

# ENDANGERED SPECIES

## Technical Bulletin

U.S. Department of the Interior  
Fish and Wildlife Service

### Reintroduction of Gray Wolves to Yellowstone National Park and Central Idaho

by Edward E. Bangs and Steven H. Fritts

Wolves were once one of the most widely distributed land mammals on earth. In North America, gray wolves (*Canis lupus*) historically occurred in almost every habitat north of what is now Mexico City. However, as European settlers decimated wild ungulate populations and replaced them with livestock, wolves and other large predators that occasionally attacked livestock were persecuted. In addition to the real and perceived conflicts with livestock, old myths had portrayed wolves as evil and satanic. For these reasons, it is not surprising that most people during the settlement era viewed wolves in an extremely negative context.

Wolf persecution and eradication were relentless and conducted with almost hysterical zeal. Wolves were not just shot, trapped, and poisoned but burned alive, dragged behind horses, and mutilated. By 1930, government predator eradication programs had eliminated wolf populations from the western United States. Similar attitudes resulted in the elimination of wolf populations from the southern portions of the western Canadian provinces by the 1950's. The fact that these events happened within the lives and memories of many western residents strongly affects the social and political climate surrounding wolf recovery efforts today.

#### Natural Wolf Recovery

In the 1960's, after scientific wildlife research began to dispel many of the



Fish and Wildlife Service photo

negative myths surrounding predators, the first calls for reintroduction of wolves to Yellowstone National Park were made. About the same time, Canadian wildlife management agencies took steps to encourage reestablishment of wolf populations in parts of southern British Columbia and Alberta by eliminating bounties and restricting wolf hunting and trapping. Throughout the 1960's and 1970's, lone wolves were occasionally sighted or killed in the northern Rocky Mountains of Montana, Idaho, and Wyoming (Weaver 1978, Ream and Mattson 1982). While Canadian wolf populations continued to expand southward, it was not until 1986 (55 years after eradication) that wolves again produced pups in the western United States (Ream et al. 1989). By 1993, the wolf population in

northwestern Montana had increased to about 50 wolves in 5 packs. No wolf packs have been documented in other areas of the western United States, although lone wolves continued to be reported in Wyoming, Idaho, Washington, and other areas.

In 1988, the U.S. Fish and Wildlife Service (FWS) established an interagency wolf recovery program to assist natural recolonization in Montana (Bangs 1991). The program strongly emphasized public education and information. Controversy over wolves and their management was still largely an issue of symbolism, with strong emotion, rumor, and myth on both "sides" of the wolf recovery issue. As a result, illegal killing by the public was the single greatest threat to wolf recovery in Montana. *(continued on page 18)*



## Regional News

Regional endangered species staffers have reported the following news:

**Region 1** - On July 27, the Fish and Wildlife Service (FWS) issued two no-

jeopardy biological opinions for the National Marine Fisheries Service (NMFS) and Bureau of Indian Affairs (BIA) allowing commercial net fisheries to begin for

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### U.S. Fish and Wildlife Service Regions

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steelhead (tribal fisheries only), salmon, herring, anchovy, and dogfish shark in ocean and bay waters around the State of Washington. The consultations, conducted under Section 7 of the Endangered Species Act, were initiated in late May. At issue was the potential for take of the Threatened marbled murrelet (*Brachyramphus marmoratus*) in gillnets and purse seines along with the targeted fish.

The biological opinions allow each fishery (treaty and non-treaty) an incidental take of five marbled murrelets. Neutral and volunteer observers on a small percentage of the boats will total the marbled murrelet mortalities and retrieve the birds. If the limit of five is reached, the agencies will reinitiate consultation with the FWS. A group of FWS, NMFS, BIA, Washington Department of Wildlife, Washington Department of Fisheries, and environmental and fishing industry representatives will meet weekly to review observer data and possibly modify the fishery to avoid take.

\* \* \*

Steve Goodbred of the FWS Sacramento Field Office attended the western division of the American Fisheries Society meeting, including sessions on stream habitat evaluation and sensitive aquatic ecology. The opening session featured speakers such as Tom Harris (known for his coverage in the *Sacramento Bee* of selenium poisoning from irrigation wastewater flowing into Kesterson National Wildlife Refuge), Marc Reisner of *Cadillac Desert* fame, and Van Stauter, President of Fox News. One of the major messages of the conference was studying and managing aquatic ecosystems for biodiversity and landscape ecology, not just single species or habitats.

\* \* \*

A biologist from the FWS Carlsbad (California) Field Office met with representatives of the City of San Diego and the Navy at the Naval Air Station in Miramar regarding vernal pools that have formed on top of a landfill on the base. The landfill had been capped with clay soil that eventually settled to form de-

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# Mollie Beattie Sworn in as Director of the Fish and Wildlife Service



photo by Tami Heilemann

Mollie Beattie was sworn in September 14 as Director of the Fish and Wildlife Service (FWS) following confirmation by

the Senate September 10. Ms. Beattie, a veteran State natural resources official from Vermont, becomes the first woman to direct the 9,000-person agency.

"Mollie Beattie brings experience, commitment, and energy to the U.S. Fish and Wildlife Service," said Interior Secretary Bruce Babbitt. "She is certain to provide the strong leadership we need to conserve our fish and wildlife resources for present and future generations."

Before President Clinton nominated her for the FWS post, Ms. Beattie was executive director of the Richard A. Snelling Center for Government in Vermont. She served as deputy secretary for Vermont's Agency of Natural Resources in 1989-90; Commissioner for the Vermont Department of Forests, Parks and Recreation in 1985-89; and Program Director and Lands Manager for the

non-profit Windham Foundation in 1983-85. Ms. Beattie earned a B.A. in Philosophy from Marymount College in Tarrytown, N.Y., an M.S. in Forestry from the University of Vermont, and an M.P.A. from the Kennedy School of Government.

The major responsibilities of the FWS are migratory birds, endangered species, freshwater and anadromous fish, and certain marine mammals. It manages 491 National Wildlife Refuges, covering more than 91 million acres, and 84 National Fish Hatcheries. The FWS mission includes enforcement of Federal wildlife laws, administration of the Endangered Species Act, wetland protection and management, and distribution of Federal aid to the States for fish and wildlife restoration.

## Regional News

(continued from page 2)

pressions that hold water and support the Endangered San Diego mesa mint (*Pogogyne abramsii*). Recently, cracks formed in the clay and started leaking methane gas. The Air Pollution Control District has issued a violation notice and is asking Miramar to re-cap the landfill. This action will require a Clean Water Act 404 permit. The FWS advised the Navy and the City of San Diego that a Section 7 consultation will be required to address impacts to the mesa mint.

\* \* \*

The FWS Ventura (California) Field Office has issued a no-jeopardy biological opinion for the Rail-Cycle/Bolo Station Landfill, a large-scale landfill operation that would dispose of non-hazardous solid waste from southern California coastal cities in a 4,800-acre (1,940-hectare) area of the Mojave Desert near Amboy, California. Most of the project site is not desert tortoise (*Gopherus agassizii*) habitat, but project implementation would result in an estimated inci-

dental take of up to 18 desert tortoises. According to a biologist familiar with the project, trash from the Los Angeles Basin would be buried in this giant landfill at an old railroad station stop "on a scale that most people cannot envision."

\* \* \*

The FWS Law Enforcement Office in Torrance, California, is developing a brochure and public service announcement for radio and television to alert members of Asian communities in the Los Angeles area about Endangered Species Act protection for desert tortoises and sea turtles, following the conviction of two men who took nine tortoises from the Mojave Desert as food for a Cambodian wedding ceremony. The men were fined \$5,000 each.

In an effort to prevent future violations, FWS Special Agents are working with public and private agencies to prepare alerts in several languages, including Cambodian, Vietnamese, and Laotian.

A California Highway Patrol Officer, Dan Laza, initiated the investigation on May 7 when he pulled over a 3-car cara-

van driving slowly along Interstate 15, near Barstow, apparently looking for more tortoises. After being stopped, a passenger tried to stuff under the rear seat a large, white rice-bag that contained round, hard, moving objects—five desert tortoises. A second bag contained four more. Officer Laza then contacted a Bureau of Land Management (BLM) ranger and a California Department of Fish and Game warden. The cases were prosecuted before U.S. Magistrate Kirtland L. Mahlum in Barstow. The Cambodian nationals also face State charges of failure to appear in court and possession of an endangered species.

All of the desert tortoises are being tested for Upper Respiratory Disease. The three tortoises that had been removed from BLM study plots will be returned to their burrow sites, health permitting. The other six will be placed through the tortoise adoption program.

\* \* \*

In early July 1993, the Reno Field Office and the Seattle national Fisheries Re-

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# Cooperative Program Pays Off for the Endangered 'Alala

by Barbara Maxfield

When only 24 birds make up a species' entire population, the addition of 7 chicks is a noteworthy event. And it's one that has all the parties involved — from the State of Hawaii, the U.S. Fish and Wildlife Service (FWS), the Zoological Society of San Diego, The Peregrine Fund, Greenfalk Consultants, National Audubon Society, and Hawaii Audubon Society to the private landowners whose ranches support the last remaining wild population — smiling broadly. The object of their cooperative efforts is the 'alala or Hawaiian crow (*Corvus hawaiiensis*), one of the most endangered birds in the world, according to the National Academy of Sciences' National Research Council.

For almost 10 years, differing opinions on appropriate management of wild 'alala populations led the landowners to restrict access to their property and the 'alala. A lawsuit filed by the Sierra Club Legal Defense Fund in April 1991 on behalf of the National and Hawaii Audubon Societies against the landowners and the FWS sought "to force the Federal government to take action to save the 'alala before it becomes extinct." In an effort to resolve the lawsuit, the parties involved — plus cooperators from across the nation — have joined in a program to benefit the 'alala.

## Decline From Abundance

Once one of three *Corvus* species in the Hawaiian Islands, the 'alala is the only remaining Hawaiian crow. Its ancestral origins are unknown, but it is probably a descendant of a *Corvus* ancestor from the Australasian region<sup>1</sup>. Although similar to North American crows, the 'alala has a bulkier bill and a duller black color, with tinges of brown in the wings.

The Hawaiians considered the 'alala an 'aumakua or spirit. When Captain Cook

arrived in the islands in the 1770's, he was not allowed to collect it since such an action would hurt or offend the spirit. (The earliest 'alala specimen was taken during the visit of Cook in 1778, despite the warning.)

The range of the 'alala apparently was relatively restricted even when populations were abundant. Its historic range is a narrow v-shaped belt of dry woodlands, o'hia (*Metrosideros polymorpha*) forests, and moist o'hia-koa (*Acacia koa*) forests at elevations of about 1,650 to 5,900 feet (500 to 1,800 meters) on the Island of Hawai'i (the "Big Island"), stretching from Hualalai southward to South Kona and northwest again to Kilauea Crater.

Although the species was described as "abundant locally" in the late nineteenth century, 'alala populations shortly began to fall<sup>2</sup>. The exact causes of the decline and their relative importance may never be known, but scientists have identified several probable factors:

- **Habitat modification.** The relatively narrow range of the species suggests a specific habitat preference for open wet o'hia/koa forests or dry o'hia forests. Lava flows, agriculture and ranching, and commercial logging have greatly reduced this forest habitat. In like manner, the diverse understory of fruit-bearing trees and shrubs that serve as the 'alala's primary food source has been heavily impacted by introduced ungulates such as cattle, sheep, and pigs as well as by non-native plants.

- **Predation.** Although early Polynesians did use crow feathers in some of their ceremonies, the brightly colored honeycreeper feathers were more popular. Arriving Europeans hunted crows for sport, and farmers shot them as agricultural pests. Mongooses, feral cats, and roof rats also prey on eggs and/or young crows. Even the pueo or Hawaiian short-eared owl (*Asio flammeus sandwichensis*) and the 'io or Hawaiian hawk (*Buteo*



Fish and Wildlife Service photo

Adult 'alala at the Olinda Endangered Species Propagation Facility on Maui.

*solitarius*), a species recently proposed for reclassification from Endangered to Threatened, are probable predators on 'alala chicks.

- **Diseases and parasites.** Introduced diseases, such as avian pox and malaria, appear to have played an important role in the decline of many endemic Hawaiian birds, including the 'alala. Mites have also been documented to parasitize the 'alala.

By 1940, the 'alala was still common within its range, but was declining rapidly. In early 1993, only 12 'alala were known to exist in the wild, all on private land in the Kona District. An additional 11 birds were in captivity at the State of Hawaii's Olinda Endangered Species Propagation Facility on the Island of Maui.

