WTGMA, including ~~that~~ at least seven (7) breeding pairs outside the National Parks and Parkway.

- A progressive public Information and Education program will be developed and implemented by the Department. This program will use a multifaceted approach to educate Wyoming's publics on all aspects of wolf management.

- The Department will use a variety of potential sources to secure funds to implement the management program for wolves. The potential cost of the management program will ultimately depend on the complexity of the monitoring program, the number and degree of wolf/human conflicts in areas where wolves are trophy game animals, and the area occupied by wolves long-term.

- Wolves can cause negative economic impacts at the site-specific level (specific landowners or drainages for ungulates). If the number of breeding pairs can be maintained near target levels, the potential economic impacts for all occupied areas should be manageable. If not, management actions will be taken to minimize impacts while ensuring at least fifteen (15) breeding pairs consisting of at least 150 wolves are maintained within the WTGMA, including at least ~~that~~ seven (7) breeding pairs ~~are maintained in Wyoming~~ outside the National Parks and Parkway.

- To the extent practicable, the Commission is committed to managing the gray wolves in Wyoming so that genetic diversity and connectivity issues do not threaten the gray wolf population. This will be accomplished by encouraging the incorporation of effective migrants into the gray wolf population. Conservation measures will include, but are not limited to, working with other states to promote natural dispersal into and within the WTGMA and, if necessary, by relocation or translocation.

INTRODUCTION

The gray wolf (*Canis lupus*) was extirpated from Wyoming by the 1930s. From that time through the early 1990s, there were occasional wolf sightings in Wyoming, but no reproduction was documented. With changing public attitudes through the 1960s and implementation of the Endangered Species Act (ESA) in 1973, wolves were protected by the Federal government. Public attitudes toward wolves continued to change through the 1980s and 1990s, with the majority of United States citizens viewing wolves as a valuable natural resource and an integral part of natural ecosystems (McNaught 1987, Bath 1991). As attitudes toward wolves changed, a national movement began that would bring wolves back to the western United States, including Wyoming. Wyoming residents were split on their views towards wolves prior to reintroduction, with 49% in favor and 39% opposed to wolf restoration into Yellowstone National Park (YNP) (Bath 1991).

With the goal of reestablishing a sustainable gray wolf population in the northern Rocky Mountains (Wyoming, Idaho, and Montana), the USFWS reintroduced 31 wolves to YNP, and 35 wolves to central Idaho in 1995 and 1996 (Bangs et al. 1998). These wolf populations have rapidly expanded in both numbers and distribution, setting forth plans for delisting, including the drafting of State management plans in Idaho, Montana, and Wyoming.

The northern Rocky Mountain wolf population is comprised of three recovery areas: Northwest Montana, Central Idaho, and the Greater Yellowstone Area (GYA). The GYA includes all of Wyoming, including YNP, Grand Teton National Park (GTNP), the NER, and adjacent parts of Idaho and Montana.

The USFWS ~~has defined~~ originally defined a recovered wolf population in the northern Rocky Mountains as 10 breeding pairs and 100 wolves in each of 3 recovery areas/states for 3 successive years (USFWS 1987, 1994)~~as one containing at least 30 breeding pairs and 300 wolves, with an equitable and uniform distribution throughout the three States for 3 consecutive years (USFWS 2002)~~. The USFWS subsequently modified its criteria to "thirty breeding pairs of wolves (defined as an adult male and an adult female that raise at least 2 pups until December 31 of the year of their birth), comprising some +300 individuals in a metapopulation with some genetic exchange between subpopulations, for three successive years" ~~A breeding pair is defined as an adult male and female raising two or more pups of the year until December 31~~ (USFWS 200~~2~~3, 2008). The ~~S~~states were also required ~~must~~ to have adequate regulatory mechanisms in place before wolves ~~will~~ could be considered for removal from protection of the ESA by the USFWS. This include~~s~~d drafting State wolf management plans. These requirements are intended to assure the gray wolf will not become threatened or endangered again. The USFWS determined that 2002 was the third year in which at least 30 breeding pairs and 300 wolves inhabited the northern Rocky Mountain recovery area ~~and has proposed d~~. Delisting was first proposed in 2003 via a "Western Distinct Population Segment" and again in 2005 and 2007 via the "Northern Rocky Mountain Distinct Population Segment." The purpose of this plan is to establish guidelines for wolf management in Wyoming that will provide for a sustainable wolf population, while minimizing wolf/human conflicts, and ensuring the long-term health and viability of all big game herds once wolves are removed from Federal protection under the ESA.

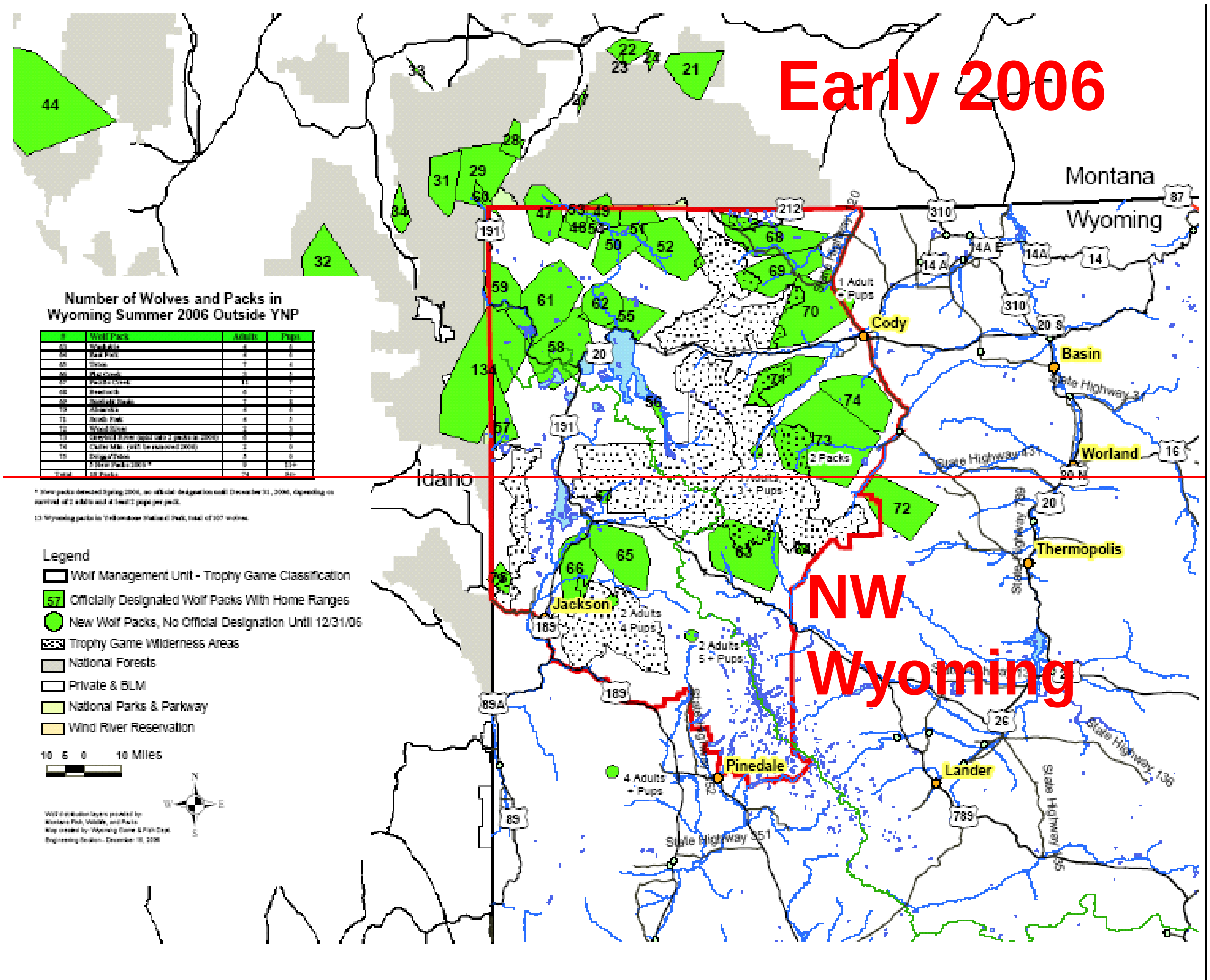
Upon delisting, management authority for wolves will return to the States in which wolves reside. The Department is the agency charged with the management of wildlife species within Wyoming, and is the appropriate agency to manage wolves within the State. Therefore, the Department will accept the responsibility and challenges of maintaining and managing Wyoming's portion of the northern Rocky Mountain wolf population residing in those areas where wolves are classified as trophy game animal outside YNP, GTNP, the Parkway, and the NER. A recent analysis of theoretically suitable wolf habitat in Montana, Idaho, and Wyoming indicates that suitable wolf habitat in Wyoming is restricted to the northwestern corner of the State (Oakleaf et al. 2006).

Prior to 2003, the gray wolf was classified by W.S. 23-1-101(a)(viii) as a predatory animal. This classification was changed in the 2003 legislative session to a dual status, following delisting by the USFWS, of "trophy game animal" or "predatory animal" depending on the area they occupy. In early 2004, the USFWS determined that Wyoming's regulatory framework was not adequate to propose delisting. In 2007, Wyoming developed new legislation and this updated Wyoming wolf management plans describes its implementation. ~~The State of Wyoming will commit to maintaining 15 breeding pairs and 150 wolves in the northwestern portion of the State including the National Parks and Parkway with 7 of these breeding pairs occupying areas outside the National Parks and Parkway.~~ From the date gray wolves are delisted, they will be classified as trophy game animals in the area of northwest Wyoming beginning at the junction of Highway 120 and the Wyoming-Montana State line; southerly along Wyoming Highway 120 to the Greybull River; southwesterly up said river to the Wood River; southwesterly up said river to the Shoshone National Forest Boundary; southerly along said boundary to the WRIR boundary; westerly, then southerly along said boundary to the Continental Divide; southeasterly along said divide to the Middle Fork of Boulder Creek; westerly down said creek to Boulder Creek; westerly down said creek to the Bridger-Teton National Forest boundary; northwesterly along said boundary to its intersection with U.S. Highway 189-191; northwesterly along said highway to the intersection with U.S. Highway 26-89-191; northerly along said highway to Wyoming Highway 22 in the town of Jackson; westerly along said highway to the Wyoming-Idaho State line; north along said State line to the Wyoming-Montana State line; north, then east along said State line to Wyoming Highway 120 (Figure 1). This area shall be known as the Wolf Trophy Game Management Area (WTGMA). Outside of the aforementioned area, wolves will be classified as predatory animals. The Department will collect certain management data in this area but will not manage nuisance conflicts. Predatory animals are regulated under Title 11, Chapter 6 of the W.S., by the Department of Agriculture. By providing the Commission authority to promulgate regulations to limit take of wolves within the described trophy game areas, Wyoming will satisfy the adequate regulatory mechanisms requirement necessary for delisting.

The State of Wyoming will commit to manage for at least fifteen (15) breeding pairs consisting of at least 150 wolves within the WTGMA including the National Parks, John D. Rockefeller Memorial Parkway (Parkway), and National Elk Refuge (NER). Of these fifteen (15) breeding pairs, at least seven (7) breeding pairs will be maintained outside the National Parks and Parkway. In the event the Commission determines there are less than eight (8) breeding pairs inside the National Parks for 2 consecutive years, the Department shall take actions to ensure the total number of breeding pairs inside the WTGMA is at least fifteen (15) breeding pairs. The

Commission shall not diminish the WTGMA unless, based on the best scientific data and information available, the Commission determines that the diminished area will sustain at least fifteen (15) breeding pairs consisting of at least 150 wolves, with at least seven (7) of those breeding pairs primarily outside of the National Parks.

One requirement for delisting is a minimum of 30 breeding pairs and 300 wolves must be maintained with an equitable ~~and uniform~~ distribution among the States of Wyoming, Idaho, and Montana. As of December ~~2006~~2007, there were ~~37~~36 documented wolf packs residing predominantly in Wyoming. ~~Fourteen~~ Eleven of these packs (including 10 breeding pairs) were present in YNP~~. As of December 2006,~~ and ~~23~~25 packs (including ~~15~~14 breeding pairs) were present outside YNP ~~and GTNP~~ (USFWS et. al. 200~~7~~8). Packs outside YNP include the ~~Teton, Gros Ventre, Washakie, Sunlight, Absaroka, Beartooth, Greybull River, East Fork, Pacific Creek, South Fork, Gooseberry, Carter Mtn, Rock Creek, Owl Creek, Cub Creek, Bliss Creek, Buffalo, Black Butte, Togwottee, Snake River, Huckleberry, Daniel, and Prospect~~Beartooth, Sunlight, Absaroka, Pahaska, South Fork, Greybull River, Gooseberry, East Fork, Washakie, Togwotee, Gros Ventre, Pacific Creek, Snake River, Huckleberry, Buffalo, Teton, Pinnacle Peak, Daniel, Green River, Black Butte, Soda Lake, Big Piney, La Barge, Prospect, and Kemmerer packs. Current numbers of packs within the Yellowstone population clearly indicate that this population has exceeded the criteria for delisting. It is clearly in the State's best interest for wolves to be delisted in a timely manner. The Department is the appropriate agency to assume management responsibility for wolves outside the National Parks and Parkway once delisting has occurred, and it is a role the Department wishes to assume.


Early 2006
NW Wyoming
Montana
Wyoming
Idaho
Number of Wolves and Packs in
Wyoming Summer 2006 Outside YNP
Legend
Wolf Management Unit - Trophy Game Classification
Officially Designated Wolf Packs With Home Ranges
New Wolf Packs, No Official Designation Until 12/31/06
Trophy Game Wilderness Areas
National Forests
Private & BLM
National Parks & Parkway
Wind River Reservation
10 5 0 10 Miles
Cody
Basin
Worland
Thermopolis
Jackson
Pinedale
Lander
1 Adult
2 Pups
2 Packs
3 Adults
3 + Pups
2 Adults
4 Pups
2 Adults
5 + Pups
4 Adults
+ Pups
State Highway 31
State Highway 351
State Highway 789
State Highway 136
State Highway 135

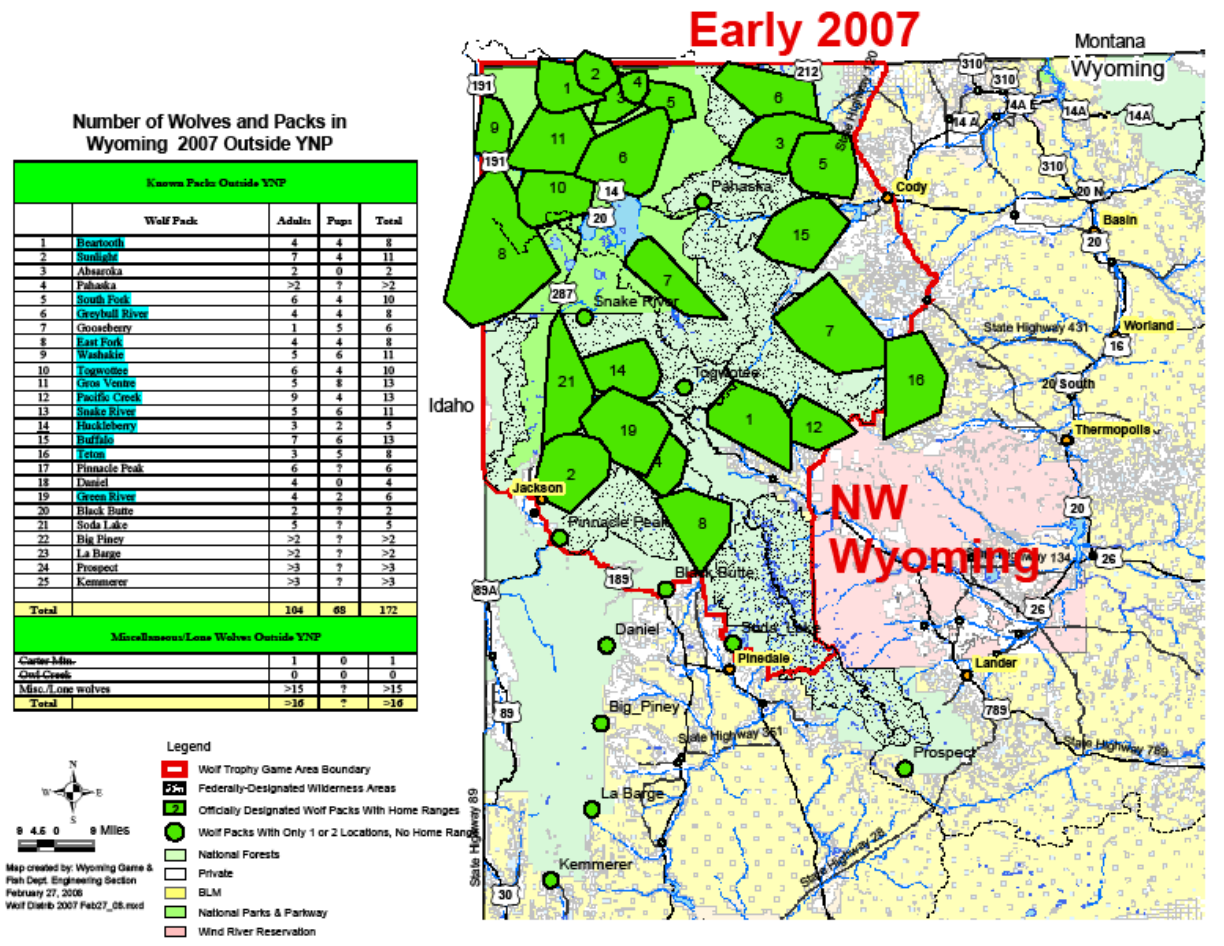


FIGURE 1. Trophy Game Area Boundary and Wolf Pack Territories in the Greater Yellowstone Area.

