

ENDANGERED SPECIES

Technical Bulletin

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

Recovery 2000: An Intensive Approach for Restoring Endangered Species

Region 3 Endangered Species Office
Twin Cities, Minnesota

In these days of limited budgets and staffing levels, the Fish and Wildlife Service must make increasingly difficult choices about where to focus its endangered species activities. Those species that are in the greatest danger generally have been given the highest priority for protection and recovery resources. Species that have been brought back from the brink of extinction but are not yet recovered have tended to be given lower funding priority. For this reason, many listed species that are within reach of complete recovery have remained in this uncertain position.

In the 1988 amendments to the Endangered Species Act, the Service was directed to give recovery priority to those species that are most likely to benefit from recovery actions. In this regard, the Fish and Wildlife Service, U.S. Forest Service, and 8 States in Region 3 (see map on page 2) have proposed an ambitious pilot initiative to recover 28 of the 41 listed Threatened and Endangered species in the Region. If *Recovery 2000* is funded and implemented as conceived, Region 3 expects that 20 of these 28 species could be fully restored and delisted by the turn of the century. Some of these animals and plants are endemic to Region 3 or occur primarily within the Region, including such species as the Higgins' eye pearly mussel (*Lampsilis higginsii*) and dwarf lake iris (*Iris lacustris*). For another 8 species, recovery within Region 3 would be achieved but delisting would depend upon recovery success in other Regions. Among these are the gray bat (*Myotis grisescens*), pink mucket pearly mussel (*Lampsilis orbiculata*), and pondberry (*Lindera melissifolia*).

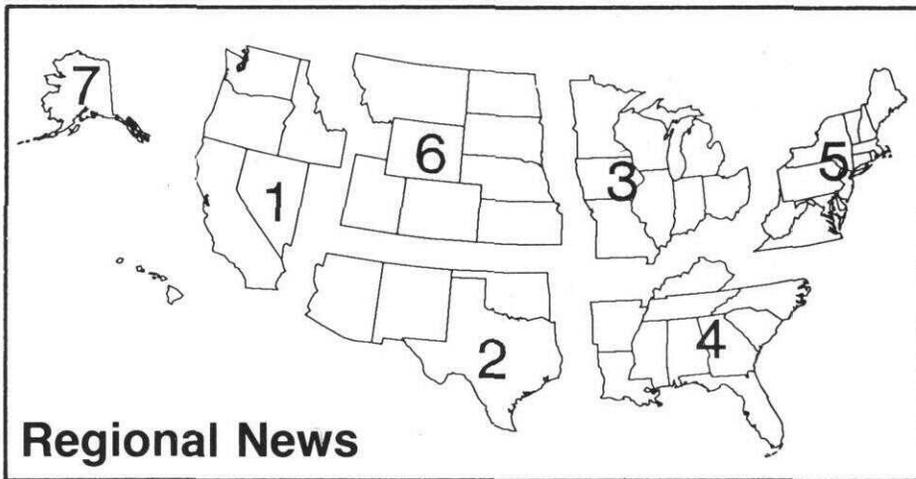
Recovery 2000 calls for achieving all of the recovery plan goals for the targeted 28 species, although not necessarily all of the tasks identified in the recovery plans, within 10 years of initiating the program. Recovery strategies for the 28 species will include habitat protection, establishment



photo by Don Kurz

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Mead's milkweed (*Asclepias meadii*) is 1 of the 28 Threatened and Endangered plants and animals in the upper Midwest targeted for recovery by the year 2000.



Regional News

Regional endangered species staffers have reported the following news:

Region 1—A nearly white bald eagle (*Haliaeetus leucocephalus*) was observed throughout a 3-week period between

Clallam Bay and Neah Bay, Oregon. It is believed to have migrated north with the estimated 1,400 or more raptors observed by participants in the Cape Flattery Spring Hawk Migration Survey. The Audubon

Society and the Clallam Bay Raptor Center participated in the survey.

An analysis of data gathered during the 1988-1989 Central Idaho Public Survey of Wolf Occurrences has been completed. A considerable number (248) of gray wolf (*Canis lupus*) sightings were reported from back-country areas.

Peregrine falcon (*Falco peregrinus*) chicks went into three hack sites in Oregon and two sites in Washington. In addition, peregrines at a coastal Oregon eyrie have successfully hatched chicks. Occupation of the site had been noted in prior years, but the new observation is the first documented successful breeding at this site for many years.

Region 2—A 3-year-old female whooping crane (*Grus americana*) died July 13, 1989, while being treated by the veterinarian at San Antonio Zoological Gardens. The bird was captured on Aransas National Wildlife Refuge on April 21, when it was found emaciated and unable to fly. The bird had avian tuberculosis, for which there is no known cure, but she was treated experimentally with some antibacterial drugs. Although there was a suspected case of avian tuberculosis in an 8-month-old whooping crane in February 1983, the recent case was the first confirmation of the disease in the Aransas/Wood Buffalo National Park population. Five birds had previously been diagnosed as having avian tuberculosis in the cross-fostered Rocky Mountain flock during the 1980's.

The U.S. Whooping Crane Recovery Team and representatives of the Canadian Whooping Crane Recovery Team met recently in Jackson, Wyoming. Part of the meeting involved a review of the whooping crane/sandhill crane cross-fostering project, which is in its 15th year. After a field trip to Gray's Lake National Wildlife Refuge, Dr. Rod Drewien presented a summary of project results. Both teams subsequently recommended that the project be continued but that no additional whooping crane eggs be placed in sandhill crane (*Grus canadensis*) nests. They suggested that the new phase of experimentation concentrate on determining whether or not the cross-fostered individuals will reproduce. Thus far, there has been none. Project personnel would also continue the powerline marker research in the San Luis Valley. The Director of the U.S. Fish and Wildlife Service and Director General of the Canadian Wildlife Service will make a decision about the project in early fall.

A waterfowl hunter has been sentenced for killing a whooping crane last January 3. This man had been using a blind on the main shoreline of San Jose Island in

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Region 1: California, Hawaii, Idaho, Nevada, Oregon, Washington, American Samoa, Commonwealth of the Northern Mariana Islands, Guam, and the Pacific Trust Territories. **Region 2:** Arizona, New Mexico, Oklahoma, and Texas. **Region 3:** Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. **Region 4:** Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Puerto Rico and the U.S. Virgin Islands. **Region 5:** Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia and West Virginia. **Region 6:** Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming. **Region 7:** Alaska. **Region 8:** Research and Development nationwide. **Region 9:** Washington, D.C., Office.

THE ENDANGERED SPECIES TECHNICAL BULLETIN is published monthly by the U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. 20240.

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Recovery 2000

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of new populations where appropriate, augmentation of existing populations, biological research, and surveys to locate unknown populations. A vigorous public information program will be conducted to increase public awareness, understanding, and support of the effort.