<sup>1</sup> National Research Council, *The Scientific Bases for the Preservation of the Hawaiian Crow*, Washington D.C., National Academy Press, 1992, page 12.

<sup>2</sup> *Ibid.*, page 16.

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## Cooperative Program for 'Alala

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### National Research Council Issues 'Alala Report

Because of the differing views on appropriate management of 'alala, the FWS asked the National Research Council (NRC) in 1991 to review the existing information and develop recommendations for recovering the species. Options considered ranged from bringing all the remaining 'alala into a captive breeding program to leaving the wild population completely undisturbed. The NRC completed its work and filed its report in May 1992.

The information and recommendations contained in the report formed the basis for the Long-Term Management Plan for the 'alala, prepared by the FWS and completed in 1993. This plan was reviewed and endorsed by the newly reinstated 'alala recovery team, and served as the guideline for management during the 1993 'alala breeding season.

### Peregrine Fund Joins Project

In March, the FWS entered into a cooperative agreement with The Peregrine Fund of Boise, Idaho, to carry out part of the plan. The Zoological Society of San Diego and Greenfalk Consultants of Boise, Idaho, subcontracted with the Fund to assist in the project.

Because knowledge about appropriate techniques for incubating 'alala eggs, rearing young, and reintroducing them to the wild is very limited, Greenfalk Consultants was asked to conduct research on similar crow and raven species in Idaho to improve the success rates in working with 'alala. The studies focused on nest manipulation techniques, egg transportation and incubation procedures, and nestling release methods.

The management plan calls for removing the first clutch of eggs from nesting wild 'alala, then incubating, rearing, and releasing at least some of the young back into the wild. Upon the removal of the first clutch, the 'alala will be allowed to raise their second clutch on their own.

This technique is known as double-clutching, and has been used successfully with other Endangered species, such as the California condor (*Gymnogyps californianus*), to bolster population sizes rapidly.

During April of this year, first clutches were collected from the three breeding pairs in the wild. This season's nesting pairs (named Kalahiki, Kealia, and Kiilae after the geographic areas in which they reside) were closely monitored by FWS personnel. Several days after incubation appeared to begin, an FWS biologist scaled the nest tree and removed the eggs for artificial incubation and rearing.

### First Clutch Produces Six Chicks

Four eggs were removed from the Kalahiki nest, three from the Kealia nest, and one from the Kiilae nest. All were flown out via helicopter and taken to a temporary incubation facility, affectionately known as the Egg House. This facility is operated by personnel from the San Diego Zoological Society at a rented house in the town of Captain Cook, Hawaii.

Shortly, the first chick (named *Hiwa hiwa*, Hawaiian for "precious, black, and pleasing to the gods") hatched. Within 2

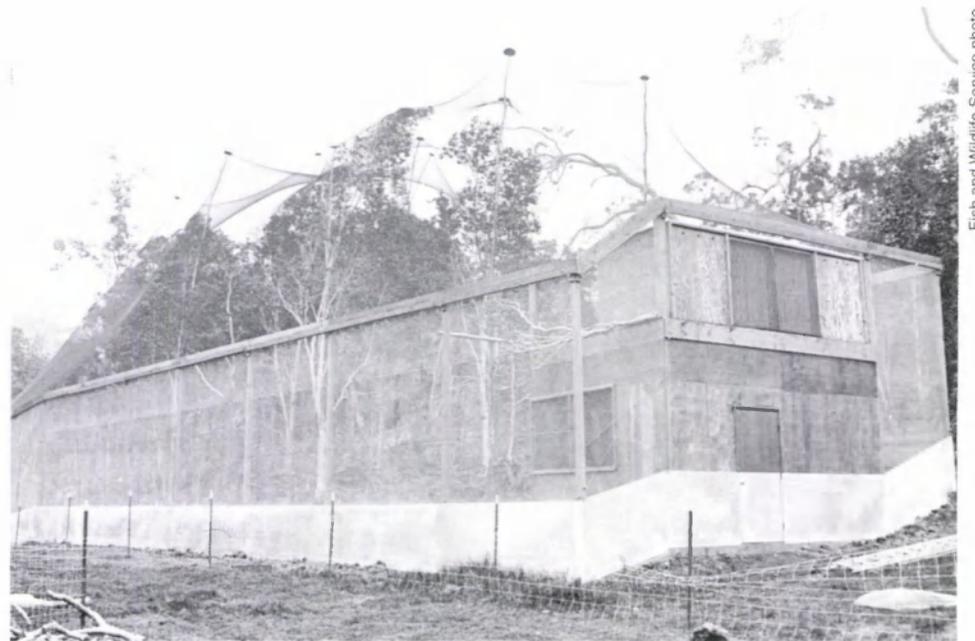
weeks, she was joined by five other chicks. One egg (that of the Kiilae pair) proved to be infertile, and the fourth egg from the Kalahiki pair failed to hatch.

After about 7 weeks of tender, loving care by the San Diego Zoo personnel, the birds outgrew the rearing facility and were ready to be moved. On June 7, the oldest three chicks, all females, were taken to a hacking facility and aviary built by The Peregrine Fund on State land adjacent to the wild 'alala habitat. Two of the other birds, both males, joined them in an adjacent hack box on June 17. The sixth chick joined the captive breeding flock.

### Strengthening the Olinda Flock

One of the priorities of the 'alala management plan is to increase and genetically diversify the captive breeding flock so that it can produce additional birds for restocking wild habitats. The FWS and State of Hawaii entered into a cooperative agreement in September 1992, providing much needed funding to improve the Olinda Endangered Species Propagation Facility.

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The Peregrine Fund built this aviary and hacking facility adjacent to the 'alala habitat to promote interaction between the fledglings and the wild flock.

Fish and Wildlife Service photo

## Cooperative Program for 'Alala

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Fish and Wildlife Service photo

**This hungry 'alala hatchling is one of several surviving chicks produced in 1993.**

On June 18, the sixth chick from the wild flock's first 1993 clutch, a female from the Kealia pair, was flown to Olinda. She will be paired with a male chick hatched at the facility in 1992. Biologists hope she will provide some genetic diversity in the flock to reduce the inbreeding problems experienced at Olinda.

In the meantime, the Olinda staff was successful in incubating and hatching an egg from its own flock on June 8. Scientists spent 36 hours carefully picking off pieces of the shell. The chick was positioned under the egg's air cell, which probably would have been fatal in the wild. Unfortunately, despite these heroic efforts, the chick died several weeks later. A necropsy revealed no signs of injury or disease, but tissue samples have been sent to the San Diego Zoo pathology department for further analysis. The remaining 13 'alala in the Olinda flock were quarantined as a precaution, but they appear to be healthy.

## Wild 'Alala Continue Renesting

After the removal of its first clutch, the Kalahiki pair hatched at least one and probably two additional eggs, but the hatchlings disappeared within a few days. The cause of the nest failure has not been determined.

This year, the Kealia pair also renested and hatched at least one, and probably more, eggs. They raised the chicks for approximately 2 weeks, but then began exhibiting unusual behavior. Biologists investigated and found a dead chick at the base of the tree, along with an empty nest. The chick could have been dislodged by the parents or a predator, but it showed no sign of predation and was apparently healthy before its fall from the nest.

Although the Kiilae pair also built a second nest, no chicks hatched. A fourth pair (known as the Hookena pair) was seen building a nest — believed to be their first — but no eggs were laid.

The Kalahiki pair, which succeeded in raising one chick in the wild in 1992, renested for a third time this season and began incubating eggs. After biologists monitoring the nest observed that the adults were not spending enough time in the nest to ensure the survival of the eggs, the nest tree was climbed and the three eggs removed on June 30. The eggs were cold and wet, and were immediately transferred to the temporary incubation facility in Captain Cook.

Two of the eggs were infertile, but the third egg was viable and hatched on July 4. Named *Pomaika'i* (Hawaiian for "fortunate" or "lucky"), this seventh 1993 chick from the wild 'alala flock was later transferred to Olinda to join the captive breeding flock.

Biologists are unsure why the Kalahiki pair abandoned their third nest. The male became less and less attentive to the female, and she may have been forced to leave the nest to search for her own food. The birds also began molting and may have been unable to produce a third nest.

## Back at the Aviary . . .

Meanwhile, back at the aviary, the oldest three chicks were released from the hack box into the aviary and began to explore their new temporary home. The 50- by 110-foot (15- by 34-meter) aviary was designed and constructed by Peregrine Fund staff. Elaborate precautions were taken to protect the chicks from predators and disease. The entire facility is surrounded by livestock fencing and an electrified wire to deter feral pigs and domestic livestock. Steel siding, electrified wire, and hardware mesh on the sides of the aviary prevent access by rats, cats, and mongooses. Mosquito-proof netting surrounds the hack box to protect the less than fully feathered young from being infected with avian malaria or pox.

After their release from the hack box, all of the birds became acclimated to the aviary and actively explored the entire area. They were fed an assortment of food, including a variety of native fruits typical of the species' natural diet.

## Joining the Wild Flock

One of the reasons the aviary was constructed near the wild habitat was so that interaction between the fledglings and wild population could be enhanced before the young birds were released into the wild flock. The surrogate research has shown that young crows and ravens on the mainland can be quickly assimilated into the wild flock if there are interactions and associations before the release. When the young 'alala were first placed into the facility, some of the wild birds approached and communicated with their off-spring. From the beginning, the male of the Kalahiki pair (and the father of the three oldest chicks), visited the facility regularly.

From the time their eyes opened, the birds were fed with a crow hand puppet to prevent them from imprinting on humans. In the aviary, the birds were free to forage from the vegetation within their

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# Genetic Restoration as a Survival Tool: Fish and Wildlife Service Reviews Comments on Florida Panther Recovery

One hundred years of isolation and inbreeding have reduced the Florida panther to a single 30- to 50-member population that faces extinction unless immediate steps are taken to restore its genetic health, experts say. Accordingly, the Fish and Wildlife Service is now reviewing public input on options and issues that should be considered in developing an Environmental Assessment (EA) to address genetic management options for this critically endangered species, as described in the approved recovery plan. Other members of the Florida Panther Interagency Committee will participate in the EA preparation. The comment period was announced in the *Federal Register* on August 17 and open for 30 days.

One option under consideration is a program to restore the historic gene flow from other *Felis concolor* subspecies that exchanged genes with the Florida panther under natural conditions. Scientists believe that gene exchanges occurred from the north through *F. c. cougar*, and from the west and northwest through *F. c. stanleyana* and *F. c. hippolestes*. The Florida panther now contains only a fraction of the genetic variability that existed before the animals were isolated a century



photo: John and Karen Hollingsworth

*Florida Panther #45, a 14-month-old male, at the Florida Panther National Wildlife Refuge.*

or more ago as a result of human persecution (shooting, trapping, and poisoning) and habitat destruction.

In particular, the Florida panther suffers from sperm abnormality that exceeds 90 percent, cryptorchidism (a testicle-descending abnormality that can render males functionally sterile, as noted in 2 of

4 kittens handled in 1992), congenital heart defects, and possible immune deficiencies.

Workshops on genetic health and population viability in May 1991 and October 1992 brought together geneticists and experts on small population bi-

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## Cooperative Program for 'Alala

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realm and from food placed on a platform. Then, on August 23, this year's efforts at the aviary culminated in a happy event. The doors of the facility were opened and, in a "soft release," the young crows were freed into the wild. Supplemental feeding on the platform will be maintained until they learn to find their own food. By the end of August, all six of the released birds were doing well.

## Cooperation Pays Off

Although disappointed that no young were raised in the wild this year, FWS

personnel — as well as all the cooperators — are very pleased that the 'alala population increased by seven birds. After years of controversy and dissent, the cooperative efforts of the past 2 years have definitely benefited the species.

The parties involved in the lawsuit have come to a final settlement and attention is turning to other management actions to benefit the 'alala. Topping the agenda is support for a second captive propagation facility, this one to be located on the Big Island. The facility will concentrate first on the 'alala, but in future years will expand to aid as many as 18 other rare species of Hawaiian forest birds.

Coordinating with more than 12 separate entities has been a challenge at times, but the FWS Pacific Islands Office staff knows the effort has its rewards. Last year, on its own, the wild 'alala flock fledged only one chick. But in 1993, with considerable help, this severely endangered species increased its numbers by nearly one-third, to a grand total of 31 birds!

