# WYOMING WOLF RECOVERY
# 2007 ANNUAL REPORT

***A cooperative effort by the U.S. Fish and Wildlife Service, National Park Service, and USDA Wildlife Services***

Photo by: Sarah Dewey NPS

This cooperative report presents information on the status, distribution, and management of wolves in Wyoming, including Yellowstone National Park, from January 1, 2007 through December 31, 2007.



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## SUMMARY

The total gray wolf (*Canis lupus*) population in Wyoming (WY) increased approximately 15% from 311 wolves in 2006 to 359 wolves in 2007. The number of wolves in WY was derived from the entire State of WY including Yellowstone National Park (YNP); however, wolf recovery occurred primarily in the northwest section of the state. The number of wolves in YNP increased 26% from 136 wolves in 2006 to 171 in 2007. YNP had 11 packs with an average pack size of 14.2 wolves. Pack size ranged from 4 to 22. Wolf numbers in WY outside YNP increased slightly from 175 wolves in 2006 to 188 wolves in 2007. WY outside YNP had 25 packs with an average pack size of 6.9 wolves. Pack size ranged from 2 to 13.

Breeding pairs in the State of WY slightly decreased from 25 in 2006 to 24 in 2007. YNP had 10 breeding pairs in 2007. Average litter size was 5.8 pups. Eleven packs produced >64 pups surviving through 31 December; however, 1 pack was not officially counted as a breeding pair due to the loss of both breeding wolves in the pack prior to 31 December. WY outside YNP had 14 breeding pairs in 2007. Average litter size was 4.5 pups. Fifteen packs produced >68 pups that survived until 31 December; however, 1 pack was not officially counted as a breeding pair due to the loss of 1 breeding wolf in the pack prior to 31 December.

Numerous ongoing research projects investigated predator-prey interactions, wolf population dynamics, disease, genetics, interactions between wolves and other predators, and livestock depredations.

We managed wolf population growth and wolf distribution in WY outside YNP to minimize chronic loss of livestock from wolves. In 2007, we reduced confirmed wolf

depredations by >55% compared to 2006 by aggressively removing chronically depredating wolves early in the grazing season. Sixty-three wolves (approximately 24% of the WY wolf population outside YNP) were lethally removed in control actions in 2007; however, we maintained the wolf population well above recovery objectives with 25 confirmed packs and 14 breeding pairs. In 2007, wolves killed >91 livestock (including 71 confirmed and 20 probable depredations) and 3 dogs (2 confirmed; 1 probable). Confirmed livestock depredations included 55 cattle (36 calves; 19 cows/yearlings) and 16 sheep (2 ewes; 14 lambs).

# GREATER YELLOWSTONE RECOVERY AREA - WYOMING

## PERSONNEL

### Personnel in Wyoming outside Yellowstone National Park

Wolves in Wyoming outside Yellowstone National Park (WY) were monitored by Project Leader Mike Jimenez U.S. Fish and Wildlife Service (USFWS), Susannah Woodruff (USFWS), Jim Pehringer (USDA Wildlife Services) (WS), Dylan Taylor (USFS), Steve Cain, Sarah Dewey (Grand Teton National Park), and volunteers Karen Colclough and Hilary Eisen. In 2007, the USFWS and WS combined funding for a third year to maintain a wolf management specialist position working under the direction of the USFWS and who is stationed in Cody, Wyoming.

USFWS law enforcement agents in Wyoming were Dominic Domenici (Resident Agent-in-Charge, Casper), Tim Eicher (Special Agent, Cody), and Roy Brown (Special Agent, Lander).

Wyoming employees of WS who were involved with wolf management in 2007 included State Director Rod Krischke, District Supervisors Craig Acres and Merrill Nelson, Roberta Despain, Vivian Meek, Asst. District Supervisor Rod Merrell, Specialists Jim Pehringer, Arnold DeBock, Tracy Frye, Michael Peterson, Chuck Bunch, Jeremy Johnson, Wade Jones, Dave Fowler, Steve Richins, Shane Huseby, Brad Seaman, Dave Johnson, Phil Heagy, Beldin Grant, Dan Bragg, and Pilots Miles Hausner, Kelly Huseby, and Ted Jensen.

### Personnel in Yellowstone National Park

Five full-time employees worked for the Yellowstone Wolf Project in 2007: Project Leader Douglas Smith and Biological Science technicians Erin Albers, Debra Guernsey, Rick McIntyre and Matthew Metz. Daniel Stahler split time between graduate work at UCLA and working in the park as the project biologist. Other paid and volunteer staff were as follows: Colin Bennell, Kira Cassidy, Nick Ehlers, Julie Kray, Scott Laursen, Nicole Legere, Sarah Malick, Jerod Merkle, Abby Nelson, Audrey Squires, Trina Wade, and Libby Williamson. Some of these people were paid technicians through the

Yellowstone Park Foundation and Yellowstone Association. For the volunteers they worked a total of 4,660 hours which was equivalent to about 2 full time GS 5 positions worth $8,730.

## MONITORING

### Monitoring in Yellowstone National Park

***Population Status:*** At the end of 2007 at least 171 wolves in 11 packs (10 breeding pairs), 3 non-pack groupings, and 7 loners occupied Yellowstone National Park (YNP) (Appendix Table 2). This represents a 26% increase over the 2006 population and is approximately equal to the population peak in 2003 (174 wolves). Both the northern range (NR) and interior wolf population increased, but despite the smaller area (11% of the park), the NR still had 55% of YNP wolves.

There was one new pack present in 2007, Gardner's Hole, but the status of this pack at the end of the year was unknown but it had likely dissolved meaning no new packs formed in 2007, a first since reintroduction.

Five packs (81 wolves, up 8% from 75) plus 13 wolves unassociated with packs made up the NR wolf population (25% total increase). Despite more wolves this is two fewer packs than 2006 as the Hellroaring Creek and Swan Lake packs are gone. The increased population is due to larger pack size for the remaining packs. Six packs (75 wolves, up 23% from 61) plus 2 loners make up the interior wolf population (26% total increase). No packs were lost nor were any gained although the status of the Hayden Valley pack was uncertain at the end of the year due to the loss of both breeding wolves (e.g., alphas). This pack existing between two larger packs, Mollies to the east and Gibbon Meadows to the west, was attacked in late October by Mollie's and both alphas were killed. The remaining 4 wolves, 3 pups and one yearling, wandered the park, but none of these wolves were radio collared so it was hard to track their movements and document their status. Pack size ranged from 4 (Hayden Valley at year's end) to 22 (Yellowstone Delta) and averaged 14.2, an increase compared to 2006 (pack size = 10.5) and this was mostly attributable to the increase in pack size for NR wolves.

Wolf-wolf clashes were again documented in 2007, especially on the northern range where wolf density is highest.

Average age at death has increased nearly every year and two especially old wolves died in 2007: male wolf #193 from Mollies's pack at 9 years of age (a mange related death, the first documented in the park) and male wolf #113 from the Agate Creek pack at 10 years of age. Both wolves held alpha status late into their life. In #113's case he remained in the pack after losing his dominant status, being tolerated by his son the new alpha, which seems to be an unusual occurrence for ex-alpha female wolves (ex-alpha females are not usually tolerated in the pack). Other notably old wolves are female #151, alpha female of the Cougar Creek pack who is 9 years of age, and female #126 presumably the alpha of the Delta pack at 10 years of age.

Across the park wolf distribution was unchanged, and has been so for several years indicating that all available wolf habitat is settled. Pack turnover, when it occurs, is always within the occupied wolf range and new areas of settlement have so far not been recorded.

Twenty-two wolves were radio collared by helicopter darting in 2007 and 33% of the wolves were collared in 91% of park packs at the end of the year.

***Reproduction*:** Pup survival was excellent in 2007 (83% not counting over-summer mortality). Total pups survived was 64 or 37% of the population was pups at year's end (a total of 77 pups were counted at dens). All 11 packs reproduced but due to the loss of both the alpha male and female in the Hayden Valley pack at the end of the year this pack did not count as a breeding pair. Three packs had >1 litter of pups, one of which was the Hayden Valley pack which was the first pack in the park interior to have >1 litter. The other two packs were both from the northern range: Slough Creek and Oxbow Creek. Average litter size/pack (pups counted at dens in May and June) was 7.0 (this does not account for >1 female breeding) and average pups survived/pack (pups counted with packs in November/December) was 5.8.

Wolf Project staff visited every den site except Delta, Bechler and Gibbon Meadows.

***Mortalities*:** Not counting over-summer pup mortality, 6 collared wolves died in 2006. These included 2 old adults (> 5 years) and 4 adults (2-5 years). Four males and 2 females died. Again the leading cause of mortality (67%) was intraspecific strife.

**Yellowstone National Park Wolf Packs in 2007**

1) *Leopold*: (16 wolves: 13 adults/3 pups) The Leopold pack continues to thrive on their longtime territory centered around the Blacktail Deer Plateau. The pack continues to be led by the alpha pair of 534M and 209F (who bred together for the fourth time during 2007). The pair produced the only litter of pups for the pack, of which at least three of the four survived to year's end. This pack was the subject of intensive summertime study due to the presence of a downloadable GPS collaring recording fixes on the wolf 48 times/day (also see Summer Predation section).

