



YELLOWSTONE WOLF PROJECT



ANNUAL REPORT
2001

Yellowstone Wolf Project

Annual Report
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Wolf logo on cover and title page: Original illustration of wolf pup #47, born to #27, of the Nez Perce pack in 1996, by Melissa Saunders. Treatment and design by Renée Evanoff.

All photos in this report not otherwise marked are by Douglas Smith.

TABLE OF CONTENTS

| | |
|--|-----------|
| Background | iv |
| 2001 Summary | v |
| Territory Map..... | vi |
| | |
| The Yellowstone Wolf Population | 1 |
| Population Status | 1 |
| Reproduction | 3 |
| Mortalities | 3 |
| Population Movements and Territories | 5 |
| Pack Summaries | 6 |
| Chief Joseph Pack | 6 |
| Swan Lake Pack | 6 |
| Leopold Pack | 6 |
| Rose Creek II Pack | 6 |
| Druid Peak Pack | 6 |
| Mollie’s Pack | 7 |
| Yellowstone Delta Pack | 8 |
| Nez Perce Pack | 8 |
| Cougar Creek Pack | 8 |
| Tower Pack | 8 |
| Wolf Capture and Collaring | 9 |
| | |
| Wolf Predation | 9 |
| Composition of Wolf Kills | 10 |
| Winter Studies | 10 |
| Wolf Management | 10 |
| Area Closures | 10 |
| Wolf Depredation Outside the Park | 10 |
| Collaborative Research | 10 |
| Projects by Graduate Students | 10 |
| Other Research | 12 |
| Public Involvement | 13 |
| Volunteer Program | 13 |
| Visiting Scholars Program | 13 |
| Acknowledgments | 13 |
| Appendix | 14 |
| Volunteer Roster, 2001 | 14 |
| Publications | 14 |



Deb Guernsey and Kerry Murphy process wolf #103F, formerly of the Druid Peak pack. In 2001, this wolf raised a litter of pups alone, then dispersed from the pack late in the year.

BACKGROUND

Although wolf packs once roamed from the Arctic tundra to Mexico, they were regarded as dangerous predators, and gradual loss of habitat and deliberate extermination programs led to their demise throughout most of the United States. By 1926 when the National Park Service (NPS) ended its predator control efforts, there were no gray wolf (*Canis lupus*) packs left in Yellowstone National Park.

In the decades that followed, the importance of the wolf as part of a naturally functioning ecosystem came to be better understood, and the gray wolf was eventually listed as an endangered species in all of its traditional range except Alaska. NPS policy calls for restoring, where possible, native species that have been eliminated as a result of human activity. Because of its large size and the abundant prey, the greater Yellowstone area was identified in the recovery plan as one of three areas where the recovery of wolf populations had a good chance of succeeding.

The U.S. Fish and Wildlife Service (USFWS) has the primary responsibility for ensuring compliance with the Endangered Species Act and oversees the multi-state wolf recovery program. The USFWS has proposed that 30 breeding wolf pairs with an equitable and uniform distribution throughout the three Rocky Mountain recovery areas (greater Yellowstone, central Idaho, and northwest Montana) for three successive years would constitute a viable and recovered wolf population. In 2000 and 2001, this goal was achieved. If other provisions required to delist are met, primarily adequate regulatory mechanisms in the form of state wolf management plans that would reasonably assure that the gray wolf would not become threatened or endangered again, the USFWS would propose removing the wolf from the list of endangered species in Wyoming, Idaho, and Montana in 2003. Currently, Idaho and Montana have written draft management plans.

Following an extended period of public planning and input, wolf restoration to the greater Yellowstone area (GYA) began in 1995, when 14 wolves were brought to the park from Alberta, Canada, held in acclimation pens for 10 weeks, and then released. Initial founder wolves, named for the geographic locales at which they were acclimated, were the Crystal Creek, Rose Creek, and Soda Butte packs on Yellowstone's northern range. In 1996, an additional 17 wolves were transplanted from British Columbia and released in more widespread locations throughout the park. In 1995–96, a companion effort to restore wolves to central Idaho occurred, using a simpler technique without acclimation. Although the original plan, outlined in *The Reintroduction of Gray Wolves to Yellowstone and Central Idaho, Final Environmental Impact Statement* (1994), called for annual translocations from Canada for up to five years, additional transplants were deemed unnecessary by 1997 because the founder wolves had higher reproduction, lower mortality, and less movement from the GYA than was originally expected. In Yellowstone, one NPS wildlife biologist is dedicated full-time to the project, with one technical assistant and from two to six seasonal volunteers.

Wolves reintroduced into Yellowstone were classified by the USFWS as “nonessential experimental” under section 10(j) of the Endangered Species Act and are managed outside the park under special rules that permit flexibility in addressing wolf conflicts with livestock and other wildlife management goals. It was anticipated that as the wolf packs established their territories, some would hunt and/or reside outside the park on other public or private land, and that some of the 412,000 livestock in the GYA would be preyed upon. The special rules contained provisions for addressing the possibility of conflicts with livestock.

To facilitate monitoring and research, all of the wolves brought from Canada were radio-collared before release, and YNP maintains radio collars on up to half of the wolves in the population. Wolf Project staff monitor population dispersal, distribution, reproduction, mortality, and predation on ungulates. Monitoring and management activities for the first two years of the project are documented in *The Yellowstone Wolf Project, Biennial Report 1995–96*. Subsequent project activities are presented in annual reports.

2001 SUMMARY

At the end of 2001, at least 218 wolves were present in the greater Yellowstone area (GYA), including 25 packs and 13 breeding pairs. As defined under the criteria for delisting the wolf as an endangered species in the Rocky Mountain recovery area, a “breeding pair” is an adult male and female who survive with at least two pups-of-the-year until December 31, and can include only one pair per alpha male. Thirty-four breeding pairs were recorded in the northern Rockies (including 14 in central Idaho, and 7 in northwest Montana). Thirty breeding pairs with an equitable distribution throughout the three recovery areas for three successive years are needed in order to meet the requirements for delisting, and 2001 was the second year when this goal was met. Last year’s annual report, which reported 28 breeding pairs, did not list 2000 as a countdown year. The U.S. Fish and Wildlife Service (USFWS) later discovered 2 more breeding pairs, bringing the total to 30. At this time, Idaho and Montana have written draft management plans.

Yellowstone National Park (YNP) and the USFWS continued to monitor wolves in the Yellowstone ecosystem. YNP staff were primarily responsible for wolves that resided largely in the park, so this report contains more details about these wolves.

Pack size in the GYA ranged from 2 to 37 wolves and averaged 8.9. However, the Druid Peak pack (37 wolves) is not expected to maintain its near-record size, and in late 2001 Druid wolves were traveling in four different subgroups.

At least 77 pups survived to the end of the year. Thirteen breeding pairs produced 17 litters of pups. Three packs that produced litters lost adult breeders and did not count as breeding pairs by year-end. All packs had one litter except the Druid Peak pack, which had at least two.

At least 16 wolves died in 2001: 13 due to humans and 3 due to natural causes.