Barbara Maxfield is the Information and Education Specialist for the FWS Pacific Islands Office in Honolulu, Hawaii.

## Genetic Restoration

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ology, captive-breeding, and panther health, biology, and demographics. They concluded that restoration of genetic variability is critical to the survival of the Florida panther. In view of population viability analysis projections that the spe-

cies will likely become extinct in 25 to 40 years and the threat that a single catastrophic event could hasten this process, experts emphasize that a program to restore the panther's genetic health should be initiated as quickly as possible.

Rapid and gradual extinction processes have depleted panther numbers. In addition to genetic erosion, other contribut-

ing factors include habitat loss, environmental contaminants, highways, human activities, and a lack of prey resources.

The Fish and Wildlife Service expects to publish a Notice of Availability of the draft EA in the *Federal Register* later this fall.

## Some Thoughts on Panther Study: A Personal View

by Ronald M. Nowak

When Roy McBride and I began an investigation of the Florida panther in early 1973, under sponsorship of the World Wildlife Fund, we could not have imagined the management, scientific, political, and financial developments that would follow. Indeed, we were looking for an almost mythical animal—one that some authorities thought was already extinct. Certainly, no definitive breeding population was known.

We had suggested that perhaps the dog-tracking procedures used by western mountain lion hunters could help locate such a population in Florida and lead to methods that would aid in its conservation. A west Texas rancher, Roy McBride was also a mountain lion hunter. We received a \$1,700 grant and spent about a month in Florida. Remarkably, McBride and his team of lion-hunting dogs treed a panther near Lake Okeechobee shortly after our arrival. We confirmed that several other panthers had been killed in the area during the previous year. On a brief return visit in 1974, McBride located panther sign in two places.

Despite our findings in southern Florida, we generally were pessimistic about the panther's situation, and were concerned that its rarity and vulnerability might preclude further intensive study. But the die had been

cast. There *was* a population, and individuals *could* be located and captured through the methodology developed in the west. It was not long before Federal and State agencies were planning major investigations.

McBride, and later his son Rocky, and their dogs were called into regular service. (In recent years, Roy McBride's younger son, Rowdy, has worked with him in Florida on the panther study.) Over time, dozens of animals were live-captured and radio-tracked, making it possible to determine the precise distribution of populations. Ecological and physiological research proliferated, millions of dollars were spent for land purchase and roadway modifications, and the panther became Florida's official State Animal. However, controversy also followed about stress to the cats, the possible long-term effects of removing wild animals for captive-breeding purposes, and even whether the panther population was a fully native component of the south Florida ecosystem.

Some people say that researchers should never have begun chasing, marking, and analyzing panthers, but should have left them behind their veil of mystery and simply done what was possible to protect their habitat. On the other hand, could the immense public and scientific support for panther conservation have developed

without gaining some familiarity with the animal?

Looking back, I am not certain that what we did two decades ago was for the best. Yet the fact that we still have wild Florida panthers, together with many people prepared to support their continued survival and well-being, gives cause for hope.

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Dr. Nowak, a mammologist with the Fish and Wildlife Service's Office of Scientific Authority, is the author of the fifth edition of *Walker's Mammals of the World*, published in 1991 by Johns Hopkins University Press, Baltimore, Maryland. The late Ernest Walker was assistant director of Washington's National Zoological Park. Dr. Nowak's views as presented in this article do not necessarily represent those of the Fish and Wildlife Service.

(Editor's Note: Since the radio-collaring program began in 1982, 2 panther deaths have been attributed, directly or indirectly, to this component of the recovery program. Altogether, 54 animals have been radio-instrumented and monitored.)

# Hockey Team Energizes Florida Panther Recovery Fund

by Ann Haas

A new hockey team, the Florida Panthers, has given impetus to ensuring the survival of its namesake, one of the most critically endangered species in the country.

H. Wayne Huizenga, owner of this National Hockey League team, has donated \$34,000 to the Panther Recovery Fund held by the National Fish and Wildlife Foundation, a non-profit conservation organization that in turn has provided \$16,000 in matching funds to benefit *Felis concolor coryi*.

In addition to this donation, the sports franchise will institute a "Panther Saves" project, through which the team will solicit pledges from corporations and the general public to contribute to the fund each time a Panther goalie makes a "save"—that is, prevents an opponent from scoring—during home games of the 1993-94 season. Along with the "Panther Saves" project, the organization is sponsoring the production of a hockey videotape, to be available from Blockbuster Video stores, which will donate all rental fees to restoring the endangered cats. The Foundation has agreed to match every dollar with an additional 50 cents. The educational video will rent for 50 cents.

In making the announcement of the historic partnership, Acting Director of the Fish and Wildlife Service (FWS) Richard Smith termed the initiative "an excellent model" and observed that it will "raise not only funds, but public awareness of the current plight of the Florida panther." Commented the Executive Director of the National Fish and Wildlife Foundation, Amos S. Eno, "It is encouraging to see professional sports, corporate America, and a conservation organization joining hands to bring attention to our rare and endangered species."

Mr. Huizenga added, "Our name-the-team contest showed real enthusiasm for the Florida Panther, and we want to do something tangible on behalf of our State animal. I'm inviting hockey fans to participate in the "Panther Saves" program,



Logo for the Florida Panthers, a new National Hockey League Team.

and hoping for support from a whole range of donors—from school children to corporations. I'm glad to be a part of efforts to help Florida panthers return to the wild and ensure that those wild places are there for the future."

Among the priority projects of the fund are protecting and acquiring habitat, reintroducing Florida panthers into their historic range, restoring the genetic diversity of the species, and creating educators' guides and developing displays. Working with private landowners to protect high-quality habitat also is an important aspect of recovery.

The number of Florida panthers in the wild is estimated at only 30 to 50 adult animals. A single catastrophe could result in their extinction. Listed since 1967 as Endangered, the cat continues to be threatened by habitat loss, declining genetic diversity, highway-related mortality, and environmental contamination.

In 1984, Congress established the National Fish and Wildlife Foundation to act as a catalyst for conservation by making Federal funds available to match private sector contributions, thus creating an incentive for giving by individual citizens and organizations. The Foundation is a non-profit organization dedicated to conservation including programs for habitat protection, environmental education, public policy development, natural re-

sources management, ecosystem rehabilitation, and leadership training for conservation professionals. To date, the Foundation has undertaken more than 700 projects and leveraged more than \$85 million for fish and wildlife protection.

The Florida Panthers recently began their first NHL season in Miami. Mr. Huizenga is also the founder of Blockbuster Entertainment Corporation and owner of the new Florida Marlins baseball team. He was one of three founders of Waste Management, Incorporated, which began as a trash company in Chicago, Milwaukee, and Fort Lauderdale, and now is the largest of its kind, disposing of all types of waste and employing thousands of people in the United States and 20 other countries.

Four agencies are actively involved in restoring Florida Panthers to a secure status in the wild. Pledged to coordination and public participation, the Florida Panther Interagency Committee consists of the FWS, the National Park Service, the Florida Game and Fresh Water Fish Commission, and the Florida Department of Environmental Protection. Recently, the FWS created the Florida Panther National Wildlife Refuge near Naples for this Endangered species.

The FWS Regional Director in Atlanta, Jim Pulliam, signed an agreement with the Foundation on April 15, 1992, establishing the Florida panther fund to provide a repository for contributions for the species. The Foundation manages the panther fund for the State and Federal recovery effort.

## How You Can Help

The Florida panther recovery fund is one of several the National Fish and Wildlife Foundation operates on behalf of the FWS to help restore endangered and threatened species. Individual funds

(continued on page 10)

# Ecosystem Management and Linkage Zones for Grizzly Bears and Other Large Carnivores in the Northern Rocky Mountains in Montana and Idaho

by Christopher Servheen and Per Sandstrom



photo by William S. Keller

grizzly bear

Habitat fragmentation, as well as outright destruction, is a major cause of wildlife decline throughout the world. Many formerly intact North American ecosystems supporting large mammals have been divided to the point that they have lost considerable value as wildlife habitat. Causes of habitat fragmentation directly related to human activities include road building and use, residential development, timber harvest and associated cover removal, water impoundments, railroads, and human presence. When such activities occur in a linear pattern, such as along a valley bottom, they have the potential to inhibit the movement of large carnivores and increase their mortality risk.

Grizzly bear habitat has been fragmented to a significant degree in the past 200 years, a fact that complicates recovery efforts. Small habitat fragments are more difficult to manage, and the populations living within them are more vulnerable to deleterious demographic, genetic, and stochastic or random factors.

The recently revised Grizzly Bear Recovery Plan outlines a process for evaluating the areas between ecosystems to assess

their usefulness for bear movement. The objective of such an assessment is to identify viable linkage zones so that managers can maintain or enhance their value. It is important to recognize, however, that simply allowing the possibility of movement does not guarantee that these areas will be used; we have no way to make bears or any other animal use linkage zones.

## Evaluating Habitat From a Landscape Approach

Landscape ecology is the study of the interactions between organisms and the environment at the landscape scale. The analysis of the interaction between landscape structure and its effect on organisms in the environment is spatial analysis. Characteristics of the landscape, combined with the ecology of the animals in question, determine the land's ability to support the needs of resident wildlife for food, shelter, breeding sites, and natural movements. As human actions change the characteristics of the landscape, they also change its capability of supporting resident wildlife.

To evaluate habitat fragmentation in the northern Rocky Mountains of Montana and Idaho, we combined several layers of landscape-level information in a computer-based geographical information system (GIS). This method assesses the degree of habitat fragmentation caused by the cumulative impacts of various human actions, and allows an evaluation of the resulting habitat disturbance and wildlife mortality risk. By rating human impacts in the linear area in question, we are able to identify land that can potentially link sections of suitable wildlife habitat separated by, or being fragmented by, human activities. For the purposes of this model, we are concerned with the wildlife and human elements within a landscape and the relationship between landscape ecology, spatial analysis, and wildlife-human interaction.

In traditional terms, areas between larger patches of habitat are termed corridors. We believe the word corridor is misleading about how animals move between areas; it connotes an area used only for travel. Therefore, we substitute the term "linkage zone," which we define as combinations of landscape structural factors that allow wildlife to move through, and live within, areas influenced by human actions.

Using GIS methodology to rate human impacts allows managers the option of working at a landscape level to minimize future habitat fragmentation or enhance linkages between areas that are being fragmented. This has direct application to the maintenance of ecosystems for large mammals like the grizzly bear (*Ursus arctos*), which is listed as Threatened in the 48 conterminous States.

An animal's ability to move from one habitat area to another depends on the

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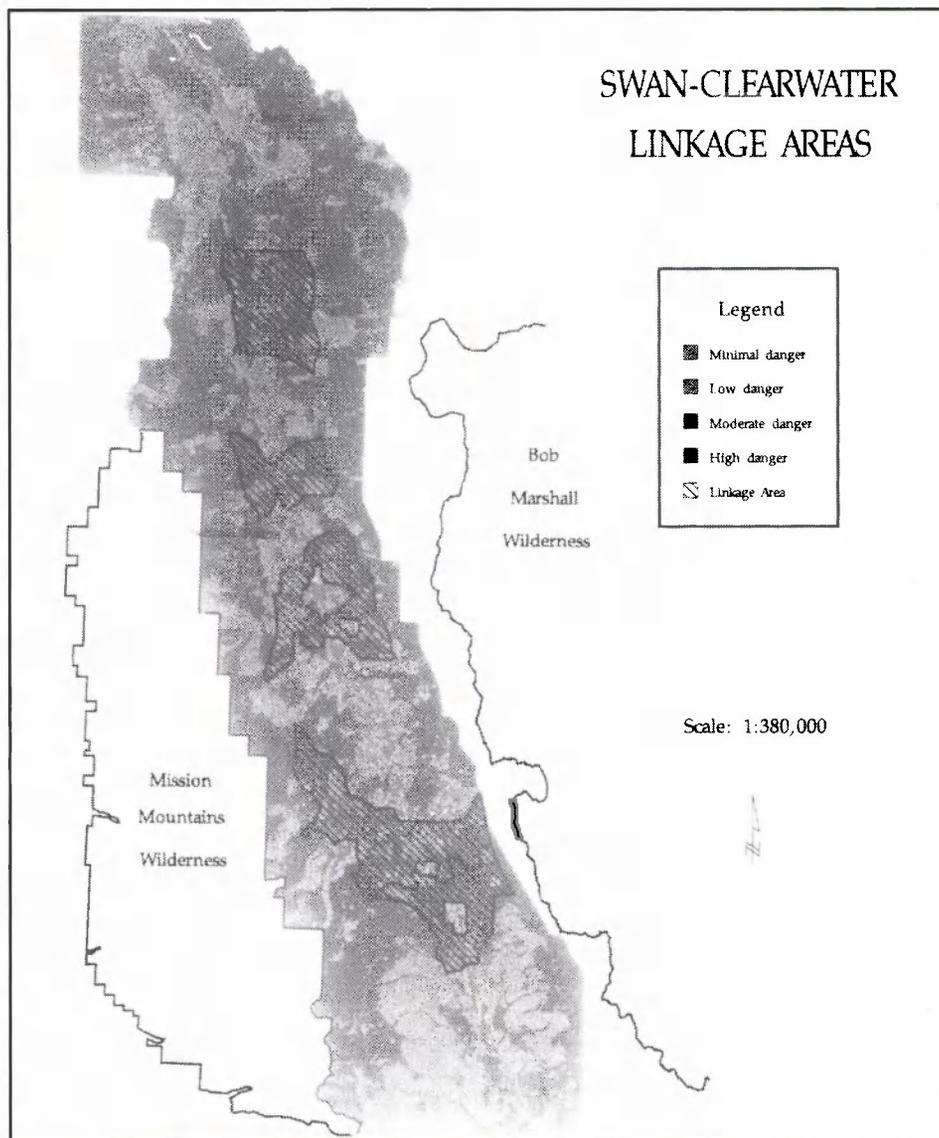
## Ecosystem Management for Grizzly Bears