2) *Oxbow Creek*: (16 wolves: 8 adults/8 pups) This pack had two litters totaling 11 pups, but one of those litters was only 1 pup and it died when the pack moved from their natal den to a second den site. Eight pups survived to years end. This pack exists in an area of high pack turnover, being the fourth pack in ten years to occupy this territory. Other territories nearby had only one pack in the same period.

3) *Agate Creek:* (17 wolves: 8 adults/9 pups) Nine pups were born and all of them survived until the end of the year. The long time alpha male was injured before the breeding season so did not breed in 2007 but his son did. He was tolerated in the pack until his death in October dying at 10 years of age.

4) *Slough Creek:* (16 wolves: 7 adults/9 pups) In late 2006 this pack lost its alpha male due to intraspecific aggression. The breeding vacancy was quickly filled by a wolf from a neighboring pack, but this wolf was hit by a car in September. Another yearling from Agate replaces this alpha. Three wolves in this pack were killed by wolves from neighboring packs, one of these had a broken foot that had fused possibly inhibiting her ability to escape the attack. Nine of 11 pups survive to year end.

5) *Druid Peak:* (16 wolves: 9 adults/7 pups) Excellent pup survival as all seven pups born survived. Denned near a backcountry campsite where a permit was mistakenly issued and use of the site caused wolves to prematurely abandon the natal den moving the pups to another more remote site. Attacked neighboring Slough Creek pack at least twice killing two wolves.

6) *Mollie's Pack: (14 wolves: 9 adults/5 pups)* Occupied its typical territory in Pelican Valley but began moving west into Hayden Valley usurping territory and killing Hayden Valley wolves (killed both alphas). Longtime alpha male died at 9 years of age from mange related problems – first mange related death recorded in YNP. Continued to prey on bison in winter and face competition from grizzly bears over use of carcasses.

7) *Yellowstone Delta:* (22 wolves: 16 adults/6 pups) The largest pack in YNP living in the remote southeast corner of the park and into Wyoming this pack has traditionally denned in YNP and continued to do so in 2007. Difficult to collar, 5 wolves were collared in 2007, and this pack has been the subject of cooperative studies between WY Game & Fish Department and YNP.

8) *Bechler:* (11 wolves: 8 adults/3pups) Like Delta this pack is difficult to collar and keep collars in, by the end of the year despite an ARGOS collar only the long-time, and old (9 years) alpha male was left radioed. Denning and spending much of their time in YNP, they also range into Wyoming and Idaho.

9) *Cougar Creek:* (7 wolves: 3 adults/4 pups) Living on the west side of the park near West Yellowstone they rarely leave YNP despite living close to the boundary. They did not produce pups in 2006 possibly due to the age (9 years) of the breeding female but successfully produced 4 pups this year doubling the size of this small pack.

10) *Gibbon Meadows:* (17 wolves: 11 adults/6 pups**)** A large and stable pack in the Madison-Firehole area of YNP they increased by 5 wolves in 2007. Like Mollie's pack in winter this pack has many bison available, but more elk. Unlike previous winters they preyed more on elk than bison.

11) *Hayden Valley:* (4 wolves: 1 adult/3 pups – NOT a BP) Living the past several years in Hayden Valley between two larger packs (Mollie's and Gibbon Meadows) this pack finally got squeezed out by Mollies. In late October Mollie's killed both alphas and in the remainder of the year the remaining wolves traveled widely. During these travels a pup was probably killed by the Gibbon Meadows pack near Old Faithful. They had two

litters this year, the first time this was documented in an interior pack and it occurred by an adult female being bred outside the pack and then returning. They have no radio collars.

*Other wolves:* Several temporary or unknown associations of wolves or groups along with loners made up the remainder of the YNP wolf population. The 2006 Hellroaring pack dissolved and the Gardner's Hole pack which formed in the same area as the Swan Lake pack likely broke up at year's end as well. Wolves from both the Leopold and Slough Creek packs traveled separately from their pack and associated with various other wolves during late 2007.

**Monitoring in Wyoming outside Yellowstone National Park**

***Population status:*** We combined 3 census techniques to estimate the total number of wolves in WY: 1) direct observations of wolves; 2) winter track counts of wolves traveling in snow; and 3) confirmed reports of wolf sightings from other agencies. We defined a pack as ≥2 wolves traveling together using a defined home range. A breeding pair was defined as ≥2 adults producing ≥2 pups that survived through 31 December of that year. We counted the number of wolves in packs containing radio collared wolves using visual observations from the ground and aerial telemetry flights. We tracked wolves in winter and counted the different sets of wolf tracks in snow. In areas where repeated sightings were confirmed, we incorporated those observations into our estimates. We averaged the high and low population estimates to calculate other statistics used to describe the wolf population in WY. Visual observations from telemetry flights in early January 2008 were also used to improve our year-end estimates.

From 1999 through 2007, we maintained radio collars on 20-30% of the wolf population in WY each year to monitor their movements, locate den and rendezvous sites, document breeding success, locate wolves to mitigate livestock conflicts, and aid in law enforcement. We used VHF radio collars for general monitoring purposes and used various types of GPS collars for specific research projects. In 2007, we monitored 52 radio collared wolves (30% of the population) in 16 packs (64% of the packs). A total of 36 wolves were radio collared in 2007 (24 wolves were collared by USFWS; 10 wolves by WS; 2 wolves were trapped by a coyote trapper and collared by the USFWS). Twelve wolves from 7 different packs were collared with Argos GPS collars that were scheduled to last from January 2007 through January 2008; however, only 3 of those collars were still fully functioning in January 2008.

As of 31 December 2007, we estimated that >188 wolves inhabited western WY in 2007. Twenty-five packs contained 172 wolves (Table 1) and another >16 wolves (single wolves and smaller groups of wolves with unknown breeding status) were located throughout the western portion of the state (Table 2). Pack size ranged from 2 to 13 and averaged 6.9 wolves.

**Table 1.** Composition of confirmed wolf packs in WY in 2007.

| Pack name | # adults | # pups | # wolves |
|---|---|---|---|
| 1) Beartooth | 4 | 4 | 8 |
| 2) Sunlight | 7 | 4 | 11 |
| 3) Absaroka | 2 | 0 | 2 |
| 4) Pahaska | >2 | ? | >2 |
| 5) South Fork | 6 | 4 | 10 |
| 6) Greybull River | 4 | 4 | 8 |
| 7) Gooseberry | 1 | 5 | 6 |
| 8) East Fork | 4 | 4 | 8 |
| 9) Washakie | 5 | 6 | 11 |
| 10) Togwotee | 6 | 4 | 10 |
| 11) Gros Ventre | 5 | 8 | 13 |
| 12) Pacific Creek | 9 | 4 | 13 |
| 13) Snake River | 5 | 6 | 11 |
| 14) Huckleberry | 3 | 2 | 5 |
| 15) Buffalo | 7 | 6 | 13 |
| 16) Teton | 3 | 5 | 8 |
| 17) Pinnacle Peak | 6 | ? | 6 |
| 18) Daniel | 4 | 0 | 4 |
| 19) Green River | 4 | 2 | 3 |
| 20) Black Butte | 2 | ? | 2 |
| 21) Soda Lake | 5 | ? | 5 |
| 22) Big Piney | >2 | ? | >2 |
| 23) La Barge | >2 | ? | >2 |
| 24) Prospect | >3 | ? | >3 |
| 25) Kemmerer | >3 | ? | >3 |
| Total: | 104 | 68 | 172 |

**Table 2.** Misc. wolves and unconfirmed packs in WY:

| Pack/general area | # adults | # pups | # wolves |
|---|---|---|---|
| Carter Mtn. | 1 | 0 | 1 |
| Big Horn Mtns. | ≥2 | ? | ≥2 |
| Bliss Creek | ? | ? | ? |
| Driggs | >2 | ? | >2 |
| S. of Rock Springs | >4 | ? | >4 |
| Misc. dispersers | 7 | ? | 7 |
| Total: | 16 | ? | 16 |

