



YELLOWSTONE WOLF PROJECT



ANNUAL REPORT
2005

Yellowstone Wolf Project

Annual Report
2005



Douglas W. Smith, Daniel R. Stahler, and Debra S. Guernsey
National Park Service
Yellowstone Center for Resources
Yellowstone National Park, Wyoming

YCR-2006-04



Suggested citation: Smith, D.W., D.R. Stahler, and D.S. Guernsey. 2006. Yellowstone Wolf Project: Annual Report, 2005. National Park Service, Yellowstone Center for Resources, Yellowstone National Park, Wyoming, YCR-2006-04.

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 not otherwise marked are NPS photos by Douglas Smith and Daniel R. Stahler.

TABLE OF CONTENTS

Background	<i>iv</i>
2005 Summary	<i>v</i>
Territory Map	<i>vi</i>
The Yellowstone Wolf Population	1
Population and Territory Status	1
Reproduction	2
Core Territory Map	3
Mortalities	4
Pack Summaries	5
Chief Joseph Pack	5
Swan Lake Pack	5
Leopold II Pack	5
Geode Creek Pack	7
Hellroaring Creek Pack	7
Agate Creek Pack	7
Slough Creek Pack	8
Druid Peak Pack	8
Specimen Ridge Pack	9
Mollie's Pack	9
Yellowstone Delta Pack	9
Hayden Valley Pack	10
Biscuit Basin Pack	10
Cougar Creek Pack	10
Gibbon Meadows Pack	10
Nez Perce Pack	10
Bechler Pack	11
Wolf Capture and Collaring	11
Wolf Predation	12
Wolf-Prey Relationships	12
Composition of Wolf Kills	12
Winter Studies	13
Summer Studies	13
Population Genetics	14
Wolf Management	15
Area Closures	15
Druid Road Management Project	15
Wolf Depredation Outside Yellowstone	16
Collaborative Research	16
Wolf Project Students—Direct Assistance	16
Other Research—Indirect Assistance	16
Staff and Public Involvement	17
Volunteer Program	17
Seasonal Staff	17
Acknowledgements	17
Appendix	18
Volunteer Roster, 2005	18
Publications	18

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 (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. (Recovery goals have been met, but delisting is contingent on the implementation of USFWS-approved state laws and wolf management plans, as required under the Endangered Species Act.)

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.

Three full-time employees worked for the Yellowstone Wolf Project in 2005: Project Leader Douglas Smith, and Biological Science Technicians Debra Guernsey and Dan Stahler. The Wolf Project was able to hire paid seasonal staff through the Yellowstone Park Foundation and Yellowstone Association to assist in several key aspects to our annual work. Emily AlMBERG, Matt Metz, Abby Nelson, and Katie Yale worked for the summer field season. Emily, Matt, and Abby also worked during the winter months. Rick McIntyre worked for the Wolf Project for six months as a National Park Service seasonal employee and six months as a volunteer. Additional volunteers (*see Acknowledgments and Appendix*) staffed the early (November–December) and late (March) winter study periods.

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.

2005 SUMMARY

At the end of 2005, at least 118 wolves in 13 packs occupied Yellowstone National Park (YNP). This represents a decline of 51 wolves (a drop of 30%) from 2004, the largest population decline since reintroduction. Seven packs counted toward the breeding pair objective for the Yellowstone Recovery Area. Four packs dissolved or left the park: Geode Creek and Specimen Ridge packs no longer exist, the Biscuit Basin pack moved into Idaho, and the Chief Joseph pack is now counted as a state of Montana pack (other than denning in the park, movements are all outside YNP). One new pack (Hellroaring Creek) formed when the Leopold pack split and some members occupied old Geode Creek territory.

The decline in 2005 is largely attributed to poor pup survival. Disease is suspected as the cause but laboratory tests are still pending. At least 69 pups were born and 22 (32%) survived. Pup survival is typically >60%. Pup survival was poorest on the northern range, where only 8 of 49 (16%) survived. Three packs (Druid Peak, Nez Perce, Swan Lake) had no pups survive and one pack (Mollie's) did not produce pups. Slough Creek and Leopold packs each had multiple breeding females. The 10 packs that produced litters had an average of 6.9 pups (range 1–19, including packs with multiple breeders), and an average of 2.2 pups per pack survived (range 0–5).

Thirty-six wolves were captured and collared. At year's end, 39 of 118 (33%) were radio collared. Global Positioning System (GPS) collars were deployed but, as in past years, transmitter failure continued to plague data gathering.

Wolf predation was monitored year round with intensive study periods during early and late winter, and May through August. Wolf Project staff documented 316 kills (definite, probable, and possible combined) made by wolves in 2005, including 244 elk (77%), 29 bison (9%), 9 wolves (3%), 6 deer (2%), 4 moose (1%), 4 coyotes (1%), 2 skunks (1%), 2 ravens (1%), 1 pronghorn (<1%), 1 badger (<1%), and 14 unknown prey (4%). The composition of elk kills was 18% calves (0–12 months), 11% cows (1–9 years old), 12% older cows (≥10 years old), 43% bulls, and 16% elk of unknown sex and/or age. The increase in the percentage of bull elk killed in 2005 reflects a change in prey selection and kill rates. Bison kills included 9 calves (unknown sex), 10 cows, 6 bulls, and 4 of unknown sex and age. During winter, some interior packs (Mollie's and Hayden Valley) fed entirely on bison.

Studies continued on scavenger use of wolf-killed prey, and expanded to include the collection of invertebrates at wolf kills.

Den closures and other wolf management activities continued and increased. The Slough Creek pack denned within view of the road and attracted large crowds of visitors. The Hayden Valley pack was often observed and caused many "wolf jams."

Wolf Project staff published 5 peer-reviewed journal articles, 2 book chapters, 2 popular articles, 2 technical reports, and 1 book.

Additional information on wolves in Yellowstone National Park is available at <www.nps.gov/yell/nature/animals/wolf/wolfup.html> and <www.r6.fws.gov/wolf/>.

