

ENDANGERED *Species* BULLETIN

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*O*ur world's rapidly growing human population poses increasingly difficult and complicated challenges to the conservation of biodiversity. But technology, which is sometimes blamed for hastening changes in the environment, is providing scientists with exciting new tools to detect, evaluate, and attempt to correct many ecological threats. Advances in computerized mapping and satellite tracking are also helping to reveal previously unknown occurrences of rare species and their important habitats. Biologists are even using new types of ultralight aircraft to teach captive-reared birds how to migrate in the wild. This edition of the ***Endangered Species Bulletin*** takes a look at how some of these modern tools are being applied to protect and restore imperiled species.



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On the Cover and Left
The Coastal California gnatcatcher (*Polioptila californica californica*) is one of many species dependent on coastal sage scrub habitat that will benefit from GIS technology.
photos by B. "Moose" Peterson/WRP©

Opposite Page
photo by Bill MacDougall/USFWS

The Endangered Species Bulletin welcomes manuscripts on a wide range of topics related to endangered species. We are particularly interested in news about recovery, interagency consultation, habitat conservation plans, and cooperative ventures. Please contact the Editor before preparing a manuscript. We cannot guarantee publication.

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GIS Technology and Sage Scrub Habitat

Geographic Information Systems (GIS) is a rapidly advancing technology that enables people to develop, analyze, and display spatially-explicit information. After incorporating the coordinates of landscape features into a computer, users can manipulate map information from any source and visualize the landscape at any scale and with any combination of features. By creating computerized maps of project areas, the GIS database can identify

The coastal sage scrub (CSS) ecological community is distributed within a narrow band along the Pacific coast of North America, from central Baja California north just into southern Oregon. Within this geographic range, it is composed of several different floristic associations, dominated by California sage (*Artemisia californica*) and other drought-deciduous shrub species. The major concentration of CSS is from south of Point Conception, California, to central Baja California. Coastal sage scrub contains a species-rich and relatively unique biota. It occurs in a biogeographic zone of transition, including elements of more temperate climates as well as elements of more subtropical conditions. The California floristic province, of which CSS is a part, is considered one of the ecological "hot spots" of the world. This also happens to be a region where almost 20 million people now live and where population increases in the near future are expected to be significant. Several species of plants and animals found in this region have been listed as threatened or endangered in the last few years and many more are continuing to decline.

The NCCP Program

The simultaneous trend of a growing human population and declining natural

habitats led to passage of the Natural Communities Conservation Planning (NCCP) Act in 1991 by the State of California. Responsibility for implementing this State law rests with the California Resources Agency, and the U.S. Fish and Wildlife Service is providing assistance. The NCCP program establishes an approach to conserve State and federally-listed species by attempting to address entire ecological communities through the development of regional conservation strategies in cooperation with local governments, landowners, and other interested parties. The Geographic Information Systems (GIS) approach has played a vital role in the planning for NCCP efforts, as it has in many other conservation programs around the world. It has been employed to assess the long-term conservation potential of CSS habitat throughout the 6,000-square-mile (15,240-square-kilometer) NCCP planning area. The results of this GIS analysis and its implications to conservation planning are discussed on the following page.



The coastal sage scrub community is considered one of the most depleted habitat types in the United States

B. "Moose" Peterson/WRP©

The major goal of the NCCP program is to identify and implement a wildland reserve design that addresses multiple species and habitats throughout the planning area. Participating entities face the formidable challenge of delineating a preserve system, through a series of separate but coordinated local efforts, that will provide for the conservation of plant and animal species that depend on CSS. Local governments, assisted by Federal funding, developed a comprehensive GIS database to enable regional conservation planning efforts. Six regional efforts were initiated in the three primary counties involved in NCCP efforts (Orange, San Diego, and Riverside), and GIS data and analyses formed the foundation of the planning approaches. Highly detailed GIS data on vegetation, land ownership, rare soil types, roads, elevation models, and other subjects proved indispensable to the local planning groups.

During the initial stages of the NCCP program, a panel of scientists was convened to provide insight on ecological issues involved in the development of conservation and land use plans prepared under the NCCP. The major contribution of this Scientific Review Panel to the NCCP program was a set of Conservation Guidelines that, if followed, would lead to sound local and regional conservation strategies. Although the Conservation Guidelines were not intended to dictate detailed criteria for reserve design, they did provide a basis from which alternative designs could be evaluated.