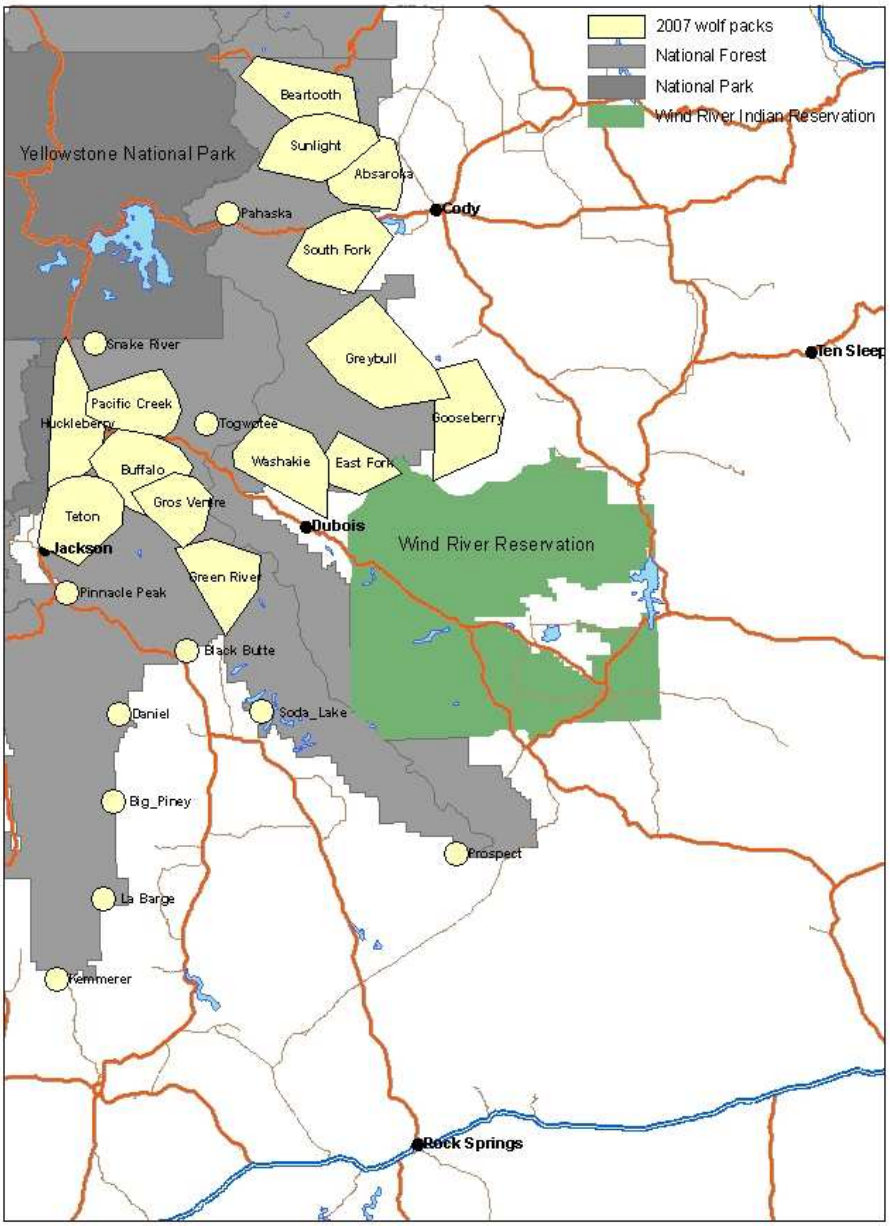


**Figure 1**. Home ranges of confirmed wolf packs in Wyoming 2007.

***Reproduction:*** Fifteen packs produced at least 68 pups that survived through December 2007; however, only the following14 packs were counted as breeding pairs: Washakie, Pacific Creek, Beartooth, Sunlight, South Fork, Green River, Greybull River, Buffalo,

Gros Ventre, Snake River, East Fork, Togwotee, Teton, and Huckleberry (Appendix Tables 4a and 4b). Mean litter size was 4.5 pups per litter (Figure 2). The Gooseberry Packs produced ≥2 pups that survived through December 2007; however, only one adult in the pack survived and therefore, the pack was not considered a breeding pair. We were not able to confirm pup production in 9 packs: Pinnacle Peak, Pahaska, Prospect, Big Piney, Kemmerer, Daniel, Black Butte, Soda Lake, and La Barge.

***Population growth:*** In 2004, we reported that the wolf population increased 23% from 82 wolves in 2003 to 101 wolves in 2004. In 2005, the wolf population increased 33% from 101 wolves in 2004 to 134 wolves in 2005. The number of wolves increased 31% in 2006 to >175 wolves. The wolf population in WY increased only 7% to 188 wolves in 2007 (Figure 3).

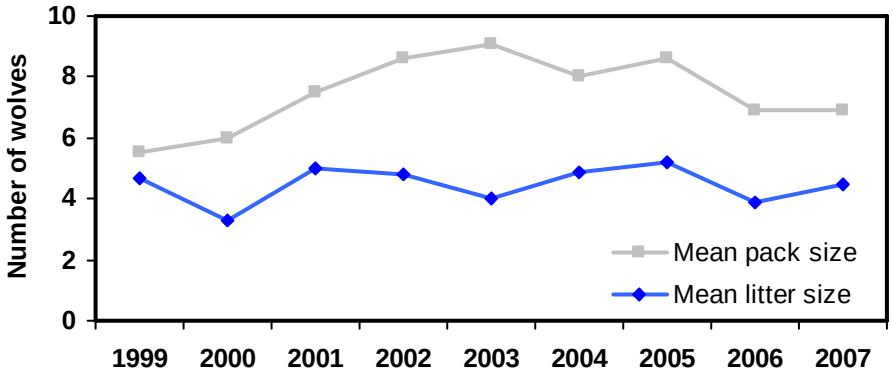


**Figure 2**. Mean pack size and mean litter size for wolves in WY from 1999 through 2007.

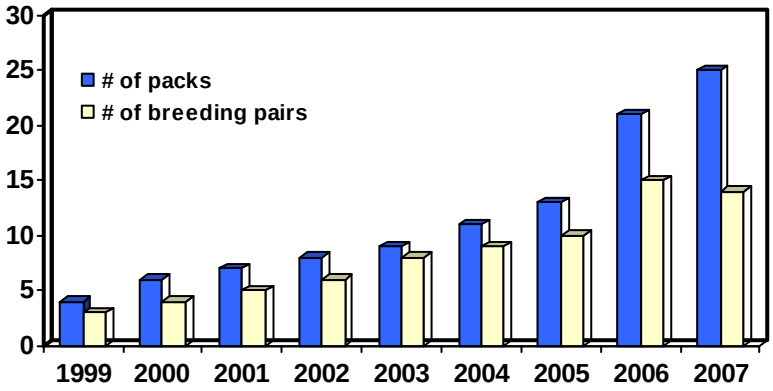


**Figure 3.** Number of wolf packs and breeding pairs in WY 1999 – 2007.

***Mortalities:*** In 2007, a total of 75 wolves (29% of the total population) were known to have died in WY. Causes of mortality included: control = 63 (83% of documented mortality); under law enforcement investigation = 5 (7%); natural = 2 (3%); other causes = 3 (4%); and unknown =2 (3%).

***Disease Surveillance:***

Mange

Sarcoptic mange is a highly contagious skin disease caused by mites (*Sarcoptes scabiei*). Mange is commonly reported in mammals throughout the world, including wolves from Canada, Alaska, Wisconsin, Minnesota, and Michigan. From 1995 through 2007, we identified wolves infested with sarcoptic mange in WY and Montana. We predict that mange infestation in the northern Rocky Mountain wolf population will progress as it has in other parts of North America by affecting local wolf packs in episodic fashion, but will not threaten regional wolf population viability.

Sarcoptic mange was first documented in WY in 2002, when a severely mange-infested wolf from the Absaroka Pack, east of YNP, was captured and radio collared. In 2003 and 2004, mange was documented in the Sunlight and Absaroka Packs in the Sunlight Basin area. Three wolves infested with mange from the Sunlight Pack were collared in 2004; however, none of the wolves from the Sunlight Pack appeared to have mange in 2005 or 2006. We suspect the wolves infested with mange in the Absaroka Pack died in winter 2005. In spring 2006, other healthy wolves recolonized the area and continued to use the same general home range of the old Absaroka Pack. However, in summer 2006, several wolves in this re-established Absaroka Pack were again infested with mange. YNP wolf #453m dispersed from the Slough Creek Pack and settled within the home range of the Absaroka Pack in spring 2006. Wolf #453m became severely infested with mange, began harassing livestock, and was eventually shot in a control action in 2006 for killing cattle.

In 2007, we documented mange in the Absaroka, Sunlight, South Fork, and Pacific Creek Packs. Mange was not detected on all members of the packs once a pack member was diagnosed with mange. We identified some wolves in the Absaroka and Sunlight Packs that had recovered from previous mange infections.

Canine Distemper and Canine Parvovirus

Canine distemper (CDV) and canine parvovirus (CPV) are highly contagious diseases that infect domestic dogs, coyotes, fox, raccoons, skunks, and wolves. Forty-five percent of WY wolves tested since 2001 were exposed to CDV and 97% of wolves tested were exposed to CPV. No evidence suggests that CDV or CPV are significant causes of mortality of wolves in WY in 2007.

# RESEARCH

## Research in Yellowstone National Park

### *Wolf-Prey Relationships*

Wolf–prey relationships were documented by observing wolf predation directly and by recording the characteristics of wolf prey at kill sites. Wolf packs were monitored for two winter-study sessions during which wolves were intensively radio-tracked for 30-day periods in March and from mid-November to mid-December. The Leopold, Druid Peak, Agate Creek (March 2007), and Oxbow Creek (November-December 2007) packs were the four main study packs monitored by three-person ground teams and all packs parkwide were monitored from aircraft. In addition, ground crews opportunistically monitored the Slough Creek, Hellroaring, and Mollie's packs collecting prey selection and kill rate data. The Cougar Creek, Hayden, and Gibbon Meadows packs were monitored from aircraft only. The Yellowstone Delta and Bechler packs were rarely located by ground or air due in part to their absence from the park or poor conditions for aerial monitoring in southern YNP. Project staff recorded and entered into a database behavioral interactions between wolves and prey, predation rates, the total time wolves fed on their kills, percent consumption of kills by wolves and scavengers, characteristics of wolf prey (e.g., sex, species, nutritional condition), and characteristics of kill sites. In addition, similar data were collected opportunistically throughout the year during weekly monitoring flights and ground observations.