Yellowstone Wolf Pack Territories, 2005

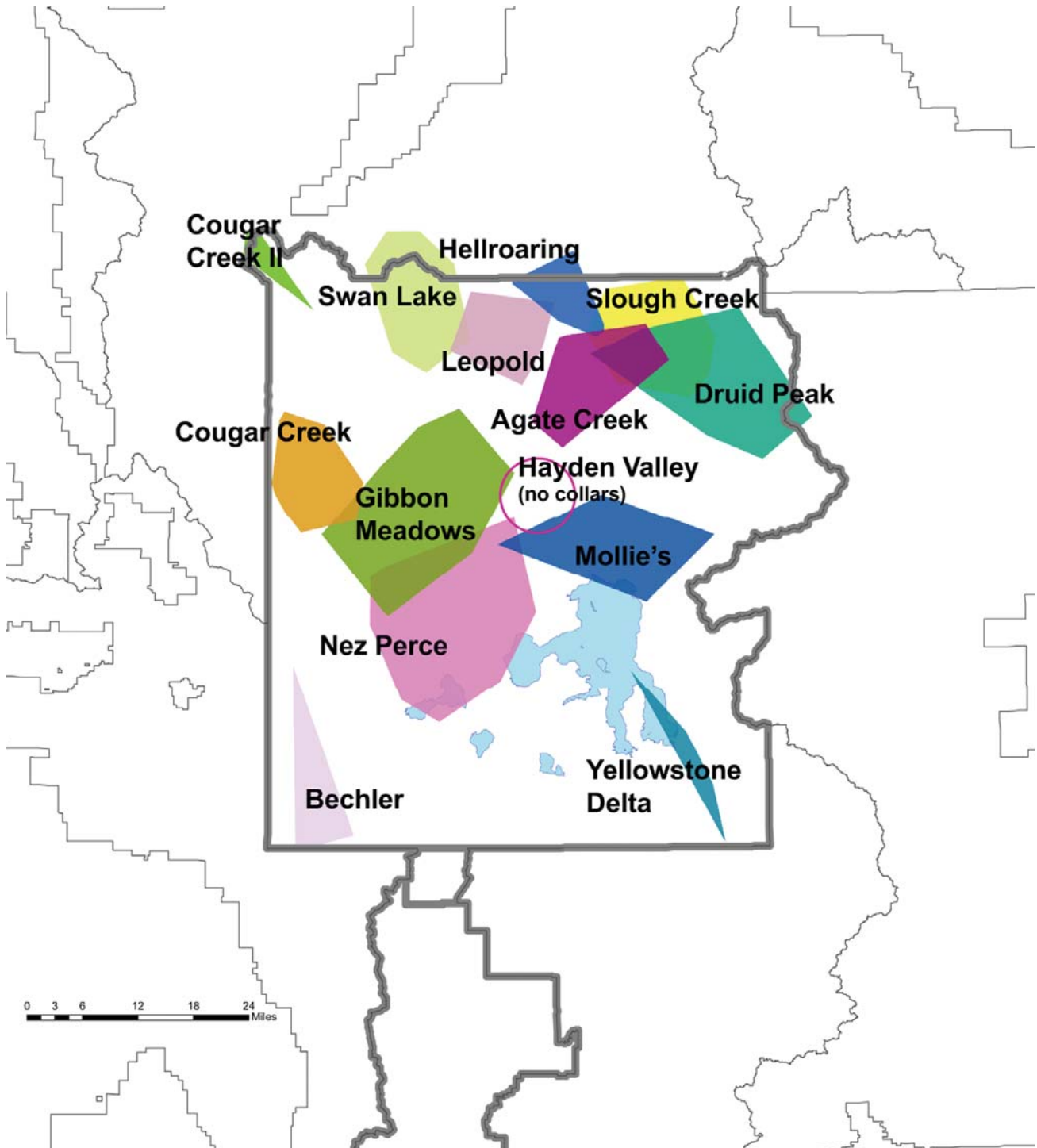


Figure 1. Wolf packs that had some or all of their territory within Yellowstone National Park in 2005, plotted as 95% minimum convex polygons.



Grizzlies often usurp carcasses from wolves, as this sow did from Mollie's pack in Pelican Valley in August 2005. It is rare, however, for the sow grizzly to be accompanied by a cub.

THE YELLOWSTONE WOLF POPULATION

Population and Territory Status

At the end of 2005, at least 118 wolves in 13 packs (Cougar Creek I and II were considered one pack) occupied Yellowstone National Park (Figure 1, Table 1). This represents a loss of 51 wolves (30%) from 2004, the largest population drop of any year since reintroduction (Figure 2). Most of the decline is attributed to poor pup survival. Disease is suspected as the cause for this high pup mortality.

Three packs either left the park or dissolved, and two others declined substantially. The Biscuit Basin pack moved out of the park and now resides in Idaho. Specimen Ridge and Geode Creek packs no longer exist. In late December 2005, the alpha female of the Nez Perce pack was killed by the Gibbon Meadows pack and the surviving Nez Perce pack members split up and dispersed.

Six packs (54 wolves, down 36% from 2004) used the northern range, and seven packs (64 wolves, down 26%) used the rest of the park. Pack size ranged from 4 (Druid Peak) to 17 (Yellowstone Delta) wolves and averaged 9.0.

In past years, one pack was typically dominant on the northern range, but this year two packs emerged as dominant: Leopold (for the second year) and Slough Creek. Leopold had fewer wolves than last year (14 compared to 23) but still trespassed into other pack territories, killed wolves from other packs (Geode Creek and Swan Lake), and maintained the most stable territory

Pack	Adults	Pups	Total
Northern Range			
Swan Lake*	3	0	3
<u>Leopold</u>	12	2	14
Hellroaring Creek	7	–	7
<u>Agate Creek</u>	5	3	8
<u>Slough Creek</u>	12	3	15
Druid Peak	4	0	4
Unknown Group*	3	–	3
Northern Range Totals	46	8	54
Non-Northern Range			
Mollie's	7	–	7
<u>Yellowstone Delta</u>	12	5	17
<u>Bechler</u>	5	4	9
Nez Perce*	4	0	4
Cougar Creek I	5	0	5
Cougar Creek II	8	–	8
<u>Gibbon Meadows</u>	6	3	9
<u>Hayden</u> (no collars)	3	2	5
Non-Northern Range Totals	50	14	64
Total	96	22	118

Underline denotes breeding pair

*Status unknown

Table 1. Yellowstone National Park wolf population, December 2005.

of any pack. The Slough Creek pack killed at least two wolves from other packs (Geode Creek and Druid Peak) and readily trespassed, pushing Druid Peak far out of their traditional territory.

By early summer, the Geode Creek pack had dissolved. The alpha male (#227) was killed by the Slough Creek pack in March, and the longtime and founding alpha female (#106) disappeared and probably died. The combination of these events resulted in the dissolution of the pack. Other collared Geode Creek wolves dispersed, died due to starvation, or were killed by elk.

The Swan Lake pack also lost their founding member and longtime alpha female (#152, age seven), three other collared wolves, and possibly some uncollared adults. Pups were born but none survived. At the end of the year, the only surviving collared member of this pack was #295, a male who was often located alone but sometimes with two other wolves. The future of this pack is uncertain.

In the park interior, the founding member and longtime alpha female of the Nez Perce pack was killed by the Gibbon Meadows pack. At age nine, she was the oldest known wolf in the population. The pack dissolved shortly after her death. The Biscuit Basin pack dispersed from the park into Idaho. At 17 wolves, the Yellowstone Delta pack was the largest in the park. The Yellowstone Delta and Bechler packs thrived in 2005, despite living in a deep snow/low prey environment. These wolves made forays outside the park in search of wintering ungulates.

Despite the significant decline, wolf distribution was largely unchanged from 2004 (Figure 3). Wolf range continued to include the northern range, Pelican Valley, Hayden Valley, the Madison–Firehole, north of the Madison River, Thorofare, and Bechler.

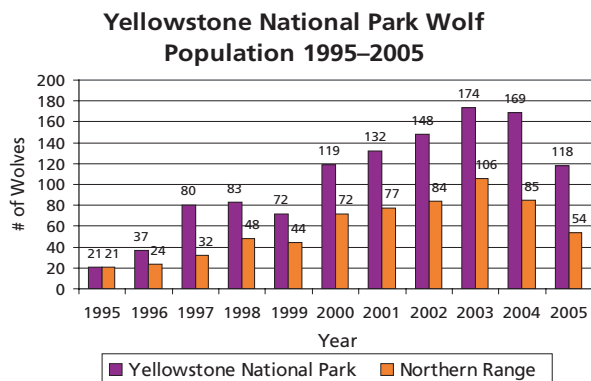


Figure 2. Yellowstone National Park early winter wolf population, 1995–2005.

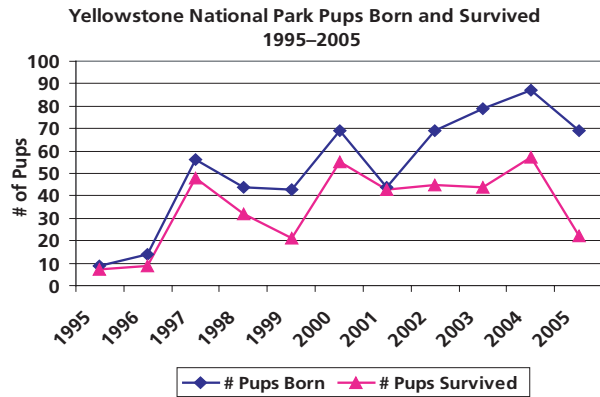
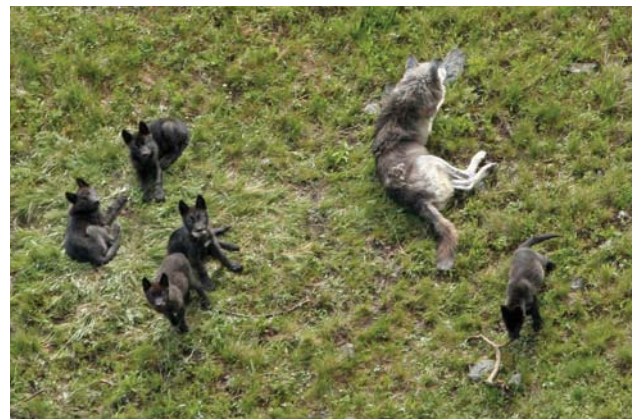


Figure 4. Yellowstone National Park pups born and survived, 1995–2005.

