

Rocky Mountain Wolf Recovery 2002 Annual Report

A cooperative effort by the U.S. Fish and Wildlife Service, the Nez Perce Tribe, the National Park Service, and USDA Wildlife Services. T. Meier, editor.



photo: T. Meier

This cooperative annual report presents information on the status, distribution and management of the recovering Rocky Mountain wolf population from January 1, 2002 through December 31, 2002. It is also available at <http://mountain-prairie.fws.gov/wolf/annualrpt02/>

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SUMMARY

Wolves (*Canis lupus*) in the Northern Rocky Mountain states (Idaho, Montana and Wyoming) continue to increase in distribution and numbers (Figures 1, 5). Estimates of wolf numbers at the end of 2002 were 284 wolves in the Central Idaho Recovery Area, 271 in the Greater Yellowstone Recovery Area, and 108 in the Northwest Montana Recovery Area for a total of 663 (Figure 1, Table 4a). By state boundaries, there were an estimated 263 wolves in the state of Idaho, 217 in Wyoming and 183 in Montana (Table 4b). Of approximately 80 groups of two or more wolves, 43 met the definition of “breeding pair,” an adult male and female raising two or more pups until December 31. This made 2002 the third year in which 30 or more breeding pairs were documented within the three-state area. Recovery criteria have been met for removing these wolves from the Endangered Species List (Table 4a). It is expected that the process of delisting could begin in 2003 if state management plans are in place. Wolves in the area subsist mainly on elk (*Cervus elaphus*), white-tailed deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*), moose (*Alces alces*), and bison (*Bison bison*). Livestock depredations in 2002 included 52 cattle (*Bos taurus*), 99 sheep (*Ovis aries*), nine dogs (*Canis familiaris*) and five llamas (*Lama glama*) confirmed lost to wolves (Table 5a, 5b). Approximately 23 of 80 known wolf packs were involved in livestock depredations. In response, 46 wolves were killed within the 3-state area. No wolves were translocated in 2002. As new packs are formed between the original core recovery/release areas, the three populations increasingly resemble and function as a single, large population (Figure 1). Approximately 12 research projects are underway, examining wolf population dynamics, predator-prey interactions and livestock depredation.

BACKGROUND

Gray wolf populations were extirpated from the western U.S. by the 1930s. Subsequently, wolves from Canada occasionally dispersed south into Montana and Idaho but failed to survive long enough to reproduce. Public attitudes toward predators changed and wolves received legal protection with the passage of the Endangered Species Act (ESA) in 1973. Wolves began to successfully recolonize northwest Montana in the early 1980s. By 1995, there were six wolf packs in northwestern Montana. In 1995 and 1996, 66 wolves from southwestern Canada were reintroduced to Yellowstone National Park (YNP) (31 wolves) and central Idaho (35 wolves).

The Northern Rocky Mountain (NRM) wolf population contains three recovery areas: The Northwest Montana recovery area (NWMT, Figs. 1, 2) includes northwest Montana and the northern Idaho panhandle. The Greater Yellowstone recovery area (GYA, figs. 1, 3) includes Wyoming and adjacent parts of Idaho and Montana. The Central Idaho recovery area (CID, Figs. 1, 4) includes central Idaho and adjacent parts of southwest Montana. Wolves in the three recovery areas are managed under different guidelines, depending upon their designated status under the ESA. NWMT wolves are classified as endangered, the most protected classification under the ESA. GYA and CID wolves are classified as nonessential experimental populations and managed with more flexible options than the endangered population. The United States Fish and Wildlife Service (USFWS), responsible for administering the ESA, believes that 30 breeding pairs of wolves, with an equitable distribution among the three states for three

successive years, would constitute a viable and recovered wolf population. That criterion was met at the end of 2002. If other provisions required for delisting are met, primarily adequate regulatory mechanisms in the form of state wolf management plans that would reasonably assure that the gray wolf would not become threatened or endangered again, the USFWS would propose delisting in 2003.

NORTHWEST MONTANA WOLF RECOVERY AREA

Personnel

Wolves in Montana (including the NWMT recovery area and parts of the GYA and CID recovery areas) were monitored in 2002 by USFWS biologists Joe Fontaine in Helena and Tom Meier in Kalispell, and Turner Endangered Species Fund (TESF) biologist Val Asher in Bozeman. They were assisted by seasonal USFWS employees Paul Frame, Rose Jaffe and Isaac Babcock, and work/study employee Therese Hartman. Other USFWS personnel in Montana included wolf recovery coordinator Ed Bangs (Helena), and law enforcement agents Roger Parker (Billings), Rick Branzell (Missoula), Doug Goessman (Bozeman) and Kim Speckman (Great Falls). In the parts of Montana that lie within the GYA and CID recovery areas, wolves were monitored cooperatively with the National Park Service (NPS) and Nez Perce Tribe (NPT) respectively. Many other individuals, organizations and agencies contribute toward wolf monitoring and management (see *Acknowledgments*).

Wolf control activities in all recovery areas were carried out by USDA/APHIS/Wildlife Services (WS). WS personnel involved in wolf management in Montana in 2002 included state director Larry Handegard, eastern district supervisor Paul J. Hoover, western district supervisor Kraig Glazier, wildlife specialists John Bouchard, Steve Demers, Michael Hoggan, Chad Hoover, R.R. Martin, Graeme McDougal, Theodore North, James Rost, Bart Smith, and James Stevens, and pilots Tim Graff and Eric Waldorf. The Montana WS operation covers parts of the NWMT, GYA, and CID wolf recovery areas.

Monitoring

Seventeen wolves were captured and radio-collared in NWMT in 2002. Seven of those were collared by WS in depredation control actions. The other 10 were captured by USFWS personnel for population monitoring. One wolf was darted from a helicopter, and the others were captured in foothold traps. At the end of 2002, 26 radio-collared wolves (23% of the population) from 15 different packs or pairs were being monitored in NWMT. These packs, together with uncollared packs that have been documented, totaled about 108 wolves (Figs 1, 2; Tables 1a, 4). Radio-collared wolves were located from aircraft approximately twice per month. Collared wolves in and around Glacier National Park (GNP) were located more frequently from the ground by GNP and USFWS staff and volunteers.

Packs included in NWMT as of December 2002 were Kintla, Murphy Lake, Ninemile, Castle Rock, Whitefish, Grave Creek, Spotted Bear, Fishtrap, Red Shale (formerly Gates Park), Fish

Creek, Lupine, Yaak, Loneline (formerly Little Thompson), Lazy Creek, Hog Heaven, Green Mountain, Great Divide, Halfway, Blanchard Creek, Potomac, and Chief Mountain. The Yaak pair consists of a female translocated to the Yaak as a pup in December 2001, and a male of unknown origin. A yearling male translocated at the same time remains in the Yaak as a lone wolf. The Apgar and Danaher Packs, discussed in previous reports, are no longer thought to be present. A possible pack on the east side of Lake Koocanusa (Ural Pack) has yet to be collared and documented. Packs of wolves in the Yaak, Kootenai, Wigwam, Spruce Creek and Belly River drainages of Canada may stray into Montana, but den and spend most of their time in Canada and are not counted in the NWMT population. The Grave Creek and Kintla Packs spend a significant part of their time in British Columbia, but are considered part of the NWMT population. Along the border between the NWMT and CID recovery areas, the Fish Creek and Lupine Packs are counted in the NWMT population, while the Bighole Pack (near Lolo Pass) is counted in the CID population.

Reproduction was confirmed in the Kintla, Murphy Lake, Ninemile, Castle Rock, Whitefish, Grave Creek, Spotted Bear, Fishtrap, Red Shale, Fish Creek, Lazy Creek, Hog Heaven, Green Mountain, Great Divide, Halfway, and Blanchard Creek Packs. In order to count as a breeding pair toward recovery goals, an adult male and female and at least two pups must be present in the pack at year's end. The Grave Creek and Lazy Creek Packs had only one pup each by the end of 2002, the Halfway Pack had only one adult, and pups from the Blanchard Creek Pack were orphaned in May and certainly died. Eleven packs met the criteria of breeding pair, counting toward recovery goals.

At least 27 wolves from the NWMT population died in 2002. This count does not include animals that disappeared whose fates were unknown, including 22 pups that disappeared. A female from the Kintla Pack was apparently killed by an elk. The other documented deaths were human-caused. Depredation control resulted in the deaths of nine wolves. Eight wolves were road-killed, and five were known to be illegally killed or their deaths are still under investigation as illegal kills. Three of the yearling wolves translocated into the Yaak in December 2001 were legally shot in British Columbia. Another of the Yaak yearlings died after getting caught in a coyote snare. A semi-tame, wolflike canid that killed two llamas and was shot near Whitefish in July 2002 was not considered to be a wild wolf and is not included in these figures. Of at least 74 wolf pups known to have been born, 44 survived until December 31, for a pup survival rate of 59% to the age of eight months. This is a maximum figure, because pup counts were not obtained until midsummer for some packs, by which time some mortality may already have occurred.

Research

Habitat selection by recolonizing wolves in the northwestern United States.

Investigators: John K. Oakleaf, Dennis L. Murray (Department of Fish and Wildlife Resources, University of Idaho), Edward E. Bangs, Joseph A. Fontaine, Michael D. Jimenez, Thomas J. Meier, Carter C. Niemeyer (USFWS), Douglas W. Smith (Yellowstone National Park), Curt M.

Mack (NPT) and James R. Oakleaf (University of Wyoming). M.S. thesis completed and available from University of Idaho, Moscow.

Gray wolf populations have persisted and expanded in the northern Rocky Mountains since 1986, while reintroduction efforts in Idaho and Yellowstone have further bolstered the population. However, rigorous analysis of either the availability of wolf habitat in the region, or the specific habitat requirements of local wolves, has yet to be conducted. We examined wolf-habitat relationships in the western U.S. by relating landscape/habitat features found within wolf pack home ranges (n = 56) to those found in adjacent unoccupied areas. Logistic regression of occupied versus unoccupied areas revealed that a higher degree of forest cover, lower human population density, higher elk density, and lower sheep density were the primary factors related to wolf occupation. Further, our analysis indicated that relatively large tracts of suitable habitat remain unoccupied, suggesting that wolf populations likely will continue to increase in the region. Analysis of the habitat linkage among the three main wolf sub-populations indicates that populations in central Idaho and northwest Montana have higher connectivity, and thus greater potential for exchange of individuals, than does either subpopulation to the Greater Yellowstone Area subpopulation. Thus, for the northern Rocky Mountains to function as a metapopulation for wolves and other carnivores (e.g., lynx, wolverine, and grizzly bears), it will be necessary that dispersal corridors to the Yellowstone ecosystem be established and conserved.

Wolf and Livestock Conflicts in Montana, Idaho, and Wyoming: an evaluation of wolf control and assessment of factors that may predispose cattle ranches to wolf predation.

Investigators: Elizabeth H. Bradley and Dr. Daniel Pletscher, Wildlife Biology Program, School of Forestry, University of Montana.

Cooperators: USFWS, Turner Endangered Species Fund, Yellowstone National Park, Nez Perce Tribe, Defenders of Wildlife, National Fish and Wildlife Foundation.

We are investigating several aspects of livestock depredation and management in the recovery areas of Montana, Idaho, and Wyoming. First, we are conducting an analysis of two different management techniques, translocation and lethal control, to determine how effective they are at reducing livestock depredations. Data are currently being compiled on all wolves translocated and lethally controlled since 1987. Effectiveness of translocation will be determined based on the extent to which wolves survive, reproduce, and/or depredate post-translocation. Sex, age, and social status of translocated wolves, distance of translocation, release method (hard/soft), and post-release movements will all be considered in this context. Effectiveness of lethal control, as well as translocation will also be determined based on the extent to which the remaining pack members (if any) continue to depredate, taking into account the number of individuals remaining and their sex, age, and social status, if known. Depredation history of packs post-lethal control or translocation will be compared to packs that depredated but did not undergo any form of control.

The second part of this study involves an analysis of what factors may predispose cattle ranches and site specific areas on cattle ranches to wolf predation. Data were collected from ranchers

who had experienced confirmed wolf depredations in confined pastures, to determine what landscape and/or ranch characteristics may be associated with these depredation events. Each depredated ranch was paired with up to four nearby non-depredated ranches for comparison. Communities that have experienced multiple depredation events have been the primary focus of this research. Data collection began in June 2002 and concluded in January 2003 and included the following areas: Paradise Valley, East Front, Marion, Eureka, Deerlodge, Bitterroot, and Big Hole areas in Montana, and the Salmon, Challis, and Stanley Basin areas in Idaho. Data are currently being compiled and prepared for analysis.

The overall purpose of this study is to provide information that may help decrease wolf conflicts with livestock. An analysis of the effectiveness of translocation and lethal control of wolves under direction of the USFWS may help future state managers in the northwestern U.S. and elsewhere improve management decisions. A better understanding of what factors are involved in wolf depredation on cattle ranches may help build better preventive methods. This project will be completed in late 2003.

Outreach

Program personnel presented informational talks and status reports throughout the year to various federal and state agencies, public and private institutions, special interest groups, and rural communities. During 2002, USFWS project personnel gave approximately 50 public presentations to audiences totaling more than four thousand people. Additionally, scores of informal presentations to small groups or individuals were conducted during this time. Numerous radio and television interviews and news spots featuring project personnel were broadcast locally and nationally.

Livestock Depredation and Management

In the Northwest Montana wolf recovery area, wolves are currently classified as endangered, and management activities are more restricted than in the experimental nonessential (Yellowstone and Central Idaho) recovery areas. The use of nonlethal ammunition and hazing is restricted to agency personnel, and lethal take permits cannot be issued to livestock owners. Under the nationwide wolf reclassification proposal expected to take effect in early 2003, wolves in NWMT would be classified as threatened, and management would be similar to that in the other two recovery areas.

All reports of wolf depredation on livestock are investigated by WS, who take appropriate control action after consultation with USFWS. Seven of the 20 known wolf packs in NWMT were involved in livestock or dog depredations in 2002. Confirmed losses in 2002 included nine cattle, 13 sheep, four dogs and five llamas killed by wolves. Losses classified as probable wolf depredation included another two cattle and five sheep. In wooded and/or mountainous country, livestock carcasses may not be found promptly, if ever. It can be difficult or impossible to confirm wolf depredation when livestock carcasses are eaten or decomposed. Therefore, confirmed losses represent only a portion of actual losses. Whether this is a large or small

portion of such losses is the subject of much controversy and research (see *Effects of Wolves on Livestock Calf Survival and Movements in Central Idaho*, CID research section). Depredation control efforts resulted in the death of nine wolves. Nonlethal control methods included trapping and hazing of packs to move them away from livestock, nonlethal ammunition, fladry and Radio Activated Guard (RAG) boxes.