The two wildlife management agencies responsible for reviewing and approving the regional plans, the Fish and Wildlife Service and California Department of Fish and Game, shared the GIS data with local governments. The spatially explicit evaluation criteria of the Conservation Guidelines were translated into a series of GIS operations that enabled decision makers to view a map-based representation of the conservation criteria against which alternative regional plans could be compared.

Geographic Information Systems Model

This GIS model applied a series of four steps to the detailed vegetation GIS data. Under the Conservation Guidelines, vegetation and species location data were used to segregate existing CSS into areas of high, intermediate, and low long-term conservation potential. The four steps included:

- ✧ *Determine higher-potential CSS habitat*—This step involved combining and manipulating one or more layers of geographic information to produce a layer of data that identified larger, more intact stands of CSS. As a result, “core” areas of intact habitat and remote stands of disjunct habitat were identified and mapped.
- ✧ *Determine CSS and other native habitats in close proximity to core CSS*—The next step identified other coastal sage (and other natural habitat types) within one-quarter to one-half mile of the core coastal sage

species locations that are within, or near, the area of a proposed project. More advanced uses of GIS employ different kinds of spatial modeling to create alternative future scenarios of the landscape, allowing resource managers to compare the projected impacts of various land management strategies. GIS has significant potential value to natural resource managers in such fields as biological inventory and monitoring, land use planning, and ecological research.



Growing cities and a decline in coastal sage scrub habitat led California to pass its NCCP Act in 1991. GIS technology has been vital in implementing this law.

USFWS photo

In the Pacific Northwest, GIS technology has been used extensively by resource managers and timber companies to develop comprehensive plans for protecting northern spotted owls and timber-related jobs. "For the long haul, putting a circle around an owl and waiting until it moves or dies is not very good biology. It becomes a game of chasing owls around the landscape until they're all gone. GIS allows us to do the kind of conceptual thinking needed to move into the next era of resource management. It's impossible to get a true sense of the landscape without GIS. . . . GIS is the only way we can present large volumes of data to natural resource managers in a way they can understand."

**-Curt Smitch
USFWS
Asst. Regional Director
North Pacific
Coast Ecogregion**

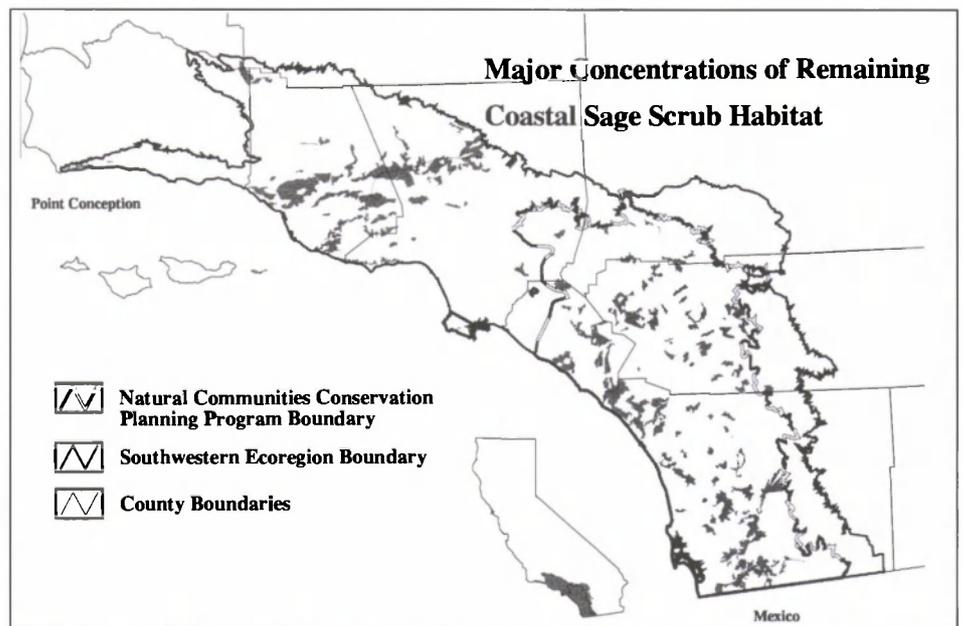
area. These are the stands of CSS deemed by the Conservation Guidelines to have potentially significant, or "intermediate," conservation value.