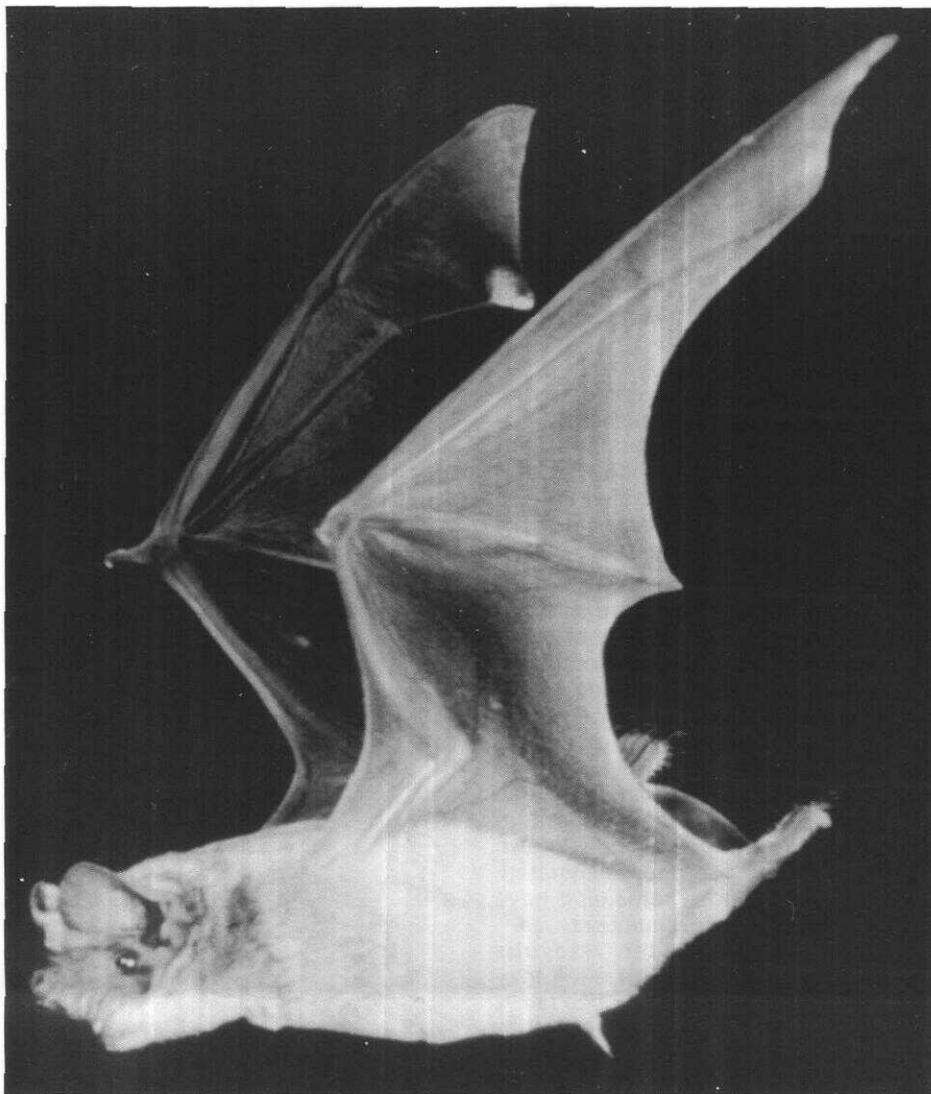
Recovery 2000 is designed to be a cooperative effort involving Federal and State agencies and private landowners. While this initiative will provide funding for recovery, State and Federal agencies will further cooperate by providing the land base, personnel, and biological expertise for many recovery efforts. The Service will channel funds to the States to enhance their own endangered species recovery programs. It is anticipated that cooperating States will enter into management agreements for most of the sites acquired by the Service for habitat protection, particularly if these areas are far from existing national wildlife refuge lands.

The Forest Service has one of the larger endangered species conservation programs in the Midwest, with involvement of virtually every national forest. Eleven of the 28 targeted *Recovery 2000* species occur in national forests and ranges of 3 other species overlap national forests. For species that occur on private lands, voluntary cooperative agreements will be sought. This approach is expected to help reduce recovery costs.

Fully implementing *Recovery 2000* would require \$12 million between the years 1990 and 2000, but the effort should save money over the long run. Savings should result from not needing to take all of the actions delineated in recovery plans, which are written to cover various contingencies that may arise if recovery programs are delayed or stretched out over time. *Recovery 2000* takes the optimistic view that, by spending money now, many suggested research and management actions will not be necessary. The savings could then be transferred to more complex recovery efforts for other listed species.

Recovery 2000 also would save money because it is a "package" program, designed to focus on actions that help several species concurrently. For example, Houghton's goldenrod (*Solidago houghtonii*), Pitcher's thistle (*Cirsium pitcheri*), and the dwarf lake iris are Great Lake shoreline plants that are sometimes found growing in the same areas. Because they share some of the same habitat, they will benefit from similar recovery actions. Similarly, cave-dependent species such as the gray bat and Indiana bat (*Myotis sodalis*) will benefit simultaneously when the habitats they share are given protection.

As the *Recovery 2000* program progresses, it is anticipated that there will be



Indiana bat (*Myotis sodalis*)

a decrease in funding requirements and an increase in results. Because habitat protection is often the most costly recovery item and one that needs to be addressed early, *Recovery 2000* costs will be higher in the first 3 years of the effort. Once a species' habitat is secure, less costly recovery activities can be undertaken. By the fourth year, delisting actions should have commenced for two plant species. By the sixth year, 8 of the 28 species covered by *Recovery 2000* should be in the delisting process. Finally, by the year 2000, 20 species should have been removed from the Threatened and Endangered species list or in the process of being delisted. The remaining eight species should by then be recovered within Region 3 and under evaluation for rangewide delisting.

Once the species have been recovered, additional savings will accrue from eliminating actions normally associated with administering various requirements of the Endangered Species Act. Service costs in Region 3 are expected to drop proportionally. For example, savings in law enforcement activities are projected at

about \$100,000 per year, and about \$60,000 annually would be saved on Section 7 interagency consultations. Finally, other Federal agencies and private corporations would save money because they, too, would not need to consult with the Service or complete extensive biological surveys as they often do now.

The Service does not intend to support *Recovery 2000* by shifting funds from other protection or recovery efforts. Nor will funding be made available by reducing the listing of additional species or conservation activities for listing candidates. Instead, *Recovery 2000*, if approved, will rely on additional, short-term funding. It is also important to note that, because *Recovery 2000* is a package program, full funding will be needed for all 28 species each year. Funding only a portion of this package will not achieve complete success.

