White-haired Goldenrod (*Solidago albopilosa*)

An herbaceous plant in the aster family (Asteraceae), *S. albopilosa* is endemic to outcrops of Pottsville sandstone found within eastern Kentucky's Red River Gorge area of Menisee, Powell, and Wolfe Counties. It grows primarily in rockhouses (natural, shallow, cave-like formations) and beneath overhanging ledges. Intensive recreational use of these outcrops is damaging *S. albopilosa* habitat, and the FWS has proposed to list the species as Endangered (F.R. 4/24/87).

Most of the Red River Gorge is within Daniel Boone National Forest, and it has been designated a National Geological Area for its unusual topography. (There are several small, private inholdings within the gorge, but the U.S. Forest Service plans to acquire those judged most significant.) The geological features (rockhouses) with which *S. albopilosa* is associated are common in this area, but only a small number currently support the species.

Red River Gorge is a recreational area that draws approximately 240,000 "visitor-use days" per year. The rockhouses are very popular destinations or sites for hiking, camping, climbing, and picnicking. Also, because of the presence of Indian artifacts, collectors dig in even the most remote rockhouses. These activities have resulted in intensive disturbance to *S. albopilosa* habitat. The species has been extirpated from some sites and is being damaged at most of the others.

A threat of a more potential nature is the proposed Red River Lake project. Although the high-water level would not inundate rockhouses, the species' habitat could be damaged by associated construction and recreational activities. The proposed impoundment, however, is opposed by the State of Kentucky and is no longer being pursued as a viable project by the U.S. Army Corps of Engineers. In the event that the proposal is someday revived, plans for protecting *S. albopilosa* would need to be incorporated; however, reauthorization is not expected.

If the species is listed, effects on Forest Service management should be minimal. They would consist primarily of measures to reduce visitor damage at the most important *S. albopilosa* sites and careful planning of any future logging operations.

Aleutian Shield-fern (*Polystichum aleuticum*)

P. aleuticum, a perennial in the fern family (Polypodiaceae), is an extremely rare plant known from only two sites in Alaska's Aleutian Islands. This diminutive species arises from a stout, dark brown rhizome and sends out fronds that reach only about 6 inches (15 cm) high. There are no closely related ferns in North America or northern Asia. Grazing, soil instability, and the species' low numbers threaten it with extinction, and the fern has been proposed for listing as Endangered (F.R. 4/24/87).

For many years, *P. aleuticum* was known only from a 1932 collection on Atka Island. Surveys conducted in 1984 and 1985 were not successful in finding the population, although the original collection site is not known and could have been overlooked. On the other hand, reindeer, non-native animals introduced to Atka in 1914, have overgrazed the west end of the island and may have contributed to the fern's apparent disappearance. In 1975, a second *P. aleuticum* population of only 15 plants was discovered on Adak Island near the summit of Mt. Reed. The site consists of treeless, alpine talus slopes vegetated with low-growing herbs and prostrate shrubs.

Caribou were introduced on Adak in 1958, and up to 400 now occur on the island. Because they are present in the Mt. Reed area, caribou may be affecting *P. aleuticum* by grazing or trampling. A more likely limiting factor is the instability of the alpine habitat on Mt. Reed due to wind erosion and solifluction (soil movement).

Both Atka and Adak Islands are within the Aleutian Islands Unit of the Alaska Maritime National Wildlife Refuge. However, part of Atka was selected and conveyed to the Atxam Native Corporation under the Alaska Native Claims Settlement Act of 1971. The northern half of Adak (including Mt. Reed), though still within the refuge, is a U.S. Naval Reservation within which the Navy has development rights. These rights can be exercised if compatible with the refuge, and discussions with the Navy have revealed no conflicts.

The listing proposal identified several immediate measures to conserve and recover *P. aleuticum*, and some have already begun. Intensive surveys for the plant are under way, and "wanted" posters have been distributed to all refuge and Naval personnel and interested private citizens. Future activities may include fencing of fern sites to exclude caribou and propagation of the plant to create a supply for reintroduction.

