On 14 January 1995, the first wolf was released into central Idaho. Photo courtesy of U.S. Fish and Wildlife Service.

Reintroducing the gray wolf to central Idaho and Yellowstone National Park

Edward E. Bangs and Steven H. Fritts

An account of the biological and political process of wolf reintroduction and a review of the current status of the wolves as of 1 August 1996

The gray wolf (*Canis lupus*) was once distributed throughout nearly all of North America (Young and Goldman 1944). Wolves, like other large predators in North America, were persecuted shortly after colonization by Europeans began and throughout the settlement period. Gradually wolves were extirpated from the contiguous 48 states except Minnesota. The desirability of retaining remnant populations in large tracts of public land in the western United States was debated even as the last wolves were being eliminated by the U.S. Biological Survey (Leopold 1945). Ironically, that agency later evolved into the U.S. Fish and Wildlife Service (USFWS) which is responsible for wolf restoration under the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531-1544). However, in the early 1900's, there were fewer wolf supporters than opponents, and the species was eradicated in the western United States, even in national parks. By about 1930, wolf populations had disappeared from Montana, Idaho, and Wyoming. A few wolves, apparently long-range dispersers from Canadian populations, were periodically killed (Nowak 1983) because wolves did not receive significant legal protection until 1974. Reproduction did not resume in the western United States until 1986, when wolves denned in Montana (Ream et al. 1989).

If any one occasion could be singled out as the beginning of organized efforts to restore wolves to Yellowstone National Park (YNP) and central Idaho, it probably would be an interagency meeting held in October 1971 in YNP. In response to an increase in reported sightings of wolves, local resource man-

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Wildlife Society Bulletin 1996, 24(3):402–413 Peer edited

agers met to discuss how to deal with a population believed to exist at low density in the area of YNP northward to the Canadian border. Subsequent field work indicated no wolf population existed there (Weaver 1978, Ream and Mattson 1982). Wolves from that area (designated *C. l. irremotus*, at that time) were listed as endangered in 1974. A recovery plan, initiated in 1974, recommended that natural dispersal and reintroduction be used to restore wolves (U.S. Fish and Wildl. Serv. 1980). A revised and more specific plan recommended: (1) promotion of natural recovery in northwestern Montana, (2) reintroduction of wolves designated "nonessential experimental" in YNP and, (3) other measures (presumably reintroduction) would be instigated in central Idaho if 2 breeding pairs had not naturally established there by 1992 (U.S. Fish and Wildl. Serv. 1987). The recovery goal was 10 breeding pairs of wolves in each of the 3 areas for 3 successive years. Achievement of this goal would be followed by removal of the gray wolf from ESA protection in the northern Rocky Mountains of the United States. A reexamination of these recovery goals by the USFWS suggested that they would lead to the establishment of a viable metapopulation of wolves in the northern Rockies, with interchange between the 3 subpopulations, as well as between the United States and Canada (Ream et al. 1991, U.S. Fish and Wildl. Serv. 1994*a*, Fritts and Carbyn 1995).

Natural dispersal of wolves from Canada into northwestern Montana and incidents of livestock depredation forced agencies into intensive management in the late 1980's (Bangs 1991, Bangs et al. 1995, Fritts et al. 1995). Increasing public support for wolf restoration and an emotional and polarized debate over the issue resulted in elected officials directing the actions of state and federal agencies through specific language attached to annual federal appropriation bills and by state law and resolutions (Fischer 1995). Because wolf reintroduction would result in a significant impact on the human environment and was controversial, an environmental impact statement (EIS) was recognized as a legal requirement by the 1987 recovery plan (U.S. Fish and Wildl. Serv. 1987). However, in 1988 and 1990 Congress specifically prohibited an EIS, but directed the National Park Service (NPS) and USFWS to conduct studies on the potential impacts of wolf recovery in the YNP area (YNP et al. 1990, Varley and Brewster 1992). In 1990 Congress established a committee composed of representatives from federal and state agencies as well as special interest groups to develop a wolf recovery plan for the Yellowstone and central Idaho areas (Wolf Manage. Comm. 1991). Congress did not act on the Committee's controversial recommendation for a congressionally legislated reintroduction (Fischer 1995), but in late 1991 directed the USFWS to consult with the NPS and U.S. Department of Agriculture Forest Service and prepare an EIS on wolf reintroduction to YNP and Idaho (U.S. Fish and Wildl. Serv. 1994*a*, Fritts et al. 1995).

The final EIS was completed in 1994. In it, the USFWS proposed that wolves be reintroduced to both YNP and Idaho designated as "nonessential experimental populations," as had been proposed in the recovery plan (U.S. Fish and Wildl. Serv. 1987) and done in the red wolf (*C. rufus*) reintroduction program (Parker and Phillips 1991). Regulations were developed to reintroduce about 15 wolves to Idaho and YNP annually for 3–5 years (U.S. Fish and Wildl. Serv. 1994*b*). All reintroduced wolves as well as other wolves found in the experimental areas after the first release would be designated as members of "nonessential experimental populations" under section 10(j) of the ESA. Some opponents and proponents of wolf restoration immediately attempted, via litigation, to prevent implementation of the reintroduction plan. Opponents believed wolves would cause undue hardship to agricultural interests and disrupt local lifestyles. Proponents believed wolves already existed or would soon naturally recolonize these areas and that wolves and wolf habitat deserved more protection than the rules afforded them. Reintroductions were conducted despite several court-ordered delays.

