



# YELLOWSTONE WOLF PROJECT



ANNUAL REPORT  
2002



# Yellowstone Wolf Project

Annual Report  
2002



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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.*

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## BACKGROUND

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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 (GYA) 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.

Following an extended period of public planning and input, wolf restoration to the 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, two NPS wildlife biologists are dedicated full-time to the project, with one technical assistant and from two to nine 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.

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## 2002 SUMMARY

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At the end of 2002, at least 272 wolves in 31 packs were present in the greater Yellowstone area (GYA), representing 22 breeding pairs. Overall 43 breeding pairs were present in the three recovery areas of greater Yellowstone, central Idaho, and northwest Montana. This was the third year when at least 30 breeding pairs were present in the northern Rocky Mountains, the minimum population size for delisting from the endangered species list. With the biological criteria met for delisting, the states of Idaho, Montana, and Wyoming need to complete approved management plans to ensure adequate wolf populations in the future. When state plans are approved, the U.S. Fish and Wildlife Service will delist wolves. As of this writing, state plans were not approved.

Pack size in Yellowstone National Park (YNP) ranged from 2 to 20 wolves and averaged 10.6. As expected, the Druid Peak pack did not maintain its record high pack size and at year's end consisted of only 11 wolves, down from a high of 37. Wolves dispersing from this pack were responsible for the formation of three new packs: Buffalo Fork, Geode Creek, and Agate Creek. The smallest pack, the Tower pack, remained only a pair of wolves probably because they were attacked by the Agate Creek wolves while the female was pregnant. One other new pack of four wolves formed in the Bechler region, the first recorded activity of a pack there since wolf reintroduction.

At least 56 pups survived to the end of the year in YNP. Average pups/litter at year's end was 4.3. Twelve breeding pairs produced 14 litters. The Druid Peak and Agate Creek packs each had two litters, but only 3 and 4 pups, respectively, survived from these litters. The Swan Lake pack may have had more than one litter, but genetic testing will be necessary to confirm.

Five radio-collared wolves in YNP died in 2002. One was hit by a vehicle and the others died of natural causes.

Eighteen wolves were captured by helicopter darting in February. Seven wolves were captured in late 2001, but were still part of the 2001–2002 season. All together 7 adults (28%), 8 yearlings (32%), and 10 pups (40%) from 9 different packs were captured and collared. Of those captured and collared, 18 were males (72%) and 7 were females (28%). Wolves were captured from the following packs: Druid Peak (7), Yellowstone Delta (5), Cougar Creek (3), Leopold (2), Rose Creek II (2), Sheep Mountain (2; captured by Wildlife Services), Mollie's (2), Nez Perce (1), and Chief Joseph (1). In addition to attachment of radio collars, standard measurements and blood (genetics and disease monitoring) were collected on all wolves handled. Weights of wolves, especially on the northern range, appear to be declining since systematic capture efforts were initiated in 1998. There were 35 (24%) wolves collared in YNP at the end of 2001.

Project staff detected 132 definite, 206 probable, and 8 possible kills made by wolves in 2002, including 291 elk (84% of total), 21 bison, (6%), 4 deer (1%), 4 coyotes (1%), 4 wolves (1%), 1 badger (<0.5%), 1 Canada goose (<0.5%), and 22 unknown prey (6%). The composition of elk kills was 34% calves (0–12 months), 31% cows, 22% bulls, 5% adult elk of unknown sex, and 8% elk of unknown sex and age. Bison kills included 10 calves (unknown sex), 3 yearlings (2 female, 1 male), and 8 adults (3 female, 3 male, 2 unknown sex). During winter, wolves killed an average of 1.8 elk/wolf/30-day study period.

Over 100,000 people have seen wolves in YNP since 1995. More visitors saw wolves in 2002 during the Lamar Valley summer season than the previous year (12,414) and public outreach was greater. Despite an increase in human presence and vehicles on the northern range, there were no known cases of wolf habituation or injury to humans or wolves during the busy summer season.

Twenty volunteers worked a total of 5,848 hours for the National Park Service worth \$66,200 of labor or the equivalent of 2.7 GS-5 employees. Dr. Rolf O. Peterson was again our visiting scholar in 2002, with brief visits by both Dr. Douglas Houston and Dr. L. David Mech.

Three full-time employees worked for the Project in 2002: Project Leader Douglas Smith, Biological Technician Debra Guernsey, and Project Biologist Daniel Stahler. Rick McIntyre worked as a seasonal employee during January and February, and from late May through early September on the Druid Road Management Project. Dan Graf and Elena West also assisted with the Road Management Project, but through the Yellowstone Association. Erin Cleere and Janice Stroud served as volunteer technicians during January, February, and June. Volunteers staffed the November–December and March winter studies.

# Greater Yellowstone Area Wolf Pack Territories 2002

(using 95% of wolf locations)