Ninemile Pack: A series of livestock depredations in the Ninemile Valley that began in late 2001 continued throughout 2002, in spite of extensive nonlethal and lethal control actions. Twelve sheep, five llamas and a dog were confirmed killed by wolves in 2002, with other livestock injured or suspected to have been killed. The use of a RAG (radio-activated guard) box, electric fencing and fladry probably helped to decrease losses, and six wolves were killed in control actions. Two more wolves were radio-collared and released, and three pups from the Ninemile Pack were killed by vehicles. Five wolves were thought to remain in the pack at the end of the year, with depredations continuing into 2003.

Castle Rock Pack: Although five wolves had been removed from the pack in 2001, the Castle Rock Pack continued to kill cattle in 2002. Four calves were confirmed to have been killed by the pack, with two others considered probable wolf depredation. Three wolves were captured, radio-collared and released. Two adult male wolves were killed in a control action in August. One producer reported 56 calves missing in fall 2002. Depredations continued, and the pack was eliminated in February 2003.

Grave Creek Pack: Two lion hounds were attacked by the Grave Creek Pack in the Deep Creek drainage in March 2002. One dog was killed and eaten, the other escaped. In July, several cattle were attacked on the Deep Creek/Grave Creek grazing allotment of the Kootenai National Forest. One cow and two calves were killed or lethally wounded, another calf injured. Because the Grave Creek Pack had also killed cattle in 2000 and 2001 with no control action taken, it was decided to remove one or more members of the pack. But when traps were set, the wolves had left the area and none were captured. The Grave Creek Pack travels widely on both sides of the Whitefish Range and into Canada. Discussions are ongoing between USFWS, the U. S. Forest Service (USFS), local ranchers, and the National Wildlife Federation, to come up with strategies to mitigate livestock depredation in this area.

Red Shale Pack: In early January 2002, the Red Shale (formerly Gates Park) Pack, in the North Fork of the Sun River, attacked two lion hounds near Gibson Reservoir. By the time the hunter located his dogs, both had been killed and one partially consumed.

Great Divide Pack: A calf was confirmed killed by the newly-formed Great Divide Pack in December 2002. The calf was a straggler that had escaped roundup. The Great Divide alpha female, #281, was one of five wolves translocated from the Castle Rock Pack to the west side of Lake Koocanusa in 2001. She had returned to within 20 miles of her natal territory and bred in 2002, but was struck by a vehicle and killed in September 2002. One Great Divide pup was captured and radio-collared in summer, but its collar was chewed off by other pack members. There are currently no radio-collars in the pack, thought to consist of the original male, four pups and a newly-arrived female.

Halfway Pack: A series of incidents of cattle being chased through fences in the area north of Avon was originally attributed to the Castle Rock Pack, until the newly-formed Halfway Pack was discovered. Alpha Female #280, originally from the Castle Rock Pack, had been translocated 200 miles northwest in 2001, but like Great Divide female #281 she returned to within 20 miles of her natal pack and bred in 2002. She had lost her collar in August 2001, was recollared in September 2002 but soon disappeared. The alpha male died in a trap in September. Livestock depredations continued into early 2003 and the pack was eliminated in February 2003.

Lonepine Pack: One cow and one calf, from separate ranches, were confirmed killed by wolves in December 2002, on the Confederated Salish-Kootenai Reservation between Hot Springs and Polson. Three wolves have been seen by ranchers in the area. A wolf that may have been associated with them, Female #276, had been mistaken for a coyote and shot earlier in the month. Female #276 had been referred to as the “Little Thompson” wolf, but the new pack has been named Lonepine to more accurately reflect their location. Lack of snow hindered attempts to locate and capture wolves from the pack using aircraft. Efforts will be made to trap and radio-collar them in 2003.

Lone/Dispersing Wolves: A lone, wolf-like animal was seen repeatedly near Ferndale in summer 2002. It attacked poultry and behaved as though it had been associated with people. The animal gradually moved north and west, killing a llama near Mud Lake in June and another llama near Whitefish in July. Because of the abnormal behavior of the animal, it was determined that it was an escaped pet wolf or hybrid, and livestock owners in the area were told that they could shoot the animal if they had the opportunity. A rancher shot it on July 19, near the site of the last llama depredation. Examination of the carcass revealed unusual skull shape, eye color, and foot size, validating the conclusion that it had been a wolf-dog hybrid.

Translocated Wolves

Between January 1999 and December 2001, 23 wolves in four groups were translocated within Montana to help mitigate livestock depredation. In each case, wolves were moved from areas with high livestock numbers to areas of public land with few livestock and abundant natural prey. Six of those wolves are still known to be alive in 2003. Ten were killed by humans, one died naturally and six are missing. The average distance wolves moved from the release site before settling down or being killed was 57 miles. Average survival after release was 14 months, as of January 2003. Seven of the 23 translocated wolves are known to have paired and bred after they were moved. The Pleasant Valley, Castle Rock and Gravelly Packs all continued to kill livestock after some of their members were translocated, and lethal control followed within a year. The Bass Creek Pack was completely eliminated by the translocation. Although wolf translocation seems like a humane alternative to lethal control, especially when pups are involved, few places in the northern Rockies remain as likely release sites. With increasing numbers of dispersing wolves and new pairs, all three recovery areas are becoming well occupied by wolves. For this reason, few if any wolf translocations are expected to be done in the future. Following are summaries of the four recent wolf translocations:

In January 1999, four wolves were captured from the Pleasant Valley Pack and moved via truck and snowmobile to Spotted Bear (65 air miles from Pleasant Valley). Adult male #117 remains as the alpha male of the Spotted Bear Pack. Yearling female #128 traveled to the East Front and was killed in depredation control. The cut-off radio-collar from male pup #119 was found in the Garnet Mountains in September 1999. Male yearling #115 was last heard in the Bob Marshall wilderness in March 2000.

Ten wolves from the Bass Creek Pack were captured in June 1999 and held until December 1999 at McCall, Idaho. Four wolves died in captivity. The adult female and five pups were transported by truck and aircraft to Spotted Bear (98 air miles from Bass Creek) in December 1999. They were held overnight in an electrified pen, and released when male #117 was found to be in the area. Female #57 remains with male #117 in the Spotted Bear Pack. Female #45 (last heard near Ferndale in June 2000) and male #50 (last heard near Big Salmon Lake in December 2000) are missing. Female #46 died of unknown causes in the South Fork of the Flathead River, in December 2000. The carcass of male #49, without its collar, was found in the Clark Fork River in May 2000. The cut-off collar from male #48 was found near Ovando in July 2000.

Five wolves from the Castle Rock (Boulder) Pack were captured in January 2001, held for two months, then transported by truck to Parsnip Creek, on the west side of Lake Koochanusa, 198 air miles from their home territory. After their release, they first traveled north to Canada, but soon doubled back, and all returned at least halfway home, to the area west of Flathead Lake. Two females, #280 and #284, returned to form new packs adjacent to their home territory, the Halfway and Great Divide Packs. Great Divide female #284 was killed by a vehicle in September 2002. Halfway female #280 disappeared in fall 2002. Little Thompson/Lonepine female #276 was mistaken for a coyote and shot in December 2002. Male #286 and female #278 remain in the Hog Heaven Pack, southwest of Kalispell.

An adult female wolf, a yearling male and six pups were removed from the Gravelly Pack between April and June 2001. They were held until December 2001, then transported by truck to the upper Yaak River and released, 319 air miles from their home territory. Female #206 soon left the release area, traveling west through Idaho and Washington, then north into British Columbia. She was last located in February 2002 near Castlegar, British Columbia, 95 miles WNW of her release site. Yearling male #204 traveled into Canada, then southeast past Kalispell. He has not been located since May 2002. Several of the pups remained in a group and caused concern among Yaak residents by their seeming lack of fear and their attraction toward domestic dogs, in winter 2001-2002. Three of them were eventually shot in British Columbia (male #229, male #233, male #234). Female #231 was found dead in April 2002, with a broken-off coyote snare on her neck. Male #232 remains in the Yaak/Pipe Creek area as a lone wolf. Female #230 has paired with a male wolf and remains in the Yaak.

GREATER YELLOWSTONE WOLF RECOVERY AREA

Personnel

Three full-time employees worked for the Yellowstone Wolf Project in 2002: Project Leader Douglas Smith, Biological Science Technician Debra Guernsey and Biologist Dan Stahler. Rick McIntyre worked as a seasonal employee on the Druid Peak Pack Road Management Project. Elena West also worked on the Road Management Project, through the Yellowstone Park Foundation (YPF). Volunteers (see *Acknowledgments*) staffed the two early (Nov-Dec) and late (March) winter study periods.

Wolves in Wyoming outside Yellowstone National Park were monitored by Project Leader Mike Jimenez (USFWS), seasonal biologists Paul Hanson (USFWS) and John Stevenson (USFS), and student volunteers from Northwest College in Powell, Wyoming (see *Acknowledgments*). USFWS law enforcement agents in Wyoming were Dominic Domenici (Casper), Tim Eicher (Cody), and Roy Brown (Lander).

Monitoring of wolves in the Montana portion of the GYA was conducted by Joe Fontaine (USFWS) and Val Asher (TESF), along with other TESF, USFWS and NPS personnel and volunteers.

Wyoming employees of WS who were involved with wolf control or management in 2002 include state director Rod Krischke, district supervisors Sam Crowe and Merrill Nelson, wildlife specialists Jack Clucas, Arnold DeBock, Casey Hunter, Michael Peterson, Marshall Robin, Jed Edwards, Tracy Frye, Stephen Moyles, James Pehringer, and pilot Ted Jensen. Wolf control in the Montana and Idaho portions of the GYA was carried out by the WS offices and local specialists in those states.

Monitoring

Yellowstone National Park

Population status: At the end of 2002, at least 148 wolves in 14 packs were present in Yellowstone National Park (Table 2, Figure 3). Of these 14 packs, 12 were considered breeding pairs according to the USFWS definition. The Tower pair was attacked by another pack of six wolves in March (Agate Creek Pack), right after breeding season, and the female likely lost her pups from wounds suffered during the attack. The Slough Creek Pack, a group that formed from the splitting of the once record-large Druid Peak Pack, also did not breed for unknown reasons.

Four new packs formed in YNP in 2002. Three of them resulted from the splintering of the Druid Peak Pack: Agate Creek, Geode Creek, and Slough Creek 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, & #106F) born at the same den in Lamar Valley in 1997. The alpha male of the Agate Creek Pack is a five-year-old male 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 consists 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. 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 and was unique, and not previously recorded in the wolf literature. As the Druid Peak Pack crumbled during the 2001-2002 winter, 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 Slough Creek Packs. Four Nez Perce wolves (#213F, #214M, #215M, & 252M) from the Madison-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, and 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 greatly increase the number of wolves present in YNP from 2001 levels (2001 = 132, 2002 = 148; 12% increase).

Reproduction: At least 67 pups were born to 12 YNP wolf packs in 2002. At least 14 litters were born; the Druid Peak and Agate Creek Packs had two litters of pups each. The Agate Creek Pack, one of the packs forming from the crumbling of the Druid Peak Pack, denned at separate locations and it appeared that they would split into two packs. However, the two groups joined up in midsummer and have been functioning as one pack since that time. Interestingly, despite the fact that both of these packs had two litters, only four pups survived out of eight for the Agate Creek Pack and three of six in the Druid Peak Pack. Geode Creek had at least eight, possibly nine, pups at midsummer but only three of those were with the pack this fall. Overall, the maximum number of pups observed at wolf dens this summer was 65 or 66, and by September only 56 (85%) of these pups could be accounted for. It is likely that more pups are missing because the observability of some packs is low.

Mortalities: At least five adult wolves died in YNP during 2002. This figure does not include pups that died within the first four months of life. Three were natural mortalities, one was a vehicle strike on highway 191, and one was of unknown cause. Two 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 (founder wolf, first shipment of wolves from Canada January 12, 1995) was killed by other wolves in May, probably by the Geode Creek Pack which was denning nearby (see Yellowstone Science Vol. 10 No. 3). Wolf #2M, lifelong 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. Wolf #2M had lost his alpha status in early December and was using the fringe of the Leopold territory with several other wolves from the main pack when he was killed. Wolf #254M, who dispersed from the Druid Peak Pack, was found dead at the base of a cliff near the headwaters of Timothy Creek. Cause of death was categorized as natural, but cause of death 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. The other natural mortality was elk-caused. Most other wolf mortalities in the GYA were outside YNP and were predominantly human-caused. One Chief Joseph wolf dispersed to north of Helena, Montana and was shot by WS after killing sheep.

Population Movements: The park's wolf population increased by 12% in 2002. Almost the entire increase was in non-Northern Range packs. Seventy-seven wolves occupied the Northern Range in 2001 and 78 did in 2002, whereas the non-Northern Range wolf population increased from 55 to 70. Therefore, despite the increased number of packs on the Northern Range in 2002 (five in 2001, eight in 2002) there were not significantly more wolves, due primarily to a realignment of packs. Throughout the rest of YNP there was only one new pack from 2001 (Bechler Pack, four 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 live in Bechler in the winter, making it difficult for wolves to live there throughout the year. During April, the time of year when pups are born, the alpha male of the Bechler Pack was located in the northern part of Yellowstone, chasing deer. The Bechler Pack must have moved to the Bechler area later, or the alpha male made extremely wide-ranging trips in search of prey for a denning female.

Monitoring: Wyoming outside YNP

Wolves continued to disperse out of Yellowstone National Park and recolonized areas in western Wyoming. In 2002, we documented approximately 67-81 wolves (38-52 adults/yearlings) in eight different packs with an average pack size of 10.1 wolves (Table 2, Figure 3). We maintained 24 radio-collars in seven packs (30% of the population). Collared wolves were located, on average, twice a month by airplane and more often by ground crews.

Six of these Wyoming packs produced a minimum of 29 pups (average litter size was 4.8 pups). For the second year in a row, the Teton Pack produced a double litter of 11 pups and the pack consisted of 23 wolves (Table 2). A total of at least eight collared wolves dispersed from their natal home ranges and six other wolves were missing at year's end. At least seven wolves died in Wyoming outside of YNP in 2002, including six wolves killed in depredation control actions. These mortalities do not include pups that we assumed perished within four months of whelping.

A dispersed two-year-old wolf from the Druid Peak Pack, male #253, was accidentally caught by a coyote trapper southwest of Ogden, Utah in November 2002. The trapper turned the wolf over

to Utah wildlife agents. USFWS policy is normally to leave such dispersed wolves alone unless there are depredations or other problems. In this case, with the wolf already in captivity, it was decided to return the wolf to YNP. This was done, and the wolf has remained in the park. Subsequent reports have indicated that more wolves are present in northeast Utah.