In YNP, two new packs formed. A disperser from the Leopold pack started the Cougar Creek pack near West Yellowstone, Montana. In early 2001, Rose Creek’s Tower subgroup splintered, but in late 2001 one wolf from this group returned to the territory with another uncollared wolf. They are currently named the Tower pack. Five new packs formed outside the park: Freezeout, Pinedale, Meeteetse, Big Piney, and Red Lodge.

For the fourth year, systematic wolf captures were conducted to put on radio collars and collect standard measurements and blood samples for genetics and disease monitoring. In YNP in January, October, and December, 32 wolves (22 males and 10 females) were darted from a helicopter. Twenty-three were pups and nine were adults. There were 45 (34%) collared wolves in YNP at the end of 2001. In the GYA, 65 (30%) wolves wore functioning collars.

In YNP, project staff detected 161 definite and 196 probable kills made by wolves in 2001, including 311 elk (87% of total), 6 bison, (2%), 1 moose (<0.5%), 6 deer (2%), 1 pronghorn (<0.5%), 6 coyotes (2%), and 26 unknown prey (7%). The composition of elk kills was 33% calves (0–12 months), 36% cows, 17% bulls, 4% elk of unknown sex, and 10% elk of unknown sex and age. Bison kills included three calves, two yearlings, and one adult, all of unknown sex. Wolves that resided on the northern range (both in and outside YNP) killed an average of 1.8 elk/wolf/30-day study period during winter from 1997 to 2000.

Collaborative research continued to be an important part of Yellowstone wolf studies in 2001. The cow elk study started in 2000 continued, and 28 more female elk were collared, 15 (54%) with Global Positioning System (GPS) radio collars.

Approximately 80,000 people have seen wolves in YNP since 1995. In 2001, wolves were sighted on 363 days, and about 11,200 people saw wolves in Lamar Valley.

Seventeen volunteers worked a total of 5,544 hours valued at \$62,758 for the National Park Service. Drs. Douglas H. Houston and Rolf O. Peterson were the Wolf Project’s visiting scholars.

Greater Yellowstone Wolf Pack Territories, 2001

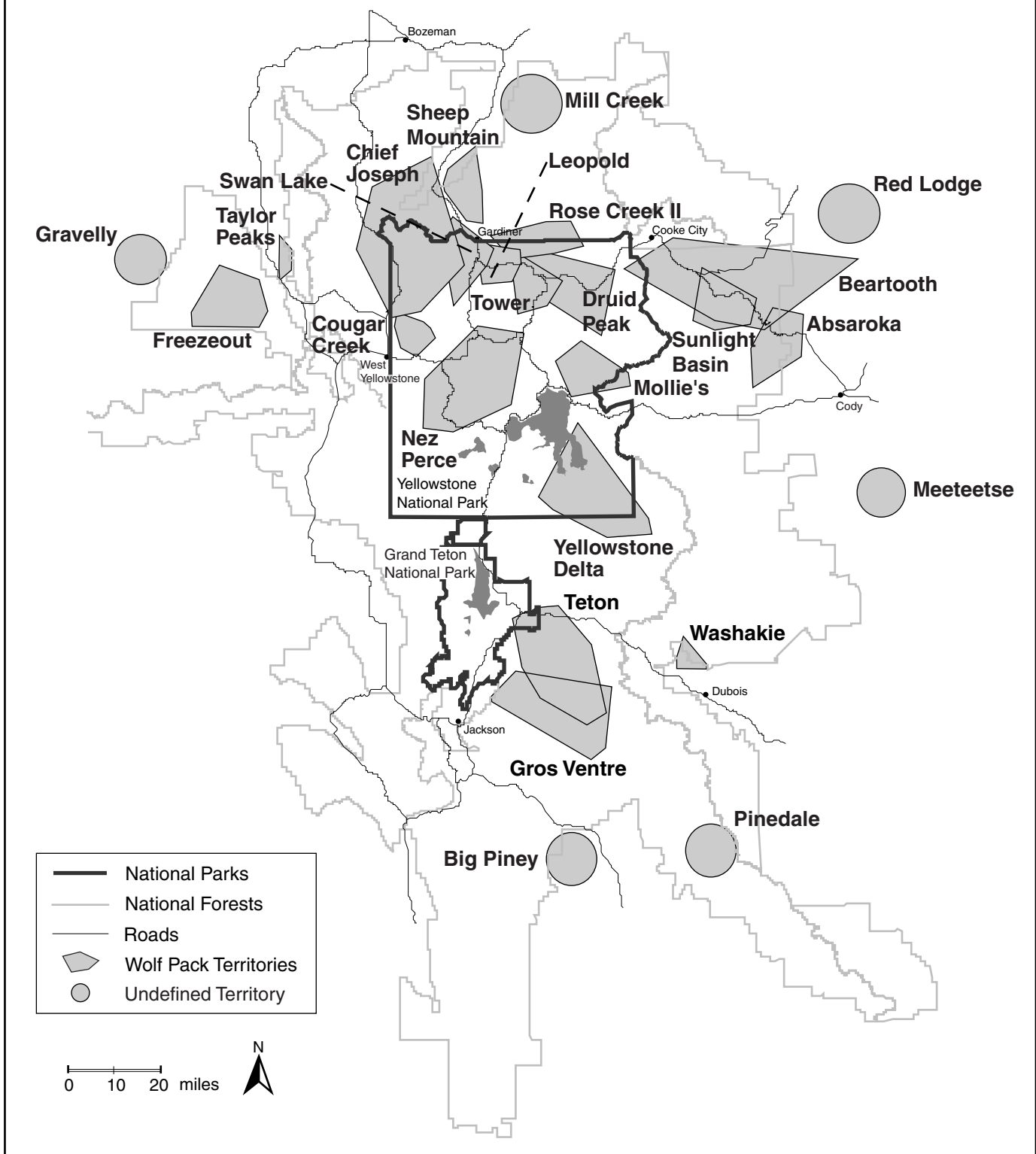


Figure 1. Wolf pack territories. At least 218 wolves—25 packs and 4 wolves without established territories—occupied the greater Yellowstone area in 2001.

THE YELLOWSTONE WOLF POPULATION

Population Status

At the end of 2001, at least 218 wolves in 25 packs were present in the greater Yellowstone area (GYA) (Fig. 1; Tables 1 and 2). Removal of wolves from the endangered species list in Idaho, Montana, and Wyoming requires 30 breeding pairs distributed throughout the three northern Rocky Mountain recovery areas (GYA, central Idaho, and northwest Montana) for three successive years. A breeding pair is defined as a pair with at least two pups-of-the-year that survive until December 31. In 2000, there were 30 breeding pairs in the northern Rocky Mountains, making it the first countdown year to removing the wolf from the endangered species list. Last year the U.S. Fish and Wildlife Service (USFWS) determined that there were 28 breeding pairs in the northern Rockies, but later discovered 2 more that brought the total to 30. In 2001, there were 34 breeding pairs in Idaho, Montana, and Wyoming (13 in the GYA), making it the second countdown year. Currently, Montana and Idaho have written draft plans.