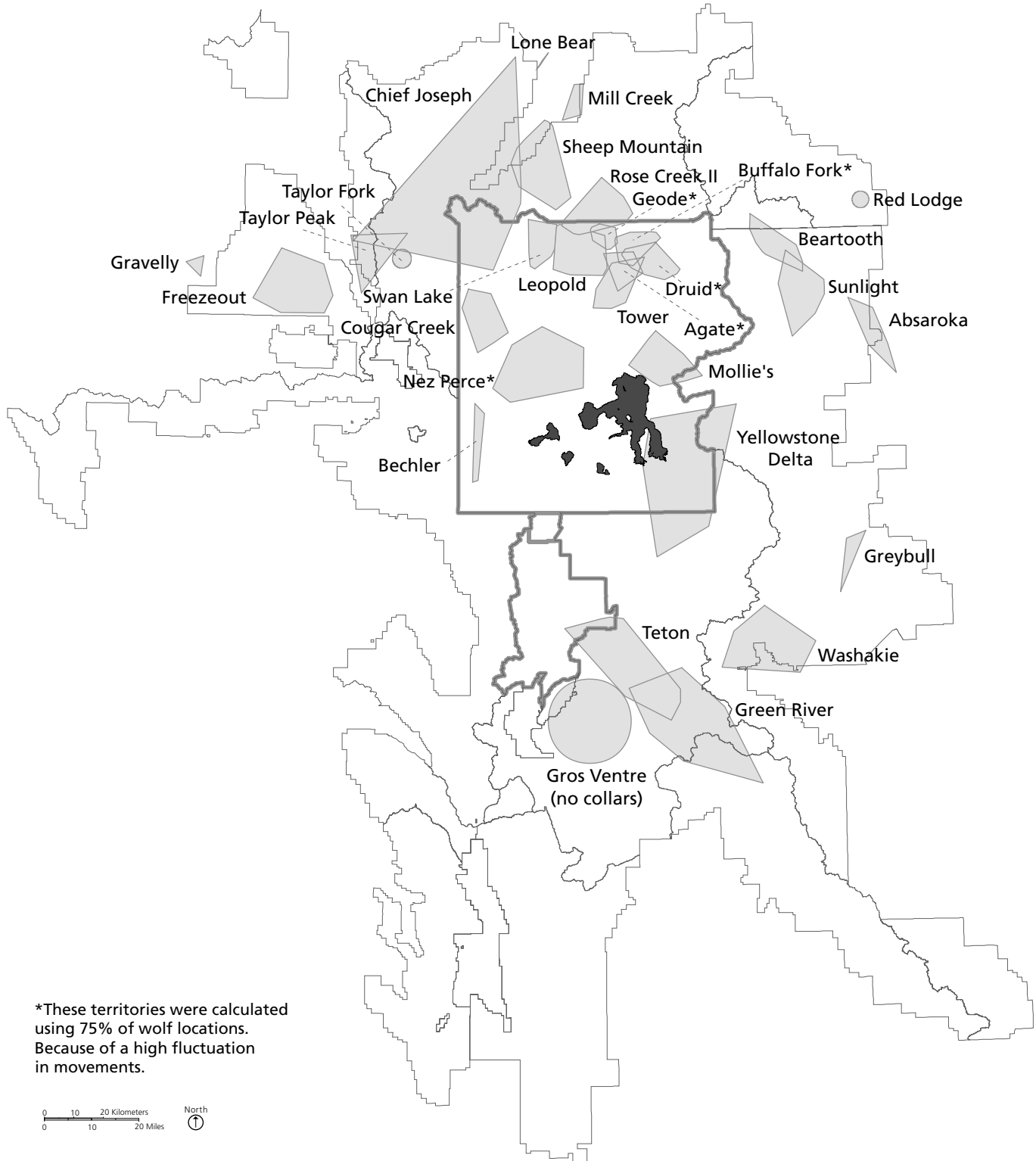


Figure 1. Wolf pack territories occupying the GYA in 2002.



# THE YELLOWSTONE WOLF POPULATION

## *Population Status*

At the end of September 2002, at least 148 wolves in 14 packs were present in Yellowstone National Park (YNP) (Tables 1 and 2, Figs. 1 and 2). Of these 14 packs, 12 were considered breeding pairs according to the US-FWS definition (Fig. 3).

Of the 14 YNP packs, all but two bred. The Tower pack female likely lost her pups from wounds suffered during the attack by the Agate Creek pack right after breeding season. The Buffalo Fork pack also did not breed for unknown reasons.

Four new packs formed in YNP in 2002. Three of them as a result of the splintering of the Druid Peak pack: the Agate Creek, Geode Creek, and Buffalo Fork packs all formed with at least one Druid Peak disperser and reside on the northern range of YNP. Interestingly, all three of these packs are anchored by females (#103F, #105F, and #106F) born at the same den in Lamar Valley in 1997.



*Agate Creek pup collared during annual collaring efforts in January. Photo by William Campbell.*

**Table 1. Summary of wolf population in Yellowstone National Park (YNP), 2002.**

<b>Pack</b>	<b>Adults/ Yearling</b>	<b>Pups</b>	<b>Total Est. Pack Size</b>	<b>Breeding Pair? (Yes/no)</b>	<b>No. of Litters</b>	<b>General Location</b>
Agate Creek	6	4	10	Yes	2	Agate to Antelope Creeks, YNP
Bechler Group	2	2	4	Yes	1	Bechler Region, YNP
Chief Joseph	2	8	10	Yes	1	West/northwest YNP
Cougar Creek	5	5	10	Yes	1	Western Yellowstone National Park
Druid Peak	8	3	11	Yes	2	Lamar Valley to Hellroaring Creek, YNP
Geode Creek	6	3	9	Yes	1	Geode Creek, YNP
Leopold	8	8	16	Yes	1	Blacktail Plateau to Mt Everts, YNP
Mollie's	10	2	12	Yes	1	Pelican Valley, YNP
Nez Perce	15? <sup>1</sup>	3? <sup>1</sup>	20 <sup>1</sup>	Yes	1	Central YNP
Rose Creek II	7	3	10	Yes	1	Hellroaring Crk to Crevice Crk, YNP
Buffalo Fork Group	4	0	4	No	0	Slough Creek, YNP
Swan Lake	5	11	16	Yes	1	Gardner's Hole/swan Lake Flat Area, YNP
Tower	2	0	2	No	0	Tower Area, YNP
Yellowstone Delta	10	4	14	Yes	1	Thorofare Region, YNP
<b>14 Packs</b>	<b>90</b>	<b>56-58?</b>	<b>148</b>	<b>12</b>	<b>14</b>	

<sup>1</sup>Adult and yearling count is estimated; pup count is at least 3; total pack size is accurate.

• Mean pack size = 10.6

*Wolves have great difficulty killing prey that do not flee. These two Druid wolves were unsuccessful in killing this bull elk that stood its ground. Photo by Monty Sloan.*



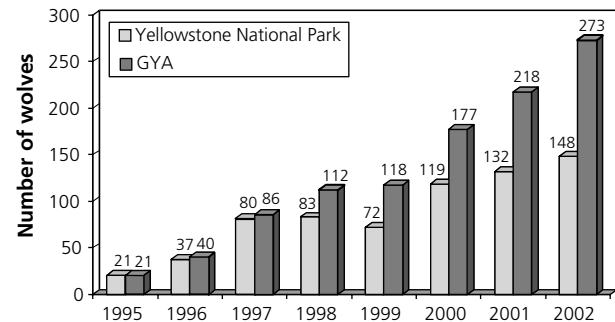
The alpha male of the Agate Creek pack is a 5-year-old from the Chief Joseph pack. The last newly formed pack is the Bechler pack, discovered in August of 2002 after numerous reports of tracks and sightings in the area. This is the first resident group of wolves in the Bechler area since wolf reintroduction began in 1995. Prior to this there was little wolf activity and only occasional reports of tracks. The group is comprised of a very large dispersing male from the Rose Creek pack and three uncollared wolves, two of which are pups so the pack will count as

a breeding pair (a minimum of two pups are required to be considered a breeding pair). They have ranged as far north as Little Firehole Meadows and have so far not been located outside YNP.

The formation of the three new packs from the splintering of the large Druid Peak pack was mostly observed by field staff. It was unique, and occurred in a manner not previously recorded in the wolf literature. As the Druid Peak pack crumbled during the winter 2001–2002, groups of wolves formed with little affinity to area, and individual wolves moved between the different groups. For example, #218F originally from the Druid Peak pack, was recorded traveling with the Agate Creek, Geode Creek, and Buffalo Fork packs. Four Nez Perce wolves (#213F, #214M, #215M, and 252M) from the Madison-

**Table 2. Summary of Greater Yellowstone wolf population outside Yellowstone National Park, 2002.**

Pack	Adults & Yearlings	Pups	Total	Breeding Pair?
Teton	3	11	14	Yes
Gros Ventre	3	0	3	No
Washakie	10	5	15	Yes
Sunlight Basin	8	4	12	Yes
Absaroka	6	3	9	Yes
Beartooth	4	3	7	Yes
Greybull River	4	3	7	Yes
Green River	2	0	2	No
Taylor Peak	2	2	4	Yes
Taylor Fork	2	0	2	No
Freezeout	?	?	9	Yes



*Figure 2. Greater Yellowstone Area wolf population, 1995–2002.*

Firehole area joined in the melee of wolves often centered around Tower Junction. The area where many of the interactions took place was mostly newly acquired Druid Peak territory (usurped from Rose Creek). On one occasion near Hellroaring Creek in March 2002 one of the “new” split-off Druid packs (Geode Creek) interacted with the old, much-reduced Druid Peak pack. Wolf #106F, an old Druid wolf, greeted her former packmates with her tail up and wagging, but an aggressive interaction ensued between the two groups. After this encounter the Druid Peak pack was split, and did not reunite until mid-April. The young pups and yearling Druid wolves remained near Hellroaring Creek killing elk on their own, while the Druid alphas with two yearlings left the area and never returned. The Hellroaring area now belongs mostly to the new Geode Creek pack (#106’s new pack).

