

ENDANGERED SPECIES

Technical Bulletin

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Sea Turtle Conservation in the Southeastern Continental United States

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Sea turtles, large air-breathing reptiles that spend almost their entire lives at sea, have existed for at least 100 million years. These remarkable animals swam the earth's oceans in countless numbers until recent times, when they have declined because of commercial exploitation, habitat alteration, incidental take by commercial fisheries, and other factors. Of the seven generally recognized species, six are listed by the United States as Endangered or Threatened.

Nesting Habitat

The southeastern United States coast, especially in Florida, provides nesting habitat for four listed species of sea turtles. About 15,000 female loggerhead turtles (*Caretta caretta*) nest annually on these beaches. This population is second in size only to the estimated 30,000 loggerheads nesting each year in the Sultanate of Oman. These aggregations comprise approximately 90 percent of the world's known population. Ninety percent of the loggerhead nesting in the United States occurs in Florida, 2 percent in Georgia, 6 percent in South Carolina, and the remaining 1 to 2 percent in North Carolina. In comparison, green turtle (*Chelonia mydas*) nesting in the continental United States is much lower, with 150 to 250 females nesting annually on east-central and southeast Florida beaches. Leatherbacks (*Dermochelys coriacea*) nest even less frequently in the continental United States, with fewer than 20 to 25 females nesting in Florida each year. The hawksbill (*Eretmochelys imbricata*) rarely nests in the continental United States.

The critical plight of the Kemp's ridley (*Lepidochelys kempii*), which only rarely nests in the United States (Texas), is well documented. An estimated 100,000 to 300,000 clutches of eggs were deposited annually on its major nesting beach in Mexico prior to 1947. This plummeted to an estimated 2,000 to 3,000 nests by the 1960's. Nesting has continued to decline, with 737 nests recorded in 1987. The

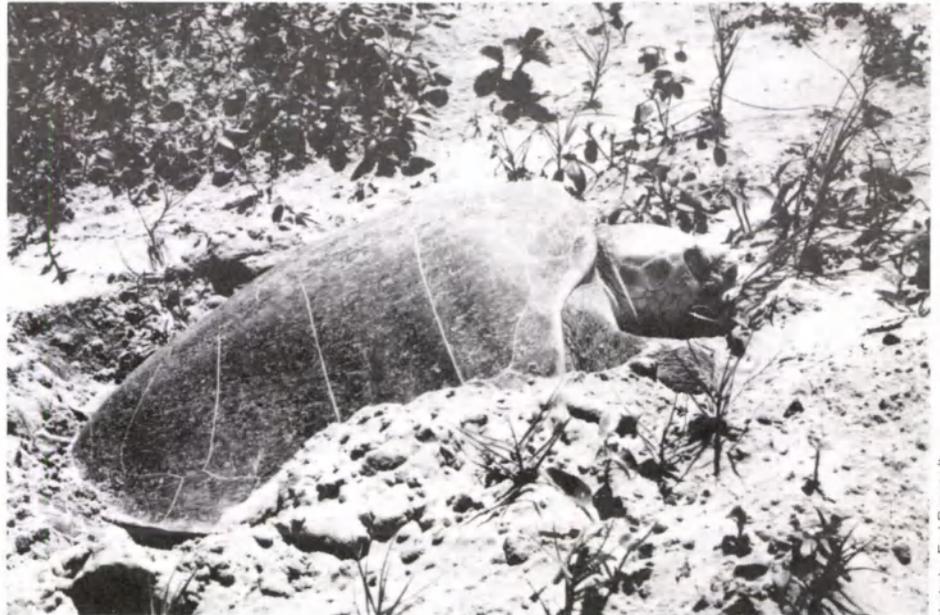


photo by Earl Possardt

Kemp's ridley sea turtle, the only listed species that normally nests in daylight, at Rancho Nuevo, Mexico

decline of loggerheads is less dramatic, but recent evidence from nesting surveys in South Carolina and tagging studies in Georgia point to a 5 and 3 percent annual decline, respectively, on nesting beaches in these States. Recorded green turtle nesting in the southeastern United States

has been recovering in recent years, from 59 nests in 1979 to 746 in 1985. Although more thorough surveys partially account for these higher numbers, comparison of beaches monitored over this period indicates a true nesting increase.

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Listing Protection Proposed for Seven Species

The Fish and Wildlife Service proposed during July to list seven taxa — two mammals, two mollusks, and three plants — as Endangered or Threatened species. If the proposals are later made final, full Endangered Species Act protection will be extended to the following:

Two Florida Beach Mice

Extensive development of beachfront habitat is threatening a number of beach mouse (*Peromyscus polionotus*) taxa in the southeastern United States. At least one subspecies on Florida's Atlantic

Coast is already believed to be extinct, and three others found near the Florida-Alabama border are listed by the Service as Endangered (see BULLETIN Vol. X No. 7). In July, the Service published a proposal (F.R. 7/5/88) to add another two subspecies, the **Anastasia Island beach mouse** (*P. p. phasma*) and the **southeastern beach mouse** (*P. p. niveiventris*) to the Federal list of Endangered and Threatened wildlife.

Beach mice are burrow-dwelling mammals that depend on natural coastal dune habitat. They cannot survive in areas that

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Regional News

Regional endangered species staffers have reported the following news from June and July:

Region 1 — Fish and Wildlife Service representatives attended the annual

meeting of the Interagency Grizzly Bear Committee (a group of State and Federal agency directors and managers who advise and direct grizzly bear (*Ursus arctos*) recovery efforts in the conter-

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minous United States). The meeting was hosted by the Committee's North Cascades Working Group, an organization of State and Federal biologists and land managers whose purpose is to oversee the evaluation of bear habitat and the status of the bear in the North Cascades ecosystem.

Two public meetings were conducted, one on each side of the Cascade Mountains. The purpose of the meetings was to expose the public to concepts of grizzly bear management in the North Cascades and to gather public responses. Considerable concern was voiced about translocation of grizzly bears into the North Cascades ecosystem. The public was assured that the Service has no plans at this time for translocating grizzly bears into this ecosystem.

Region 2 — A wild male sandhill crane (*Grus canadensis*) was captured at Grays Lake National Wildlife Refuge in Idaho during August 1987, shipped to Patuxent Wildlife Research Center in Maryland, and paired with a captive-reared female. A good pair bond seemed to be established and the pair was shipped to Grays Lake in May. They were held in an enclosure in the marsh for several weeks and then released. They continued to behave like a pair immediately after their release, but they later separated. This test of force-pairing was an effort to see how whooping cranes might respond in similar circumstances.

The 1988 breeding season in Arizona for the bald eagle (*Haliaeetus leuccephalus*) was a record breaker. A total of 24 young fledged this year from 23 occupied breeding areas. The previous high was in 1985 when 22 young were fledged from Arizona nests. Two new breeding areas were discovered this year, bringing the total of known breeding areas in Arizona to 27. This number is up significantly from 1971, when we knew of only one bald eagle breeding area in the State.

The Arizona Nest Watch Program continues to contribute to the recovery of this population by monitoring all active nests during the breeding season. This season, nestwatchers were directly responsible for saving four young eaglets—placing three stranded nestlings back into their nests and removing a large fishing lure from the beak of the fourth, thus saving it from starvation.