Monitoring: Montana portion of GYA

Ten packs of wolves that live partly or entirely within the Montana portion of the GYA have been formed in recent years by wolves moving out of Yellowstone National Park. These include the Sheep Mountain, Mill Creek, Lone Bear, Taylor Peaks, Sentinel, Freezeout, Gravelly, Beartrap, Mission Creek and Red Lodge Packs (Table 1b, Figure 3). The Chief Joseph Pack, though classified as a Yellowstone National Park pack, also spends considerable time outside of the park. Of an estimated 55 wolves (not including the Chief Joseph Pack), 16 wore radio-collars during 2002 and five new collars were put out between March and December 2002. Two radio-collared Druid dispersers (wolf #224 and wolf #252) were tracked outside of the park during the reporting period and were associated with non-collared wolves at some point. Packs were monitored throughout the year by TESH, NPS, MSU, WS and USFWS personnel by radio telemetry, visual observation and snow tracking. Five packs were confirmed as breeding pairs. Although other packs produced pups, their status at the end of the year could not be determined. Nineteen wolves died of human-caused mortalities, including 13 in control actions, four legally shot by landowners, one hit by a car and one still under investigation.

Research

Research in Yellowstone National Park

Wolf-prey relationships: Wolf-prey relationships were documented by observing wolf predation directly and by recording the characteristics of wolf prey at kill sites. Wolf packs were monitored 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, Slough Creek, 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 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., 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 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 (<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 made 13 of the bison kills and 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 per wolf per 30-day study period.

Winter Studies: During the 2002 March winter study (30 days), wolves were observed for 243 hours from the ground. 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-Carnivore Interactions: The reintroduction of wolves into YNP has provided an opportunity to examine interactions among a full suite of carnivores and their prey. Preliminary evidence from concurrent field studies focusing on the park's large carnivores (wolves, cougars, grizzly bears, and black bears) suggests that these interactions have significant effects on carnivore community structure, population dynamics, and prey populations. Collaborations with interdepartmental (Bear Management, Ungulate Project, Bison Management) and interagency (Interagency Grizzly Bear Study Team, Montana Fish, Wildlife & Parks) researchers have already been productive in pursuing science-based questions on multi-carnivore relationships. The use of new technologies such as GPS telemetry collars will advance our ability to understand the carnivore community and its interactions, as well as its impact on prey populations.

In fall 2002, a manuscript was submitted to a scientific journal describing the activities of humans and carnivores on YNP's northern boundary prior to and during the fall elk hunting season. The study monitored the movements of grizzly bears, wolves, and cougars in a 2,391-km² study area centered on YNP's Northern Range and the Absaroka Wilderness. Grizzly bears were more likely to be located inside the YNP boundary during the pre-hunt period and outside of the boundary once hunting began. Cougars tended to be found outside the park during the pre-hunt period and moved inside the park when hunting began. Wolves did not significantly change their movement patterns during the pre-hunt and hunting periods. Qualitative information on elk indicated that prey moved into the park once hunting started, suggesting that cougars followed living prey, bears focused on dead prey (gut piles and crippled elk) and wolves may have taken advantage of both.

In addition, project staff are documenting behavioral interactions between wolves and grizzly bears, in order to examine the population and community-level consequences of those interactions. In 34% of bear-wolf interactions, the two species were simply seen in the same area. Most wolf-bear interactions (66%) occurred at kill sites. In 19% of interactions, bears were seen defending kills from wolves (probably wolf kills usurped by bears). In another 19%, bears were seen actually usurping wolf kills. When a kill site was contested between bears and wolves, bears were usually the winners (40% of the time), or the winner could not be determined (40%), even though wolves outnumbered bears in 76% of the interactions. Adult bears without cubs were involved in 88% of the encounters.

The use of wolf-killed ungulate remains by bears is particularly high in Pelican Valley, where most elk leave in winter, but some bison remain. Bison or elk killed by the Mollie's Pack in that part of YNP are routinely lost to grizzlies. In fact, every time project staff aerially located Mollie's Pack on a kill during the spring, summer, and fall of 2002, at least one grizzly was in the area, or more commonly, at the kill. During a September backcountry horse trip into upper Pelican Creek, Doug Smith, Dan Stahler, and Wayne Brewster documented six recently-killed bull elk carcasses, all of which were probably Mollie's Pack kills and each had evidence of bear visitation. In poor whitebark pine cone production years, such as 2002, carrion available to bears from wolf kills may have significant population-level effects. Such routine wolf-grizzly interactions have important implications both behaviorally and ecologically for both species. Continued research will allow us to better understand their relationship.

Although wolves lost most disputed kills to bears, wolves were quite successful at defending dens, as highlighted by the following two observations. On a flight in late July 2002, the Yellowstone Delta Pack was observed holding a large adult grizzly at bay at the pack's Thorofare den. One of the wolves came up behind the bear and bit it on its hind end, and eventually two wolves escorted the bear out of the den area, with two additional wolves following. Two weeks later, the same pack was aerially located at their Thorofare rendezvous site, with a large grizzly bear sitting in the middle of six adult wolves and four pups. The wolves were agitated by the bear's presence and maintained pressure on the bear to keep it away from the pups. Although the outcome of this second observation is unknown because the animals went out of sight into thick willows, the wolves appeared to successfully protect their pups.

Research in Wyoming outside Yellowstone National Park

Wolf/elk interactions on state-managed feed grounds in Wyoming

Investigators: Michael Jimenez (USFWS), John Stevenson (USFS).

Cooperators: USFWS, USFS, National Elk Refuge, Grand Teton National Park, and the Wyoming Game and Fish Department.

We monitored wolves during the winters from 1999 through 2002 to determine the distribution of wolf packs, describe prey selection by wolves, and document the behavioral response of elk to

the presence of wolves on three state-managed feed grounds (Alkali, Patrol Cabin, and Fish Creek) along the Gros Ventre River drainage in Wyoming. We used radio telemetry to locate wolves and estimate home ranges. We backtracked wolves in snow to locate carcass remains of elk killed or scavenged by wolves. Elk (identified with radio-collars or tags) were followed to describe how elk responded to wolves hunting on the feed grounds. Two wolf packs recolonized in the Gros Ventre drainage and their home ranges overlapped in two elk feed grounds (Alkali and Patrol Cabin). We located 119 kills made by wolves in the three feed grounds and adjacent areas within the national forest. The mean age of adult elk killed was 10 years and the oldest elk killed was 23 years old. Forty-three percent of the elk killed were cows, 4% were bulls, and 53% were calves. Mean consumption of elk carcasses was 83% and surplus killing was documented on six occasions. Calf/cow ratios dropped in 2002 from a 5-year average of 24 calves/100 cows to 17 calves/100 cows. Approximately 800 elk were fed hay in each of the three feed grounds. Elk frequently left the northern (Fish Creek) and southern (Alkali) feed grounds but dispersed to the middle feed ground (Patrol Cabin) when wolves were present. Even though wolves killed elk on Patrol Cabin feed ground, elk often remained in the area. This unexpected crowding of elk on one feed ground became very controversial as the state game managers were forced to adjust winter feeding programs.

Recolonizing wolf research in the Jackson, Wyoming area

Investigators: Joel Berger, Kim Berger (Wildlife Conservation Society, Utah State University)

Cooperators: Wildlife Conservation Society, Utah State University, USFWS, USDA/APHIS/WS, Wyoming Game and Fish, Grand Teton National Park, Bridger-Teton National Forest.

We initiated a three-year study to examine indirect effects of wolves on predator-prey relationships in and around Grand Teton National Park (GTNP), in the southern portion of the Greater Yellowstone Ecosystem. Of particular focus is the extent to which wolves may modulate relationships between coyotes and pronghorn. During the first year, 10 coyotes and 38 pronghorn were radio-collared to enable the collection of detailed information on age, body mass, movement, pregnancy, home range, and survivorship. Additionally, a pack of 11 to 22 wolves has primarily inhabited GTNP and an additional pack has a home range outside the park and contained primarily within the Gros Ventre River Drainage (GVRD) that encompasses a portion of the longest remaining migration route for pronghorn in the USA.

Preliminary results indicate pronghorn fawn mortality is high in both GTNP and GVRD, averaging ~90% and 80%, respectively. Coyotes were identified as a primary mortality source in most cases, although disease, drowning, and raptor predation played minor roles. Pronghorn birth weights and fawn sex were not apparently associated with mortality profiles.

Additionally, we assessed whether handling by humans might have contributed to the high juvenile mortality rate by contrasting fawn:doe ratios in areas where fawns were not handled. Amongst three areas in GTNP, fawn:doe ratios did not differ dramatically.

Nearly all (80%) of the radio-collared coyotes spent time on the National Elk Refuge during winter, presumably to take advantage of abundant elk carcasses. The concentration of carcasses on the Refuge as a consequence of elk feeding may be sustaining higher coyote densities than would otherwise be possible in the absence of this supplementary food source, since winter availability of food limits coyote densities. Coyote densities appear lower in the GTNP wolf core area, and three cases of wolf predation on coyotes have been noted.

Future study plans include: 1) developing home range and density estimates for wolves and coyotes and analyzing associated spatial relationships; 2) documenting over-winter and migratory patterns of the surviving fawns and subsequent fidelity to GTNP summer ranges; and 3) increasing the sample size of radio-collared coyotes.

Research in the Montana portion of the Greater Yellowstone Recovery Area

Factors affecting wolf-elk interactions in the Greater Yellowstone Area:

Investigators: Scott Creel, Bob Garrott, Justin Gude, John Winnie, Eric Bergmann, Thain Cook, Knut Solberg, Montana State University (MSU).

Cooperators: Montana Fish, Wildlife & Parks, Yellowstone National Park, USFWS.

The wolf population reintroduced into Yellowstone National Park has grown steadily since 1995, expanding in both numbers and geographic distribution. With this growth has come recolonization by wolves of areas outside of Yellowstone National Park. The effect of wolf recolonization on the numbers, distribution and behavior of elk is a contentious issue in the statewide management of both wolves and elk. In anticipation of federal delisting of the wolf (beginning perhaps as early as 2003), data on wolf-elk interactions in areas outside of YNP will be critical. This study is collecting data on wolf-elk interactions from five sites in the Greater Yellowstone Ecosystem (one in YNP in the Madison-Gibbon-Firehole area, and four outside the park). Data collection includes (1) monitoring trends in elk population sizes and recruitment, (2) quantifying offtake by wolves, (3) examining interactions between the distributions and movements of elk and wolves, and (4) examining behavioral responses of elk to the risk of predation. In addition, we are using noninvasive physiological assays of pregnancy rates and stress hormone levels in elk, to test for sublethal effects on fitness. Analysis will include comparisons among the five sites, which differ with respect to fundamental variables expected to affect the rate of predation (e.g., snow depth, herd size), and comparisons within sites of pre-wolf and post-wolf data on population size and demography. Pre-wolf data extend as far back as 75 years, for some sites.

Outreach

YNP wolf staff gave approximately 50 formal presentations to approximately 1500 people and an untallied number of informal talks both within and outside YNP. USFWS staff gave

numerous presentations and status reports to federal and state agencies, conservation groups, rural communities, guide/outfitters organizations, livestock associations, schools, and various private institutions. These included 13 formal talks to approximately 1700 people. Wolf recovery personnel also participated in television interviews and newspaper feature stories.

Livestock Depredation and Management

Wyoming portion of GYA

Five of Wyoming's 32 known wolf packs were implicated in livestock depredation in 2002. Potential livestock depredations in Wyoming are investigated by WS and USFWS. Depredations are classified as either confirmed, probable, or other, based on specific criteria agreed upon by the USFWS and WS. If wolf depredation is confirmed, nonlethal or lethal control, or a combination thereof, is implemented under the direction of USFWS.

In 2002, we recorded 23 confirmed and four probable livestock losses to wolves (25 calves, one heifer, and one cow). Three additional calves were attacked but survived and one dog and two horses were injured by wolves. Control actions in response to livestock depredations included: trapping and radio-collaring wolves, intensive monitoring, increased riders on grazing allotments, harassing wolves with rubber bullets, cracker shells, and lights, moving livestock to different pastures, issuing three shoot-on-site permits to ranchers, and lethally removing six wolves. Defenders of Wildlife paid compensation for all confirmed and probable livestock losses. Livestock losses occurred in the following areas:

Teton Pack: One calf was killed in Teton National Park and one heifer and one cow were killed on private land. In addition, one calf and one heifer survived wolf attacks in Teton National Park. The Teton Pack was suspected in other livestock depredations in the Gros Ventre River drainage. Please refer to the section titled: "*Other wolves (including collared and uncollared)*" for further details.

Gros Ventre Pack: The Gros Ventre Pack was suspected in livestock depredation in the Gros Ventre River drainage. Please refer to the section titled: "*Other wolves (including collared and uncollared)*" for further details.

Green River Pack: The Green River Pack was suspected in livestock depredation in the Gros Ventre River drainage and Union Pass area. Please refer to the section titled: "*Other wolves (including collared and uncollared)*" for further details.

Washakie Pack: Over the last several years, the Washakie Pack has repeatedly killed livestock on public and private land. In 2002, at least five calves were killed by wolves on private land. Three wolves were killed in control actions, and one adult male wolf was captured, radio-collared, and released on site.

Beartooth Pack: No depredations reported.

Absaroka Pack: No depredations reported.

Sunlight Pack: Wolves from the Sunlight Pack killed and attacked numerous livestock in 2001. In 2002, at least four calves were killed on public land by Sunlight wolves. Three wolves were killed in control actions, and the alpha male and female wolves were trapped, fitted with new radio-collars, and released on site.

Greybull River Pack: No depredations reported.

Other wolves (including collared and uncollared): In 2002, at least 27 cattle were killed by wolves (reported as confirmed and probable). Twelve of these 27 cattle were killed by wolves from the Teton, Washakie, and Sunlight Packs. Ten additional cattle were killed in the Gros Ventre River drainage where the home ranges of the Teton, Green River, and Gros Ventre Packs overlap. Five cattle were killed (one confirmed, four probable) by wolves in the Union Pass area where home ranges of the Green River, Washakie, and Gros Ventre Packs overlap. Depredations were reported and promptly investigated. Despite intensive monitoring and trapping efforts by WS and the USFWS, we were not able to determine which wolves were responsible for these specific depredations because wolves repeatedly left the kill sites. Regardless of which wolf pack caused the depredation, ranchers were compensated for all confirmed and probable livestock losses reported. Livestock producers in the Gros Ventre and Union Pass area claimed their losses increased substantially this year, but neither the ranchers, USFWS, WS, nor the Wyoming Game and Fish Department were able to determine whether some cattle died of depredation (wolf or grizzly bear) or other unknown causes.

Depredation and Management: Montana portion of GYA

In the Montana portion of the Yellowstone Wolf Recovery Area (Figure 1), seven of 10 known wolf packs were involved in livestock depredation in 2002. Cattle and sheep depredations continue to be a significant problem in this area. A variety of nonlethal techniques have been used to help reduce depredation, in addition to the lethal removal of 17 wolves in 2002. Confirmed losses in 2002 included 10 cattle and 71 sheep killed by wolves, and an additional 25 sheep injured. Four cattle and 34 sheep were classified as probable wolf depredation.