Pack size ranged from 2 to 20 and averaged 10.6. As expected the record-large Druid Peak pack did not stay together so the formation of new packs did not appreciably increase the number of wolves present from 2001 (2001 = 132, 2002 = 148; 12% increase).

### Reproduction

At least 65 pups were born to 12 YNP wolf packs in 2002 (Fig 4). At least 14 litters were born; the Druid Peak and Agate Creek packs each had two litters. Swan Lake had 11 pups so it is likely two litters were produced, but this is not confirmed. The Agate Creek pack, one of those formed from the crumbling of the Druid Peak pack, denned at separate locations and appeared as if it would split into two packs. They did not, however, and joined up mid-summer and have been functioning as one pack since that time. Despite the fact that both of these packs had two litters only four out of eight pups survived for the Agate Creek pack and three of six in the Druid Peak pack. Geode Creek had at least eight, possibly nine, pups mid-summer but only three of those were with the pack this fall. Overall, the maximum number of pups observed by wolf dens this summer was 65 or 66 (Geode Creek count was imprecise at eight or nine). Of these pups, 56 (85%) could be accounted for in September, but it is likely more pups survived because observation of some packs is difficult.

### Mortalities

At least five adult wolves died in YNP in 2002

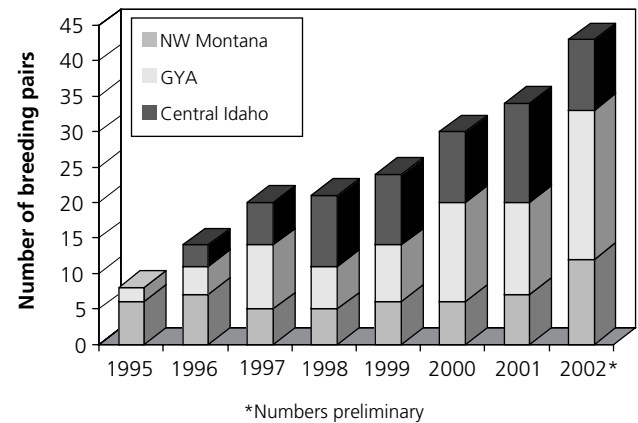


Figure 3. Northern Rocky Mountain wolf breeding pairs.

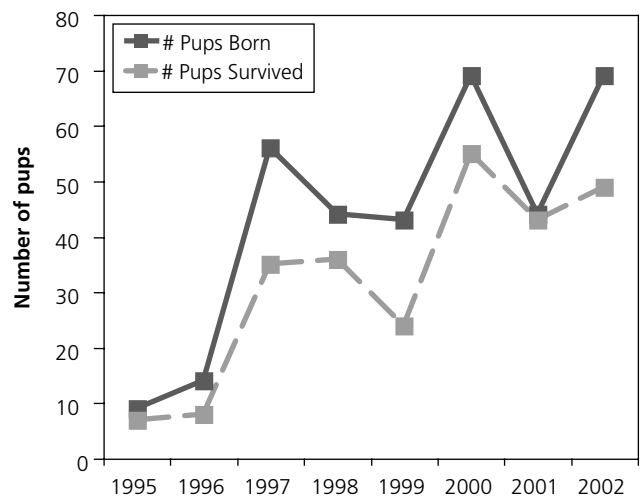


Figure 4. Yellowstone National Park, pups born and survived.

(Fig. 5). This figure does not include pups that died within the first four months of life. Four were natural mortalities and one was a vehicle strike on U.S. Highway 191. Two, possibly three of the natural mortalities were due to interpack conflict, and one was due to injuries sustained from encountering prey. Longtime alpha female #7F of the Leopold pack was killed by other wolves in May (see inset story), probably by the Geode Creek pack which was denning nearby (see *Yellowstone Science* 10(3)). Wolf #2M, life-long mate of #7F and alpha male of the Leopold pack (also a founder wolf from Canada, 1995), was killed on the last day of the year likely by the same Geode Creek pack that killed his mate in May (see inset story). Wolf #254M, who dispersed from the Druid Peak pack,

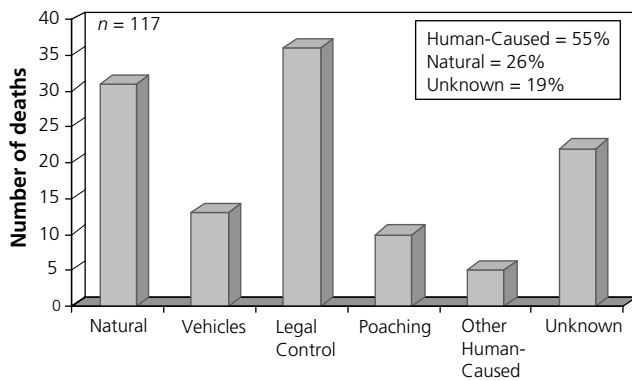


Figure 5. Causes of death for wolves in GYA, 1995–2002.

was found dead at the base of a cliff near the headwaters of Timothy Creek. Cause of death was categorized as natural, but could have been accidental (base of a cliff), or could have involved other wolves. The carcass was partly decayed so positive determination was not possible. Wolf #218F of the Geode Creek pack was likely killed from injuries sustained encountering an elk. Most other wolf mortalities in the GYA were outside YNP and were predominantly human caused. One Chief Joseph wolf dispersed to near Helena, Montana, and was shot by USDA Wildlife Services after depredateing sheep.

### *Population Movements and Territories*

The YNP wolf population increased by 12% in 2002. Almost all of the increase was in non-northern range packs (Fig. 6). Seventy-seven wolves occupied the northern range in 2001 and 78 did in 2002, whereas the



An average of 24 wolves/year have been collared since systematic collaring began in 1998. Photo by William Campbell.

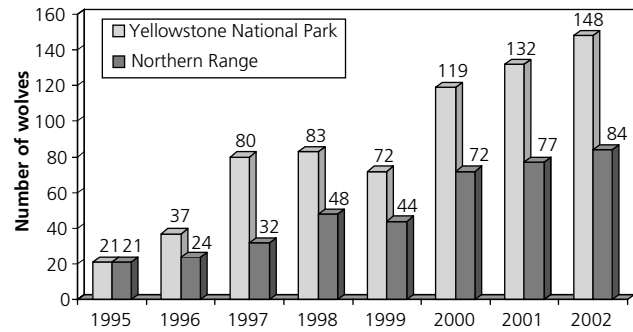



Figure 6. Yellowstone National Park Wolf Population, 1995–2002.

non-northern range wolf population increased from 55 to 70. Therefore, despite the increased number of packs on the northern range in 2002 due primarily to a realignment of packs (5 in 2001, 8 in 2002) there was not an increase in the number of wolves. Throughout the rest of YNP there was only one new pack from 2001 (Bechler pack, 4 wolves), so the increased number of wolves was due to increases in the number of wolves in existing packs (Nez Perce 18 to 20, Cougar Creek 6 to 10, Mollie's 10 to 12, etc).

Wolf use of YNP was typical of previous years (see territory map) except for the new Bechler pack. Few prey exist in Bechler in the winter making it difficult for wolves to live there throughout the year. The alpha male of that pack, for example, was located chasing deer in the northern part of Yellowstone in April, the time of year when pups are born. Either the Bechler pack moved there later, or the alpha male made extremely wide-ranging trips in search of prey for a denning female.

A greater amount of overlap between wolf territories on the northern range was documented in 2002. The Rose Creek II, Geode Creek, Agate Creek, Buffalo Fork, Nez Perce, and Mollie's pack were all involved with trespasses on the northern range. Territory boundaries between the Geode Creek, Agate Creek, Druid Peak, and Buffalo Fork packs were not well established (Fig. 1). 