### *Composition of Wolf Kills*

Project staff detected 323 kills (definite, probable, and possible combined) made by wolves in 2007, including 272 elk (84 %), 11 bison (3.4%), four deer (1 %), three moose (<1%), one pronghorn (<1%), one golden eagle (<1%), four coyotes (1%), two black bears (< 1%), one red fox (<1%), one otter (<1%), seven wolves (2%), and 16 unknown prey (5%). The composition of elk kills was 21 % calves (0–12 months), 16 % cows (1-9 years old), 12 % old cows (≥ 10 years old), 41 % bulls, and 10 % elk of unknown sex and/or age. Bison kills included six calves (unknown sex), three bulls, and two unknown sex adults.

Preliminary examination of winter predation rates in 2007 shows a decrease in kill rate compared to earlier years. Winter predation rates for the period of 1995-2000 showed wolves residing on the northern range killed an average of 1.8 elk/wolf/30-day study period. Changes in prey selection (shift to bull elk from elk calves) and an increase in scavenging on winter-killed ungulates by wolf packs factor in to this decrease in kill rates.

### *Winter Studies*

***March*** **-** During the 2007 March winter study (30 days), study packs were observed for 372 hours from the ground. The number of days wolf packs were located

from the air ranged from 8 (Hellroaring) to 21 (Leopold). Sixty-six definite or probable wolf kills were detected, including 57 elk, six bison, two moose, and one unknown species. Among elk, 14 (25%) were calves, 13 (23%) were cows, 29 (51%) were bulls, and one (2%) was of unknown sex adult. In addition, 14 ungulates (10 bison, three elk, one moose) that died from other natural causes were scavenged by wolf packs. Documenting the consumption of biomass from ungulates not killed by wolves is important to explaining variation in kill rates through time. Lower than expected kill rates, particularly for larger wolf packs, can sometimes be explained by increased scavenging of winterkilled ungulates.

***November-December -*** During the 2007 November–December winter study (30 days), wolves were observed for 347 hours from the ground. The number of days wolf packs were located from the air ranged from 12 (Gibbon) to 14 (Leopold, Slough Creek, Oxbow Creek, Agate Creek, Druid Peak, Mollie's, Cougar Creek). Aerial monitoring was effected by poor weather conditions. Forty-seven definite or probable wolf kills were detected during the November-December 2007 winter study. Project staff only documented elk being killed by wolves, and their breakdown includes 14 (30%) cows, 18 (38%) bulls, 14 (30%) calves, and one (2%) were of unknown sex and age.

After a switch to selection for calves in the early winter study of 2006, this year returned to the previous years' pattern of selection for bulls. Although difficult to test, we hypothesize that 2007's drought conditions resulted in poor forage quality, which when coupled with the energetically costly behavior of rutting bull elk, make this age and sex class more vulnerable to predation in early winter compared to females and calves.

### *Summer Predation*

In the summer of 2007, project staff continued efforts to document summer predation patterns of wolves. Documenting the predatory habits of wolves in summer is problematic due to the lack of snow for tracking, increased nighttime activity of wolves, lack of pack cohesiveness, and smaller prey packages leading to quick consumption and loss of evidence. Traditionally, the best data concerning wolf summer food habits have come from analysis of scat contents collected at den and rendezvous sites. Although this effort on scat collection continued in 2007, GPS collar technology was used to facilitate a greater understanding of summer predation patterns.

In the 2007 capture season, the Wolf Project deployed three downloadable GPS (Global Positioning System) collars on the northern range to enhance understanding of: 1) seasonal predation patterns; 2) spatial and temporal interactions with other wolf packs and other carnivores; 3) movements with respect to dens during pup rearing season; and 4) territory size, use, and overlap. Using GPS collars with downloadable data acquisition technology, the goal was to perform weekly data gathering on collars programmed to collect location data every 30 minutes. This approach has proven successful in prior years for summer predation studies by yielding high-resolution wolf movement data revealing wolf prey selection and kill rates, even for newborn elk calves.

As has been the case over the past several years, malfunctioning collars made summer predation patterns challenging to document. Oxbow wolf 589F and Druid 570M had GPS collars that failed shortly after collaring. However, the GPS collar deployed on a Leopold yearling female (593F) functioned well, allowing us to obtain our best summer predation sequence to date. Project staff worked intensively to locate and perform weekly downloads on 593F's collar, as well as map and search clusters for potential kills. Over the summer, crew members hiked over 450 miles in the Leopold pack's territory to investigate clustered GPS points. During this effort, a total of 30 wolf kills were documented including 29 elk (58% bulls, 17 % cows, 24% calves) and one mule deer doe. Several patterns emerged. First, there was a selection for bulls overall, which may reflect seasonal vulnerability, as well as availability in the Leopold pack's territory. The majority of bull elk (80%) killed in May had gelatinous bone marrow, indicating that they had still not recovered from winter's effects. Second, as the summer progressed, wolves began to utilize elk calves and cows more, indicating a response to their availability and vulnerability within their territory. More intensive field work and modeling efforts are planned for summer 2008 to understand the relationship between pack size, prey availability, and number of GPS collared wolves to elucidate summer predation patterns.

**Population Genetics**

Collaborative efforts between the Wolf Project and the University of California, Los Angeles continued in 2007. With Dan Stahler attending UCLA for the first half of 2007, the Wolf Project and members of the Dr. Robert Wayne's canid genetics lab published the first round of analyses on Yellowstone wolf genetics in the journal *Molecular Ecology* (see Publications for 2007). These analyses addressed an important question concerning the reintroduction of endangered species by examining the degree to which genetic variation is preserved and the behavioral mechanisms involved. By analyzing DNA from hundreds of Yellowstone wolves over the first 10 years of recovery, it was found that the population maintained high levels of genetic variation with low levels of inbreeding. The genealogies of major pack lineages were reconstructed based on genetic and field data allowing us to discover that Yellowstone wolves avoid inbreeding through a wide variety of behaviors, including absolute avoidance of breeding with related pack members, male-biased dispersal to packs where they breed with non-relatives, and female-biased subordinate breeding. We documented a greater diversity of breeding patterns in Yellowstone than previously observed in any other natural wolf population. Inbreeding avoidance is nearly absolute despite the high probability of within-pack inbreeding opportunities and extensive kinship ties between adjacent packs.

In addition to this publication, a larger scale analysis of genetic diversity and gene flow between the three Rocky Mountain recovery areas was nearly complete at the end of 2007. These analyses will address issues of population connectivity and migratory exchange among recovery areas and the importance this has for genetic diversity and long-term population sustainability.

## Collaborative Research

The wolf project and Yellowstone Park Foundation provided financial and in-kind support for collaborative research with scientists at other institutions, including universities, interagency divisions, and non-government research organizations. These investigations required wolf project staff to assist graduate students and outside researchers in their efforts to better understand wolf ecology, ecosystem function, and conservation work, much of which is pioneering research.

## Wolf Project Students: Direct Assistance

Three students worked in collaboration with the Wolf Project in 2007: Daniel Stahler, Emily Almberg, and Matt Metz. All three are long-time employees on the project that have moved on to work in a new capacity and are partially supported by project funding. Dan's project focuses on combining behavioral data gathered in the field with genetic data gleaned from blood samples and overlaying the two techniques to better understand wolf social behavior. Dan works with Dr. Robert Wayne at the University of California at Los Angeles. Emily's project focuses on wolf diseases both from a current and historical perspective. With severe mortality caused by disease in 2005, and evidence of a smaller outbreak in 1999, Emily plans to fully explain the role of diseases for wolf population ecology. Emily works with Dr. L. David Mech and the University of Minnesota. Matt's project will focus on summer predation patterns in wolves by incorporating downloadable GPS collar technology and modeling techniques. Matt will be working with Dr. John Vucetich and Michigan Technological University.

*Title*: Behavioral, ecological, and genetic influences on life-history strategies and social dynamics of gray wolves.
*Graduate Student*: Daniel Stahler, doctoral student
*Committee Chair*: Dr. Robert Wayne, University of California, Los Angeles
*Project Summary*: The evolution of complex societies, such as seen in wolves, is greatly influenced by how ecological and social constraints impact population structure and mating systems. In combination with the underlying genetic structure of wolf packs, aspects of wolf ecology such as reproduction, dispersal, pack formation, and territoriality is predicted to vary with the abundance and distribution of resources. This research will investigate the link between socioecological conditions and these aspects of wolf ecology in Yellowstone. This project will take advantage of long-term datasets following the 1995 reintroduction: 1) a complete population pedigree of marked individuals resulting from the integration of molecular and field-based behavioral data; and 2) predator-prey and wolf population dynamics. By combining field and laboratory-based data, this study will ask questions concerning breeding strategies, reproductive success, territoriality, and pack interactions and how it is associated with kinship and ecological condition. By combining long-term ecological, behavioral, and molecular datasets, this study will enhance our understanding of the evolution of complex, kin-structured societies, as well as provide a better understanding of how social and ecological conditions are related to wolf population dynamics and conservation.