Taylor Peaks Pack: A ranch manager's herding dog was killed in his yard by the Taylor Peaks Pack on March 21. He and neighboring landowners were trained and given permits to use less-than-lethal munitions to haze wolves. A RAG box was set up around the house and a telemetry receiver and antenna were issued to monitor the wolves. In August the wolves were reported hanging around the ranch house again. On August 10, project personnel walked in on the female wolf and hazed her out of a daybed near the ranch house. A neighboring ranch reported wolves feeding on a calf carcass in late August, but it could not be verified as wolf predation. A male pup was captured and radio-collared on September 23. A calf was confirmed killed by wolves in September, but control actions were not taken by request of the landowner. Two more calf carcasses were found on the property in early November but they were determined to have died of pneumonia.

Sentinel Pack: This new pack has formed in the Taylor Fork drainage. The male is a collared gray wolf from the Taylor Peaks Pack, wolf #234. No depredations were reported in this area in 2002.

Freezeout Pack: A wolf-killed calf was investigated in April and traps were set, but no wolves were captured. On July 20, two ewes and probably two lambs were killed by wolves on a USFS allotment in the Gravelly range. One non-collared gray yearling female was shot by WS on July 25. The other members of the Freezeout Pack were harassed by helicopter in hopes of driving the wolves out of the area, where six bands of sheep were stationed. The bands are monitored by herders and guard dogs. In September, WS investigated a pileup of 80 dead sheep crushed against a fence. The cause could not be determined. On September 11, WS confirmed a calf killed by a wolf in the Freezeout Pack territory. One non-collared gray male wolf was killed nearby on September 12, but it was unknown whether this wolf was associated with the pack.

Gravelly Pack: Twenty-one sheep were killed and 13 others wounded by wolves on February 24. Tracks indicated at least two wolves were responsible. This area is fifteen miles from where the Gravelly Pack killed sheep last year. Two non-collared wolves were left from last year's control action, after eight wolves were relocated and one killed. Tracks and sightings of three black wolves had been observed in the area over the winter. Lethal control was authorized, and on February 27, WS shot two of the wolves, with the third escaping into the timber. One of the wolves shot was #202, a Chief Joseph disperser whose collar had failed, and the other was a non-collared female. On March 3, seven ewes and one ram were killed by wolves, and another 11 wounded. WS continued to look for the third wolf to lethally remove it, and lethal-take permits were issued to qualifying ranches in the area. No wolves were killed under the 45-day shoot-on-sight permit, which expired in early July.

In early July, a 45-day permit to shoot two wolves *seen in the act of attacking livestock* was issued to producers who graze sheep on USFS allotments in the Gravelly range. These producers had losses earlier in the spring on private property. In late August-early September, sheep were killed by predators in the Dillon/Gravelly area. WS set M-44 cyanide devices as part of a coyote control action. Two wolf pups pulled M-44's and were killed. During the week of September 7, a shoot-on-sight permit for one wolf was issued to a sheep producer. The producer's tentative totals were 32 sheep missing, 12 found dead by the rancher, eight confirmed as wolf kills by WS and three more ewes found dead near the dead wolf pups.

During the week of September 13, several sheep were reportedly killed by either a mountain lion or wolves. No control was taken as the bands of sheep were due to move off grazing allotments around September 15. On October 7, a sheep producer shot a gray wolf on private land using his lethal control permit. The wolf was YNP Druid disperser #252, who had been traveling with two black wolves in the area for most of the summer. This was the first wolf killed under these permits. On Oct. 8 WS darted and collared an adult black female wolf and released her on-site. She was found to be traveling with a black animal, presumed to be a pup. Three ewes were killed by wolves on private land in the Dillon/Gravelly area on October 22. The radio-collared female was in the area and sightings of two wolves were reported. Lethal control and shoot-on-

sight permits were reauthorized. On October 24, the radio-collared female and her pup were lethally removed by WS. The landowner's lethal take permit ended on December 6.

Mill Creek Pack: A landowner killed a male Mill Creek Pack wolf in May 2002 when it killed and fed on his calf. A lactating female (wolf # 271) was caught and radio-collared in the area by WS ten days later. In October, the Mill Creek Pack killed 15 sheep and ran off a llama. A ram was killed on the next day. Fladry (flagging) was hung around the sheep pasture on October 31 and a RAG box was set up in the pasture. Carcasses were removed and buried on the property. A kill permit to remove two wolves was issued to the landowner and adjacent neighbors. Two gray female pups were legally removed using this take permit in November. The owner of the sheep was issued a permit to remove one wolf and a second RAG box was put in the pasture when the wolves continued to frequent the property. Adjacent landowners in the area were issued permits to use less-than-lethal munitions to haze wolves. One ewe was confirmed killed on December 12, when two wolves jumped over the flagging to kill and feed on her. The flagging seemed to be effective for about forty-two days. WS began a trapping and collaring effort. One wolf jumped the flagging and killed a pregnant ewe on December 26. Efforts are still being made to collar more members in this pack. Flagging has been removed.

Sheep Mountain Pack: Six wolves were reported harassing a cow and her calf in March, near Emigrant in Paradise Valley. The landowner was issued a less-than-lethal munitions permit and given a telemetry receiver to monitor the wolves. The wolves were seen in a neighboring calving pasture the same night and were hazed by a landowner using a pick-up truck. On March 13 the wolves ate a calf that had died of natural causes. The wolves killed a calf on March 18. Intensive night monitoring of the wolves was conducted. The wolves were found feeding on a cow carcass. She may have been run through a fence by the wolves and eventually died. Carcasses were removed from both properties. A RAG (Radio Activated Guard) box was set up on March 21. Four wolves were lethally controlled on March 26, including Druid disperser #224, and one wolf infected with mange. By the end of April, the pack seemed to localize at their natal den site. In September, the Sheep Mountain Pack occupied a rendezvous site in the middle of a cow/calf operation. The landowner was diligent in hazing the wolves over a month-long period using trucks, ATV's, horses and gunfire. A RAG box was also set up in the pasture. No depredations occurred during this time.

Red Lodge Pack: WS confirmed a wolf-killed calf in the Red Lodge area on the night of May 25. Efforts to radio-collar members of the pack, suspected to be four to five wolves, were attempted throughout the summer, but searches did not reveal a concentration of wolf sign and trapping was not conducted. On September 23, WS confirmed another calf killed by wolves. Efforts to trap, collar and release on-site were made until nighttime temperatures became too cold for safe wolf trapping. A cow was confirmed to have been killed by the pack in December. The Red Lodge Pack was finally radio-collared, and later eliminated, in February 2003.

Lone Bear Pack: WS investigated a wolf-killed calf in the Wineglass area south of Livingston the week of September 20. Efforts to trap, collar and release on-site were made. No wolves were caught. This new group was reported feeding on a calf carcass early in November, but no depredations were confirmed. Landowners in the area were issued permits for less-than-lethal

munitions. Two pups and one yearling had been caught incidentally and reported by a coyote trapper near Paradise Valley in late November and early December. The wolves were radio-collared and released on-site by WS and wolf project personnel.

Mission Creek Pack: Three wolves have been sighted repeatedly in this area, and WS heard howling during a depredation investigation. Wolf #241, a Sheep Mountain disperser, has been located in the area, but it is not known whether she is associated with the pack.

Beartrap Pack: A group of four gray wolves was repeatedly sighted on and near the Flying D ranch, south of Gallatin Gateway, in November and December. At least one of the wolves is thought to be a pup. Efforts will be made to radio-collar these wolves.

Chief Joseph Pack: A livestock producer reported that several members of the Chief Joseph Pack were coming into a Paradise Valley calving pasture and killing deer. The cows were starting to calve, so fladry (flagging) was hung around a 10-15 acre pasture to deter the wolves from entering. It was determined by snow-tracking that the wolves tested the flagging until they found a gap in it. They entered the pasture and tried to exit at the opposite end, testing the flagging in numerous places, but would not cross it, and eventually circled back and exited the way they came in. The gap in the flagging was fixed, and no depredations occurred. The flagging kept the wolves out for about 30 days, before one wolf jumped over it. Calves were moved out of the pasture when they were older, and the flagging was removed with the help of Predator Conservation Alliance volunteers.

Fresh digging was found in April 2002, at the 2000 den site in Cinnabar Basin. The new breeding female may have been born in the 2000 den and was trying to re-dig the den to have pups. As in 2001, the den was again filled in with mothballs, sticks and rocks in an attempt to persuade the wolves to den in Yellowstone National Park, as they had in previous years. This was apparently successful, and they returned to the Park den. Throughout the year, the Chief Joseph Pack traveled through Cinnabar Basin and Tom Miner Basin. No conflicts occurred, although they were quite visible to landowners in both basins. Landowners were issued permits for less-than-lethal munitions in both areas.

Miscellaneous and Lone Wolves: Dispersing male wolf #203, originally from the Chief Joseph Pack, killed 19 sheep near Wolf Creek on April 8. The wolf was shot by WS when it returned the next day. A calf was killed near Pipestone Pass (south of Butte) by a single wolf on April 24. Traps were set around the carcass, but the wolf, probably a disperser, did not return to the area. A cocker spaniel near Livingston was severely injured by a large canid in April. A dispersing wolf was suspected. In late December 2002, 34 sheep were killed by an unknown predator near Harlowton. It was suspected that a lone wolf was responsible, but it could not be found in two days of aerial hunting, and no further depredations were reported.

Depredation and Management: Idaho portion of GYA

No wolf depredations were known to have occurred in the portion of Idaho that lies in the Greater Yellowstone wolf recovery area (east of Interstate 15) in 2002.

CENTRAL IDAHO WOLF RECOVERY AREA

Personnel

The Nez Perce Tribe Wolf Recovery Program, headed in 2002 by Project Leader Curt Mack and biologists David Bell, Adam Gall, Jim Holyan, Jason Husseman, and Kent Laudon, conducted management and monitoring of the Central Idaho wolf population. Volunteers Isaac Babcock, Eric Burnham, Brady Couvillion, Jamie Craig, Denise Jantzer, Cherise Miller, Erin Simmons, and Harvey Zimmer assisted during the field season. Cheri Ramos, office assistant, left the Project. Her position has yet to be refilled.

The USFWS was represented in Idaho by Idaho recovery coordinator Carter Niemeyer, and in Montana by biologist Joseph Fontaine. Law enforcement agents in the Boise USFWS field office included Senior Agent Craig Tabor and Special Agent Scott Bragonier. Special Agents Steve Magone (Idaho Falls) and Paul Weyland (Boise) transferred out of the Boise office.

WS personnel involved in wolf control or management in Idaho in 2002 included State Director Mark Collinge, Assistant State Director George Graves, District Supervisors Layne Bangerter, Charles Carpenter and Craig Maycock, wildlife specialists Jeff Ashmead, Lee Czapenski, Jonathan Farr, Douglas Hunsaker, Gary Looney, Justin Mann, Kelly Parker, Eric Simonson, Dave Thomas, and Richard Williamson, and pilot Gerald Peterson.

Monitoring

Twenty-five wolves were captured during the 2002 field season; 16 by helicopter darting and nine by leg-hold trapping. Of that total, 22 new wolves were collared and three wolves were recollared. At the end of 2002, 38 wolves (13% of the population) were being monitored in 19 groups. These packs, along with known uncollared packs, accounted for about 284 wolves in the central Idaho recovery area. Approximately 263 of these live in the state of Idaho (Table 3) and 21 in the state of Montana (Table 1b). Radio-collared wolves were located approximately twice per month by airplane. Packs in Idaho as of December 2002 included Big Hole, Buffalo Ridge, Chamberlain Basin (extant but not monitored due to loss of radio-collars), Five Lakes Butte (no radio-collars), Gold Fork, Gospel Hump, Jureano Mountain, Kelly Creek, Landmark, Marble Mountain, Moyer Basin, Orphan, Scott Mountain, Selway, Thunder Mountain, Wildhorse, and Wolf Fang (Table 3, Figures 1,4). In addition, five packs are suspected to live in the Montana portion of the recovery area; in the East Fork of the Bitterroot River drainage (Sapphire Pack), the West Fork of the Bitterroot River drainage (Painted Rocks Pack), in the west-central Bitterroot valley (Como Lake), in the North Fork of the Bighole River drainage (Battlefield Pack), and in the Flint Creek area (Willow Pack) (Table 1b).

Reproduction was confirmed in 12 packs, producing a minimum of 52 pups. Nine of the 12 reproductive packs met the recovery standards of a breeding pair (Tables 1b, 3). Two wolves died of natural causes, 19 of human-related causes (including 14 removed in control actions), and five of unknown causes. Two collared wolves were known to have dispersed away from their home territories and another four wolves went missing in 2002 and may have dispersed.

Four new Idaho wolf packs were documented in 2002: Buffalo Ridge (with alphas that dispersed from the former Stanley Basin and Moyer Basin Packs, respectively), Como Lake (on the Montana-Idaho border), Five Lakes Butte (possibly the former Snow Peak Pack), and Moyer Basin (composed of a dispersing male from the former Stanley Basin Pack and a female of unknown origin).

The status of the Chamberlain Basin Pack was unknown by the end of 2002. Both radio-collars in the pack expired, so the fates and whereabouts of the remaining members are unknown. Investigations during the summer showed that wolves used the traditional den site, and visual observations, tracks, scats, and howls indicated that wolves still inhabit the territory. There are no known radio-collared members in the Five Lakes Butte Pack, so monitoring is problematic. The Whitehawk Pack was eliminated through lethal control in April.

Of the five packs known to live in the Montana portion of the CID recovery area, only one, the Willow Pack, is currently radio-collared. Collared wolves from the Painted Rocks and Battlefield Packs were illegally killed in 2002, leaving no radio-collars in those packs. The Como Lake and Sapphire Packs are known only from reported sightings. In 2003, increased efforts will be made to radio-collar and monitor these packs.

Research

Continued conflicts between wolves and livestock and potential effects of wolves on big game populations remain key management issues. The Recovery Program continues participation in ongoing research to help address these challenges. Scientific information collected through these efforts will foster a better understanding of wolf-livestock and wolf-big game relationships, and more effective wolf conservation and management. Five research projects have been initiated since 1999. Two address predator-ungulate relationships and three concern wolf-livestock interactions.

Preliminary Assessment of Radio Activated Guard Units in Deterring Wolf Predation in the East Fork of the Salmon River of Central Idaho.

Investigators: Stewart Breck, USDA/APHIS/WS/National Wildlife Research Center; Rick Williamson, USDA/APHIS/WS.

Cooperators: Nez Perce Tribe, USFWS, and private landowners.

From January 2001 to April 2002, WS specialists and researchers tested the effectiveness of Radio Activated Guard (RAG) units for deterring livestock depredation by the Whitehawk wolf pack. In early February 2001 the Whitehawk Pack moved into the East Fork of the Salmon River and killed a calf. A WS specialist in Idaho, in conjunction with researchers at National Wildlife Research Center, placed RAG boxes and monitors in small pastures of privately owned property to deter wolves from killing more cattle and to test the effectiveness of RAG boxes.