The Service is confident that if this program is funded and implemented as conceived, significant savings of both dollars and species will result. If it is successful, this prototype recovery program may well be duplicated in other parts of the country.

photo by Merlin D. Tuttle, courtesy of Bat Conservation International

Proposed Listings—July 1989

Nine plants and two freshwater mussels were proposed by the Fish and Wildlife Service during July 1989 for listing as Endangered or Threatened species. If the listing proposals are approved, Endangered Species Act protection will be extended to the following:

Two Southern Appalachian Plants

Two perennial herbs native to the southern Appalachian Mountains of western North Carolina and eastern Tennessee have been proposed by the Service for listing as Endangered species (F.R. 7/21/89). Both of the following plants are subject to intensive recreational impacts on their habitat:

- **Spreading avens (*Geum radiatum*)**—This plant, a member of the rose family (Rosaceae), produces a basal rosette of leaves and stems that grow up to about 20 inches (50 centimeters) tall, topped with large, bright yellow flowers. This attractive plant faces threats from illegal collecting as well as habitat degradation. Five of the historically known populations have been eliminated, and most of those remaining have been reduced to low numbers.
- **Roan Mountain bluet (*Hedyotis purpurea* var. *montana*)**—A low-growing perennial in the coffee family (Rubiaceae), this plant forms loose tufts up to about 6 inches (15 cm) in height with bright purple flowers. One of the six historically known populations has disappeared. Those remaining are vulnerable and small; two of them occupy a total of less than 12 square yards (10 square meters).

Both species are endemic to a few scattered mountaintops, where they grow in full sunlight on the shallow, acidic soils of cliffs, rock outcrops, and talus slopes. Some of the sites also are occupied by Heller's blazing star (*Liatris helleri*) and/or Blue Ridge goldenrod (*Solidago spithamea*), plants that are already listed by the Service as Threatened species. Six of the remaining 11 spreading avens populations are on privately owned lands; 4 are on public land administered by the U.S. Forest Service and National Park Service; and 1 is on parkland managed by the State of North Carolina. Four of the five known Roan Mountain bluet sites, and part of the fifth, are privately owned, with the remainder managed by the Forest Service.

The habitats occupied by these plants are in high demand for recreation. In the past, the greatest damage has probably come from the development of ski resorts and associated commercial enterprises. Others are experiencing trampling, soil

compaction, and erosion from heavy use by hikers and sightseers.

Both the National Park Service and the U.S. Forest Service are working with the Fish and Wildlife Service to develop protection plans for these plants. Efforts to negotiate cooperative management plans with private landowners also are under way.

Five San Joaquin Valley Plants

A proposal to list five plants restricted to the native grasslands of the southern San Joaquin Valley, California, and neighbor-

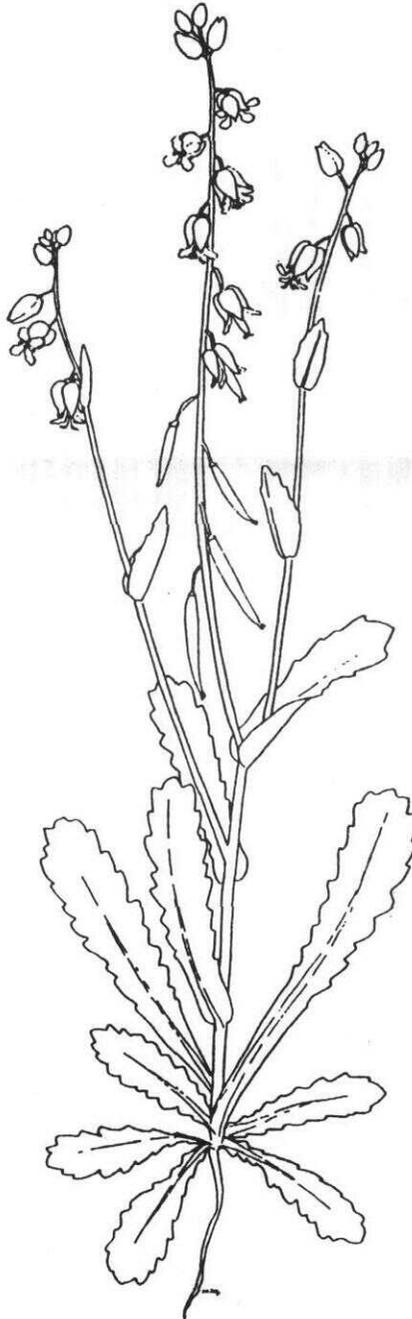
ing foothills and valleys was published in the July 7 *Federal Register*. The classification of Endangered was recommended for the following:

- **California jewelflower (*Caulanthus californicus*)**—This plant, a rosette-forming annual herb in the mustard family (Brassicaceae), grows to about 1 foot (30 centimeters) in height and bears translucent white flowers with purple to green tips. Although it once was considered abundant and was known from 40 sites, *C. californicus* has been reduced to three colonies.
- **Kern mallow (*Eremalche kernensis*)**—A small annual herb in the mallow family (Malvaceae), this plant develops a stem only 4 inches (10 cm) high. Its flowers are white to rose-pink or lavender in color. Two of the Kern mallow's six known historical sites no longer support the species.
- **San Joaquin wooly-threads (*Lembertia congdonii*)**—This plant, an annual herb in the sunflower family (Asteraceae), produces "white-wooly" stems that grow up to about 10 inches (25 cm) in length and often trail on the ground. Its small flowers, which measure only ¼ inch (6 millimeters) across, have yellow disks and lack rays. Out of 49 known populations, 33 have been lost to habitat modification.
- **Bakersfield cactus (*Opuntia treleasei*)**—A low-growing succulent in the family Cactaceae, *O. treleasei* typically spreads to form thickets of spiny pads (flattened stems) that are shaped like small beaver tails. Its attractive flowers are large and magenta in color. The remaining colonies of this historically abundant cactus are numerous but small, isolated, and vulnerable.

The status of one other San Joaquin Valley plant, while believed to be vulnerable, apparently is not as critical, and it was proposed for listing as Threatened:

- **Hoover's wooly-star (*Eriastrum hooveri*)**—This small annual herb, a member of the phlox family (Polmoniaceae), produces grayish, fuzzy stems that reach only 2 to 3 inches (5.0 to 7.5 cm) high and 5-petaled white flowers about ¼ inch in diameter. It has been eliminated from 11 of its 49 historically known sites.

Approximately 96 percent of the native grassland and scrub habitat once occupied by these species has been lost. Most was converted to agricultural uses or destroyed by urbanization. Livestock grazing, water development, oil and gas



California jewelflower

drawing courtesy of the Endangered Plant Program, California Department of Fish and Game

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photo by D.W. Chamberlain

The Bakersfield cactus was eliminated from the field in the background when the former grassland habitat was converted to cropland. Since this photograph was taken, the clumps of cactus in the foreground have been lost due to intensive livestock grazing.