*Project Activity in 2007*: Coursework, wrote research proposal, conducted field work, published paper on Yellowstone genealogy and genetic diversity.
*Anticipated Completion Date*: 2010

*Title*: A comprehensive survey of the infectious diseases and parasites of Yellowstone wolves: Implications for population dynamics and management
*Graduate Student*: Emily Almberg, doctoral student
*Committee Chair*: Dr. L. David Mech, University of Minnesota, St. Paul
*Project Summary*: In 1999 and 2005, the Yellowstone wolf population experienced significantly reduced pup recruitment suggestive of a disease outbreak. Despite fuelling abundant speculation, these two suspected outbreaks have highlighted how little is known about the presence and role of disease in the Yellowstone wolf population. The present study seeks to (i) identify and describe the spatial and temporal patterns of select pathogens and parasites in the Yellowstone National Park (YNP) and the Greater Yellowstone Ecosystem (GYE) wolf populations, (ii) to attempt to understand the impacts of disease on population parameters such as adult wolf mortality and pup survival, (iii) to track the distribution, prevalence, and population-level effects of sarcoptic mange among wolves in YNP and the GYE, and (iv) to address the potential role of domestic dogs and sympatric carnivores in pathogen/parasite invasion and persistence in YNP. The study will begin its first field season in summer, 2007.
*Project Activity in 2006*: Coursework and development of research questions.
*Anticipated Completion Date*: May, 2010

*Title*: Summer patterns of prey selection and kill rates for gray wolves.
*Graduate Student*: Matt Metz, master's student
*Committee Chair*: Dr. John Vucetich, Michigan Technological University
*Project Summary*: The summer predation patterns of wolves are mostly unknown, which creates an important gap of knowledge with regards to wolf yearly kill rates. Currently, wolf kill rates from winter are often projected throughout the year in order to estimate a wolf's impact on the prey population for the entire year. This likely overestimates kill rates (at least in kg/wolf/day, not necessarily in ungulates/wolf/day) due to the data being gathered only in winter, when adult prey become increasingly vulnerable. This data has often been projected for the entire year because of the difficulty of finding kills in the summer due to a lack of snow and increased plant foliage. Additionally, the need to provide for pups and the utilization of small prey items change the foraging strategy of wolves in the summer. Finally, the presence of both grizzly and black bears in Yellowstone may cause wolves to spend only a short time period at a kill. Due to these challenges, GPS collars deployed on individual wolves will help to identify and search clusters in an attempt to find summer kills and then examine their characteristics. Additionally, ecological modeling approaches will be used to incorporate variables of the wolf, pack, landscape, prey, and time of year to improve accuracy of predation rate estimates. *Project Activity in 2007*: Summer fieldwork of GPS collar download and cluster search, development of research questions.
*Anticipated Completion Date*: May, 2010

**Other Research or Collaborative Work with the YNP Wolf Project**

| *Topic* | *Collaborator* | *Institution* |
|---|---|---|
| Wolf-cougar interactions | Toni Ruth, | Wildlife Conservation Society |
| Wolf-coyote interactions | Robert Crabtree, Jennifer Sheldon | Yellowstone Ecological Research Center |
| Wolf-bear interactions | Charles Schwartz, Mark Haroldson, Kerry Gunther | Interagency Grizzly Bear Study Team, Bear Management Office/YCR |
| Wolf-carnivore interactions | Howard Quigley | Beringia South |
| Wolf population genetics | Robert Wayne, Bridgett vonHoldt, John Pollinger | University of California, Los Angeles |
| Wolf-elk relationships-Madison-Firehole Watershed | Bob Garrott, Matt Becker, Claire Gower, Shana Dunkley | Montana State University |
| Wolf-pronghorn | P.J. White, John Byers | YCR, University of Idaho |
| Wolf-willow | Evelyn Merrill, Francis Singer, Roy Renkin, Bill Ripple, David Cooper, Tom Hobbs, Don Despain, Nathan Varley | Univ of Alberta, USGS, YCR, Colorado State Univ. |
| Wolf –aspen | William Ripple, Eric Larsen, Roy Renkin, Matt Kauffman | Oregon State University, Univ of Wisconsin at Stevens Point, YCR, Univ. of Montana |
| Wolf –trophic cascades | L. David Mech; Mark Boyce, Nathan Varley; Rolf Peterson Dan MacNulty John Vucetich | USGS; University of Alberta; Michigan Technological University University of Minnesota |
| Wolf predation | Tom Drummer, John Vucetich, Rolf Peterson | Michigan Technological University |
| Wolf survival | Dennis Murray | Trent University |

**Research in Wyoming outside Yellowstone National Park**

*Wolf habitat selection in a variety of land-use types: assessing the impact of elk and cattle distribution on wolf habitat use and cattle depredation patterns in the Absaroka Range of Wyoming.*
*Graduate Student*: Abby Nelson, University of Wyoming, Laramie, Wyoming.
*Major advisors:* Matt Kauffman and Steven Buskirk, University of Wyoming.
*Cooperators*: U.S. Fish and Wildlife Service, USDA Wildlife Services, and Wyoming Game & Fish Department.
*Status*: Field work began in summer 2007.
*Project Summary:* In collaboration with the US Fish and Wildlife Service and the Wyoming Game and Fish Department, the University of Wyoming Cooperative Fish and Wildlife Research Unit is entering the second year of its Absaroka wolf-cattle study. The first objective of this study is to analyze the temporal changes in wolf habitat selection in response to seasonally driven elk and cattle distribution within two wolf pack territories in the Absaroka Range in Wyoming. The second objective is to locate wolf-killed cattle and native prey using fine-scale spatial data from wolf GPS collars. Ultimately, an analysis of kill sites incorporating wolf habitat use, ungulate distribution and landscape attributes will provide a gradient of risk for cattle depredations and will provide wildlife managers with information on species, age and sex of native wild ungulates that are killed by wolves in the study area.

To meet the first objective, wolf habitat selection information was collected throughout 2007 by six Argos GPS collars. In summer 2007, to address the second objective, kills were located in the Sunlight and Absaroka pack territories by searching GPS location clusters based on a 20-minute fix rate. Ungulate distribution flights were conducted on a weekly basis to help determine the extent to which cattle depredations are mediated by the distribution of resident native prey. Eight depredations occurred in 2007 within the two packs' territories (1 within the cluster search period). Within the Absaroka and Sunlight packs, five deer, three bull elk, and ten elk calves were located as probable wolf kills. Non-wolf-killed carcasses found at GPS clusters included six cattle and one cow elk. Other prey items found at GPS clusters included one coyote, a skunk, a flicker and one unknown ungulate. Due to malfunctions with both GPS collars deployed for the predation study, the summer 2007 predation study period was truncated by 33%, resulting in a smaller than predicted sample of kills. In 2008, the six Argos GPS collars will be replaced and an additional field season will be conducted with three predation collars during summer and early fall.

*Absaroka elk ecology project*
*Graduate Student*: Arthur Middleton, University of Wyoming, Laramie, Wyoming.
*Major advisor:* Matt Kauffman, University of Wyoming.
*Cooperators*: U.S. Fish and Wildlife Service and Wyoming Game & Fish Department.
*Project Summary:* In collaboration with US Fish and Wildlife, the Wyoming Game and Fish Department and the University of Wyoming are entering the second year of the Absaroka Elk Ecology Project between Cody, Wyoming and Yellowstone National Park. The project's primary objectives are to 1) determine proportion of migratory and resident

elk in the Clark's Fork herd unit; 2) determine the routes and timing of seasonal movements by migratory elk; 3) increase understanding of elk use of private lands for improved habitat conservation; and 4) understand the influence of wolves on elk habitat use, movements, and behavior. To meet these objectives, the project relies on a sample of approximately 60 GPS-collared elk cows in the Clark's Fork Herd Unit, and two GPS-collared wolves in each of the three wolf packs—Sunlight, Absaroka, and Beartooth Packs—that prey on the Clark's Fork elk. Starting in winter 2008, a PhD student from the University of Wyoming's Cooperative Fish and Wildlife Research Unit will complement this accumulating spatial dataset on elk and wolf movements by conducting field observations on the behavior of collared elk and their surrounding groups. The body condition and pregnancy status of collared elk, sampled in biannual recaptures, will be related to three winters' habitat selection, movement, and behavioral data to address questions of how temporal, spatial, and individual gradients of elk condition might influence elk responses to wolf predation risk. Ultimately, the study aims to address multiple applied questions directly relevant to elk and wolf management, as well as ongoing conceptual questions relevant to our understanding of ungulate-predator interactions in large-scale temperate ecosystems.

*Winter predation patterns of wolves near Jackson, Wyoming:* USFWS Wolf Recovery Program, Jackson, Wyoming.
*Cooperators*: Grand Teton National Park, National Elk Refuge, Bridger-Teton National Forest, and Wyoming Game and Fish Department.
*Project Summary:* We used VHF radio telemetry to monitor the movements of collared wolves near Jackson, Wyoming. We tracked wolves in the snow from December through March each year to locate 330 carcass remains of ungulates killed or scavenged by wolves in winter from 2000 though 2007. Winter prey species consisted of 95% elk (*Cervus elaphus*), 4% moose (*Alces alces*), 0.7% deer (*Odocoileus hemionus*), and 0.3% bison *(Bison bison)*. Prey composition of elk killed by wolves was 39% cows, 15% bulls, and 46% calves. Prey composition of moose killed in winter was 53% cows and 47% calves. Mean age of adult elk killed was 9.3 years, and the oldest elk was 23 years old. Prior to wolf recolonization in 1999, elk and moose calf/cow ratios declined from 1989 through 1999, and the 10-year average ratio was 28.8 elk calves/100 cows and 41 moose calves/100 cows. Since wolf recolonization, calf/cow ratios averaged 25.5 elk calves/100 cows and 33 moose calves/100 cows.