This paper reviews the biological and political progress of wolf reintroduction and the general status of wolves in Idaho and YNP as of 1 August 1996. Throughout the period of planning and implementing reintroductions the wolf population in northwestern Montana was increasing. By August 1996 about 8–10 breeding pairs of wolves (80–100 individuals) occupied the area resulting from natural recolonization that began in the early 1980's (J. Fontaine, U.S. Fish and Wildl. Serv., Helena, Mont., pers. commun.; Ream and Mattson 1982; Fritts et al. 1995).

Study sites

The Idaho primary analysis area (where wolf packs will most likely persist and have impacts; Fig. 1) is about 53,900 km^2 of rugged mountainous terrain, including almost 16,200 km^2 of designated Wilderness (Table 1; U.S. Fish and Wildl. Serv. 1994*a*). It supports >241,000 wild ungulates, including mule deer (*Odocoileus hemionus*) and white-tailed deer (*O. virginianus*), elk (*Cervus elaphus*), mountain goats (*Oreamnos americanus*), bighorn sheep (*Ovis canadensis*), and moose (*Alces alces*). The annual hunter harvest is about 33,360 ungulates. Mountain

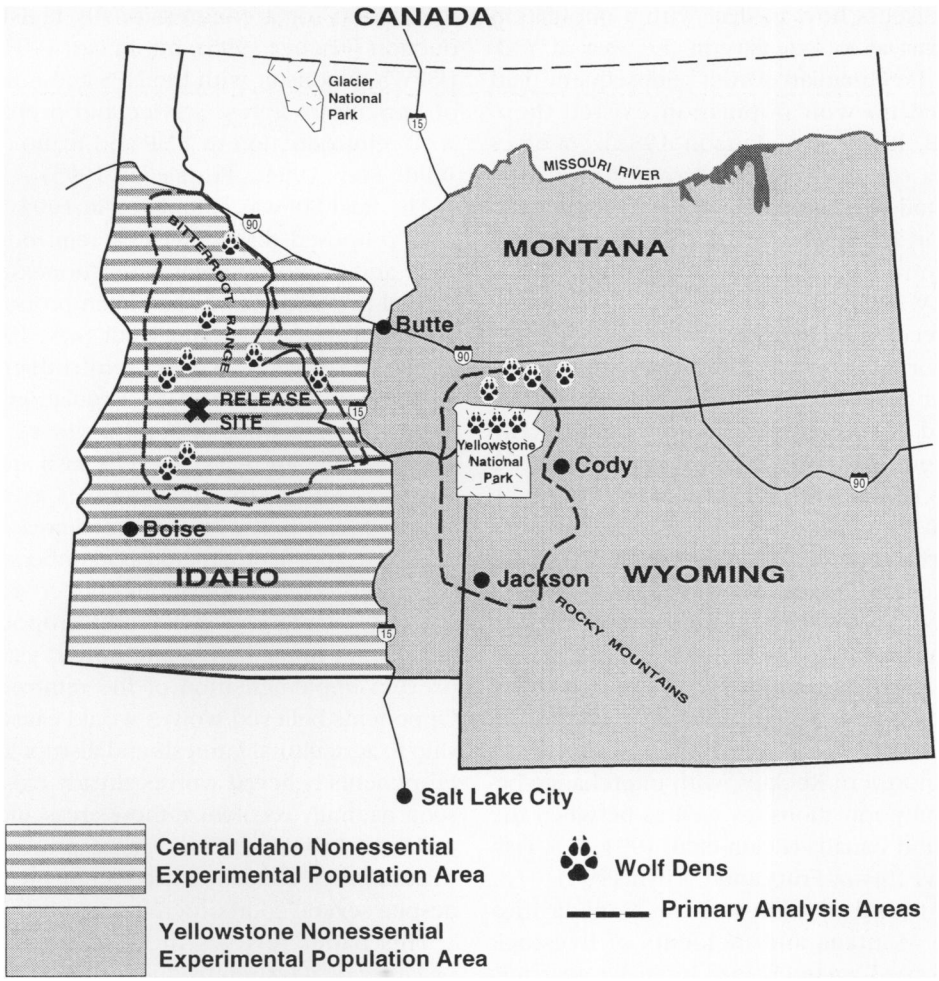


Fig. 1. Nonessential experimental population areas in Idaho and Yellowstone National Park (YNP). Primary analysis areas are those where impacts of wolf population recovery would occur. Paw prints represent the general location of 5 suspected and 3 confirmed wolf dens in Idaho, and 1 suspected and 6 confirmed dens in or near YNP. The X in Idaho locates the general area where wolves were released in Idaho. Wolves were released in the north or west-central part of YNP.

lions (*Puma concolor*), black bears (*Ursus americanus*), and coyotes (*Canis latrans*) are abundant. About 17,666 km^2 (32%) of the federal land is seasonally grazed by >300,000 livestock (Table 1). Livestock are also abundant throughout the year on adjacent private lands. Annual livestock losses average about 12,310 cattle and 9,360 sheep. The human population is about 92,400 residents. The local economy is about $1.3 billion annually; only 8% is related to farm products. The area receives about 8 million recreational visits annually (Table 1).

The YNP primary analysis area (Fig. 1) is about 64,800 km^2 of mountainous terrain (Table 1; U.S. Fish and Wildl. Serv. 1994*a*). It has >95,000 wild ungulates including elk, mule and white-tailed deer, moose, bighorn sheep, bison (*Bison bison*), pronghorn antelope (*Antilocapra americana*), and mountain goats. Hunters annually harvest >14,300 ungulates. Black bears, grizzly bears (*Ursus arctos*), mountain lions, and coyotes are common. Federal land is seasonally grazed by >410,000 livestock (Table 1). Within this area, at least 30,400 km^2 of public land, including all YNP, has no livestock grazing. Livestock are abundant throughout the year on private lands. Annual livestock losses from all causes average about 8,340 cattle and 12,990 sheep. The local human population is about 288,000 residents. The annual local economy is about $4.2 billion; only 6.4% is related to farm products. Some 14.5 million recreational visits are made to the area annually (Table 1).