## PACK SUMMARIES

### *Chief Joseph Pack*

At the beginning of 2002, the Chief Joseph pack had no radio-collared wolves. Unusual events had led to the demise of both alpha wolves (both collared), and the loss

of other collared wolves either through dispersal or mortality. Nearly half of the pack was radio collared late in 2001,—one of the higher proportions for any Yellowstone area pack,—but the year ended with none of them collared. A male pup was collared in January, but this animal was rarely tracked with the pack and dispersed by the end of the year.

Eight pups were observed at their traditional den site in the northwest corner of the park. Denning activity probably began in Tom Miner Basin, with the pack later moving back into YNP. They spent most of the rest of the summer in YNP, but indications were that as soon as the pups were able, they traveled widely west of the park. Some opportunistic observations were made by wolf project staff and park rangers, allowing us to determine that the pack consisted of a breeding pair and eight additional wolves.

### *Swan Lake Pack*

Numbering 16 wolves, the Swan Lake pack has become one of the larger packs in the ecosystem. Eleven pups were counted in this pack, possibly indicating more than one litter was produced. Blood samples from captured pups will be necessary in 2003 to positively determine the actual number of litters. Unlike previous years, pup survival was also good; all of these pups were spotted at the end of the year.

### *Leopold Pack*

One of the older, and more stable packs in the ecosystem, the Leopold pack experienced dramatic change in 2002. Both alpha wolves, #2M and #7F, the original progenitors of the pack, were killed by other wolves (see inset story).

In May, #7F was traveling near the eastern boundary of her territory when she was attacked by other wolves, probably the Geode Creek pack in that they had denned nearby, and had a kill even closer to where #7F was found dead. Number 7F had given birth to eight pups and a necropsy indicated that she was still nursing them at the time of her death, about five to six weeks after the pups were estimated to have been born. All of the pups survived and were seen being cared for (not nursed) by other members of the pack.

Winter study crews had documented #2M's ejection from the pack by late November. It was initially presumed



*Most wolf packs in Yellowstone dig more than one den hole each denning season. This is hole #2 for the Leopold pack. Photo by Douglas Smith.*

that his departure was temporary in order to find a new mate following #7's death. Observations later indicated that he had lost his dominant status to another pack member, an uncollared gray male of unknown origin. Number 2 traveled outside of core Leopold territory, occasionally with other wolves, until he was found dead on the last day of the year. An examination of the site and the carcass clearly indicated that he also had been killed by other wolves, probably Geode Creek again in that he was inside their territory, and they were the closest pack to #2M at the time of his death. Number 2M was the last surviving wolf from the 1995 reintroduction.

Beginning in 2003, this pack will be given the roman numeral II after Leopold (i.e., Leopold II) to signify its turnover from original wolves, as none are left. Because the pack uses the same territory, and because descendents



## END OF AN ERA FOR THE LEOPOLD PACK

### *The Death of #2 and #7*

In January 1996, two wolves were spotted together on the Blacktail Deer Plateau. Prior to this sighting, no wolf packs existed in YNP other than those that had been reintroduced. Blacktail was prime wolf habitat; two other wolves awaited release in an acclimation pen nearby. Over the next several weeks we monitored the two wild wolves, which were both collared, and determined they were indeed a pair intending to settle in the area. Our plans to release the other two wolves on Blacktail were scrapped (we released them near Old Faithful), leaving the newly paired wolves room to roam across the Blacktail Deer Plateau. These wolves were #2M and #7F, and they started one of the most stable and productive wolf packs so far in Yellowstone's new wolf era. We named them the Leopold pack, commemorating Aldo Leopold's recommendation in 1944 that wolves be reintroduced to Yellowstone. This pair would have made Leopold proud.

Number 2M and #7F were both in the first shipment wolves. On January 12, 1995, they came from Alberta, Canada, with tremendous fanfare. They were unmoved. Number 7F was a female pup placed in the Rose Creek pen, and #2M was a male pup placed in the Crystal Creek pen. Eventually these would be the names of their respective packs. Upon release from her

pen, #7F left her mother #9F and step-father #10M. She traveled alone from March 1995 to January 1996, until we saw her that day in January 1996 with #2M. Number 2M, on the other hand, lived most of 1995 with his pack dispersing late in the year finding #7F soon after he left his pack.

In April 1996 they had their first litter of pups. The pair was observed chasing elk only days before #7F gave birth. Their first litter was small, just three pups. They overcame the slow start and went on to produce six more litters. Over the course of her life, #7F gave birth to at least 39 pups all fathered by #2M, of which at least 29 survived to become yearlings. By 1998 the pack had 13 wolves, and from 1998 through 2002 their pack size varied less than any other pack for that time period ranging from 11 to 14. Their territory also changed little over the years, it was probably the most fixed of any pack in the ecosystem. Blacktail Deer Plateau was Leopold turf, and they never left YNP.

Many of their offspring also did well as they went on to form new packs and populate the Yellowstone ecosystem. A daughter (#152F) dispersed nearby and started the


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*Leopold pack traveling on Blacktail Deer Plateau. Photo by Douglas Smith.*

Swan Lake pack, another daughter (#151F) dispersed to near West Yellowstone to form the Cougar Creek pack. A son (#150M) joined the Rose Creek pack during their precipitous decline from 24 wolves, helping hold that pack together through a period of high mortality and dispersal.

In May 2002, #7F was near the east end of her territory where she was attacked and killed by other wolves. A new pack, splintered off from the massive Druid Peak pack, had picked up residence next door. This upstart pack, the Geode Creek pack, was denning in the area and made a kill within Leopold pack territory. The kill might have attracted #7F, or it could have brought Geode Creek close to #7F's den, however it happened, she was killed. Her teats were distended and bare indicating that she was nursing pups at the time of her death. We estimated her pups to be four to five weeks old, around the time pups are typically weaned. There was some concern over their fate, Yellowstone's foundational wolves could be cracking at the base, but a couple weeks later all of the pups were observed mobbing a non-lactating female. They were rambunctious and healthy.

Then on the last day of 2002, we found #2M dead. Unlike #7F, he had lost his position in the pack and dispersed before his death. Packless, he traveled a month, sometimes with other wolves, sometimes alone, and sometimes in Geode Creek pack territory. We do not know who he was with when he was attacked, but we know from tracks that multiple wolves found him. When we inspected the site it was clear what had happened: several other wolves had caught him at the top of a hill, driven him into a downed tree, broken branches with wolf hair, and a blood trail 50 meters down a hill. We found him at the bottom, fed on by birds, his side ripped open and exposed. His carcass was littered with tooth marks and hemorrhaged flesh. We collected his head for historic purposes, leaving his carcass for eagles, ravens, and magpies to consume.

A pack still resides on the old territory, many descendents of #2M and #7F's, but Blacktail was theirs, now they're gone, and it is not the same. In their absence, we now call the pack there Leopold II, a way of noting the loss of these first generation wolves in Yellowstone's new wolf era. 

from the original wolves are present, the pack will retain the name Leopold.

Despite these losses, the Leopold pack thrived in 2002. At year's end there were 16 wolves in the pack, eight pups and eight adults. One of the younger collared wolves appears to have taken over the alpha female position. Their territory remains the same even without the former pack leaders.

The Leopold pack is unique among many of the park packs in that late winter prey availability in their territory is restricted primarily to bulls, so almost all of the kills made by the pack at this time of year are bulls.