The current Arizona bald eagle ecology study is in its second year. One of the more interesting findings is that all radioed juveniles disperse in June, fly north for the summer, then return to their desert natal areas in the fall of the same year. A male juvenile eagle that was banded and radio-tagged during the 1987 season migrated to Yellowstone Lake in Wyoming in June 1987 and returned to Arizona in September. He then returned to Yellow-

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Approved Listing Rules

During July 1988, final listing rules were approved for two fishes, a mussel, a mammal, and two plants. Endangered Species Act protection is now available to the following:

- **shortnose sucker (*Chasmistes brevirostris*) and Lost River sucker (*Deltistes luxatus*)**—These fishes are restricted to the Klamath Basin of south-central Oregon and north-central California. Dams, draining of marshes, diversion of rivers, and dredging of lakes have reduced the range and numbers of both species by more than 95 percent. Both are jeopardized by continued loss of habitat; hybridization with more common fishes; and competition with, and predation by, non-native species. No significant recruitment of young into the population has occurred for about 18 years. Both species were proposed for listing as Endangered on August 26, 1987 (see summary in BULLETIN Vol. XII No. 9), and the final rule was published in the July 18, 1988, *Federal Register*.

- **James spiny mussel (*Pleurobema collina*)**—This small freshwater clam, endemic to the James River drainage of Virginia and West Virginia, survives in only 5 to 10 percent of its historical range. It is in danger of extinction from water quality degradation and invasion of its habitat by the

exotic Asiatic clam (*Corbiculata fluminea*). The September 1, 1987, proposal to list the James spiny mussel as Endangered (see BULLETIN Vol. XII No. 10) was made final July 22, 1988.

- **Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*)**—A small, hopping mammal with elongated hind legs, the Tipton kangaroo rat was distributed historically in dry, open scrub habitat in the Tulare Lake Basin of the San Joaquin Valley, California. Conversion of native wildlands for agricultural production has eliminated the species from about 96 percent of its known former range. Much of the remaining habitat is highly fragmented and long-term survival of the species in these areas is not ensured. The Service proposed listing the Tipton kangaroo rat on July 10, 1987, as Endangered (see BULLETIN Vol. XII No. 8), and the final rule was published July 8, 1988.

- **Houghton's goldenrod (*Solidago houghtonii*)**—A perennial in the family Asteraceae, this plant grows to a height of about 30 inches (77 centimeters) and bears flat-topped clusters of relatively large yellow flowers. It is native to beach flats along the northern shores of Lakes Michigan and Huron. Currently, its range is reduced to 39 sites in 8 Michigan counties and several

sites in Ontario, Canada. The main threats to its survival are residential development of beachfront habitat, off-road vehicle use and certain other recreational activities, and rising lake levels. The August 19, 1987, proposal to list Houghton's goldenrod as a Threatened species (BULLETIN Vol. XII No. 9) was made final on July 18, 1988.

- **Pitcher's thistle (*Cirsium pitcheri*)**—This plant, another member of Asteraceae, also grows to about 30 inches high. Among its distinguishing characteristics are the white-wooly, deeply divided leaves and cream-colored or yellowish flowers. Pitcher's thistle occurs along the sandy shores of the Great Lakes, primarily on stabilized, well developed dunes. Its range includes sites in Indiana, Michigan, Wisconsin, and Ontario. Although there have been few documented losses of complete populations, many colonies have been reduced in size and are therefore probably less able to reclaim disturbed areas. Because this plant grows along lakeshores, its habitat is likely to become increasingly vulnerable to development and recreation. The Service proposed on July 20, 1987, to list Pitcher's thistle as Threatened (see BULLETIN Vol. XII No. 8), and the final rule appeared in the July 18, 1988, *Federal Register*.

Sea Turtles

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Aquatic Habitat

The coastal marine environment of the southeastern United States provides equally important habitat for sea turtles. The bays, sounds, and nearshore waters from Chesapeake Bay to Laguna Madre in Texas are rich sources of benthic invertebrates, such as mollusks, sponges, and horseshoe crabs, which are the primary prey for juvenile and adult loggerheads. Green turtles, although greatly diminished from historical numbers, still graze on the coastal sea grass pastures of Florida's east coast and the Gulf of Mexico. Flotillas of leatherbacks are also occasionally sighted within several miles of shore feeding on concentrations of their principal food, jellyfish and other soft-bodied animals. Adult Kemp's ridleys, when away from their nesting beach in Mexico, are primarily associated with nearshore and inshore habitat in the Gulf of Mexico. Juveniles are found in these same habitats in the Gulf and along the South Atlantic coast. Both juvenile and adult Kemp's ridleys prey on the abundance of crabs found in these waters.

Threats on Land and at Sea

Sea turtles face serious danger throughout all life history stages. Threats on the nesting beaches include the de-



green sea turtle digging its nest

struction of nesting habitat from natural or human-accelerated beach erosion and the construction of sea walls, riprap, or other devices to protect oceanside property. Artificial lighting in developed areas disorients hatchlings when they emerge at night. Significant hatchling mortality can result as the young turtles crawl toward the lights. The same lights may deter

some females from nesting, particularly green turtles, which appear to be more sensitive to this factor. High-rise condominiums and exotic Australian pines can shade nests and alter the natural sex ratio, since incubation temperature influences the gender of the embryos as they develop. Beach nourishment projects can

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Sea Turtles

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disrupt nesting turtles, destroy nests, and leave beach sand too compact for subsequent nesting. Predators, such as raccoons, feral hogs, ghost crabs, and in some cases man, take a heavy toll of eggs on many nesting beaches.

Other dangers are encountered at sea. Probably the most serious threat to sea turtles in the South Atlantic and Gulf of Mexico is shrimp trawling. The National Marine Fisheries Service (NMFS) has estimated that nets from shrimp vessels drown over 11,000 sea turtles annually. Other commercial fisheries in these waters cause additional deaths but to an unknown degree. Marine pollution from oil and human refuse is another documented threat. Three percent of Florida's sea turtle strandings between 1980 and 1985 were linked to the ingestion of tar balls or were otherwise related to petroleum. Leatherbacks die from impaction of their digestive systems after ingesting plastic bags which resemble jellyfish, their primary food item. Boat strikes also take a toll; in Florida, for example, between 1980 and 1985, 23 percent of stranded turtles had evidence of propeller wounds or cracked carapaces from boat collisions. It is unknown, however, what percentage of these wounds occurred pre- or post-mortem.

Research, Conservation, and Protection

Fortunately, sea turtle conservation is a truly cooperative effort, and many organizations, agencies, and universities are working together to improve the odds for these species. The NMFS, which is responsible for sea turtle protection in the marine environment, has been working on regulations that require shrimp vessels 25 feet or more in length to use turtle excluder devices (TEDs) in their trawls at certain times. This is probably the single most important action taken for sea turtle conservation since the 1970's, when the six listed sea turtle species were given Endangered Species Act protection. (The recent legislation reauthorizing the Endangered Species Act contained a provision to delay the implementation of the TEDS regulations.) A long-term tagging project at Cumberland Island National Seashore by the University of Georgia has provided not only the best data available on loggerhead nesting population dynamics, but also a unique opportunity to evaluate the effectiveness of TED regulations on a nesting population of loggerhead turtles.