Methods and results

Predictions

Opinion surveys, extrapolation from field studies elsewhere, and modeling were used to predict the

Table 1. Key characteristics of the primary analysis area (PAA) in which potential impacts by wolf recovery were predicted in central Idaho (including parts of 10 adjacent counties) and around Yellowstone National Park (including parts of 17 adjacent counties). Information is summarized from the Final Environmental Impact Statement for the reintroduction of gray wolves to Yellowstone National Park and central Idaho, U.S. Fish and Wildlife Service, 1994.

	Central Idaho	Yellowstone
Area	53,900 km^2	64,800 km^2
Federal ownership (%)	99%	76%
Regional Population (including surrounding communities)	92,400	288,000
Recreational visits/yr to federal land	8,600,000	14,500,000
Current active sites for M-44 use (coyote cyanide devices)	31 ranches	185 ranches
Local economy (including surrounding counties)		
Total income	$1.43 billion	$4.2 billion
Farm	8.0%	6.4%
	(65% by livestock)	(55% by livestock)
Livestock		
Peak numbers of livestock on PAA including the surrounding counties-		
(spring) cattle	384,990	354,000
(spring) sheep	100,713	117,000
On U.S. Dep. Agric. For. Serv. in PAA (May-Oct)		
Adult cattle and calves	81,893	145,658
Adult sheep and lambs	223,523	265,152
Horses	1,109	1,270
Total livestock grazed on national forest	306,525	412,080
Livestock mortality in the PAA and surrounding counties from all causes per year based upon spring cattle and sheep numbers:		
cattle	12,314	8,340
	3.2% loss	2.36 % loss
	(69% calf)	(67% calf)
sheep	9,366	12,993
	9.3% loss	11.1% loss
	(72% lambs)	(74% lambs)
horses	Unknown, very low	Unknown, very low
Ungulates (after hunting season)		
Elk	76,300	56,100
Deer (mule and white-tailed)	159,600	29,500
Moose	1,700	5,800
Bighorn sheep	1,800	3,900
Bison	0	3,600
Mountain goat	2,000	few
Pronghorn antelope	0	400
Total	241,400	99,300
Hunter harvest/year	33,358	14,314

potential effects of wolf restoration in the Idaho and YNP areas (Yellowstone Natl. Park et al. 1990, Varley and Brewster 1992, Cook 1993, U.S. Fish and Wildl. Serv. 1994*a*).

The EIS projected growth of the wolf population based on the following assumptions (U.S. Fish and Wildl. Serv. 1994*a*). Fifteen wolves would be reintroduced annually in each area beginning in the late fall of 1994. Only 2/3 of those released would contribute to population growth because 1/3 would disappear (fate unknown) or move outside the recovery areas. Every year 10% of the wolves remaining within the recovery area would be removed in agency control actions, and another 10% would die from various causes. Pups would first be produced in the spring of 1996 when 2 litters with 5 pups each (the average litter size in northwestern Montana [Pletscher et al. In press]) would survive. These parameters resulted in estimates of 14 wolves by late fall 1995 and 27 wolves by late fall 1996 in each reintroduction area. After 4 years of reintroductions we assumed the wolf population would grow at 22% annually (the population growth rate for wolves in northwestern Montana [Fritts et al. 1995]). The population would reach a minimum of 10 breeding pairs in each of the 3 recovery areas for 3 successive years and be removed from ESA protection by 2002.

Capturing a wolf near Hinton, Alberta, 1995. Photo courtesy of U.S. Fish and Wildlife Service.

The EIS predicted that a recovered wolf population (10 breeding pairs or about 100 wolves) in Idaho would kill 10 cattle, 57 sheep and about 1,600 wild ungulates, primarily deer, annually (Table 2; U.S. Fish and Wildl. Serv. 1994*a*). Wolf predation would reduce harvest of female elk by 10–15%. Hunter harvest of male elk, deer, moose, bighorn sheep, and mountain goats would not be affected. Wolf presence would not change uses of public or private land, except for use of toxicants for predator control. Visitor use would likely increase 8% for out-of-area residents and 2% for local residents but economic benefits were not estimated. Annual economic losses as a result of wolf predation were anticipated because of fewer hunter benefits (what hunters reported that hunting female elk was worth to them), because of reduced hunter expenditures (what hunters reportedly spent hunting female elk), and because of livestock losses (Table 2).

The EIS predicted a recovered wolf population in the YNP area would kill 19 cattle, 68 sheep, and about 1,200 wild ungulates, primarily elk, annually (U.S. Fish and Wildl. Serv. 1994*a*). Wolf predation would reduce populations of elk 5–30% in some herds, deer 3–19%, moose 7–13%, and bison ≤15%. This would not affect hunter harvest of male ungulates but would reduce harvest of female elk, deer, and moose. Harvest of bighorn sheep, mountain goats, and antelope would not be affected. Wolves would not change uses of public or private lands except for limited use of predator toxicants. Visitor use would increase 5% for out-of-area residents and 10% for local residents. Economic losses from wolf predation would result from fewer hunter benefits, reduced hunter expenditures, and livestock losses. Surveys indicated that the presence of wolves would make YNP a more attractive location for visitors (U.S. Fish and Wildl. Serv. 1994*a*). More people and longer stays would generate an additional $23 million in the local economy annually (Table 2).