Proposed Listings

(continued from previous page)

exploration and development, off-road vehicle use, mining, and use of low-lying areas for aquifer recharge basins or agricultural runoff collection have contributed to the modification or loss of habitat in the San Joaquin Valley. Many of these habitat changes create conditions that favor the invasion of exotic plants, which compete with native species for living space, nutrients, and water. Even air quality may be influencing plant composition; non-native species that are tolerant of air pollution have an edge over native plants that require cleaner air.

The remaining native habitat in the San Joaquin Valley is highly fragmented, and some parcels may not be large enough to

sustain colonies of the rare plants indefinitely. Most of the factors that led to the decline of suitable habitat continue to pose threats. The lands occupied by the proposed species are in Federal, State, and private ownership.

Potential Federal activities that may affect the five San Joaquin plants include flood control and water development projects, new allocations of water from existing Federal projects, and Federal loans and subsidies that promote urbanization and agricultural expansion. If the plants become federally listed as Endangered or Threatened, Federal agencies will be required to ensure that their actions will not jeopardize the survival of these species.

Palo de Rosa (*Ottoschulzia rhodoxylon*)

The palo de rosa, so named for its reddish heartwood, is a small evergreen tree that grows to a height of about 15 feet (5 m) and has thick, leathery leaves. This species, a member of the family Icacinaeaceae, is endemic to two Caribbean islands. A total of only nine individuals is known to exist on the island of Puerto Rico. The species also occurs on the island of Hispaniola (in the eastern or Dominican Republic side), where it is reportedly rare. Because of the species' dangerously low numbers and the potential threats to its habitat, the Service has proposed listing *O. rhodoxylon* as Endangered (F.R. 7/27/89).

Deforestation for agriculture, grazing, charcoal production, and urban and in-

dustrial development has had a significant effect on the native flora of both islands. Much of their remaining forest consists of secondary growth. An unknown number of *O. rhodoxylon* trees were lost to forest clearing. The species is known to survive in three areas of Puerto Rico, including the Guanica and Maricao Commonwealth Forests; however, because of its critically low numbers and the lingering ecological effects of deforestation, this plant is in danger of extinction.

Virginia Spiraea (*Spiraea virginiana*)

A shrub in the rose family, the Virginia spiraea grows from 2 to 10 feet (0.6 to 3.0 m) tall, with arching and upright stems. This species is a prolific sprouter under suitable conditions, and it forms dense clumps that spread in rock crevices and around boulders. Its leaves are quite variable in size and shape. During June and July, cream-colored flowers are borne on branched, flat-topped inflorescences.

Currently, the Virginia spiraea is known from 18 locations in 5 States: West Virginia, Virginia, North Carolina, Tennessee, and Georgia. It apparently is extirpated from Pennsylvania. Although the species is distributed over a wide region, it is restricted to a narrow ecological niche and occurs in limited to moderate numbers at most sites. The Fish and Wildlife Service has proposed to list the Virginia spiraea as a Threatened species (F.R. 7/21/89).

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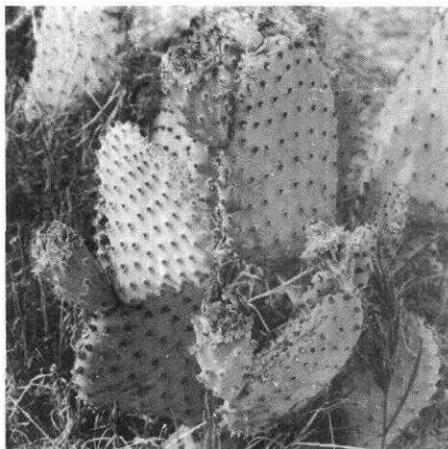


photo by D.W. Chamberlain

Bakersfield cactus

Proposed Listings

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Spiraea virginiana is found in disturbed habitats along the scoured banks of high gradient streams or the braided features of lower stream reaches. The degree and frequency of scouring must be sufficient to prevent the encroachment of tall, shade-producing plants but not enough to remove all small species. Although it can tolerate some shading, at least for a time, the Virginia spiraea grows best in full sun.

Other significant limiting factors for the Virginia spiraea are an apparently low seed viability and a restricted gene pool. Field biologists have not reported the presence of seedlings at any population, and germination tests have produced little success. Many of the populations show aborted seeds. Although the plants can spread clonally, most of those observed were very old and the opportunities for natural colonization of new sites are probably very limited. Further, observations made during field visits suggest that each population may represent only one genotype (for a total of 18 different genotypes).

Because of reservoir construction and a variety of human-related environmental impacts, some former *S. virginiana* sites no longer support the species. Additional hydroelectric facilities have been proposed for sites upstream of two populations in Virginia and West Virginia. Both projects would require a license from the Federal Energy Regulatory Commission (FERC). If the species is listed as Threatened, FERC and other Federal agencies may be required to consult with the Service to avoid jeopardizing the plant's survival.

Purple Cat's Paw Pearly Mussel (*Epioblasma (Dysnomia) obliquata obliquata* (*E. sulcata sulcata*))

This subspecies of freshwater mussel or clam can be distinguished from related mollusks by its 3- to 4-inch (7.5- to 10.0-cm) shell, which is purplish on the inside and has fine, wavy green rays on the outside. Historically, the purple cat's paw occurred throughout the Ohio River and its major tributaries in Ohio, Indiana, Illinois, Kentucky, Tennessee, and Alabama. Due to widespread alteration and pollution of its riverine habitat, this mussel now occurs in only two relic, apparently nonreproducing populations. The Service has proposed to list the subspecies as Endangered (F.R. 7/27/89).

Like other freshwater mussels, the purple cat's paw feeds by filtering food particles from the water. It has a complex reproductive cycle that includes a stage during which mussel larvae parasitize a host fish. The species of preferred host



Virginia spiraea

photo by Sharon Morgan

fish and other critical aspects of purple cat's paw life history are unknown.

The last two known purple cat's paw sites are shared by other endangered mussel species. A major factor in the decline of these mollusks has been the conversion of free-flowing habitat to large impoundments, which reduced the amount of riverine gravel/sand substratum upon which the adult mussels live and likely affected the distribution of the mussels' fish hosts. Both remaining populations of the purple cat's paw face additional threats. Those mussels in the Green River (Warren and Butler Counties, Kentucky) are vulnerable to the effects of stream flow changes from upstream reservoirs and to water quality impacts from oil and gas production. The Cumberland River population in Smith County, Tennessee, faces potential threats from river channel maintenance, navigation projects, and sand and gravel dredging.

Neither of the populations is believed to be reproducing, and both may in fact contain only old mussels that have passed their reproductive age. Unless healthier populations are discovered or methods can be developed to maintain the known populations, the purple cat's paw will become extinct within the foreseeable future.

Arkansas Fatmucket (*Lampsilis powelli*)

Another freshwater mussel, the Arkansas fatmucket is native to parts of the Oachita, Saline, and Caddo River systems in central Arkansas. It has disappeared from at least 40 percent of its presumed historical habitat, and most of the remaining populations face a number of environmental threats. This species has been proposed for listing as Threatened (F.R. 7/27/89).