The Fish and Wildlife Service (Service) is acting to increase hatchling production for the 6 to 10 percent of the sea turtles in the Southeast that nest on national wildlife refuges each year. Predation is being



photo by Earl Possardt

Beachfront development can have serious impacts on sea turtle reproduction.

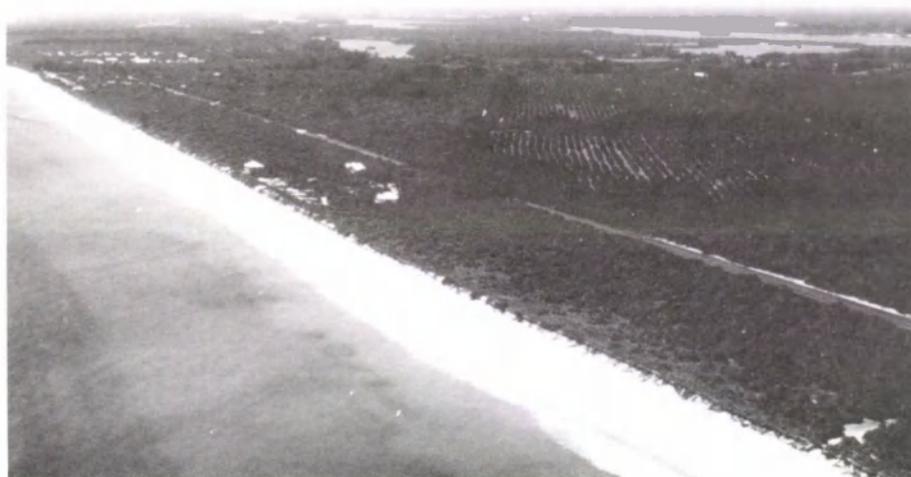


photo by Earl Possardt

This undeveloped beach may be protected as part of the Indian River acquisition proposal.

reduced by screening nests and removing raccoons, and nests are being relocated on beaches that are experiencing severe erosion. The Air Force, Marine Corps, National Park Service, many Florida State Parks, South Carolina Wildlife and Marine Resources Department, some local communities (such as the City of Boca Raton, Florida), Greenpeace, Caretta Research Inc., and many volunteers implement similar programs.

An excellent example of interagency cooperation and success is at Cape Canaveral, Florida, where 4,000 to 5,000 clutches are deposited annually on the 42 miles (68 kilometers) of beaches managed by the National Park Service, Merritt Island National Wildlife Refuge, and the Air Force. Nest protection efforts by these agencies in 1987 resulted in over 60 percent of the nests producing hatchlings. Without these efforts, raccoon and hog

predation would have destroyed over 95 percent of the nests. The Service has funded researchers from the University of North Carolina (Wilmington), University of Toronto, and the Kennedy Space Center to determine the natural sex ratio of hatchlings on southeastern nesting beaches. This information will be used to evaluate nest relocation projects that may be inadvertently skewing the natural sex ratio.

A 22 mile (35 km) stretch of beach between Melbourne Beach and Wabasso Beach, Florida, accounts for approximately 25 percent of all green and loggerhead nesting in the United States. Nesting densities reach 800 nests per kilometer on some segments. The Service and Florida Department of Natural Resources are developing acquisition proposals which would protect an estimated

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9 miles (15 km). With 5 miles (8 km) already publicly owned by Brevard County and the State, a total of about 14 miles (23 km) of this crucial nesting habitat could eventually be protected for sea turtles and other wildlife.

Many coastal communities are passing lighting ordinances to reduce hatchling mortality. Brevard County instituted the first such ordinance for Florida in 1985. Prior to implementation of the ordinance, researchers at the University of Central Florida had documented hatchling disorientation at approximately 12 percent of the nests on a 13-mile (21 km) study area in south Brevard County. The year after the lighting ordinance became effective, hatchling disorientation was reduced to about one percent.

The Army Corps of Engineers Waterways Experiment Station in Vicksburg, Mississippi, has been involved in testing the response of hatchlings to various artificial light regimes, with some promising possibilities for compatible beachfront lighting. The newly created Sea Turtle Research Center at the University of Florida, Gainesville, will continue to pursue the problem of hatchling disorientation and search for non-detrimental light systems. The Corps also is engaged in evaluating sand compaction levels on natural and nourished beaches, the impacts of compacted beaches on turtle nesting, and the effectiveness of tilling as a means to ease beach compaction. This summer, University of Indiana researchers will explore hatchling orientation mechanisms and mortality factors in the Florida near-shore and offshore marine environment.

The Minerals Management Service is funding studies to determine the abundance of sea turtles around offshore oil rigs in response to concern about sea turtle mortality from the removal of oil rigs by

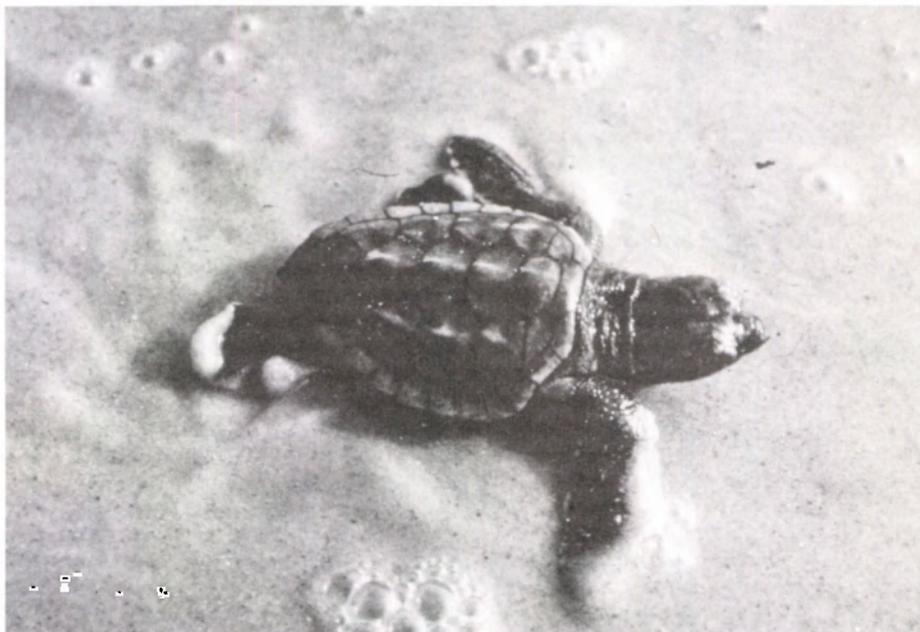


photo by David Goethe

A hatchling loggerhead represents hope for the survival of the species.

explosives. It also funded a recent study by the University of Miami on the effects of oil on sea turtles to better evaluate risks from offshore oil development.

Sea turtle population studies in the Indian River, Florida, by the University of Central Florida have documented a high incidence of fibropapillomas, a tumorlike condition, in green turtles. Research on the etiology of these large wart-like growths is being conducted at the University of Florida's School of Veterinary Medicine.