Reproduction

Pup survival was poor in 2005. Sixty-nine pups were born parkwide but only 22 (32%) survived (Figure 4). Forty-nine pups were born on the northern range but only eight (16%) survived. The Druid Peak, Swan Lake, and Nez Perce packs had pups but none of them survived. The breeding (alpha) female in Mollie’s pack died shortly before the breeding season and was not replaced; the pack did not produce pups. The Slough Creek and Leopold packs each had multiple litters of pups. Despite multiple breeding females in each pack, only 3 out of 15 pups born in the Slough Creek pack survived, and only 2 out of 19 pups born in the Leopold pack survived. The 10 packs that produced litters had an average of 6.9 pups (range 1–19, including packs with multiple breeders), and an average of 2.2 pups per pack survived (range 0–5).



Breeding female #286 of the Druid Peak pack with five pups (a total of six were counted). None of these pups survived, probably due to disease.

Yellowstone Wolf Pack Core Territories, 2005

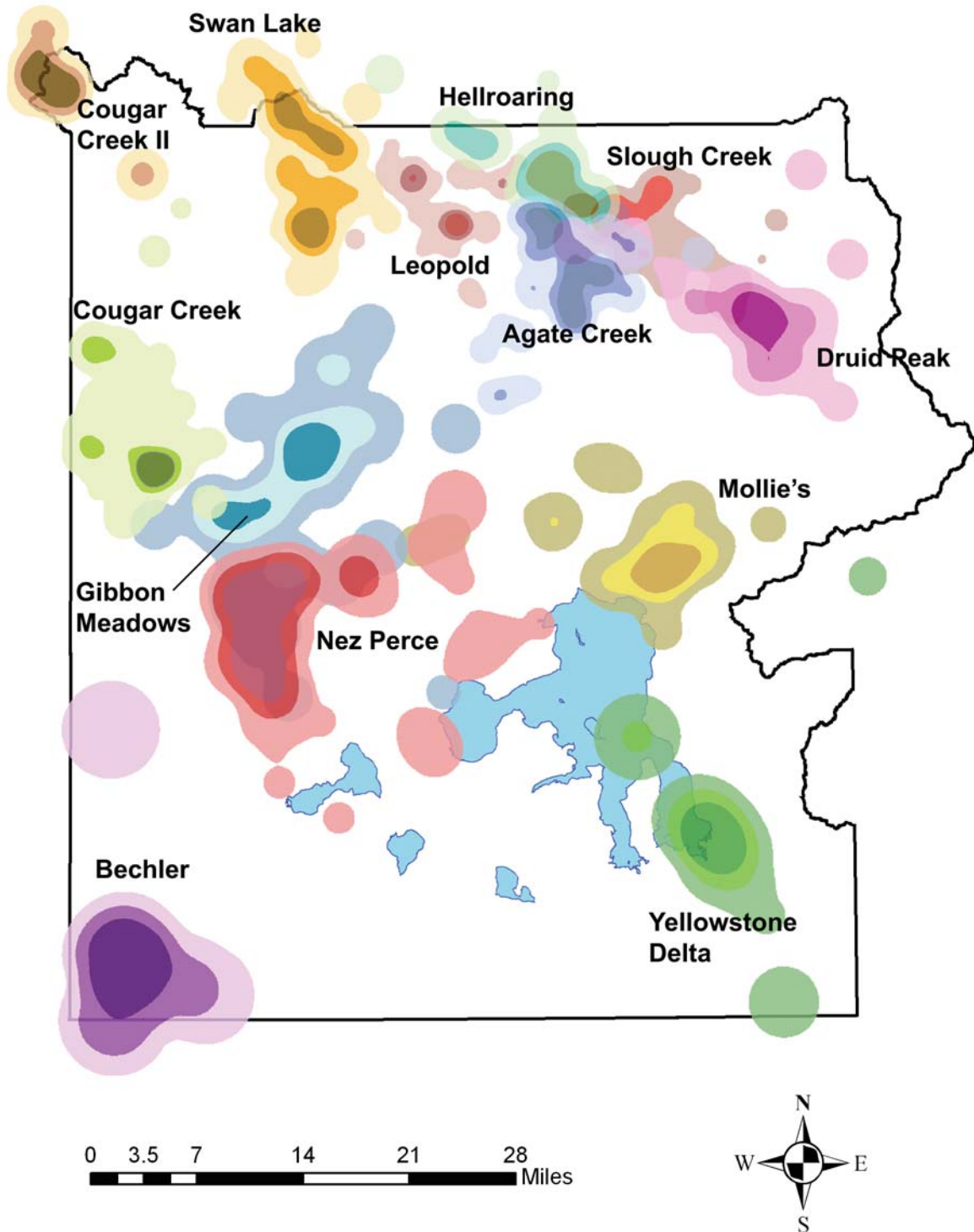


Figure 3. Wolf pack territories in Yellowstone National Park in 2005, plotted as kernel estimates. Darker colors depict higher use, or core, territories.



Wolf Project staff travel the Hellroaring Creek trail to inspect the Geode Creek pack's den. This pack had dissolved by the end of 2005.

Wolf Project staff visited den sites and collected scats for summer food habit studies. The Swan Lake, Leopold, Delta, Bechler, Gibbon Meadows, Cougar Creek, and Nez Perce wolves denned in previously used dens. Agate Creek, Slough Creek, Druid Peak, and Hayden Valley denned in new dens.

Mortalities

Not counting over-summer pup mortality, 25 radio-collared wolves died in 2005 (Table 2). These included 4 old adults (>6 years old), 14 adults (2–5 years), 6 yearlings, and 1 radio-collared pup. Thirteen males and 12 females died. The leading cause of mortality was intra-specific strife (Figure 5). Overall the wolf mortality rate

# of Deaths	Wolf #/Sex	Age Class	Social Class	Pack	Date of Death	COD
1	044F	Adult	Unknown	Dispersed from Yellowstone Delta	5/1/2005	Unknown
2	048F	Adult	Alpha	Nez Perce	12/7/2005	Intraspecific
3	070M	Adult	Alpha	Nez Perce	5/28/2005	Intraspecific
4	152F	Adult	Alpha	Swan Lake	7/23/2005	Interspecific
5	204M	Adult	Unknown	Dispersed from Swan Lake	4/5/2005	Intraspecific
6	219M	Adult	Possible Alpha	Casey Lake	6/8/2005	Mange
7	227M	Adult	Alpha	Geode Creek	3/27/2005	Intraspecific
8	255F	Adult	Possible Breeder	Druid Peak	11/4/2005	Unknown
9	257M	Adult	Possible Alpha	Gibbon Meadows	10/1/2005	Natural Unknown
10	327F	Adult	Possible Alpha	Chief Joseph	2/7/2005	Mange
11	343M	Yearling	Unknown	Mollie's	1/8/2005	Unknown
12	349M	Yearling	Unknown	Disperser from Druid Peak	1/26/2005	Human Other
13	352M	Adult	Unknown	Dispersed from Geode (poss. Moccasin Lake, MT)	11/1/2005	Mange
14	355F	Adult	Subordinate	Swan Lake	7/26/2005	Natural Unknown
15	356M	Adult	Unknown	Disperser from Swan Lake	1/8/2005	Intraspecific
16	375F	Yearling	Subordinate	Druid Peak	2/10/2005	Intraspecific
17	379M	Adult	Unknown	Disperser from Mollie's	11/2/2005	Interspecific
18	381M	Adult	Beta	Leopold	7/17/2005	Natural Unknown
19	388F	Adult	Unknown	Disperser from Cougar Creek	7/20/2005	Natural Unknown
20	475F	Pup	Subordinate	Biscuit Basin	1/31/2005	Intraspecific
21	476F	Adult	Unknown	Dispersed from Biscuit Basin	5/5/2005	Illegal
22	483F	Adult	Possible Breeder	287M Group	6/27/2005	Interspecific
23	484M	Yearling	Subordinate	Nez Perce	8/7/2005	Natural Unknown
24	488M	Yearling	Disperser	Disperser from Geode Creek	8/8/2005	Malnutrition
25	496F	Yearling	Subordinate	Mollie's	6/4/2005	Intraspecific

Table 2. Yellowstone National Park wolf mortalities (collared YNP wolves), 2005.

in 2005 was 15%, slightly lower than the 10-year average of 20%.