Management strategy

Strategy for managing wolves in the experimental areas was developed from published literature, congressionally mandated studies, experiences of project personnel, an evaluation of the need for and legal constraints to wolf management under the ESA (Fritts 1993*a*), about 170,000 comments received on the draft EIS, and 426 comments on the proposed nonessential experimental population rules (U.S. Fish and Wildl. Serv. 1994*a*,*b*). Public comment generally indicated that wolf populations should be restored, that wolves should be managed to minimize conflicts with local people, and that both these concerns should be addressed as inexpensively as possible (U.S. Fish and Wildl. Serv. 1994*a*,*b*). The final rules were an attempt to balance the biological needs of wolf populations (Fritts and Carbyn 1995) with concerns of the public and of the 3 state governments that there be enough management flexibility to address local social conditions. This kind of flexibility in management was not possible in northwestern Montana because section 10(j) of the ESA specified that areas with a wolf population could not be part of an experimental population area (Fritts 1993*a*).

Expecting some wolves to travel widely, the USFWS established large experimental population areas, thereby broadening the area of management flexibility (Fig. 1), and prepared to reintroduce wolves near the centers of those areas in YNP and to U.S. Department of Agriculture Forest Service lands in central Idaho. If naturally occurring wolf packs were discovered within 90 days following release, the reintroduced wolves would be removed and the experimental rules canceled. Otherwise, reintroductions were planned to continue until 2 breeding pairs had produced 2 pups each for 2 consecutive years. It was estimated that this would require 3–5 years of reintroduction and the release of 45–75 wolves, in each area.

The plan was that all wolves in the experimental areas (i.e., including any already present) would be managed under the special rules as soon as wolves were released (U.S. Fish and Wildl. Serv. 1994*b*). Agencies would move or kill any wolves that attack livestock. The first time wolves attacked livestock they would be moved. Those that attacked livestock after being moved would be killed. A private fund by the Defenders of Wildlife would compensate producers for livestock losses (Fischer 1995). Wolves also

Table 2. Expected impacts of recovered wolf population (100 wolves). Information is taken from the Final Environmental Impact Statement for the reintroduction of gray wolves to Yellowstone National Park and central Idaho, U.S. Fish and Wildlife Service, 1994.

Impact	Central Idaho experimental area	Yellowstone experimental area
Impact to big game populations	Elk 5–10% reduction, others no effect in central Idaho area by 2002.	Elk 5–30% reduction, mule deer 3–19% reduction, moose 7–13% reduction, bison ≥15% reduction, others no effect.
Effects of hunter harvest	Reduced anterless harvest (elk only) 10–15%, no effect on antlered harvest.	Reduced anterless harvest 8% (range = 2–30%), no effect on antlered harvest.
Livestock depredation	Annual average 10 (range = 1–19) cattle, average 57 (range = 32–92) sheep.	Annual average 19 (range = 3–32) cattle, average 68 (range = 38–110) sheep.
Land-use restrictions	≤41 km^2 for ≤5 packs, none after ≥6 packs established.	≤41 km^2 for ≤5 packs, none after ≥6 packs established.
Visitor use	Probable 2% increase likely.	Probable 5% increase in nonresident and 10% increase in local visitation.
Economic effects	Decreased hunter benefits $757,000–$1,135,000/yr. Decreased hunter expenditures $572,000–$857,000/yr. Livestock losses $2,923–$18,503/yr. Increased visitor expenditures likely.	Decreased hunter benefits $187,000–$465,000/yr. Decreased hunter expenditures $207,000–$414,000/yr. Livestock losses $1,888–$30,470/yr. Visitor expenditures increase $23,000,000/yr.

would be moved if conflicts with people became unavoidable and it became apparent that the relocation would benefit the overall wolf restoration program. Wolves on private land could be harassed but not injured by landowners at any time. Wolves seen attacking livestock on private land could be shot by landowners. Livestock permittees on public land could be issued a permit to kill wolves that were attacking livestock if previous depredations had been confirmed and ≥6 packs were established in that experimental area. No government land-use restrictions to benefit wolves could be implemented on private land. On public land, restrictions could be used only within 1.6 km of active dens and only when ≤5 packs were established. State or tribal wildlife agencies were encouraged to develop wolf-management plans. Once plans were approved by the USFWS, the states and tribes could assume federal funding and responsibility for wolf management. States and tribes could relocate wolves that they determined were significantly affecting ungulate populations.

Secretary of the Interior Bruce Babbit, U.S. Fish and Wildlife Service Director Molly Beattie, and Yellowstone National Park Wolf Restoration Project Leader Mike Phillips, carrying in the first wolf to an acclimation pen in 1995. Photo courtesy of U.S. Fish and Wildlife Service.

Reintroduction

Previous reintroductions and translocations of wolves were thoroughly reviewed (Fritts 1993*b*), and opinions on wolf reintroduction strategies and techniques were solicited from experts on wolves (U.S. Fish and Wildl. Serv. 1994*a* [Appendix 4]). Experts generally agreed that source populations for wolves should be wild populations living in mountainous areas where elk and deer were the primary prey, and livestock and potentially infectious diseases were rare. Only wolves from the Canadian Rocky Mountains met those criteria. A review of gray wolf taxonomy in western North America concluded that southwestern Canada was a suitable source of wolves (Brewster and Fritts 1995). Officials in Alberta and British Columbia offered wolves for reintroduction but required preliminary studies to ensure that local wolf populations had surplus animals, and subsequent monitoring to assess the impact of wolf removals. This resulted in about 10–20 wolves in Canada being radiocollared and monitored before and after each reintroduction.