When the wolf reintroduction program began in 1995, Yellowstone National Park (YNP) staff were responsible for population data ecosystem-wide. Since February 1999, Michael Jimenez of the USFWS has



Drs. Rolf Peterson, Douglas Smith, and L. David Mech (left to right) necropsy a bison killed by wolves. The bison had fat-depleted bone marrow, and Smith's knife is pointing to an abscessed tooth. NPS photo.

TABLE 1. 2001 SUMMARY OF WOLF POPULATION IN YELLOWSTONE NATIONAL PARK.

| Pack | Adults & Yearlings | Pups | Total Est. Pack Size | Breeding Pair (Yes/No) | No. of Litters | General Location |
|-------------------|-------------------------------|-------------|-----------------------------|-------------------------------|-----------------------|------------------------------------|
| Druid Peak | 26 | 11 | 37 | Yes | 2–4 | Lamar Valley to Hellroaring Creek |
| Rose Creek II | 4 | 5 | 9 | Yes | 1 | Hellroaring Creek to Crevice Creek |
| Tower | 2 | 0 | 2 | No | 0 | Tower area |
| Leopold | 10 | 4 | 14 | Yes | 1 | Blacktail Plateau to Mt. Everts |
| Swan Lake | 6 | 2 | 8 | Yes | 1 | Gardner's Hole/Swan Lake Flat area |
| Mollie's | 4 | 6 | 10 | Yes | 1 | Pelican Valley |
| Chief Joseph* | 4 | 7 | 11 | No | 1 | W/NW YNP |
| Nez Perce | 18 | ? | 18 | Yes | 1 | Central YNP |
| Cougar Creek | 3 | 3 | 6 | Yes | 1 | Western YNP |
| Yellowstone Delta | 11 | 5 | 16 | Yes | 1 | Thorofare Region |
| Loner** | 1 | n/a | 1 | n/a | n/a | Central YNP |
| Total | 89 | 43 | 132 | 8 | 10–12 | |

**no breeding pair at end of year.*

***192M—disperser from Tower pack.*

reported on Wyoming packs outside YNP, and the USFWS Helena office has reported on Montana packs outside YNP, aided in 2001 by Turner Endangered Species Fund personnel. The GYA wolf population data presented in this report therefore distinguishes between inside and outside YNP, the sum being the GYA total.

At the end of 2001, approximately 132 wolves in 10 packs were located inside YNP (8 breeding pairs), and at least 86 wolves were located outside YNP: 9 packs in Wyoming (5 breeding pairs) and 6 in Montana (no breeding pairs). Of the 10 YNP packs, only the Tower pack did not breed, and the Chief Joseph pack lost both breeders. One new pack formed inside YNP when a dispersing female (#151) from the Leopold pack paired with an uncollared wolf and had a litter of at least three pups in the Madison Flats–Cougar Creek area of YNP. They were named the Cougar Creek pack. Rose Creek’s Tower subgroup splintered, but one wolf returned with an uncollared wolf, and they were named the Tower pack. Five new packs formed outside the park: Freezeout, Pinedale, Meeteetse, Big Piney, and Red Lodge.

Pack size in the GYA ranged from 2 to 37 and averaged 8.9. (Excluding the Druid Peak pack, mean pack size was 7.7.) Pack size inside YNP ranged from 2 to 37 wolves and averaged 13.1. (Excluding the Druid Peak pack, mean pack size was 10.4.) The very large Druid Peak pack (37 wolves) is unusual and may be a record for wolf pack size. The Druid Peak wolves are not expected to remain together. At the end of 2001, the pack had already splintered into 4 subgroups, and no more than 16 wolves were sighted in the core (alpha pair) group.

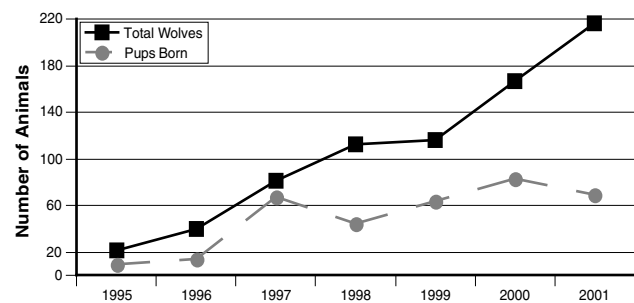


Figure 2. Wolves in the GYA, 1995–2001.

TABLE 2. 2001 SUMMARY OF GREATER YELLOWSTONE WOLF POPULATION OUTSIDE YELLOWSTONE NATIONAL PARK.

| Pack | Adults & Yearlings | Pups | Total Est. Pack Size | Breeding Pair (Yes/No) | No. of Litters |
|------------------|--------------------|--------------|----------------------|------------------------|----------------|
| Teton | 3 | 9 | 12 | Yes | 1 |
| Gros Ventre | 3–4 | ? | 3–4 | No | ? |
| Washakie | 6–7 | 4 | 10–11 | Yes | 1 |
| Sunlight Basin | 5–7 | 4–5 | 9–12 | Yes | 1 |
| Absaroka | 4 | 4 | 8 | Yes | 1 |
| Beartooth | 3 | 3 | 6 | Yes | 1 |
| Meeteetse | 6 | ? | 6 | No | ? |
| Pinedale | 2 | ? | 2 | No | ? |
| Big Piney | ? | ? | ? | No | ? |
| Taylor Peaks | 3 | 0 | 3 | No | 0 |
| Freezeout | 2 | 4 | 6 | No | 1 |
| Gravelly | 3 | 0 | 3 | No | 0 |
| Mill Creek | 5–7 | ? | 5–7 | No | ? |
| Sheep Mountain | 1 | 6 | 7 | No* | 1 |
| Red Lodge | 3–5 | ? | 3–5 | No | ? |
| Loners | 3 | n/a | 3 | n/a | n/a |
| Total | 52–60 | 34–35 | 86–95 | 5 | 7 |
| GYA TOTAL | 141–149 | 77–78 | 218–227 | 13 | 17–19 |

*No breeding pair at end of year.

TABLE 3. YNP WOLF MORTALITIES DURING 2001.

| Wolf | Pack | Date of Death | Sex | Age | Cause of Death |
|------|--------------|---------------|--------|----------|------------------------------|
| 033F | Chief Joseph | 08/08/2001 | Female | Adult | Vehicle |
| 034M | Chief Joseph | 11/27/2001 | Male | Adult | Natural |
| 092M | Nez Perce | 01/13/2001 | Male | Adult | Natural |
| 148F | Leopold | 03/22/2001 | Female | Adult | Vehicle |
| 191M | Loner* | 11/28/2001 | Male | Adult | Control Action (outside YNP) |
| 212F | Nez Perce | 01/17/2001 | Female | Yearling | Handling |

*Disperser from the Nez Perce pack.

Reproduction

At least 77 pups survived to December 31, 2001, in the GYA (Figs. 2 and 3). Forty-three (56%) of these pups were born in YNP. At least 17 litters were born to 16 packs. The Druid Peak pack had at least two litters and possibly more, as four females localized in April but left their dens to join the pack at the main Lamar Valley den, and the fate of any pups born to these females was unknown. Recovery plan standards define a breeding pair as a male and female wolf that successfully raise at least two pups to December 31. Chief Joseph, Sheep Mountain, and Freezeout lost adult breeders, so they could not be counted as breeding pairs at the end of 2001, hence the total of 13 breeding pairs. Litter size in YNP ranged from 2 to 7 and averaged 5.0 (N = 10). Although the Druid Peak pack had 12 pups total, it is unknown how many pups were born to each female.