Wolves are of national interest, and the national public, not just the license-buying public of Wyoming, should share in the funding of wolf management. Supplemental funding will be sought through special Federal or State appropriations, public/private foundations, and other sources.

The success of any management program depends, at some level, upon successful coordination with other agencies and the public. A wolf management program for the State of Wyoming should be sufficiently similar to management programs for the States of Idaho and Montana to facilitate adequate management of the entire Greater Yellowstone wolf population. Although the dual status classification and the management actions it entails are unique to Wyoming, this plan will allow Wyoming, in conjunction with Idaho and Montana, to effectively manage a recovered Greater Yellowstone wolf population. Both Idaho and Montana have finalized their wolf management plans and the USFWS has approved them as adequate regulatory mechanisms for wolf conservation in those States. Appendix 1 illustrates the similarities and differences among the three State management plans.

WOLF LIFE HISTORY[1]

Physical Characteristics: The wolf is the largest member of the dog family *Canidae*. Pelt color can be highly variable ranging from white to black, with grizzled gray or black being most common in the northern Rocky Mountains (Gipson et al. 2002. Weight typically ranges from 80 to 90 pounds (36 to 41 kg) for females and 90 to 110 pounds (41 to 50 kg) for males. Height averages 26 to 32 inches (65 to 80 cm) at the shoulder, and length typically measures 4.5 to 6.5 feet (1.4 to 2.0 m) from nose to tail tip. Approximate track size is 4 inches wide by 5 inches long (9.5 by 12.1 cm), and can be difficult to differentiate from tracks of large domestic dogs.

Reproduction and Social Behavior: Wolves form family groups ~~referred to as~~ called packs. A pack consists of at least two individuals of the opposite sex that establish territories, breed and produce pups. For monitoring purposes, the USFWS defines "pack" as two adult wolves traveling together within a distinct territory (USFWS et al. 2008:212). Wolves are sexually mature at 22 months of age (Mech 1970). The dominant male and female in the pack (alpha pair) produce most of the young; however, 20-~~-~~40% of packs containing two or more adult females produce two litters/year (Mech 1991). In YNP, about 15% of the packs have had multiple litters (Smith et al. 2006). Breeding occurs during February or March, and pups are born after a 63-day gestation period in April or May. Litter sizes in Wyoming have averaged approximately five pups (USFWS 2002; Smith et al 2006). Pups remain at a den site for about 6 weeks until they are weaned. The pack then moves to rendezvous sites (home sites) until the pups are old enough to hunt with the pack (e.g., September, October). Once pups begin hunting, these rendezvous sites are no longer used and packs range throughout their territory.

Yearlings tend to leave the pack during fall to find a mate and develop a new territory and pack (Fritts and Mech 1981); however, some individuals stay with the pack longer. Pack territories are defended against other wolves. Territory location is advertised to other wolves through scent marking and howling. Territory size appears related to prey density (Ballard et al. 1987, Fuller 1989). Territory sizes of wolves recolonizing northwest Montana average 300-400 mi^2 (777 to 1,036 km^2). Territories of wolves in the GYA average over 200 mi^2 (535 km^2) and range from 50 to 550 mi^2 (Smith et al. 2006). Pack sizes typically range from 2 to 16 wolves, but it appears pack size may be related to size of prey species. For example, wolf packs in Minnesota that preyed primarily on white-tailed deer (*Odocoileus virginianus*) averaged 6.7 wolves (Fuller 1989), whereas wolf packs in Alaska averaged 11.2 wolves where moose (*Alces alces*) were the primary prey species (Peterson et al. 1984). The average size of the ~~23~~ 25 packs in Wyoming outside of YNP in ~~2006~~ 2007 was ~~6.7~~6.9 wolves (range ~~3~~2-13) and ~~10.5~~14.2 wolves (range 4-~~19~~22) for the ~~13~~ 11 packs inside YNP (USFWS et al ~~2007~~2008).

Population Growth: Wolves have a high reproductive potential and populations can sustain moderately high levels of mortality (Fuller 2003). Keith (1983) reported an average annual population increase of 29% from seven wolf populations in the United States and Canada. Three populations were exploited through a concentrated effort to reduce these populations using a variety of methods of take, while four were unexploited, but yielded similar rates of increase. Unexploited wolf populations may increase 28-35% annually. Wolves recolonizing northwest Montana increased an average of 22%~~/yr~~ per year since 1986 (Fritts et al. 1994). Since 1998, the wolf

[1]From USFWS 1994:Appendix 2, unless direct reference is provided.

population in the GYA has also increased an average of 22%~~/yr~~ per year (Figure 2). In unexploited populations, wolf density is ultimately limited by prey abundance (Fuller 1989).

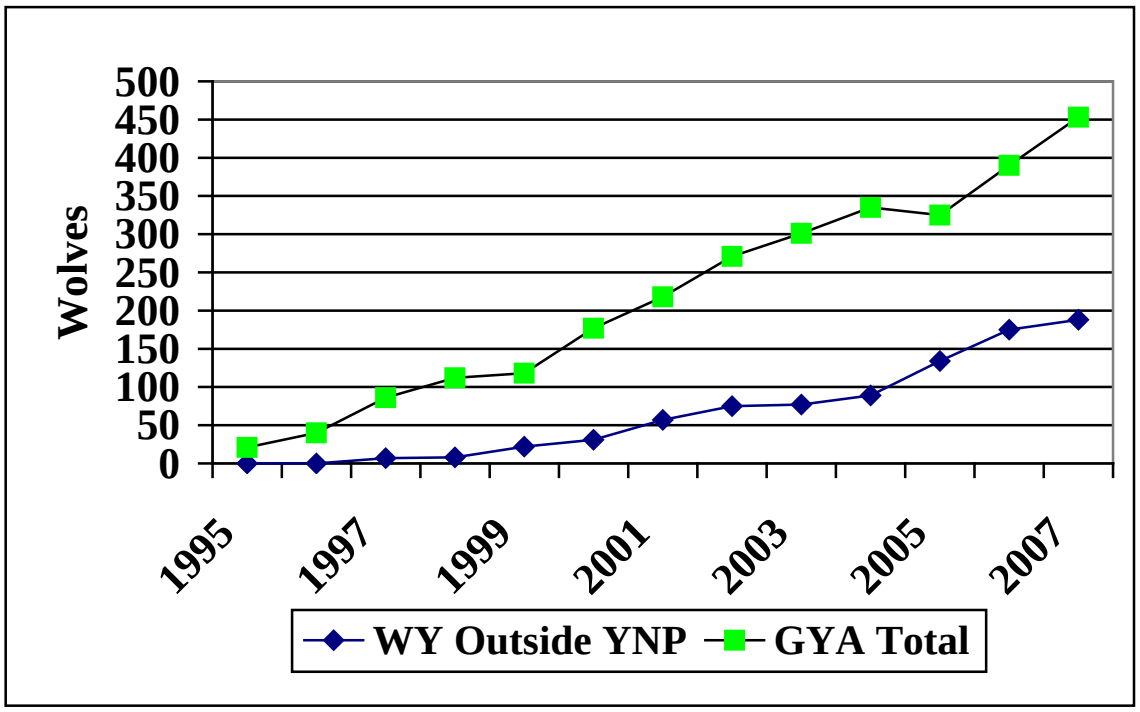


FIGURE 2. Wolf population size in Wyoming and GYA 1995-~~2006~~2007. All the statistics are in our interagency wolf report for ~~2006~~2007 on line at http://westerngraywolf.fws.gov.

Mortality Factors: In areas where human-caused mortality is low, disease, starvation, and killing by other wolves are the primary causes of wolf mortality. Mortality rates in unexploited wolf populations average 45% for yearlings and 10% for adults. However, human exploitation tends to be the highest form of mortality in most wolf populations. In northwest Montana and adjacent Canada, 77% of documented wolf mortalities were human-caused (33 of 44) (USFWS 1993). Since The USFWS began publishing annual reports in ~~1995~~1999 (through 2007), ~~53%~~ 73% of documented wolf mortalities in the GYA have been human-caused ~~(Smith and Guernsey 2002)~~. Of the documented ~~95~~572 ~~total~~ wolf mortalities in ~~the GYA since 1995, 27~~ 116 were natural mortalities, ~~12 were from vehicle collisions, 27~~ 344 were from control actions for livestock depredations, ~~7 were illegally taken, 3~~ 73 were other human-caused (including vehicle collisions, research-related mortalities, and illegal shootings), and ~~19~~ 39 were from unknown causes. During this period, annual mortality rates ranged from 7-24% and averaged 17%. Annual mortality rates of 30 to 40% may suppress wolf population growth (Keith 1983, Ballard et al. 1987, Fuller 1989).

Feeding Habits: Wolves are highly efficient predators that feed primarily on large ungulates, although beaver (*Castor canadensis*) and other small mammals also may be utilized at certain times of the year. Prey preference appears related to prey size and availability. Order of preference by wolves tends to be deer (*O.* spp.), elk (*Cervus elaphus*), and bighorn sheep (*Ovis canadensis*) where they coexist, and wolves tend to select elk over moose, and bison (*Bison bison*) (Singer 1991).

Based on preference and prey availability in the GYA, wolves reintroduced into YNP were expected to select elk most often followed by mule deer (*O. hemionus*) and bison (Singer 1991). Recent studies of wolf-prey relationships in and adjacent to YNP have documented >85% of wolf kills to be elk, followed by bison, moose, deer, and pronghorn (*Antilocapra americana*) (Smith et al. 2006, Smith et al. 2002, USFWS 2002, Jaffe 2001, Mech et al. 2001).

Wolves are largely opportunistic, generally taking young-of-the-year and old animals (Peterson et al. 1984, Fuller 1989, Boyd et al. 1994). However, wolves also are known to feed on prime age animals when prey becomes scarce (Potvin et al. 1988). Wolf consumption rates can vary from 6 to 14 pounds/wolf/day (2.7-6.4 kg/wolf/day; Boyce and Gaillard 1992). Singer (1991) speculated that each wolf on the northern range of the GYA would consume an average of 9.9 elk, 2.4 mule deer, 0.2 each of bison, moose, and pronghorns, and 0.03 bighorn sheep annually based on preference of prey and availability. At the 2006 population level, wolves in Wyoming would consume an estimated 3,079 elk, 746 mule deer, and 62 each of bison, moose and pronghorn antelope. Smith et al. (2004) documented a kill rate of 1.9 ~~kills~~ungulates/wolf/month during ~~winter months (~~November – March~~)~~ in YNP (1995 – 2000), kills were 90% elk. Anticipated impacts of wolf predation on ungulate populations in the GYA indicated population reductions of 5-20% for elk, 3-19% for deer, up to 15% for bison, and up to 7% for moose may occur once the wolf population ~~i~~was at the recovery level. Impacts on other ungulate populations ~~are~~ were expected to be minimal (Boyce and Gaillard 1992). By the end of 2001, there were 218 wolves in the GYA recovery area and by 200~~6~~7 the population had increased to an estimated ~~390~~453 wolves. There has been a much greater decline in calf:cow elk ratios in herd units adjacent to YNP in Wyoming by comparison to other elk herds in the State. Although the extended drought and other environmental factors may be contributing ~~to these declining ratios~~factors, undoubtedly wolf predation is responsible for a portion of this decline. More research on wolf/wildlife interaction is needed to better quantify the effects wolves have on their prey. Ungulate monitoring efforts will be enhanced in those areas with established wolf packs until the effects of wolf predation are better understood.

Livestock Depredation: In the western United States, wolves gained a notorious reputation as livestock killers by the early 1900s, as livestock replaced native ungulates on western rangelands. The impact of wolf predation on livestock during this time contributed to the extermination of the gray wolf from the western United States (Young and Goldman 1944). From 1897-1907 bounties were paid on 20,819 wolves in Wyoming alone [Seton 1929:261; coyotes (*Canis latrans*) were likely mistaken for wolves in some cases]. Wolf depredation on livestock undoubtedly intensified due to the depletion of natural prey and expanding livestock presence.

While livestock losses to wolves are minimal industry-wide, losses to individual operators can be significant (Fritts et al. 1992, Mack et al. 1992). Wolf depredation rates on cattle were 0.12, 0.37, and 0.87/1000 available in Minnesota, British Columbia, and Alberta, respectively (Mack et al. 1992). Wolves accounted for 31% of the documented domestic calf mortalities on an allotment in Idaho during 1999 and 2000 (Oakleaf et al. 2003). Depredation rates on sheep were 2.37 and 0.54/1,000 available in Minnesota and British Columbia, and annual losses to wolves averaged 33 sheep/year in Alberta (number of sheep available to wolves in Alberta was not documented; Mack et al. 1992). A recovered wolf population in the GYA was expected to account for an average of 19 cattle (range: 1-32) and 68 sheep (range: 17-110) depredations annually (USFWS 1994). In ~~2006~~2007, 1~~23~~ 79 cattle, ~~38~~ 35 sheep, and ~~0~~ 3 dogs were confirmed killed by wolves in the GYA;

confirmed losses in Wyoming consisted of ~~23~~ 55 cattle, 16 sheep, and 2 dogs (Table 1). Control actions included lethally removing ~~44~~ 63 wolves in ~~2006~~Wyoming. Control of offending wolves, improved livestock management practices (e.g., carcass management, fencing, etc.), compensation for losses, and communication with the public have been suggested as means to enhance wolf recovery where wolf-livestock conflicts exist (Fritts et al. 1992, Mack et al. 1992, Niemeyer et al. 1994, Bangs et al. 2006).

TABLE 1. Confirmed wolf-caused livestock/dog depredations in Wyoming and GYA 1999 – ~~2006~~ 2007 (USFWS ~~2007~~2008).

YEAR	SHEEP		CATTLE		~~HORSES~~OTHER LIVESTOCK*		DOGS	
	Wyoming	GYA	Wyoming	GYA	Wyoming	GYA	Wyoming	GYA
1999	0	13	2	4	1	1	6	7
2000	25	39	3	7	0	0	6	8
2001	34	117	18	22	0	0	2	4
2002	0	71	23	33	0	0	0	1
2003	7	90	34	45	~~0~~10	~~0~~10	0	0
2004	17	99	75	100	2	4	2	6
2005	27	53	54	61	0	0	1	2
2006	38	41	123	135	1	1	0	0
2007	16	35	55	79	0	13	2	3
Totals	164	558	387	486	14	29	19	31

* includes horses, llamas, mules, donkeys, goats

ISSUES AND STRATEGIES

LEGAL STATUS

The ESA provided protection for wolves in Wyoming, Montana, Minnesota, Arizona, and New Mexico beginning in 1974. A wolf recovery team for the northern Rocky Mountains, consisting of individuals from Federal and State agencies and conservation groups, also was appointed in 1974. The recovery team was assigned development of the Northern Rocky Mountain Wolf Recovery Plan. A draft of this plan was completed in 1980 (USFWS 1980) and subsequently reviewed by government agencies, livestock and environmental groups, and wolf experts. Following review and revision, the Northern Rocky Mountain Wolf Recovery Plan was approved in 1987 (USFWS 1987). The Recovery Plan called for natural migration of wolves into central Idaho and northwest Montana from existing packs in Canada, but recommended reintroduction of wolves into the GYA due to geographical isolation and the low probability of natural establishment.