The NMFS station at Panama City, Florida, is conducting studies of juvenile Kemp's ridley and green sea turtles in the northeastern Gulf of Mexico. Its Beaufort, North Carolina, laboratory will soon initiate sea turtle population studies in Pam-

lico and Core Sounds in North Carolina with the cooperation of the State and the Service.

Education

The cornerstone of a successful sea turtle conservation program is education. One organization, the Center for Environmental Education (Sea Turtle Rescue Fund) in Washington, D.C., is providing information to the public through newsletters, bilingual sea turtle education kits, and pamphlets. The Florida Power and Light Company, NMFS, and South Carolina Wildlife and Marine Resources Department also have produced educational brochures. The Service has developed a bilingual slide-tape program, entitled "America's Sea Turtles," which is available on loan from most of the Service's coastal field stations and the Atlanta and Albuquerque Regional Offices. In Florida, "sea turtle walks" conducted by Florida Power and Light, Canaveral National Seashore, several State parks, and other organizations are very popular and inspire a lasting interest in sea turtle conservation.

While it is evident that much work and research is being conducted, and progress has been made on some critical issues, the survival of the listed sea turtles is by no means assured. The success or failure of some management actions cannot be determined until many years after implementation. Only continued or even increased conservation efforts will determine whether these ancient creatures, which have roamed the seas for over 100 million years, survive or are driven to a premature extinction.



photo by Scott A. Eckert

Earthwatch volunteers with a nesting leatherback sea turtle at Sandy Point National Wildlife Refuge in the U.S. Virgin Islands

Listing Proposals

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have been altered by condominium developments and other construction. Beach mice also are threatened by the influx of non-native animals associated with human habitation, including such predators as free-roaming house cats and competitors like the house mice (*Mus musculus*) that colonize adjacent dune grasslands. As a result, beach mouse populations in many areas have been either eliminated or fragmented into small colonies.

Historical records indicate that the Anastasia Island beach mouse once occurred from the mouth of the St. Johns River at Jacksonville (Duval County) to the southern end of Anastasia Island (St. Johns County). Currently, viable populations are believed to exist only at the ends of Anastasia Island on public land (Anastasia State Recreation Area to the north and Matanzas National Monument to the south). A proposed bridge scheduled for construction in the early 1990's would lead directly into the limited habitat of the southern population. It could be detrimental to the survival of the mouse in that area unless planners can find ways to avoid or offset impacts. This subspecies was proposed for listing as Endangered.

The southeastern beach mouse historically inhabited coastal dune habitat from Ponce (or Mosquito) Inlet (Volusia County) south to Hollywood Beach (Broward County). In the late 1800's, it was considered extremely abundant from Palm Beach to the northern limit of its range. Extensive surveys in recent years, however, found that urbanization apparently has eliminated the southeastern beach mouse from most of its southern range. Good populations still occur on protected habitat within Cape Canaveral National Seashore and Merritt Island National Wildlife Refuge. Because this subspecies is vulnerable but in somewhat less critical danger than the Anastasia Island beach mouse, the southeastern beach mouse was proposed for listing as Threatened.

With publication of the listing proposal, a Federal agency whose activities are likely to jeopardize the survival of these beach mice is required to confer with the Service. In the case of Fort Matanzas National Monument, the National Park Service will need to ensure that the new bridge proposed for Matanzas Inlet will not jeopardize the Anastasia Island beach mouse on park property. Under the National Flood Insurance Program, the Federal Emergency Management Agency also will have to confer with the Service if any flood insurance that it authorizes will permit and/or in effect subsidize construction that could jeopardize either of the two beach mice. It is not known at this time, however, whether or not any Fed-

eral activities will actually be affected by consultations.

Magazine Mountain Shagreen (*Mesodon magazinensis*)

The Magazine Mountain shagreen is a dusky brown or buff colored snail approximately 0.5 inch (13 millimeters) long and 0.3 inch (7 mm) high. It is found only in cool, moist crevasses within rock slides on the north slope of Magazine Mountain in Logan County, Arkansas. Because of its extremely limited range, this snail is vulnerable to any land use changes that would alter the rock slide habitat. Accordingly, the Service has proposed listing the Magazine Mountain shagreen as a Threatened species (F.R. 7/5/88).

Magazine Mountain is relatively separated from other mountains in the region and is regarded as an "island" ecosystem that provides habitat for a number of endemic animal and plant taxa. One or more of these endemics will probably be proposed for listing following the assimilation of additional data. The mountain, which lies within the Ozark National Forest, is classified by the U.S. Forest Service as a Special Interest Area and is being considered for designation as a Research Natural Area.

The Arkansas Department of Parks and Tourism is interested in developing Magazine Mountain as a State Park and has applied for a special use permit from the Forest Service, although the State may also request a land exchange. Any construction (e.g., structures, roads, trails) or recreational activities associated with a State Park could threaten the snail if the rock slides on the north slope are disturbed. The U.S. Army also would like to use the National Forest in this area for training exercises. The Forest Service will be required to confer with the Fish and Wildlife Service before allowing any activities in the National Forest that would be likely to jeopardize the snail.

Speckled Pocketbook Mussel (*Lampsilis streckeri*)

Another Arkansas species, this freshwater mussel is restricted to the Middle Fork of the Little Red River with a current range of not more than 6 miles in Van Buren and Stone Counties. The speckled pocketbook has an elliptical yellow or brown shell up to 3 inches (76 mm) long with chevron-like spots and obvious rays. Impoundments, channelization, and water pollution eliminated this mollusk from other parts of the Little Red River system where it historically occurred. The current population is estimated at only a few hundred individuals, and the Service has proposed to list the speckled pocketbook mussel as Endangered (F.R. 7/25/88).

Federal agencies whose activities could affect the survival and recovery of the speckled pocketbook include the U.S. Army Corps of Engineers and the Environmental Protection Agency (EPA). The Corps conducts channel maintenance for flood control on the Archey and South Forks of the Little Red River, both of which contained habitat for the mussel until they were channelized. It is considered possible that sections of habitat in both forks could be renovated and populations of the speckled pocketbook reestablished. The EPA could be involved through efforts to restore water quality within the species' range.

Autumn Buttercup (*Ranunculus acriformis* var. *aestivalis*)

This plant, a herbaceous perennial in the buttercup family (Ranunculaceae), is endemic to the upper Sevier River Valley in western Garfield County, Utah. Its habitat consists of peaty hummocks in a freshwater marsh. Livestock grazing has extirpated the autumn buttercup from its type locality and reduced its single known

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Magazine Mountain shagreen

photo Ronald F. Caldwell

drawing by K. H. Thorne



autumn buttercup (*Ranunculus acriformis* var. *aestivalis*)

remaining population by over 90 percent in the past 5 years. Approximately 11 individuals survive on less than 0.01 acre of privately owned land that is highly vulnerable to continued grazing and habitat modification. Believing the species to be in imminent danger of extinction, the Service has proposed to list it as Endangered (F.R. 7/22/88).

The landowner has tentative plans to increase the size of the spring-fed pond immediately to the north of the autumn buttercup site. That action could subject the population to further grazing and trampling pressure. The owner, however, may be willing to allow construction of a protective fence. The Great Basin Field Office of The Nature Conservancy has purchased an option to acquire the site. Also, the Center for Plant Conservation, through The Arboretum at Flagstaff, has obtained two seedlings and will attempt to propagate them.