The Arkansas fatmucket prefers river pools and backwater areas with a sandy/rocky substratum and a flow strong enough to periodically remove organic debris. Like many other mussels, it does not occur in impoundments. Much of this species' riverine habitat has been altered by navigation projects or inundated by reservoir construction, and additional projects are under consideration. Water quality is being affected by mine wastes, runoff of agricultural chemicals, siltation, gravel dredging, and municipal discharges. Suitable habitat and good populations occur in 20 percent or less of the Arkansas fatmucket's historical range.

Regional News

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Aransas Bay that was constructed on marshlands owned by the State of Texas. The whooping crane was reportedly mistaken for a snow goose. The last known illegal killing of a whooping crane by a hunter also occurred near Aransas National Wildlife Refuge in January 1968.

The crane killed this year was a 4-year-old female who had brought her first chick to Aransas National Wildlife Refuge last winter. The defendant was fined \$15,000 under Federal charges. The State of Texas also requested \$11,000 in restitution.

Mr. Wayne Shifflett, manager of the Buenos Aires National Wildlife Refuge in southern Arizona, reports that the refuge's masked bobwhite quail (*Colinus virginianus ridgwayi*) population is looking the best it has in recent history. Biologist Steve DoBrott located 17 coveys containing a minimum of 175 birds this summer,

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Final Listing Rules Approved for 10 Species

During July of 1989, listing rules for 10 vulnerable taxa—9 plants and 1 animal—were made final. Endangered Species Act protection is now available to the following species:

Shale Barren Rock Cress (*Arabis serotina*)

This biennial plant, a member of the mustard family (Brassicaceae), typically grows to a height of 1 to 2 feet (30 to 60 centimeters) and has a spreading, compound inflorescence with many tiny whitish flowers. The plant has a highly restricted range, occurring on shale deposits on southerly-facing slopes at elevations of 1,300 to 1,500 feet (400 to 460 meters). *Arabis serotina* is known from only 26 populations in 5 Virginia counties and 3 West Virginia counties. Numbers are fairly low at all 26 locations. Most of the populations occur partially or completely within the George Washington and Monongahela National Forests.

In West Virginia, five of the shale barrens supporting populations of the plant have been partially destroyed by road construction, and a sixth was affected by a small flood-control dam. In Virginia, three of the shale barrens supporting populations were partially destroyed by road construction, two were damaged by railroad construction, and one is crossed by a hiking trail. Most of the populations are moderately to severely browsed by deer, which is one of the main threats currently facing the plant. The shale barren rock cress was proposed for listing as an Endangered species in the November 17, 1988 *Federal Register* (see summary in BULLETIN Vol. XIII, Nos. 11-12), and the final rule was published on July 13, 1989.

Four Florida Plants

A final rule to list four Florida plant species, the Brooksville bellflower (*Campanula robinsiae*), Cooley's water-willow (*Justicia cooleyi*), scrub blazing star (*Liatris ohlingerae*), and Florida ziziphus (*Ziziphus celata*), as Endangered was published in the July 27, 1989, *Federal Register*. All four species are threatened by habitat loss due to residential and agricultural development.

The Brooksville bellflower, a member of the family Campanulaceae, is an annual herb about 0.4 to 6.0 inches (1 to 15 centimeters) tall, with purple bell-shaped flowers about 0.28 to 0.31 inches (7 to 8 mm) wide. It is only known to occur in three sites. Although there appears to be little danger to this plant from direct destruction, changes in land use in the surrounding watersheds could threaten the survival of the species. The plant is also vulnerable to overcollecting and vandalism.

Cooley's water-willow, a member of the acanthus family (Acanthaceae), is a rhizomatous perennial herb usually less than 16 inches (40 cm) high with bright lavender-rose flowers 0.28 to 0.31 inches (7 to 8 mm) long. The plant occurs in hardwood forests on sand to clay soils that range from moist to seasonally wet. Two of the seven sites where this species is known to occur have been modified, one by a highway right-of-way and the other by cattle grazing. In addition to impacts from residential and agricultural development, this species is threatened by limestone mining.

The scrub blazing star is a perennial herb restricted to sand pine scrub vegetation in central Florida. It is a member of the aster family (Asteraceae or Compositae) and grows up to 3 feet (1 meter) tall, with striking pink-purple flower heads. Because it has conspicuous flowers and is easily identified, the scrub blazing star has been collected frequently. Habitat loss is another problem; many of the 93 sites (71 of which are in a single county) where the plant was known to occur have already been destroyed. Most of the extant sites are small and are disappearing very rapidly.

The Florida ziziphus, a member of the buckthorn family (Rhamnaceae), is one of the rarest shrubs in North America. It grows up to 5 feet (1.5 m) high and has small, dark, glossy green leaves on conspicuously zigzag spiny branches. Only two populations are known to occur. One consists of only about 30 stems in two groups, most or all of which may be from the same rootstock.

The Service first published proposals to list the Brooksville bellflower and Cooley's water-willow as Endangered in the September 12, 1988, *Federal Register*, and the scrub blazing star and Florida ziziphus in the September, 28, 1988, *Federal Register* (see BULLETIN Vol. XIII, Nos. 9-10).

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

The autumn buttercup is a herbaceous perennial plant in the buttercup family (Ranunculaceae). It normally grows about 1 to 2 feet (0.3 to 0.6 m) tall, has simple but deeply palmately divided leaves clustered at the base, and bears 6 to 10 yellow flowers. The plant is endemic to the upper Sevier River Valley in Utah, occurring on less than 0.01 acre (0.004 hectare) within a freshwater marsh. The single known population has experienced a population decline of over 90 percent in the past 6 years and now numbers only about 20 individuals. Although The Nature Conservancy has purchased the site where the last known population exists,

the low numbers and limited distribution of the species makes it vulnerable to natural or human-caused stresses. The Service proposed listing the autumn buttercup as Endangered in the July 22, 1988, *Federal Register* (see BULLETIN Vol. XIII, No. 8), and the final rule was published July 21, 1989.

American Hart's-tongue Fern (*Phyllitis scolopendrium* var. *americana*)

This fern, a member of the spleenwort family (Aspleniaceae), has evergreen, strap-shaped fronds that are 5 to 17 inches (12 to 42 cm) long. The fronds arise in a cluster from a short, creeping rhizome that is covered with cinnamon-colored scales. It usually is found growing on or in close association with dolomitic limestone in areas with high humidity, shaded conditions, and a moist substrate. Apparently always extremely rare, the American hart's-tongue fern occurs in small, widely disjunct groups of populations. It is currently known from only seven counties in the Canadian Province of Ontario, two counties in New York, two counties in Michigan, two counties in Alabama, and one county in Tennessee. The species is threatened throughout most of its range by alteration or destruction of its habitat resulting from logging, quarrying, and residential or other development. On September 12, 1988, the Service published a proposal to list the American hart's-tongue fern as Threatened (see summary in BULLETIN Vol. XIII, Nos. 9-10); the final rule was published July 14, 1989.