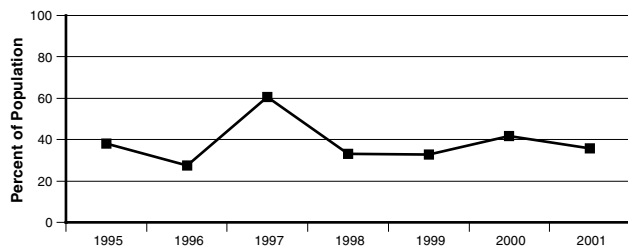


Figure 3. Percentage of pups in the GYA wolf population as of December 31, 2001, 1995–2001.

Mortalities

At least 16 wolves died in the GYA in 2001: 6 from the YNP population (Table 3). (For further information on wolf mortalities outside the park, see the USFWS *Rocky Mountain Wolf Recovery 2001 Annual Report*, available at www.r6.fws.gov/wolf/annualrpt01/index.htm.) This number does not include pups that died within the first four months of life. At least 13 wolves died due to human-caused mortality (9 in control actions, 2 by vehicles, 1 to handling, and 1 shot illegally), and 3 died due to natural causes (prey, drowning, and other wolves). No control actions occurred within YNP. Since 1995, 53 percent of all wolf deaths have been due to human causes (Fig. 4).

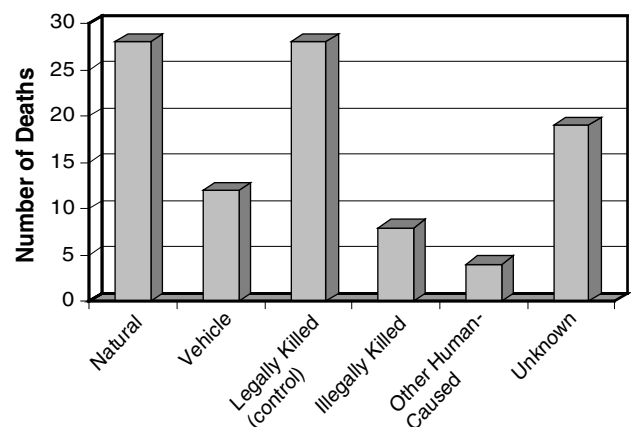


Figure 4. Cause of mortality for radio-collared wolves in the GYA, 1995–2001.

MOLLIE'S PACK

THE STORY OF THE CRYSTAL CREEK PACK

Since wolf restoration began in Yellowstone in 1995 there have been many stories about individual wolves, but few about wolf packs. In 2001, 10 packs made all or most of their home in the park. Each pack has an interesting history, but arguably the one with the most riveting details is the story of Mollie's pack.

The original name of Mollie's pack was the Crystal Creek pack, and their first noteworthy episode began when, after the gate to their pen was opened, they refused to leave. It was supposed to be the beginning of free-ranging wolves in Yellowstone after a nearly 70-year absence, and the event made Paul Harvey's noontime news. Mr. Harvey said that "welfare wolves" that preferred "free food to freedom" had been created. It was true that the wolves would not leave the pen, but it was because of a natural distrust of humans. Humans entering through that gate had fed the wolves twice a week, and consequently, the wolves avoided that area even though it led to freedom. A camera mounted in a tree and left to run for an hour recorded alpha female #5, the first wolf carried into Yellowstone, approaching the gate six times in 20 minutes and looking out, but not leaving.

By day five, the wolves had left the pen at night, but they returned during the day until leaving for good another five days later. They immediately settled in the Lamar Valley, the prey-rich area in the northeastern corner of the park. Number 5 dug several dens that year, but did not have pups, experiencing a pseudopregnancy. That first year, the Crystal Creek pack's hold on Lamar Valley was undisputed, and a few long-time wolf watchers remember the days when Lamar was Crystal territory and not in the grip of the Druid wolves.

The Druid Peak pack evicted the Crystal wolves from Lamar in May 1996. That year #5 did breed and had a den in the Soda Butte cone area. The Druid wolves found the den, and a Helena, Montana, photographer filmed part of their attack on the Crystal pack. Number 4 (#5's mate) and all the pups were killed, leaving #5 badly injured and

#6. They left Lamar and took up residence in Pelican Valley.

In August 1998, the alpha male #6 died, probably while trying to kill an elk. He was found dead with a severed femoral artery 100 meters from a dead bull elk that his pack had fed on. His death contributed to the pack's decline. Fifteen strong in 1998, they produced only one pup in 1999 and none in 2000 when they dwindled to four wolves, including old #5.

By 2000, #5 was probably 8 to 10 years old and was having trouble keeping up with the pack; it was not uncommon to locate her alone. During summer 2000 she became a lone wolf, and since late 2000 her radio signal has not been located. Her fate will probably remain a mystery. She wore a relatively new collar, but it may have malfunctioned, a common occurrence. She was the last original Crystal Creek wolf, and since her descendents no longer lived by Crystal Creek, the pack was renamed Mollie's pack to commemorate the contribution to wolf recovery made by the late Director of the U.S. Fish and Wildlife Service, Mollie Beattie.



NPS photo.

The first wolf (alpha female #5) to be carried into the park, arguably the most famous photograph of the Yellowstone wolf reintroduction. Mollie Beattie, late Director of the U.S. Fish and Wildlife Service, carries her crate. To her right in the photo are former Yellowstone Superintendent Michael Finley and former Secretary of the Interior Bruce Babbitt.

A snow–bison–elk relationship has contributed to this pack’s story. In the summer, Pelican Valley is equal in prey to Lamar Valley, the original home of the Crystal Creek pack, but in the winter Pelican Valley is much different. Most of the elk migrate, leaving variable numbers of tough-to-kill bison. Pelican also gets a lot more snow; it can be waist deep in some places.

Once the elk leave Pelican in early winter, the wolves travel widely. Radio tracking has found them on the east side of Yellowstone Lake, in Hayden Valley, at Canyon, on Specimen Ridge, and on the North Fork of the Shoshone River. They have left for as long as six weeks and sometimes take multiple short trips, most often to the North Fork, but they always find their way back to the heart of the park. Then, in late winter, they settle down, travel less, and focus on bison.

Winter weakens some bison, and by late winter they may become prey for wolves. It is primarily calves and vulnerable adults that the wolves choose to prey on, but bringing down bison is still difficult; battles observed between wolves and bison have lasted up to 9 hours and involved up to 14 wolves. In late winter, the wolves are lucky to kill one bison a week.

Early spring is also the time when grizzly bears emerge from their dens and seek carcasses. Wolf kills provide easy meals for bears, especially when there are only four wolves in a pack (as Mollie’s pack numbered in early 2001), making it difficult for them to defend a kill. Also, four wolves can only eat so much of a carcass before they need to digest some of the food, leaving bears a chance to move in. In the summer of 2001, no wolf kill was found that had not been taken over by a grizzly bear. In one case, 10 grizzlies and 4 wolves shared (not simultaneously) a wolf-killed bull elk in Pelican Creek. The wolves waited their turn, undoubtedly a common occurrence.