During this process, recovery areas in northwest Montana, central Idaho, and the GYA were identified (Appendix I; USFWS 1987:23). The following criteria were used to select the three recovery areas: presence of an adequate year-round prey base; at least 3,000 mi^2 (7,770 km^2) of contiguous wilderness, national parks, and adjacent public lands; a maximum of 10% private land;

the absence, if possible, of livestock grazing; and isolation from populated and heavily used recreation areas allowing protection of 10 breeding pairs of wolves from human disturbance (USFWS 1987).

Wolves were reintroduced into YNP and central Idaho in 1995 and 1996 as nonessential, experimental populations under Section 10j of the ESA (Bangs and Fritts 1996). Section 10j provides much more management flexibility than the strict "threatened" or "endangered" classification. In populations designated as nonessential experimental, only those wolves within national parks or preserves receive the fully protected, endangered status (ESA, Section 7). Wolves in northwest Montana are present due to natural emigration from the Canadian population to the north, thus are classified as endangered.

Prior to 2003, the gray wolf was classified by W.S. 23-1-101(a)(viii) as a predatory animal. This classification was changed in the 2003 legislative session, and again in the 2007 legislative session to a dual status of "trophy game animal" or "predatory animal" depending on the location of a pack or individuals. ~~From the date gray wolves are delisted, they will be~~ Wyoming Statute and Commission regulation classif~~ied~~y gray wolves as trophy game animals in that portion of northwestern Wyoming depicted in Figure 1. Wolves located outside ~~these~~ this area~~s~~ ~~will be~~ are classified as predatory animals.

POPULATION MANAGEMENT

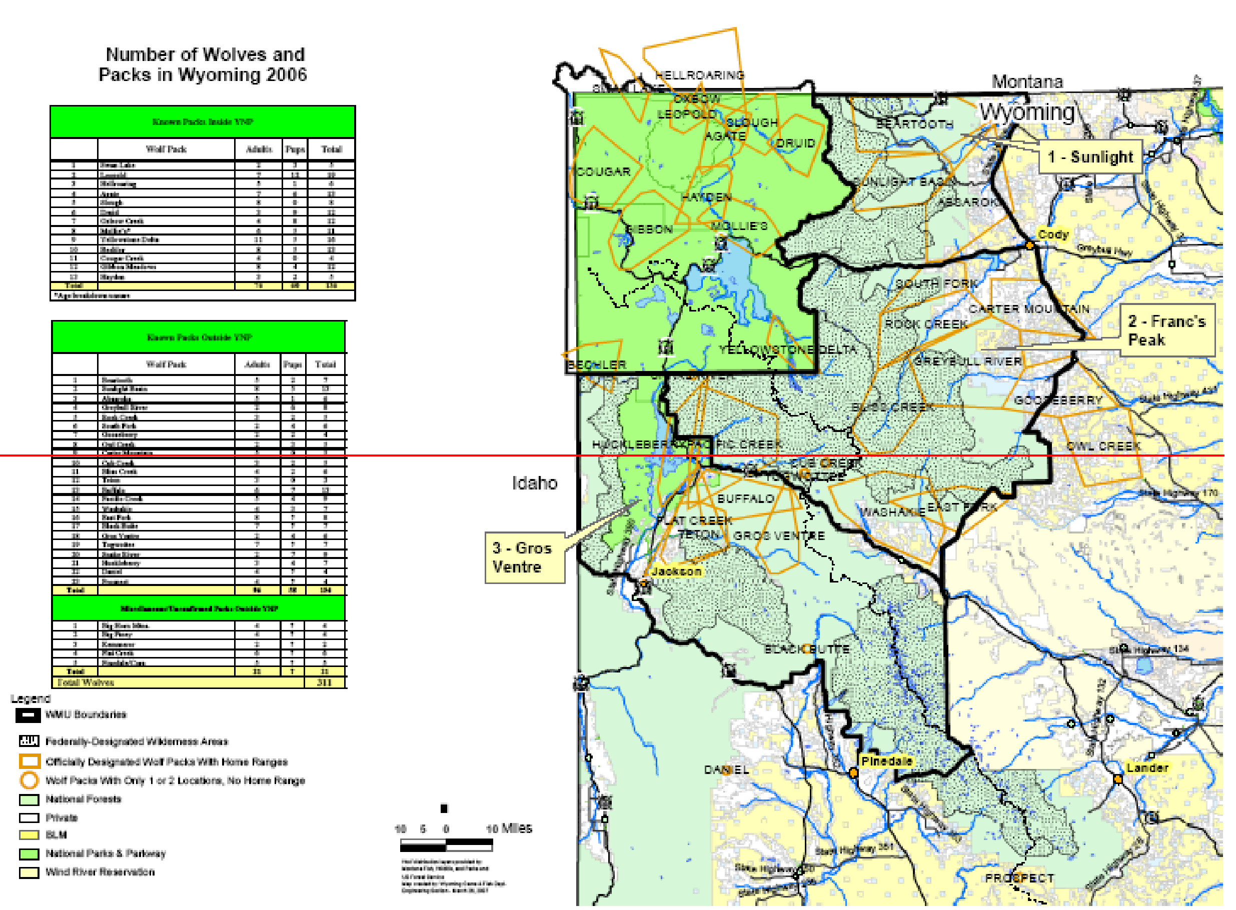
~~Population Objectives: According to W.S. 23-1-304 and interpretation of said statute by the Wyoming Attorney Generals Office, u~~Upon delisting, Wyoming will maintain a minimum of 15 breeding pairs consisting of at least 150 wolves within the State including YNP, GTNP, the Parkway, the NER, and adjacent portions of northwestern Wyoming (the WTGMA). At least ~~S~~seven of ~~the~~ those 15 breeding pairs will be maintained in northwestern Wyoming but outside YNP, GTNP, and the Parkway. ~~Since the Commission does not have the legal authority to actively manage wolves within the National Parks, its management emphasis will be applied to maintaining seven breeding pairs that inhabit primarily areas outside the Parks~~ If the Commission determines there are less than eight (8) breeding pairs inside the National Parks for 2 consecutive years, the Department shall manage for a sufficient number of breeding pairs and wolves in the area of the WTGMA located outside of the National Parks to assure at least 15 breeding pairs consisting of at least 150 wolves are maintained within the WTGMA. Additionally, the Commission does not have any authority to manage wildlife within the boundaries of the WRIR, except on fee title (private) lands and any wolf breeding pairs that might become established on the reservation would not reduce Wyoming's commitment to maintain at least seven breeding pairs outside the National Parks in northwestern Wyoming. As such, this plan will have no bearing on any potential breeding pair establishment within the Reservation. However, the Department will continue to coordinate with appropriate authorities on the WRIR to assure that wolf management objectives can be mutually agreeable to both the State and the Tribes.

Under W.S. 23-1-101(a), the Commission has the ability to establish regulations pertaining to wolf management in areas where wolves are classified as trophy game animals. Regulations will

be drafted which will provide for regulated public take in these areas when the wolf population is sufficient to sustain harvest.

The ~~Trophy Game Area depicted in Figures 1 and 3 will be the~~ Northwest Wyoming Wolf Data Analysis Unit (DAU) is the portion of the WTGMA outside YNP and ~~will~~ consists of three Wolf Management Units (WMUs) depicted in Figure 3. Breeding pair objectives (>7) will be set at the DAU level, while the WMUs will be used to primarily regulate public take. The Department uses this approach to manage all other species of big game and trophy game animals. The DAU is used to manage a population of animals, while Hunt Areas or WMUs are used to manage specific harvest objectives for a population. ~~Formulation of b~~Both the DAU and Hunt Areas (WMUs) ~~are done~~ were delineated irrespective of land status. Any wolves that occupy areas outside ~~this DAU~~ the WTGMA will be classified as predatory animals, and public take will not be ~~subject to management under any Commission~~ restricted by Commission regulation~~s~~ other than the requirement to report any wolf that is killed within 10 days. However, the Department will collect appropriate management data on wolves statewide. Wolf packs that occupy the DAU will be actively managed and public take will be regulated under appropriate State statutes and Commission regulations to assure ~~that~~ at least seven (7) breeding pairs occupy this DAU and at least fifteen (15) breedng pairs consisting of at least 150 wolves occupy the WTGMA.

The size of the DAU was selected based on several criteria. It provides an area of sufficient ~~in~~ size to ~~ensure adequate regulatory mechanisms are in place to~~ maintain at least seven wolf breeding pairs outside the National Parks and the Parkway, and additional breeding pairs if the number of breeding pairs in YNP should decline to less than 8. The DAU is large enough to encompass seasonal movements of most of the current wolf packs and their prey. The amount of data that is available from radio-collared individuals is marginal for most packs and does not exist for some other packs. As such, the area within this DAU should provide suitable habitat to account for any unknown movement patterns that might exist for some packs. There ~~are~~ is currently ~~suitable numbers of associated~~ a sufficient ungulate prey ~~species~~base to support more than seven breeding pairs of wolves in the DAU (at least 14 breeding pairs were present in 2006 and 2007). The Wyoming Range and the lower end of the Wind River Range were excluded from the DAU because of the high potential for persistent conflicts due to existing numbers of domestic sheep that are grazed on both public and private lands in these areas. Several individual ~~and pairs of~~ wolves and packs have attempted to use the lower portion of the Wyoming Range in the last few years. Almost all of them have been removed from the population due to livestock depredations. The WRIR was excluded because the Department does not have any statutory authority to manage wildlife on Tribal lands. However, efforts to work with WRIR Tribal authorities to coordinate wolf management efforts will continue. The size of the proposed DAU also allows for some flexibility in where the seven breeding pairs will be maintained, in the event pack densities need to be reduced in one area to minimize wildlife or livestock conflicts in exchange for a replacement 7th breeding pair in a less densely occupied area within the DAU.



Number of Wolves and Packs in Wyoming 2006
Known Packs Inside YNP
Wolf Pack
Adults
Pups
Total
Known Packs Outside YNP
Miscellaneous/Unconfirmed Packs Outside YNP
Total Wolves
311
Legend
WMU Boundaries
Federally-Designated Wilderness Areas
Officially Designated Wolf Packs With Home Ranges
Wolf Packs With Only 1 or 2 Locations, No Home Range
National Forests
Private
BLM
National Parks & Parkway
Wind River Reservation
10 5 0 10 Miles
Montana
Wyoming
Idaho
HELLROARING
OXBOW
LEOPOLD
SLOUGH
AGATE
DRUID
BEARTOOTH
COUGAR
SUNLIGHT BASIN
ABSAROKA
HAYDEN
GIBBON
MOLLIE'S
SOUTH FORK
ROCK CREEK
CARTER MOUNTAIN
YELLOWSTONE DELTA
BECHLER
GREYBULL RIVER
BLISS CREEK
GOOSEBERRY
HUCKLEBERRY
PACIFIC CREEK
OWL CREEK
BUFFALO
WASHAKIE
EAST FORK
FLAT CREEK
TETON
GROS VENTRE
BLACK BUTTE
DANIEL
PROSPECT
1 - Sunlight
2 - Franc's Peak
3 - Gros Ventre
Cody
Jackson
Pinedale
Lander

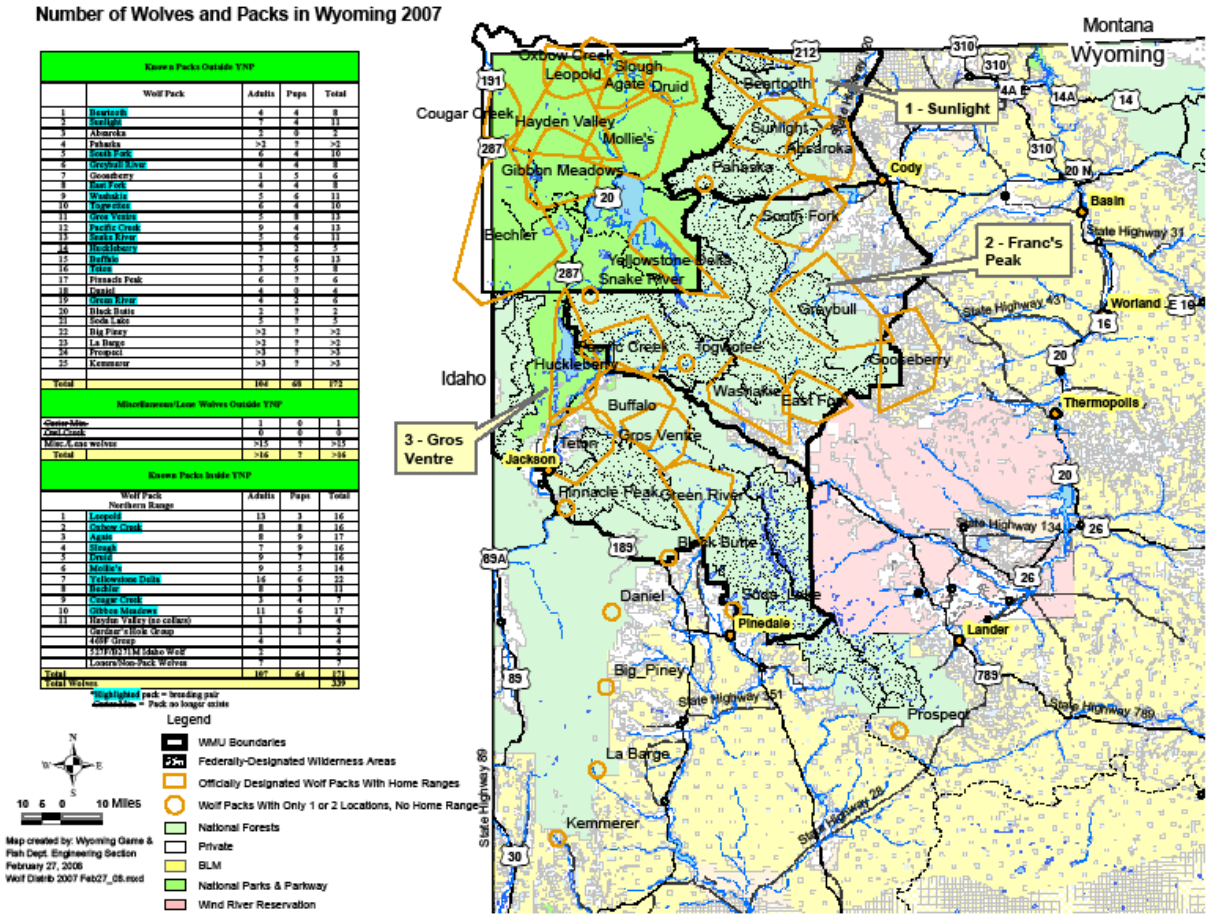


FIGURE 3. Northwest Wyoming Wolf DAU and WMUs.

Population Monitoring: ~~Initially w~~When wolves are ~~removed from Federal protection under the ESA~~delisted and placed under state management, it will be necessary for the Department to monitor the number of breeding pairs residing in Wyoming, regardless of legal classification, and document their distribution, reproduction, and mortality. The Department will be responsible for monitoring these parameters in all occupied habitat outside YNP, GTNP, the Parkway, the NER, and the WRIR. The National Park Service will monitor wolves inside YNP (D. Smith pers. comm.) and GTNP (S. Cain pers. comm.), and USFWS will monitor wolves on the NER (B. Smith pers. comm.). The agencies have ~~already~~ agreed to share information regarding the status of wolves in Wyoming. The Department recognizes the efforts and commitment these agencies have made toward the wolf recovery program, and urges continued Federal funding at or above current levels, so their wolf programs can continue after wolves are delisted. To ensure at least seven breeding pairs are maintained as described above, the Department will prioritize data collection to determine population status within the DAU. Wolves outside that area will remain classified as predatory animals. Consequently, the Department will use less intensive techniques for monitoring these wolves. The Department will use a variety of techniques including standard and GPS radio-telemetry monitoring to document wolf abundance, distribution, and pack breeding success,

and it will coordinate with other State and Federal agencies to assure similar data is being collected so the population's status can be assessed.

~~The USFWS~~ Wyoming has ~~proposed to modify the monitoring criteria~~ adopted the U.S. Fish and Wildlife Service's definition ~~regarding~~ of what constitutes a successfully reproducing pack [breeding pair] of wolves. The current criterion defines a breeding pair as an adult male and an adult female successfully rearing at least two pups through December 31. ~~The proposal being evaluated would change the definition of a breeding pair to maintenance of a certain number of individuals. Current estimates of the number of individual wolves in a pack in mid-winter correlate to successful reproduction of the alpha pair (i.e., "breeding pair") so that each wolf pack containing four or more individuals but of unknown composition contributes some proportion towards the overall estimated number of breeding pairs in each State (Mitchell et al. submitted). If this new procedure to estimate breeding pairs were adopted, it could greatly reduce the effort needed to determine pack composition and would still provide accurate estimates of wolf breeding pairs but would allow for less expensive and intensive wolf monitoring. The USFWS has not implemented these new criteria and probably will not establish them by the time this plan is completed, but they will be useful in the future. The Department will use the current definition of a breeding pair, which is an adult male and an adult female successfully rearing at least two pups through December 31, to measure wolf status in Wyoming.~~

Wolf populations in Wyoming will be monitored using whatever techniques are applicable with primary emphasis on extensive radio-collaring (including using GPS technology where appropriate), monitoring of those radio-collared individuals and intensive surveys during the winter and denning periods when wolves are most visible. The monitoring program will emphasize existing protocols and techniques ~~that~~ employed by the USFWS and YNP ~~have employed~~, which have permitted adequate documentation of population status to assess whether recovery criteria have been met.