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level and types of human activities present in the linkage zone, as well as the natural history of the species. We are now seeing increasing human development in valley bottoms within several ecosystems used by grizzly bears. This linear pattern of development in valley bottoms, what we define as a "habitat fracture zone," is fragmenting occupied grizzly habitat.

Long-term conservation of large carnivores in the northern Rocky Mountains, not only the grizzly bear but also the Endangered gray wolf (*Canis lupus*), and potential listing candidates such as the wolverine (*Gulo gulo*) and lynx (*Felis lynx*), depends on managing large, contiguous habitat units in ways that balance the needs of these species with the needs of humans. Such conservation efforts could be more efficient if they were combined into an integrated multispecies conservation program. Western Montana and northern Idaho, a region still occupied by all four of these carnivores, provides an opportunity for integrated species management in one of the largest regions of public land in the conterminous 48 States. Employing integrated ecosystem management in the northern Rockies rather than individual species management would follow the requirement of the Endangered Species Act to conserve listed species and the ecosystems on which they depend.

To be successful at ecosystem management, we must identify, understand, and manage the factors that affect the movement of wildlife across habitat fracture zones. For help in identifying and understanding these factors, we have developed To be successful at ecosystem management, we must identify, understand, and manage the factors that affect the movement of wildlife across habitat fracture zones. For help in identifying and understanding these factors, we have developed a linkage zone prediction model. This model combines various human-related factors, such as roads, home development, and visual cover changes, and displays their current level and the distribu-



**The linkage zones shown above are areas where contiguous habitat of low human influence is available across the valley and where good grizzly bear habitat is available on both sides of the valley. This black and white rendition of the original color map is printed to give an example of the type of map used to plot linkage zones.**

tion of their effects. The spatial distribution of these human effects can be used to determine if animals can move across, and/or live seasonally within, areas of development. Managers can use maps produced with such a model to identify areas still having potential to allow wildlife movement. They can then focus appropriate management actions in such areas. Private land trust organizations can also use such maps to better target conservation easements and habitat acquisitions with willing property owners.

### Study Area

The prediction model to test the linkage zone concept was developed for the

Swan/Clearwater Valleys in western Montana. This area is within currently occupied grizzly bear range in the Northern Continental Divide ecosystem, and is a habitat fracture zone. It is bounded on the east by the Swan Mountain Range and on the west by the Mission Mountains, and it covers 624 square miles (1,620 square kilometers). Land ownership in the Swan-Clearwater Valleys complex is distributed in a checkerboard pattern.

### Study Methods

The traditional approach for evaluating the suitability of an area for grizzly (continued on page 12)

## Ecosystem Management for Grizzly Bears

(continued from page 11)

bears has been to build a detailed habitat map based on available food types. This approach assumes that the distribution of quality habitat, as defined by the potential of the habitat to provide food and cover, is the primary factor determining bear distribution. Our approach differed; we assumed the most critical factor determining grizzly bear habitat selection and movement patterns in developed valleys within the northern Rockies was not quality habitat containing bear foods, but human activity. Using this approach, we were concerned primarily with the presence and types of specific human activities in the study area instead of the distribution of bear foods.

To proceed on this assumption, we assigned a score to the influence of various human activities on bear habitat use and mortality risk. Scores were subjectively based on general knowledge of how bears react to human presence. We developed computer-based digital maps of the four data layers used in the analysis--human residences and developments, open roads, hiding cover, and riparian zones--using aerial photos, Landsat images, and field checking. Much of this data was collected by the Forest Service. Maps were developed at a resolution of 50 by 50 meter (165 by 165 feet) pixels.

Developed sites with potential influence on bear habitat use were assigned an influence zone according to whether they may attract a bear (such as a house where garbage could be present) or be avoided by a bear (because of fear of humans). Riparian zones were the base habitat layer because they are used for feeding, travel, and cover, and they extend across valleys.

To assess the impacts of roads, it was necessary to know the spatial distribution of road density in the area. We used a computer-based method we called a Moving Circle Analysis to determine this. It enabled us to calculate open road density for the square mile (2.6 sq km) circle surrounding each pixel. The program then moves from pixel to pixel, repeating

the process, which accounts for the name "moving circle." The Swan-Clearwater Valleys analysis area contains 648,960 pixels of 50 by 50 meters.

Open road density, as calculated by the moving circle analysis method, varied by ownership. As expected, private lands had the highest scores, given the high level of development and roads associated with dwellings on many small parcels. Road density on private lands is expected to increase as development increases.

Densities of open roads are not equally distributed throughout the valleys. The highest densities are in central portions of the valleys, where human settlement often occurs in a linear pattern. High open road densities also occur in areas of intensive commercial timber harvest.

Open road densities were grouped into four categories for scoring purposes: 0 mile per square mile, 0.01-1.0 miles per square mile, 1.01-2.0 miles per square mile, and greater than 2.0 miles per square mile. Each pixel received an open road density influence score based on one of four categories. The variation in the amount of area in each category gives a far different picture of the open road density in the Swan-Clearwater Valleys when compared to the average open road density of 1.49 miles per square mile for the entire 624 square mile area.

### Scores For Human Influence

To score the combined influence of open roads, human developed sites, hiding cover/non-cover, and riparian layers, the values assigned to each 50 by 50 meter pixel for each layer were combined to create a single scored map. The range of possible values ranged from 7 to 20, and they were grouped into four categories to simplify interpretation (Table 1).

As expected, the distribution of scores by land ownership shows that private lands are areas of high human influence and risk to wildlife. The areas of highest influence (those in the "high danger" category) exist in only three percent of the Swan-Clearwater Valleys. However, using the scored map, managers can see that these areas occur linearly along the

INFLUENCE LEVEL	SCORE
Minimal Danger	7-10
Low Danger	11-12
Moderate Danger	13-14
High Danger	15-20

**TABLE 1. Levels of influence on the scored map of human influence. The higher the score, the higher the influence on bear behavior and the higher the mortality risk from development and other human activities.**

valley bottom, creating a barrier to wildlife movement and occupancy, and increasing the risk of mortality.

By using the scored map to determine spatial distribution of the high danger areas, we could identify five wildlife linkage zones across the Swan/Clearwater Valleys. In these places, the effects of human activity are currently at lower levels.

### Management Options

If we are to maintain opportunities for grizzly bears and other large carnivores to move between large blocks of Federal lands, we must understand the impacts of land use decisions on habitat values. Because of the intermingled ownership of lands within many linkage zones, proper management requires a team approach involving private, State, corporate, and Federal participants. Such a team has been created to establish linkage zone management in the Swan Valley. Some management options for linkage zones are presented in Table 2. Human activities in these areas need not be precluded, but they should be planned and carried out with consideration for their impacts on animal behavior and mortality.

\* \* \*

History shows that we can rapidly fragment wildlife habitat through human. Our ability to conserve species, especially large carnivores, is compromised by such habitat fragmentation. An integrated ecosystem management approach can work where several species coexist and habitats are still relatively intact. Applying the type of model discussed above to predict the level and distribution of hu-

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## Ecosystem Management for Grizzly Bears

(continued from previous page)

man activities in the northern Rockies is an important part of ecosystem management of this vast and important area.

The long-term maintenance of grizzly bears, gray wolves, wolverines, lynx, and many other large mammals in the northern Rocky Mountains depends on our ability to limit fragmentation of wildlife habitat caused by human activities. The land ownership pattern in this region of-

fers a chance to control fragmentation through innovative cooperative efforts between private landowners and government agencies. We still have a window of opportunity to maintain intact ecosystems, but it will not remain for much longer.

Christopher Servheen is the Grizzly Bear Recovery Coordinator, U.S. Fish and Wildlife Service, NS 312, University of Montana, Missoula, Montana 59812.

Per Sandstrom is with the Montana Cooperative Wildlife Research Unit, University of Montana, Missoula, Montana 59812.

## Hockey Team Energizes Panther Fund

(continued from page 9)

benefit the black-footed ferret (*Mustela nigripes*), red wolf (*Canis rufus*), Attwater's greater prairie-chicken (*Tympanuchus cupido attwateri*), California least tern (*Sterna antillarum browni*), Mexican wolf (*Canis lupus baileyi*), grizzly bear (*Ursus arctos horribilis*), Coachella Valley fringed-roed lizard (*Uma inornata*), and four Colorado River fish species. Funding for the fish species now amounts to \$500,000.

For information about how to contribute—and help generate matching funds—contact the National Fish and Wildlife Foundation, 1120 Connecticut Avenue, N. W., Suite 900, Washington, D. C. 20036; telephone 202/857-0166.

Road management to limit road density
Close roads where possible
New roads of low standard open only during duration of management activity, then obliterated
Maintain existing percentage of areas of no road density
Increase size and distribution of security areas away from roads
Special emphasis on garbage management and food attractant management
Minimize roads in areas of limited hiding cover
Careful review of subdivision development
Careful review of commercial development such as restaurants, campgrounds, etc.
Public education about the value of linkage zones to the preservation of large carnivores
Maintenance of hiding cover through innovative silvicultural practices
Clearcut management to assure no openings more than 50 meters (165 feet) from adjacent hiding cover
Riparian wet site management to maintain contiguous hiding cover and limitations on roads through riparian zones
Cooperation on development of conservation easements on private lands
Team approach to cooperative management program involving federal, state, corporate, and private landowners

TABLE 2. Management options to maintain linkage zones

## New Hope for the Peters Mountain Mallow

by Judy Jacobs

The Peters Mountain mallow (*Iliamna corei*), a plant in the hibiscus family (Malvaceae), occurs naturally at only one spot on earth — Peters Mountain in southwestern Virginia. In 1927, when the species was discovered, its population totalled about 50 individuals. Due to a variety of factors (such as a lack of new plants, browsing by deer and feral livestock, and an invasion of weedy competitors following habitat alteration), this number steadily declined. By the time the species was listed in 1986 as Endangered, only three individuals remained. To make matters worse, the fruits were dropping from these plants before seeds were produced, and no new mallow plants were germinating. It seemed cer-

tain that, unless drastic measures were taken, extinction was imminent.

Listing the Peters Mountain mallow focused the attention of the botanical community on the species' plight, and the Endangered Species Act provided a funding avenue for research and recovery. Botanists at Virginia Polytechnic Institute and State University (VPI & SU) began looking for viable seeds at the population site. By sifting painstakingly through samples of the leaf litter, they were able to find more than 95 mallow seeds. The next problem was to determine why these seeds were not germinating naturally. Botanists learned that the seeds had to be scarified (i.e., have the hard seed coat opened) in order to germinate. Nicking



photo by Judy Jacobs

Peters Mountain mallow in experimental gardens at VPI & SU.

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## New Hope for Peters Mountain Mallow

(continued from page 13)

the seed coats with a razor blade permitted germination and the production of many healthy mallow plants. Later, these plants bore healthy fruits that, in turn, produced thousands of seeds.