In 2001, #5’s progeny rallied and resurrected the pack. They produced a litter of 6 pups, increasing the pack to 10 wolves. Next spring these new additions may help to defend food from the ever-present grizzlies, or at least get more of it eaten before it is taken. To the wolves, Pelican probably offers a lot, and they to the valley, as the sound of a wolf once more echoes through the heart of Yellowstone.



Population Movements and Territories

Most wolf population expansion in 2001 was outside YNP. The YNP population expanded by 11 percent (Fig. 5), while the outside YNP population grew by 45 percent. The population on the park’s northern range was even more stable, increasing from approximately 72 to 77 (7%) wolves. In the rest of the park, wolves increased from approximately 52 to 61 (17%), due primarily to the new Cougar Creek pack and reproduction in Mollie’s pack. This represents fairly modest population growth compared to 2000, when wolves in the park increased by 65 percent and by 63 percent on the northern range. The large increase in 2000 was likely due to the relatively low 1999 population because of poor pup survival, and extraordinary reproduction in the Druid Peak pack.

The Druid Peak pack continued to pressure the Rose Creek II pack. Several interactions between the two packs were observed and resulted in loss of territory for Rose Creek II. At the end of 2001, the Druid Peak pack occupied territory from Lamar to Slough Creek and north of the Yellowstone River to Cottonwood Creek. Rose Creek II territory historically included the area from Crevice Creek to Slough Creek. Despite this pressure, the Rose Creek II pack was never located west of Bear Creek (i.e., outside YNP).

Drought conditions prevailed again in 2001, possibly causing unusual elk movements. Three wolf packs had extraterritorial moves in November and December that coincided with early elk movements from summer range. The Nez Perce pack (18 wolves) traveled outside the park to Ashton, Idaho, and other unrecorded locations south of YNP for the first time. They also made two forays, lasting about a week each, to the northern range where they made several elk kills, similar to 2000. They had a skirmish

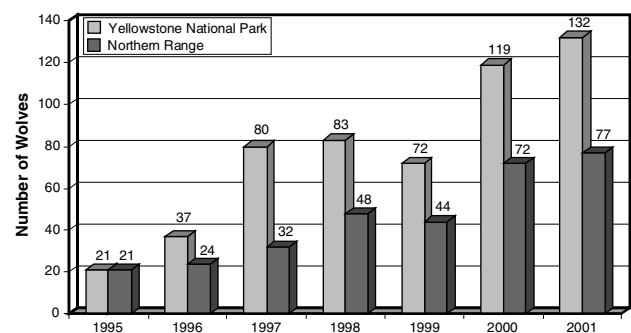



Figure 5. Yellowstone National Park Wolf Population, 1995–2001.

with the Druid Peak pack, and at least two wolves from the Nez Perce pack were injured. The Yellowstone Delta pack (16 wolves) traveled south into the Bridger-Teton Wilderness about six weeks earlier than usual. The Druid Peak pack (37 wolves) traveled further north than had been previously recorded. All other packs remained in their usual territories in 2001. 

PACK SUMMARIES

Chief Joseph Pack

The Chief Joseph pack spent most of its time in YNP, but also traveled outside the park, especially to the west. In 2000 they denned on private land, but in 2001 they denned in their traditional area along the Gallatin River in YNP. At least seven pups, born to maybe two females, were produced in 2001. Both alpha wolves (#33F and #34M) died in 2000, altering pack dynamics. Since reintroduction began, no other pack has lost both alpha wolves in the same year. Number 33 was hit by a car on Highway 191, a section of road that has killed six wolves (50% of all wolves hit by vehicles in YNP). Number 34 was injured, probably by an elk, and finished off by wolves from the Cougar Creek pack. Both wolves were part of the reintroduction from British Columbia in 1996. Park biologists can no longer reliably track this pack due to dispersal, death, and radio failure. Seven wolves wore collars at the end of March, but there were no radio-collared wolves present in the pack at the end of the year, when pack size was estimated to be 11. Several wolves from this pack, including two in 2001 (#198F and #203M), have dispersed west into areas like the Taylor Fork Creek and Madison Valley.

Swan Lake Pack

Although their territory borders on the town of Gardiner, Montana, the Swan Lake pack has rarely left YNP during their two years of existence. They are one of only two packs in the GYA that are entirely gray in color (Nez Perce is the other). Pup production was low, with only two surviving. The reason for the low output was unknown. The area around Swan Lake where they denned was heavily used by humans in the summer; evidence shows they had multiple dens and moved their pups

often. At year-end the pack numbered eight wolves, one more than in 2000.

Leopold Pack

This pack has had the same breeding male (#2) and female (#7) since the pack formed in 1996. Pack size since 1998 has been stable, fluctuating between 11 and 14 during that time period. At the end of 2001, there were 14 wolves in the pack. In addition to having a stable breeding pair and pack size, the pack's territorial boundaries have changed little since 1997. In 2001, they dug a den in a new location and had four pups. This pack has also provided a large number of dispersers. Two wolves started new packs, #152F (Swan Lake) and #151F (Cougar Creek), and a third (#150M) joined the Rose Creek II pack. A fourth disperser (#148F) was fatally hit on the road near Livingston, Montana.

Rose Creek II Pack

After several years of instability, the Rose Creek pack split into two autonomous groups: Rose Creek II and Tower. None of the original Rose Creek wolves were present in 2001, but #18F is the daughter of #9F, the 1995 alpha female, hence the name Rose Creek II. This pack occupies the area north of the Yellowstone River from Cottonwood Creek to Deckard Flats near Jardine, bounded by Bear Creek. (The Tower pack ranges mostly south of Tower Junction.) Rose Creek II historically occupied the area east to Slough Creek, but that portion of their territory has been usurped by the larger Druid Peak pack. The creek border is a fairly definite boundary; project personnel have documented a number of interpack encounters in this area. The Rose Creek II pack had five pups and numbered nine wolves at the end of 2001.

Druid Peak Pack

Still the largest pack in the GYA, they had at least 2 females (#42 and #103) reproduce and raise 11 pups to the end of the year. In April, two other females (#105 and #106) localized around dens but abandoned them early, making the survival of any pups questionable. In August, 37 animals were in the pack, making it one of the largest ever recorded (see *International Wolf Magazine*, Winter 2002). Forty-two wolves were counted together in Wood Buffalo National Park, Alberta, Canada, in 1974, but it is

unknown if this was one pack or a loose affiliation of packs. One other pack of 36 was recorded in Alaska in the 1960s.

Large pack size was probably why this pack has expanded its territory westward, usurping Rose Creek II territory. Lamar Canyon was the approximate western edge of Druid Peak territory until 2000, but in 2001 they expanded west to Cottonwood Creek, well within old Rose Creek territory. On one occasion in December 2001, 23 wolves in the Druid Peak pack were seen resting on the east side of Cottonwood Creek, 400 meters away from 9 Rose Creek II wolves who were resting on the west side of the creek.