Two Colorado Plants

Two wildflowers endemic to the shale badlands of north-central Colorado have been proposed for listing as Endangered species (F.R. 7/5/88). Both species are characterized by the clusters of showy flowers they bear. The **Osterhout milk-vetch (*Astragalus osterhoutii*)** is a tall, rush-like plant with linear leaflets and bright green stems that reach up to 40 inches (100 centimeters) in height. Each

inflorescence bears 12 to 25 white flowers that measure about one inch (2.5 cm) across. The **Penland beardtongue (*Penstemon penlandii*)**, another herbaceous perennial, belongs to the snapdragon family (Scrophulariaceae). A shorter plant, it produces linear leaves and several clumped, pubescent stems up to 10 inches (25 cm) tall. There are 5 to 15 brightly bicolored flowers on each inflorescence. The blooms measure about 0.6 inch (1.5 cm) wide and have blue lobes with a violet throat.

Both species are endemic to Middle Park, a sagebrush basin in Grand County. The beardtongue is known only from one area. The milk-vetch occurs at the same area but also at small sites scattered over a 12-mile region, with most along the Muddy Creek drainage. The Bureau of Land Management (BLM) administers most of the land on which both species are found. A portion of the beardtongue site has been impacted by mineral exploration.

The main threat to the Osterhout milk-vetch is the proposed Muddy Creek Reservoir. Construction of a high dam would inundate approximately 14 percent of the known plants, and a low-dam alternative would flood about 8 percent. Although the expected direct impacts are small, potential secondary effects could threaten another 60 percent of the milk-vetch habitat. The degree of secondary impacts would be the same under both of the reservoir alternatives. Most of these associated effects would result from the construction of recreational facilities and from increased ORV use by visitors drawn to the area. The habitat is currently susceptible to habitat damage from off-road vehicle (ORV) use. Additionally, the fragile soils, steep topography, and arid environment in the badlands exacerbate ORV impacts.

The Service has worked with the Colorado River Water Conservation District (the main proponent of the dam), the District's consultants, and the BLM on development of a draft environmental impact statement for the reservoir project. Potential mitigation measures that may be proposed include fencing milk-vetch habitat from ORV use, measures to reduce other harmful impacts from recreation, and population monitoring efforts. The Corps of Engineers will be involved in project evaluations due to the need for a construction permit under Section 404 of the Clean Water Act. Both agencies also are now subject to the interagency conferral provisions of the Endangered Species Act.

Conservation Measures Authorized by the Endangered Species Act

Among the conservation benefits provided to a species if its listing under the Endangered Species Act is approved are:

protection from adverse effects of Federal activities; restrictions on take and trafficking; the requirement for the Service to develop and implement recovery plans; the authorization to seek land purchases or exchanges for important habitat; and the possibility of Federal aid to State or Commonwealth conservation departments that have signed Endangered Species Cooperative Agreements with the Service. Listing also lends greater recognition to a species' precarious status, which encourages further conservation efforts by State and local agencies, independent organizations, and 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 authorize, fund, or carry out are not likely to jeopardize the survival of a listed species. If an agency finds that one of its activities may affect a listed species, it is required to consult with the Service on ways to avoid jeopardy. For species that are proposed for listing and for which jeopardy is found, Federal agencies are required to "confer" with the Service, although the results of such a conference are non-binding.

Further protection is authorized by Section 9 of the Act, which makes it illegal to take, possess, transport, or engage in interstate or international trafficking in listed animals except by permit for certain conservation purposes. For plants, the rule on take is different; the prohibitions against collecting and destruction apply only to listed plants found on lands under Federal jurisdiction. Some States, however, have their own more restrictive laws against take of listed plants.

Regional News

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stone Lake for his second summer. Some migrating juveniles have been tracked as far north as British Columbia and Manitoba, Canada. Equally interesting is the speed at which they migrate. This year, one of the juveniles traveled 420 miles in one day! A total of 39 juvenile eagles have been banded and 10 of them carry radio transmitters.

The first survey of wintering bald eagles in the Grand Canyon was conducted in January. Eighteen eagles in one day were observed foraging on trout at the mouth of Nankoweap Creek.

Grand Canyon National Park is sponsoring a 3-year survey to determine the productivity of peregrine falcons (*Falco peregrinus*) in the Canyon and to develop a monitoring handbook. Surveys conducted this spring resulted in the discovery of 26 eyries. The researchers estimate that only 40 percent of the available

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Regional News

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peregrine habitat was surveyed this spring and that the actual number of eyries could be between 60 and 70. These estimates, if borne out, indicate that the Grand Canyon may support the largest concentration of peregrines for an area its size in North America.

Region 4 — The Service's Asheville, North Carolina, Field Office, in cooperation with the U.S. Forest Service and the National Park Service, is sponsoring a cave management seminar at Gatlinburg, Tennessee, March 8-11, 1989. The seminar will be conducted by the American Cave Conservation Association, a private nonprofit organization at Horse Cave, Kentucky, that is dedicated to the protection of cave and karst resources in the United States. The seminar program will involve professional cave managers from Federal and State agencies, the academic community, and private organizations like The Nature Conservancy. In the past, the Association has conducted seminars for the National Park Service, the U.S. Forest Service, and the Bureau of Land Management. The emphasis of the Gatlinburg seminar will be on the Endangered, Threatened, and listing-candidate species that are associated with, or are dependent on, cave and karst systems. For more information about the seminar, contact Bob Currie, U.S. Fish and Wildlife Service, 100 Otis Street, Room 224, Asheville, North Carolina 28801 (telephone 704/259-0321 or FTS 672-0321).

Region 6 — Representatives of Region 6 also attended the Interagency Grizzly Bear Committee's annual meeting. A special Committee task force recently reviewed the status of the grizzly bear population in the Yellowstone ecosystem, which includes 9,600 square miles of rugged habitat. Because of the difficulty of counting the Yellowstone bears, total numbers cannot be accurately determined. However, the results of the recent survey show that there were at least 45 adult female grizzly bears in the ecosystem as of 1985, as compared to a minimum of 32 adult females known to be alive in 1983. Based on the number of females actually counted each year, the task force estimated that there were a minimum of 170-180 grizzlies in the ecosystem in 1985 and that the population is now increasing at a rate of up to about 2 individuals per year.

There are probably more than 170-180 grizzly bears alive now in the Yellowstone ecosystem. This marks the first time the Yellowstone grizzly bear population has shown an increase since 1975, when the grizzly was declared a Threatened species in the conterminous 48 States. The increase is believed to be partially a result of interagency management programs and increased efforts to find existing bears. The increase in the population is cause for optimism, but continued intensive management and public support are essential for the survival and long-term recovery of the grizzly bear in the Yellowstone ecosystem.

Bald eagles have successfully nested in North Dakota for the first time since 1975. Two adult bald eagles and a fully feathered nestling were observed in June 1988

in trees along the Missouri River near Garrison Dam. The birds were observed on several other occasions, and in early July a warden for the North Dakota Game and Fish Department observed both adults and the fledgling flying near the nest.