**Other Collaborative Research Projects with the USFWS Wolf Recovery Program**

| Topic | Collaborators | Institution |
|---|---|---|
| Lead ingestion by scavenging carnivores in the Yellowstone ecosystem | Tom Rogers | Beringia South |
| Summer food habits of wolves near Jackson, Wyoming | Bonnie Trejo<br>Steve Cain | Grand Teton National Park |
| Population genetics of wolves in the GYA | Robert Wayne<br>Bridgett vonHoldt | Univ. of California, Los Angeles |
| Wolf Movements/Dispersals | Douglas McWhirter, L.D. Mech, Doug Smith | Wyoming Game & Fish<br>USGS, NPS |

## MANAGEMENT

### Management in Yellowstone National Park

#### *Area Closures*

On the Northern Range, temporary closures were instituted around the den sites of the Oxbow Creek, Slough Creek, and Druid Peak packs during the highly sensitive periods following the birth of pups. All closures were lifted by mid-May. In the interior, the Hayden Valley pack denned close to a trail and were highly visible from the road, leading to a temporary closure of a section of hiking trail and off-trail hiking. Despite this level of protection, this pack was viewed from across the Yellowstone River at close proximity to hundreds of people. This pack, possibly as a result of this close contact with people, has made them the most human tolerant of any pack in the park, a concern both for their and human welfare. Additionally, the uncollared Snake River pack that dens near the south entrance of the park had a temporary closure to off trail travel along a section of trail near their den site.

#### *Wolf Road Management Project (Formerly Druid):*

Since wolf reintroduction, Lamar Valley and other areas in the park have become premier locations worldwide to observe free-ranging wolves. The main pack of interest has been the Druid Peak pack, which had denned in the valley from 1997 through 2004. Since then when the Druid Peak pack has not been visible, other packs such as, Slough Creek or

Agate Creek, have been able to fill the void. Nonetheless, each year visitor numbers have grown and in 2000, the Yellowstone Center for Resources (YCR), Resource and Visitor Protection, and Division of Interpretation cooperated to better deal with the opportunities and problems that accompany increasing visitors that want to see wolves. As a result, the Druid Management Project was initiated, with the following objectives: 1) human safety: protect visitors that are viewing wolves alongside the road, and control both traffic along the road and parking to prevent an accident; 2) wolf safety: protect wolves from vehicle strikes, permit wolves to cross roadways without harassment from visitors, and protect the closed area around the den from visitor intrusion; 3) visitor enjoyment: through protection of natural wolf behavior, preserve visitor opportunity to view wolves and interpret wolf and other wildlife ecology to visitors; and 4) wolf monitoring and research: continue to monitor and study the denning behavior, predation, activity, and interactions of wolves with other wildlife. Since the Druid Peak pack is less visible than they were, the project has evolved to manage other packs and educate visitors where they encounter wolves.

The 2007 Druid Road Management Project season started on 5/29 and ended on 9/22, a period of 117 days. This was the eighth year of the project. At least 32,600 people observed wolves while our staff was working, an estimate that is considered an underestimate by independent researchers (J. Duffield et al., University of Montana) in the park who estimate the number of visitors observing wolves was closer to 310,046. Our staff made 8,775 visitor contacts and gave 230 informal talks to 2,300 visitors for a total of 11,075 visitor contacts. Wolves were in view for 750 hours and visible 117 out of 117 possible days to view them (sighted 100% of the days).

The 2007 season was very different from recent seasons. The Slough Creek Pack, a pack that had been very visible to visitors in other springs, denned out of sight of the road. The adult Slough wolves were only periodically visible during the first half of the season. In August and September, the pack used rendezvous sites that at times enabled visitors to see adults and pups.

The Druid Peak Pack also denned out of sight of the road and were not often visible during the early portions of our season. The Druids were more visible during the later part of the season. The Agate Creek Pack denned in their usual area at Antelope Creek and was occasionally visible during the first two thirds of the season. Around mid-August, visitors regularly saw the adults and pups. The Agates were visible for a much longer period in 2006 and far more visitors saw them that year.

Due to the lower number of wolf sightings during the first half of the season in our primary area, Yellowstone's Northern Range, the road management crew often traveled to Hayden Valley. The Hayden Valley Pack became very visible to visitors starting in early July and was seen on a nearly daily basis from then to the end of our season.

## Management in Wyoming outside Yellowstone National Park

### *Livestock Depredation & Management*

Potential livestock depredations in WY were investigated by WS and USFWS. Depredations were classified as confirmed, probable, or other based on specific criteria agreed upon by the USFWS and WS. The following livestock depredation statistics were based on reported livestock losses and do not reflect lost or missing livestock. In 2007, wolves in WY were responsible for killing at least 91 livestock (including 71 confirmed and 20 probable depredations) and 3 dogs (2 confirmed and 1 probable). Confirmed livestock depredations included 55 cattle (36 calves; 19 cows/yearlings) and 16 sheep (2 ewes; 14 lambs) (Appendix Tables 2, 5a, and 5b). The total number of livestock depredations recorded in 2007 decreased significantly from 162 confirmed depredations in 2006 down to 71 confirmed depredations in 2007 (Table 3).

**Table 3.** Confirmed livestock depredations in WY from 1999 through 2007.

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|
| Cattle | 2 | 3 | 18 | 23 | 34 | 75 | 54 | 123 | 55 |
| Sheep | 0 | 25 | 34 | 0 | 7 | 18 | 27 | 38 | 16 |
| Dogs | 6 | 6 | 2 | 0 | 0 | 2 | 1 | 1 | 2 |
| Goats | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 |
| Horses | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 1 | 0 |
| Wolves controlled | 1 | 2 | 4 | 6 | 18 | 29 | 41 | 44 | 63 |

### *Number of Packs Involved in Depredations*

Since 1999, the WY wolf population has increased annually and wolves have recolonized new areas in northwest WY. Wolves living in areas with relatively high native ungulate densities and relatively low exposure to domestic livestock caused fewer conflicts with livestock producers. Wolves that recolonized areas where large numbers of livestock graze on private and public lands were responsible for chronic depredations on domestic livestock. Fourteen of the 25 known packs in WY were involved in at least 1 depredation in 2007 (Figure 4).

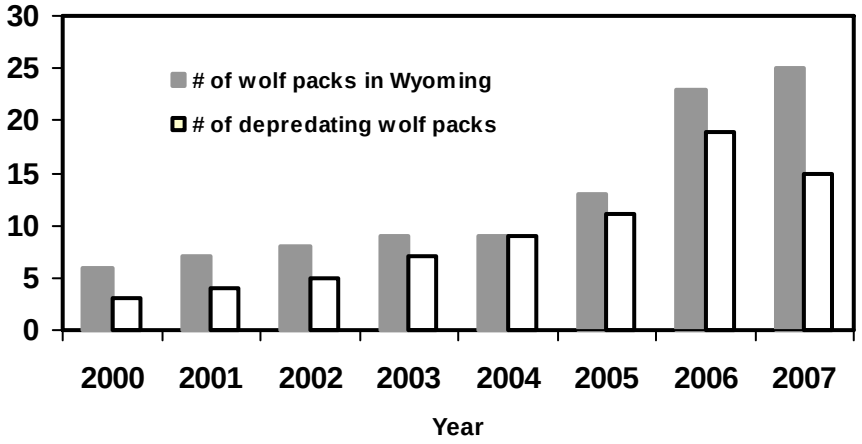


**Figure 4.** Annual number of wolf packs in WY and number of wolf packs that are involved in at least 1 livestock depredation/given year.

### *Frequency of Depredations to Individual Producers*

In 2007, we documented 29 people who experienced depredations by wolves. Each depredation event was recorded as confirmed or probable and included all cattle, sheep, dogs, and horses that were killed or injured by wolves. Ten people (34%) experienced multiple depredation events by wolves and 19 individuals (66%) experienced a single depredation by wolves in 2007 (Figure 5). Twenty-five people had animals killed by wolves that were recorded as strictly confirmed depredation events. Fourteen of these individuals (56%) had losses due to wolves more than once, and eleven people (44%) experienced a single depredation by wolves in 2007 (Figure 6).

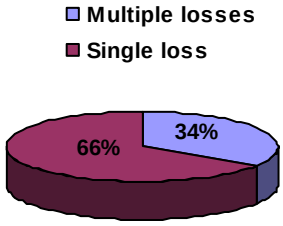


**Figure 5.** Frequency of multiple and single losses of all recorded wolf damages.

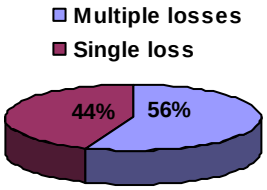


**Figure 6.** Frequency of multiple and single losses of all confirmed wolf depredations.

### *Time of Year and Location of Livestock Depredations*

Cattle depredations followed a seasonal pattern in 2007 with the highest number of depredations occurring in late summer from July through October (Figure 7). In 2007, confirmed cattle depredations occurred in 4 counties: Park 49% (n=27), Sublette 25% (n=14), Fremont 22% (n=12), and Lincoln County 4% (n=2) (Figure 8).