Both aerial and ground surveys will be employed in the spring during denning when pups are more visible to aid in assessing successful reproduction for all packs. If appropriate individuals are radio-collared, the ability to determine alpha male and female and pup survivorship through the remainder of the year will be greatly enhanced. By monitoring pack numbers, distribution, breeding success, and mortality, population trends can be tracked over time~~,~~ and appropriate management actions can be implemented to maintain at least seven breeding pairs outside the National Parks and Parkway and at least 15 breeding pairs consisting of at least 150 wolves throughout the WTGMA.

Upon delisting, wolves with active radio-collars will continue to be monitored. Radio-collars also may be deployed in depredation situations. Emphasis will be placed on deployment of radio-collars in packs without any radioed animals. Several techniques, from aerial tranquilizing to trapping, will be used to collar individuals. Personnel from YNP have demonstrated that the use of helicopters during the winter when packs are more visible and accessible can increase the number of wolves that are collared over a shorter time frame, which greatly reduces the personnel time required when using traditional trapping techniques. This situation may or may not be applicable in Wyoming depending on the location of specific packs during the winter months. The Department will not be able to use this technique if packs are within wilderness areas because of Federal restrictions for landing helicopters in these areas. Trapping also will be used to ensure ~~that~~ the number and

distribution of collars is sufficient to allow the Department to adequately monitor wolf packs. Radio-telemetry data will be very useful in documenting the number of packs present, reproduction, distribution, and movements following delisting.

In addition to radio-telemetry monitoring, emphasis will be placed on non-invasive techniques such as winter track counts, aerial surveys during denning periods, hair sampling, howling surveys, and observations by field personnel for basic survey and inventory data collection.

During periods of snow cover, aerial and ground track counts may be used to document wolf presence or absence. Track counts also may be used to estimate pack size, but they must be done repeatedly to provide accurate information, as wolves will step in each other's tracks while traveling in groups. Currently, the ~~Department~~ WGFD conducts winter ground track surveys for lynx (*Lynx canadensis*), pine marten (*Martes americana*), and wolverine (*Gulo gulo*) using snowmobiles. Some of these routes may be utilized in areas known to have wolves. Separate routes specifically intended for wolf surveys may be established within pack territories as they become known. New developments in aerial track surveys for population estimation may provide another non-invasive and cost-effective monitoring technique. If this new technique is applicable, it will be used when appropriate.

Hair samples from wolves can be ~~obtained from~~collected by setting up rubbing posts or hair capture corrals. Hair can be analyzed and wolf presence can be documented. Genetic profiling may be done from hair, blood, or tissue samples, in which maternity, paternity, dispersal, or overall genetic diversity can be analyzed. A reservoir of genetic samples obtained from wolves in Montana, central Idaho, Wyoming, and an adjacent Canadian source population already exists. Genetic samples will be added to this library as samples become available.

In the late spring and summer months, howling surveys at rendezvous sites can help biologists determine whether a pack is raising pups. Pup vocalizations can easily be distinguished from that of an adult. Although a precise count is usually not possible, wolf responses can indicate relative pack size. Since packs react to artificial howls differently, howling surveys may not work in all cases.

Field ~~Observation~~ reports have been very useful to the Federal recovery program. Numerous observations of wolves or sign in an area have led to the discovery of new packs. Observation reports may also confirm pack persistence. The Department will incorporate wolf sightings into its current Wildlife Observation System. Information also will be solicited from the public, and used in any long-term monitoring program. ~~Additionally, the Department will establish public working groups consisting of volunteers from different interest groups across the occupied range of wolves to assist with appropriate data collection.~~

Each monitoring protocol has ~~its own~~ advantages and disadvantages. While no single method will be suited to all packs, the Department will consider all methods, including new methods as they are developed. Corroborating evidence will be gathered using multiple methods, but specific protocols will be tailored to the pack, setting, and appropriate season for collecting that type of data. This will facilitate a balance between monitoring responsibilities, information needs, cost effectiveness, and scientific rigor.

Wolf Mortality: Disease, starvation, and intraspecific strife are some of the primary causes of wolf mortality in unexploited populations. Average annual mortality rates in unexploited populations are 45% for yearlings, and 10% for adults (USFWS 1994). However, human-caused mortality is a major factor in most wolf populations. Human-caused mortality includes legal and illegal harvest, agency control, ~~and~~ vehicle accidents, and research-related mortalities such as capture myopathy. Managing human-caused mortality will be an important component to Wyoming's wolf management. Total ~~A~~annual mortality rates of 30-40% may suppress wolf population growth (Keith 1983, Ballard et al. 1987, Fuller 1989). All forms of wolf mortality will be considered when making management decisions.

Analysis of radio-telemetry data from wolves in Montana, Idaho, and Wyoming from the mid-1980s through 2004 indicate that about 26% of the adult-sized wolves die each year. Human-caused mortality is the major cause of wolf death. Estimates indicate that agency control and illegal killing each remove about 10% of the adult-sized wolves annually. In addition, another 3% of the radio-collared wolves were accidentally killed each year through vehicle collisions, incidental trapping, and other human activities. About 3% of the wolf population dies from natural causes such as disease, territorial strife, accidents, or being killed while attacking prey (Smith et al. 2006).

Since the Department will be required to monitor the status of wolves Statewide while they are under the initial dual status protocol, it will be imperative that the Department be promptly notified of all forms of public take, regardless of location and legal status of wolves. There will be differ~~ent~~ing timeframes for public reporting of take but the Department must have specific biological information from wolves taken by the public to accurately assess population status and to assure that recovery criteria are met.

Legal Wolf Mortality: Upon delisting, legal wolf mortality will result from such things as agency removals, public take ~~(i.e., hunting and trapping)~~, or ~~in~~ defense of life or private property. The Department or its authorized agent may lethally remove wolves, when deemed necessary, to mitigate wolf conflicts with wildlife, livestock, or humans (see "Nuisance Wolf Management" section of this plan). Taking wolves in areas where they are designated as predatory animal also will be legal.

~~After the wolf is reclassified under State statute following delisting, i~~In areas where ~~they~~ wolves are classified as a trophy game animal, the Commission will actively manage the take of gray wolves by the public under existing State statutes and Commission regulations. ~~W.S. 23-3-115~~ Chapter 21, Section 7(a) will allow a property ~~land~~owner ~~or their agent~~ to ~~legally~~ immediately take a wolf ~~in the act of~~ doing damag~~ing~~e to private property~~. Other species included in this statute are black bears, mountain lions, and bobcats.~~ Chapter 21, Section 3(b) defines "doing damage to private property" as "the actual biting, wounding, grasping, or killing of livestock or domesticated animal, or chasing, molesting, or harassing by gray wolves that would indicate to a reasonable person that such biting, wounding, grasping, or killing of domesticated animals is likely to occur at any moment." "Owner" means "the owner, lessee, immediate family, employee, or other person who is charged by the owner with the care or management of livestock or domesticated animals." Wolves taken under authority of this regulation shall be reported to a Department representative within 72 hours. The

person reporting shall include the date the animal was killed, its location (identified by the section, township and range, or UTM coordinates), and the name and address of the person taking the gray wolf. The carcass of the gray wolf shall not be removed form the site of kill and the area around the carcass shall not be disturbed until investigated by the Department.

Additionally, the Department ~~also~~ may issue ~~special~~ "~~kill~~ lethal take permits" ~~to~~ authorizing property owners to take not more than 2 gray wolves in areas experiencing chronic wolf ~~conflicts~~depredation within the WTGMA (Chapter 21, Section 8). Chapter 21, Section 3(a) defines "chronic wolf depredation" as "a geographic area limited to a specific parcel of private land or a specific grazing allotment described on the permit within the Wolf Trophy Game Management Area where gray wolves have repeatedly (twice or more within a two-month period immediately preceding the date on which the owner applies for a lethal take permit) harassed, injured, maimed or killed livestock or domesticated animals." Wolves taken under the authority of a lethal take permit shall be reported to the Department representative specified on the permit within 24 hours. Lethal take permits shall expire on December 31 of the year issued. However, lethal take permits shall be immediately suspended or cancelled if the Department determines further lethal control may result in the number of wolves in the WTGMA decreasing below 15 breeding pairs or 150 wolves, or below 7 breeding pairs outside the national parks and parkway. In addition, lethal take permits shall be immediately suspended or cancelled if the Department determines further lethal control may result in the relisting of gray wolves under the Endangered Species Act. In either of these circumstances, non-lethal control actions shall be initiated to mitigate continued harassment, injury, maiming or killing of livestock or domesticated animals.

~~Within the area where the Commission has classified wolves as trophy game animals, wolves taken damaging property shall be reported within 72 hours.~~ The ~~taking of~~ legal harvest of any wolf classified as ~~either~~ a trophy game animal ~~or predatory animal for any reason other than damaging property~~ by a licensed person shall be reported within 24 hours. Within ~~10~~5 days, ~~. The person reporting shall present~~ the unfrozen pelt and skull shall be presented to a Department employee during business hours for examination. Per W.S. 23-1-102(a)(vii) "take" is defined as hunt, pursue, catch, capture, shoot, fish, seine, trap, kill, or possess. The terms harvest and hunt are considered synonymous, therefore included in the State statutory definition of take.

Unregulated Public Take: In areas of Wyoming where the wolf is classified as a predatory animal, take will not be regulated. However, persons who take a wolf in areas of the State where they are classified as predatory animals will be required to notify the Department within 10 days of taking a wolf. The~~y~~ person will be required to ~~present an unfrozen pelt and skull to a Department employee so that biological information can be collected from the animal~~ report the name and address of the person taking the gray wolf, date the wolf was killed, the sex of the wolf, and the site of kill (identified by~~. They also will be required to furnish the Department, to the extent possible, with the location of the take including,~~ the section, range and township, or UTM coordinates). The Department may also seek the person's cooperation in obtaining any additional information relevant to wolf management, as warranted.

Regulated Public Take: Regulated public take ~~(i.e., hunting and trapping)~~ will be used for wolf population management in areas where wolves are classified as trophy game animal. ~~Hunting and trapping r~~Regulations will be implemented through the same rule-making process used for other

trophy game animals in Wyoming, including public input. The Department may use a variety of harvest regimes to manage for at least (7) breeding pairs of wolves outside the National Parks and Parkway and at least fifteen (15) breeding pairs consisting of at least 150 wolves within the WTGMA. Harvest quotas may be established at the appropriate time. Seasons will be closed when the mortality quota ~~has been~~ is reached or if the Commission deems it necessary to limit take in additional areas that are designated for trophy game animal protection. As with mountain lions and black bears, license sales will not be restricted (general license), unless limited quota harvest regimes are utilized. Under a limited quota scenario the number of hunters would be limited to assure that harvest objectives are met. Wolf mortality quotas will be based on desired pack densities for each WMU and total numbers of packs at the DAU level.

All management recommendations for wolves will be formulated with input from the public. At the appropriate time, Department personnel will propose management options that will be reviewed internally within the Wildlife Division. Once the recommendations have been approved ~~at this level~~, they will be taken to the public, in accordance with the Administrative Procedure Act, for comment. Public comments will be summarized and presented to the Commission, along with the Department's recommendations for final approval.

Management objectives will be based on population status at the time wolves are delisted. It is not prudent to formulate management recommendations, such as legal harvest objectives, at this time using current information. The Department will begin formulating final management recommendations ~~during the time between approval of the State wolf management plan and final delisting~~when wolves are legally delisted and the states have assumed management jurisdiction.

Currently it is unlawful to take trophy game animals by trapping in Wyoming. Upon delisting, trapping of gray wolves classified as trophy game animals ~~will~~ may become legal as set forth by W.S. 23-2-303(d). The Department will enact regulations setting forth the specifications for traps and snares used for the taking of gray wolves.

Where wolves are classified as trophy game animals, mandatory reporting criteria will be implemented. Within ~~10 days~~ 24 hours of taking a wolf, the licensee shall report the wolf to a Department representative. Within 5 days, the person shall present the pelt and skull to a Department employee during business hours for examination and reporting. The pelt and skull shall be presented in unfrozen condition in order to allow for collection of necessary biological information. The licensee also shall furnish to the Department, at the time of reporting, the location~~, to the extent possible,~~ of the site of harvest to include section, township and range, or UTM coordinates.

Illegal Wolf Mortality: Wolves taken outside the framework established by State statute and Commission regulations in areas where they are classified as trophy game animal will be considered taken illegally and will be investigated by Department law enforcement personnel.

Incidental Mortality: Occasionally ~~wolf mortalities may occur~~ wolves are killed accidentally (i.e., capture myopathy, vehicle accidents, or from legally trapping other species). These types of mortalities are not expected to occur often and will likely have little effect on wolf populations. The Department will formulate criteria to address which types of mortality will count against the quotas.

~~However, all incidental mortalities must be reported to the Department within 10 days.~~ We will encourage other agencies and the public to report incidental mortalities within a reasonable timeframe. Prompt notification by the public will aid the Department in collecting important information from these types of mortalities.

Research: When funding is available, research conducted by the Department will focus on obtaining information that will help meet wolf management objectives, address wolf/ungulate concerns, improve survey techniques, and manage wolf-related conflicts. Priority will be placed on improving techniques to assess population status. Additional information obtained from future research should investigate wolf habitat use patterns, prey ~~species composition~~ selection and consumption rates, pack and territory sizes, age and rate of dispersal, population growth rate, and mortality factors. Research on wolf/wildlife interactions will be focused in areas of the State where wildlife may be most impacted by wolf predation, such as elk feedgrounds and crucial wintering areas for ungulates. The Department will promote these information needs primarily to non-Department ~~wolf~~ researchers.

Currently, the Department is a cooperating agency with the USFWS in an ongoing research project involving the elk feedgrounds in the Gros Ventre drainage of western Wyoming (Jimenez 2003-2006. Goals of this research include documenting wolf depredation rates, consumption rates, and wolf/elk interactions including elk movements and displacement. Information gained will be used to manage elk and wolves in this area. The USFWS also is cooperating with the Department, University of Wyoming, and others on several other research projects to investigate what role wolf predation may play in the population dynamics of elk populations east of YNP and moose populations in the Jackson, Wyoming, area.

Genetics/Connectivity: Connectivity implies that wolves in each of the three States are functionally connected through emigration and immigration events, resulting in the exchange of genetic material between sub-populations. This functional relationship is consistent with the biological intent of the recovery plan and is an underlying prerequisite for successful wolf recovery in the northern Rockies.

Designation of habitat linkage zones or migration corridors is impractical for a habitat generalist and highly mobile species like the gray wolf. Outside refuges such as national parks, legal protection across broad landscapes and public education will facilitate those functional connections ~~across the region~~ (Forbes and Boyd 1997). YNP, GTNP, and Glacier National Park function as refugia at opposite ends of the geographic extent of wolf distribution in the northern Rockies. The network of public lands in western Montana, central Idaho, and northwest Wyoming facilitates connectivity between the sub-populations. The legal protections and public outreach described in this plan will help ensure the integrity of wolf movement between these two refuges. No specific linkage corridors are ~~proposed~~ needed in Wyoming, because all suitable wolf habitat occurs as one contiguous block in NW Wyoming.

Sufficient dispersal and exchange of wolves between the three sub-populations will ~~be necessary to maintain~~ assure genetic variation is maintained in the northern Rocky Mountain wolf population. In isolation, ~~none of~~ the ~~three~~ recovered sub-populations ~~could~~ may not maintain ~~its~~ sufficient genetic viability over the long-term (USFWS 1994). However, ~~I~~isolation is unlikely if

populations remain at or above recovery levels and regulatory mechanisms prevent chronically low wolf numbers or minimal dispersal (Forbes and Boyd 1997).

The Department recognizes ~~that~~ wolves move within and between islands of occupied habitats. Dispersing wolves will travel through some habitats unsuitable for long-term occupancy due to of the potential for conflict. Lone wolves in these areas may not be immediately removed through agency actions unless conflicts arise. However, wolves in these areas may be subject to liberal public take regulations. Public education efforts will emphasize that lone wolf sightings do not necessarily mean a pack is forming in the area.