Opinions of experts on release protocols varied drastically (U.S. Fish and Wildl. Serv. 1994*a*). Some supported a quick (hard) release, in which wolves

Alaska Game and Fish biologist carrying a wolf from a helicopter at Switzer Provincial Park near Hinton, Alberta, 1995. Photo courtesy of U.S. Fish and Wildlife Service.

would be captured, transported, and immediately released with a minimum of holding, handling, and expense. Wolves released in this manner would separate and travel widely, generally in the direction from which they had come, but would not be able to reach home (Fritts 1993*b*). Most would survive and some would pair-bond and establish packs. To mimic natural dispersal patterns, unrelated young adult wolves were preferred for quick release.

The majority of experts believed that an ideal reintroduction would involve use of family groups that had been acclimated in pens for weeks or months before release (U.S. Fish and Wildl. Serv. 1994*a*). They reasoned that a slow (soft) release was more likely to maintain cohesiveness of packs, encourage wolves to settle near their release sites, and lead to early reproduction. This was a compelling approach where practical. The maintenance of wild wolves in pens was far less feasible in Idaho than in YNP. Experts concurred that there was no single "right" answer and an adaptive or learn-by-doing approach should be used.

Scientific opinion, access to release areas, and other logistical challenges led the USFWS to plan a quick release of young adult wolves in Idaho and a slow release of family groups in YNP. Releases were planned to begin early in the fall so that wolves would settle before the mid-February breeding season. Several experts believed that breeding in the wild would be more successful than in captivity. Canadian biologists preferred that wolves be captured in early November, after the end of most of their big-game hunting seasons. We planned to begin releases in Idaho in the fall so that wolves would have ample time to wander and pair-bond before mid-February. The plan in YNP was to build 3 chain-link pens (approx 0.4 ha) and place a breeding pair and other pack members in each pen in November. They would be released in January. The release sites were near YNP's northern border, in areas with the highest ungulate densities in the Park. Because the northern border averages 23 km from livestock production areas, a type of release that minimized long-range movement of wolves was preferable.

Litigation in November 1994 set the reintroduction schedule back by several weeks. While a court order prevented wolves from being transported into the United States, project biologists and local fur-trappers east of Jasper National Park in Alberta captured wolves in modified neck snares (Fritts et al. In press). These wolves were examined, radiocollared, and released on site in November and December. On 3 January 1995 the court order was lifted. Wolves were then captured by an interagency team of about 15 biologists, public affairs specialists, and veterinarians from Alberta Environmental Protection, USFWS, NPS, U.S. Department of Agriculture Animal Damage Control, National Biological Service, Alaska Department of Fish and Game, Wyoming Game and Fish Department, Idaho Department of Fish and Game, and fixed-wing aircraft and helicopter pilots under contract to the USFWS. Private conservation groups also provided volunteers and funding.

Radiocollared packs were located by telemetry from fixed-wing aircraft. Other wolves were located by fixed-wing aircraft pilots from Alaska who were skilled at following wolf tracks in snow. Wolves were darted from helicopters using a Palmer Cap-Chur rifle (Palmer Chemical and Equipment Co., Douglasville, Ga.) and Telazol® (A.H. Robins Co., Richmond, Va.; Ballard et al. 1991). The immobilized wolves were brought to a central holding facility and placed in 4- x 2- x 2-m chain-link kennels furnished with straw bedding and straw bales and covered with tarps. Each wolf was examined, blood tested for diseases, vaccinated for a wide variety of diseases, treated for external and internal parasites, ear-tagged, implanted with a passive integrated transponder, radiocollared, and given fluids. Eleven to 19 wolves were placed in individual metal shipping boxes and flown to the United States on a U.S. Department of Agriculture Forest Service cargo aircraft (Fritts et al. In press).

Captures for the 1995 reintroduction began on 7 January and ended on 17 January, during which time 34 wolves (including 5 caught in early Jan by local trappers) were handled. One wolf died from a dart wound. No wolves tested positive for rabies or brucellosis (M. R. Johnson, Wildl. Vet. Resour., Gardiner, Mont., pers. commun.). Costs in 1995 (including the pre- and post-reintroduction monitoring in Canada)

until the wolves were released in Idaho and placed into pens in YNP totaled $735,000. Nearly all of the effort was funded by the USFWS and YNP, including salaries, travel, equipment, contracts, and transportation expenses. Costs in 1995 included initial equipment purchases. We believe costs in 1995 were as much as 20% higher than they would have been because of litigation-caused delays.

Wolves scheduled for reintroduction during the second year were captured in British Columbia. In late November 1995, biologists from the British Columbia Ministry of Environment, Lands, and Parks, Wildlife Program, began to helicopter-dart, radiocollar, and release wolves in an area north of Fort St. John, British Columbia. The 1996 reintroduction began 16 January and ended on 27 January, during which time 53 wolves were handled. The only mortality occurred when a caged male wolf bit a biologist's thumb and was euthanized, as required by public health protocol. None of the wolves tested positive for rabies or brucellosis (M. R. Johnson, Wildl. Vet. Resour., Gardiner, Mont., pers. commun.). The 1996 reintroduction, including the pre- and post-monitoring phases up until the release of wolves into Idaho and introduction to pens in YNP cost federal agencies $267,000. Shutdowns of the U.S. government from October 1995 until early January 1996 interrupted fiscal contracts with British Columbia and for aircraft support. Congressional cuts to the USFWS wolf recovery program were made expressly to prohibit the 1996 reintroduction. Private conservation groups (Wolf Education and Research Center, Boise, Id.; Defenders of Wildlife, Washington D.C.; and Yellowstone Association, Mammoth, Wyo.) responded by providing about $100,000 to fund cooperative agreements with British Columbia and for aircraft support and other services, without which the project would not have proceeded.