* * *

Available Conservation Measures

Among the conservation benefits provided by a listing as Threatened or Endangered under the Endangered Species Act are: protection from adverse effects of Federal activities; prohibitions against certain practices; the requirement for the FWS to develop and implement recovery plans; the possibility of Federal aid to State and Commonwealth conservation departments that have signed Endangered Species Cooperative Agreements with the FWS; and the authorization to seek land purchases or exchanges for important habitat. Listing also lends greater recognition to a species' precarious status, which encourages further conservation efforts by State and local agencies, various organizations, and individuals. Section 7 of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for listed species. It also requires these agencies to ensure that any actions they authorize, fund, or carry out are not likely to jeopardize the survival of a listed species. If any agency finds that one of its activities may affect a listed species, it is required to consult with the FWS on ways to avoid jeopardy or adverse modification of Critical Habitat. For species that are *proposed* for listing and for which jeopardy or adverse modification is found, Federal agencies are required to "confer" with the FWS, although the results of such a conference are non-binding. Potential conflicts almost always are avoided by planning early and using the Section 7 process.

Further protection is authorized by Section 9 of the Act, which makes it illegal to take, possess, transport, or engage in interstate or international trafficking in listed animals, except by permit for certain conservation purposes. For listed plants, the rule is different; the trafficking restrictions apply, but collecting of listed plants without a permit is prohibited only on lands under Federal jurisdiction. Some States, however, have their own laws protecting listed plants and animals that may be more restrictive.

Parvovirus and Heartworm Found in Minnesota Wolves

L. David Mech and Steven H. Fritts[1]

Just when it looked like the main threat to the Minnesota wolf (*Canis lupus*) population was long-term human development of habitat, two new, more immediate problems have appeared. Canine parvovirus (CPV) and heartworm (*Dirofilaria immitis*) recently were documented in Minnesota wolves. Both are potentially fatal and are new to wild gray wolves. Their threat to the population is unknown but could be serious.

CPV is a newly discovered disease thought to be an escaped laboratory artifact, and was first found in 1976 in domestic dogs. It raced through the dog population and killed numerous pets — especially pups — before a vaccine was developed. Affecting primarily the digestive system, it is spread via infected feces. CPV had reached the dog population in Ely, the heart of the Minnesota wolf range,

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Minnesota Wolves

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by 1979. In 1983, CPV killed 11 of 12 wolf pups and yearlings in a captive wolf colony just north of Minneapolis, thus demonstrating that CPV could be just as serious to wolves as to dogs.

Serologic studies of wolves live-trapped in northern Minnesota then showed that CPV had hit the wild wolf population. By testing serum for antibodies to the disease, we were able to conclude that about half of the surviving wolves in northern Minnesota had been exposed to CPV from 1977 through 1983. This technique, however, does not indicate how many of Minnesota's 1,200 wolves might have perished from the disease, and that remains a mystery.

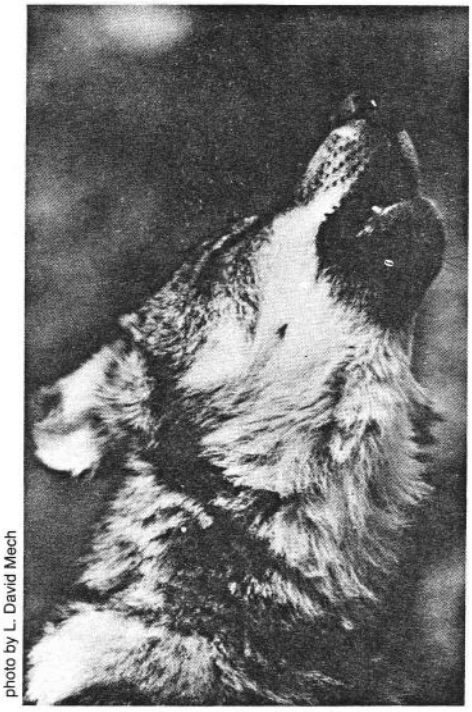

photo by L. David Mech

gray wolf

That CPV does adversely affect wild wolves was documented in nearby Wisconsin in 1985. There, Wisconsin Department of Natural Resources biologist Dick Thiel found a dead, emaciated wolf that a few months earlier had had an active CPV infection. A single mortality may not seem like much of a problem, but, to a critically low wolf population that has not been able to exceed 30 members since it began to recolonize the State about 1975, the loss of one animal can be critical.