The interagency effort to maintain linkage zones and movement corridors in the northern Rockies for grizzly bears, forest carnivores, and big game also will benefit wolves. A major emphasis of this cooperative effort is to create areas of safe passage for wildlife across highways, railroad lines, and through areas of intense human development (R. Rothwell, pers. comm.). The Department is committed, to the extent practical, to ensure that genetic diversity and connectivity issues never threaten the GYA wolf population. This will be accomplished by encouraging the incorporation of effective migrants into the GYA wolf population. Conservation measures ~~could~~ will include, but would not be limited to, working with other States to promote natural dispersal into and within various portions of the GYA, and if necessary by relocation or translocation.

Connectivity between the central Idaho sub-population and the GYA sub-population has been documented on about a dozen occasions. In the spring of 2002, wolf B58, an adult male originally from the central Idaho population, was captured in the Greybull river drainage west of Meeteetse, Wyoming. Wolf B58 traveled about 330 miles from Idaho to start what is now known as the Greybull River pack. It is assumed the alpha female is a disperser from the Yellowstone population (M. Jimenez, pers. comm.). At least two pups in this pack were observed in July 2002. In 2007, a radio-collared male wolf from central Idaho also paired with a female wolf inside Yellowstone National Park. There is currently a major effort in cooperation with UCLA to investigate the genetic diversity and population viability of the wolf population in the GYA (Wayne et al. ~~I~~*in prep*.). In addition, a publication is being prepared on the dispersal of radio-collared wolves in the NRM since the mid-1990s (Boyd et al. In prep.).

To the extent practicable, the Commission is committed to managing the gray wolves in Wyoming so that genetic diversity and connectivity issues do not threaten the gray wolf population. This will be accomplished by encouraging the incorporation of effective migrants into the gray wolf population. Conservation measures will include, but are not limited to, working with other states to promote natural dispersal into and within the WTGMA and, if necessary, by relocation or translocation.

DISTRIBUTION

The reintroduction of wolves into the GYA focused on the large tracts of public lands in the region, especially YNP and the surrounding U.S. Forest Service lands. This area was considered more suitable for reintroduction because of the large populations of natural prey ~~species~~ and the lower potential for wolf/human conflicts. Wolf management in Wyoming will continue to focus on this area of the State once wolves are delisted.

By State Statute, wolves ~~will be~~ are classified ~~upon delisting,~~ as trophy game animals in the area ~~in~~ of northwestern Wyoming designated as the WTGMA (~~depicted in~~ Figure 1).

HABITAT MANAGEMENT

The GYA was chosen for wolf reintroduction because of its high prey densities (i.e. wild ungulates) and the relatively low potential for human disturbance (USFWS 1994). These two factors, in conjunction with the abundance of Federal lands connecting central Idaho, western Montana, and northwestern Wyoming, should provide sufficient wolf habitat. Therefore, the Department will not recommend any land use restrictions within Wyoming based solely on the presence of wolves.

Wolves are considered habitat generalists~~, which~~ that do not require a specific habitat type for survival. Wolf habitat is based largely on the ~~density~~ abundance of prey, ~~species~~ isolation, and low potential for conflict~~found in a given habitat~~. To maintain wolf habitat, the Department must continue to manage for viable, robust ungulate populations. The Department manages ungulate populations by balancing natural population fluctuations and public hunting. This adaptive management approach will assure adequate prey ~~abundance~~ remains available to sustain a recovered wolf population, as well as the hunting and trapping tradition enjoyed by many in Wyoming. Wolf/prey interactions are discussed further in the "Wolf/Wildlife Interactions" section of this document.

Wolves are not known to demonstrate behavioral aversion to roads. In fact, they readily travel on roads, frequently leaving visible tracks and scat (Singleton 1995). In Minnesota and Wisconsin, wolves have been known to occupy den and rendezvous sites located near logging operations, road construction work, and military maneuvers with no adverse effects [Minnesota Department of Natural Resources (DNR) 2001]. The underlying concern about road densities stems from the potential for increased accidental human-caused mortalities and illegal killings (Mech et al. 1988; Mech 1989; Boyd-Heger 1997; Pletscher et al. 1997). Although some of the areas within the GYA are administered by the U.S. Forest Service for multiple use purposes and have high road densities, much of the GYA ~~includes~~ is national parks or wilderness areas that have limited road access and minimal human activity.

NUISANCE WOLF MANAGEMENT

Managing human/wolf conflicts will be an integral part of the wolf management program in Wyoming. Emphasis will be placed on avoiding or minimizing wolf conflicts by incorporating wolf conflict avoidance into the information and education program. When wolf conflicts occur, they will be dealt with in a prompt, appropriate manner.

Wolf-livestock Conflicts: ~~How~~ The manner in which wolf-livestock conflicts will be handled, and ~~what kind of~~ implementation of a compensation program ~~will be implemented~~ after the wolf is delisted, are ~~two~~ issues of major concern. Since wolves were reintroduced into YNP in 1995, USDA/WS, in cooperation with USFWS, has taken the lead in dealing with wolf-livestock conflicts. The USDA/WS personnel, with assistance from USFWS, have investigated reports of

livestock depredations by wolves in Wyoming and have determined, based on the evidence available, whether wolves were responsible. If it was determined wolves were responsible for the depredation, USDA/WS, in consultation with USFWS, decided what management action should be taken. Management actions were taken based on all available data and evidence from the incident(s), on a case-by-case basis.

In portions of the State where wolves are classified as trophy game animals, the Department will be the lead agency responding to wolf-livestock conflicts after delisting. The Department will enter into a Memorandum ~~O~~of Understanding (MOU) with USDA/WS, in which USDA/WS will assist in wolf-livestock conflict investigations and implement management actions to resolve conflicts. The Department and USDA/WS will decide on appropriate management action, based on the specific circumstances of each conflict. Management actions could include a variety of responses and will be determined on a case-by-case basis. Management actions are discussed in detail later in this section. The Department recommends continued ~~F~~federal funding ~~of~~ to support USDA/WS ~~in Wyoming for~~ involvement and assistance with wolf conflict resolution in Wyoming.

The Department will not manage nuisance ~~activities~~ problems in the portion of the State where wolves are classified as predatory animals. Nor will the Department compensate livestock producers for livestock that are killed by wolves where wolves are designated as predatory animals.

Following delisting ~~and when the gray wolf is classified as a trophy game animal~~, ~~it~~ the gray wolf will be included in the list of animals ~~in W.S. 23-3-115, which allows~~ property owners or their agents to may legally take ~~wolves~~ when doing damaging private property, as specified in W.S. 23-3-115.

The Department and USDA/WS will work with livestock producers and non-governmental organizations to minimize wolf-livestock conflicts. Technical assistance may include guidance on carcass disposal, fencing, scare devices, and other non-lethal or lethal control methods.

Compensation for Livestock Losses: The Department recognizes the importance of financial compensation to livestock producers who sustain losses due to wolf depredation where wolves are classified as trophy game animals. Defenders of Wildlife (Defenders), a non-profit wildlife conservation organization, ~~currently~~ has administer~~s~~ed a ~~compensation~~ program to compensate ranchers for wolf-killed livestock in the GYA. Defenders reimburses livestock producers at the current market value for losses due to confirmed wolf depredations. The Department recommends that Defenders continue its compensation program after delisting. However, it is anticipated that when the wolf is delisted, this program will ~~not be continued~~ end and the Department will become responsible for compensation under State statutes in that portion of Wyoming where wolves are classified as trophy game animals. The Department will not be liable for compensation of livestock lost to wolves in any portion of the State where wolves are classified as predatory animals.

A scientific evaluation of State government and Defenders' predator compensation programs in Idaho, Montana, and Wyoming for grizzly bears (in Idaho and Montana) and wolves has been ~~initiated~~ completed. Objectives ~~are~~ were to evaluate the effectiveness of various compensation programs, examine the role compensation programs play in predator conservation efforts within

agricultural settings, and assess the impact that compensation programs have on public opinions and attitudes regarding predator conservation and management. This effort is known as the Predator Compensation Research Study. Results of the study can be found at:

http://www.forestry.umt.edu/personnel/faculty/mike/pcrp/.

A final report was completed and several reports have been published (Montag 2003, 2004; Montag et al. 2003). Results of the study may provide the Department with information to aid in development of compensation programs.

The Department will pursue all possible funding sources for the livestock compensation program, including Federal or State appropriations, public/private foundations, and other sources. The Department will work diligently to ensure that revenue from license fees ~~are~~ do not ~~the only~~ become a major source of funding for a livestock compensation program.

Other Wolf-Human Conflicts: Past accounts ~~Reviews~~ of wolf-human interactions ~~concluded~~ indicate that wild, healthy wolves in North America present little threat to human safety (Young and Goldman 1944, Mech 1970, 1990). However, occasionally, wolves are aggressive toward humans. McNay (2002) concluded the vast majority of wolf-human interactions in Alaska and Canada resulting in human injury were from wolves habituated to humans or conditioned to human foods. The Department will incorporate materials in its information and education program to emphasize the importance of preventing wolves from obtaining human foods and becoming habituated to humans ~~into its information and education program~~. Incidents involving aggressive behavior of wolves ~~classified as trophy game animals~~ toward humans will be investigated immediately~~,~~ and appropriate management actions will be taken when the incidents happen within the WTGMA.

Management Actions: Management actions will be implemented by the Department only in areas where wolves are designated as trophy game animals. ~~These~~ Appropriate actions will be based on the unique ~~set of~~ circumstances surrounding each wolf conflict. Possible management actions include:

No Action: No action may be taken after the initial investigation if the circumstances of the conflict do not warrant control, or the opportunity for control is minimal.

~~Aversive Conditioning or Deterrence: Various methods may be used to deter or preclude wolf depredation of livestock, or other nuisance behavior (i.e., scare devices-visual and auditory, shock-collars, electric fences, non-lethal projectiles, etc.). Actively deterring or aversive conditioning wolves may prevent nuisance behavior in some cases (Bangs and Schivik 2001, Bangs et al. 2006).~~

~~Relocation: Capture and relocation operations may be initiated when other options are not applicable (Bradley et al. 2005).~~

~~Removal~~Lethal Control: ~~Lethal control may be used when other options are not practical or feasible.~~ Removal is ~~often~~generally the most effective management option for wolves that kill livestock (Bangs et al. in press). Any gray wolf doing damage to private property may be immediately taken and killed by the owner of the property. Upon verification that a gray wolf or wolves are doing damage to private property, or occupying a chronic wolf depredation area, the Department may: issue a gray wolf lethal take permit to the owner; authorize USDA-APHIS-

Wildlife Services to remove the offending gray wolf or wolves; or authorize Department personnel to lethally remove the offending gray wolf or wolves. Removal by means of lethal control will be the preferred method to alleviate livestock depredation problems. However, lethal control through agency control actions or lethal take permits shall not be authorized in the event the removal of gray wolves may result in the number of gray wolves in the WTGMA decreasing below fifteen (15) breeding pairs or 150 wolves, or the number of breeding pairs primarily outside of the national parks and parkway decreasing below seven (7) breeding pairs, or may result in re-listing wolves under the Endangered Species Act.

~~Property Owner~~Lethal Take Permit: If chronic livestock depredation is experienced, the Department could issue the property owner or property owner-representative a permit to lethally take ~~one or more~~ not more than 2 wolves in areas where wolves are classified as trophy game animals. These types of permits have been issued by the USFWS in Wyoming beginning in 1999. In addition, W.S. 23-3-115 allows property owners, their lessees, or their agents to legally take wolves classified as trophy game animals that are damaging property or attacking livestock.

Non-lethal control alternatives shall be initiated if further lethal control may result in the number of breeding pairs of gray wolves in the WTGMA decreasing below fifteen (15) breeding pairs consisting of at least 150 wolves, the number of breeding pairs primarily outside the National Parks decreasing below seven (7) breeding pairs, or may result in the listing of gray wolves under the Endangered Species Act. Non-lethal control alternatives include:

Aversive Conditioning or Deterrence: Various methods may be used to deter or preclude wolf depredation of livestock, or other nuisance behavior (i.e., scare devices-visual and auditory, shock-collars, electric fences, non-lethal projectiles, etc.). Actively deterring or aversive conditioning wolves may prevent nuisance behavior in some cases (Bangs and Schivik 2001, Bangs et al. 2006).

Relocation: Capture and relocation operations may be initiated when other options are not applicable (Bradley et al. 2005).

WOLF/OTHER WILDLIFE INTERACTIONS

Predator/Prey Interactions: Wildlife populations are affected by various factors such as weather, disease, habitat availability and condition, human impacts, and predation, to name a few. These factors often ~~combine to form~~ interact in complex ~~interactions~~ ways that make it very difficult to determine the actual cause of population fluctuations. Thus, the influence predators have on their prey may be variable not only between, but within regions as conditions change over time and space. Predation may affect prey populations through juvenile mortality, adult mortality, or a combination of both (Gasaway et al. 1992, Ballard et al. 1997, Kunkel and Pletscher 1999, National Research Council 1997, Mackie et al. 1998, Ballard et al. 2001). Wolves in Minnesota do not appear to impact white-tailed deer populations overall, but there are some localized effects of wolf predation in the poorest quality deer habitat (Mech and Nelson 2000, Minnesota DNR 2001). Biologists in Wisconsin have reported that habitat and climate influenced deer populations more than wolf predation (Wisconsin DNR 1999). Studies in YNP identified winter severity as a major influence on the level of wolf predation on elk, with wolf

predation higher in more severe winters (Mech et al. 2001; Jaffe 2001). However, wolf predation had an increasingly additive effect on mortality of female elk as the ratio of wolves to elk increased in the Northern Yellowstone Elk Herd (White and Garrott 2005). A subsequent study by Eberhardt et al. (1997) suggested wolf predation may have less impact on elk population trajectory than harvest by hunters due to greater selection (by wolves) of calves and older female elk with "low reproductive value." However, the authors did not quantitatively assess the degree to which wolf predation of female calves, which normally have very high survivorship through the winter, may impact the population trajectory. The authors' recommendation to discourage harvest of calves seems to contradict the notion that wolf predation has a lesser impact than hunting harvest. According to their own data, wolves selected elk calves at about double the rate hunters did (Eberhardt et al. 2007: Figs. 5 and 6). If calf harvest by hunters has the potential to affect the elk population trajectory, then wolf predation of calves has a ~~much~~ greater potential impact. Furthermore, as wolf populations increase and wolf predation exceeds hunter harvest, the impact caused by wolves can become as important or more important than the impact caused by hunters.

Sensitive Big Game Ranges: Localized impacts of wolves on prey may be greatest on crucial ungulate winter ranges and elk winter feedgrounds in western Wyoming. The Whiskey Mountain bighorn sheep winter range near Dubois and crucial bighorn ranges on the Shoshone River and near Jackson are very important to the conservation of bighorn sheep populations in these areas. A review of the literature on predation on bighorn sheep by Sawyer and Lindzey (2002) found the terrain bighorn sheep frequent prevents predators such as wolves from significantly impacting bighorn populations in most situations. However, when bighorns seek forage away from escape terrain or in timbered areas where predators can approach undetected, wolves can inflict considerable mortality (Sawyer and Lindzey 2002). Sheep populations on these important winter ranges are currently monitored for population fluctuations. This monitoring will continue and will help ascertain possible wolf predation impacts.

Potential impacts to specific populations of moose are a concern. There is crucial moose winter range in the Buffalo Valley/Spread Creek portion of the Jackson Herd Unit. Population trend counts for the Jackson Herd Unit were relatively stable 1991-2000, with a decline beginning in 2001 (Figure 4). The ratio of calves per 100 cows in the population is used as an indicator of recruitment of young into the population. These ratios and the population trend counts indicate the moose population was fairly stable from 1991 to 2000, but trending downward the last 6 years (Figure 4). Research done by Berger (pers. comm.) on the Jackson moose herd points to several factors that likely contribute to this decline. Pregnancy rates of adult cow moose in the area have been fluctuating between 70-80% since 1994. These rates are in the bottom 10% of all moose populations in North America and significantly lower than pregnancy rates reported by Houston (1968) for the Jackson moose herd in the 1960s, which averaged over 95%. Starvation was the primary source of adult female moose mortality in this study from 1994-2001, accounting for 57% of all known mortality. Wolf predation accounted for 3%. Starvation also was a significant factor in reducing moose calf survival from an average of about 90% to nearly 10% in 2001 (Berger, pers. comm.). These data indicate ~~a~~ the population may have been ~~under the~~ influenced ~~of~~ by larger environmental and/or density dependent factors. However, wolf predation can become a major factor in moose calf survival. In 1998, calf survival decreased to nearly 40% due mostly to wolf predation (Berger, pers. comm.). The large amount of elk prey

available in the Jackson area may cause wolf numbers to increase and remain high, possibly resulting in impacts to the moose numbers in the area. ~~Current r~~Research into the effects of predators on the Jackson moose population will continue, and combined with the current monitoring of the population by the Department, will help determine the effects of wolf predation ~~effects~~.