Gray wolf in a holding kennel in Switzer Provincial Park near Hinton, Alberta, 1995. Photo courtesy of U.S. Fish and Wildlife Service.

Release

In January 1995, 7 males and 8 females were released into Idaho (Fig. 1). Release was about 2 months later than had been planned. Weather and a court order delayed the first releases, causing the wolves to spend nearly 90 hours in their shipping boxes. In all subsequent releases wolves spent <24 hours in shipping boxes. Meanwhile in YNP, 3 groups of 6, 5, and 3 wolves (9 M, 5 F) were each placed in separate pens that had been constructed near a maintained highway in the northern part of YNP. These wolves were fed road-killed ungulates until the pens were opened in late March. The wolves were allowed to exit the pens at their own pace. Some did not leave for about a week and then only after larger openings were provided (M. K. Phillips and D. Smith, Natl. Park Serv., Yellowstone Park, Wyo., pers. commun.). The delay in capture of wolves in Canada, when added to the planned acclimation period of 8 weeks, meant that YNP wolves were in captivity during the breeding season, despite efforts to avoid this.

In January 1996, 11 males and 9 females were released into Idaho (M. D. Jimenez, Nez Perce Tribe, Lapwai, Ida., pers. commun.). In YNP, 4 groups of 6, 5, 4, and 2 wolves (6 M, 11 F) were placed in pens. They were released in early April. Two groups were allowed to exit their pens, 1 in northern and another in western YNP. One other group was transported to the recently vacated pen in western YNP and then allowed to exit. Another pair was immobilized and left to awaken in southern YNP in what was considered a modified quick release.

Status of reintroduced wolves

All wolves were monitored using standard radiotelemetry techniques. No wolf moved outside the experimental area in which it was released.

Central Idaho. Actions of the Idaho State Legislature prohibited the Idaho Department of Fish and Game from any involvement in wolf recovery except to help develop the EIS and to control nuisance animals. The Nez Perce Tribe completed an acceptable wolf management plan and is cooperating with the USFWS to monitor and manage wolves in Idaho. Rugged terrain and limited ground access greatly hamper monitoring of Idaho wolves. Wolves have been located via aerial telemetry about every 3 weeks; they are rarely observed during flights (M. Jimenez, Nez Perce Tribe, Lapwai, Ida., pers. commun.).

Wolves reintroduced in Idaho traveled widely and generally northward, but most remained on public

land within the core reintroduction area (M. Jimenez, Nez Perce Tribe, Lapwai, Ida., pers. commun.). Four Idaho wolves died; 1 was illegally shot; 1 was killed by a mountain lion; 1 was accidentally killed during an agency wolf-control action; and 1 death is being investigated. One wolf has not been found since March 1995 but 30 others are being monitored. No pups were born in 1995. Movement patterns suggest that 8 pairs (5 pairs from wolves released in 1995 and 3 pairs released in 1996) might be raising pups in 1996, but at this time only 3 litters have been confirmed (Fig. 1). One pair, near the northern border of the Idaho experimental area includes a wolf that probably dispersed naturally into the area. As of 1 August 1996 we estimated that ≥31 adults and ≤40 pups may be in Idaho. No livestock were killed by wolves in 1995, but 3 calves were killed by a wolf in June 1996. While an attempt was being made to capture that wolf, it accidentally drowned. No Idaho wolves have been captured or moved in other management actions and no land-use restrictions have been imposed.

Yellowstone. Wolves in the YNP area are monitored weekly by the NPS (M. Phillips and D. Smith, Natl. Park Serv., Yellowstone Park, Wyo., pers. commun.). Of the 7 groups released, all but 1 breeding pair remained together, unless a breeding member died. All groups but one tended to remain near their pens before traveling more widely, generally north. While most made some long range exploratory moves, all but one (it was brought back) of the intact packs returned to establish home ranges in the vicinity of their pens. Territory boundaries are still being established as the packs explore, establish routines, and react to one another's presence. Of the 31 wolves released and 23 born, 9 wolves have died. Three were illegally shot, and 2 were struck by vehicles. Two males from different 1995 packs that had denned and possibly a new-born litter from one of those packs were killed by a wolf pack released in 1996 that did not den. One male was killed by Animal Damage Control when it attacked sheep again after being moved for killing sheep. A newly released female carrying 6 fetuses died in April 1996 after being burned by a natural thermal feature. Five mortalities occurred inside YNP and 4 outside. In July 1996, one 3-month-old pup was accidentally trapped and disabled in a control action. It was placed in a wildlife research and educational facility (Wildlife Science Center, Forest Lake, Minn.).

Wolves released in YNP twice killed livestock outside the Park. In January 1996, a 1995-released male dispersed out of YNP and killed 2 sheep 40 km north of the park; 2 other sheep were reported missing. The wolf was moved back to YNP, held about 2 weeks, and then released in the south-central portion of YNP. Within a week he traveled >96 km back to the same ranch, attacked another sheep, and then was killed by federal agents. We suspect that a nearby colony of captive wolves was the primary attractant to this area because other wolves have since visited the same locality. In June and July 1996, the alpha female of the only pack that did not remain together after its release killed 8 ewes and 2 lambs 45 km northeast of YNP. Alone, she gave birth to 5 pups in late April southwest of Nye, Montana, but was joined by a lone male from a neighboring pack in late June 1996. The male was captured in July and returned to a pen in YNP. One of her pups was accidentally trapped and was too injured to return to the wild. Attempts to capture the female and her 4 pups are continuing. In addition to the livestock attacked, one pack killed a lion-hunting dog 40 km northeast of YNP in December 1995. As policy, control is not conducted for depredations on pets until the second incident and then only when wolves search out pets at residences. Compensation was paid for lost livestock and for expected weight loss in 7 lambs that were orphaned. Compensation is not paid for pets.