### *Rose Creek II Pack*

After several years of instability and decline, the Rose Creek recovered and stabilized at 10 wolves (7 adults and 3 pups). After being one of the largest packs in the ecosystem (1998 saw 24 wolves in this pack), they declined partially through pressure from the Druid Peak pack which usurped a large portion of their territory. Much of the area they used in the wintertime, an area of prime importance due to large numbers of wintering elk, was lost. They still den inside YNP, but spend most of the summer in the Absaroka-Beartooth wilderness of Gallatin National Forest. Wolf #18F, born to #9F in 1995, is completely gray now, but still the presumed alpha female.

### *Druid Peak Pack*

Beginning the year as the largest pack in the ecosystem, possibly one of the largest packs in recorded history, the Druid Peak pack declined from 37 to 11 wolves by year's end. This splintering created several new packs: Geode Creek (#106F), Agate Creek (#103F and #251F), and Buffalo Fork (#105F). These different packs formed over the winter of 2001–2002. The alpha wolves, #21M and #42F, are aging and are rarely observed killing elk now, leaving the job to the younger wolves in the pack, instead.

Two females (#42F and an uncollared black) bred in the Druid Peak pack giving birth to a combined six pups. Their dens were in close proximity, located across Lamar Valley from each other. These pups experienced high mortality; at year's end only three were still alive.

Number #253M left the pack late in the year and went to Utah. He was last observed in Lamar Valley on October 16 and was caught in a coyote trap near Mason,



*Rick McIntyre and Dan Graf, both seasonal workers for the Wolf Project, inspect den site #1 used by the Druid Peak pack. Photo by Douglas Smith/NPS.*



*Research on wolves, grizzly bears, and bison during March in Pelican Valley continued for the fifth consecutive year. Photo by Daniel Stahler/NPS.*

Utah, in December. He was moved and released near Moran, Wyoming, and then rejoined the Druid Peak pack in Lamar Valley. The straight line distance from Lamar Valley to Mason is approximately 220 miles. It was thought he was traveling with another wolf, but this has not been confirmed.

The Druid Peak pack continues to attract large numbers of visitors in both summer and winter. An estimated 100,000 people have now observed these wolves since 1996.

### ***Geode Creek Pack***

A splinter group from the Druid Peak pack, the Geode pack formed in 2002. They are led by #106F, born to the Druid Peak pack in Lamar Valley in 1997, and the only collared wolf in this pack of nine. By mid-summer at least 10 pups were observed, possibly indicating two litters, but only three pups were present at year's end. This pack lives in an area that was formerly Rose Creek II territory, occupying the area between Cottonwood and Little Buffalo Creeks and some of the area south of the Yellowstone River. This was probably the pack that killed the two alpha wolves of the Leopold pack.

### ***Agate Creek Pack***

Another splinter group from Druid (#103F and #251F), this pack also has wolves from the Chief Joseph pack (#113M). Numbering 10 wolves at the end of the year they had two litters of pups, of which four survived. Two of the pups are very light gray, almost white in color.

This pack denned near Tower Junction, while another member of the group (#103F), like last year, denned alone on Specimen Ridge. The wolves reunited later in the summer. They usurped the Tower pack's territory, frequently using Antelope Creek as well as areas around Tower Junction and even, on occasion, north of the Yellowstone River and into Slough Creek.

### ***Buffalo Fork Pack***

Yet another pack formed from the dissolution of the Druid Peak pack, the Buffalo Fork pack did not reproduce and numbered only four wolves. It is unknown why they did not have pups in 2002. Wolf #105F of this pack is sister to #106F and #103F, all three of which were born in the same den in Lamar Valley in 1997. These wolves ranged less than other northern range packs sticking to the country around Buffalo Fork and Slough Creek.

### ***Mollie's Pack***

Lost in the obscurity of Pelican Valley, faced with hard winters and bison, this pack struggles on. Their numbers have grown since 2000, numbering 12 (10 adults, 2 pups) at the end of the year, but another cycle of decline seems imminent. Both wolves that were radio collared last year (#261M and #262M) have left the pack. Wolf 261M moved to the northern range and #262M was last located late in the year in Targhee National Forest and has not been found since.

Again this pack had frequent encounters with grizzly bears. Every documented kill made by Mollie's pack was





*Horse pack trip in upper Pelican Creek to pick up dead wolf #253M. Wayne Brewster is riding Cherokee Lace while Doug Smith is riding Joker, a colt, and packing Pistol, another colt. Number 253M died of natural causes. Photo by Daniel Stahler/NPS.*

discovered and usurped by grizzly bears. This pattern begins each year when the bears emerge from their dens. In March, a ground crew stationed in Pelican Valley and living in tents observes intense interactions between the wolves and bears at wolf kills. Typically within several hours of making a kill, almost always a hard-fought battle with a bison, bears move in and take the carcass from the wolves. This year was especially acute, with the poor whitebark pine crop, so bears focused more on wolf kills. This same pattern was repeated throughout the park as we observed more bears on wolf kills than in any other year. In one case in August, 10 wolves and 4 bears were observed on a wolf-killed bull elk. The year before in July the same scene was observed only with 10 bears and 4 wolves.

At the close of 2002, the pack was showing typical behavior and making wide-ranging moves out of Pelican Valley, probably in search of prey. Pack counts were difficult through this period but not all of the wolves were present during these forays indicating more dispersal and/or mortality. This pack periodically increases and declines (1998 = 16 wolves; 2000 = 4; 2002 = 12; 2003 = ?) and it appears they may be in another downward phase. Pelican Valley is not an easy place to be a wolf.

### ***Yellowstone Delta***

Five wolves were collared in December 2001, and by

spring 2002 four of the newly collared wolves had their collars chewed off. Eight wolves have been collared in the last two years, but none of those collars are still on any of the wolves. Wolf 126F is the alpha female and the only collared wolf in the pack.

Fourteen wolves (10 adults, 4 pups) were in the pack at year's end. Their summer territory is remarkably stable centering on the Thorofare region of the park, but in winter they are hard to track and much less is known about their movements, most of which are in the Bridger-Teton wilderness.



*Occasionally, wolves will chew radio collars off of each other. The Yellowstone Delta pack is particularly prone to this behavior. Photo by Daniel Stahler/NPS.*

### *Nez Perce Pack*

Ranging in the Madison-Firehole area of YNP, this was the largest pack in the park with 20 wolves. We recorded at least three pups in the pack, but there were probably more. Summer movements of this pack were wide-ranging, and we rarely located them all together, unlike other packs. In mid-December, the wolves left their normal territory, one trip took them to the northern range, and by year-end they were missing.

Like Mollie's pack, the Nez Perce wolves have a large prey biomass available to them in the form of bison, which they occasionally kill, but still rely primarily on elk.

Persistent reports from other researchers and park personnel indicate that there is a small group of uncollared wolves that may be a spin-off group from the Nez Perce pack but is autonomous from the larger pack. This small group of three to four wolves ranges from near Norris Geyser Basin to the Madison Junction area.

### *Cougar Creek Pack*

Another pack with the chewing collar habit (we lost two of three collars), this pack resides on the west side of the park east of the Montana town of West Yellowstone. They had 10 wolves (5 adults and 5 pups) in 2002.

Unfortunately, we have not been able to visit their den after they have left it in the summer, but we suspect they frequently prey on beavers. Near where they den is one of the higher densities of beaver colonies found in YNP (Maple, Cougar, Gneiss, Campanula Creeks). Also, we rarely observe elk in the area. Beaver have been shown to be an important summer food for wolves where the two co-occur.