The Minnesota wolf population can withstand considerable mortality from many causes; however, fatalities along the periphery of the Minnesota range, where wolf numbers are lowest, would minimize continued dispersal of animals to Wisconsin. This could then impede or prevent wolf recovery in Wisconsin and Michigan.

The same potential problems also could result from heartworm. This parasite is spread from animal to animal via mosquitoes and has gradually made its way northward from the southern United States. It has infected dogs in central Minnesota for several years, and was first found in Ely dogs (within the wolf range) during 1986. On December 31, 1986, a blood sample from an 8-year-old wild wolf in the Ely region, No. 6021, showed larval heartworm. The wolf died as a result of capture in an illegal snare, and an autopsy showed several large adult worms in her heart.

Heartworm larvae are shed by the adult worms that inhabit the heart chambers, although they also can live elsewhere. As the host ages, the worm enlarges and the chances of new infections via more mosquito bites also increase. Thus, greater and greater strain is placed on the heart. For animals like the wolf that earn their living by running, this strain might greatly reduce chances of catching prey and result in premature death.

In 1975, Glynn Riley and Roy McBride wrote about the red wolf, just before its demise in the wild from several possible causes: "Heartworms (*Dirofilaria immitis*) have been present in all 27 wolves examined...," and "Red wolves three years of age and older usually were heavily parasitized by heartworms, sometimes to the point that the heart valves could not close" ("A Survey of the Red Wolf," pp. 263-277 in *The Wild Canids* by M. W. Fox).

Conceivably, either heartworm or CPV could diminish productivity of an affected animal or survival of its offspring by limiting its hunting abilities. In this respect, Wolf 6021's breeding history is of interest. Born about 1979, Wolf 6021 produced surviving pups in summer 1982 and 1983, and probably also in 1984. In 1985 and 1986, if 6021 bore pups, none survived beyond the first month, even though the wolf held the same territory and mate. No evidence is available connecting this animal's decreased productivity with her heartworm infection, but the possibility of such a link is strong.

Without more information about the natural history of both heartworm and CPV in wild hosts, and the hosts' responses to them, it is impossible to predict the ultimate consequences of these pathogens. Fortunately, in at least part of Minnesota, 20 years of baseline information on natural wolf population fluctuations is available to compare with any changes these two diseases may bring in wolf numbers.

Such a comparison can indicate whether medical measures must be developed to deal with these two new threats or whether the wolf population can contend with them. The answer should become apparent within the next few years. Meanwhile, the Patuxent Wildlife Research Center, in collaboration with the National Wildlife Health Laboratory, will continue to monitor the incidence of these pathogens in the wolf population.

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The Role of Captive Propagation in the Recovery of the Mississippi Sandhill Crane

Janet L. McMillen[1], David H. Ellis[1], and Dwight G. Smith[2]

The Mississippi sandhill crane (*Grus canadensis pulla*), darkest colored of all *G. canadensis* populations, was described as a distinct subspecies in 1972. Although its range formerly extended at least from Louisiana into Alabama, the single remaining wild population is confined to southern Jackson County in southwestern Mississippi.

The Mississippi sandhill crane was officially listed in 1973 as Endangered because of its small population (less than 50 individuals), its limited distribution, and the lack of suitable habitat. Habitat destruction and human disturbance led to its decline. Thousands of acres of nesting habitat were altered for private and commercial development. More important, large tracts of habitat were drained and planted in dense stands of slash pine (*Pinus eliottii*) for pulpwood. Access roads, drainage ditches, and highways were built across savannas, increasing disturbance, interrupting the natural flow of water, and subjecting the bird to increased human-related mortality.

A recovery program is under way to preserve the bird in captivity and augment the wild population. Key components of the effort include: (1) acquisition and management of habitat on the Mississippi Sandhill Crane National Wildlife Refuge; (2) development of a captive flock at the Patuxent Wildlife Research Center in Laurel, Maryland, for production of eggs and young; and (3) release of Patuxent-produced stock into the wild.

Habitat Acquisition and Management

The Mississippi sandhill crane NWR was officially established in Jackson County, Mississippi, in 1975 when the Fish

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