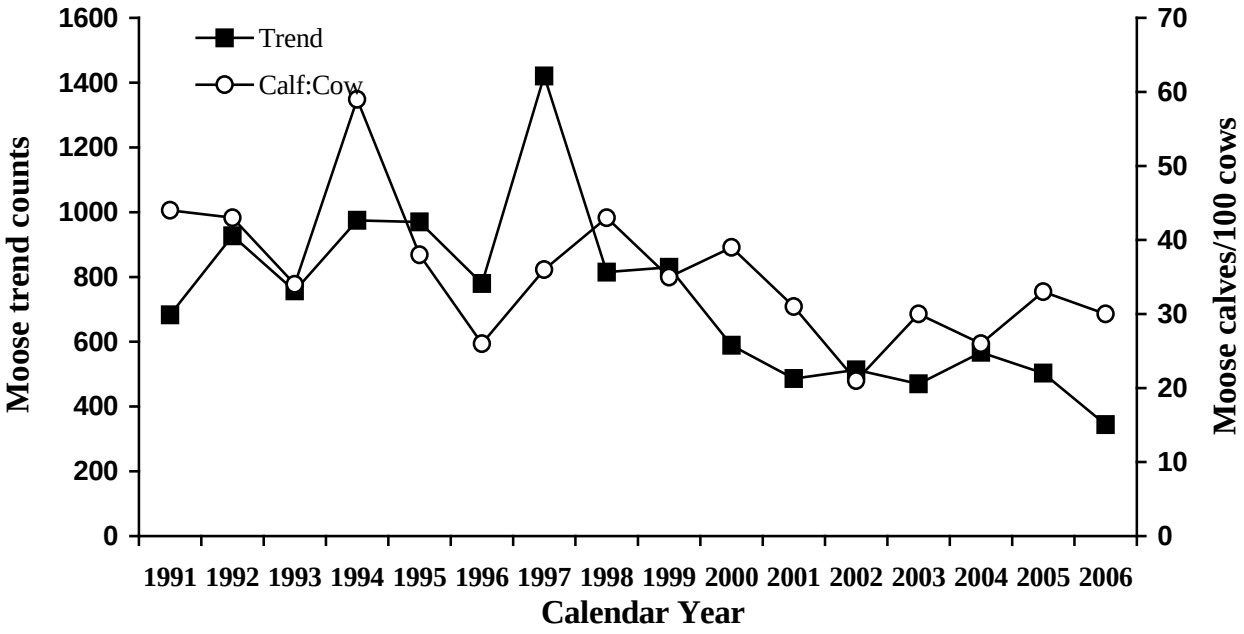


FIGURE 4. Annual Jackson moose herd trend counts and calf:cow ratios. Trend counts are conducted in January or February of each calendar year. Factors such as snow cover and other environmental conditions can influence the way animals concentrate on winter ranges or their visibility from the air and thus affect the results of trend counts from year to year. Data are from Wyoming Game and Fish Department.

~~Potential impacts from w~~Wolf predation could also ~~could occur in~~ impact the Cody and Clark's Fork Moose Herd Units. These two herds are currently below management objectives and appear to be in a downward trend with low recruitment. Wolf predation on these herds has been documented but it is not known if this predation is the only reason for this downward trend. These herds also could be experiencing ~~some of the same~~ similar environmental effects documented in the Jackson moose herd or impacts from grizzly bear predation. The~~is~~ situation necessitates continued monitoring to ensure the long-term health and viability of this herd.

Wyoming has the largest elk-feeding program in the United States, feeding over 23,000 elk annually (Smith 2001). The Department operates 22 elk feedgrounds in the Jackson, Pinedale, Big Piney, and Afton areas of western Wyoming. The USFWS also operates the NER near Jackson. These feedgrounds concentrate elk in lower elevation areas during the midwinter months with the intent of mitigating habitat loss, minimizing damage ~~done by elk~~ to private lands

in the area, preventing vehicle/elk collisions, and preventing the spread of brucellosis from elk to cattle on winter feedlines.

Wolves were first observed in the Jackson area in small numbers during the winter of 1997-1998. In the winter of 1998-1999, 2 separate packs killed an estimated 60 elk on the NER (Table 2) (B. Smith, NER, pers. comm.). Over the next few years, wolves killed fewer elk on the NER, but began killing more elk on and around the Department feedgrounds in the Gros Ventre drainage. To date, the estimated numbers of elk killed by wolves each winter in the NER and Gros Ventre areas ~~and NER~~ represent~~s~~ less than 1% of the total Jackson elk herd. ~~The 2003 calf:cow ratios for both the Gros Ventre feedgrounds and the NER decreased for the second consecutive year (Table 2). However, the number of wolf-killed elk confirmed on both the Gros Ventre feedgrounds and the NER decreased in 2003.~~ However, calf:cow ratios on the Gros Ventre feedgrounds have been consistently lower. While there has been a significant wolf presence on the Gros Ventre feedgrounds in recent years (USFWS 2002), wolf presence on the NER has been minimal or nonexistent during that time (B. Smith, pers. comm.). Thus, the decline in calf:cow ratios in both areas indicates that while wolf predation likely played a role in the decrease of the Gros Ventre feedground ratios, factors such as other predators and the prolonged regional drought also were influential.

TABLE 2. Elk calves per 100 cows and the number of wolf-killed elk found on feedgrounds in the Jackson area administered by the Department (Gros Ventre) and USFWS (NER). USFWS (2002), Bruce Smith, NER (pers. comm.), and Department data. Numbers of wolf-killed elk from the Gros Ventre were tallied from the entire drainage, not just Department feedgrounds.

CALENDAR YEAR	GROS VENTRE FEEDGROUND AREA		NATIONAL ELK REFUGE	
	Calf:Cow	Wolf-killed Elk	Calf:Cow	Wolf-killed Elk
1990	32.3		23.2	
1991	31.7		22.8	
1992	27.2		23.7	
1993	34.1		24.3	
1994	28.1		17.5	
1995	32.4		23.6	
1996	23.1		18.6	
1997	26.1		17.9	
1998	22.8		16.7	
1999	24.8		18.8	~60
2000	26.5	48	24.8	11
2001	31.2	19*	24.1	2
2002	17.5	52	20.1	0
2003	15.2	26	16.2	2
2004	31.5	2	15.0	18
2005	16.2	28	20.3	63
2006	22.8	29	25.8	11

***** Poor snow cover created difficult access for researchers to areas where wolves hunted in Gros Ventre in 2001.

Wolves can also displace wintering elk from native winter ranges and feedgrounds onto adjacent private property, ~~which may~~ increase~~e~~ing the potential for damage and ~~elk/livestock~~ commingling with livestock. This has been documented on Bald Ridge and along the face of the Beartooth Mountains in the Cody region as well as Department feedgrounds. Wolf presence was documented on 14 of the Department's 22 elk feedgrounds during the winter of 2001-2002 and on 12 feedgrounds in the winter of 2002-2003. ~~Wolf p~~Predation by wolves was documented on 12 feedgrounds in 2001-2002 with 73 elk killed and/or fed on by wolves and on 9 feedgrounds in 2002-2003 with 47 elk killed. A study of collared elk on the Gros Ventre feedgrounds has found that elk displaced by wolves in that area often return within a day of being displaced (M. Jimenez, USFWS, pers. comm.) (Jimenez et al. 2003-2006). However, there is still potential for conflicts on feedgrounds in several ways (Table 3). These include elk causing damage to stored hay and elk feeding on livestock feedlines, which causes hay loss and increases risk of brucellosis transmission from elk to cattle. Another potential conflict occurs where feedgrounds are near highway rights-of-way. Elk presence near highways frequently forces the Department to initiate feeding in response to public concerns over vehicle/elk collisions. Elk crowding also can have negative management consequences when elk move from one feedground to another. Crowding aggravates the risk of brucellosis transmission among elk. It also is more difficult to implement the vaccination program with crowding and elk reacting to ongoing wolf predation. Hay supplies to feedgrounds are delivered during summer and fall, based on elk numbers from previous years. When elk redistribute among feedgrounds, the Department must react to hay shortages. This work is difficult in winter conditions because routes the Department must use are ~~sometimes~~ often shared with recreationists, and because of equipment and manpower limitations. Many of these problems existed prior to wolf presence on the feedgrounds, but wolf presence has exacerbated the problems. Wolf management actions discussed under "Big Game Management" may be desirable if a given conflict could be prevented.

TABLE 3. Potential conflicts anticipated in managing elk at feedgrounds in Wyoming.

Feedground	Elk Damage to Stored Hay or Cattle Feedlines and Brucellosis Transmission to Livestock	Elk on Highway Rights-of-Way	Elk Crowding, Brucellosis, Hay Supply	No Apparent / Identified Conflicts
Alkali	X		X	
Alpine	X(1)	X(1)		
Bench Corral	X		X(2)	
Black Butte	X	X(3)	X	
Cabin			X	
Camp Creek		X	X	
Dell Creek	X			
Dog Creek		X		
Fall Creek	X			
Finnegan	X			
Fish Creek			X	
Forest Park				X
Franz	X		X	
Green River Lakes				X
Horse Creek	X(1)	X(3)	X	
Jewett	X			
McNeel	X		X	
Muddy Creek	X			
North Piney	X(2)		X(2)	
Scab Creek	X			
Soda Lake	X(1)		X	
South Park	X	X(3)		
Totals	**16**	**6**	**11**	**2**

(1) Risk partially mitigated by elk fence.
(2) Risk considered and management options are tested viable.
(3) Conflict has never matured to be a public issue, but elk have been on highway as a result of management.

Big Game Management: Successful wolf conservation in Wyoming will depend, in part, on the availability of natural prey populations. Ungulate populations are important to not only wolves and other carnivores, but to human hunters and others in the State whose income depends upon hunting and other wildlife-related activities. Hunting licenses fund the majority of wildlife management and conservation ~~efforts~~ in Wyoming. This investment has produced abundant ungulate populations throughout the State. Therefore, it is important that the Department balance the wolves' need for prey with the public's investment in these ungulate populations ~~and~~ in order to maintain the~~ir~~ public's opportunity to hunt and otherwise enjoy them in a sustainable and responsible manner.

Data from studies conducted in YNP provide insight into the rate at which wolves kill prey in the GYA. Jaffe (2001) estimated winter kill rates in the Madison/Firehole area of YNP. Kill rates in this area of YNP ranged from 2.04 kills/wolf/30 days in the winter of 1998-99 to 1.47 kills/wolf/30 days in the winter of 1999-2000. Similar rates were reported by Smith et al. (2004) and White and Garrott (2005) for the northern range of YNP. ~~This study estimated wolf kill rates for two 30-day periods in early (mid-November to mid-December) and late (March) winter in the northern range of YNP from November 1997 to March 2000.~~ Kill rates were 1.6 kills/wolf/30 days in early winter and 2.2 kills/wolf/30 days in late winter, with an overall 3-year average of 1.8 kills/wolf/30 days. These numbers demonstrated kill rates were variable not only between, but within winter seasons. The YNP kill rates are generally higher than most other wolf/ungulate systems, which is characteristic of a re-establishing and expanding wolf population (Jaffe 2001). Because these studies were conducted during winter, they should not be used to estimate annual kill rates for GYA wolf populations. ~~Very little is known about summer kill rates of wolves in the GYA or any ecosystem.~~However, White et al. (2005) estimated annual kill rates "have been closer to 22 ungulates per wolf per year," based on an assumption that summer kill rates are approximately 70% of winter kill rates. Additional research is currently being conducted to document summer prey selection and kill rates.

It is reasonable to assume ~~that in the future,~~ wolf predation ~~may~~ will have a negative effect on some ~~northwestern Wyoming~~ elk, moose, mule deer, and bighorn sheep herds in northwestern Wyoming and~~, thus,~~ consequently, on hunt~~er~~ing ~~harvest~~opportunity. However, since most of the packs that reside outside YNP and the NER are subject to ~~take under the dual status classification~~control actions and will eventually be hunted under a quota system, impacts to big game are expected to be tolerable. Impacts to big game herds outside the WTGMA are expected to be minimal because most wolves in this area become involved in livestock conflicts and are removed. The effect of wolves on elk numbers in the GYA is related to winter severity (Mech et al. 2001). Mech and Nelson (2000) found that wolf predation impacted hunter harvest of white-tailed deer in areas of lower deer densities. Many elk herds in northwestern Wyoming have been above herd objectives, but are declining. Liberal issuance of antlerless hunting permits and extended seasons, combined with drought and predation, have reduced some of these herds ~~to objective~~. In the future, it is possible severe environmental conditions may reduce some elk populations in the GYA to the point ~~where~~ wolf predation ~~may have~~ exerts a stronger influence ~~on them~~.

Currently, Department biologists consider factors such as population objectives, drought, winter severity, juvenile to adult ratios, and both natural and human cause~~s~~d ~~of~~ mortality in setting big

game harvest quotas. ~~As a natural cause of mortality, w~~Wolf predation will also be ~~included~~ factored into these decisions. As with any other source of mortality such as severe winterkill, hunter harvest may be ~~altered~~ adjusted in response to wolf predation in order to ensure the health of the ungulate populations in question. If wolf predation negatively affects the maintenance of management objectives for specific ungulate populations, the Department may recommend that the population objectives be modified to account for wolf predation. In areas where wolves are classified as trophy game animals, management actions ~~will~~ may be taken in the event that wolves begin to significantly affect ungulate populations in localized areas such as feedgrounds and crucial winter range. Gray wolves may be lethally removed when, based on best scientific data and information available, the Department determines a wild ungulate herd may be experiencing unacceptable impacts or when wolf-wild ungulate conflict occurs at any State operated feedground. However, wolves will not be lethally removed to if further removal may result in the number of gray wolves in the WTGMA declining to below fifteen (15) breeding pairs or 150 wolves, the number of breeding pairs primarily outside of the National Parks decreasing below seven (7) breeding pairs, or may result in re-listing of wolves under the Endangered Species Act.

Management Actions: In the ~~final~~ revised nonessential, experimental population rule for the GYA (~~59 FR (224):60252-60263~~73 FR (18):4720-4736), USFWS encouraged States and Tribes to define unacceptable ~~wolf~~ impacts to wild ungulate populations. The Commission has defined "Unacceptable impact" as any decline in a wild ungulate population or herd that results in the population or herd not meeting the State population management goals or recruitment levels established for the population or herd" [Chapter 21, Section 3(g)]. "Wild ungulate population or herd" means "an assemblage of wild ungulates living in a given area" [Chapter 21, Section 3(h)]. Upon approval of this State wolf management plan by the USFWS, the Department ~~will have the option to~~ may submit proposals subject to USFWS approval, to ~~translocate or lethally take~~ control wolves ~~from~~ in areas where wolf predation is a major cause of an ungulate~~s are negatively impacted~~herd not meeting one or more State management objectives. After wolves are delisted, approval by the USFWS will not be required. However, the Department shall determine an "unacceptable impact" based upon the best scientific data and information available [Chapter 21, Section 3(g)]. Some wintering elk, deer, moose and bighorn sheep sub-populations on native winter range and elk on winter feedgrounds or near cattle feed lines could be susceptible to ~~negative~~ unacceptable impacts from wolf predation and management action may be necessary under specific conditions.

Most management actions taken to reduce impacts will involve removing individual wolves at an early stage before it is necessary to remove multiple individuals or entire packs if problems continue. In the event that non-pack individuals create unacceptable conflict, offending animals will be removed. In all cases, legitimate rationale will be needed before actions will be taken. All management actions will be documented, summarized, and made available to the public annually.

PUBLIC INFORMATION & EDUCATION

As the Department prepares to assume management of wolves after delisting, it will be necessary to identify and address ~~the~~ a broad array of questions concerning wolves and their impact on

wildlife. The Department ~~is~~ has ~~preparing now to~~ published information on its website (http://gf.state.wy.us/) that answers many of these questions ~~that will emerge as Wyoming moves into wolf management~~. Because wolf management procedures will be closely examined and arouse controversy, the Department seeks to build a balanced management approach that acknowledges the complexity of the political, social and environmental factors associated with wolves and their management. This section will serve as the Department's guide as it prepares to inform its constituents about gray wolf management in Wyoming.