For the first time, three wolves died from mange related problems (e.g., hair loss, malnutrition, hypothermia). Two of the wolves began the year within Yellowstone National Park, dispersed, and died outside the park. So far mange has not been a significant cause of mortality within the park. Only one wolf (a Chief Joseph pack member who primarily ranged outside the park to the northwest) is known to have had the infection. 🐾

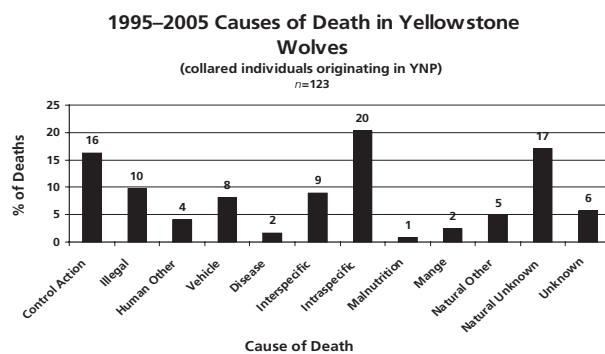


Figure 5. Causes of death for wolves in Yellowstone National Park, 1995–2005.

PACK SUMMARIES

Chief Joseph Pack

For the first year since reintroduction, the Chief Joseph pack is no longer counted as part of the Yellowstone National Park population. The pack now spends most of the year outside the park and is counted by the State of Montana.

Swan Lake Pack

The status of the Swan Lake pack is unknown. The pack was formed in 2000 when female #152 dispersed from the neighboring Leopold pack. In 2005, this pack had high adult mortality. At least four adult wolves died and no pups survived. Two of the mortalities (including longtime alpha female #152) were attributed to other wolves, one to an elk, and one was unknown. Male #295 was the only remaining collared wolf. He was most often spotted alone but was also observed with two other wolves who were probably males. His movements in 2005 only roughly approximated use of traditional Swan

Lake territory, indicating the pack no longer exists.

Early in 2005, the pack size was 10 wolves, but by late February two separate groups were spending increasing amounts of time apart. One group dispersed from the park, leaving only #152F and four other pack members. The remaining wolves began to travel independently with no consistent pattern.

Female #152 denned at her traditional den site and produced pups for the sixth time, but none of them survived the summer. It is not known whether the poor pup survival was due to disease, the loss of so many adults (including the alpha female), or human disturbance resulting from the den's location in an area readily accessible to humans.

Leopold II Pack

In early 2005, Leopold was the largest pack in the park at 25 wolves. By the end of the year they numbered only 14. Their large size enabled them to trespass into other pack territories more often than in previous years, and they killed at least three wolves from other packs. This pack's territory use, centered on the Blacktail Deer Plateau, continued to be the most stable in Yellowstone National Park.

Alpha female #209 denned at the pack's traditional den site and at least two other females bred, producing a total of 19 pups. A beta female and another uncollared female denned some distance away from each other. At first they did not mix, but sometime in May the subordinate females moved to the alpha female's site, and the pups were tended by the whole pack. Two dead pups were found at the pack's summer rendezvous site and tests



When grizzly bears visit wolf dens, the wolf response is much more vigilant and persistent than in contests over carcasses.



The Nez Perce pack in a thermal area. Number 48F (far right) leads the others.

NEZ PERCE PACK LOSES LONGTIME ALPHA FEMALE #48

by Virginia Warner

In December 2005, Nez Perce alpha female wolf #48 was killed near Old Faithful in a scuffle with the Gibbon Meadows pack. At age nine, she was the oldest known wolf in the Yellowstone National Park population. She would have been 10 years old in April. Her death is poignant for those who remember her from the early days of wolf reintroduction in Yellowstone National Park (YNP).

Number 48F was born to female #27, a British Columbia wolf who was notoriously free spirited. When #27F was released into the acclimation pen in 1996, she wore her teeth down trying to chew through the chain-link fence. When the time came to release the wolves from the pen, most were cautious about venturing out. In fact, when wolf management staff ultimately resorted to cutting holes in areas of the fence well away from where humans had been, the wolves were still reluctant to leave the enclosure, emerging only when no one was around to observe them. Number 27, on the other hand, did not hesitate to bolt immediately while the research team looked on.

Traveling solo, #27F headed north and made it almost as far as Red Lodge, Montana, before turning around, perhaps deterred by the highway. She was pregnant at the time, and according to Wolf Project Leader

Doug Smith, “only slowed down to give birth.” The pups, including #48F, were born near Nye, Montana. Somehow, #27F managed to feed her pups, hunting successfully even with her worn down teeth and without the aid of other pack members. She killed some domestic sheep during her time outside the park. Because it was a first offense and early in the reintroduction effort when every individual was important to the future of a sustainable YNP wolf population, #27F was captured, returned to the park, and given a second chance. In the end, she left the park again, this time on the west side, and killed sheep near Dillon, Montana. There was no third chance for #27F, and in 1997, she was removed in a control action.

Number 48F apparently inherited some of her mother’s traits, showing signs of resisting acclimation at an early age. She had split from #27F on that last foray outside the park and eluded staff for several weeks until she gave her location away by killing sheep. Again, with so few packs there was some flexibility in dealing with livestock depredation in those days, and the decision was made to capture and return her to the park. Although she managed to escape from the pen and ranged widely at first, the effort at “rehabilitation” was successful, and eventually #48F launched the true Nez Perce pack era.

Unlike the original “ready-made” group of British Columbia transplants (referred to as the Nez Perce pack because they were released near Nez Perce Creek), a new Nez Perce pack coalesced naturally with #48F as the alpha female. They soon became the dominant pack in the Madison–Firehole area, their core territory for the rest of #48F’s life. The Madison–Firehole is a tough place for wolves to make a living, especially in winter, and the Nez Perce were one of the first Yellowstone packs to prey on bison in addition to elk. The pack also ranged widely, traveling as far as Hayden Valley, West Thumb, and occasionally the northern range.

Number 48F was first collared in 1997 when she was a pup. She later mated with one of the Sawtooth pack pups (#70M and #72M, the so-called “bad boys from Choteau, Montana”) who had been brought to Yellowstone in 1997 after their parents were removed in a control action for preying on cattle. Over the years, she produced many pups and the Nez Perce pack thrived under her leadership (in 2000 their number peaked at 22). Number 48F was last captured and her collar replaced in Hayden Valley in 2003, but after that she was often seen in the company of her pack members by wolf project staff on monitoring flights. In the last few years of her life she had begun to show her age as her muzzle turned gray and her ears became tattered. In 2005, she denned for the last time but no pups survived.

When #48F was killed by the Gibbon Meadows pack in December, the Nez Perce pack numbered five wolves. It appears that the Nez Perce pack has dissolved without her, and the Gibbon pack, with nine wolves, is now dominant in the Madison–Firehole area. 🐾



Number 48F (far left, facing right).

are pending to determine whether disease was the cause of death.

In late 2005, the pack split and some Leopold wolves moved into the void left by the now extinct Geode Creek pack. The area settled by the dispersing group had initially been explored by three Leopold wolves during the summer. When the only female (#483) in the “new” pack was killed by an ungulate of unknown species (probably an elk), the two surviving males (#287 and #468) rejoined the Leopold pack for the remainder of the summer. In fall 2005, the same two males and some additional Leopold wolves dispersed again to the old Geode territory and formed the Hellroaring Creek pack.