Activation of the device, utilizing signals from radio-collars, triggered a strobe light and loud sound effects from a tape player. By adjusting the gain and volume, the sensitivity of the receiver was fine-tuned so that it fired only when individuals entered the area to be protected. The radius of protection varied from 66 feet (20 meters), which may keep wolves out of dead animal pits or other small areas, to 984 feet (300 meters), which could be effective for protecting small pastures. In order to reduce habituation to the device, 30 different recorded sounds were used, and each time the box was triggered, a different sound was played. Within each base station, a small electronic monitor was installed to record radio-collar frequency, date and time that wolves activated a RAG box, and the number of pulses received during a predetermined time interval. Monitors were used to evaluate the performance of the RAG boxes and detect behavioral responses of wolves to the scare device.

The Whitehawk Pack activated the scare devices approximately 10-15 times from mid-February to mid-April 2001. No calves were killed in pastures protected by RAG boxes and there was no indication that wolves were habituating to the boxes. However, on March 19, 2001, a calf was killed by the pack in a pasture where a RAG box was present but malfunctioned, i.e., did not activate when the wolves came into the field.

RAG boxes were used again during late winter/spring 2002 with the same pack in the same area of the East Fork of the Salmon River. Eight to nine RAG boxes were used from February to early April. Initially it appeared the RAG boxes were helping keep wolves away from livestock but in late March 2002 the pack habituated to the devices and began killing livestock despite the presence of RAG boxes. Data from the monitors clearly indicated that these wolves had habituated to the devices. Generalizations about the amount of time it took wolves to habituate to RAG boxes should not be made until further monitoring has been conducted. However, it does appear that RAG boxes offer short-term (2-3 months) protection and significant advantage over other scare devices that fire randomly or at fixed intervals.

Preliminary Assessment of Fladry as a Deterrent to Wolf Depredations in Central Idaho.

Investigators: Stewart Breck, USDA/APHIS/WS/National Wildlife Research Center; Rick Williamson, USDA/APHIS/WS.

Cooperators: Nez Perce Tribe, USFWS, USFS, Defenders of Wildlife, private landowner.

Fladry, a non-lethal livestock protection technique, was tried for the first time in Idaho in 2002 at two sites. A technique borrowed from Polish wolf hunters, fladry involved encircling the wolves

with a barrier of colored flags, evenly spaced, hung from ropes. For unknown reasons, wolves do not willingly cross this "fence," so it was hoped that wolves would be unable to gain access to livestock surrounded by fladry. WS and Defenders of Wildlife, with the cooperation of the owner of an inholding in the Salmon National Forest, strung approximately nine miles of fladry entirely around the fenced 1,000-acre (400-hectare) ranch. Approximately 400 cattle grazed here from late May through mid-October. After the Jureano Mountain pack, which denned on the privately owned parcel, moved to a rendezvous site off of the ranch, fladry was installed. It was also used for approximately one month during September in the Sawtooth Valley following a depredation there.

The goal of this project was to monitor wolf activity on and off the ranch using two different techniques. The first monitoring technique used a receiver and a data logger that collected and stored information when it received a signal from a radio-collared wolf. Data included the radio-collar frequency, date and time, and duration a signal was received. The second monitoring method used tracking plots to detect wolf presence. Such plots have been used successfully with numerous carnivore species to ascertain activity levels.

Fladry was set on the existing barbed wire fence that surrounded the ranch. The entire perimeter of the ranch was examined every 48 hours to maintain the flagging barrier. We recorded the number of days wolves were located within 1.9 miles (3 km) of the ranch, and the number of days fladry was set before wolves crossed it. Wolves were monitored from the ground and air in an attempt to obtain one location per day. Of the eight members of the pack, four were radio-collared when the study began and two more were collared during the course of work.

Members of the Jureano Mountain Pack crossed fladry barriers after 61 days. The effectiveness of fladry for protecting large areas is not well understood, though results from this study indicated that it may be useful for limited time periods. During the trial some flags either got wrapped around the barbed wire or were pulled off by cattle. Thus, fladry required persistent maintenance along the perimeter. While this pack was excluded from the ranch they depredated on free-ranging livestock on an adjacent public grazing allotment.

Winter Predation and Interactions of Wolves and Cougars on Panther Creek in Central Idaho.

Investigators: Dennis Murray and Jason Husseman, University of Idaho; Gary Power, Lemhi County; and Dick Wenger, USFS. MS thesis completed and available from University of Idaho, Moscow.

Cooperators: Nez Perce Tribe, Salmon-Challis National Forest, USFWS, Bureau of Land Management, Rocky Mountain Elk Foundation, Wolf Education and Research Center, Hornocker Wildlife Institute, Idaho Department of Fish and Game, Lemhi County.

This 3-year study was initiated to investigate wolf-cougar interactions and predation on wintering ungulate populations within GMU 28 west of Salmon, Idaho. Two groups of wolves,

the Jureano Mountain and Moyer Basin Packs, had established territories within the study area. In addition, four to six cougars were radio-tracked over the course of the study.

We documented prey characteristics and kill-site attributes of predator kills during winters 1999-2001 in Idaho, and located 120 wolf-killed and 98 cougar-killed ungulates on our study site. Elk was the primary prey for both predators (wolf = 77%; cougar = 74%), followed by mule deer (wolf = 23%; cougar = 24%). Both predators preyed disproportionately on elk calves (wolf = 60%; cougar = 53%) and old individuals. Among mule deer, wolves appeared to select for fawns (65%), whereas cougars killed primarily adult deer (76%). Nutritional status of prey, as determined by percent femur marrow fat, was consistently poorer in wolf-killed prey, with a greater proportion of wolf-killed prey exhibiting fat levels indicating severe malnutrition.

We found that wolf kills occurred in habitat that was more reflective of the entire study area than cougar kills, suggesting that the coursing hunting behavior of wolves likely operated on a larger spatial scale than did the ambush hunting strategy of cougars. We concluded that the disparity in prey selection and hunting habitat between predators probably was a function of predator-specific hunting behavior and capture success, where the longer prey chases and lower capture success of wolf packs mandated a stronger selection for disadvantaged prey. For cougars, prey selection seemed to be limited primarily by prey size, which could be a function of the solitary hunting behavior of this species and the risks associated with capturing prime-aged prey.

Winter Predation and Interactions of Cougars and Wolves in the Central Idaho Wilderness.

Investigators: Holly Akenson, James Akenson, Howard Quigley.

Cooperators: University of Idaho, Hornocker Wildlife Institute - Wildlife Conservation Society, DeVlieg Foundation, Nez Perce Tribe, Idaho Department of Fish and Game.

The winter of 2002 was the fourth field season tracking wolves, primarily the Chamberlain Basin pack, and cougars in the Idaho wilderness. This research project was initiated in 1998, following the reintroduction of wolves to Idaho in 1995. We are evaluating the effects of wolf and cougar predation on wintering elk, mule deer, bighorn sheep, and moose populations and investigating the interspecific interactions and competition between cougars and wolves.

Since 1999 we have examined 183 large mammal carcasses. Twice as many carcasses were found of animals killed by cougars as those killed by wolves. An extensive forest fire burned most of the winter range in 2000 and contributed to changes in animal numbers and distribution on the Big Creek winter range. A helicopter elk census in 2001 confirmed that elk numbers have declined 30% during the last six years, although observations of mule deer suggest that deer numbers are stable or increasing. Cougar and wolf winter diets were similar. Neither predator showed a strong diet preference between elk and mule deer. Being coursing predators, wolves killed more elk in poor condition than did cougars, which hunt by stalking and ambushing prey. The large home range of the wolf pack allowed the wolves to follow the elk when they migrated

to a new unburned ungulate winter range the first winter after the wildfire. The cougar response to post-fire changes in elk numbers and prey health was to remain in their smaller home ranges and diversify their diets. Cougars even killed three moose that were starving after the fire burned up the riparian shrubs. Moose are usually not vulnerable to cougar predation due to their large size. Elk calves and deer fawns were more vulnerable to wolf predation than cougar predation.

The cougar population experienced a high rate of replacement for resident cats due to mortality. The main causes of cougar mortality were hunter harvest, fighting between males, wildfire, and starvation. Strife among carnivores was documented on several occasions. Cougars killed three cougars, three coyotes, and two bobcats, while wolves killed two coyotes. Cougars appeared to avoid wolves and their kills. Cougar kitten production has been low. In the two winters since the forest fire, no kitten production was documented. Track surveys and carcass locations suggest there are several areas previously used by female cougars that are now unoccupied. During winter 2001-2002, the Chamberlain Basin wolf pack contained 8-12 wolves. The wolf pack hunted in two ungulate winter ranges. Last winter was the first in which more kills were found on the Big Creek winter range made by wolves than cougars.

These large carnivores indirectly influence animal and plant populations and communities at lower trophic levels. For example, cougars and wolves repeatedly killed coyotes and bobcats during this study. These midsize carnivores strongly targeted fawns as a food source. If the large carnivores suppress the midsize carnivore populations, predation pressure could shift from deer fawns toward elk calves. In contrast, where female cougar home range areas have been unoccupied following the fire, coyote activity and predation on fawns have increased.

Effects of Wolves on Livestock Calf Survival and Movements in Central Idaho.

Investigators: John K. Oakleaf (University of Idaho), Curt Mack (Nez Perce Tribe), Dennis L. Murray (University of Idaho). MS thesis completed and available from University of Idaho, Moscow.

Cooperators: USFWS, Salmon-Challis National Forest, Lemhi County Cattle Association, Diamond Moose Association, Lemhi County, Defenders of Wildlife, Wolf Education and Research Center, National Wildlife Federation, Idaho Cattle Association.

We examined interactions between wolves and domestic calves within a grazing allotment in central Idaho to evaluate the role of wolves in calf survival and movements. During the 1999 and 2000 grazing seasons we radio-marked 231 calves per year, representing 33% of the calf population, on the Diamond Moose Association (DMA) grazing allotment, and monitored their survival and movements relative to wolf distribution. Overall, calf survival was high (95%), with relatively few mortalities ($n = 13$) among the marked population. Of the 13 calf mortalities, eight were unrelated to predation (pneumonia, unknown natural causes, and fire), four were wolf predation, and one was coyote predation. Calves selected by wolves were younger than the surviving cohort by an average of 24 days (wolf-killed: March 31 ± 13 days, $n = 4$ [mean birth

date \pm SE]; live population: March 7 ± 1.6 days, $n = 207$) ($P < 0.05$). Calf movement patterns and group size did not vary relative to the level of spatial overlap with wolves. However, vulnerability to predation appeared to be correlated with spatial proximity of calves to wolf home ranges and rendezvous sites. These results suggest that in our study area wolves did not significantly affect calf survival or behavior.

Carcass detection rates were low in our study, suggesting that current compensation procedures in the western U.S. may require adjustment to fully cover losses incurred from wolf depredation (i.e., an increased payment for each confirmed wolf-caused calf mortality). Currently, compensation payments result from confirmed wolf-killed cattle found by ranchers on an allotment (Fischer 1989). In the case of the DMA, our detection rate data suggest that this method of compensation would result in payment of only one-eighth of the actual losses to wolves. Although this ratio may be lower (e.g., one-half) in less timbered or rugged country, it is indicative of a consistent underpayment of ranchers with wolf depredations occurring on their allotment.

Outreach

Program personnel presented informational talks and status reports throughout the year to various federal and state agencies, public and private institutions, special interest groups, and rural communities. Additionally, scores of informal presentations to small groups or individuals were conducted during this time.

Livestock Depredation and Management

Of approximately 25 packs of wolves in the Central Idaho recovery area, four to six packs were involved in livestock depredation in 2002. All reports of livestock depredation are investigated by WS, who then take appropriate action in consultation with USFWS. A total of 10 calves, 15 sheep, and four dogs were confirmed killed by wolves in the CID recovery area in 2002. Another seven calves were classed as probable wolf kills and wolves probably wounded one calf. Fourteen wolves were killed in depredation control actions, and none were translocated. Another four wolves were captured and released on-site in these operations. The number of investigations and numbers of livestock killed in 2002 was similar to 2001. The number of wolves killed in 2002 was more than double the number killed in 2001. The similarity in depredation investigations and losses may be related to the continued presence of wolf packs, despite prior wolf control, in areas that overlap livestock grazing allotments.

Whitehawk Mountain Pack: After the Stanley Basin Pack's territory was left vacant through relocations, dispersals, and lethal control, the Whitehawk Mountain Pack moved into the area. They also used parts of the former White Cloud Pack's territory along the East Fork of the Salmon River. Two members of this pack were lethally controlled in 2001. The NPT and WS attempted to deter them from additional depredations through the use of RAG boxes and nonlethal hazing. In early spring the pack was implicated in three depredations (one sheep and two calves confirmed killed and two calves probably killed) on privately-owned land in the East

Fork of the Salmon drainage. Control actions were implemented following each incident, and ultimately all 10 wolves were killed.

Jureano Mountain Pack: Alpha female B46 reclaimed her natal territory to rejuvenate the Jureano Mountain Pack in 2000. Unfortunately she continued the tradition of livestock depredations in this area west of Salmon, Idaho. Six calves were confirmed killed by this pack in summer 2002, and one additional calf was classified as a probable kill. B46 and a yearling male wolf were lethally removed, and one adult and two yearlings were captured, radio-collared, and released on-site.

Wildhorse Pack: The Copper Basin region that this pack inhabits holds several thousand cattle during the summer grazing season, but this pack ranged widely this summer following the death of alpha female B66 in January, and spent less time there than in 2001. In May and June at least some of the four radio-collared members of this pack were located nearby when one calf and 18 sheep were classified as possible wolf kills. These three incidents occurred well outside of the home range used by the Wildhorse Pack during 2000 and 2001. No control actions were authorized.

Gold Fork Pack: This pack, which committed three confirmed depredations in 2001, was implicated in four depredation incidents in 2002. All were classified as probable wolf involvement; with three calves killed and one calf injured. The livestock producer operating in the area discovered several additional carcasses, but there was not enough evidence present to determine why the animals had died.

B133 and associates: B133, a subadult male, was captured in May at the site of a confirmed wolf depredation on sheep. B133, and as many as three other wolves, were implicated in three additional depredations that resulted in 11 dead ewes/lambs. Following the fourth depredation WS lethally removed two uncollared subadult females, leaving B133 and an uncollared wolf. There were no further depredations after this control action.

Lone and Dispersing Wolves: Radio-collared male wolf B105 may have been responsible for two calves killed by an unknown predator in the area south of Riggins, Idaho. B107, a dispersing female from the Moyer Basin Pack, killed a domestic calf in the Sawtooth Valley. A lethal control action was authorized, but was later rescinded when an injunction against lethal control on lands administered by the Sawtooth National Recreation Area was handed down. Three sheep were confirmed killed by wolves in the Big Smoky drainage in late June. Although B133 and wolves associated with him had used this area, it was not determined that they were present at this time. A WS trapping effort did not result in the capture of any wolves.