The entire pack has not been sighted together since August 2001. In late 2001 the pack splintered into four subgroups: 1) the main group including the alpha pair (#21M and #42F) and 12–16 other wolves, 2) a group anchored by wolf #106F and up to 7 other wolves, 3) a group of up to 5 uncollared wolves sporadically visible, and 4) a group of variable number anchored by #105F. Pack dynamics were fluid and many associations were often temporary, with group compositions changing frequently. Several yearling wolves (#216F, #219M, and #224M) have dispersed, contributing to the decrease in pack size. This pack probably killed a grizzly bear cub in Lamar Valley this summer, one of only two recorded instances in YNP (see Nez Perce pack summary).

This pack has denned about 600 meters from the road in Lamar Valley since 1997. Wolves cross the road daily to hunt elk, and this has become a huge visitor attraction. Using private funds raised by the Yellowstone Park

Foundation, two people were hired in 2000 and 2001 to manage the situation. During these two years, an estimated 19,355 people viewed wolves for a total of 651 hours. Wolves were observed crossing the Northeast Entrance road at least 635 times, and only one wolf was struck by a vehicle. This safe viewing of wolves was achieved with minimum restrictions (no stopping or standing in the area where wolves usually cross the road).

Mollie's Pack

After declining to only 4 wolves in 2000 (from 15 in 1998) and not producing any pups, this pack produced 6 surviving pups in 2001. They continue to spend most of their time in Pelican Valley, a prey-rich area in summer, but with scarce prey in winter. They continue to kill bison in winter, but a series of mild winters have made bison vulnerable only in late winter. Their small pack size has left them susceptible to food loss due to grizzly bears. With only four adult wolves, consumption of an entire elk or bison carcass was not possible before satiation. Discovery of leftover meat on the wolf-killed carcass by grizzly bears was common, and bears almost always usurped the carcass from the wolves. In July in Pelican Valley, Darren Ireland (from the YNP Bear Management Office) observed 4 wolves and 10 grizzly bears feeding on a dead bull elk. In comparison, the much larger Nez Perce pack (18 wolves), which summered in Hayden Valley (another high density grizzly bear area), consumed carcasses more quickly and lost little food to bears. Mollie's pack numbered 10 wolves at the end of 2001.



Long-time Yellowstone park ranger Gerald Mernin (now retired) leads the way across Mirror Plateau for park ranger Michael Ross. Den visitation and collection of scats at wolf homesites is part of annual summer fieldwork in YNP.

Yellowstone Delta Pack

Living in the remote southeast corner of Yellowstone, this pack has grown to 16 wolves. Five pups survived to year-end. Denning south of Yellowstone Lake, they were regularly heard howling by backcountry visitors. Because this pack spends part of the winter outside YNP in the Bridger-Teton Wilderness, an early season capture operation was conducted in December 2001. Five wolves were captured and collared. This pack had been seen interacting with grizzly bears, but unlike wolves elsewhere in YNP (Mollie's and Nez Perce), the interactions took place near their den site. Wolf behavior near the den was significantly different than around wolf-kills. Close to dens, wolves were still cautious around bears, but were more steadfast in their position, e.g., always keeping themselves between the bear and the den. Wolves often behaved playfully, darting in at the bear, moving in quickly from behind, or otherwise distracting the bear. No bear was ever documented at the den site.

Nez Perce Pack

The second largest pack in the GYA (18 wolves), they denned and lived in the Madison–Firehole area of YNP. Their den was observed for about two months, and they were counted as a breeding pair, although no pup counts were made. Over the summer, this pack spent significant time in Hayden Valley, where they killed at least two bison, scavenged several others, and interacted with grizzly bears at carcasses. One grizzly bear cub was probably killed, as determined from a necropsy.

Like other large packs in the GYA in 2001, this pack made an extraterritorial foray in early winter (November–December). Reports of wolves consistent with this pack came from Ashton, Idaho. Although they were never radio-located in the area, they were located enroute. This pack typically travels west in early winter each year, usually into the Targhee National Forest, but they did not travel there this year.

This pack declined from at least 22 wolves last year to 18 at the end of 2001. They are one of only two packs that are all gray (Swan Lake is the other).

Cougar Creek Pack

A new pack in 2001, the Cougar Creek pack formed when female #151 dispersed from the Leopold pack. With



The Yellowstone Delta pack's 2001 den site. Wolves often dig dens under the supportive root structure of trees.

her were two uncollared black wolves of unknown origin, presumably males. They settled in the Madison Valley area on the west side on YNP and produced three surviving pups, so pack size was six at the end of 2001.

Tower Pack

The Tower pack (two wolves) formed in late 2001, but is probably more accurately described as a remnant of the old Rose Creek pack. Since the 1998 high of 24 wolves in the original Rose Creek pack (1995–2000), their steady decline in number has produced some interesting combinations of wolves and patterns of landscape use. In 2000 the Rose Creek pack split into two subgroups, with a “Tower” group occupying the Tower–Antelope Creek area, and a “Main” group in the area north of the Yellowstone River (see Rose Creek II, above). The Tower group of five wolves, which did not breed, split up over the summer of 2001. Two of the collared wolves in the pack dispersed (#162M and #192M). Wolf #208M spent the summer around Tower–Blacktail and paired late in 2001 with an uncollared gray wolf (presumably a female). They now comprise the Tower pack. 🐾

WOLF CAPTURE AND COLLARING

In January, October, and December 2001, helicopter darting was used to capture 32 wolves in YNP; 2 more were captured by Wildlife Services (USDA/APHIS) outside YNP. Twenty-three males (68%) and 11 females (32%) were captured. Twenty-five (74%) were pups, and 9 (26%) were adults. Wolves were captured in the following packs: Swan Lake (3), Leopold (4), Rose Creek II (2), Druid Peak (8), Yellowstone Delta (8), Nez Perce (4), Chief Joseph (3), and Sheep Mountain (2). (Although the Sheep Mountain pack is otherwise counted as a pack outside of YNP, they are included here and in wolf predation studies because they are important for purposes of northern range research.) Besides the attachment of radio collars, standard measurements and blood (for genetics and disease monitoring) were collected on all wolves handled.



Ed Bangs, U.S. Fish and Wildlife Service Wolf Recovery Coordinator for the northern Rockies, handles a Yellowstone Delta wolf in December 2001.

The total number of wolves collared in YNP at year-end was 45 (34%) of the approximately 132 wolves. In the GYA, 65 (30%) wolves wore functioning collars. This was the fourth consecutive year in which wolves were systematically captured by helicopter darting in YNP. The average number of wolves captured over the four winters was 25 (including members of the Sheep Mountain pack). YNP staff plan to capture a similar number in 2002. 🐾

WOLF PREDATION

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 during two winter-study sessions, 30-day periods in March and November–December during which wolves were intensively radio-tracked. The Leopold, Rose Creek II, and Druid Peak packs were monitored by two-person teams from the ground and from aircraft; the Chief Joseph, Mollie's, Nez Perce, Sheep Mountain, Tower, Cougar, and Yellowstone Delta packs were monitored from aircraft only. YNP staff recorded and entered into a data base 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., nutritional condition), and characteristics of kill sites. The abundance and sex-age composition of elk within wolf pack territories were also estimated from the ground and from fixed-wing aircraft.