Geode Creek Pack

The Geode Creek pack dissolved in 2005. After the alpha male (#227) was killed by the Leopold pack in March, the pack localized around a den but their time at the site was brief and the pack split up with no pups surviving. It is possible that the pack’s founding and only alpha female (#106) died and the pack dissolved due to the loss of both alphas in a relatively short period of time. Because #106F’s radio collar was non-functional (only one year after being deployed), definitive data are lacking and cause of death is unknown. The remaining collared wolves either dispersed or died (one starved and another was killed by an elk).

Hellroaring Creek Pack

New in 2005, the Hellroaring Creek pack formed in the recently vacated Geode Creek territory. The pack is comprised almost entirely of dispersing Leopold wolves; however, one female (#353) was a Geode Creek wolf who had dispersed and denned independently in 2005. It is unknown whether any of her pups survived. Her reproductive failure likely led to her reoccupation of her old territory and union with emigrating Leopold wolves. Some movement of wolves between the Hellroaring and Geode packs was documented, but they remained autonomous despite similar origins and history. At year’s end the Hellroaring Creek pack numbered seven adults and no pups.

Agate Creek Pack

One of the more stable packs on the northern range in 2005, the Agate Creek pack used its traditional territory spanning the Washburn/Antelope Creek Basin,

Specimen Ridge, Tower Junction, Floating Island Lake, and Little America. Notably, male #295 began the year with the pack, was recaptured for replacement of a non-functioning collar (again, a premature malfunction), but in spring dispersed into the Swan Lake pack. At the end of 2005, he was one of only three surviving Swan Lake wolves and the only one with a radio collar.

At least eight pups were born but only three survived, representing better pup survival than in any other pack on the northern range in 2005. The pack's rendezvous site near Antelope Basin was visible from the road and attracted many visitors.

At year's end the pack numbered eight wolves, including five adults and three pups. At eight years, alpha male #113 is currently one of the oldest wolves in the Yellowstone population. (Number 193M of Mollie's pack is the only other wolf within the park known to be eight years of age.)

Slough Creek Pack

At 15 wolves, the Slough Creek pack was the largest northern range pack at the end of 2005. During summer the pack was even larger when four females produced at least 15 pups, but only three of the pups survived to year's end. All four females were observed breeding in February with at least four males. Denning was communal and nursing duties were shared among the females. The pack used seven dens in rotation, showing preference for some sites over others. Two male wolves from Mollie's pack joined the Slough Creek pack during the breeding season only to emigrate back to Mollie's during spring and summer. They were not witnessed breeding with any of the Slough Creek females.

The pack's breeding behavior and den holes were visible from the road and attracted visitors for some of the best wolf watching since reintroduction. Throngs of people observed the Slough Creek wolves on a daily basis, especially during the morning and evening hours when wolf activity peaked.

In 2005, the Slough Creek pack expanded its territory into Lamar and Soda Butte valleys, displacing the Druid Peak pack from territory they'd held since 1996. The resulting clashes led to the death of Druid wolf #375F and contributed to the Druid Peak pack's decline to just four wolves.

By year's end, Slough Creek's uncollared alpha female was no longer observed and it was assumed she died. She was replaced by female #380. Male #453 dispersed outside the east park boundary near Cody, Wyoming.



Wolves from the Hellroaring Creek pack on a foray into the Absaroka-Beartooth Wilderness.



Roger Stradley in a PA-18 Super Cub—essential to Wolf Project operations—comes in for a landing near Gardiner, Montana.

Although it is fairly common for large packs to split into subgroups, this pack had not split by year's end and still numbered 15 wolves.

Druid Peak Pack

Ousted after occupying Lamar Valley for ten years, the Druid Peak pack experienced a significant decline in 2005. Not only did they lose much of their traditional territory, they also lost a lot of wolves. Six pups were born but none of them survived. Two adult females died: #375 was killed by Slough Creek wolves, and #255 died in Calfee Creek. The location and status of female #286 are unknown. Her detachable GPS collar was recovered when it came off as scheduled. (GPS collars last only about 10



Two wolves from the Druid Peak pack at play. Once the dominant pack on the northern range, this pack now numbers only four wolves (compared to 37 in 2001) and occupies a small portion of their former territory.

months, compared to about five years for other radio collars.) Only four wolves remained at year's end: alpha male #480, adult male #302, and two yearling females. Four years ago this pack numbered 37 wolves.

For the first time since 1997, the pack did not use their traditional den in Lamar Valley, but denned in the Cache Creek area instead.

As with the Slough Creek pack, this pack's breeding behavior was observed by Wolf Project staff. The alpha female bred with both alpha male #480 and adult male #302, while the other adult female (#255) only bred with #480M.

The Druid Peak pack was no longer the focus of a ground crew during winter study.

Specimen Ridge Pack

The only collared wolf in the pack (#194M) died in late 2004. Without him, tracking was difficult and dependant on chance observations. Three wolves from this pack were observed in early 2005 but none since that time. The status of this pack is unknown, but it is no longer considered to exist.

Mollie's Pack

Mollie's pack did not breed in 2005. The death of longtime alpha female #174 immediately before the breeding season precluded replacement. Yearling male #343 died around the same time, the alpha male #193

was also presumed dead, and the pack was not located in their traditional Pelican Valley territory for about two months during midwinter. It was assumed the pack no longer existed. However, they reappeared in late February without alpha male #193, apparently led by male #378, a wolf that had spent time in the Slough Creek pack. By summer, aerial photography revealed that #193M was not dead but had rejoined the pack and was dominant over #378M. Also during summer, a yearling female from the Nez Perce pack joined Mollie's and became the new alpha female. In addition to #343M, two other wolves died. Number 379, a five-year-old male, was killed by an elk or a bison, and #496, a yearling female, was probably killed by the Hayden Valley pack. Despite these mortalities, pack size throughout 2005 fluctuated little due to immigration (#378M and #486F) and ended the year at seven wolves. The pack continues to kill bison in winter, especially late in the season, and was the focus of an intensive research effort during March.

Yellowstone Delta Pack

This pack continued to be the most difficult of all Yellowstone National Park packs to monitor. Their territory is large and extends outside of the park. Sometimes months passed between telemetry locations. It is difficult to keep the wolves in this pack collared for several reasons, including frequent collar loss, dispersal out of the park, and mortalities. Only one wolf out of 17 was collared in 2005. Yearling female #492F's collar only partial-



Grizzly bears and wolves in Pelican Valley. A wolf-killed carcass is nearby.

ly revealed pack activities but indicated movement in the area of one of their traditional YNP den sites. Five pups were observed in late 2005. The number of wolves fluctuated enough to indicate that the pack may be splitting.

Hayden Valley Pack

Numbering five wolves at the end of the year, this is the only uncollared pack in Yellowstone National Park. In 2005, they continued to use their traditional territory in Hayden Valley where they denned and produced pups. The pack was often observed and photographed by park visitors. Congested traffic conditions or “wolf jams” were common during summer. Because of their proximity to the road, the prevention of habituation to vehicles and people is an issue of special concern for this pack. The lack of radio collars made the situation difficult to manage because the wolves could not be tracked and located reliably. Like Mollie’s, the Hayden Valley pack lives amidst only bison in winter and is a bison-killing pack.

Biscuit Basin Pack

This pack emigrated from Yellowstone National Park into neighboring Idaho and is now monitored by the Idaho Fish and Game Department.

Cougar Creek Pack

The Cougar Creek pack denned but it appears that



A lone wolf interested in a bison calf must first contend with the cow. This attempt was unsuccessful.