### *Tower Pack*

Still two wolves, the Tower pack did not reproduce in 2002. A near fatal encounter with the Agate Creek pack in March 2002 probably resulted in the loss of a litter. Residing mostly in the country behind Tower Junction and east into Antelope Creek, this pack was attacked by six wolves in the Agate Creek pack. Agate Creek wolves had made a kill within Tower pack territory near Tower Fall. The next day #208M, the only collared wolf in the pair, was seen immobile in a pool of blood on the snow. Presumed dead, a team of Wolf Project personnel headed in the following day to positively determine cause of death (if certain,

and no lab necropsy was necessary, his carcass would remain in the backcountry). A simultaneous aerial location found that he had moved, but was still badly injured. After 10 days of little movement, #208 fully recovered and reunited with his mate. The two remained in the area for the summer but moved to higher elevations around Mount Washburn, possibly to avoid contact with the nearby denning Agate Creek wolves. At the end of 2002 they were still at high elevation despite increasing snow depths and elk migrations to lower elevations.

### *Bechler Pack*

The Bechler pack was discovered in August 2002 after persistent reports of sightings and tracks were received from park personnel. Investigations by the Wolf Project revealed four wolves, two adults and two pups. One collared male wolf (#192M), formerly of the Rose Creek pack, was present. It is interesting and unknown how this pack got started. Wolf #192M was located on the northern range in April, which is the time females usually give birth to their pups. He was traveling far from his mate and litter. Either they had not yet had pups, or they had their pups somewhere else and moved to Bechler later. The Bechler region was still under snow in April 2002.

They began the winter in Bechler, which typically has no prey throughout the winter due to heavy snow accumulations. Bechler has been the area of YNP with the lowest recorded wolf use. 


## WOLF CAPTURE AND COLLARING

Eighteen wolves were captured by helicopter darting in February, and seven were captured in December 2001 (total for capture season = 25). This was the first time a December capture was conducted and was designed to advantageously collar Yellowstone Delta wolves before they moved into wilderness, where darting is not permitted (five Delta wolves were captured). Including wolves captured in late 2001, 7 adults (28%), 8 yearlings (32%), and 10 pups (40%) from 9 packs were captured and handled. Of these wolves, 18 were males (72%) and 7 were females (28%). Wolves were captured in the following packs: Druid Peak (7), Yellowstone Delta (5), Cougar Creek (3), Leopold (2), Rose Creek II (2), Sheep Mountain (2; captured by USDA Wildlife Services), Mollie's (2), Nez Perce (1), and Chief Joseph (1). Besides



*Wolf Project staff Debra Guernsey, Daniel Stahler, and Douglas Smith process two Geode pack wolves. Photo by Kerry Gunther/NPS.*

attachment of radio collars, standard measurements and blood (genetics and disease monitoring) were collected on all wolves handled. Weights of wolves, especially on the northern range, appear to be declining since systematic capture efforts were initiated in 1998. Weights of captured wolves ranged from 68 to 100 lbs. for pups and 70 to 120 lbs. for adults.

Total number of wolves collared in YNP at year's end was 37 (25%) of the approximately 148 wolves; 73 (27%) of 273 wolves in the GYA were collared. This was the fifth year of systematic helicopter capture of wolves in YNP. YNP staff plans are to capture a similar number in 2003. 

## WOLF PREDATION

### *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 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, Geode Creek, and Druid Peak packs were monitored by two person teams from the ground and from aircraft; the Swan Lake, Agate Creek, Tower, Buffalo Fork, Mollie's, Nez Perce, Cougar Creek, Bechler, Yellowstone Delta, Chief Joseph, and Sheep Mountain packs were monitored from aircraft only. YNP staff recorded and entered into a data base behavioral interactions between



*Elena West and Ben Johnson, both Winter Study volunteers, examine a bison killed by the Druid wolves in December. The bison had a severe infection in the hump and shoulder area. Photo by Douglas Smith/NPS.*

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 (Figs. 7 and 8). In addition, similar data were collected throughout the year during weekly monitoring flights and ground observations. The abundance and sex-age composition of elk within wolf pack territories were also estimated from the ground and from fixed-wing aircraft.

### *Composition of Wolf Kills*

Project staff detected 132 definite, 206 probable, and 8 possible kills made by wolves in 2002, including 291 elk (84% of total), 21 bison, (6%), 4 deer (1%), 4 coyotes (1%), 4 wolves (1%), 1 badger (<0.5%), 1 Canada goose

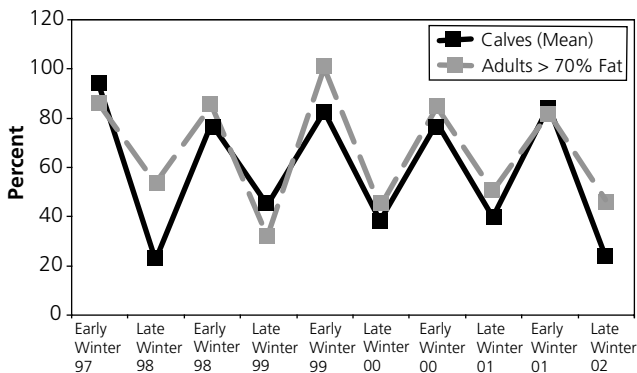


*Wolf 113M, alpha male of the Agate Creek pack, attacks a fleeing cow elk. Photo by anonymous donor.*

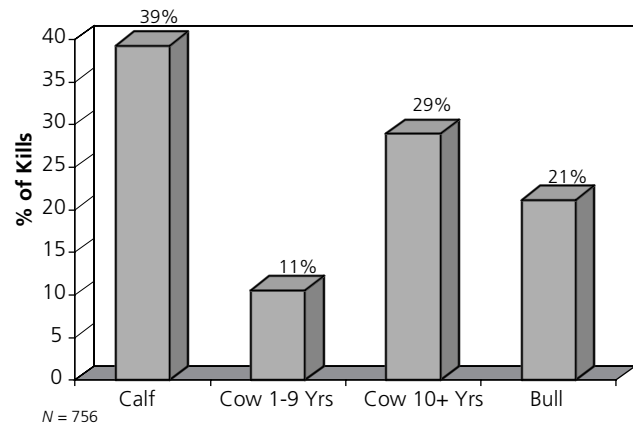
(<0.5%), and 22 unknown prey (6%). The composition of elk kills was 34% calves (0–12 months), 31% cows, 22% bulls, 5% adult elk of unknown sex, and 8% elk of unknown sex and age. Bison kills included 10 calves (unknown sex), 3 yearlings (2 female, 1 male), and 8 adults (3 female, 3 male, 2 unknown sex). Of the bison kills, 1 was killed during December, 1 in January, 5 in February, 6 in March, 7 in April, and 1 in late May. The Nez Perce pack were known to make 13 of the bison kills and both the Mollie’s pack and Druid Peak pack each killed 2. During winter, wolves residing on the northern range killed an average of 1.8 elk/wolf/30-day study period.

**Winter Studies**

During the 2002 March winter study (30 days), wolves were observed for 243 hours from the ground.