Region 6 has printed and distributed copies of the Dwarf Bear-poppy (*Arctomecon humilis*) Recovery Plan. The plant was listed as Endangered in 1979, and is restricted to the eastern edge of the Mojave Desert in Washington County, Utah. Past impacts to the species have resulted from highway construction and expansion of the city of St. George. The most severe current threats to the plant are off-road vehicles and continued urban development. Recovery actions will include restrictions on off-road vehicle use and public information on the species' plight.

Region 8 (Research) — The Patuxent Wildlife Research Center reports that 50 active palila (*Loxioides bailleui*) nests have been located in the Mauna Kea study area on the Island of Hawai'i. Nesting success has been calculated to be 47 percent, with most of the successful nests fledging just one bird.

There has been poor success with the radio telemetry studies of the endangered palila during the breeding season. The radios placed on 7 birds ceased to operate within 5 days of release. This is in contrast to successful radio tracking of palilas for up to 28 days during the non-breeding season. The birds mutually preen one another during the breeding season and appear to be damaging or removing the radios.

Approved Recovery Plans

Caria W. Corin

Under the Endangered Species Act, the Fish and Wildlife Service is responsible for developing and carrying out recovery plans for all listed domestic species under its jurisdiction. Accordingly, recovery plans were recently approved for the following species:

Blue Ridge Goldenrod

The Blue Ridge goldenrod (*Solidago spithamaea*) is a perennial herb 4 to 8 inches tall with yellow flowers blooming from July to September. It is a member of a large and taxonomically complex genus in the equally large and complex aster (Asteraceae) family. This species, found only in limited areas of the Blue Ridge Mountains in North Carolina and eastern

Tennessee, is one of the few southeastern representatives of a widely distributed group of goldenrod species abundant in more northern alpine localities. It inhabits rock outcrops, ledges, cliffs, and balds at elevations generally above 4,600 feet (1,400 meters). *S. spithamaea* is possibly a relict from a cooler, moister time, surviving at these higher elevations when the climate warmed.

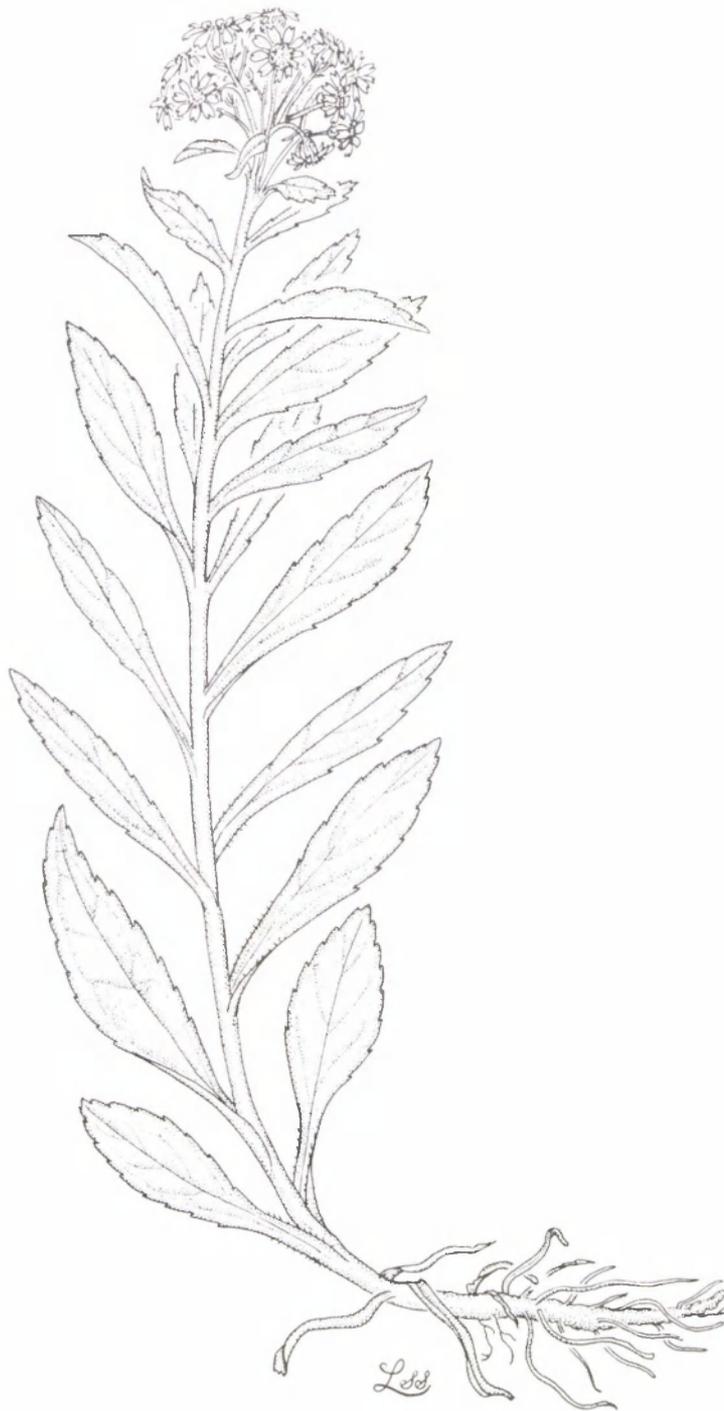
The Blue Ridge goldenrod was federally listed as Threatened on March 28, 1985. It is also listed as threatened by North Carolina and endangered by Tennessee under their State provisions to protect threatened and endangered species. The Federal law prohibits taking plants from Federal lands without a permit

and regulates interstate trade. Both States prohibit taking without a permit and landowner's permission, and North Carolina also regulates intrastate trade.

The life history of *S. spithamaea* is little known. Although various hymenopterous insects have been seen on the flowers, the pollinators have not been identified. The goldenrod appears to spread vegetatively by extending rhizomes, and presumably reproduces by seed, but the relative importance of each method of reproduction is unknown.

The main potential threats to the Blue Ridge goldenrod are impacts associated with recreation, including loss of habitat to development and trampling by climbers,

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Blue Ridge goldenrod

hikers, and sightseers. Natural succession, climatic extremes, erosion, and possibly acid precipitation are other factors. At present, there are three known populations: on National Forest land at Roan Mountain; at Grandfather Mountain, a commercial recreation site; and at Hanging Rock, a ski area under development.

Three additional historical sites are known, but all have been extensively developed since the original collections and no Blue Ridge goldenrods have been found there in over 50 years. Three other reported sites have been searched repeatedly over the past 7 years with no success.

The primary objective of the recovery plan approved by the Fish and Wildlife Service on October 28, 1987, is to attain 5 self-sustaining, protected populations of the Blue Ridge goldenrod. At that level, the plant could be considered for removal from the Federal Endangered and Threatened Species List. To achieve this goal, the three known populations need to be protected, and two more either discovered or reestablished in the plant's historic range.