Battlefield Pack (state of Montana): In late April, WS confirmed that wolves had killed one calf, and probably killed another, north of Wisdom, Montana. Wolf B100, a disperser from Idaho, was in the area along with three other wolves. Traps were set, but no wolves were captured. In May, wolves harassed cattle at a night calving pen, causing damage to fences but no mortalities. A mortality signal was received from B100's collar, in the Big Hole River, in early 2003. Three other wolves are still thought to be in the area.

PLANNING AND LEGAL ISSUES

Reclassification and Delisting of the Gray Wolf

Wolves, once common throughout North America, are protected under the ESA because human persecution nearly eliminated them from the contiguous United States. By 1974, there were none left in the northern Rocky Mountain states (NRM). The ESA prohibited people from harming wolves and mandated that all federal actions seek to conserve and not jeopardize wolves. Ultimately, three distinct wolf recovery programs in the Midwest, NRM, and Southwest were initiated. In the NRM, 2002 marked the third consecutive year that 30 or more breeding pairs of wolves were documented. The population of 663 wolves has achieved biological recovery objectives.

USFWS can propose delisting when it determines that the wolf population has been recovered and it is reasonably assured that wolves would not become threatened again if the ESA protections were removed. The ESA contains several checks and balances, and protections to ensure that any decision to delist a species is scientifically sound and will not result in it becoming listed again. The ESA requires that all decisions be based on the best scientific data available. USFWS is mandated to examine all of the factors that may have caused a species to become threatened and to determine that they are not likely to cause the species to become threatened again. Regulating the level of human-caused mortality is the primary factor that must be resolved before delisting could be proposed. The ESA requires that USFWS must determine that regulations, other than the ESA, will prevent unchecked human-caused mortality from once again driving wolves toward extinction. Wildlife mortality is typically regulated by state fish and wildlife management agencies. USFWS requested that Montana, Idaho, and Wyoming develop state wolf management plans so that wolves would be adequately conserved under state management. In addition, USFWS believed that state wolf plans would help the public to understand the consequences of delisting and would provide a solid administrative foundation for the final decision. State laws, as well as state management plans, are expected to be consistent with long-term conservation of the wolf population.

In the NRM, Idaho has completed a wolf management plan. Montana and Wyoming should have their wolf plans completed by Summer 2003. As expected, state wolf planning is an emotional and intensely debated issue within the states. The states must strike the difficult balance between protection of livestock, state-managed big-game populations, wolf conservation, and funding. USFWS will review state laws and wolf management plans before delisting is proposed, to assure that the states' plans, in combination, will adequately conserve the wolf population, so that it will not become threatened again. Because the NRM wolf population will be delisted as a single entity, the three state plans will be evaluated together. If USFWS review indicates that management by the states would maintain the recovered wolf population, USFWS would propose delisting.

A delisting proposal would include relevant data and a thorough analysis of USFWS's rationale. It would be published, and extensive public and professional peer review would be requested.

After public comment and any new information were analyzed, USFWS could withdraw the proposal, modify it, or finalize it. The NRM wolf population could be delisted as early as 2004. Upon delisting, each state would be responsible for the conservation and management of wolves within their respective borders. Coordination among the three states is expected, and already established through a memorandum of understanding signed by the respective governors, and cooperation between state wildlife agencies. After the wolf population is delisted, the ESA requires a mandatory, minimum 5-year post-delisting oversight period. That period, during which USFWS reviews the implementation of state management plans, provides a safety-net to ensure that the species is able to sustain itself without the protection of the ESA. If wolves became threatened again, USFWS could re-list them by emergency order.

Many people are concerned about what would happen to wolves if ESA protections were removed, while many other people wonder about the impact to livestock and big game if wolves aren't delisted. The delisting process will be well publicized, controversial, and will almost certainly result in litigation. However, USFWS is confident that the extensive safeguards required by the ESA for any delisting proposal will ensure that a viable wolf population will be conserved in the NRM into the foreseeable future.

Nationwide wolf reclassification proposal: A separate proposal for the reclassification of wolves nationwide is currently in review within USFWS. This proposal would not change the status of wolves in the experimental nonessential populations (Central Idaho and Yellowstone) but would change the status of wolves in the NWMT recovery area from endangered to threatened. This would allow wolves to be managed under virtually the same rules throughout the NRM. Activities that are likely to be allowed under threatened status that are not allowed while wolves are endangered include the use of nonlethal munitions to haze wolves away from livestock, and the ability for livestock owners to legally kill a wolf caught in the act of attacking livestock. The activities of government agencies in managing depredating wolves would not be significantly different under the changed status in NWMT. The reclassification proposal is expected to be finalized, and to take effect, in March 2003. When the new rules become effective, they will be widely publicized. The reclassification of wolves, a separate administrative procedure, is not expected to affect the timetable for complete delisting of wolves in the NRM.

Litigation

The United States District Court for the District of Idaho. Western Watersheds Project and Idaho Conservation League vs. Sawtooth National Forest, Bill Levere, Sawtooth National Forest Supervisor, and USFS, Case No. CIV 01-389-E-BIW.

This case was initiated in Summer 2002 and revolves around the establishing legislation for the Sawtooth National Recreation Area (SNRA). That legislation suggests preferential use by wildlife in the SNRA. The SNRA has been historically used for livestock grazing under federal grazing permits. Since the USFWS's reintroduction efforts in 1995, the wolf population in Idaho has expanded, with at least one wolf pack using part of the SNRA. Because of chronic livestock depredations by wolves on private land adjacent to the SNRA and within it, agency wolf control

ultimately resulted in the removal of all 10 members of the Whitehawk Pack. Environmental groups filed suit and the Judges' preliminary ruling directed the USFS to give preference to wildlife but also to balance out wildlife with permitted livestock grazing. The Court ruled that the USFS needed to do a more thorough environmental assessment of the conflict between livestock grazing and predators, primarily wolves, in the SNRA.

The Court further issued an injunction on the USFWS that prohibited lethal control of wolves that depredated on livestock within the SNRA during 2002. The USFWS requested the Judge reconsider that position since the USFWS was not part of the original litigation and that control of wolves that attack livestock is a necessary part of wolf restoration in the northern Rocky Mountains of Montana, Idaho, and Wyoming. The FWS/DOI worked with DOJ and filed an appeal of the court's decision. No further action has been taken by the court on the USFWS's appeals at this time. The USFWS stands ready to continue to assist to reduce livestock depredations in other non-lethal ways in the SNRA, but lethal control of problem wolves within the SNRA is currently prohibited by court order.

Appeal of Diamond G lawsuit: On February 25, 2003, the Tenth Circuit Court of Appeals issue a ruling which resolved the last of the litigation over the legality of the wolf recovery program. The case involved the Diamond G Ranch, Inc, a Wyoming Corporation, vs. Secretary of the Interior Gale Norton and USFWS. A ruling by the United States District Court for the district of Wyoming, made in 2001, had found that the wolf recovery program did not violate the Fifth Amendment's takings provisions or the regulations promulgated under the Endangered Species Act. The Appeals Court affirmed the District Court ruling which dismissed the Diamond G's takings claims and the ESA claims.

Funding of Wolf Recovery

Wolf recovery in the northern Rocky Mountains from 1973 through 2002 cost about \$15,200,000 (with no adjustments for inflation). If recovery continues at the current rate and management costs remain within predictions, wolf delisting should be completed in 2004 at an additional cost to taxpayers of \$1,400,000 annually for 2003 and 2004. The total cost for the restoration, management, recovery, and delisting of wolves between 1973 and late 2004 should be about \$18,000,000. Costs in 2002 were:

U. S. Fish and Wildlife Service: \$1,111,000 (\$500,000 in Region 1 and \$611,000 in Region 6). (USFWS Region 1 includes Idaho. Region 6 includes Wyoming and Montana). This funding is used for overall coordination on local and national wolf issues, monitoring, research, control, public information, litigation, biologists in Helena and Kalispell, MT, Lander, WY and Boise, ID, support to WS for assistance in wolf control (\$100,000), and funding the Nez Perce Tribe for leading wolf management in Idaho (\$400,000). Region 6 also funded Montana, Idaho, and Wyoming to assist in the preparation of the delisting proposal (\$6,500 each), and to assist the states with their state wolf management planning (Montana \$20,000, Wyoming \$20,000 plus a federal grant for nearly \$80,000).

USDA Wildlife Services: \$89,000 (from USDA, for investigating reports of wolf damage and increased costs of coyote control in areas occupied by wolves). In addition, WS received an additional \$1,300,000 to their budget in the MT, ID, and WY funding to assist in control of predators, some of which could be used to support investigation of suspected wolf-caused livestock losses, and wolf control activities. Senate language in FY 2003 [Oct 2002-Sept 2003] recommends the \$1,300,000 increase for WS in MT, ID, and WY become an annual permanent increase, largely because of the expanding wolf population and increased potential for wolf-caused damage.

National Park Service: \$220,000 (NPS funds for monitoring, research, coordination, and public information).

Initial recovery costs were lower than predicated in the EIS, primarily because reintroduction objectives were met in two years rather than in the 3-5 years that had been predicted. Wolves remained in Yellowstone National Park and in wilderness areas of central Idaho to a greater extent than predicted, and reproduction and survival exceeded expectations. Also, depredations on livestock were below the levels expected, and private groups and individuals made substantial contributions to the program. Currently, the private Turner Endangered Species Fund is funding all costs for an experienced wolf biologist in Bozeman, Montana who is directly supervised by the USFWS to monitor wolves and to assist in resolving conflicts between wolves and private landowners in southwestern Montana. Defenders of Wildlife provides a compensation program for livestock killed by wolves, with expenditures of more than \$270,000 between 1987 and 2002. Universities in Idaho, Montana and Wyoming have provided substantial funding and support for their graduate students conducting wolf research.

The issue of who should or will pay for management of a recovered, delisted wolf population is still a subject of intense debate. The costs of wolves as a state-managed animal have been estimated by the various states. The states of Montana, Idaho, and Wyoming argue that there must be federal assistance for wolf management after the population is delisted or their plans cannot be implemented. Without some sort of federal assistance they would not support assuming management authority.

Law Enforcement

Montana

The following is a synopsis of *known* wolf mortalities in the state of Montana during calendar year 2002 that were investigated by USFWS special agents.

On or about 12/04/01, two wolves were shot and killed in the Big Hole area of southwestern Montana. On 02/07/02, information was received by the Office of Law Enforcement and an investigation was initiated. The investigation revealed that the two wolves, B-63 and another wolf, were shot by a Stevensville, MT resident. The shooter told agents that he thought the wolves were coyotes until after he shot them. The results of the investigation were referred to

the U. S. Attorney's office for review. As a result, charges were filed for violating the Endangered Species Act. The defendant entered a plea of guilty (with an explanation) that he thought the two animals were coyotes. His occupation is a taxidermist and tanner. He has hunted in Montana for many years. As a result of his occupation and hunting experience the judge felt the defendant knew the animals were wolves and not coyotes when he shot them. As a result of his guilty plea he was placed on probation for three years, during which time he may not hunt; ordered to pay \$2,000 in restitution to the state wildlife laboratory in Bozeman; forfeit to the government the rifle used to kill the wolves and pay a fine of \$4,025 all but \$525 of which was suspended. The rifle that was forfeited went to the state hunter safety program.

On 04/05/02, wolf number 267 (a collared male), was found dead in the Fishtrap Creek drainage in Sanders County, Montana. The wolf carcass was recovered and the subsequent necropsy revealed that the wolf died as a result of a puncture wound to the chest, possibly from an antler or sharp stick. The animal is believed to have died as a result of (other than human-caused) activity, possibly in a confrontation with an elk or deer. There was no evidence of illegal activity. (This mortality is thought to have occurred in late 2001, and was tabulated in the 2001 wolf recovery report).

On 06/18/02, wolf number 256 (a collared female), was found dead inside Glacier National Park, near an elk kill site. The wolf carcass was recovered and the subsequent necropsy revealed the wolf died as a result of a blow to its head. There was no indication or evidence to suggest illegal activity.

On or about 08/06/02, two (2) wolf pups were found dead along side of a road in the Ninemile Valley of Montana. The two carcasses were recovered and a subsequent necropsy revealed the pups died as a result of blunt force trauma, likely from a vehicle. There is no evidence to date that suggests illegal activity.

On or about 09/05/02, two (2) wolf pups were found dead in the vicinity of Dillon, MT. The wolf carcasses were found near two M-44 "coyote getters" set by WS. The wolf carcasses were recovered and necropsies revealed the wolves died as a result of cyanide poisoning from the M-44's. A review of WS trapping protocol was conducted and forwarded to the U. S. Attorney's office for review. The U. S. Attorney's office declined any prosecution.

On 09/11/02, a wolf was found dead in the Helmville, MT area. The wolf, a pup from the Halfway Pack, was determined to have died from a vehicle strike.

On 10/18/02, a wolf pup was hit and killed by a vehicle in the Dickey Lake area of Montana. An investigation revealed that the incident was an accident.

On 12/02/02, wolf number 276 was shot and killed west of Polson, MT. Upon realizing he had shot a wolf the shooter reported the killing to the FWS. The shooter told the agent that he thought the wolf was a coyote. The agent documented all of the evidence and is presenting the case to the U. S. Attorney's office and Regional Solicitors office for their review.

USFWS Law Enforcement--Wyoming

There were no documented illegal kills of wolves during 2002 in Wyoming.

Law Enforcement continues efforts to prevent the illegal killing of wolves. These efforts include the mailing of wolf information to some hunters that will be hunting in areas occupied by wolves. This information is intended to inform the hunters that wolves may be present, gives tips on wolf identification, as well as providing phone numbers and addresses to report wolf sightings. Special Agents still continue to educate people about wolves. One of the more effective tools that Law Enforcement has used is the back country horse patrol. Special Agents patrol the back country during high use periods to provide a deterrent to those who may otherwise kill a wolf, and to educate and answer questions about wolves. These patrols have been effective in preventing the illegal killing of wolves in remote areas.

USFWS Law Enforcement--Idaho

What follows is a listing of *known* wolf mortalities occurring in Idaho during calendar year 2002 that were investigated by Special Agents of the USFWS:

1. An uncollared wolf was found dead on 01/04/2002 near Glenn's Ferry, Idaho. Investigation and lab necropsy revealed that the wolf had been shot. This investigation is ongoing.
2. B66, a collared female wolf, was found dead in the Muldoon Creek drainage (near Carey, Idaho) on 01/13/2002. Necropsy determined that this wolf likely died of natural causes.
3. B71, a collared male wolf, was found dead in the Big Smoky Creek drainage (north of Fairfield, Idaho) on 05/10/2002. This wolf's collar had been on mortality since March, but snow conditions in the area had prevented recovery of the carcass and crime scene investigation. All that remained of the wolf were bleached bones - it appeared that the carcass had been in place for possibly two years, and no live signals had been received from this wolf's collar in about that length of time. The carcass was found within a few miles of where another wolf had died of 1080 poisoning. Due to the advanced decomposition of the remains, it could not be determined whether poison had been involved in B71's death.
4. B48, a collared male wolf, was found dead near Dworshak Reservoir on 07/14/2002. The carcass was sent to the lab for necropsy, and apparent wounds observed at the time the carcass was recovered were determined by the lab to have likely been the result of scavengers. No bullet fragments, broken bones, hemorrhaging or other signs of trauma were observed.
5. B134, a collared female wolf, was found dead in the Panther Creek drainage (west of Salmon, Idaho) on 11/26/2002. Bullet wounds were evident on the carcass, and the

location where it was found suggests it was shot from a nearby Forest Road. The carcass was sent to the lab for necropsy, and it was confirmed that the wolf was shot. Investigation in this case is ongoing.