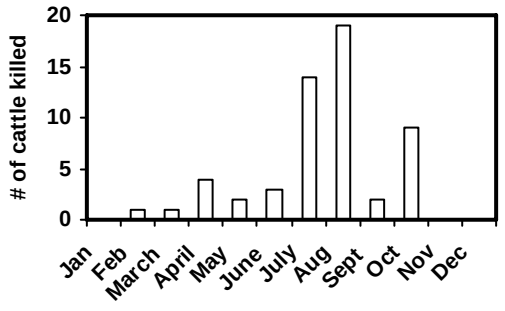


**Figure 7.** Number of confirmed cattle depredations/month.

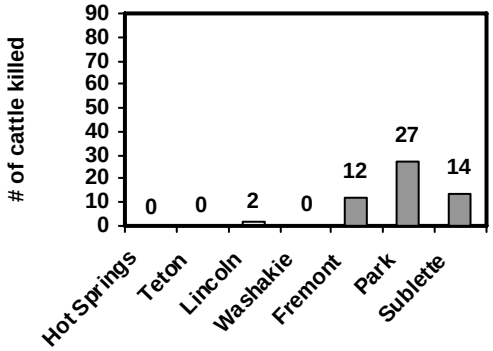


**Figure 8.** Number of confirmed cattle depredations/county.

In 2007, sheep depredations occurred during June and July (Figure 9) in 2 counties: Lincoln 75% (n=12) and Johnson 25% (n=4) (Figure 10).

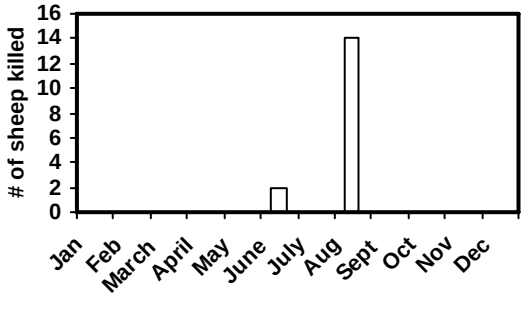


**Figure 9.** Number of confirmed sheep depredations/month.

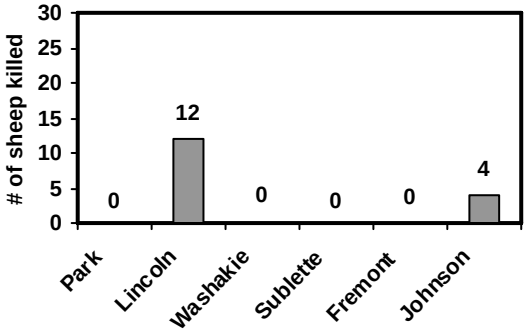


**Figure 10.** Number of confirmed sheep depredations/county.

***Livestock Depredation Control***

Control actions in response to confirmed livestock depredations included trapping and radio collaring wolves; intensive monitoring; increasing riders on grazing allotments; harassing wolves with rubber bullets, lights, and cracker shells; moving livestock to different pastures; lethally removing wolves; and issuing shoot-on-site (SOS) permits. Non-lethal control was routinely considered but was often not applicable in many areas in WY due to: 1) specific wolf packs chronically killing livestock year after year; 2) unpredictable travel patterns and movements by wolves; and 3) very large wolf home ranges that cover vast areas where cattle grazed on public grazing allotments. When non-lethal control methods were not effective, wolves were lethally removed in an attempt to prevent further livestock depredations.

We managed wolf population growth and wolf distribution to minimize chronic loss of livestock from wolves. In 2007, we reduced confirmed wolf depredations by >55% compared to 2006 by aggressively removing chronically depredating wolves early in the grazing season. Sixty-three wolves (approximately 24% of the WY wolf population) were lethally removed in control actions in 2007; however, we maintained the WY wolf population well above recovery objectives with 25 confirmed packs and 14 breeding pairs (Figure 11). In addition to agency wolf control, 3 SOS permits were issued in 2007, but no wolves were killed by private citizens.

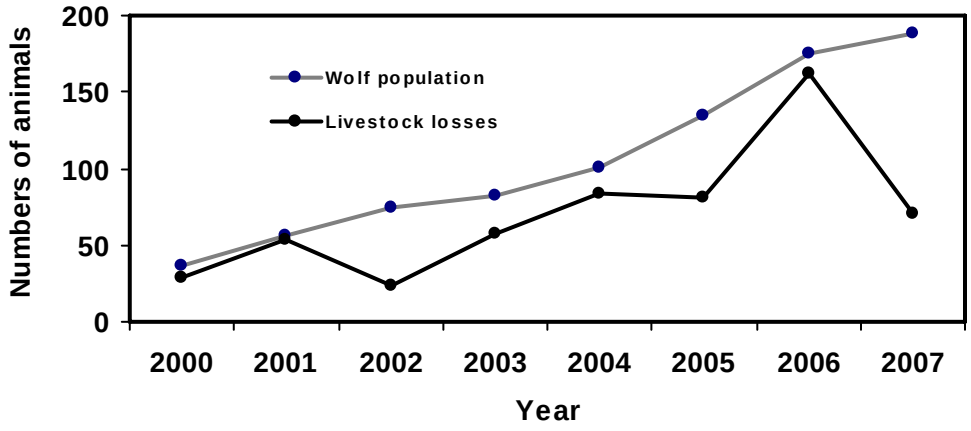


**Figure 11.** Annual wolf population size and number of confirmed livestock losses/year in WY, 2000 - 2007.

## WOLF PACKS IN WYOMING OUTSIDE YNP IN 2007

### *Confirmed Packs*

Eleven confirmed wolf packs recolonized areas in northwest WY where wolves prey on relatively high native ungulate densities and have relatively low seasonal exposure to domestic livestock. Livestock depredations in these areas have been relatively few and sporadic since 2003. Pack size and composition are based on our best estimates as of 31 December 2007.

1) *Beartooth Pack:* (8 wolves: 4 adults/4 pups) The Beartooth Pack produced 4 pups in 2007 and were considered a breeding pair. The Beartooth Pack killed 4 cattle in 2007; however, no previous depredations were confirmed in 2003, 2004, 2005, or 2006.

2) *Buffalo Pack:* (13 wolves: 7 adults/6 pups) The Buffalo Pack formed in 2006 usurping the Teton Pack from their territory the same winter. This pack produced its second documented litter in 2007 and was considered a breeding pair. A 2-year old radio-collared female, dispersed from the Buffalo pack in fall 2007 to the Pinnacle Peak Pack, allowing USFWS to confirm that pack. Wolves from the Buffalo Pack killed 1 horse in 2006 and 1 dog in 2007.

3) *Gros Ventre Pack:* (13 wolves: 5 adults/8 pups) The Gros Ventre Pack was again a breeding pair in 2007 with 8 pups. The home range of this pack encompasses a largely unpopulated area. One livestock depredation was confirmed in 2006, but no depredations occurred in 2007.

4) *Huckleberry Pack:* (5 wolves: 3 adults/2 pups) The Huckleberry Pack formed in 2006 and possibly combined with the Sage Pack in 2007. The home range of this pack was almost entirely within the boundaries of Grand Teton National Park. Two pups survived in 2007, and this pack was counted as a breeding pair again in 2007. The Huckleberry Pack was not involved in any depredations in 2006 or 2007.

5) *Pacific Creek Pack:* (13 wolves: 9 adults/4 pups) The Pacific Creek Pack was first documented in 2004, and successful reproduction was documented in both 2006 and 2007. During winter radio collaring, mange was documented in this pack in 2007; no known deaths occurred from mange. This pack was counted as a breeding pair in 2007. The Pacific Creek Pack killed 4 cattle in 2005, but had no depredations in 2006 or 2007.

6) *Pahaska Pack:* ($\geq$2 wolves) The Pahaska Pack consists of 1 radio collared female disperser from the Absaroka Pack and at least 1 other wolf. Reproduction is unconfirmed and little else is known about this pack. In 2008, there will be continued monitoring of this pack. The Pahaska Pack was not involved in any depredations in 2007.

7) *Pinnacle Peak Pack:* (6 wolves: unknown composition) The Pinnacle Peak Pack was confirmed in 2007. Numerous reports of wolves in the Pinnacle Peak area led USFWS to investigate. A missing radio collared wolf from the Buffalo Pack was located with 5

other wolves. Reproduction was unconfirmed in this pack. No depredations were recorded for the Pinnacle Peak Pack in 2007.

8) *Snake River Pack:* (11 wolves: 5 adults/6 pups) Reproduction in the Snake River Pack was documented again in 2007 with a minimum 6 pups. Due to their remote location, exact composition was not determined. This pack was again counted as a breeding pair. The Snake River Pack was not involved in any livestock conflicts in 2006 or 2007.

9) *Sunlight Pack:* (11 wolves: 7 adults/4 pups) The Sunlight Pack was again a breeding pair in 2007. Mange was found in 2003 and 2004 in this pack. In 2005 and 2006, no mange was found; however, mange was found on one wolf during capture in summer 2007. The Sunlight Pack killed 1 calf in 2004, 2 calves in 2005, 1 calf in 2006, and 1 calf in 2007.

10) *Teton Pack:* (8 wolves: 3 adults/5 pups) The Teton Pack formed in 1998 on the eastern side of Grand Teton National Park. In 2006, the pack did not reproduce; however, in 2007, 5 pups survived until 31 December. A second female dug a den nearby, but there was no indication of a double litter. The Teton Pack killed 1 calf in 2005, 1 calf in 2006, and no livestock in 2007.