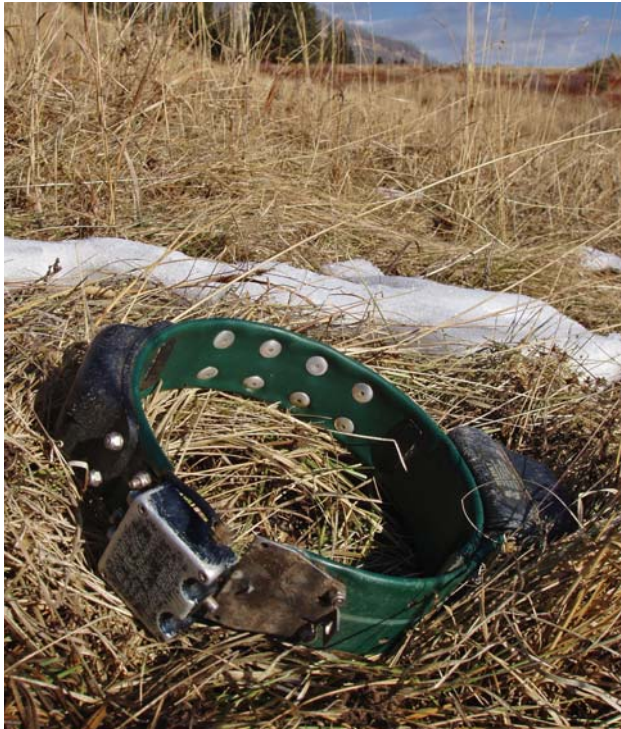
no pups survived. Beginning the year at 12 wolves, the pack later split and had dwindled to five by the end of the year. Approximately eight members of the pack dispersed north to the Gallatin River area and established an autonomous pack. This new pack is being monitored by the state of Montana and is referred to as the Cougar Creek II pack. The old Cougar Creek I pack subsists on a combination of elk, bison, and beavers. Founding female wolf #151, who dispersed from Leopold in 2001, is still the breeding female and one of the oldest wolves in the Yellowstone National Park population (she was born in 1998).

Gibbon Meadows Pack

The Gibbon Meadows pack appears to be displacing Nez Perce as the dominant pack in the Madison–Firehole area. Much of their movement is within old Nez Perce territory and in December they killed #48, the longtime alpha female of the Nez Perce pack. The pack has expanded its traditional range in Gibbon Meadows to Old Faithful, West Thumb, and Hayden Valley. This pack also commonly kills bison, primarily in winter, in addition to elk. At the end of 2005, there were nine wolves in the pack, including three pups.

Nez Perce Pack

All but gone by the end of 2005, this pack was down to five individuals when alpha female #48 was killed by the Gibbon Meadows pack (see inset story, page 6). After this fatal encounter with Gibbon, two of the remaining



A dropped GPS collar. Despite frequent setbacks, the Wolf Project continues to deploy three to five satellite telemetry collars per year.

wolves (both collared) fled south but eventually returned to the Madison–Firehole area. Upon return they were not traveling together and there is no evidence that the pack has reconstituted itself.

Number 48F did localize at a den site but if she had pups none of them survived.

Depending on the fate of the remaining Nez Perce wolves, this closes an interesting chapter in the story of wolves in Yellowstone National Park, especially in the Madison–Firehole area. Since 1998, Nez Perce was the dominant pack in this area, provided dispersers who formed other packs, and at one time numbered more than 20 wolves. Number 48F was the only Nez Perce alpha female from the pack's inception until her death in 2005.

Bechler Pack

Like the Yellowstone Delta pack, the Bechler pack continues to eke out an existence in an area of heavy snowfall. In 2005, the Bechler pack numbered nine wolves including at least four pups. The pack is slated to be collared with satellite telemetry to better facilitate tracking. 🐾

Capture Date	Wolf #/ Sex	Age	Color	Pack
1/17/2005	295M	Adult	Gray	Agate Creek
	471F	Yearling	Gray	Agate Creek
	472F	Adult	Black	Agate Creek
	209F	Adult	Black	Leopold
	288F	Adult	Gray	Leopold
	468M	Adult	Gray	Leopold
	469F	Yearling	Gray	Leopold
	470F	Pup	Black	Leopold
	152F	Adult	Gray	Swan Lake
	473M	Pup	Gray	Swan Lake
1/21/2005	474M	Pup	Black	Biscuit Basin
	475F	Pup	Gray	Biscuit Basin
	476F	Yearling	Gray	Biscuit Basin
	477M	Yearling	Black	Cougar Creek
	478F	Yearling	Black	Cougar Creek
	479M	Adult	Gray	Cougar Creek
1/23/2005	302M	Adult	Black	Druid Peak
	480M	Adult	Black	Druid Peak
	481M	Pup	Black	Gibbon Meadows
	482M	Adult	Black	Gibbon Meadows
1/25/2005	483F	Adult	Gray	Geode Creek
	484M	Pup	Gray	Nez Perce
	485F	Pup	Gray	Nez Perce
	486F	Pup	Gray	Nez Perce
	227M	Adult	Gray	Geode Creek
1/27/2005	488M	Pup	Gray	Geode Creek
	379M	Adult	Black	Slough Creek
	489M	Adult	Black	Slough Creek
	490M	Adult	Black	Slough Creek
	491M	Pup	Gray	Slough Creek
	487M	Adult	Gray	Yellowstone Delta
1/31/2005	492F	Pup	Gray	Yellowstone Delta
	493M	Pup	Black	Yellowstone Delta
	495M	Pup/ Yearling	Black	Mollie's
2/22/2005	496F	Pup	Black	Mollie's
	497M	Pup	Black	Mollie's

Table 3. Yellowstone Wolf Project collaring operations, 2005 calendar year.

WOLF CAPTURE AND COLLARING

Thirty-six wolves in 12 packs were captured and handled in 2005 (Table 3). Wolf Project objectives are to maintain radio collars in all packs. This objective was not achieved as one pack (Hayden Valley) remained uncol-

lared due to an inability to locate them for aerial capture. Fifteen pups, 5 yearlings, and 16 adults were handled and marked with collars (no wolves were ear tagged). In addition, each wolf was measured and had blood drawn for genetic and disease analysis. At year's end, 39 (33%) of 118 wolves were collared. 🐾

WOLF PREDATION

Wolf–Prey Relationships

Wolf Project staff documented wolf–prey relationships by observing wolf predation directly and recording the characteristics of wolf prey at kill sites. Wolf packs were monitored by intensive radio-tracking during two 30-day winter study sessions in March and November–December. The Leopold, Geode Creek, Slough Creek, and Hellroaring packs were monitored by two-person teams from the ground and from aircraft; the Swan Lake, Agate Creek, Mollie's, Gibbon Meadows, Nez Perce, and Cougar Creek packs were monitored from aircraft only. The Yellowstone Delta, Bechler, and Biscuit Basin packs were rarely located by ground or air due to their absence from the park or poor conditions for aerial monitoring in southern Yellowstone National Park. Wolf Project staff recorded and entered into a database behavioral interactions between wolves and prey, predation rates, the total time wolves fed on their kills, percent consumption of kills by wolves and scavengers, characteristics of wolf prey (e.g., sex, species, nutritional condition), and characteristics of kill sites. In addition, similar data were collected opportunistically throughout the year during weekly monitoring flights and ground observations. The abundance and sex-age composition of elk within wolf pack territories were also estimated from the ground.

Composition of Wolf Kills

Wolf Project staff detected 316 kills (definite, probable, and possible combined) made by wolves in 2005, including 244 elk (77%), 29 bison (9%), 9 wolves (3%), 6 deer (2%), 4 moose (1%), 4 coyotes (1%), 2 skunks (1%), 2 ravens (1%), 1 pronghorn (<1%), 1 badger (<1%), and 14 unknown prey (4%). The composition of elk kills was 18% calves (0–12 months), 11% cows (1–9 years old), 12% older cows (≥10 years old), 43% bulls, and 16% elk of unknown sex and/or age. Bison kills included 9 calves (unknown sex), 10 cows, 6 bulls, and 4 of unknown sex and age.



Biological Technician Matt Metz doing what he does best, processing a wolf kill for the vital data.



Nearly white and seven years old, Bechler's alpha male #192 and pack mates feed on a partially buried bull elk carcass.