6. A wolf monitoring flight on 01/07/2003 detected a mortality signal from the collar of Wolf B133 in the area of Pine, Idaho (east of Boise). The collar was recovered the following day in the S. Fork of the Boise River. The collar had evidently been cut off the animal (presumably after it was killed), and thrown into the river from a bridge. Algae growth on the collar indicated it had been in the river for some time. Although the collar was found during calendar year 2003, Wolf B133 likely died weeks or months earlier - during the hunting seasons and during a period of more than two months when there were no monitoring flights. Investigation in this case is ongoing.
7. A mortality signal (B132) was found after the resumption of monitoring during a flight in late November 2002 in the area of Yellowpine, Idaho. This collar was determined to be in an area which, due to terrain and snow conditions, will be inaccessible to investigators until after snowmelt.
8. B67, a wolf that was originally collared as a member of the Big Hole Pack in 1999, had dispersed in 2001 and taken up residence in the Painted Rocks Reservoir area. She was associated with an unknown number of other wolves there. In late November 2002 her radio signal was detected in mortality mode. A USFWS Law Enforcement agent retrieved the carcass. Necropsy revealed that the wolf had been shot. This incident is under investigation.

USFWS Special Agents in Idaho began, in the Fall of 2002, to conduct wolf protective details in Idaho. These were conducted in areas of the state where there has been a past pattern of wolves being illegally killed. Agents used horses to access back-country areas, as well as using vehicles in areas that are easily accessed on maintained roads. The agents made contacts with individuals in these areas soliciting information on unsolved wolf cases, and establishing an enforcement presence. It is hoped that, at a minimum, this activity will have a deterrent effect. This effort is expected to continue this year, with primary emphasis being during the Fall hunting seasons.

Idaho Wolf Management Planning

The Idaho legislature passed a joint resolution in March 2002 accepting the Idaho Wolf Conservation and Management Plan. The plan has been given tentative approval by USFWS, but still must be scientifically reviewed. Idaho state law must be changed to allow the Department of Fish and Game (IDFG) to take over management when wolves are delisted. The Governor's Office of Species Conservation (OSC) is proposing legislation to repeal Idaho Code 36-715, which currently restricts IDFG's involvement. Additionally, OSC is proposing to the legislature and USFWS that the state become involved with wolf management prior to delisting. Idaho's Wolf Plan identifies the IDFG as the primary manager of wolves following delisting, but the Nez Perce Tribe (NPT) will also have a significant role. The NPT and State will have to

agree upon a role for the tribe, and those discussions are ongoing. The IDFG and OSC currently are involved in coordination with surrounding states and the USFWS in writing a delisting plan. IDFG is also increasing monitoring of ungulates, trying to determine possible impacts of wolves. Research and monitoring, include investigating areas with and without recent fire and with and without wolves, will try to identify ecosystem-level habitat and predator-prey interactions. Full implementation of the Plan and management of wolves will be dependent upon federal funds.

Montana Wolf Management Planning

The Montana Wolf Management Advisory Council was appointed in April 2000 by former Gov. Marc Racicot to advise Montana Fish Wildlife & Parks (FWP) as it prepares a management plan for the gray wolf upon federal delisting. The Council was a diverse group, representing the interests of conservationists, hunters, landowners, livestock producers, outfitters, educators, and others. The Council completed their deliberations and presented their report to newly-elected Governor Judy Martz early in 2001. Governor Martz directed FWP to use it to frame a wolf management plan. In response, FWP released the "Montana Wolf Conservation and Management Planning Document" in January 2002. While the 117-page planning document reflected what a state wolf management plan could resemble if it were based on the council's work and recommendations, FWP still needed to hear from others and explore various alternatives before adopting a management plan in full compliance with the legal requirements of the Montana Environmental Policy Act.

Using this document as a basis for discussion, FWP opened the "scoping" comment period for its wolf management environmental impact statement (EIS) in February 2002. Community work sessions were held throughout the state and written comments and emails were also accepted. FWP collected nearly 4,000 comments and written correspondence. Because many of the written letters and emails identified more than one issue or concern, FWP recorded nearly 6,500 individual comments. In all, the comments reflected a full spectrum of issues and concerns about wolves in general and more specifically about a wolf conservation and management program led by FWP.

Because wolf recovery and eventual state management are issues of such great significance to Montana, Governor Martz reappointed the original Wolf Management Advisory Council in January 2003. FWP consulted with the Council prior to finalizing the EIS alternatives. The fundamental issues of wolf conservation and management, associated social factors, state and federal administrative responsibilities, prey populations and their management, and concerns about livestock and compensation for wolf-caused losses were significant enough to drive the creation of specific alternatives. The lack of strongly conflicting public comments on issues like human safety, the need for information outreach and education, or wolf population monitoring, for example, allowed FWP to address several issues in different ways within the spectrum of alternatives created based on the major issues. Ultimately, FWP crafted a total of five alternatives, ranging from little to no management by the State of Montana to aggressive management by FWP. The Council's work will be presented as one of the alternatives.

Montana's Wolf Conservation and Management Draft EIS will be released in March 2003. FWP will accept public comments on its draft EIS at a series of community work sessions, via written letters, or email. FWP expects to complete the EIS process in Summer 2003. More information can be found at www.fwp.state.mt.us.

Wyoming Wolf Management Planning

The Wyoming Legislature passed a state wolf management plan in late February 2003. The bill reclassified wolves as either trophy game or predators, depending on their location and on the overall wolf population level in Wyoming. The USFWS will be working with the Wyoming Game and Fish Commission on the specifics of how this legislation might be implemented. Depending upon the details of the state wolf plan, USFWS may forward it, along with state wolf plans from Idaho and Montana, for public comment as part of any proposal to delist wolves this summer. The adequacy of state plans to conserve the wolf population will be determined by independent professional peer review at that time.

ABBREVIATIONS AND ACRONYMS

U. S. Fish and Wildlife Service	USFWS
U. S. Forest Service	USFS
U. S. National Park Service	NPS
Nez Perce Tribe	NPT
USDA/APHIS/Wildlife Services	WS
Endangered Species Act	ESA
Northern Rocky Mountains	NRM
Northwest Montana wolf recovery area	NWMT
Central Idaho wolf recovery area	CID
Greater Yellowstone wolf recovery area	GYA
Yellowstone National Park	YNP
Glacier National Park	GNP
Grand Teton National Park	GTNP
Montana State University	MSU

CONTACTS

For further information or to report wolf sightings, please contact:

U. S. Fish and Wildlife Service, Helena MT: (406) 449-5225
U. S. Fish and Wildlife Service, Kalispell MT: (406) 751-4581
U. S. Fish and Wildlife Service, Lander WY: (307) 332-7789
U. S. Fish and Wildlife Service, Boise ID: (208) 378-5639
Yellowstone Center for Resources, YNP WY: (307) 344-2243
Nez Perce Tribal Wolf Program, McCall ID: (208) 634-1061

To report livestock depredations:

USDA/APHIS/Wildlife Services, Montana: (406) 657-6464
USDA/APHIS/Wildlife Services, Wyoming: (307) 261-5336
USDA/APHIS/Wildlife Services, Idaho: (208) 378-5077

To report discovery of a dead wolf or information regarding the illegal killing of a wolf:

U.S. Fish and Wildlife Service Special Agent, Billings, MT: (406) 247-7355
U.S. Fish and Wildlife Service Special Agent, Missoula, MT: (406) 329-3000
U.S. Fish and Wildlife Service Special Agent, Bozeman, MT: (406) 582-0336
U.S. Fish and Wildlife Service Special Agent, Great Falls, MT: (406) 453-4761
U.S. Fish and Wildlife Service Special Agent, Casper, WY: (307) 261-6365
U.S. Fish and Wildlife Service Special Agent, Lander, WY: (307) 332-7607
U.S. Fish and Wildlife Service Special Agent, Cody, WY: (307) 527-7604
U.S. Fish and Wildlife Service Special Agent, Boise, ID: (208) 378-5333
U.S. Fish and Wildlife Service Special Agent, Idaho Falls, ID: (208) 523-0855
U.S. Fish and Wildlife Service Special Agent, Spokane, WA: (509) 928-6050

WEBSITES:

- USFWS Rocky Mountain weekly & annual wolf updates:
<http://westerngraywolf.fws.gov/>
- USFWS Midwestern gray wolf recovery, national wolf reclassification proposal:
<http://midwest.fws.gov/wolf/>
- USDA/APHIS/Wildlife Services:
<http://www.aphis.usda.gov/ws/>
- National Wildlife Research Center:
<http://www.aphis.usda.gov/ws/nwrc/>
- Nez Perce Tribe Wildlife Program and 2001 progress report:
http://www.nezperce.org/Programs/wildlife_program.htm
- Turner Endangered Species Fund:
<http://www.tesf.org/>
- Yellowstone Park Foundation:
<http://www.ypf.org/>
- Yellowstone Wolf Tracker:
<http://www.wolftracker.com/>
- Yellowstone National Park technical information page:
<http://www.nps.gov/yell/technical/index.htm>
- Montana Fish, Wildlife & Parks:
<http://www.fwp.state.mt.us/>
- Montana Fish, Wildlife & Parks wolf management planning:
<http://www.fwp.state.mt.us/wildthings/wolf/wolfmanagement.asp>
- Montana Natural Resource Information System:
<http://nris.state.mt.us/>
- Montana State University wolf-ungulate research:
<http://www.montana.edu/ecology/staff/garrott/wolf%20ungulate/index.htm/>
- Idaho Fish and Game:
<http://www2.state.id.us/fishgame/>
- Idaho Office of Species Conservation:
<http://www.state.id.us/species/>
- Wyoming Game and Fish Department:
<http://gf.state.wy.us/>
- Wolves in Utah (report from Utah State University):
<http://www.cnr.usu.edu/nrei>
- Wyoming agricultural statistics:
<http://www.nass.usda.gov/wy/>
- Idaho agricultural statistics:
<http://www.nass.usda.gov/id/>
- Montana agricultural statistics:
<http://www.nass.usda.gov/mt/>
- National agricultural statistics:
<http://usda.mannlib.cornell.edu/reports/nassr/livestock/>
- Defenders of Wildlife wolf compensation trust:
<http://www.defenders.org/wolfcomp.html>
- International Wolf Center:
<http://www.wolf.org/>
- Wolf Recovery Foundation:
<http://forwolves.org/>
- Wolf Education and Research Center:
<http://www.wolfcenter.org/>
- People Against Wolves:
<http://home.centurytel.net/PAW/home.htm>

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ROCKY MOUNTAIN WOLF PUBLICATIONS 1998-2002

- Arjo, W.M., D.H. Pletscher, and R.R. Ream, 2002. Dietary overlap between wolves and coyotes in northwestern Montana. *J. of Mammalogy* 83(3): 754-766.
- Asher, V., J. A. Shivik, K. Kunkel, M. Phillips, and E. Bangs. 2001. Evaluation of electronic aversive conditioning for managing wolf predation. Proceedings of the International Theriological Congress People and Predators Conference, South Africa.
- Ballard, W. B., D. Lutz, T. W. Keegan, L. H. Carpenter, and J. C. Devos Jr. 2001. Deer-predator relationships: a review of recent North American studies with emphasis on mule and black-tailed deer. *Wildlife Society Bulletin* 29(1): 99-115.
- Bangs, E. E., S. H. Fritts, J. A. Fontaine, D. W. Smith, K. M. Murphy, C. M. Mack, and C. C. Niemeyer. 1998. Status of gray wolf restoration in Montana, Idaho, and Wyoming. *Wildlife Society Bulletin* 26:785-798.
- Bangs, E. 2000. Gray wolf restoration in the northwestern United States. Pages 39-45 in Predator Management in Montana: Symposium Proc. January 2000, Billings, MT. Conducted by Montana Outfitters and Guides Assoc. and Montana Fish, Wildlife and Parks.
- Bangs, E. 2001. Wolf management by zoning. *International Wolf* Vol 11 (3): 21.
- Bangs, E., J. Fontaine, M. Jimenez, T. Meier, C. Niemeyer, D. Smith, K. Murphy, D. Guernsey, L. Handegard, M. Collinge, R. Krischke, J. Shivik, C. Mack, I. Babcock, V. Asher, D. Domenici. 2001. Gray wolf restoration in the northwestern United States. *Endangered Species Update* 18(4): 147-152.
- Bangs, E., and J. Shivik. 2001. Managing wolf conflict with livestock in the northwestern United States. *Carnivore Damage Prevention News* No. 3:2-5.
- Bangs, E. 2002. Wolf predation and elk in the Greater Yellowstone Area. *International Wolf* 12(4):28.
- Boyd, D. K., and D. H. Pletscher. 1999. Characteristics of dispersal in a colonizing wolf population in the central Rocky Mountains. *J. of Wildlife Management* 63:1094-1108.
- Boyd, D. K., S. H. Forbes, D. H. Pletscher, and F. W. Allendorf. 2001. Identification of Rocky Mountain gray wolves. *Wildlife Society Bulletin* 29(1): 78-85.
- Carroll, C., M. K. Phillips, N. H. Schumaker, and D.W. Smith. 2002. Impacts of landscape change on wolf restoration success: Planning a reintroduction program using static and dynamic models. *Conservation Biology* 17:1-15
- Claar, J. J., et.al., 1999. Carnivores. Pages 7.1- 7.63 in Effects of Recreation on Rocky Mountain Wildlife: A Review for Montana (G. Joslin and H. Youmans, coordinators). Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society. 307 pp.
- Evans, S., D. W. Smith and K. Murphy. 2000. Evaluation of wolf activity along the Tower to Canyon road in Yellowstone National Park, 1995-1999. YNP report, 17 pp.
- Fascione, N., H. Ridgley, and M. Selden, 2000. Proceedings of Defenders of Wildlife's Carnivores 2000: A Conference on Carnivore Conservation in the 21st Century. Defenders of Wildlife, Washington D. C. 208 pp.