This seed source has provided critical stock for studying the species' biology. For example, cross-pollination experiments revealed that the original plants were not producing seeds because the species is not self-compatible — that is, the flowers must be pollinated by another individual to produce viable seed. Having an expanded seed source also permitted botanists to conduct germination studies. In an important discovery, they found that, under natural conditions, the

seed coats were almost certainly broken by light fires. Thus, the suppression of wildfires had actually contributed to the species' decline.

Finally, listing the Peters Mountain mallow provided impetus to preserving its ecosystem. This goal was accomplished in 1992 when a private conservation organization, The Nature Conservancy (TNC), purchased the only known site. Now that the habitat is under protective ownership and we understand many of the species' requirements, attention has shifted to the use of management tools, such as prescribed burning, to promote the species' recovery.

Following its acquisition of the Peters Mountain site, TNC and biologists with the Virginia Natural Heritage Program began conducting limited spring burns to stimulate seed germination. The 1992

burn resulted in 12 mallow seedlings, 4 of which survived their first year. But this year's success exceeded all expectations. Following the May 1993 burn, some 500 seedlings appeared in the 33-by 43-foot (10- by 13-meter) test area! Even with only a projected 20 percent survival rate, this will greatly increase the natural population, and take the Peters Mountain mallow closer to the day when it will be a secure, self-sustaining member of its ecosystem.

Judy Jacobs, a biologist in the FWS Annapolis, Maryland, Field Office, wrote the Peters Mountain Mallow Recovery Plan.

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## Listing Proposals — May/July 1993

From May through July 1993, three animals and seven plants were proposed by the Fish and Wildlife Service for listing as Threatened or Endangered. If the listing proposals are approved, Endangered Species Act protection will be extended to the following:

### Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

The breeding range of this small songbird includes Arizona, New Mexico, southern California, extreme southern portions of Nevada and Utah, far western Texas, and perhaps southwestern Colorado and extreme northwestern Mexico. Within this region, however, the southwestern willow flycatcher is restricted to remnants of dense riparian (streamside) vegetation. Because of large-scale habitat loss and nest parasitism, the flycatcher's population now probably numbers fewer than 500 pairs. On July 23, the FWS proposed to list the subspecies as Endangered and to designate important parts of its remaining range as Critical Habitat.

As its name implies, the southwestern willow flycatcher depends on dense



photo by B. "Moose" Peterson/WFRP

**Southwestern willow flycatchers are small songbirds with a grayish-green back and wings, whitish throat, light grey-olive breast, and pale yellowish belly. Their nests, built in thickets of shrubs or trees, are compact cups of fiber, bark, and grass lined with a layer of grass or other fine, silky plant material. The birds typically raise one brood of three or four young per year.**

growths of willow (*Salix* spp.) and structurally similar vegetation. Such thickets, often with a cottonwood (*Populus* spp.) overstory and surface water nearby, provide necessary foraging and nesting habi-

tat. Unfortunately, most of the southwest's riparian habitats have been modified or lost altogether due to live-

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## Listing Proposals

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stock grazing, urban and agricultural development, stream channelization and diversion, invasions of the non-native tamarisk or saltcedar (*Tamarix* spp.), and gross changes in the watershed. The few that remain are mostly small and widely scattered.

As the flycatcher populations become fragmented by habitat loss, they grow increasingly vulnerable to nest parasitism by the brown-headed cowbird (*Molothrus ater*). Cowbirds lay their eggs in the nests of other, usually smaller, songbirds, and their eggs are incubated along with those of the host species. Because cowbird chicks generally hatch earlier, and are larger and more aggressive, they usually outcompete the hatchlings of the host bird. Livestock grazing and associated agricultural developments are promoting the spread of cowbirds.

Portions of the flycatcher's remaining range in California, Arizona, and New Mexico have been proposed for designation as Critical Habitat. (See the July 23 *Federal Register* for maps and habitat descriptions.) Under the Endangered Species Act, Federal agencies are required to ensure that their activities do not adversely modify designated Critical Habitat.

## Kootenai River White Sturgeon (*Acipenser transmontanus*)

The Kootenai River population of the white sturgeon inhabits a stretch of about 168 river miles (270 kilometers) from Cora Linn Dam in British Columbia, Canada, through northern Idaho, to Kootenai Falls in Montana. Isolated from other white sturgeon stocks of the Columbia River basin for 10,000 years, the Kootenai River population is genetically distinct. It is also small in number and rapidly aging. Habitat alteration has reduced the population to approximately 880 individuals, with about 80 percent over 20 years of age. There has been an almost complete lack of recruitment to the population since 1974, soon after Libby Dam began operation. On July 7, the FWS proposed listing the population as Endangered.

Sturgeon are distinguished by their cartilaginous skeleton, protractile, tubelike mouth, and bony plates (scutes) lining the body. White sturgeon are the largest freshwater or anadromous fish in North America, reportedly weighing up to about 1,800 pounds (820 kilograms). Individuals from the Kootenai River population, however, are smaller, with no recorded specimens exceeding 200 pounds (90 kg) in size. White sturgeon up to 44 years of age have been collected from the Kootenai River.

Construction of the Libby Dam for hydropower and flood control has altered much of the sturgeon's free-flowing habitat, reducing flows during the critical spawning and early rearing stages, and lowering the river's overall biological productivity. If the Kootenai River white sturgeon population is listed as Endangered, the Federal agencies involved in operation of the Libby Dam — the Army Corps of Engineers and the Bonneville Power Administration — will be responsible for ensuring that their activities are not likely to jeopardize the sturgeon's survival.

## Alabama Sturgeon (*Scaphirhynchus suttkusi*)

The Alabama sturgeon, a distinctive freshwater fish, has an elongated, heavily armored body. Relatively small for a sturgeon, it reaches a maximum standard length of about 28 inches (72 cm). This species is endemic to the Mobile River system of Alabama and Mississippi, where it once was considered common. Widespread habitat modification, however, has eliminated the Alabama sturgeon from most of its range. Its decline can be traced primarily to the widespread conversion of free-flowing habitat to impoundments, other water flow alter-

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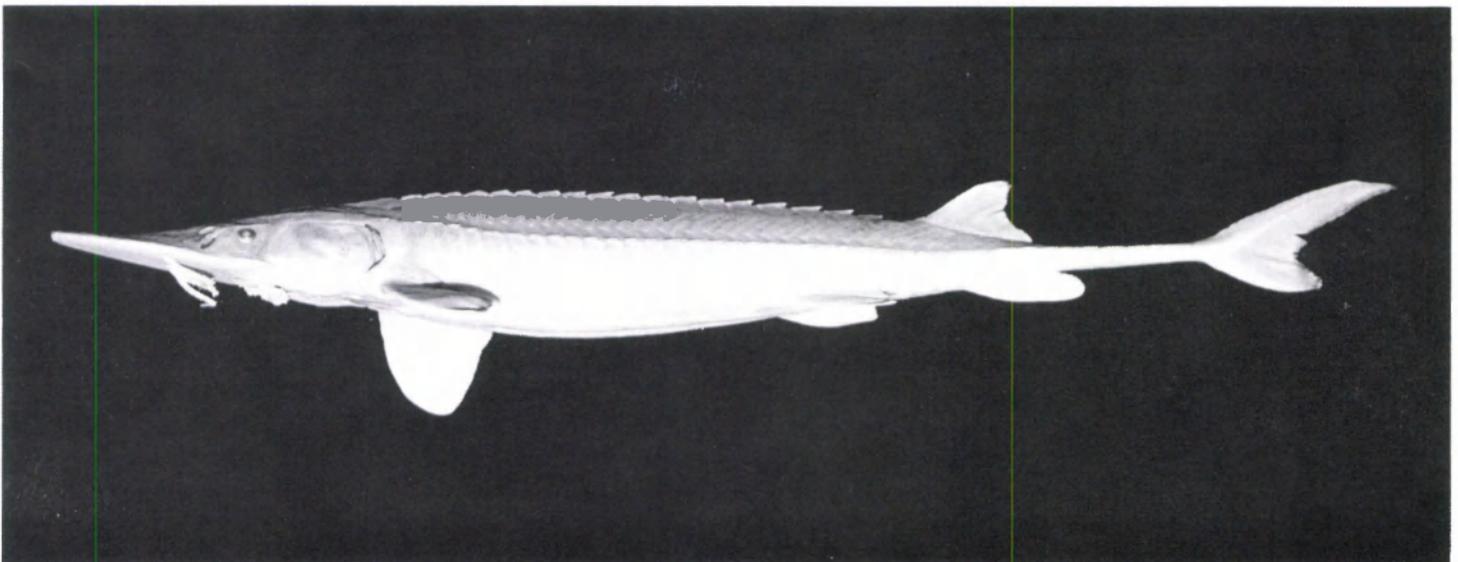


photo by Jam 35 D. Williams

Alabama sturgeon are elongate, heavily armored fish that were once abundant in the Mobile River system of Alabama and Mississippi.

## Listing Proposals

(continued from page 15)

ations, gravel dredging, and certain channel maintenance methods. On June 15, the FWS proposed listing the Alabama sturgeon as Endangered.

Based on a 1985 capture of two gravid females and a juvenile, and unconfirmed reports of subsequent captures, the FWS believes the Alabama sturgeon may still reproduce, at low levels, in the Cahaba and lower Alabama Rivers (two tributaries of the Mobile River) in Alabama. Both of these areas, and the free-flowing portion of the lower Tombigbee River in Alabama, have been proposed as Critical Habitat for the sturgeon. (See the June 15, 1993, *Federal Register* for a map and habitat description.) The FWS does not anticipate that the listing and Critical Habitat designations, if approved, would significantly affect river channel maintenance for navigation purposes.

## Seven Hawaiian Plants

Seven plant taxa endemic to the Hawaiian Islands were proposed recently in two separate packages for listing as Endangered. One proposal, published May 11, covered three species in the genus *Melicope*, which belongs to the citrus family (Rutaceae). All three are found only on the slopes of the volcano Haleakala on the island of Maui, and are very rare:

- *Melicope adscendens* - a sprawling shrub; one individual is known to exist.
- *Melicope balloui* - a small tree or shrub; two populations contain a total of no more than 10 plants.
- *Melicope ovalis* - a small tree; one small population is known.

The second package, published June 24, proposed listing four taxa of ferns. Three are in the spleenwort family (Aspleniaceae):

- *Asplenium fragile* var *insulare* - a variety once found on two islands but now

surviving only on the island of Hawai'i (the "Big Island").

- *Ctenitis squamigera* - a species historically recorded from six islands but seen only on O'ahu, Maui, and Lana'i in recent decades.
- *Diplazium molokaiense* - reduced in distribution from five islands to two (O'ahu and Maui).

The fourth species in the second Hawaiian plant package is a member of the maidenhair fern family (Adiantaceae):

- *Pteris lidgatei* - a species recorded from two islands but now found only on O'ahu.

Native vegetation on all of the main Hawaiian Islands has undergone extreme alteration. Like the other 105 Hawaiian plants already listed as Endangered or Threatened, the 7 recently proposed species have declined in numbers and range because of urbanization, ranching and ag-

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# Final Listing Rules Approved for 17 Species

Final rules adding 17 species — 3 animals and 14 plants — to the U.S. List of Endangered and Threatened Wildlife and Plants were published by the Fish and Wildlife Service from May through July 1993. These animals and plants now receive Endangered Species Act protection, and recovery plans will be developed for all but the one foreign species. A list of the newly added taxa, with their legal classifications and *Federal Register* publication dates, follows:

## ANIMALS

- Spectacled Eider (*Somateria fischeri*) - a large-bodied marine duck found only in Alaska and Russia (Siberia); Threatened; F.R. 5/10/93.
- Carolina Heelsplitter (*Lasmigona decorata*) - a freshwater mussel that survives in a few small streams in North and South Carolina; Endangered; F.R. 6/30/93.

- Saimaa Seal (*Phoca hispida saimensis*) - a subspecies of the ringed seal that has adapted to the freshwater environment of Lake Saimaa in eastern Finland; F.R. 5/6/93.