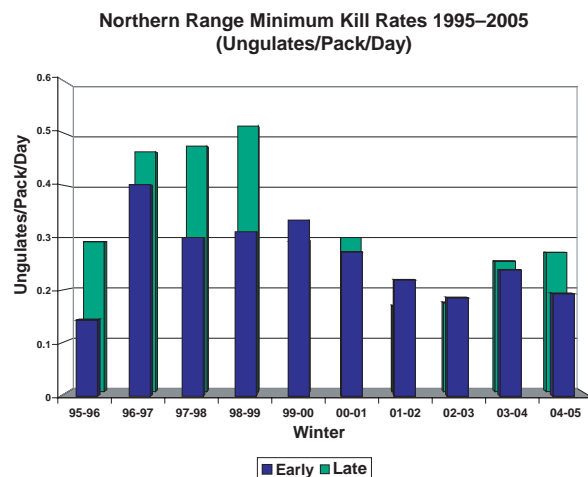


Figure 6. Yellowstone northern range minimum kill rates, 1995–2005.



A wolf, a fox, and some ravens vie over a winterkill bison carcass in Pelican Valley.



For 30 days twice each year, winter study crews endure fierce winter conditions to gather data on wolf ecology and behavior.

Winter predation rates (calculated via the double count method) for the period of 1995–2000 showed that wolves residing on the northern range killed an average of 1.8 elk/wolf/30-day study period. Using a slightly different method (minimum kill rate) for winters 2004 and 2005, wolves on the northern range killed an average of 0.9 elk/wolf/30-day study period. Although the methods of calculation are not directly comparable, this decline suggests changing ecological conditions on the northern range. A significant increase in scavenging by wolf packs on winter-killed bison and elk maintained wolf food consumption rates for winters 2004 and 2005.

Winter Studies

March. During the 30-day March 2005 winter study, wolves were observed for 404 hours from the ground. The number of days wolf packs were located from the

air ranged from 3 (Biscuit Basin) to 18 (Leopold, Geode, Druid Peak, Slough Creek, Agate Creek). Sixty-nine definite or probable wolf kills were detected, including 60 elk, 3 bison, 2 mule deer, 1 moose, and 3 unknown species. Among elk, 7 (12%) were calves, 15 (25%) were cows, 33 (55%) were bulls, and 5 (8%) were adults of unknown sex. In addition, 16 ungulates that died from other natural causes (e.g., winter kill, cougar kill, stuck in mud) were scavenged by wolf packs, including nine bison and seven elk. Of note, the 25-member Leopold pack had an unusually low kill rate in March because they scavenged four bison and three elk carcasses.

November–December. During the 30-day November–December 2005 winter study, wolves were observed for 296.5 hours from the ground. The number of days wolf packs were located from the air ranged from 9 (Druid Peak) to 18 (Leopold, Hellroaring Creek, Slough Creek, Agate Creek, Cougar Creek). Fifty-five definite or probable wolf kills were detected, including 44 elk, 5 bison, 2 deer, 2 moose, and 2 unknown. Among elk, 11 (25%) of the kills were calves, 12 (27%) were cows, 18 (41%) were bulls, and 3 (7%) were elk of unknown sex and age.

These recent findings indicate a shift in prey selection by wolves compared to the first eight years: use of elk calves has declined while use of bulls has increased. In recent years, food consumption by wolves in early winter compared to late winter has varied less than it typically did in the first five years after reintroduction, which suggests wolves are killing at a minimal rate approximately equal to their daily food requirement throughout winter (Figure 6).

Summer Studies

Summer Predation. During summer 2005, Wolf Project staff continued efforts to document summer predation patterns of wolves. This goal is problematic due to the lack of snow for tracking, increased nighttime activity of wolves, lack of pack cohesiveness, and smaller prey packages leading to quick consumption and loss of evidence. Traditionally, the best data concerning wolf summer food habits have come from analysis of scat contents collected at den and rendezvous sites. In addition to continuing scat collection in 2005, the Wolf Project staff deployed five downloadable GPS (Global Positioning System) collars to enhance our understanding of 1) seasonal predation patterns; 2) spatial and temporal interactions with other wolf packs and other carnivores; 3) movements with respect to dens during pup rearing



Winter camp in Pelican Valley. Wolf studies in the park's interior in winter require extended backcountry stays.

season; and 4) territory size, use, and overlap. Once a week Wolf Project staff attempted to download the data from collars that had been programmed to collect location data every 30 minutes during the summer season. This provided researchers with high resolution mapping of wolf movements and allowed researchers to find wolf kills—even newborn elk calves.

Unfortunately, challenges associated with malfunctioning collars or the death of wolves wearing them made summer predation patterns difficult to document. Geode alpha male #227 was wearing a summer predation GPS collar, but was killed by the neighboring Leopold pack in March. Another Geode wolf, pup #488M, was fitted with a summer predation GPS collar. After the death of the alpha male and because of strife with the Leopold pack, the Geode pack dismantled and disappeared. Number 488M dispersed and spent the summer alone. Wolf Project staff monitored him all summer, successfully tracking his movements and feeding patterns, but as a lone wolf he primarily scavenged. He died in late summer due to starvation, but the GPS data showed that he had survived as a lone wolf for over three months by scavenging over 10 carcasses ranging from two weeks to four months old, most of which consisted of only bone and hide.

Another summer predation collar on Leopold's #470F worked well until early summer, after which it malfunctioned and prevented staff from downloading data. Summer predation studies will continue with newer collars in 2006.

Summer Scavenging. The effects of wolf restoration on scavenger guilds in the Greater Yellowstone Ecosystem is an important aspect of trophic cascade research. Research on wolf and scavenger interactions has been



Emily Almberg retrieves an elk carcass from the middle of the Lamar River.

conducted through support from Canon U.S.A, Inc., and the Yellowstone Center for Resources (YCR) since 1998. This research, conducted mainly in winter, has monitored how wolves influence the abundance and distribution of carrion both spatially and temporally, and how they facilitate food acquisition by other carnivores. Although a great deal has been learned about the magnitude and relative importance of wolf-killed carcasses to the winter scavenger communities, little is known about the impact on summer scavengers, both vertebrate and invertebrate.

In summer 2005, Wolf Project staff, in collaboration with Dr. Chris Wilmers (University of California, Davis) began a pilot project to document invertebrate diversity and abundance at summer carcasses. This effort will continue in 2006 with increased monitoring efforts.

Population Genetics

A collaborative effort with the University of California at Los Angeles (UCLA) was initiated in 2005 to use genetic techniques to construct a pedigree for all handled Yellowstone wolves and examine gene flow among the three Rocky Mountain wolf recovery areas. Blood samples from over 500 wolves from Idaho, Montana, and Wyoming were sent to the canid genetics lab of Robert Wayne at UCLA for genotyping and determination of heterozygosity (a measure of genetic diversity).

A high level of heterozygosity (0.64) was found for Yellowstone wolves, indicating a genetically robust population. Regional differences in the wolf populations were also determined, for example, wolves from the three recovery areas can be distinguished and migration assessed. Movement of Yellowstone wolves to Idaho appears



Wolf Project staff and winter study volunteers. Front row, from left: Matt Metz, Scott Laursen, Tim Hudson, Angela Jardine. Back row (standing), from left: Stefani Farris, Doug Smith, Dan Stahler, Deb Guernsey, Emily Almberg, Elissa Pfost, Erin Albers. (Not pictured: Abby Nelson.)



Assigned to the Wolf Project in 1999, Amos had been everywhere and knew the backcountry and its cabins better than anyone (and could find them in the dark). He gave his heart and soul to everything we asked of him, even after losing one eye. He is shown here on Mirror Plateau on his last backcountry trip. Amos was a victim of cancer in 2005.

to be frequent, but no wolves moved from Yellowstone to the northwest Montana recovery area. Immigration from Idaho and northwest Montana into Yellowstone appears to be rare, indicating some isolation of wolves in Yellowstone from other recovery areas. Work on the population pedigree is ongoing. 🐾

WOLF MANAGEMENT

Area Closures

To prevent human disturbance of young pups, areas surrounding the Slough Creek Pack's den were closed to visitors through July 1. This closure in the Slough Creek Flats area southwest of the Slough Creek Campground was about one square mile in size and was centered on the den site. Hundreds of visitors were still able to observe adults and pups from a safe distance, providing both protection to the pack and enjoyment to visitors. Temporary closures of one to two weeks were put into effect around the Agate Creek and Hayden Valley packs' den sites until the packs moved to more remote dens or rendezvous sites. Closures were in effect to protect den sites for the Leopold, Mollie's, and Nez Perce packs in the Blacktail (March 15–June 30), Pelican Valley (April 1–July 3), and Firehole (March 15–Memorial Day weekend) Bear Management Areas. The areas around other den sites were not closed because of historically low visitor use.