On 3 occasions wolves have been relocated back into YNP to reduce the potential for conflicts and enhance population recovery. In April 1995 a mated pair left YNP, traveled northeast to the edge of agriculture areas and the male was illegally killed. The female gave birth to 8 pups near Red Lodge, Montana, where future conflicts were likely and chances of survival apparently low. She and the 5-week-old pups were moved into a pen in YNP and released in October 1995. They were immediately joined by a dispersing male from a nearby pack. This group is raising 3 pups in YNP in 1996 and, at 11 members, is the largest pack there. In June 1996, a pack that moved northeast of YNP in early 1996 and later denned on private land east of Nye, Montana was moved to YNP. The 3 adults and 3 pups will be transferred to a new pen in the southern part of YNP and released again this fall. A young male from that pack was not captured at that time. He traveled about 16 km west and joined a lone female with pups that had killed sheep near Nye, Montana. He was trapped and moved back to YNP in July. Two yearling wolves from the one pack that initially separated, later reunited 50 km north of YNP and were repeatedly seen chasing livestock. In June 1996, they were darted, moved into a pen in YNP, and will be released in the southern part of YNP.

There have been no land-use restrictions outside of YNP and virtually none inside. Public access was restricted near the pens while the wolves were held. In addition, a temporary no-stopping zone was established along a 6.4-km section of highway in the north-

ern portion of YNP in 1995 after an adult female was seen excavating a den near the road. She moved after a few days and did not produce pups, and the restriction was lifted. It was estimated that in 1995 about 4,000 YNP visitors saw or heard wolves, and in 1996 the rate of observation may be even higher (R. McIntyre, Natl. Park Serv., Yellowstone Park, Wyo., pers. commun.). According to newspaper reports, local businesses were profiting from the growing interest in wolves.

Discussion

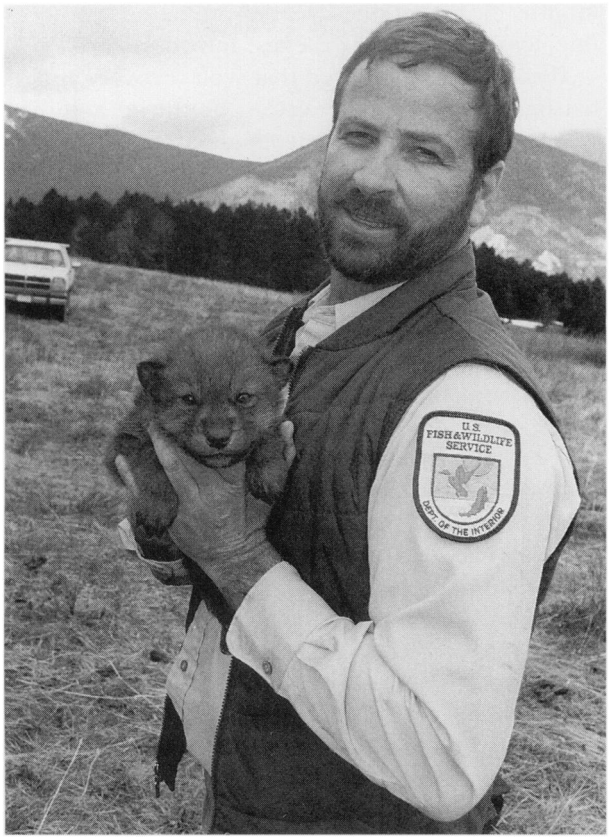
It is too early to judge which of the reintroduction approaches will result in reaching 10 breeding pairs the quickest; a thorough analysis and comparison of the 2 strategies will be made after more data are collected. At this time, however, we can say that results from both approaches have exceeded expectations. In Idaho there are up to 8 breeding pairs that could produce as many as 40 pups in 1996. In addition there are ≤15 adult wolves in the Idaho recovery area that could form additional breeding pairs and produce pups in 1997. We expect >10 breeding pairs in Idaho by June 1997. These wolves primarily use lands administrated by the U.S. Department of Agriculture Forest Service. In the past 18 months, only 1 of the reintroduced wolves in Idaho has attacked livestock. It was killed after it severely wounded 1 calf and killed 2 others. The producer publicly stated he would refuse any compensation because he did not approve of the wolf program.

Wolf groups released into YNP tended to stay together and restrict their movements more than Idaho wolves did (Fig. 1; Fritts et al. In press). A few wolves appeared to have suffered varying degrees of tooth damage, including loss of canine teeth during confinement. Twenty-three pups have been born. As of August 1996, there were 2 surviving litters from 1995 and 4 surviving litters from 1996. There are 6 existing wolf groups that could produce pups in 1997. One of these was formed by dispersing wolves from 2 groups released in 1995, and we suspect similar situations will occur in 1997. There are <10 wolves that could form additional packs this winter. There are 15 adults, 16 yearlings, and 14 pups in the YNP area. All wolf groups use YNP primarily, in part because of management actions that returned wolves to YNP. To date 10 sheep have been killed and 2 are missing because of 2 wolves. One man who mistakenly shot a wolf immediately turned himself in, and he was fined $500. Another man who tried to avoid detection after shooting and skinning a wolf was found guilty by a local jury and sentenced to 6 months incarceration, 1 year of probation, a $10,000 fine, loss of hunting privileges, and court costs.