In late winter, wolves often prey on animals in poor condition from YNP's long winters. The fat in ungulates' bone marrow is the last fat source to be metabolized. The fat content of the sample above was severely depleted, indicating malnutrition.


Composition of Wolf Kills

Project staff detected 161 definite and 196 probable kills made by wolves in 2001, including 311 elk (87% of total), 6 bison, (2%), 6 deer (2%), 6 coyotes (2%), 1 moose (<0.5%), 1 pronghorn (<0.5%), and 26 unknown prey (7%). The composition of elk kills was 33% calves (0–12 months), 36% cows, 17% bulls, 4% elk of unknown sex, and 10% elk of unknown sex and age. Bison kills included three calves, two yearlings, and one adult, all of unknown sex. Of the bison kills, one was killed during February, two in April, and three during the summer months. The Nez Perce pack made two of the summer kills; the third was made by the Druid Peak pack. The moose and pronghorn kills were made by the Druid Peak pack; the moose kill during late winter, and the pronghorn kill in October.

During winter, wolves residing on the northern range killed an average of 1.8 elk/wolf/30-day study period.

Winter Studies

During the March winter study, wolves were observed for 261 hours from the ground. The number of days wolf packs were located from the air ranged from 10 (Yellowstone Delta) to 21 (Leopold, Rose Creek II, and Druid Peak). One hundred and eight definite or probable wolf kills were detected, including 98 elk, 2 mule deer, 1 moose, and 7 prey of unknown species. Among elk, 31 (32%) were calves, 40 (41%) were cows, 18 (18%) were bulls, 6 (6%) were of unknown sex, and 3 (3%) were of unknown sex and age.

During the November–December winter study, wolves were observed for 174 hours from the ground. The number of days wolf packs were located from the air ranged from 3 (Yellowstone Delta) to 12 (Swan Lake and Leopold). Forty-one definite or probable wolf kills were detected, including 35 elk, 2 coyotes, and 4 unknown prey. Among elk, 15 (43%) of the kills were calves, 11 (31%) were cows, 6 (17%) were bulls, and 3 (9%) kills were adult elk of unknown sex. 

WOLF MANAGEMENT

Area Closures


To prevent human disturbance of young pups, visitor entry was closed to areas surrounding two dens of the

Druid Peak pack. Each closure was about four square miles and was centered on the dens. A no-stopping zone was also instituted along the road to Cooke City near the den of the Druid Peak pack to discourage visitors from parking their vehicles outside established pullouts and to keep them from stopping near wolves that were trying to cross the road near the den. Using private funds raised by the Yellowstone Park Foundation, two people were also hired to direct traffic, monitor wolf activity, and educate the public about YNP wildlife and Rocky Mountain ecosystems. Hiking trails in the vicinity of the closures remained open to travel.

The Daly Creek trail in the northwest part of the park was closed to off-trail hiking to protect the denning area of the Chief Joseph pack. Den sites for the Leopold, Mollie's, and Nez Perce packs were protected from disturbance as a result of Bear Management Area closures: Blacktail (March 15 to June 30), Pelican Valley (April 1 to July 3), and Firehole (March 10 to May 26).

The areas around the den sites of the Rose Creek II, Yellowstone Delta, Swan Lake, and Cougar Creek packs were not closed because of historically low visitor use.

Wolf Depredation Outside Yellowstone

Wolves killed 22 cattle, 117 sheep, and 4 dogs in the GYA during 2001. Nine wolves were killed during control actions by the USFWS and USDA Wildlife Services in response to livestock losses; eight were translocated. (For further information, see the USFWS *Rocky Mountain Wolf Recovery 2001 Annual Report*.) 

COLLABORATIVE RESEARCH

The wolf project and the Yellowstone Park Foundation provided direct and indirect support for collaborative research with scientists at other institutions, primarily universities. Most of the studies represent pioneering work on wolves within the topic of interest.

Wolf Project Students—Direct Assistance

Graduate Student: Shaney Evans (Master of Science candidate)

Committee Chair: Dr. L. David Mech, University of Minnesota, St. Paul

Title: Elk (*Cervus elaphus*) seasonal distribution and

adult mortality post-wolf (*Canis lupus*) reintroduction in Yellowstone National Park, WY

Project Narrative: As part of a three-tiered study, “Multi-trophic level ecology of wolves (*Canis lupus*), elk (*Cervus elaphus*), and vegetation in Yellowstone National Park, Wyoming,” seasonal distributions of elk will be examined to estimate the behavioral effects of wolves on elk. Individual elk locations will be paired with wolf locations to establish the proximity of elk to wolves. In addition, patterns of distribution will be compared for cows with calves versus cows without calves and for gravid versus non-gravid females. Biologists John Cook and Rachel Cook will estimate the nutritional status of cow elk during capture using ultrasonography and body condition scoring. The extent that elk distribution patterns (group size and location) are correlated with elk nutritional condition and age will also be examined. Comparisons will be made between a new model of predation risks for cow elk and empirical data collected during this study.

Project Activity in 2001: Shaney assisted with elk capture, continued fieldwork, and attended courses during fall 2001.

Anticipated Completion Date: May 2003

Graduate Student: Julie Mao (Master of Science candidate)

Committee Chair: Dr. Mark S. Boyce, University of Alberta

Title: Habitat selection by elk (*Cervus elaphus*) following wolf (*Canis lupus*) reintroduction in Yellowstone National Park

Project Narrative: Habitat selection by elk will be modeled using data from pre-wolf (1987–1990) and post-wolf reintroduction (2000–2001) periods. Forty-five cow elk were captured on the northern range during March 2000 and fitted with VHF radio-collars. Beginning in late June, each animal was located from the air every 7 to 14 days. During spring and summer, elk dispersed from their winter range to higher elevations on the Buffalo Plateau, Upper Cache Creek, Upper Lamar River, Quadrant–Mt. Holmes, and Heart Lake–Lewis Lake area. All radio-collared elk migrated back to the northern winter range during October and November. Initial analysis of 2000



Collaring elk is not new in YNP. This collar, probably deployed by John and Frank Craighead in the 1960s, was found by Julie Mao while doing fieldwork.

summer habitat use data suggested strong selection for mosaics of grass-forb vegetation and burned, regenerating forest. Tracking of radio-collared elk will continue through 2001. Preliminary models of elk habitat selection and distribution constructed for pre-fire (1988 burns), post-fire, and post-wolf reintroduction periods will be compared.

Project Activity in 2001: Julie continued her course work and began data collection.

Anticipated Completion Date: May 2002

Graduate Student: Linda Thurston (Master of Science candidate)

Committee Chair: Dr. Jane Packard, Texas A&M University

Title: Homesite attendance as a measure of alloparental and parental care by gray wolves in northern Yellowstone National Park

Project Narrative: This study focused on parental and alloparental (non-breeder) care by gray wolves. Four packs were observed during two denning seasons (1997–98) using radio telemetry, supplemented by direct observations. Thirty comparisons were made of homesite attendance by individuals that were

matched for breeding status, age, and opposite gender. Homesite attendance by parental females and alloparental females was greater than or equal to attendance by parental males and alloparental males, respectively, in 100 percent of the cases. Alloparental care was less than or equal to parental care in 75 percent of the cases. High variation in the trends of both parental and alloparental care was found.