Currently, the most vigorous populations are at the Grandfather Mountain site. A conservation agreement has been in place since 1983 among the Service, North Carolina Department of Agriculture, and Grandfather Mountain, Inc. The owner of Grandfather Mountain has been very cooperative in conservation efforts for the goldenrod and other rare species on his property. On the other hand, the population on Roan Mountain (a massif on the North Carolina-Tennessee border that provides habitat for a number of listing candidates) is not as secure. The U.S. Forest Service, despite efforts to protect the *S. spithamea* populations at its Roan Mountain site by blocking access to unauthorized "bushwhacked" trails, has had problems in some areas with trampling of plants and damage to habitat by hikers and sightseers. A closure order for one Forest Service site is successfully protecting the species at that isolated location. The plants at the Hanging Rock ski area in North Carolina are on a steep cliff face, and the owner and developer have expressed a willingness to cooperate in their protection.

Besides continuing efforts to protect these three populations, the Service plans to conduct population studies and ecological research on the Blue Ridge goldenrod. Information gathered during these studies may be used to develop a more specific management strategy, which may include reintroduction of the plant to suitable sites in its historic range.

Ringed Sawback Turtle

The ringed sawback turtle (*Graptemys oculifera*) was listed on December 23, 1986, as a Threatened species. This small freshwater turtle is found only in the Pearl River and one of its tributaries, the Bogue Chitto River, in Mississippi and Louisiana. In the Pearl River, it has been collected from near the coastal salt water influence upstream to Neshoba County, Mississippi. The highest densities are above the Ross Barnett Reservoir and below the confluence with the Strong River in Simpson County. In the Bogue Chitto River, the ringed sawback turtle has been found as far upstream as Franklinton, Louisiana.

G. oculifera is a relatively small turtle, adults ranging from 2.9 to 8.7 inches (7.5-22 centimeters) in plastron length. Its

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Recovery Plans

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common name is derived from the yellow ring, bordered on both sides by dark olive-brown, on each shield of the spiny, sawtooth-ridged carapace. The plastron is yellow. There also is a large yellow spot behind the eye, two yellow stripes running from the orbit back to the neck, and a yellow stripe covering the entire lower jaw. In *A Field Guide to Reptiles and Amphibians of Eastern and Central North America*, Roger Conant describes the ringed sawback as having "... a clownish appearance, as though smeared with grease paint...."

The ringed sawback turtle is found on wide river stretches with a moderate current, numerous basking logs, and sandy nesting beaches. Nest site suitability appears to be influenced by sand particle size, elevation above and distance from the water's edge, and cover quality. The life history of the ringed sawback turtle has not been intensively studied, but research on various members of the genus has provided some information on *G. oculifera*. These studies have indicated, based on the numbers of eggs and follicles found in reproducing *G. oculifera* females, that this species may have a lower reproductive potential than other members of the genus. The nesting season is probably from mid-May to early August. As in many other turtles, nest temperature may be a determining factor in the sex of the hatchlings. Studies on three related species (*G. geographica*, *G. ouachitensis*, and *G. pseudogeographica*) found that at nest temperatures below 28° C. only males were produced, and only females were produced at temperatures over 30.5° C.

Egg mortality may be a limiting factor for the ringed sawback turtle. In other *Graptemys* species, egg mortality ranged from 82 to over 90 percent. It is unknown how inundation or submersion of eggs influences mortality. If this is a major problem, then the quality of available nest sites could be an important limiting factor for the ringed sawback turtle. Nest predation, mainly by fish crows and raccoons, is the dominant factor limiting *G. pulchra*, the Alabama map turtle, which is the only other member of the genus found in the Pearl River. *G. oculifera* is probably also a victim of such predation.

The main limiting factor for this turtle seems to be habitat availability. The ringed sawback turtle apparently does not migrate across land to other drainages. Much of its habitat has been lost to modification and degradation of water quality. Construction of the Ross Barnett Reservoir, modification of the west channel of the Pearl River to Bogalusa, Louisiana, and floodplain clearing at Jackson, Mississippi, have impacted 21 percent of *G.*

oculifera's historic range. The reservoir alone inundated 30 river miles. Planned or authorized projects will impact up to 28 percent of the remaining Pearl River habitat. Authorized channelization of 100 river miles of the Bogue Chitto River would likely eliminate the turtle from that tributary. Flood control projects on both the Pearl and Bogue Chitto Rivers may adversely modify the turtle's habitat. Water quality has been degraded by increased turbidity and by agricultural runoff that may contain pesticides. Sand and gravel dredging also degrades the environment by both direct habitat destruction and increased siltation.

The goal of the Ringed Sawback Turtle Recovery Plan, approved by the Fish and Wildlife Service on April 8, 1988, is to recover the turtle to the point where it is secure and no longer needs listing protection. In order to meet this goal, the following objectives must be met:

- 1) Protect a total of 150 river miles in 2 reaches of the Pearl River, one above and one below the Ross Barnett Reservoir, with a minimum of 30 miles in either of these reaches.
- 2) Attain a stable or increasing population over at least 10 years on these 2 reaches.
- 3) Establish a plan to periodically monitor population trends and habitat quality to ensure a continuing stable population.

To meet these objectives, further study of the two most vigorous populations of the ringed sawback turtle (above the Ross Barnett Reservoir and below the Strong River) is needed to evaluate population trends, and more detailed life history studies of this species are needed. Habitat characteristics must be described and limiting factors determined. Reproductive

requirements, population structure, food sources, and behavior need to be studied. After gathering this information, the specific habitat that needs protection can be determined, and specific plans and actions to protect and monitor the population will be developed.

Piping Plover—Great Lakes and Northern Great Plains Populations

On January 10, 1986, the piping plover (*Charadrius melodus*) was added to the endangered and threatened species list. The northern Great Plains breeding population was listed as Threatened and the Great Lakes breeding population as Endangered; both populations in migration and on the wintering grounds are considered Threatened. The Atlantic Coast breeding population of the plover was also listed as Threatened. (See BULLETIN Vol. XIII No. 5 for story on that recovery plan.) The Great Lakes and Northern Great Plains Piping Plover Recovery Plan was approved on May 12, 1988.

This 7-inch (17-centimeter) long shorebird has a sand-colored upper body and white underparts. There are a black breastband and bar across the forehead except during winter plumage. The inland birds have a more complete breastband than the Atlantic Coast birds, but morphological studies have not found significant differences over the plover's range, and recent electrophoretic analyses show no genetic differences.

The ranges of the Great Lakes and

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piping plover

photo by James P. Mattsson

northern Great Plains populations of the piping plover remain similar to those described in historical accounts, but there has been a decline in number, particularly in the Great Lakes, where only about 17 pairs bred in 1986 and 1987. This decrease in the Great Lakes population has caused a gap in the distribution of the bird across North America. Past records for the northern Great Plains indicate breeding in Montana, Wyoming, New Mexico, North Dakota, South Dakota, Nebraska, and Iowa; at present there are no populations remaining in Wyoming or New Mexico. Nesting in the plains States is on sandflats, sandbars, silty flats, sandy beaches, gravel parking lots, saline wetlands, and sand and gravel pits and spoil piles. Between 1986 and 1987, it is estimated that 1,241- 1,309 pairs bred in the northern Great Plains (665 in the U.S., 576-644 in Canada).