The 1994 EIS estimated that wolf recovery and delisting, using reintroduction, could be achieved within 8 years. Minimal wolf-human conflicts were expected because wolves would be managed to populate remote areas with few livestock. The estimated cost from the beginning of reintroduction in fall 1994 until de-listing in 2002 was $6.7 million. The EIS estimated that wolf recovery relying on natural dispersal would be more prolonged and less predictable but would likely occur by about 2025. Natural dispersal would have resulted in more conflicts than reintroduction because of reduced management flexibility in management of naturally dispersing wolves and because dispersing wolves would colonize agricultural areas as they moved southward toward central Idaho and YNP. The cost of achieving wolf recovery through natural dispersal between 1994 and 2025 was estimated to be $10–15 million.

The estimated cost of recovering a wolf population in Montana, Idaho, and Wyoming from 1973–2002, using reintroduction, was estimated to be about $12 million or about 5 cents/American citizen. These costs include the management and study of naturally occurring wolves in northwestern Montana (Bangs 1991), extensive planning, studies, research, and public involvement required by Congress, an extensive public information program, reintroduction, and management of wolves in all 3 states until de-listing occurred.

The wolf recovery program is ahead of schedule, under budget, and is occurring with less conflict than predicted, so reintroduction will not occur in 1997. Despite the biological success of reintroduction and the flexibility the experimental population rules have given the USFWS in addressing local concerns about wolves, wolf recovery remains controversial to an extent that is out of proportion to wolves' impacts on people. Litigation by the American Farm Bureau et al., Sierra Club Legal Defense Fund and Audubon et al., Montana Stockgrowers et al., and 2 Wyoming residents is ongoing. Rulings on this litigation could result in the removal of all reintroduced wolves from the Idaho and YNP experimental areas. Local elected officials at the state and federal level often comment on the reintroduction effort, usually negatively. They most often express concern about program cost but at the same time request more resources be directed to addressing local concerns. Budget cuts directed at the program resulted in the loss of 3 of 5 project personnel from the lead USFWS office in Helena, Montana, during late 1995 and early 1996. The wildlife agencies in the states of Montana, Wyoming, and



U.S. Fish and Wildlife biologist with gray wolf pup from first litter of wolves released in Yellowstone. Photo courtesy of U.S. Fish and Wildlife Service.

Idaho have not been able or willing to assume wolf management authority due to controversy and concerns over the security of federal funding. Although state law in Montana protects wolves, there is limited active state involvement in the program. Wyoming state law classifies wolves as predators, preventing management by the Wyoming Game and Fish Department. Similarly, Idaho state law prevents nearly all involvement by the Idaho Department of Fish and Game.

Every wolf-related issue, whether based on scientific opinion or conjecture, results in extensive press coverage and emotional public debate. This encourages the false public perception that wolves are somehow less manageable than other large predators that live in the northwestern United States (Fritts et al. 1994). This contentious atmosphere could subside as local residents become accustomed to living with wolves, and as the species becomes less "newsworthy." Wolf restoration will for some time continue to be unnecessarily controversial, expensive, complex, and challenging. We predict that controversy will continue well beyond the time when wolves are recovered and removed from federal protection, although the focus will shift from whether and how wolves should be restored to how wolves should be managed (Mech 1995), particularly in relation to state-regulated ungulate hunting programs. Despite the ongoing controversy surrounding wolf recovery as the 20th century comes to a close, we are convinced that 50 years from now the Idaho and YNP wolf reintroductions will be viewed as a milestone in carnivore conservation. We are proud to have had the privilege of working with colleagues who strived over the past 25 years toward the project's success.

Acknowledgments. Many people contributed to wolf restoration in the western United States, but W. Brewster deserves special recognition. Others who deserve specific recognition include V. Asher, R. Askins, D. Baldes, D. Boyd, R. Barbee, D. Carney, R. Demarchi, J. Dennis, A. Dood, J. Duffield, M. Fairchild, H. Fischer, J. Fontaine, J. Gunson, J. Hansen, D. Harms, E. Holman, M. Jimenez, T. Kaminski, T. Koch, L. Kronemann, G. Lajeunesse, S. Laverty, C. Mack, J. Mack, D. Mech, W. Mott, C. Niemeyer, W. Paul, C. Perry, M. Phillips, D. Pletscher, J. Rachael, R. Ream, L. Robinson, D. Smith, J. Talbott, C. Tenney, J. Till, F. Thompson, J. Turner, J. Varley, J. Weaver, A. Whitelaw, M. Zallen and, of course, their families who support their efforts. We thank M. Phillips, D. Smith, M. Jimenez, and C. Mack for use of data on the wolves that were released in Yellowstone National Park and central Idaho. This paper is dedicated in memory of U.S. Fish and Wildlife Service Director Mollie Beattie for her leadership, courage, and undaunted support of the wolf recovery program.

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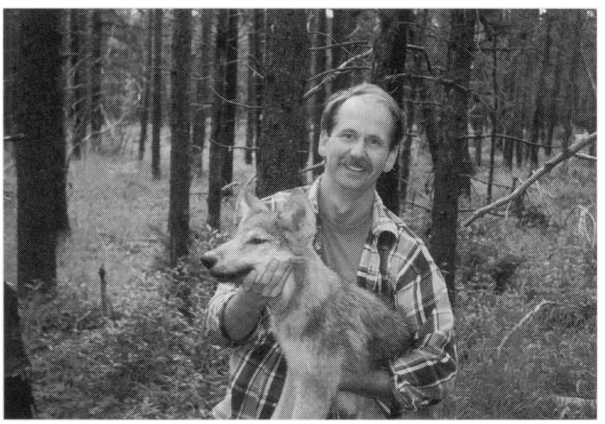

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