*Figure 7. Percent bone marrow fat of wolf-killed ungulates, 1997–2002.*



*Figure 8. Yellowstone Northern Range wolf-killed elk age class, 1995–2002. Data collected from necropsied kills only.*

The number of days wolf packs were located from the air ranged from 1 (Yellowstone Delta) to 15 (Leopold, Rose Creek II, Tower, and Sheep Mountain). Seventy-two definite or probable wolf kills were detected, including 65 elk, 3 bison, and 4 prey of unknown species. Among elk, 19 (29%) were calves, 22 (34%) were cows, 18 (28%) were bulls, 4 (6%) were of unknown sex, and 2 (3%) were of unknown sex and age.

During the 2002 November–December winter study (30 days), wolves were observed for 373 hours from the ground. The number of days wolf packs were located from the air ranged from 1 (Bechler) to 18 (Leopold, Druid Peak, Geode Creek, and Agate Creek). Fifty-nine definite or probable wolf kills were detected, including 57 elk, 3 coyotes, 1 bison, and 1 unknown prey. Among elk, 22 (39%) of the kills were calves, 15 (26%) were cows, 18 (32%) were bulls, and 2 (3%) 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 4 mi<sup>2</sup> in size 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. The Daly Creek trail in the northwest portion of the park was closed to off-trail hiking to protect the denning area of the Chief Joseph pack. Den sites for the Leopold, Crystal Creek, and Nez Perce packs were protected from disturbance incidental to closures for the Blacktail (March 15 to June 30), Pelican Valley (April 1 to July 3), and Firehole (March 10 to about May 26) Bear Management Areas.

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

### *Druid Road Management Project*

Since wolf reintroduction, the Lamar Valley has become the premier location worldwide to observe free-ranging wolves. The main pack of interest is the Druid Peak pack, which has denned in the valley since 1997. Each year visitor numbers have grown and in 2000, the Yellowstone Center for Resources, Resource and Visitor Protection, and Division of Interpretation cooperated to better deal with the opportunities and problems that accompany increasing visitor numbers. As a result, we initiated the Druid Road Management Project 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 roadway 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.

This was the third year that private funds were used to manage wolf viewing in Lamar Valley. Several paid personnel (Rick McIntyre, Dan Graf, Elena West) were hired through the Yellowstone Park Foundation and three other volunteers (Ray Rathmell, John Good, and Bill Wengeler) assisted. The project began on May 5 and ended September 7, 2002. There were no accidents involving visitors, vehicles, or wolves during the 126 days of the Druid Road Management Project's third season. We experimented with a new "No Stopping Zone" near the



*Wolves continue to be extremely popular with visitors to Yellowstone National Park. Since 1995, over 100,000 people have observed wolves in the wild in YNP. Photo by Douglas Smith/NPS.*


main Druid den site and it lessened the number of times wolves were blocked from crossing the road. This season wolves successfully crossed the road on 79% of attempts, compared to 69% in 2001. We also tried a new method of traffic control which resulted in only two drivers being asked to stop for crossing wolves, whereas in the previous year, traffic was stopped on 50 occasions. More visitors saw wolves this season (12,414) than last season (11,210) and we estimate that wolves were in sight for 460 hours, compared to 368 hours in 2001. We contacted more visitors in 2002 (11,204) than in 2001 (10,927). In addition, we had no cases of wolf habituation during this field season.

### *Wolf Habituation Management*

An issue of special concern is habituation of wolves to the road, vehicles, and people. Some wolves in YNP (especially the Druid Peak pack) are exposed to a great deal of human contact and impact. That exposure can and in several circumstances already has led to some wolves having a casual attitude towards humans for a period of time. In the summer 2002 season, however, we had no identified cases of habituation occurring or unnatural behavioral response to humans from the Druid wolves, despite the increase in visitor presence. We feel that this success is largely due to our road management program described above. The Wolf Project is currently developing a Wolf Habituation Plan which will be completed by early 2003 which will allow project staff to address, prevent,

and respond to wolf habituation should it occur. The main objectives of this plan are to: (1) maintain a wild population of wolves in YNP; (2) stop the development of habituated wolves in YNP; (3) reduce wolf/human contact; (4) prevent human injury due to an habituated wolf; (5) educate the public about wolf viewing to prevent them from habituating wolves; and (6) gather more information on habituated wolves to help manage future situations that may develop.

### *Wolf Depredation Outside Yellowstone*

Wolves killed 37 cattle, 74 sheep, and 1 dog in the GYA during 2002. Twenty-three wolves were killed during control actions by USFWS and USDA Wildlife Services in response to livestock losses. 

## 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 (Table 3). 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:* Adult cow elk (*Cervus elaphus*) seasonal distribution and mortality post-wolf (*Canis lupus*) reintroduction in Yellowstone National Park, Wyoming

*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 and movements of elk will be examined to evaluate the behavioral effects of wolves on elk and establish baseline data for future analyses. Individual elk radio-locations will be paired with wolf radio-locations to establish the proximity of elk to wolves. Comparisons of individual differences in cow elk distribution will be investigated with respect to several variables including: age, presence of calf, pregnancy status, nutritional condition, group size, spatial and temporal factors, and wolf density. In addition, a survival analysis will provide information on relative factors

**Table 3. Other research—indirect assistance or collaborative work with the wolf project.**

Topic	Collaborator	Institution
Wolf-cougar interactions	Toni Ruth, Howard Quigley	Hornocker Wildlife Institute/Wildlife Conservation Society
Wolf-coyote interactions	Robert Crabtree, Jennifer Sheldon	Yellowstone Ecosystem Studies
Wolf-bear interactions	Charles Schwartz, Mark Haroldson	Interagency Grizzly Bear Study Team
Wolf-scavenger relationships	Chris Wilmers, Wayne Getz; Bob Crabtree	University of California at Berkeley; Yellowstone Ecosystem Studies
Wolf-elk relationships—Firehole Watershed	Bob Garrott, Eric Bergman	Montana State University
Wolf-pronghorn	John Byers	University of Idaho
Wolf-willow	Francis Singer	USGS
Wolf-aspen	William Ripple	Oregon State University
Wolf-trophic cascades	L. David Mech; Mark Boyce, Nathan Varley; Rolf Peterson	USGS; University of Alberta; Michigan Technological University
Wolf predation	Tom Drummer	Michigan Technological University
Wolf survival	Dennis Murray	University of Idaho; Trent University

influencing mortality of cow elk in Yellowstone's Northern Range herd.

*Project Activity in 2002:* Shaney assisted with elk capture, continued fieldwork, and completed graduate course work during 2002.

*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 before and after wolf reintroduction in Yellowstone National Park

*Project Narrative:* Elk (*Cervus elaphus*) may alter their selection of habitat and resources in response to the heightened predation risk brought with the return of the wolf (*Canis lupus*) population. For example, elk may select for more forested areas to seek hiding cover, or areas of steeper slopes to provide better vantage points for vigilance. Habitat selection by elk is being examined using radio-collared cow elk location data from pre-wolf (1984–1990: courtesy of F. J. Singer, D. J. Vales, and J. M. Vore) and current (2000–2002) periods. Habitat attributes (*e.g.*, vegetation type, elevation, slope, aspect, relative wolf density, and snow water equivalent) were determined from GIS, and then analyzed using logistic regression to generate predictive models of elk habitat selection. Preliminary analysis indicates that elk currently select for areas of higher elevation and lower slope than before wolf reintroduction, and elk currently select strongly for burned forest. Changes in elk habitat selection may be attributable to a combination of drought, wolf predation, and long-term succession following the 1988 fires.

*Project Activity in 2002:* Julie assisted with elk capture, continued her fieldwork, and began data analysis.