Two Colorado Plants

The Osterhout milk-vetch (*Astragalus osterhoutii*) and Penland beardtongue (*Penstemon penlandii*) are herbaceous perennials endemic to shale badlands in Colorado, primarily at sites administered by the Bureau of Land Management. A member of the pea family (Fabaceae), the Osterhout milk-vetch is a rush-like plant that grows up to 40 inches (100 cm) tall and has large white flowers. An estimated 25,000 to 50,000 individuals are known, but about 90 percent occur on a 132-acre (53-ha) area around a proposed reservoir. Associated development and recreational use could threaten the survival of the species.

The Penland beardtongue is a short plant, growing up to 10 inches (25 cm) high, with linear leaves, several clumped, pubescent stems, and showy, bicolored flowers. This perennial belongs to the snapdragon family (Scrophulariaceae). Its population of about 5,000 plants occurs in one area approximately 1.5 miles long by

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and he estimates that the total pre-nesting population is twice that number. The birds are scattered throughout the refuge, and the habitat is in good condition. The nesting season coincides with the July/August rainy season. Refuge personnel are preparing to release 2,000 to 2,500 captive-reared bobwhites this year to supplement the wild population. They also are working with El Centro Ecologia de Sonora to census bobwhite and protect habitat in Sonora, Mexico, the only other location where wild masked bobwhite quail survive.

Seven northern aplomado falcons (*Falco femoralis septentrionalis*) were hacked at Laguna Atascosa National Wildlife Refuge on the Texas Coast this year. Two were killed by a barn owl, but the others reached independence. This is the fourth year aplomados were hacked on the refuge. A male sub-adult from the 1988 release returned this year to help raise the 1989 young. The young birds are produced by The Peregrine Fund at its Santa Cruz, California, facility as part of an effort to reintroduce this subspecies to the United States. Artificial nest structures have been placed in some yucca plants in preparation for the time when these birds may again try to nest in Texas.

Region 4—The U.S. Forest Service is reevaluating its regional red-cockaded woodpecker (*Picoides borealis*) management policies in light of recent population surveys indicating possible declines in small populations. As a first step, a "Policy on Cutting Within $\frac{3}{4}$ Mile of RCW Colonies on Existing Timber Sale Contracts" was made effective on March 27, 1989. Some of the important provisions of the policy include: cancellation of regeneration cuts within $\frac{1}{4}$ mile of active red-cockaded woodpecker colonies in awarded sales; cancellation of regeneration cuts in the older stands between $\frac{1}{4}$ and $\frac{3}{4}$ mile from active colonies in awarded sales; a requirement for the Regional Forester's approval for any regeneration cuts between $\frac{1}{4}$ and $\frac{3}{4}$ mile of active colonies in awarded sales; and a requirement for thinning stands within $\frac{3}{4}$ mile of active and inactive colonies to retain at least 60 square feet of basal area per acre while retaining the oldest and largest trees (those most suitable as future nesting habitat).

Other provisions include: a requirement to retain and protect relict trees within $\frac{3}{4}$ mile of active and inactive colonies; withdrawal of all advertised sales containing regeneration cuts within $\frac{3}{4}$ mile of all active and inactive colonies; and authorization only for thinning cuts within $\frac{3}{4}$ mile of active and inactive colonies in pro-

posed sales until interim guidelines are completed.

The National Forest Products Association has voiced concerns regarding the policy, and the decision is still subject to appeal. The Service has concurred with the Forest Service decision that the policy is likely to benefit the species.

An eighth population of the Ozark cavefish (*Amblyopsis rosae*) has been discovered in Benton County, Arkansas, by Dr. Arthur Brown of the University of Arkansas. This population is in a cave on the west side of Beaver Reservoir, which likely influences the water level in the cave. Very little of this cave is accessible to people. There are unconfirmed reports of a recent sighting of Ozark cavefish in Mitchell Cave, Oklahoma. If confirmed, this would be only the third reported sighting in this cave and the first since about 1980.

The 1988 survey of the interior least tern (*Sterna antillarum*) population in the lower Mississippi River Valley resulted in a population estimate of 2,475 adult birds in 64 colonies. This fourth annual survey covered the Mississippi River from Cape Girardeau, Missouri, to Baton Rouge, Louisiana, and the Arkansas River from its confluence with the Mississippi River to the Oklahoma-Arkansas State line. The past 3 years of survey data indicate that the population ranges from 2,200 to 2,600 birds, distributed in 30 to 64 colonies. The fifth annual survey will be conducted this summer.

This spring, reptile collectors visited several of North Carolina's most important bog turtle (*Clemmys muhlenbergii*) sites and collected an estimated 25 to 30 animals, presumably for the pet trade. The demand for this Category 2 listing candidate by turtle fanciers has steadily increased in recent years, and the illegal collection of wild animals has increased concurrently. Most bog turtle populations are small and cannot withstand intense collecting pressure. The recent North Carolina collections severely disrupted an important long-term demographic research project that had accumulated 15 years of data on individual turtles' growth, reproduction, and movements.

The scrub mint (*Dicerandra frutescens*), which was listed in 1985 as an Endangered species, has been found to consist of two distinct species. The plant had been known to systematists primarily from Archbold Biological Station and a few other sites in scrub vegetation near the town of Lake Placid, Florida. A few plants collected further north, east of Sebring, had been included in the species.

When Steven Christman subsequently relocated the Sebring sites during a 3-year inventory of the sand pine scrub biota for the Florida Game and Fresh

Water Fish Commission, he noticed that the plants had a strong aroma of eucalyptus oil. This is in contrast to the peppermint aroma of other *Dicerandra* species. A systematic study by Robin Huck and five others, recently published in "Systematic Botany," confirms that the Sebring populations are a distinct species, which they have named *Dicerandra christmanii*. The Service has adopted the new nomenclature for the List of Endangered and Threatened Wildlife and Plants through publication of a notice in the *Federal Register* (F.R. 9/21/89). A separate action to list *D. christmanii* is unnecessary because the plants in question were already protected under the name *D. frutescens*.

Bok Tower Gardens at Lake Wales, Florida, has had encouraging initial results in its effort to propagate the Florida ziziphus (*Ziziphus celata*), an Endangered shrub. The plant's discoverer has found a second wild population, but the species is still believed to be exceedingly rare.

A unique situation may develop in the Florida Keys with the Endangered key deer (*Odocoileus virginianus clavium*). Heartwater, a tropical disease, shows

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Final Listing Rules

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0.5 miles wide (2.4 km by 0.8 km). This species could be vulnerable to off-road vehicle damage and mineral exploration.