The objectives of the information and education section of this plan include:

1. Increase public awareness of the gray wolf, its recovery, and State management authority after delisting.
2. Increase awareness of the status of the gray wolf in Wyoming, the delisting process and delisting milestones.
3. Increase awareness of the array of management tools the Department will employ when the gray wolf is delisted.

Through the print and electronic media, the appropriate branches of the Services Division will produce news releases, video productions and radio spots for Statewide distribution. These productions will be used to convey factual information regarding wolf management, policy, actions and issues of public concern, and answers to questions most likely to be asked about wolf management. The wolf management plan ~~will~~ has also been posted on the Department's website for the public to review.

Informative articles will continue to be published in the Department's Wyoming Wildlife News, Wyoming Wildlife Magazine, and Hunter Education Newsletter. These articles ~~will~~ focus on wolf biology, identification, behavior, population status, and management as it relates to the audience of these publications.

Wolves will be integrated into the Department's ongoing education outreach. Four "target audience" categories will be a high priority:

1. Resident and non-resident hunters.
2. Schools, teachers and youth organizations.
3. The general populace of Wyoming with emphasis on residents of, and visitors to, the GYA.
4. Livestock producers in affected counties with emphasis on the distribution of information on proven and appropriate techniques, which may reduce the number, and frequency of wolf/livestock conflicts.

The Department will include a discussion of wolves in its annual "Living in Bear and Mountain Lion Country" workshops. The discussion will focus on co-existing with wolves, and will include wolf biology, the relationship between wolves and their prey, food habituation, and ways to reduce human-wolf conflicts.

Volunteer hunter education instructors will receive wolf presentations at annual instructor workshops. Each presentation will include information on wolf biology, wolf identification, wolf management and conflict prevention.

1. A pocket identification card, similar to that used in bear identification, will be developed and provided to instructors.
2. A one-page handout will be developed for use in the hunter education "classroom."

In Project WILD workshops, teachers will be introduced to wolf education materials and wolf education materials will be acquired and used to the extent practicable and appropriate.

The recommendations in this section should be implemented immediately upon adoption of this management plan.

FUNDING

In accordance with the Commission's 1992 Wolf Position Statement, Department participation in wolf management ~~is~~ was predicated upon securing a stable, long-term source of funding. Consistent with that position, the Commission has taken action since that time to address funding. In 1997, the Commission began communicating with Congress and the Federal Administration to provide annual Federal appropriations for USDA/WS to help address wolf-related depredation issues in Wyoming. The Wyoming Legislature appropriated $2.48 million of general fund revenues to establish a Department wolf program through fiscal year 2010. The program is currently staffed by a wolf management coordinator and 3 wolf biologists. Future funding will be requested biennially through the Legislature. ~~The Commission also took steps internally to limit Department expenditures on wolf management. A Commission motion in October 1997 clarified guidelines to Department personnel dealing with depredation and law enforcement matters involving wolves prior to Federal delisting of the species.~~ With delisting close at hand, the issue of future funding ~~is~~ continues to be of major importance to the State~~, as it prepares to assume management responsibility for a recovered wolf population~~. Efforts to obtain Congressional funding, especially for livestock compensation, are continuing.

Currently, USDA/WS receives an annual appropriation from Congress for predator control and utilizes portions of this appropriation for nuisance wolf management in Wyoming. When the wolf is delisted, USDA/WS may not have sufficient funding to deal with wolf conflicts. The Department will promote and support the continuation of this allocation, as it intends to enter into an MOU with USDA/WS for their continued assistance in managing nuisance wolves. If this allocation can be maintained, in the short-term, it should cover the majority of costs associated with on-the-ground management of conflicts between wolves and livestock. Adequate USDA/WS funding will result in significant fiscal savings for the Department.

Section 6 ~~or~~and other ESA funding is available only until a species is delisted. The Department has coordinated, and will continue to coordinate, with Idaho, Montana, and other appropriate agencies, organizations and interest groups, and political leaders to secure stable funding for its wolf

management program. For the foreseeable future, the funding effort will focus on annual Congressional appropriations for the three States based upon demonstrated need and ongoing success by the States in managing this shared wolf population. The three States are working closely together to ensure all funding needs are developed in a consistent manner through a single funding request to Congress.

The three States also will continue to advocate for the longer-term concept of Congress establishing and funding the proposed Northern Rocky Mountain Grizzly Bear and Gray Wolf Management Trust. The Trust concept was developed by Wyoming several years ago and has since gained the support of Idaho and Montana. The Trust concept has formally been endorsed by the Wyoming and Montana legislatures.

As envisioned, the Trust would originate from a one time Congressional appropriation and form the basis of an inviolate corpus, upon which the available annual interest would be sufficient to offset most of the three States' costs of managing grizzly bears and wolves. Since both of these species are considered species of national significance, this would be an appropriate funding mechanism. This approach would allow the American public to share in the cost of these management programs, rather than having it fall entirely to the States which rely almost exclusively on license fees and excise taxes on outdoor sporting equipment to support agency programs. It would have the added benefit of providing dependable funding, upon which an adequate management program could be maintained over time.

The Department also will continue to seek expanded contributions from other potential Federal sources for wolf management costs, such as legislative measures similar to Title III of the Conservation and Reinvestment Act, and the State Wildlife Grant Program. Out of necessity, if for no other reason than to provide the State's match for Federal funds, the Department will need to annually allocate some money from the Game and Fish Fund toward wolf management efforts. The Department also will examine other potential sources of funding at the State level, beyond license revenue, to assist financially with managing wolves once they are delisted. These could include, but not be limited to, private donations, grants from foundations, assistance from non-governmental organizations and funding partnerships with other interested entities.

~~The estimates for Wyoming's wolf management program, as reflected in Table 4, presume that the Department assume management authority in 2008, and are based on wolf abundance and distribution expected at that time. Projected costs are only for that portion of the wolf population that resides outside YNP, GTNP, the Parkway, and NER. In addition to the estimated direct expenditures in Table 4, the Department also expects to assume several additional overhead costs within existing programs. Additional efforts will be required in law enforcement, information and education, fiscal, administrative, and legal programs within the Department. The estimated cost of wolf management in Wyoming will be, on average, $2.27 million per year for full implementation the first 2 years after the Department assumes management.~~

~~TABLE 4. Projected Bienniel Budget for Wolf Management (2008-09).~~

~~PROGRAM ACTIVITY EST COSTS $~~

~~Personnel costs~~	~~$1.3 million~~
~~Includes 7 permanent personnel (locations: Jackson, Cody, Lander, Pinedale)~~ ~~8 six-month seasonal AWEC employees~~	
~~Damage claims~~	~~$1.1 million~~
~~Wildlife services contract (aerial location, gunning, removal)~~	~~$500,000~~
~~Aerial contracts~~	~~$342,000~~
~~Equipment start-up costs (vehicles, ATV's, snowmobiles, horses, etc.)~~	~~$600,000~~
~~Radio collars and other field supplies~~	~~$325,000~~
~~Vehicle operating costs~~	~~$255,000~~
~~Other supportive costs~~	~~$125,000~~
~~**TOTAL**~~	~~**$4.55 million**~~

ECONOMIC IMPACTS

A recovered wolf population in Wyoming will bring both positive and negative economic impacts. Positive impacts may be realized in the gateway communities to YNP from increased tourism. Wyoming is well known for its abundant wildlife, scenic mountains, national parks and wildlife refuges. Wildlife viewing is among the top activities for visitors and residents alike. Wolves add to the host of viewable wildlife in Wyoming. Negative impacts include economic losses from livestock depredations, and possibly decreased hunter opportunity due to lower ungulate populations and reduced recruitment. If hunter opportunity decreases, the Department~~, through decreased license sales,~~ may see reduced license sales and associated income, and local economies may be impacted. The outfitting industry also may be negatively impacted if license sales decrease. However, outfitters also may gain some clientele wanting to view or hunt wolves. The economic impacts from wolves are difficult to predict, but may be tracked through time as a viable wolf population is established in the GYA, and wolf management in Wyoming evolves.

Because of the national interest in wolves, their presence in the GYA was expected to increase tourism in the area. However; overall visitation to YNP has decreased for unknown reasons since wolf reintroduction. Economic benefits generated by a recovering wolf population are difficult to gauge. However, while there may be benefits to local communities from increased interest in viewing wolves, this does not generate income for wolf management by the Department.

Boyce and Gaillard (1992) estimated a recovered population of 100 wolves in the GYA could ultimately result in a 5-10% reduction in hunter harvest of elk in the Jackson Herd (165-330 elk) and a 1-2% reduction in elk harvest for the North Fork Shoshone Herd (6-13 elk). The North Fork Shoshone Herd was combined with the Carter Mountain Herd in 1992 and now represents part of the Cody Herd. These reductions equate to annual revenue losses between $232,000 to $465,000 from hunter harvest and between $207,000 to $414,000 from additional hunter expenditures (USFWS 1994:4-22). There also are wolves using the Clark's Fork Elk Herd Unit. Based on the most recent information regarding pack numbers and future management direction in the GYA, a recovered wolf population will probably fluctuate around 250 animals in YNP and the adjacent Wyoming portion of the GYA, suggesting that Boyce and Gaillard's (1992) estimates of wolf impact on hunter harvest are conservative. However, to date there are no definitive data showing decreased hunter harvest or opportunity due to wolf predation on elk or moose in Wyoming. As

more is learned about wolves and their effects on game populations, economic impacts will be evaluated.

At recovery, livestock losses to wolves in the GYA were estimated to range from 1 to 32 cattle and 17 to 110 sheep/year (USFWS 1994:4-16). This depredation rate would result in an annual loss of approximately $1,900 to $30,500. In 2001, with 218 wolves in the GYA, there were 117 sheep, 22 cattle, and 4 dogs confirmed killed by wolves, resulting in compensation payments from Defenders of $43,495 ($20,175 in Wyoming). ~~By~~ From 1995-200~~6~~7, along with the increased number of wolves, livestock losses and the associated economic losses ~~from 1995-2006~~ have increased ~~annually~~ consistently and ~~now~~ total at least ~~336~~895 cattle, ~~211~~1,778 sheep, ~~20~~101 dogs, ~~10 goats,~~ and ~~4 horses~~44 "other" livestock. The annul losses in 2007 decreased somewhat from 2006 losses, likely the result of much more intensive control efforts (186 wolves were lethally removed in 2007 compared to 142 in 2006 and 103 in 2005). However, ~~it is recognized that~~research has documented the number of livestock that are killed by wolves, but not detected (especially sheep and calves), often exceeds ~~in addition to~~ confirmed livestock losses~~, livestock may be missing as a result of wolf predation~~(Oakleaf 2003). This is consistent with ~~e cost of missing livestock may exceed the cost of confirmed losses based on~~ the Department's experiences ~~with~~handling grizzly bear depredations on ~~livestock predation and research done in Idaho (Oakleaf 2003)~~. The Department is determined to keep economic losses from a recovered wolf population ~~to~~at a minimum.

LITERATURE CITED

Ballard, W.B., J.S. Whitman, and C.L. Gardner. 1987. Ecology of an exploited wolf population in south-central Alaska. Wildlife Monographs No. 98. 54pp.

Ballard, W.B., L.A. Ayres, P.R. Krausman, D.J. Reed, and S.G. Fancy. 1997. Ecology of wolves in relation to a migratory caribou herd in northwest Alaska. Wildlife Monographs No. 135.

Ballard, W.B., D. Lutz, T.W. Keegan, L.H. Carpenter, and J.C. Devos, Jr. 2001. Deer-predator relationships: a review of recent North American studies with emphasis on mule and black-tailed deer. Wildlife Society Bulletin 29(1): 99-115.

Bangs, E.E., and S.H. Fritts. 1996. Reintroducing the gray wolf to central Idaho and Yellowstone National Park. Wildlife Society Bulletin 24:402-413.

Bangs, E.E., S.H. Fritts, J.A. Fontaine, D.W. Smith, K.M. Murphy, C.M. Mack, and C.C. Niemeyer. 1998. Status of gray wolf restoration in Montana, Idaho, and Wyoming. Wildlife Society Bulletin 26(4):785-798.

Bangs, E., and J. Schivik. 2001. Managing wolf conflict with livestock in the northwestern United States. Carnivore Damage Prevention News No. 3:2-5.

Bangs, E., M. Jimenez, C. Niemeyer, J. Fontaine, M. Collinge, R. Krischke, L. Handegard, J. Shivik, C. Sime, S. Nadeau, C. Mack, D. Smith, V. Asher, and S. Stone. 2006. Nonlethal and lethal tools to manage wolf/livestock conflict in the northwestern United States. Proceedings of the Vertebrate Pest Conference 22:7-16.

Bangs, E., M. Jimenez, C. Niemeyer, J. Fontaine, C. Sime, S. Nadeau, and C. Mack. In press. The art of wolf restoration in the northwestern United States: Where do we go now? Pages 000-000 in 'The World of Wolves', eds. M. Musiano, P. Paquet, and L. Boitani. University of Calgary Press. Calgary, AB.

Bradley, E.H., D.H. Pletscher, E.E. Bangs, K.E. Kunkel, D.W. Smith, C.M. Mack, T.J. Meier, J.A. Fontaine, C.C. Niemeyer, and M.D. Jimenez. 2005. Evaluating wolf translocation as a non-lethal method to reduce livestock conflicts in the northwestern United States. Conservation Biology 19:1498-1508.

Bath, A.J. 1991. Public attitudes in Wyoming, Montana and Idaho toward wolf restoration in Yellowstone National Park. Trans. N. Am. Wildlife and Nat. Res. Conf. 56:91-95.

Boyce, M.S., and J.M. Gaillard. 1992. Wolves in Yellowstone, Jackson Hole, and the North Fork of the Shoshone River: simulating ungulate consequences of wolf recovery. Pages 4-71 to 4-115 *in* J. D. Varley and W. G. Brewster, eds. Wolves for Yellowstone? a report to the U.S. Congress. Vol. IV, Research and Analysis. Yellowstone National Park, Wyoming.

Boyd, D. 2006. pers. comm., related to in preparation wolf dispersal paper. Boyd, D.K., E. Bangs, D. Smith, J, Jimenez, J. Fontaine, C. Mack. In Prep. Wolf dispersal in the northern Rocky Mountains of the United States, 1995-2005.

Boyd, D.K., R.R. Ream, D.H. Pletscher, and M.W. Fairchild. 1994. Prey taken by colonizing wolves and hunters in the Glacier National Park area. J. Wildl. Management 58:289-295.

Boyd-Heger, D.K. 1997. Dispersal, genetic relationships, and landscape use by colonizing wolves in the central Rocky Mountains. PhD dissertation, University of Montana. 184 pp.

Eberhardt, L.L., P.J. White, R.A. Garrott, and D.B. Houston. 2007. A seventy-year history of trends in Yellowstone's Northern Elk Herd. J. Wildl. Manage 71(2):594-602.

Federal Register. 1994. Establishment of a nonessential, experimental population of gray wolves in Yellowstone National Park in Wyoming, Idaho, and Montana. U.S. Fish and Wildlife Service 59(224):60252-60263.

Forbes, S.H., and D.K. Boyd. 1997. Genetic structure and migration in native and reintroduced Rock Mountain wolf populations. Conservation Biology 11:1226-1234.

Fritts, S.H., and L. D. Mech. 1981. Dynamics, movements, and feeding ecology of a newly protected wolf population in northwestern Minnesota. Wildlife Monographs No. 80. 79 pp.

Fritts, S.H., L.D. Mech, and D.P. Scott. 1992. Trends and management of wolf-livestock conflicts in Minnesota. U.S. Fish and Wildlife Resour. Publ. No. 181. Washington, D.C. 27 pp.

Fritts, S.H., E.E. Bangs, and J.F. Gore. 1994. The relationship of wolf recovery to habitat conservation and biodiversity in the northwestern United States. Landscape and Urban Planning 28:23-32.

Fuller, T.K. 1989. Population dynamics of wolves in north-central Minnesota. Wildlife Monographs No. 105. 41 pp.

Fuller, T.K., L.D. Mech, and J.F. Cochrane. 2003. Wolf population dynamics. Pages 161-191 *in* Wolves: Behavior, Ecology, and Conservation. L.D. Mech and L. Boitani, eds. University of Chicago Press, Chicago. 448 pp. (2)

Gasaway, W.C., R.D. Boertje, K.V. Grangaard, D.G. Kellyhouse, R.O Stephenson, and D.G. Larsen. 1992. The role of predation in limiting moose at low densities in Alaska and Yukon and implications for conservation. Wildlife Monographs. No. 120.