Druid Road Management Project


Since wolf reintroduction, 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 (YCR), 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, the Druid Road Management Project was initiated, with the following objectives: 1) human safety: protect visitors that are viewing wolves alongside the road, and control both traffic along the road and parking to prevent an accident; 2) wolf safety: protect wolves from vehicle strikes, permit wolves to cross 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 sixth year that private funds were used to manage wolf viewing in Lamar Valley and the surrounding area. This year was radically different from the

past five seasons, however. For the first time since establishing themselves on the northern range, the Druid Peak pack did not return to their traditional den site near the road in Lamar Valley. As a result, project staff did not need to monitor or control vehicular traffic in that area. Instead, efforts were focused on managing the Slough Creek wolf viewing area.

Two accidents were reported at Slough Creek but no one was injured and traffic congestion was less of an issue overall than in past years, especially after the Slough Creek Road opened. Before that there had not been enough parking. The Slough Creek pack denned just west of Slough Creek, in a location that was visible from the Northeast Entrance Road and from the Slough Creek Campground Road. Large numbers of visitors viewed adult wolves and pups at or near the den area from early April through late July. During summer, two staff members from the Division of Interpretation, assigned to the northern range to help educate the public about wolves, spent most of their time in the Slough Creek area working alongside Wolf Project staff.

Wolf Depredation Outside Yellowstone

Information on wolf depredation in the greater Yellowstone recovery area is available at <www.r6.fws.gov/wolf/annualrpt05>. 

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

No students received direct assistance in 2005.

Indirect Assistance or Collaborative Work with the Wolf Project

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



Breeding female #209 of the Leopold pack nursing pups. Only 2 out of 19 Leopold pups survived in 2005.

STAFF AND PUBLIC INVOLVEMENT

Volunteer Program

Thirteen volunteer field technicians worked a total of 5,614 hours in 2005, worth \$74,160.94 at the GS-5 level (see Appendix), which was equal to 2.7 full time GS-5 employees. Volunteer field positions continued to be highly competitive with three to four applicants applying for each position. Chosen volunteers received free housing and a \$500/month food stipend.

Most positions are available during winter, when studies of wolf behavior and predation rate take place. A background in a biological science 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.

Seasonal Staff

The Wolf Project was able to hire paid seasonal staff through the Yellowstone Park Foundation and Yellowstone Association to assist in several key aspects to our annual work. Emily Almborg, Matt Metz, Abby Nelson, and Katie Yale worked for the summer field season and were crucial to the summer predation study and

other project work. Emily, Matt, and Abby also worked during the winter months in this capacity. Rick McIntyre worked diligently for the Wolf Project for six months as a National Park Service seasonal employee and six months as a volunteer. Emily and Rick worked primarily for the Druid Road Management Project during the summer, but also assisted in many other project goals during winter months. All five spent many hours collecting data throughout the year and contributed largely to the increased research productivity of the Yellowstone Wolf Project for the year. 🐾

ACKNOWLEDGEMENTS

We thank all of the Wolf Project volunteers, especially winter study volunteers, without whom we could not carry on the vital research and management of wolves in Yellowstone. We also thank the growing number of people who support the project through the Yellowstone Park Foundation. With each passing year this support takes on greater significance to keeping the program afloat. Too many to mention, we appreciate your continued interest. Finally, thanks to Virginia Warner for editorially shepherding us through our many errors. 🐾

APPENDIX

Yellowstone Volunteer Wolf Project Roster, 2005

Name	Period of Involvement	Hours Worked
Erin Albers	11/8/2005–12/15/2005	342
Emily Almberg	11/8/2005–12/15/2005 & 2/23/2005–3/31/2005	638
Jessica Auer	2/23/2005–3/31/2005	296
Jack Bean	2/23/2005–3/31/2005	296
Adam Fahnestock	2/23/2005–3/15/2005	168
Stefani Farris	11/8/2005–12/15/2005	342
Tim Hudson	11/8/2005–12/15/2005	342
Angela Jardine	2/23/2005–3/31/2005 & 11/8/2005–12/15/2005	638
Laura Kelly	2/23/2005–3/31/2005	296
Scott Laursen	11/8/2005–12/15/2005 & 2/23/2005–3/31/2005	638
Matt Metz	11/8/2005–12/15/2005 & 2/23/2005–3/31/2005	638
Abby Nelson	11/8/2005–12/15/2005 & 2/23/2005–3/31/2005	638
Elissa Pfof	11/8/2005–12/15/2005	342
Total Volunteer Hours		5,614

Publications in 2005

- Bangs, E.E., J.A. Fontaine, M.D. Jimenez, T.J. Meier, E.H. Bradley, C.C. Niemeyer, D.W. Smith, C.M. Mack, V. Asher, and J.K. Oakleaf. 2005. Managing wolf-human conflict in the northwestern United States. Pgs. 340–356 in *People and Wildlife: Conflict or coexistence?* Editors, R. Woodroff, S. Thirgood, and A. Rabinowitz. Cambridge University Press.
- Bangs, E., M. Jimenez, C. Niemeyer, T. Meier, V. Asher, J. Fontaine, M. Collinge, L. Handegard, R. Krischke, D. Smith, and C. Mack. 2005. Livestock guarding dogs and wolves in the northern Rocky Mountains of the United States. *Carnivore Damage Prevention News*, 8: 32–39.
- Berger, J., and D.W. Smith. 2005. Restoring functionality in Yellowstone with recovering carnivores: gains and uncertainties. In: *Large carnivores and the conservation of biodiversity* (Ed. by J.C. Ray, K. H. R., R.S. Steneck, J. Berger), pp. 100–109. Washington, D.C.: Island Press.
- Bradley, E.H., D.H. Pletscher, E.E. Bangs, K.E. Kunkel, D.W. Smith, C.M. Mack, T.J. Meier, J.A. Fontaine, C.C. Niemeyer, and M.D. Jimenez. 2005. Evaluating wolf translocation as a nonlethal method to reduce livestock conflicts in the northwestern United States. *Conservation Biology*, 19:1498–1508.
- Fortin, D., H.L. Beyer, M.S. Boyce, D.W. Smith, T. Duchesne, and J.S. Mao. 2005. Wolves influence elk movements: behavior shapes a trophic cascade in Yellowstone National Park. *Ecology*, 86(5):1320–1330.
- Mao, J.S., M.S. Boyce, D.W. Smith, F.J. Singer, D.J. Vales, J.M. Vore, and E.M. Merrill. 2005. Habitat selection by elk before and after wolf reintroduction in Yellowstone National Park. *Journal of Wildlife Management*, 69(4):1691–1707.
- Smith, D.W. 2005. Mixed messages about opportunistic carnivores. *Conservation Biology*, 19:1676–1678.
- Smith, D.W. 2005. Ten years of Yellowstone wolves 1995–2005. *Points West, Buffalo Bill Historical Center, Cody, Wyoming*, Spring 2005: pp. 3–10.
- Smith, D.W. 2005. Ten years of Yellowstone wolves, 1995–2005. *Yellowstone Science*, 13(1):7–33.
- Smith, D.W., and G. Ferguson. 2005. *Decade of the Wolf: Returning the wild to Yellowstone*. 212 pp. The Lyons Press, Guilford, Connecticut.
- Smith, D.W., D.R. Stahler, and D.S. Guernsey. 2005. Yellowstone Wolf Project: Annual Report 2004. National Park Service, Yellowstone Center for resources, Yellowstone National Park, Wyoming, YCR-2005-02.
- Vucetich, J.A., D.W. Smith, and D.R. Stahler. 2005. Influence of harvest, climate, and wolf predation on Yellowstone elk, 1961–2004. *Oikos*, 11:259–270. 