- Fritts, S. H. 2000. Review of Carnivores in Ecosystems: the Yellowstone Experience. Ecology 81(8): 2351-2352.
- Fritts, S. H. 2000. A greater tolerance: coexistence of wolves and humans. International Wolf 10(1): 8-11.
- Fritts S.H., C.M. Mack, D.W. Smith, K.M. Murphy, M.K. Phillips, M.D. Jimenez, E.E. Bangs, J.A. Fontaine, C.C. Niemeyer, W.G. Brewster, and T.J. Kaminski. 2001. Outcomes of hard and soft releases of reintroduced wolves in Central Idaho and the Greater Yellowstone area. Pages 125-147 in D.S. Maehr, R.F. Noss and J.L. Larkin, editors. Large Mammal Restoration: Ecological and Sociological Challenges in the 21st Century. Island Press, Washington, D.C.
- Gipson, P.S., E.E. Bangs, T.N. Bailey, D.K. Boyd, H. D. Cluff, D.W. Smith, and M.D. Jimenez. 2002. Color patterns among wolves in western North America. Wildlife Society Bulletin 30(3):821-830.
- Husseman, J.S. 2002. Prey selection patterns of wolves and cougars in east-central Idaho. Unpublished thesis, University of Idaho.
- Jaffe, R. 2001. Winter wolf predation in an elk-bison system in Yellowstone National Park, Wyoming. Unpublished thesis, Montana State University.
- Jimenez, M. D., and J. Stevenson. 2003. Wolf-elk interactions on state-managed feed grounds in Wyoming. 2002 progress report. USFWS, 190 N First St., Lander WY 82520. 11 pp.
- Kunkel, K. E., D. H. Pletscher. 1999. Species-specific population dynamics of cervids in a multipredator ecosystem. Journal of Wildlife Management 63:1082-1093.
- Kunkel, K. E., T. K. Ruth, D. H. Pletscher, and M. G. Hornocker. 1999. Winter prey selection by wolves and cougars in and near Glacier National Park, Montana. Journal of Wildlife Management 63:901-910.
- Kunkel, K. and D. H. Pletscher. 2000. Habitat factors affecting vulnerability of moose to predation by wolves in southeastern British Columbia. Canadian Journal of Zoology 78: 150-157.
- Kunkel, K. and D. H. Pletscher. 2001 Winter hunting patterns and success of wolves in Glacier National Park, Montana. Journal of Wildlife Management 65: 520-530.
- Kunkel, K.E., D.H. Pletscher, D.K. Boyd, R.R. Ream, and M.W. Fairchild. 2003. Factors affecting foraging behavior of wolves in and near Glacier National Park, Montana. Accepted by Journal of Wildlife Management.
- Mack, C., and K. Laudon. 1999. Idaho wolf recovery program: The restoration and management of gray wolves in central Idaho. Progress Report 1995-1998. Nez Perce Tribe, Department of Wildlife Management, Lapwai, ID. 22 pages.
- Mack, C.M., I. Babcock, and J. Holyan. 2002. Idaho Wolf Recovery Program: Recovery and Management of Gray Wolves in Idaho. Progress report 1999-2001. Nez Perce Tribe, Department of Wildlife Management, Lapwai, ID. 34 pp.
- McIntyre, R., and D. W. Smith. 2000. The death of a queen: Yellowstone mutiny ends tyrannical rule over Druid Pack. International Wolf 10 (4): 8-11.
- McNay, M.E. 2002. Wolf-human interactions in Alaska and Canada: a review of the case history.

Wildlife Society Bulletin 30(3): 831-843.

- MacNulty, D.R., N. Varley, and D.W. Smith. 2001. Grizzly bear, *Ursus arctos*, usurps bison, *Bison bison*, captured by wolves, *Canis lupus*, in Yellowstone National Park, Wyoming. *Canadian Field-Naturalist* 115: 495-498.
- Mech, L. D., D.W. Smith, K.M. Murphy, and D.R. MacNulty. 2001. Winter severity and wolf predation on a formerly wolf-free elk herd. *J. of Wildlife Management* 65(4): 998-1003.
- Meier, T. 2001. Wolf depredation in the United States. *International Wolf* Vol 11 (3): 4-5.
- Montana Wolf Management Advisory Council, 2000. Report to the Governor. Montana Fish, Wildlife & Parks, Helena. 12 pp.
- Montana Wolf Management Advisory Council, 2002. Montana wolf conservation and management planning document. Draft. Prepared in response to the wolf management advisory council recommendations. C. Sime, ed. Montana Fish, Wildlife & Parks, Helena. 117 pp. <http://www.fwp.state.mt.us/wildthings/wolf/wolfmanagement.asp>
- National Research Council. 2002. Ecological dynamics on Yellowstone's Northern Range. Committee on ungulate management in Yellowstone National Park. National Academy Press, Washington, DC. 198 pp. <http://www.nap.edu/catalog/10328.html>
- Peterson, R.O., A.K.Jacobs, T.D. Drummer, L.D. Mech, and D.W. Smith. 2002. Leadership behavior in relation to dominance and reproductive status in gray wolves, *Canis lupus*. *Canadian Journal of Zoology* 80:1405-1412.
- Oakleaf, J. K. 2002. Wolf-cattle interactions and habitat selection by recolonizing wolves in the northwestern United States. M.S. Thesis, University of Idaho, Moscow, Idaho.
- Oakleaf, J. K., C. Mack, and D. L. Murray. 2003. Effects of wolves on livestock calf survival and movements in central Idaho. *Journal of Wildlife Management*: In Press (April Issue).
- Oakleaf, J. K., D. L. Murray, E.E. Bangs, C.M. Mack, D. W. Smith, J.A. Fontaine, J. R. Oakleaf, M.D. Jimenez, T. J. Meier, and C. C. Niemeyer. In Review. Habitat selection by recolonizing wolves in the northwestern United States.
- Phillips, M., N. Fascione, P. Miller and O. Byers. 2000. Wolves in the Southern Rockies. A population and habitat viability assessment: Final Report. IUCN/SSC Conservation breeding Specialist Group, 12101 Johnny Cake Ridge Road, Apple Valley, MN 55124.
- Phillips, M.K., E.E. Bangs, L.D. Mech., B.T. Kelly, and B. Fazio. In press. Living alongside canids: lessons from the extermination and recovery of the red and grey wolves in the contiguous United States. Pages XXX-XXX in D. McDonald and C. Sillero, editors. *the biology and conservation of wild canids*. Oxford University Press, New York, Oxford.
- Reinhart, D. 1999. Gray wolves (*Canis lupus*). Pp 31-36 in Effects of winter recreation on wildlife of the Greater Yellowstone Area: A literature review and assessment (T. Olliff, K. Legg, and B. Kaeding, editors). Report to the Greater Yellowstone Coordinating Committee. Yellowstone National Park, Wyoming. 315 pp.
- Ripple, W.J., E.J. Larsen, R.A. Renkin, and D.W. Smith. 2001. Trophic cascades among wolves, elk and aspen on Yellowstone National Park's Northern Range. *Biological Conservation*. 102: 227-234.

- Schaefer, C.L. 2000. Spatial and temporal variation in wintering elk abundance and composition, and wolf response on Yellowstone's Northern Range. Unpublished thesis, Michigan Technological University.
- Shivik, J. 2001. The other tools for wolf management. *WOLF!* Vol 11 (2): 3-7
- Smith, D. W., W. G. Brewster, and E. E. Bangs. 1999. Wolves in the Greater Yellowstone Ecosystem: restoration of a top carnivore in a complex management environment. Pages 103-125 in *Carnivores in Ecosystems* (T. Clark et al., eds.). Yale University Press.
- Smith, D. W., K. M. Murphy, and D. S. Guernsey, 1999. Yellowstone Wolf Project: Annual Report, 1998. National Park Service, Yellowstone Center for Resources, Yellowstone National Park, Wyoming, YCR-NR-99-1. 14 pp.
- Smith, D. W. 2000. The wolves of Yellowstone. *Southeastern Wildlife Magazine*.
- Smith, D. W., L. D. Mech, M. Meagher, W. E. Clark, R. Jaffe, M. K. Phillips, and J. A. Mack. 2000. Wolf-bison interactions in Yellowstone National Park. *Journal of Mammalogy* 81(4): 1128-1135.
- Smith, D. W., K. M. Murphy, and D. S. Guernsey. 2000. Yellowstone Wolf Project: Annual Report, 1999. National Park Service, Yellowstone Center for Resources, Yellowstone National Park, Wyoming, YCR-NR-2000-01.
- Smith, D.W., K.M. Murphy, R. McIntyre, T. Zieber, G. Plumb, B. Phillips, B. Chan, J. Knuth Folts, D. Chalfant, and B. Suderman. 2000. Managing wolves and humans in Lamar Valley: A final report on the Druid road project 2000. YNP report, 5pp.
- Smith, D. W. and M. K. Phillips. 2000. Northern Rocky Mountain Wolf (*Canis lupus nubilus*). Pp. 219-223, in *Endangered Animals: A Reference Guide to Conflicting issues* R.P. Reading and B. Miller, eds). Greenwood Press, Westport, CT. 383 pp.
- Smith, D.W. 2001. Wildlife Art: Does it make a difference for wolves? *Wildlife Art*. 20 (6): 102-105.
- Smith, D. W., and D. S. Guernsey. 2001. Yellowstone Wolf Project: Annual Report, 2000. National Park Service, Yellowstone Center for Resources, Yellowstone National Park, Wyoming, YCR-NR-2001-01. 14 pp.
- Smith, D.W., R. McIntyre, E. Cleere, G. Plumb, B. Phillips, B. Chan, M. Ross, J. Knuth Folts, D. Chalfant, and B. Suderman. 2001. Managing wolves and humans in Lamar Valley: A final report on the Druid road project 2001. YNP report. 7pp.
- Smith, D. W. K. M. Murphy, S. Monger. 2001. Killing of Bison (*Bison bison*) calf, by a wolf (*Canis lupus*), and four coyotes (*Canis latrans*), in Yellowstone National Park. *Canadian Field-Naturalist*. 115 (2): 343-345.
- Smith, D.W. 2002. Wolf #7: The passing of a matriarch. *Yellowstone Science* 10:18-19.
- Smith, D.W. 2002. Wolf Pack Leadership: Doug Smith explores the issue in Yellowstone and Isle Royale. *Howlings: The Central Rockies Wolf Project* 11(2):10-12.
- Smith, D. W. 2002. Book review -- *Wolves and Human Communities: Biology, Politics, and Ethics*. *Journal of Mammalogy* 83:915-918.

- Smith, D.W., and D.S. Guernsey. 2002. Yellowstone Wolf Project: Annual report, 2001. National Park Service, Yellowstone Center for Resources, Yellowstone National Park, Wyoming, YCR-NR-2002-04.
- Stahler, D.R., B. Heinrich, and D.W. Smith. 2002. Common ravens, *Corvus corax*, preferentially associate with gray wolves, *Canis lupus*, as a foraging strategy in winter. *Animal Behavior* 64:283-290.
- Smith, D.W. and R. McIntyre. 2002. Wolf pack size: How did the Druid Peak Pack get to be so big? *International Wolf* 12(1):4-7.
- Smith, D.W., D. R. Stahler, R. McIntyre, D. Graf, E. West, G. Plumb, B. Phillips, B. Chan, M. Ross, J. Knuth Folts, D. Chalfant, and B. Suderman. 2002. Managing wolves and humans in Lamar Valley: A final report on the Druid road project 2002. YNP report. 9 pp.
- Smith, D.W., R.O. Peterson, D. Houston. 2003. Yellowstone after wolves. *BioScience*, April.
- Stahler, D.R. 2000. Interspecific interactions between the common raven (*Corvus corax*) and the gray wolf (*Canis lupus*) in Yellowstone National Park, Wyoming: Investigations of a predator and scavenger relationship. Unpublished thesis, University of Vermont.
- Stahler, D.R., D.W. Smith, and R. Landis. 2002. The acceptance of a new breeding male into a wild wolf pack. *Canadian Journal of Zoology* 80: 360-365.
- Switalski, T.A., T. Simmons, S.L. Duncan, A.S. Chavez, and R.H. Schmidt. 2002. Wolves in Utah. An analysis of potential impact and recommendations for management. Utah Cooperative Fish and Wildlife Research Unit, Utah State University. Natural Resource and Environmental Issues, Volume X. <http://www.cnr.usu.edu/nrei>
- Taper, M.L., and P.J.P. Gogan. 2002. The northern Yellowstone elk: Density dependence and climatic conditions. *Journal of Wildlife Management* 66(1): 106-122
- Thurston, L.M. 2002. Homesite attendance as a measure of alloparental and parental care by gray wolves (*Canis lupus*) in northern Yellowstone National Park. Unpublished thesis, Texas A&M University.
- USDA./APHIS/Idaho Wildlife Services. 2001. Wolf Activity Report, Fiscal Year 2000. USDA/APHIS/Wildlife Services, 9134 West Black Eagle Drive, Boise ID 83709. 14 pp.
- USDA./APHIS/Idaho Wildlife Services. 2002. Wolf Activity Report, Fiscal Year 2001. USDA/APHIS/Wildlife Services, 9134 West Black Eagle Drive, Boise ID 83709. 13 pp.
- USDA./APHIS/Idaho Wildlife Services. 2003. Wolf Activity Report, Fiscal Year 2002. USDA/APHIS/Wildlife Services, 9134 West Black Eagle Drive, Boise ID 83709. 13 pp.
- U. S. Fish and Wildlife Service. 2000. Proposal to reclassify and remove the gray wolf from the list of endangered and threatened wildlife in portions of the conterminous United States. *Federal Register* 65(135): 43449-43496.
- U. S. Fish and Wildlife Service, Nez Perce Tribe, National Park Service, and USDA Wildlife Services. 2000. Rocky Mountain Wolf Recovery 1999 Annual Report. USFWS, Ecological Services, 100 N Park, Suite 320, Helena MT. 23 pp. <http://mountain-prairie.fws.gov/wolf/annualrpt99>

- U. S. Fish and Wildlife Service, Nez Perce Tribe, National Park Service, and USDA Wildlife Services. 2001. Rocky Mountain Wolf Recovery 2000 Annual Report. USFWS, Ecological Services, 100 N Park, Suite 320, Helena MT. 35 pp.
<http://mountain-prairie.fws.gov/wolf/annualrpt00>
- U. S. Fish and Wildlife Service, Nez Perce Tribe, National Park Service, and USDA Wildlife Services. 2002. Rocky Mountain Wolf Recovery 2001 Annual Report. T. Meier, ed. USFWS, Ecological Services, 100 N Park, Suite 320, Helena MT. 41 pp.
<http://mountain-prairie.fws.gov/wolf/annualrpt01>
- U. S. Fish and Wildlife Service, Nez Perce Tribe, National Park Service, and USDA Wildlife Services. 2003. Rocky Mountain Wolf Recovery 2002 Annual Report. T. Meier, ed. USFWS, Ecological Services, 100 N Park, Suite 320, Helena MT. 64 pp.
<http://mountain-prairie.fws.gov/wolf/annualrpt02>