Gipson, P.S., E.E. Bangs, T.N. Bailey, D.K. Boyd, H. D. Cluff, D.W. Smith, and M.D. Jimenez. 2002. Color patterns among wolves in western North America. Wildlife Society Bulletin 30(3):821-830.

Houston, D.B. 1968. The Shiras moose in Jackson Hole, Wyoming. National Park Service Technical Bulletin 1:1-110.

International Association of Fish and Wildlife Agencies. 1994. Issues management handbook. T.R. Thompson, *ed*. IAFWA, Washington, D.C. 127pp.

Jimenez, M.D., and J. Stevenson. 2003. Wolf-elk interactions on state-managed feed grounds in Wyoming. 2002 progress report. U.S. Fish and Wildlife Service, 190 N First St., Lander Wyoming 82520. 11 pp.

Jimenez, M.D., and J. Stevenson. 2004. Wolf-elk interactions on state-managed feed grounds in Wyoming. 2003 progress report. U.S. Fish and Wildlife Service, P.O. Box 2645, Jackson, Wyoming 83001. 13 pp

Jimenez, M.D., S.P.Woodruff, S. Cain, and S. Dewey. 2005. Wolf-elk interactions on winter range and state-managed feed grounds in Wyoming. 2005 progress report. U.S. Fish and Wildlife Service, P.O. Box 2645, Jackson, Wyoming 83001. 12 pp.

Jimenez, M.D., S.P.Woodruff, S. Cain, and S. Dewey. 2006. Wolf-elk interactions on winter range and state-managed feed grounds in Wyoming. 2006 progress report. U.S. Fish and Wildlife Service, P.O. Box 2645, Jackson, Wyoming 83001. XX pp.

Keith, L.B. 1983. Population dynamics of wolves. Pages 66-77 *in* L. N. Carbyn, ed. Wolves in Canada and Alaska: their status, biology, and management. Can. Wildlife Serv. Rep. Ser. No. 45, Ottawa, Ont.

Kunkel, K., and D.H. Pletscher. 1999. Species-specific population dynamics of cervids in a multipredator ecosystem. Journal of Wildlife Management 63(4):1082-1093.

Mack, J.A., W.G. Brewster, and S.H. Fritts. 1992. A review of wolf depredation on livestock and implications for the Yellowstone area. Pages 5-3 to 5-20 *in* J. D. Varley and W. G. Brewster, eds. Wolves for Yellowstone: a report to the U.S. Congress, Vol. IV, Research and Analysis. Yellowstone National Park, Wyoming.

Mackie, R.J., D.F. Pac, K.L. Hamlin, and G.L. Dusek. 1998. Ecology and management of mule deer and white-tailed deer in Montana. Montana Fish, Wildlife and Parks, Wildlife Division, Federal Aid to Wildlife Restoration Report, Project W-120-R, Helena, USA.

McNaught, D.A. 1987. Wolves in Yellowstone National Park?--Park visitors respond. Wildlife Soc. Bull. 15:518-521.

McNay, M.E. 2002. A case history of wolf-human encounters in Alaska and Canada. Wildlife Technical Bulletin 13. Alaska Department of Fish and Game, Juneau. 44 pp.

Mech, L.D. 1970. The wolf: the ecology and behavior of an endangered species. University of Minnesota Press, Minneapolis. 384 pp.

Mech, L.D., S.H. Fritts, G.L. Radde, and W.J. Paul. 1988. Wolf distribution and road density in Minnesota. Wildlife Soc. Bull. 16:85-87.

Mech, L.D., S.H. Fritts, G.L. Radde, and W.J. Paul. 1989. Wolf population survival in an area of high road density. Am. Midl. Nat. 121:387-389.

Mech, L.D., S.H. Fritts, G.L. Radde, and W.J. Paul. 1990. Who's afraid of the big bad wolf? Audubon 92(2):82-85.

Mech, L.D., S.H. Fritts, G.L. Radde, and W.J. Paul. 1991. The way of the wolf. Voyageur Press, Stillwater, Minnesota. 120pp.

Mech, L.D., S.H. Fritts, G.L. Radde, and W.J. Paul, and M.E. Nelson. 2000. Do wolves affect white-tailed buck harvest in northeastern Minnesota? Journal of Wildlife Management 64(1):129-136.

Mech, L.D., S.H. Fritts, G.L. Radde, and W.J. Paul, and M.E. Nelson, D.W. Smith, K.M. Murphy, and D.R. MacNulty. 2001. Winter severity and wolf predation on a formerly wolf-free elk herd. Journal of Wildlife ~~Mangement~~Management 65(4):998-1003.

Minnesota Department of Natural Resources. 2001. Minnesota wolf management plan, February 2001. Minnesota Department of Natural Resources, Minneapolis. 36 pp.

Mitchell, M., D. Ausband, C. Sime, E. Bangs, J. Gude, M. Jimenez, C. Mack, T. Meier, S. Nadeau, and D. Smith. Submitted. Estimation of self-sustaining packs of wolves in the U.S. Northern Rocky Mountains. Journal of Wildlife Management.

Montag, J.M. 2004. Lions, Wolves, and Bears, Oh My! Predator Compensation Programs in the West. Fair Chase, Summer: 52-54.

Montag, J. 2003. Compensation and predator conservation: limitations of Compensation. Carnivore Damage Prevention News 6:2-6.

Montag, J.M., M.E. Patterson, and B. Sutton. 2003. Political and Social Viability of Predator Compensation Programs in the West. Final Project Report. Wildlife Biology Program, School of Forestry, University of Montana, Missoula. 136 pp.

National Research Council. 1997. Wolves, bears, and their prey in Alaska: biological and social challenges of wildlife management. National Academy Press, Washington, D.C. USA.

Niemeyer, C.C., E.E. Bangs, S.H. Fritts, J.A. Fontaine, M.D. Jimenez, and W.G. Brewster. 1994. Wolf depredation management in relation to wolf recovery. Proc. Vertebr. Pest Conf. 16:57-60.

Oakleaf, J.K., C. Mack, and D.L. Murray. 2002. Effects of wolves on livestock calf survival and movements in Central Idaho. Journal of Wildlife Management. 67(2):299-306.

Oakleaf, J.K., D.L. Murray, J.R. Oakleaf, E.E. Bangs, C.M. Mack, D.W. Smith, J.A. Fontaine, M.D. Jimenez, T.J. Meier, and C.C. Niemeyer. 2006. Habitat selection by recolonizing wolves in the Northern Rocky Mountains of the United States. Journal of Wildlife Management 70:554-565.

Pletscher, D.H., R.R. Ream, D.K. Boyd, M.W. Fairchild, and K.E. Kunkel. 1997. Population dynamics of a recolonizing wolf population. Journal of Wildlife Management. 61(2):459-465.

Peterson, R.O., J.D. Woolington, and T.N. Bailey. 1984. Wolves of the Kenai Peninsula, Alaska. Wildlife Monographs No.88. 52pp.

Potvin, F., H. Jolicoeur, and J. Huot. 1988. Wolf diet and prey selectivity during two periods for deer in Quebec: decline versus expansion. Can. J. Zool. 66:1274-1279.

Sawyer, H., and F. Lindzey. 2002. A review of predation on bighorn sheep (*Ovis canadensis*). Wyoming Cooperative Fish and Wildlife Research Unit, Laramie, Wyoming. 36 pp.

Seton, E.T. 1929. Lives of game animals. Charles T. Branford, Co., Boston, Massachusetts.

Singer, E.T. 1991. Some predictions concerning a wolf recovery into Yellowstone National Park: how wolf recovery may affect park visitors, ungulates and other predators. Trans. North Amer. Wildlife & Nat. Resour. Conf. 56:567-583.

Singleton, P. 1995. Winter habitat selection by wolves in the North Fork of the Flathead River Basin, Montana and British Columbia. MS Thesis, University of Montana, Missoula.

Smith, B.L. 2001. Winter feeding of elk in western North America. Journal of Wildlife Management 65(2):173-190.

Smith, D.W., D.R. Stahler, D.S. Guernsey, M. Metz, E. Albers, L. Williamson, N. Legere, E. Almberg, and R. McIntyre. 2008. Yellowstone Wolf Project: Annual Report, 2007. National Park Service, Yellowstone Center for Resources, Yellowstone National Park, Wyoming, YCR-2008-01.

Smith, D.W., and D.S. Guernsey. 2002. Yellowstone Wolf Project: Annual Report, 2001. National Park Service, Yellowstone Center for Resources, Yellowstone National Park, Wyoming, YCR-NR-2002-04.

Smith, D.W., D.S. Guernsey, T.D. Drummer, K.M. Murphy, D.S. Guernsey, and S.B. Evans. 2004. Winter prey selection and estimation of wolf kill rates in Yellowstone National Park, 1995-2000. Journal of Wildlife Management 68:153-166.

Smith, D.W., D. Stahler, D. Guernsey, and E. Bangs. 2006. Wolf Restoration in Yellowstone National Park. Pages 242-254 in D. R. McCullough, K. Kaji and M. Yamanaka (eds.), Wildlife in Shiretoko and Yellowstone National Parks: Lessons in Wildlife Conservation from Two World Heritage Sites. Shiretoko Nature Foundation, Hokkaido, Japan.

U.S. Fish and Wildlife Service. 1980. Northern Rocky Mountain Wolf Recovery Plan. U.S. Fish and Wildlife Service, Denver, Colorado. 67 pp.

U.S. Fish and Wildlife Service. 1987. Northern Rocky Mountain Wolf Recovery Plan. U.S. Fish and Wildlife Service, Denver, Colorado. 67 pp.

U.S. Fish and Wildlife Service. 1993. Gray wolf EIS planning update report. U.S. Fish and Wildlife Service, Helena, Montana. 6 pp.

U.S. Fish and Wildlife Service. 1994. The reintroduction of gray wolves to Yellowstone National Park and central Idaho: Final Environmental Impact Statement. U.S. Fish and Wildlife Service, Denver, Colorado.

U.S. Fish and Wildlife Service, Nez Perce Tribe, National Park Service, Montana Fish, Wildlife and Parks, Idaho Fish and Game, and USDA Wildlife Services. 2007. Rocky Mountain Wolf Recovery 2006 Annual Report. C.A. Sime and E.E. Bangs, editors. USFWS, Ecological Services, 585 Shepard Way, Helena, Montana. 235 pp. http://westerngraywolf.fws.gov

U.S. Fish and Wildlife Service, Nez Perce Tribe, National Park Service, Montana Fish, Wildlife & Parks, Blackfeet Nation, Confederated Salish and Kootenai Tribes, Idaho Fish and Game, and USDA Wildlife Services. 2008. Rocky Mountain Wolf Recovery 2007 Interagency Annual Report. C.A. Sime and E. E. Bangs, eds. USFWS, Ecological Services, 585 Shepard Way, Helena, Montana. 59601. 275pp. http://www.fws.gov/mountain-prairie/species/mammals/wolf/annualrpt07/index.html

U.S. Fish and Wildlife Service, Nez Perce Tribe, National Park Service, Montana Fish, Wildlife and Parks, Idaho Fish and Game, and USDA Wildlife Services. 2002. Rocky Mountain Wolf Recovery 2001 Annual Report. U.S. Fish and Wildlife Service, Helena, Montana. 35pp.

U.S. Fish and Wildlife Service, Nez Perce Tribe, National Park Service, and USDA Wildlife Services. 2003. Rocky Mountain Wolf Recovery 2002 Annual Report. T. Meier, ed. U.S. Fish and Wildlife Service, Helena, Montana. 64pp.

Wayne, R., J. Pollinger, and B. vonHoldt. In prep. Genetic characterization of the Yellowstone Park, Idaho, and Montana wolf populations.

White, P.J., D.W. Smith, J.W. Duffield, M. Jimenez, T. McEneaney, and G. Plumb. Yellowstone after Wolves: Environmental impact statement predictions and ten-year appraisals. Yellowstone Science 13(1):34-41.

White, P.J. and R.A. Garrott. 2005. Northern Yellowstone elk after wolf restoration. Wildl. Soc. Bull. 33(3):942-955.

Wisconsin Department of Natural Resources. 1999. Wisconsin Wolf Management Plan. PUBL-ER-099 99. Wisconsin Department of Natural Resources, Madison. 74 pp.

Young, S.P., and E.A. Goldman. 1944. The wolves of North America. Dover Publications, Inc. New York, New York. 636 pp.

APPENDIX 1.
Comparison of Final Management Plans for Idaho, Montana, and Wyoming

ISSUE	IDAHO	MONTANA	WYOMING
Population	Maintain >15 breeding pairs. No limits on total numbers.	Maintain >15 breeding pairs. No limits on total numbers. Uses current definition of pack.	Maintain >15 breeding pairs consisting of >150 wolves ~~Statewide~~within the WTGMA. Maintain >7 breeding pairs outside parks & parkway
Distribution	No boundaries	No boundaries	Limited to NW Wyoming
State Classification	Big game, furbearer, or special classification of predator	<15-Species in need of management, >15-Big game or furbearer	Dual status of trophy game & predatory animal
Livestock Depredation	MOU with WS	MOU with WS	MOU with WS
Livestock Compensation	Continue Defenders Program or Federal funds for compensation	Continue Defenders Program. Continued use of private funding source	~~Cover~~ Compensate depredations by wolves within the WTGMA ~~under~~ as required by current State statutes ~~for only trophy game animals~~
Wolf Population Control	<15-depredation control only, emphasizing non-lethal methods. >15-managed like bears & lions using hunting & trapping	<15-non-lethal control emphasized. >15-allow public take including hunting & trapping.	Regulated take ~~through hunting & trapping~~ restricted to areas where wolves are classified as trophy game animal. Unlimited take in the rest of the State.
Wolf Population Monitoring	<15-more intensive monitoring including radio-collars on every pack. >15-less intensive.	Intensive monitoring for 5-year post-delisting including radio-collars on each pack. After 5 years & >15, less intensive	Intensive monitoring following delisting including radio-collars & aerial surveys
Prey Populations	Collect abundance & sex & age ratio data annually. More intensive if excessive predation is documented.	Monitor big game populations as usual & enhance monitoring where wolves occur.	Continue to monitor big game populations & enhance if excessive predation occurs.
Information & Education	Establish strong public education program that emphasizes biology, management, & conservation & presents balanced view of social impacts & costs.	Provide comprehensive, scientifically based program on ecology, behavior, & management. Create a more informed less emotional public.	Provide comprehensive, scientifically based program on ecology, behavior, & management.

Funding	$837,325/year full implementation Depends on Federal funding.	$765,296/year full implementation. Depends on Federal funding, Bear/wolf trust, & CARA.	$~~2.27~~2.48 million first 2 years ~~avg/year~~ for full implementation. Depends on ~~Federal~~ State Legislature appropriations or other funding from several sources.

APPENDIX 2.
Boundary Descriptions for Wolf Management Units 1, 2, and 3.

Unit 1 – Beginning at HWY 120 and the WY/MT State line, southerly along HWY 120 to the junction of HWY 14 at the town of Cody, westerly along HWY 14 to the boundary of Yellowstone National Park, north along said boundary to the Wyoming/Montana State line, east along said line to its intersection with HWY 120.

Unit 2 – Beginning at the junction of HWY 120 and HWY 14 in the town of Cody, southerly along HWY 120 to the Greybull River; southwesterly up said river to the Wood River; southwesterly up said river to the Shoshone National Forest Boundary; southerly along said boundary to the boundary of the Wind River Indian Reservation, westerly and then southwesterly along said boundary to its junction with HWY 26/287, northwesterly along HWY 26/287 to the boundary of Grand Teton National Park, northerly along said boundary to the east boundary of the John D. Rockefeller Memorial Parkway, north along said boundary to Yellowstone National Park boundary, easterly and then northerly along Yellowstone National Park boundary to the junction of HWY 14, easterly along HWY 14 to the junction with HWY 120 in the town of Cody.

Unit 3 – Beginning at the boundary of the Wind River Indian Reservation and the junction of HWY 26/287, southerly along said boundary to the Continental Divide; southeasterly along said divide to the Middle Fork of Boulder Creek; westerly down said creek to Boulder Creek; westerly down said creek to the Bridger-Teton National Forest boundary; northwesterly along said boundary to its intersection with U.S. Highway 189-191; northwesterly along said highway to the intersection with U.S. Highway 26-89-191; northerly along said highway to Wyoming Highway 22 in the town of Jackson; westerly along said highway to the Wyoming-Idaho state line; north along said State line to the Yellowstone National Park boundary, east along said boundary to the east boundary of the John D. Rockefeller Memorial Parkway, southerly along said boundary to the boundary of Grand Teton National Park, easterly and southerly along Grand Teton National Park boundary to HWY 26/287, southeasterly along HWY 26/287 to the Wind River Indian Reservation boundary.