## PLANTS

- Seven Puerto Rican Ferns
  - On June 9, four species of ferns endemic to the island of Puerto Rico were listed as Endangered: *Adiantum vivesii*, *Elaphoglossum serpens*, *Polystichum calderonense*, and *Tectaria estremerana*.
  - A separate July 2 rule listed another three endemic Puerto Rican ferns as Endangered, all in the genus *Thelypteris*: *T. inabonensis*, *T. verecunda*, and *T. yaucoensis*.
- Five Florida Plants
  - A July 12 rule listed five Florida plants, all but one in the category of En-

dangered: the Apalachicola rosemary (*Conradina glabra*), short-leaved rosemary (*Conradina brevifolia*), Etonia rosemary (*Conradina etonia*), and Okeechobee gourd (*Cucurbita okeechobeensis*). The fifth plant, Godfrey's butterwort (*Pinguicula ionantha*), judged to be in slightly less danger, was listed as Threatened.

- Applegate's Milk-vetch (*Astragalus applegatei*) - a perennial herb growing only in the vicinity of Klamath Falls, Oregon; Endangered; F.R. 7/28/93).
- Penland Alpine Fen Mustard (*Eutrema penlandii*) - perennial wildflower found only in high mountain wetlands in central Colorado; Threatened; F.R. 7/28/93.

## Listing Proposals

(continued from previous page)

ricultural development, and the introduction (accidental as well as intentional) of non-native animals and plants. Habitat degradation and/or predation by feral goats, sheep, cattle, axis deer, and pigs are continuing problems, as is competition from alien plants for space, water, light, and nutrients.

\* \* \*

## Available Conservation Measures

Among the conservation benefits authorized for Threatened and Endangered plants and animals under the Endangered Species Act are: protection from adverse effects of Federal activities; restrictions on take and trafficking; a requirement that the FWS develop and carry out recovery plans; authorization to seek land purchases or exchanges for important habitat; and Federal aid to State and Commonwealth conservation departments

that have approved cooperative agreements with the FWS. Listing also lends greater recognition to a species' precarious status, which encourages other conservation efforts by State and local agencies, independent organizations, and concerned individuals.

Section 7 of the Act directs Federal agencies to use their legal 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 fund, authorize, or carry out are not likely to jeopardize the survival of any Endangered or Threatened species, or to adversely modify its designated Critical Habitat (if any). When an agency finds that one of its activities may affect a listed species, it is required to consult with the FWS to avoid jeopardy. If necessary, "reasonable and prudent alternatives," such as project modifications, are suggested to allow completion of the proposed activity. Where a Federal action may jeopardize the survival of a species that is *proposed* for listing, the Federal agency is required

to "confer" with the FWS (although the results of such a conference are not legally binding).

Additional protection is authorized by Section 9 of the Act, which makes it illegal to take, import, export, or engage in interstate or international commerce in listed animals except by permit for certain conservation purposes. The Act also makes it illegal to possess, sell, or transport any listed species taken in violation of the law. For plants, trade restrictions are the same but the rules on "take" are different. It is unlawful to collect or maliciously damage any Endangered plant on lands under Federal jurisdiction.

Removing or damaging listed plants on State and private lands in knowing violation of State law, or in the course of violating a State criminal trespass law, also is illegal under the Act. In addition, some States have more restrictive laws specifically against the take of State or federally listed plants and animals.

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## Delisting Actions

The Fish and Wildlife Services (FWS) recently took action to remove two plants from the list of Threatened and Endangered species:

### **Tumamoc Globeberry** (*Tumamoca macdougallii*)

Named for Tumamoc Hill, a site west of Tucson where it was first collected, this vining perennial occurs primarily in the Sonoran Desert. It is a member of the gourd family (Cucurbitaceae) and grows from a tuber-like root, producing lobed leaves, yellowish-green flowers, and bright red fruits. In 1986, when this species was listed as Endangered, the total known population numbered fewer than 2,400 individuals in southern Arizona and northern Mexico, and much of its habitat was considered vulnerable. Subsequent surveys have located enough additional

populations that the species is no longer in danger of extinction; accordingly, the Tumamoc globeberry was removed from Endangered Species Act protection on June 18, 1993.

The FWS will continue to monitor the species' status for at least 5 years (as required under the Act), and both the Bureau of Land Management and the Forest Service — which manage much of the globeberry's habitat — will retain it on their "sensitive species" lists. In addition, preserves for the species, established by the Bureau of Reclamation to mitigate habitat damage caused during construction of the Central Arizona Project Canal, will be maintained indefinitely.

### **Cuneate Bidens** (*Bidens cuneata*)

The cuneate bidens, an herb or small shrub in the aster family (Asteraceae), is

endemic to the Hawaiian Islands. It was described as a species in 1920 from a specimen collected on the slopes of Diamond Head, a volcanic crater on the island of O'ahu. Based on the very small known range and the vulnerability of its habitat, the cuneate bidens was listed in 1984 as Endangered.

Recently, however, the taxonomy of the genus *Bidens* has been revised, and the cuneate bidens is now considered an outlying population of *Bidens molokaiensis*, a species common on the island of Moloka'i. Because it apparently is not a distinct taxon, the cuneate bidens is considered ineligible for Endangered Species Act protection. It was proposed July 7, 1993, for removal from the Endangered Species List.

## Reintroduction of Gray Wolves

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Since 1989, FWS biologists have given more than 300 presentations to livestock, hunter, environmental, and civic groups that attracted over 13,000 local residents. In addition, the FWS helped generate hundreds of newspaper, television, and magazine articles that provided information about wolves and their recovery. Other FWS-led interagency wolf recovery programs were established in Idaho, Wyoming, and Washington. They are focused primarily on wolf monitoring and on public information and education (Fritts et al. 1993).

Since 1980, conflicts with livestock production have been minor, although still controversial (Bangs et al. 1993). As of September 1, 1993, 17 cattle and 12 sheep have been killed by wolves, all in Montana. Seventeen wolves were moved or killed by FWS and U.S. Department of Agriculture Animal Damage Control personnel to prevent further livestock losses and build local tolerance of non-predating wolves (the majority of the wolf population). In 1987, a private organization, Defenders of Wildlife, established a successful program that compensates ranchers for livestock killed by wolves. About \$11,000 has been paid to date. In 1993, Defenders also began a program that pays \$5,000 to any landowners on whose property wolves successfully raise pups. Effective agency control of problem wolves and the private compensation program have helped reduce controversy about the presence of wolves.

The FWS, other cooperators, and the University of Montana have initiated research on wolves and ungulates in and adjacent to Glacier National Park. Wolves in the Glacier Park area generally live in packs of 8-12 wolves, use territories of about 300 square miles (780 square kilometers) in valley bottoms, have a single litter of 5 pups in late April, feed primarily on white-tailed deer (*Odocoileus virginianus*), and die most often at the hands of people.

Data indicate that wolves are simply another predator in the northern Rocky Mountains ecosystem. Of 120 adult female white-tailed deer, elk (*Cervus elaphus*), and moose (*Alces*) monitored with radio telemetry over the past 4 years in the Glacier Park area, 49 have died. Mountain lions (*Felis concolor*) killed 15, wolves 11, grizzly bears (*Ursus arctos*) 8, humans 8, coyotes (*Canis latrans*) 3, old age 1, and 3 others died from unknown causes (D. Pletscher, Univ. of Montana, pers. commun.). Research on mountain lions in 1992 suggested that wolves may be a more direct competitor with them than previously believed. Wolves killed 3 mountain lions, and it was not uncommon for wolves to track lions and usurp their ungulate kills (M. Hornocker, Hornocker Wildl. Res. Inst. Inc., pers. commun.). These data suggest that the potential impact of wolves on ungulate populations may be lower than previously predicted.

### Recovery Planning

In 1974, wolves gained Federal protection under the Endangered Species Act of 1973 (Act) and restoration programs were initiated in the northern Rocky Mountains (Fritts 1991, Fritts et al. 1993). The State of Montana led an interagency team, established by the FWS, that developed a formal Northern Rocky Mountain Wolf Recovery Plan. That 1980 plan recommended that a combination of natural recovery and reintroduction be used to restore wolf populations in the area around Yellowstone National Park and north to the Canadian border.

The FWS approved a revised recovery plan in 1987. It defined wolf recovery in the northern Rockies as the survival of at least 10 breeding pairs of wolves, for 3 consecutive years, in each of 3 recovery areas (northwestern Montana, central Idaho, and the Yellowstone area). Including all pack members, this would mean a total of approximately 300 wolves. The plan also recommended using the "experimental population" provision of the Act to promote public acceptance of the

timely reintroduction of wolves into Yellowstone National Park. This designation, authorized in section (10j) of the Act, allows considerable management flexibility, particularly in the control of problem animals, as a means of allaying local concerns about potential negative impacts. Under the revised recovery plan, if 2 wolf packs had not been discovered in central Idaho within 5 years, a similar reintroduction would occur there also.

Carefully controlled reintroductions into designated recovery zones is preferred as an alternative to waiting indefinitely for wolves to reestablish themselves. Recolonizing wolves could disperse into areas where they may pose a problem, real or perceived, for people and livestock, thereby undermining public support for wolf recovery. Reintroduced wolves can be designated as an experimental population — a management option not legally available for naturally recolonizing wolves, which have full protection under the Endangered Species Act. In addition, reintroduction would lead to a more rapid recovery, and thereby hasten the day when the northern Rocky Mountain wolf can safely be removed from the endangered species list.

### Gray Wolf EIS

In November 1991, Congress directed the FWS, in consultation with the National Park Service and Forest Service, to prepare an environmental impact statement (EIS) that considered a broad range of alternatives on wolf reintroduction in Yellowstone National Park and central Idaho. In 1992, Congress further directed the FWS to complete the EIS by January 1994 and to select a preferred alternative consistent with existing law.

The FWS formed and funded an interagency team to prepare the EIS. In addition to the National Park Service and Forest Service, the States of Wyoming, Idaho, and Montana, the USDA Animal Damage Control, and the Wind River Tribes participated. The Gray Wolf EIS

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## Reintroduction of Gray Wolves

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program emphasized public participation. In the spring of 1992, nearly 2,500 groups or individuals that had previously expressed an interest in wolves were contacted directly, and the EIS program was widely publicized.

In April 1992, 27 "issue scoping" open houses were held in Montana, Wyoming, and Idaho, along with 7 more in other locations throughout the U.S. The meetings were attended by nearly 1,800 people, and thousands of brochures were distributed. Nearly 4,000 people provided thoughts on issues they felt should be addressed in the EIS. The most commonly mentioned issues involved ecosystem completeness, land use restrictions, livestock losses, humane treatment and respect of wolves, potential impacts on ungulate populations and hunting opportunities, and management strategies and costs. A report describing the public's comments was mailed to 16,000 people in July 1992.

In August 1992, another 27 "alternative scoping" open houses and 3 hearings were held in Wyoming, Montana, and Idaho. Three other hearings were held in the States of Washington (Seattle) and Utah (Salt Lake City), and in Washington D.C. In addition, a copy of the alternative scoping brochure was inserted into a Sunday edition of the two major newspapers in Montana, Wyoming, and Idaho. Nearly 2,000 people attended the August meetings, and nearly 5,000 comments were received.

The public comment reflected the strong polarization that has typified management of wolves. A majority (many urban or not living in the potentially affected areas) indicated it wanted immediate reintroduction and full protection of wolves. Many others (primarily rural residents in or near central Idaho or Yellowstone) indicated they did not want wolves to be recovered. A report on the public's ideas and suggestions was mailed to about 30,000 people in November 1992.

In April 1993, a Gray Wolf EIS planning update report was published. It discussed the status of the EIS, provided factual information about wolves, and requested the public to report observations of wolves in the northern Rocky Mountains. It was mailed to nearly 40,000 people in all 50 States and over 40 foreign countries that had requested information.

## Reintroduction of Wolves as Nonessential Experimental Populations

The draft EIS was released to the public on July 1, 1993, for review and comment. It contained an FWS proposal to reintroduce gray wolves into both Yellowstone National Park and central Idaho if 2 naturally occurring wolf packs are not found in either area before October 1994. The reintroduced wolves would be designated "nonessential experimental populations" to allow additional flexibility in the management of wolves by government agencies and the public. Such a designation would minimize conflicts over public lands, effects on domestic animals and livestock, and impacts on ungulate populations. There would be no land use restrictions for wolf management. State and tribal wildlife agencies would be encouraged to take the lead in wolf management outside national parks and national wildlife refuges. The EIS estimated that reintroduction would result in wolf recovery in and around Yellowstone National Park and central Idaho by 2002. Total management costs of the program until recovery (10 breeding pairs in each area for 3 years) and delisting were projected to be about \$6 million.