*Anticipated Completion Date:* May 2003

*Graduate Student:* Daniel MacNulty (Master of Science)

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

*Title:* The predatory sequence and the influence of injury risk on the hunting behavior of the wolf

*Project Narrative:* To study the hunting behavior of



*Recovery of willows along Blacktail Deer Creek, and in other areas, has generated much research interest in a possible trophic cascade triggered by wolf restoration. Photo by Douglas Smith/ NPS.*

the wolf I described the wolf predatory sequence as consisting of six distinct behaviors: travel, approach, watch, attack, target, and capture. These behaviors were organized into three nested groups: predation attempt, prey encounter, and hunting bout. The typical hunting pattern involved a brief hunting bout (<60 min.) including at least one prey encounter (<15 min.) and at least one predation attempt (<4 min.). Bison confronted wolves more often than did elk. As a result, wolves spent more time watching and less time attacking bison compared to elk and consequently killed bison less frequently (0.04 kills/encounter) than elk (0.24 kills/encounter). These results indicate that wolves are averse to the risk of prey-caused injury, which likely explains why wolves kill mainly vulnerable ungulates.

*Project Activity in 2002:* Defended thesis in February and graduated in May

*Graduate Student:* Daniel MacNulty (Ph.D. Candidate)

*Committee Chair:* Dr. Craig Packer, University of Minnesota

*Title:* Analysis of the behavioral mechanisms underlying the effects of predator and prey densities on

wolf predation

*Project Narrative:* The objective of this study is to identify the behavioral mechanisms that cause wolf kill rate (i.e., kills per wolf per time) to vary with wolf, elk, and bison densities. The effect of predator and prey densities on kill rate is a key structural element in ecological models that seek to predict the effects of wolf predation on ungulates and vegetation. Very little is known, however, about the mechanisms that actually cause wolf and ungulate densities to affect kill rate. This gap in knowledge is problematic because it separates mathematical abstractions of kill rate from biological reality. Consequently, our ability to understand and predict wolf impacts in real-world systems is compromised. This study will examine several proposed behavioral mechanisms that link kill rate to density in an effort to identify a model of wolf kill rate that is biologically justified.

*Project Activity in 2002:* Performed literature review, conducted fieldwork in Pelican Valley in March and November, and trained wolf project volunteers to collect data on wolf hunting behavior during the biannual winter wolf predation study

*Anticipated Completion Date:* May 2004

*Graduate Student:* Gregory Wright (Master of Science candidate)

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

*Title:* An analysis of the northern Yellowstone elk herd: Population reconstruction and selection of elk by wolves and hunters

*Project Narrative:* I conducted a feasibility study of population reconstruction as a tool to monitor northern Yellowstone elk population dynamics, and compared my results with elk population data from aerial counts and the Gardiner late hunt. Aerial abundance estimates were greater than population reconstruction estimates from 1995 to 2000. However, as additional elk mortality data is collected and added to population reconstruction each year, abundance estimates from population reconstruction will approach and may exceed aerial abundance estimates. Bull elk age distributions from population reconstruction and the Gardiner late hunt were very similar. Cow elk age distributions from population reconstruction

estimated fewer young cows and more old cows in the population than Gardiner late hunt data. I also compared selection of female northern Yellowstone elk (*Cervus elaphus*) with regard to age and impacts to recruitment by hunters in the Gardiner late hunt and northern Yellowstone wolves (*Canis lupus*) for the period 1996–2001. The age classes of female elk selected by wolves and hunters were significantly different. Hunters selected a large proportion of female elk with the greatest reproductive values, whereas wolves selected a large proportion of elk calves and old females with low reproductive values. The mean age of adult females killed by hunters throughout the study period was 6.5 years, and the mean age of females killed by wolves was 13.9 years.

*Project Activity in 2002:* Greg defended his thesis in December and will graduate in 2003

*Anticipated Completion Date:* May 2003



## PUBLIC INVOLVEMENT

### *Volunteer Program*

Twenty volunteers worked a total of 5,848 hours in 2002, worth \$66,200 at the GS-5 level (see Appendix), 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. Chosen volunteers received free housing




*Wolf Project volunteers Matt Metz, Janice Stroud, and Katie Yale help process wolf #217FB. Photo by Douglas Smith/NPS.*



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 resume to the Yellowstone Wolf Project, P.O. Box 168, Yellowstone National Park, Wyoming 82190.


### *Visiting Scholars Program*

Dr. Rolf O. Peterson was again our visiting scholar in 2002. Rolf visited the park for two weeks in March and helped with fieldwork and finished two collaborative projects. He senior authored a publication involving several YNP staff on wolf pack leadership, and co-authored with D. Smith and D. Houston a publication due out in 2003 in the journal *BioScience* on the predicted impacts of wolves on the Yellowstone ecosystem. Dr. Douglas Houston also visited briefly in 2002 to wrap up work on the ecosystem paper that will be titled "Yellowstone After Wolves." Dr. L. David Mech also briefly visited YNP in 2002 to oversee some of the work being done by his graduate students and to participate in a second National Geographic film on wolves in YNP. 

### ACKNOWLEDGMENTS

As the years go by and the Yellowstone Wolf Project matures over and over we are impressed by the number of people helping, and their extraordinary dedication. One group of people that are there every year in a significant fashion are the volunteers. We could not do what we do without them. Many other qualified volunteers wanted to work with us, but we simply can only accommodate so many each year. We thank those that did work and those that applied but could not be accepted. We are also grateful to the Yellowstone Park Foundation and the Yellowstone Association for their support and to Dan Graf and Elena West who worked for the Wolf Project through them. We also thank Ray Rathmell, John Good, and Bill Wengeler for the time they spent assisting in the field. Also, through Yellowstone Park Foundation, we appreciate those of you who participated in the 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 2002. And again, we owe sincere thanks to our editor Sarah Stevenson. The quality of her work is reflected throughout this report. 

## APPENDIX

### Yellowstone Wolf Project Volunteer Roster, 2002.

Name	Period of Involvement	Hours Worked
Bly-Honness, Kristy	2/25/2002–4/1/2002	272
Boone, Daniel	1/14/2002–4/1/2002	384
Brecht, Charles	3/17/2002–3/31/2002	120
Cleere, Erin	1/14/2002–4/5/2002	384
Geremia, Chris	11/12/2002–12/16/2002	280
Graf, Dan	2/25/2002–4/1/2002	272
Johnson, Ben	11/12/2002–12/16/2002	280
Macnulty, Daniel	3/17/2002–3/31/2002 and 11/14/2002–11/25/2002	120 96
Metz, Matt	11/12/2002–12/16/2002 and 2/25/2002–4/1/2002	280 272
Montgomery, Robert	11/14/2002–11/25/2002	96
Muller, Chris	11/6/2002–12/4/2002	232
Naftal, Stephanie	2/25/2002–4/1/2002	272
Peer, Melissa	2/25/2002–4/1/2002	272
Stebbins, Dan	2/25/2002–4/1/2002	272
Sterling, John	11/12/2002–12/16/2002	280
Sterling, Heather	11/12/2002–12/16/2002	280
Stroud, Janice	5/13/2002–6/23/2002 and 11/12/2002–12/16/2002	336 280
Varley, Nathan	3/17/2002–3/31/2002	120
West, Elena	6/10/2002–6/30/2002 and 11/12/2002–12/16/2002	88 280
Yale, Katie	11/12/2002–12/16/2002	280
<b>Total Hours Worked</b>		<b>5848*</b>

\*Equivalent of 2.7 GS-05 employees

### *Publications*

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

MacNulty, D.R. 2002. The predatory sequence and the

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