Breeding of piping plovers in the Great Lakes area has all but ceased in Minnesota, Wisconsin, Illinois, Indiana, Ohio, Pennsylvania, and New York, and now reliably occurs only in Michigan. The bird apparently was never abundant in the other States. In Michigan, the plover formerly nested on beaches of Lakes Superior, Michigan, Huron, and Erie, but the only remaining breeding populations are found in 6 counties of northern Michigan: Emmet, Charlevoix, and Leelanau Counties on Lake Michigan; and Chippewa, Alger, and Luce on Lake Superior.

The piping plover spends about 4 to 5 months on the breeding grounds, beginning to arrive in mid-April. Nesting is in open, sparsely vegetated habitats. Plovers are sometimes found nesting within colonies of common terns (*Sterna hirundo*) in Minnesota, least terns (*S. antillarum*) on riverine sandbars and sand pits in the Dakotas and Nebraska, and American avocets (*Recurvirostra americana*) along alkaline wetlands in North Dakota. Incubation lasts 25-31 days, with both sexes participating. Juveniles leave the breeding grounds after the adults, and most are gone by late August.

Inland populations of the piping plover nest in riverine and saline wetland habitats that tend to be ephemeral or subject to modification. Habitat has been lost to a variety of causes. On the Great Lakes, high water levels, flooding, and beach erosion have been major factors in the decline. On river systems in the Great Plains, piping plovers nest on sandbars within the channel and at sand and gravel pits along the rivers. Now, reservoirs, channelization, and flow modification have eliminated many sandbars in the Missouri and Platte Rivers, the main systems used by piping plovers. Reduced flows over many years have caused a riparian forest and other vegetation to invade river channels and eliminate nesting habitat for piping plovers. Regulated flows cause fluctuations at times inappropriate to nesting. The recovery plan

calls for a determination and implementation of adequate flows.

Many piping plover nesting areas are at sand and gravel pits where nesting success is limited by vehicular and foot traffic and predation. In some areas of the plains, cattle may trample nests and leave footprints in which young birds may become trapped.

Band returns and sightings of color-marked piping plovers indicate that most inland plovers winter along the Gulf of Mexico coast. Most migrate to Texas, but some winter in Louisiana, Mississippi, Alabama, and Florida. Winter habitat on the Gulf coast is threatened by industrial development and urban expansion, recreational beach use, and, occasionally, oil spills. Stabilization of sand barrier islands can result in vegetation encroachment that reduces the quality of plover habitat.

The piping plover's status has received much publicity, and there are many encouraging efforts under way to aid its recovery. Intensive surveys are being carried out in most States where it occurs. Many nest sites are protected by posting, fencing, and patrols in areas where the birds may be subject to disturbance. Many sites are being protected through acquisition by States or The Nature Conservancy.

Because of the wide distribution of the piping plover, the recovery objectives take into account current information on the abundance and distribution of plovers in each State; knowledge of how thoroughly each State has been surveyed; historic population data; loss of viable habitat; assessment of the potential to increase breeding pairs at currently occupied sites; and potential to establish breeding pairs at unoccupied sites. There are separate goals for the northern Great Plains and the Great Lakes populations. To recover the Great Plains population, the following objectives must be met:

- 1) Increase the number of birds in the U.S. Northern Great Plains to 1,300 pairs (a 70 percent increase over the 1986 estimate);
- 2) maintain the 1,300 pairs in a specified distribution for 15 years;
- 3) attain the Canadian Recovery Objective of 2,500 birds for its prairie region; and
- 4) protect essential breeding and wintering habitat.

To prevent extirpation of the piping plover on the Great Lakes, the following criteria will be attained. Once they are met, it may be possible to consider reclassifying that population to Threatened.

- 1) Increase the population to 150 pairs;
- 2) protect essential breeding and wintering habitat;
- 3) achieve the Canadian Recovery Objective of restoring the Great Lakes population; and
- 4) maintain the following distribution for 15 years:

Duluth-Superior Harbor: 5 pairs
Wisconsin: 15 pairs (including the Duluth-Superior population)
Michigan: 100 pairs
Other Great Lakes Sites: 35 pairs.

The recovery plan emphasizes the protection of habitat as the principal means to achieve recovery. Indeed, a number one priority task in the northern Great Plains is the acquisition of breeding habitat in North Dakota and on the Platte River, Nebraska. The plan lists all known essential breeding and wintering habitat. Although all of this habitat is not likely to be acquired by the Service, the recovery plan lists a variety of Memoranda of Understanding and other agreements among public agencies and private organizations that must be completed to adequately protect essential habitat. For example, the recovery plan calls for a Memorandum of Understanding among the U.S. Army Corps of Engineers, National Park Service, U.S. Fish and Wildlife Service, and State agencies for the permanent protection and management of all essential piping plover habitat on the Missouri River in North Dakota, South Dakota, and Nebraska.

In order to meet the recovery objectives, a wide range of tasks is planned. Extensive surveys will be conducted to determine the current distribution and population trends during breeding, migration, and wintering. About 70 percent of the plovers' time is spent at areas other than the breeding grounds, but their location during that time is one of the least-known aspects of their life history. Winter studies are needed to more precisely determine their habitat requirements throughout the year.

Finally, the plan recommends designation of a recovery plan coordinator to coordinate the research and management activities that are being conducted by a variety of Federal, State, local, and private groups. Additionally, the coordinator would be able to assist in international efforts to help the piping plover. Canada now has a recovery plan. A public information campaign and other work are needed in Mexico and the Caribbean, where plovers may winter but where specific sites and threats are as yet unknown.

The Great Lakes and Northern Great Plains Piping Plover Recovery Plan summarizes a large body of data on the piping plover, an extensive bibliography, a list of people knowledgeable about the plover to contact in each State, population survey techniques, and other useful information on the species.

Copies of these and all other recovery plans are available for purchase about 6 months after they are approved. Requests should be sent to the Fish and Wildlife Reference Service, 6011 Executive Boulevard, Rockville, Maryland 20852, or call toll-free 800.582-3421. (In Maryland, dial 301/770-3000.)

BOX SCORE OF LISTINGS AND RECOVERY PLANS

Category	ENDANGERED			THREATENED			SPECIES* TOTAL	SPECIES WITH PLANS
	U.S. Only	U.S. & Foreign	Foreign Only	U.S. Only	U.S. & Foreign	Foreign Only		
Mammals	31	19	240	5	2	23	320	24
Birds	61	15	145	7	3	0	231	57
Reptiles	8	7	59	14	4	14	106	22
Amphibians	5	0	8	4	0	0	17	6
Fishes	45	2	11	24	6	0	88	47
Snails	3	0	1	5	0	0	9	7
Clams	31	0	2	0	0	0	33	22
Crustaceans	8	0	0	1	0	0	9	4
Insects	10	0	0	7	0	0	17	12
Arachnids	3	0	0	0	0	0	3	0
Plants	149	6	1	40	6	2	204	82
TOTAL	354	49	467	107	21	39	1037	283 **

Total U.S. Endangered **403**
 Total U.S. Threatened **128**
 Total U.S. Listed **531**

Recovery Plans approved: 242
 Species currently proposed for listing: 12 animals
 16 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, 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.

**More than one species are covered by some recovery plans, and a few species have separate plans covering different parts of their ranges.

Number of Cooperative Agreements signed with States and Territories: 51 fish & wildlife
 November 30, 1988 36 plants

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ENDANGERED SPECIES

Technical Bulletin

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