In the draft EIS, the FWS considered 4 alternatives to the proposed action: 1) "Natural Recovery" (which could lead to wolf recovery by about 2025 and cost about \$10-\$15 million); 2) "No Wolf" (which would expressly prohibit recovery, in violation of law, and cost about \$100,000 to eliminate recolonizing wolves); 3) "Wolf Management Committee" (which could lead to recovery by

about 2015, and cost \$100-\$129 million for land acquisition and intensive management of wolves, ungulates, and their habitat); and 4) "Reintroduction of Nonexperimental Wolves" (which could lead to recovery by about 2000, with a total cost of \$28 million, including habitat purchases). The impact of each wolf management strategy (except the "No Wolf" alternative) on livestock, ungulate populations, hunting, land use restrictions, visitor use, and local economies varied primarily in the time and location of the impacts rather than major differences in the *level* of impacts.

The Yellowstone area comprises about 25,000 square miles (64,750 sq km), 76 percent of which is federally managed land. This area has over 95,000 ungulates (with a hunter take of 14,314 annually), is grazed by about 412,000 livestock, receives about 14,500,000 recreational visits annually, and supports a \$4.2 billion local economy (3.5 percent due to livestock). The central Idaho area is about 20,700 square miles (53,613 sq km) in size and is nearly all National Forest land. The central Idaho area has about 241,000 ungulates (with an annual hunter take of 33,358 ungulates), is grazed by about 306,525 livestock, receives about 8,000,000 recreational visits annually, and supports a \$1.43 billion local economy (5.2 percent due to livestock).

A recovered wolf population in the Yellowstone area would be anticipated to kill about 19 cattle (1-32), 68 sheep (17-110), and up to 1,200 ungulates (primarily elk) each year. It would not affect hunter take of male ungulates, but could reduce harvests of female elk, deer, and moose from some herds. A recovered wolf population would not affect hunter harvests or populations of bighorn sheep (*Ovis canadensis*), mountain goats (*Oreamnos americanus*), or pronghorn (*Antilocapra americana*). A recovered wolf population may reduce populations of elk 5-30 percent (30 percent in some small herds), deer 3-19 percent, moose 7-13 percent, and bison (*Bison bison*) up to 15 percent.

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## Reintroduction of Gray Wolves

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The presence of wolves would not change uses of public or private land except for restricting potential use of M-44 cyanide devices ("coyote getters") for predator control in occupied wolf range. Visitor use would increase (at least 5 percent for out-of-State residents and at least 10 percent for local residents), and would generate \$7-10 million in additional net economic benefits each year.

A recovered wolf population in the central Idaho area would kill about 10 cattle (1-17), 57 sheep (32-92), and up to 1,650 ungulates (primarily mule deer) each year. It would not measurably affect ungulate populations. Although hunter take of female elk could fall 10-15 percent, harvest of male elk would be unaffected. Further, a recovered wolf population in this region would not measurably affect hunter take of deer, moose, bighorn sheep, or mountain goats. Wolf presence would not change uses of public or private land (except for restricting use of M-44 devices in occupied wolf range). Visitor use would likely increase (at least 8 percent for out-of-State residents and at least 2-12 percent for local residents), and would generate \$5.6-\$8.4 million in additional net economic benefits each year.

### Public Comment on the Draft EIS

Nearly 1,700 copies of the draft EIS and 75,000 copies of the summary draft

EIS were distributed in July, August, September, and October of 1993. A copy of the summary draft EIS, a schedule for 16 public hearings (4 each in Montana, Idaho, and Wyoming, and 4 in other parts of the country), and a request for the public to report wolf observations were published in the 2 major newspapers serving Montana, Wyoming, and Idaho. Public comments on the draft EIS will be accepted until November 26, 1993.

### Preparing the Final EIS

Public comments are being analyzed this fall and winter, and a final EIS will be completed in early 1994. Once the EIS is completed, it will be forwarded to decisionmakers in the Department of the Interior, who will determine how wolf recovery will proceed. All requests for information or the final EIS should be directed to Ed Bangs, Gray Wolf EIS, P.O. Box 8017, Helena, Montana 59601 (telephone 406/449-5202).

The only prediction considered absolutely safe is that controversy will continue to characterize wolves and wolf management for many years to come.

\* \* \*

### Suggested Reading about Wolves in the West:

Bangs, E. 1991. Return of a predator: wolf recovery in Montana. *Western Wildlands* 17:7-13.

\* \* \*

to largemouth bass predation. Despite intensive efforts since 1991 to eliminate threats, this species may be on the verge of extinction. The Reno Field Office will brief the Regional Office and meet with the Nevada Department of Wildlife to determine a course of action.

In cooperation with the Bureau of Land Management (BLM), the FWS Boise (Idaho) Field Office participated in a 2-week field survey to locate habitats of the Bruneau Hot Springsnail (*Pyrgulopsis bruneauensis*) and update the status of the

Bangs, E.E., S.H. Fritts, D.R. Harms, J.A. Fontaine, M.D. Jimenez, W.G. Brewster, and C.C. Niemeyer. 1993. Control of Endangered Gray Wolves in Montana. Proc. 2nd N. Am. Wolf Symposium, Edmonton, Alberta. In Press.

Fritts, S.H. 1991. Wolf and wolf recovery efforts in the northwestern United States. *Western Wildlands* 17:2-6.

Fritts, S.H., E.E. Bangs, J.A. Fontaine, W.G. Brewster, and J.E. Gore. 1993. Restoring wolves to the northern Rocky mountains of the United States. Proc. 2nd N. Am. Wolf Symposium, Edmonton, Alberta. In Press.

Ream, R.R. and U.I. Mattson. 1982. Wolf Status in the northern Rockies. Pages 362-381 in F.H. Harrington, and P.C. Paquet, eds. *Wolves of the World: perspectives of behavior, ecology, and conservation*. Noyes Publ. Park Ridge, NJ.

Ream, R.R., M.W. Fairchild, D.K. Boyd, and A.J. Blakesley. 1989. First wolf den in western U.S. in recent history. *NW. Naturalist* 70:39-40.

Weaver, J. 1978. *The Wolves of Yellowstone*. Research report 14. National Park Service, Yellowstone National Park, WY.

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Edward Bangs is Project Leader for the Gray Wolf EIS, and Steven Fritts is the Northwest U.S. Wolf Coordinator. Both can be contacted at the Helena Field Office, U.S. Fish and Wildlife Service, 100 North Park, Suite 320, Helena, Montana 59601 (telephone 406/449-5225).

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search Center inventoried the only remaining population of an Endangered Nevada fish, the White River spinedace (*Lepidomeda albivallis*), but observed only 14 fish. In June 1991, biologist observed more than 40 individuals and estimated the population at 100. White River spinedace exist in a 3-spring system within the Kirch Wildlife Management Area, but are restricted to a relatively unsuitable portion of the spring system due

recently listed Endangered species. The FWS has contracted with Greg Mladenka, the researcher most familiar with the species and its habitats, to locate all thermal spring sites identified in his 1992 thesis; assist with field efforts to determine Global Positioning System (GPS) coordinates; mark each site for subsequent monitoring; determine springsnail presence or absence at each site; and measure the water's temperature, depth, and flow.

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Beginning in fall 1993, BLM intends to measure surface elevations at each identified thermal spring site along the Bruneau River and in Hot Creek. These efforts will initially target spring sites and springsnail habitats upstream of Hot Creek considered most at risk from further declines in the aquifer. Information gained from the survey will be useful in documenting declines of the geothermal aquifer and in completing future Section 7 consultations with BLM and Farmers Home Administration.

\* \* \*

After visiting one site of the Idaho douglasia (*Douglasi idahoensis*), a species of alpine primrose, staff from the FWS Boise Field Office and the Boise National Forest agreed that a monitoring program should be implemented in 1993 to assess the effects of sheep herding on this listing candidate, for which the FWS has a pending draft conservation agreement with the Forest Service.

\* \* \*

Staff from the FWS Coeur d'Alene (Idaho) Field Office attended the International Mountain Caribou Technical Committee meeting at the Forest Service's Sullivan Lake Ranger District office on July 15-16. Among the issues discussed was a summary of the 1993 winter census effort, which revealed a total of 51 woodland caribou (*Rangifer tarandus caribou*), including 7 calves, in the Selkirk Ecosystem. This population represents an increase of 4 animals since the 1992 survey.

\* \* \*

**Region 2** - The U.S. captive population of Mexican wolves (*Canis lupus baileyi*) increased from 39 to 63 following this year's breeding season. Of the 30 pups born to 5 mothers at 12 facilities, 24 survived (15 males and 9 females). Five pups in one litter died from a virulent bacterial infection, and another pup disappeared from its pen. The U.S. captive population of Mexican wolves has doubled in the past 3 years following a

decision to maximize reproduction of this Endangered species for proposed reintroductions. Seven more facilities will join the breeding project in the next year to accommodate the new pups.

\* \* \*

A survey techniques workshop that Dr. Paul Joslin of Wolf Haven International conducted May 27, 1993, at La Michilia Biosphere Reserve in Durango, Mexico, marked the beginning of an initiative to determine the status of wild populations of Mexican wolves in that country. Survey results will help direct recovery planning efforts for the species in Mexico and the United States. Approved by the U.S.-Mexico Joint Committee on Wildlife Conservation, the survey is a joint private sector-public sector project, to which the FWS has committed \$15,000. Wolf Haven International is providing technical assistance, equipment, and matching funds, and at least three Mexican non-government organizations are also contributing funds and staff.

\* \* \*

Canadian and U.S. biologists picked up 25 viable whooping crane (*Grus americana*) eggs in Wood Buffalo National Park, Canada, on May 27, 1993. They took 9 eggs to the International Crane Foundation in Baraboo, Wisconsin, and the rest to the FWS Patuxent Wildlife Research Center in Laurel, Maryland. Meanwhile, these two breeding facilities produced 21 fertile eggs, providing a bumper crop of chicks for the guide bird research project in Idaho (an experiment to see whether captive-bred chicks will bond with wild birds held in captivity for ultimate release to the wild), additions to the Canadian Wildlife Service's captive flock at Calgary Zoo in Alberta, and another potential release in Florida. Patuxent also shipped 6 sub-adult whooping cranes to the Calgary Zoo, bringing to 10 the total number of birds in the captive flock that the Canadian Wildlife Service is developing.

\* \* \*

As required by the District Court for the Southern District of Texas to settle a lawsuit on management of the Edwards

Aquifer, minimum springflow determinations for San Marcos Springs, Comal Springs, and Edwards Aquifer water levels have been established. The FWS Austin Field Office provided the determinations to the Department of the Interior's Office of the Solicitor for final presentation to the Court. Minimum springflow determinations will avoid impact to several Endangered and Threatened species, including the fountain darter (*Etheostoma fonticola*), Texas wild rice (*Zizania texana*), San Marcos salamander (*Eurycea nana*), San Marcos gambusia (*Gambusia georgei*), and Texas blind salamander (*Typhlomoge rathbuni*).

\* \* \*

From July 28-30, in Phoenix, Arizona, a multi-agency group held a Symposium on Vegetation Management of Hot Desert Rangeland Ecosystems. The program examined the ecology and management of hot desert rangeland ecosystems in the southwestern U.S. and northern Mexico, including the Mojave, Sonoran, and Chihuahuan Deserts. Designed to provide a forum on the state of knowledge for managing hot desert vegetation, and to identify gaps in that knowledge, the symposium focused on research and expertise related to weather, fire, plant succession, recreation, riparian biodiversity, wildlife habitat, grazing, hydrology, soil erosion, wild horses and burros, Threatened and Endangered species, and revegetation of disturbed lands.

The symposium was sponsored by the Bureau of Land Management, Arizona Society for Range Management, and the University of Arizona. The FWS was a co-sponsor, along with the Arizona State Land Department, U.S. Soil Conservation Service, Cattlemen's Association, The Nature Conservancy, U.S. Forest Service, Arizona Association of Conservation Districts, and Arizona State University. For information on papers and other material, including posters, contact the Phoenix Ecological Services Field Office at 602/379-4720.

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**Region 3** - Biologists conducting surveys for Kirtland's warblers (*Dendroica kirtlandii*) on the species' Michigan nesting grounds located 485 singing males, an increase from a 1987 low of 167. This year's number is the largest in Michigan since a 1961 survey located 502 singing males.