11) *Togwotee Pack:* (10 wolves: 4 adults/6 pups) The Togwotee Pack was again a breeding pair in 2007 with 4 pups. While there were few known locations for this pack, USFWS believes the home range of this pack was largely within designated wilderness. No depredations were confirmed for the Togwotee Pack in 2006 or 2007.

In 2007, home ranges of 14 wolf packs in WY overlapped areas where large numbers of domestic livestock graze on private and public lands. Over the last 4 years, the USFWS has removed many wolves from some of the following packs due to chronic livestock depredations. Some entire packs have been removed more than once; however, new packs have frequently recolonized the area by the following year.

12) *Absaroka Pack:* (2 wolves: 2 adults) Mange was documented in this pack again in 2007; however, a summer recapture of a wolf, which was mange-infested in winter, showed hair re-growth and no mange. The pack was not a breeding pair in 2007. The Absaroka Pack killed 7 cattle in 2004, 1 calf in 2005, 5 cattle in 2006, and >8 cattle in 2007. Due to continued depredations, all but 2 wolves were removed in control actions in 2007.

13) *Big Piney Pack:* ($\geq$ 2 wolves) Multiple wolves were again found in the Big Piney region in 2007. Depredations have been chronic in this area in the past, but no depredations were confirmed in 2007. Pack composition and actual numbers are unknown.

14) *Black Butte: (*2 wolves) At the end of 2006, there were 7 wolves in the Black Butte Pack. One radio-collared wolf went to the Green River, and reformed the Green River

Pack. In 2007, one cattle depredation was confirmed, and there were at least 2 wolves in the Black Butte area at year's end. Radio contact with the remaining Black Butte wolves was lost during summer 2007.

15) *Daniel Pack:* (4 wolves: unknown composition) At the end of 2007, 4 wolves remained in the Daniel Pack. Historically this pack has been involved in chronic depredations, and the entire pack has been removed in past years. In early 2007, this pack killed 1 dog and 1 calf. Three wolves were controlled in April, and no depredations were reported after the control action. Reproduction was not documented, and therefore, the pack was not considered a breeding pair.

16) *East Fork Pack:* (8 wolves: 4 adults/4 pups) The East Fork Pack was first documented in 2005, but is suspected to have been around since at least 2004. In 2006, a radio collared disperser from the adjacent Washakie Pack joined the East Fork Pack. The East Fork Pack killed 2 cattle in 2005, 2 cattle in 2006, and 6 cattle in 2007. Five wolves were removed in 2007. Confirmed reproduction of 4 pups counts this pack as a breeding pair again in 2007.

17) *Green River Pack:* (6 wolves: 4 adults/2 pups) With several thousand cattle grazing in the Upper Green River drainage, the Green River Pack has been removed several times due to chronic depredations since 2002. The pack killed >10 cattle in 2002, >9 cattle and 1 sheep in 2003, >20 cattle in 2004, >10 cattle in 2005, >27 cattle in 2006, and 12 cattle in 2007. In 2007, 6 wolves were controlled . By fall 2007, the Green River Pack consisted of 6 wolves, and the pack was counted as a breeding pair in 2007.

18) *Greybull River Pack:* (8 wolves: 4 adults/4 pups) The Greybull River Pack was again a breeding pair in 2007 with 4 pups. This pack has been involved in chronic depredations due to high numbers of livestock in this area. In 2007, 8 wolves were controlled for confirmed depredations of 2 cattle in an effort to stop depredations.

19) *Gooseberry Pack:* (6 wolves: 1 adult/5 pups) */Owl Creek* (0 wolves) In 2005, all but one wolf were removed from the Owl Creek Pack. This radio collared wolf paired with another wolf to form the Gooseberry Pack in 2006 within a similar home range. Other wolves also reformed the Owl Creek Pack in 2006. Both packs killed livestock in 2006 and members of the Gooseberry Pack were controlled. Again in 2007, these packs killed >8 cattle, and all members of the Owl Creek Pack were removed. Neither pack was counted as a breeding pair at the end of 2007.

20) *Kemmerer Pack:* (>3 wolves: unknown composition) A group of at least 3 wolves existed in Kemmerer in 2007. No reproduction was confirmed and pack structure is unknown. Chronic depredations have occurred in the Kemmerer area in past years; however, in 2007, no depredations were reported. This pack is not considered a breeding pair.

21) *La Barge Pack:* (>2 wolves; unknown composition) In 2007, at least 2 wolves were found in the La Barge area. In winter 2007, a wolf incidentally caught in a trap by a

bobcat trapper was euthanized by USFWS due to extensive foot injuries. At the time of trapping, another wolf was in the area. In summer 2007, 12 sheep were confirmed killed by wolves in this area. No reproduction was documented, and this was not a breeding pair.

22) *Prospect Pack:* (>3 wolves: unknown composition) At the end of 2006, 4 uncollared wolves were believed to exist in the Prospect Pack, and in 2007, at least 3 wolves were confirmed. Since 2005, the Prospect Pack has been implicated in multiple depredations—33 sheep in 2005, and 22 cattle in 2006. In 2007, no depredations were reported. No reproduction was documented, and the pack was not counted as a breeding pair.

23) *Soda Lake Pack:* (5 wolves: unknown composition) Since 2003, occasional wolves have dispersed into the Pinedale corridor. Being an area of abundant livestock, depredations have been common, and numerous wolves have been controlled. No depredations were reported in 2007. At the end of 2007, 5 wolves were present in the Soda Lake area.

24) *South Fork Pack:* (10 wolves: 6 adults/4 pups) Since forming in 2005, the South Fork Pack has been involved in numerous depredations killing 3 cattle in 2005, 19 cattle in 2006, and 1 calf in 2007. One wolf was controlled in 2007, and no other depredations were reported. This pack was a breeding pair in 2007. One adult radio collared wolf with severe mange was euthanized after it left the pack and began spending time near a rural housing development.

25) *Washakie Pack:* (11 wolves: 5 adults/6 pups) The Washakie Pack was again a breeding pair in 2007. This pack has been implicated in numerous depredations since 1998. The Washakie Pack killed >4 cattle in 2003, >8 cattle in 2004, >1 calf in 2005, >4 cattle in 2006 and >6 cattle in 2007. Two wolves were removed in control actions in 2007.

***Misc./Unconfirmed Packs***

In 2007, we recorded >16 wolves that live in Wyoming outside YNP as either lone wolves or possible unconfirmed non-breeding packs; however, we were not able to confirm any pack activity, pack size, pack composition, or reproduction. We received reports of possible wolf activity in the following areas:

26) *Big Horn* (≥ 2 wolves) USFWS has never confirmed any reproduction in the Big Horn Mountains. Wolves in this area have been responsible for depredations in past years. In 2007, 4 sheep were confirmed killed by wolves. One wolf was killed by an M-44.

27) *Bliss Creek* (unknown number of wolves) Wolves were suspected in the Bliss Creek drainage in 2006 and 2007, but numbers and pack composition remain unknown. The Bliss Creek area is remote and has no livestock.

28) *Carter Mountain* (1 wolf) In past years, chronic depredations have been documented in the Carter Mountain Pack, and depredations continued in 2007. After, two confirmed cattle were killed, all but one wolf were removed in control actions to prevent ongoing depredations as have been seen in the past. Only the radio collared alpha female remains in this pack.

29) *Driggs* (>2 wolves) Wolves were first documented in the Driggs area in 2005 when a radio collared male dispersed from the Teton Pack. This collar was chewed off by other wolves in 2006, and radio contact was lost. In summer 2006, after killing livestock, 2 wolves were shot by the livestock producer under the amended Idaho 10j rule. Another wolf was radio-collared in summer 2006, but later died of natural causes, and radio contact was again lost. In summer 2007, agency reports of howling of more than 2 wolves indicated the presence of wolves, but confirmation of pack structure and actual numbers were not confirmed.

30) *South of Rock Springs* ($\geq$ 4 wolves: unknown composition) There have been multiple agency reports of at least 4 wolves in the area south of Rock Springs. Pack composition and actual numbers of wolves are unknown.

## OUTREACH

### Outreach in Yellowstone National Park

Yellowstone Wolf Project staff gave 76 talks and 52 interviews. Talks were at both scientific conferences and to general audiences.

For the seventh straight year wolf project staff rode horseback into outfitter camps near YNP to discuss wolf issues. Accompanying Stahler and Smith this year was Domenic Domenici and Gary Mowad of the USFWS. The location of this years trip was Gallatin National Forest north of YNP and was coordinated through the Gardiner USFS Office.

### Outreach in Wyoming outside Yellowstone National Park

In 2007, the WY wolf recovery program continued to give numerous formal presentations to public schools, universities, wildlife symposiums, state and federal management agencies, livestock association meetings, state legislature committees, and environmental groups. We were also interviewed for numerous magazine, newspaper, and television feature stories.

## USFWS LAW ENFORCEMENT

Enforcement efforts continue in WY. The Office of Law Enforcement continues to use traditional enforcement along with programs designated to prevent illegal killing of wolves. Fast and appropriate response to wolf problems by the USFWS and Wildlife Services has done much to ensure that individuals do not become frustrated and illegally kill wolves. Currently, the State of Wyoming has no laws to protect wolves.

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