Project Activity in 2001: Linda defended her thesis and will graduate in 2002.

Anticipated Completion Date: May 2002

Graduate Student: Gregory Wright (Master of Science candidate)

Committee Chair: Dr. Rolf O. Peterson, Michigan Technological University

Title: An analysis of Yellowstone National Park's northern range elk herd

Project Narrative: The first objective of this study is to document the demographics of elk (*Cervus elaphus*) on the northern winter range using population reconstruction. This technique requires age, sex, and date-of-death information from a sample of elk mortalities each year. Based on these data, retrospective estimates of population size and sex-age composition are made based on elk longevity. The second objective is to compare characteristics of northern range elk killed by gray wolves (*Canis*

lupus) to those harvested by hunters.

Project Activity in 2001: Greg assisted with Wolf Project field operations in March and continued his coursework and data analysis.

Anticipated Completion Date: May 2002

Graduate Student: Daniel R. MacNulty (Master of Science candidate)

Committee Chair: Dr. L. David Mech, University of Minnesota

Title: The predatory sequence in the wolf

Project Narrative: The objective of this study is to better understand wolf behavior while they are killing elk. Dan is studying 565 attempts by wolves to capture elk and bison, and organizing each sequence into common elements. He has found six distinctive behaviors involved with each attempt: travel, approach, watch, attack, target, and capture. Not all of the elements are present in every encounter. Wolves were less successful in killing bison than elk.

Commonalties with other studies and wolf hunting behavior are also subjects of interest in Dan's study.

Project Activity in 2001: Dan conducted fieldwork in Pelican Valley in March and on the northern range in November. He attended school the remainder of the year.

Anticipated Completion Date: May 2002

Other Research—Indirect Assistance or Collaborative Work with the Wolf Project

| TOPIC | COLLABORATOR | INSTITUTION |
|---|--|---|
| Wolf–cougar interactions | Howard Quigley, Toni Ruth | Hornocker Wildlife Institute |
| Wolf–coyote interactions | Robert Crabtree, Jennifer Sheldon | Yellowstone Ecosystem Studies |
| Wolf–bear interactions | Charles Schwartz, Mark Haroldson; Kerry Gunther | Interagency Grizzly Bear Study Team; YNP |
| Wolf–elk relationships in the Firehole watershed | Bob Garrott, Eric Bergman | Montana State University |
| Wolf stress hormones | Scott Creel, Jennifer Sands | Montana State University |
| Wolf–scavenger relationships | Wayne Getz, Chris Wilmers; Bob Crabtree | California State University, Berkeley; Yellowstone Ecosystem Studies |
| Wolf–aspen | William Ripple | Oregon State University |



PUBLIC INVOLVEMENT

Volunteer Program

Seventeen volunteers worked a total of 5,544 hours in 2001 (see Appendix), valued at \$62,758 at the GS-5 level, which was equal to approximately 2.7 full-time GS-5 employees. Volunteer positions continued to be highly competitive, with three to four applicants applying for each position. Volunteers received free housing and a \$200/month food stipend.

More positions are available during winter when studies of wolf behavior and predation rate take place. In some cases a minimum stay of three months is required. Interested persons should mail a cover letter and resumé to the Yellowstone Wolf Project, P.O. Box 168, Yellowstone National Park, Wyoming 82190.

Visiting Scholars Program

Drs. Rolf O. Peterson and Douglas B. Houston participated in our visiting scholars program in 2001. Dr. Houston visited Yellowstone in February and March, and Dr. Peterson in March and April. Doug worked in YNP from 1970 to 1979 and contributed his vast knowledge on the ecological history of the park and the ungulate story to help us design and analyze work on the return of the wolf. Rolf was a visiting scholar in 1995 and has since advised several graduate students. He currently supervises Greg Wright's elk research at Michigan Tech. Rolf continues to help with long-term wolf prey studies; he is a noted expert in that field. He has presided over the longest continuous wolf study in the world in Isle Royale



Volunteers Daniel Boone and Erin Cleere help to process wolves near Tower Junction. Much of the YNP winter fieldwork is accomplished through volunteer labor.




Visiting scholars Drs. Douglas Houston (left) and Rolf Peterson (right) examine new growth in a willow stand near the Druid Peak pack den.

National Park (principal investigator since 1974), providing a great example for wolf studies in Yellowstone National Park. Both Rolf and Doug's long-term approach to understanding ecological complexity and relationships will be valuable in studying the Yellowstone ecosystem post-wolf reintroduction. Some of these ideas will appear in a manuscript that Smith, Peterson, and Houston are currently working on. 🐾

ACKNOWLEDGMENTS

As the years go by and the Yellowstone Wolf Project matures, we continue to be impressed by the number of people who want to help, and their extraordinary dedication. One significant group of dependable people is the volunteers. We could not do what we do without them. Many qualified volunteers wanted to work with us, but we can only accommodate so many each year. We thank those who worked, and those who applied but could not be accepted. We are also grateful to the Yellowstone Park Foundation (YPF) for their support, and to Erin Cleere

and Linda Thurston, who worked for the Wolf Project through the YPF. We also appreciate those of you who participated in the YPF collar sponsorship program.

We are thankful for the contributions from individuals, corporations, and foundations that donated funds to the various needs and causes of the Yellowstone Wolf Project in 2001. And again, we owe sincere thanks to Tami Blackford, our steady and committed editor. 

APPENDIX

Yellowstone Wolf Project Volunteer Roster, 2001

| Name | Period of Involvement | Hours |
|-------------------------------------|--|---------------|
| Boone, Daniel | 11/05/2001–12/14/2001 | 312 |
| Cleere, Erin | 02/23/2001–04/06/2001 and 11/01/2001–12/14/2001 | 696 |
| Hessick, Kristin | 02/23/2001–04/06/2001 | 344 |
| Huntzinger, Brett | 11/08/2001–12/14/2001 | 296 |
| Irvin, Cole | 11/08/2001–12/14/2001 | 296 |
| Koitzsch, Ky | 01/02/2001–04/06/2001 | 760 |
| Lindh, Hilary | 02/23/2001–04/06/2001 | 344 |
| MacNulty, Dan | 03/22/2001–03/31/2001 | 80 |
| Miller, Guy | 02/23/2001–04/06/2001 | 344 |
| Peer, Melissa | 02/23/2001–04/06/2001 | 344 |
| Roscrow, Lynne | 11/06/2001–12/14/2001 | 312 |
| Stahler, Dan | 03/22/2001–03/31/2001 | 80 |
| Temple, Larry | 02/23/2001–03/31/2001 | 296 |
| Thurston, Linda | 11/08/2001–12/14/2001 | 296 |
| Varley, Nathan | 03/22/2001–03/31/2001 | 80 |
| Wright, Greg | 02/20/2001–04/06/2001 | 368 |
| Zieber, Tom | 11/08/2001–12/14/2001 | 296 |
| Total Volunteer Hours Worked | | 5,544* |

*Equivalent to 2.7 GS-05 employees.

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