\* \* \*

The FWS Columbia (Missouri) Field Office assisted the Missouri Department of Conservation in a search for the Endangered Curtis' pearly mussel (*Epioblasma florentina curtisi*). After several hours of work, the searchers finally found *one* live male. Extensive searching in the same pool where the male was discovered, and at other sites on the Little Black River where the species was common about 8 years ago, resulted in no additional finds.

\* \* \*

The FWS Twin Cities (Minnesota) Field Office continues to collect herring gulls (*Larus argentatus*) and fish at Voyageurs National Park in Minnesota as part of a bald eagle (*Haliaeetus leucocephalus*) research. The study is attempting to determine the potential contaminant impact of avian and fish prey on the bald eagle. Eagle reproduction at the park has been low, and eaglet plasma has indicated elevated levels of PCBs, DDE, and mercury.

\* \* \*

**Region 4** - While surveying for the Alabama sturgeon (*Scaphirhynchus suttkusi*) in the lower Alabama and Cahaba Rivers, biologists from the Alabama Department of Conservation and Natural Resources (ADCNR) and the FWS have observed several rare or listing candidate species. In May, the Daphne, Alabama, Field Office netted an Alabama shad (*Alosa alabamae*)—the first confirmed record from the Alabama River in 15 years. The species was previously considered extirpated from the river.

Below Miller's Ferry lock and dam and Claborne lock and dam, paddlefish (*Polyodon spathula*), a listing candidate,

are seen almost routinely. This fact indicates that the fish are responding positively to the prohibited harvest imposed by the State. Observed paddlefish ranged from 2 to 5 feet (0.6 to 1.5 meters) in total length.

While biologists have found another candidate species, the blue sucker (*Cyprinus elongatus*), at a number of Mobile River basin sites, as of August, they had not located any Alabama sturgeon, a species proposed as Endangered on June 15, 1993. (See story in this edition.)

\* \* \*

**Region 5** - Biologists from the Virginia Natural Heritage Program extended the known range of Michaux's sumac (*Rhus michauxii*) into Virginia and discovered what may be the largest population of this Endangered plant, previously reported only in North Carolina, South Carolina, and Georgia. The Virginia scientists located several thousand plants on Fort Pickett in a controlled access area where artillery and small arms training is conducted. Frequent fires appear to be favoring the species' habitat. The Heritage Program is developing a Michaux's sumac management plan for Fort Pickett.

\* \* \*

Restricting off-road vehicle (ORV) access to beaches or segments of beaches to protect nesting birds—roseate terns (*Sterna dougalii dougalii*), least terns (*Sterna antillarum*), and piping plovers (*Charadrius melodus*)—is a hot topic of discussion at seaside communities on Cape Cod, Martha's Vineyard, and Nantucket every summer. Combatting misinformation about beach access restrictions can be a challenging job.

\* \* \*

The FWS New England Field Office (NEFO) is becoming increasingly active in public awareness initiatives about the Endangered Species Act, especially liability aspects of Section 9 and potential ORV beach access restrictions. Last winter, biologists participated in meetings with Martha's Vineyard officials and Congressional staffs to discuss the FWS position on protecting nesting piping plovers. This spring, because of the tourist-based economy of Martha's Vineyard,

biologists met with members of Edgartown's Chamber of Commerce, Board of Trade, and Board of Realty to dispel rumors that beaches might be closed to pedestrians as well as ORVs. All who attended expressed appreciation for the efforts to provide information and address the islanders' concerns.

The NEFO has established contacts to distribute Atlantic Coast Piping Plover Lesson Plans to teachers on both Martha's Vineyard and Nantucket, and a cooperative effort among the FWS, Massachusetts Division of Fish and Wildlife, and The Trustees of Reservations (a private conservation organization) resulted in the development of a fact sheet on beach access.

\* \* \*

NEFO staff coordinated the development of a censusing protocol for an Endangered orchid, the small whorled pogonia (*Isotria medeoloides*). Extensively reviewed by New England botanists, this methodology is designed to generate consistent censusing of large populations. Using the new methodology should produce information that will allow for comparison of population trends throughout the range of this plant.

\* \* \*

In May, the FWS Pennsylvania Field Office completed the final recovery plan for an Endangered plant, the northeastern bulrush (*Scirpus ancistrochaetus*). Copies of the plan will soon be available for distribution.

\* \* \*

Staff from the FWS Long Island Field Office and FWS New York Field Office (NYFO) are involved in informal Section 7 consultations on more than 20 beach erosion repair and stabilization projects as a result of severe winter storms along the Long Island coast. These projects involve Army Corps of Engineers (Corps) emergency repairs and beach nourishment, Corps Section 10 and 404 permits, and Federal Emergency Management Agency disaster relief funded work at locations of

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the Threatened piping plover and seabeach amaranth (*Amaranthus pumilis*), a plant also listed as Threatened. FWS staff members are working with the involved agencies to identify measures that can be incorporated into the projects to avoid potential impacts on these species.

\* \* \*

NYFO staff joined the New York Natural Heritage Program, The Nature Conservancy, and the Minnesota Department of Natural Resources to inspect New York locations of Leedy's roseroot (*Sedum integrifolium* ssp. *leedyi*), a Threatened plant known at only six sites in New York and Minnesota. In New York, a viable population of the Leedy's roseroot grows on cliff faces along a lake shoreline; at the State's other location, the population consists of a single plant. The inspection group discussed protection and recovery strategies for the larger site, which could involve the cooperation of as many as 50 private landowners.

\* \* \*

NYFO staff met with representatives of the Lower Hudson Chapter of The Nature Conservancy (TNC) to discuss its Bioreserve Strategy Plan for the Neversink River watershed. The meeting took place at the Neversink River near the New York population of the Endangered dwarf wedge mussel (*Alasmidonta heterodon*). The site supports what is believed to be the largest remaining healthy population of this mussel species. TNC has almost completed the Strategy Plan, featuring partnerships with local, State, and Federal agencies (including the FWS), as well as private organizations, industries, and landowners, to implement a comprehensive program of protection, management, research, and public education throughout the watershed.

\* \* \*

Several projects to conserve the Endangered Karner blue butterfly (*Lycæides melissa samuelis*) are under way or scheduled for New York. Activities include conducting surveys and monitoring populations, mapping and managing

habitat, and contacting landowners to negotiate conservation agreements. The New York State Department of Environmental Conservation, the New York Natural Heritage Program, and The Nature Conservancy are undertaking the work, with funds provided by the FWS under Section 6 of the Endangered Species Act.

\* \* \*

The Maryland Department of Natural Resources has completed a follow-up status survey of 177 bog turtle (*Clemmys muhlenbergii*) sites originally studied during the mid-1970's. Of the 158 sites that biologists obtained permission to enter, 90 had bog turtles and 68 lacked turtles. Likely factors responsible for turtle extirpation include habitat succession, encroachment of exotic plants, and wetland draining, dredging and filling. Although some sites still had suitable habitat, they lacked turtles, possibly due to illegal collecting.

\* \* \*

**Region 7** - Biologists in Alaska initiated two satellite telemetry studies this summer to locate the molting and wintering grounds of the spectacled eider (*Somateria fischeri*) in the hope of gaining some insight into the causes—as yet unknown—for the decline of this Threatened species. Satellite transmitters used in these studies weigh less than 30 grams (1.0 ounce) and are expected to transmit 42-52 weeks.

In May and June, FWS endangered species biologists attached six satellite transmitters to spectacled eiders (2 males and 4 females) using neoprene harnesses. As of mid-August, these birds were still on the North Slope. Alaska Fish and Wildlife Research Center (AFWRC) biologists implanted 15 satellite transmitters in the body cavities of Yukon-Kuskokwim (Y-K) Delta spectacled eiders (5 males and 10 females). As of mid-August, four males had been tracked to the coast of the Chukotka Peninsula, two females had moved to Norton Sound, and the remaining females were still near the breeding grounds.

AFWRC researchers also conducted preliminary investigations on the

Indigirka River Delta in Russia, identifying potential spectacled eider habitat. They concluded that the river delta has sufficient numbers of birds to initiate a study. Prospects for a joint study between the U.S. and Russia on eider nesting biology on the Indigirka River Delta are good.

The final rule listing the spectacled eider as Threatened was published in the May 10, 1993, *Federal Register*. In the U.S., the number of eider nests increased slightly this year—a reprieve from dramatic annual declines of the recent past.

\* \* \*

Population surveys for the Steller's eider (*Polysticta stelleri*) continued this year, in the spring in southwest Alaska and in the summer on the North Slope. FWS biologists and North Slope Borough researchers jointly conducted nesting and productivity surveys near Barrow. The FWS Division of Migratory Birds will also track eiders during the emperor goose (*Chen canagica*) fall migration survey. Surveys of Steller's eiders on the Alaska peninsula to count the spring population and note incidental occurrences of other eider species and seabirds will continue in April and May of 1994.

On May 8, 1992, the FWS published its finding that a proposal to list the Steller's eider was warranted but precluded by higher priority listing actions. This species no longer nests on the Y-K Delta, and no more than a few thousand nest in extreme northwestern Alaska.

\* \* \*

On July 13, 1993, the FWS issued a negative finding in response to a petition to list the Alaska breeding population of the dovekie (*Alle alle*), also called the "little auk," as an Endangered species. The FWS concluded that scientists consider the Alaska dovekie a peripheral segment of the species' total population. The center of the dovekie's population is primarily in Greenland, Iceland, Russia, and Norway, where this small seabird totals more than 30 million pairs. While the FWS feels the dovekie's occurrence in Alaska is notable, this segment does not

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constitute a significant component of the species' overall population.

\* \* \*

Field work for 1993 on the Aleutian Island breeding grounds of the Aleutian Canada goose (*Branta canadensis leucopareia*) included nesting surveys and color-marking of the little-known remnant population at remote Chagulak Island. Biologists counted 18 nests, indicating no change from 1990. As in the past, flightless adults and goslings were captured with great difficulty, and only 9 birds were fitted with green tarsus bands. Studies are ongoing to determine factors limiting the growth of the approximately 100-bird remnant population on Chagulak Island. Additional nesting habitat for the island geese is being restored after what appears to be a successful attempt this year to eradicate introduced arctic foxes from nearby Yunaska Island. The number of Aleutian Canada geese in Alaska is estimated at 10,000.

\* \* \*

The long-established Eagle Management Program delivered a dozen bald eagle (*Haliaeetus leucocephalus*) chicks from nests in southeastern Alaska, where the species is plentiful, to California, where it is listed as Endangered. Their new home will be the Ventana Wilderness Sanctuary in Los Padres National

### BOX SCORE LISTINGS AND RECOVERY PLANS

Category	ENDANGERED		THREATENED		LISTED SPECIES TOTAL	SPECIES WITH PLANS
	U.S.	Foreign Only	U.S.	Foreign Only		
Mammals	56	250	9	22	337	34
Birds	73	153	17	0	243	72
Reptiles	16	64	18	14	112	26
Amphibians	6	8	5	0	19	9
Fishes	58	11	37	0	106	59
Snails	12	1	7	0	20	26
Clams	51	2	5	0	58	40
Crustaceans	11	0	2	0	13	4
Insects	15	4	9	0	28	14
Arachnids	5	0	0	0	5	0
Plants	324	1	78	2	405	167
<b>TOTAL</b>	<b>627</b>	<b>494</b>	<b>187</b>	<b>38</b>	<b>1,346*</b>	<b>451**</b>
Total U.S. Endangered	627	(303 animals, 324 plants)				
Total U.S. Threatened	187	(109 animals, 78 plants)				
Total U.S. Listed	814	(412 animals, 402 plants)				

\* Separate populations of a species that are listed both as Endangered and Threatened are tallied twice. Those species are the leopard, gray wolf, grizzly bear, bald eagle, piping plover, roseate tern, chimpanzee, Nile crocodile, green sea turtle, and olive ridley sea turtle. For the purposes of the Endangered Species Act, the term "species" can mean a species, subspecies, or distinct vertebrate population. Several entries also represent entire genera or even families.

\*\* There are 347 approved recovery plans. Some recovery plans cover more than one species, and a few species have separate plans covering different parts of their ranges. Recovery plans are drawn up only for listed species that occur in the United States.

Number of CITES Party Nations: 120

September 1, 1993

Forest. California joins Indiana, Missouri, New York, North Carolina, and Tennessee as yet another State to wel-

come these native Alaskans in an attempt to recover our country's symbol across the nation.

June-October 1993

Vol. XVIII No. 3

# ENDANGERED SPECIES

## Technical Bulletin

Department of Interior, Fish and Wildlife Service  
Washington, D. C. 20240

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