Both plants were proposed for listing as Endangered on July 5, 1988 (see summary in BULLETIN Vol. XIII, No. 8), and the final rule was published on July 13, 1989.

American Burying Beetle (*Nicrophorus americanus*)

The American burying beetle is the largest member of its genus in North America, measuring up to 1.4 inches (36 millimeters) in length. It also is identifiable by its large orange-red pronotal disk. Once widely distributed throughout eastern North America, the species has disappeared from most of its historic range. Only two populations are known today, one on an island off the coast of New England and the other in eastern Oklahoma. The New England population was estimated at 520 beetles in 1986; the size of the Oklahoma population, which was recently discovered, is unknown. The cause of the species' decline also is unknown. The beetle was proposed for listing as an Endangered species on October 11, 1988 (see summary in BULLETIN Vol. XIII, Nos. 11-12), and the final rule was published July 13, 1989.

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extreme pathogenicity to white-tailed deer. At present, this disease is unknown in the key deer herd, but it is carried by the tropical bont tick, which has been found on cattle egrets in Puerto Rico and other Caribbean islands. The potential for migrating birds to carry tropical bont ticks to the Florida Keys poses a distinct threat to the key deer population. The Key Deer National Wildlife Refuge manager is considering the development of a monitoring and contingency program to deal with the ticks or the disease. With only 200 to 300 key deer left, any threat must be evaluated thoroughly.

Region 6—An endangered species workshop was hosted by the Region 6 Office June 20-22, 1989, in Denver. The workshop was attended by biologists representing all of the Region's Enhancement Field Offices, and by individuals from the Divisions of Refuges, Fisheries, Federal Aid, Engineering, and Administration. The workshop covered issues relating to listing candidates, listing, delisting, reclassification, recovery, Section 6 funding, and Section 7 consultation procedures. Speakers included Mike Young of the Solicitor's Office in Washington, Margot Zallen of the Solicitor's Office in Denver, Nora Murdock from Region 4 (Asheville, North Carolina), and Jim Bartel from Region 1 (Sacramento, California).

On June 29, 1989, 9,000 greenback cutthroat trout (*Oncorhynchus clarki stomias*) were transported from the State of Montana's Blue Springs hatchery to Colorado. These Endangered fish, averaging 6 inches in length, were stocked by helicopter the following day into lakes within Rocky Mountain National Park. Despite the fact that the fish were on trucks for over 24 hours, and were transferred up to five times during the operation, less than one percent of the fish were lost during transit. The Bluewater hatchery personnel did an exceptional job of rearing and shipping the fish, ensuring that they arrived in excellent condition. The number of fish reintroduced to the wild in this single effort was over four times the number known to exist in the wild in 1973.

The only known population of clay phacelia (*Phacelia argillacea*) has declined drastically over the past several years. In 1988, the population decreased from about 50 plants to 19. The major factors impacting the plant are human disturbance and wildlife/livestock grazing. The Service has obtained permission to protect the remaining plants from deer, elk, and domestic sheep with grazing cages. The Service also plans to erect a fence around the remaining habitat. The Center

for Plant Conservation and the State Arboretum of Utah have been requested to assist in recovery by establishing a horticultural population at the University of Utah. Studies are also being conducted on the reproductive and pollination biology of the plant by the U.S. Department of Agriculture's Agricultural Research Service-Bee Pollination Laboratory in Logan, Utah.

The Nature Conservancy, through its Utah Field Office, recently obtained a 1-year option to purchase the site of the single remaining population. The area will encompass 69 acres and cost \$50,000. The Service has expressed its support for this land acquisition effort, which should greatly enhance the species' chances for survival.

Region 8 (Research)—National Ecology Research Center work on West Indian (Florida) manatees (*Trichechus manatus latirostris*) is supporting Section 7 consultation at the Service's Jacksonville, Florida, Fish and Wildlife Enhancement Field Office. Potential conflicts between manatee conservation and rapidly increasing coastal development are surfacing throughout Florida, and Federal permits for new marina construction require particularly close scrutiny. Decisions to approve, deny, or modify development plans must be based on the best available knowledge of local manatee movement patterns, distribution, and mortality.

A broad, geographically-referenced data base on these topics has been compiled over the years by research biologists at the Center's Sirenia Project in Gainesville, Florida, and by the Florida Department of Natural Resources. However, access to these data has been cumbersome due to a lack of automated, user-friendly tools for retrieval and display. In response, the Center's staff is completing development of a desktop mapping and data-retrieval system that runs on IBM-compatible personal computers. Called "QuickMAP," this system will allow geographically-referenced information (e.g., coordinates of manatee locations as determined by satellite telemetry) to be displayed quickly for various regions of Florida, using coastal outlines at the level of detail found in nautical charts.

QuickMAP is intentionally not as sophisticated in its analytical capabilities as complex, commercially available geographic information systems. This allows it to be inexpensive, simpler to learn, and easier to use. QuickMAP has features that facilitate the interchange of information with existing software and data bases. For example, detailed shoreline data acquired from one agency's geographic information system may be combined with manatee mortality from another agency's data base management system. QuickMAP's output can be transferred to drawing software for further annotation

and even incorporated in publications with desktop publishing software. QuickMAP meets industry standards and works on a variety of hardware encountered in different agency and field offices. These qualities are a great advantage to permit reviewers.

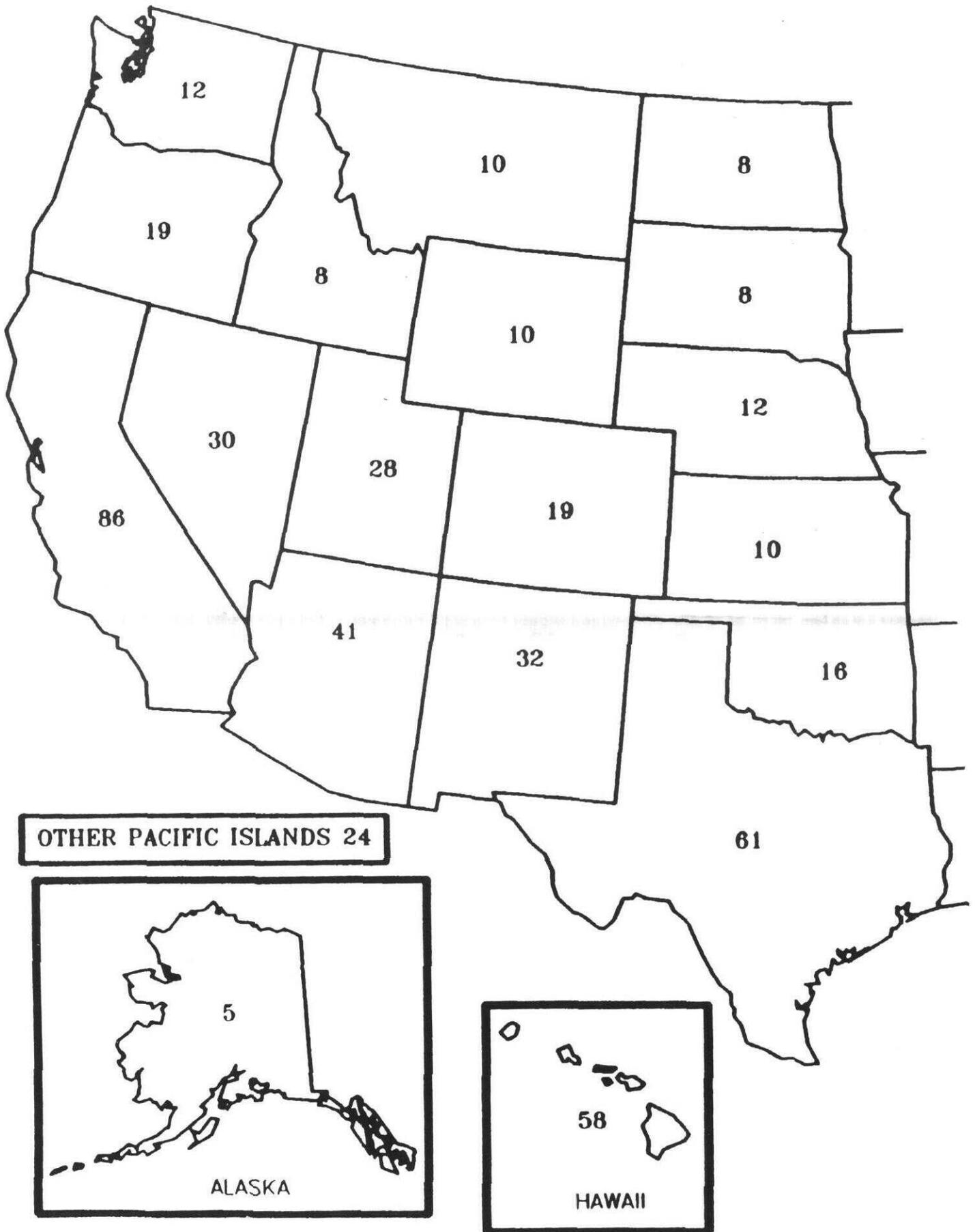
Comparative laboratory studies of the growth rates and foraging behaviors of the Threatened Concho water snake (*Nerodia harteri paucimaculata*) and two related species, *N. erythrogaster* and *N. rhombifera*, are being performed using juveniles born in captivity at the Service's National Ecology Research Center field station at the University of New Mexico. These studies, combined with field studies of foraging behavior and the thermal characteristics of Concho water snake habitat, are designed to help explain why juvenile Concho water snakes are restricted to sites with rocky shorelines. At the same time, researchers from Texas A&M University are studying the general biology and demography of the Threatened snake.

The 1989 spring California sea otter (*Enhydra lutris nereis*) survey, conducted by biologists with the Service and the California Department of Fish and Game, yielded some encouraging results. The total count—1,864 sea otters, including 1,574 independent animals and 290 pups—was the highest recorded since the current survey methods were adopted in 1982. This spring's pup count was also the highest to date. The increased number of sea otters counted over the past 5 years is believed to result from 1) decreased mortality due to depth restrictions placed on the gill net fishery within the otters' range by the California Department of Fish and Game and 2) increased survival of juvenile animals due to several recent mild winters. These counts do not include sea otters that have been translocated to the waters around San Nicolas Island off southern California.

Region 9 (Washington, D.C., Office)—The Division of Endangered Species and Habitat Conservation's (EHC) Branch of Special Projects hosted a tour of the National Wetlands Inventory facilities in St. Petersburg, Florida, by scientists from the Soviet Union. The visitors included an aquatic biologist, a chemist, and a natural resource manager. They were part of a joint U.S./U.S.S.R. effort, sponsored by the Environmental Protection Agency, to share wetland research knowledge. The visiting scientists were very interested in the wetland mapping process; they indicated that there currently is no such program in the Soviet Union.

In order to promote more effective cooperation among the Federal agencies

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LISTED SPECIES BY STATE/TERRITORY 10/31/89

(Omits some extirpated species)



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concerned with conservation of the northern spotted owl, an informal coordinating group was formed in Washington, D.C. Originally composed of representatives of the Fish and Wildlife Service, Forest Service, and Bureau of Land Management, the National Park Service is now included. Members of the group have been involved in Congressional briefings on the owl, and have assisted offices of the involved agencies in setting up a scientific committee to develop a long-term owl conservation strategy.

On August 31, the Service's Office of Migratory Bird Management requested that a previous intra-agency Section 7 consultation with EHC be reinitiated to consider a new proposal for goose hunting in the Central Valley of California. The consultation addressed potential impacts of the hunting program on the Aleutian Canada goose (*Branta canadensis leucopareia*), an Endangered subspecies of the common Canada goose that migrates to California from the Aleutian Islands each winter. The proposal included a provision to maintain the hunting closure areas that have been in place for the past 10 years to protect the rare birds.

After considering the impacts of the proposed action, EHC issued a Biological Opinion that the proposed hunt is not likely to jeopardize the subspecies' survival. In the opinion, EHC recommended that any incidental take of Aleutian Canada geese be monitored. If a significant risk to the subspecies does arise, the Service can use its statutory authority to invoke emergency closures of the hunting season.

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 | 32 | 19 | 241 | 6 | 2 | 23 | 323 | 24 |
| Birds | 61 | 15 | 145 | 7 | 3 | 0 | 231 | 57 |
| Reptiles | 9 | 7 | 59 | 14 | 4 | 14 | 107 | 22 |
| Amphibians | 6 | 0 | 8 | 4 | 1 | 0 | 19 | 5 |
| Fishes | 48 | 2 | 11 | 25 | 6 | 0 | 92 | 48 |
| Snails | 3 | 0 | 1 | 6 | 0 | 0 | 10 | 7 |
| Clams | 34 | 0 | 2 | 0 | 0 | 0 | 36 | 22 |
| Crustaceans | 8 | 0 | 0 | 1 | 0 | 0 | 9 | 4 |
| Insects | 10 | 1 | 1 | 7 | 0 | 0 | 19 | 12 |
| Arachnids | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| Plants | 163 | 6 | 1 | 42 | 7 | 2 | 221 | 86 |
| TOTAL | 377 | 50 | 469 | 112 | 23 | 39 | 1070* | 287** |

Total U.S. Endangered **427**
 Total U.S. Threatened **135**
 Total U.S. Listed **562**

Recovery Plans approved: 247

*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. Recovery plans are drawn up only for listed species that occur in the United States.

Number of Cooperative Agreements signed with States and Territories: 51 fish & wildlife
 October 31, 1989 36 plants

August 1989

Vol. XIV No. 8

ENDANGERED SPECIES

Technical Bulletin

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

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