- * *Identify CSS and other native habitats that may support populations of target species*—Existing known locations of target species (i.e., species of special interest to the NCCP effort) were given additional weight in assessing the relative value of habitat. Many of these locations are included in GIS databases maintained by the California Natural Diversity Data Base and by local government agencies.
- * *Identify linkages between blocks of habitat defined as high/intermediate conservation potential*—The final step involved a complicated set of GIS operations that identified a possible "least cost" path to link each core area with at least one other core area. This exercise demonstrated one method, based on some simple but sound ecological assumptions of how

easy or difficult a given habitat type might be to traverse for a migrating or dispersing individual, for locating linkage between the isolated core areas. The results of this step showed the marginal value of establishing linkages between some of the more isolated core areas.

GIS alone cannot provide the answers to these complicated questions of preserve design. However, it is now an indispensable tool in the formulation of alternatives and the evaluation of proposals. Every component in the process, from the initial scoping and planning phases to the land management phases after a reserve system is put in place, will benefit greatly from this technology.

Dr. Stine is an Ecologist with the National Biological Service at the California Science Center in Sacramento, California. In October 1996, this office will become part of the Biological Resources Division of the U.S. Geological Survey.



Graphic Information Systems map identifying major remaining concentrations of coastal sage scrub habitat in southern California.

Satellite Telemetry Solves Eider Mystery

by Margaret R. Petersen

One of the last big mysteries for biologists studying North American waterfowl was the location of molting and wintering areas for the spectacled eider (*Somateria fischeri*), a species of arctic duck that spends most of its life at sea. In the 1970's, when scientists wondered how they might track the birds from the species' breeding grounds, conventional radio telemetry was considered impractical. It was expensive and carried the high personal risk of flying small airplanes throughout the Bering Sea. In winter, the amount of daylight is markedly reduced at that latitude, winter storms are frequent and unpredictable, and fog often blankets wide areas.

In the 1970's, U.S. Fish and Wildlife Service (FWS) biologist Christian Dau suggested that a study be initiated using satellite telemetry. However, no transmitters small enough to place on birds that weigh only 1,000 to 1,500 grams (35 to 52 ounces) were available.

Between the 1970's and 1990's, the numbers of spectacled eiders nesting on the major breeding area in western Alaska declined by 96 percent, and the species was listed as threatened in 1993. Biologists thought it possible that some change in habitat or some disturbance at sea could have contributed to the decline, but the lack of basic distribution information made an assessment impossible.

By the early 1990's, technology had advanced to the stage that satellite transmitters (Platform Transmitter Terminals or PTTs) were being used by biologists studying birds throughout the world. Those transmitters were large and attached by back-pack harnesses,

neck collars, or glue. Because these techniques would alter the behavior of diving ducks, however, they were deemed inappropriate for study of the spectacled eider. When transmitters became small enough, we decided to implant them within the birds. This technique, developed by C. F. Korschgen of the U.S. National Biological Service, was found to be successful for use with diving ducks. By 1993, a PTT transmitter weighing only 30 grams (about 1 ounce) and small enough to fit in the body cavity of an eider had been developed and tested by Paul Howey.

We implanted PTT transmitters within eiders in the western Alaska breeding grounds in 1993 and 1994, and expanded the effort to Russia in 1995. Deployment involved placing the transmitter in the peritoneal cavity. Each instrument was encased in a hermetically sealed package along with a teflon-coated, stainless-steel antenna that exited the eider's skin near the tail. The transmitters were programmed to provide data on location, body temperature, and remaining battery potential with each transmission.

With the information received from the PTTs, we were able to delineate areas at sea in which pilots could concentrate their aerial surveys. Before long, it became clear why few observations of molting or staging spectacled eiders had been recorded. These birds congregate in very dense flocks far from land, they frequent areas few vessels visit, and they are easily missed if the survey plane is not within a few kilometers of a flock. Although by fall 1994 we knew much more than before

about the at-sea distribution of eiders, we still did not know where the birds spent their winters.

Finally, in February 1995, a signal was received from what seemed the middle of the pack ice in the Bering Sea. Based on that location, FWS biologists Bill Larned and Greg Balogh flew to that general area and located dense flocks of spectacled eiders in holes within the nearly continuous pack ice northeast of St. Matthew Island, Alaska. (See *Bulletin* Vol. XX No. 5.) At long last, we believe we have found the species' primary wintering area.

More satellite transmitters were deployed during the 1996 nesting season, and locations from these transmitters will be used to guide further aerial surveys of molting and wintering areas. By the time the project is finished, we hope to: (1) provide information on the general use of molting and wintering areas over a 4-year period; (2) identify primary molting, staging, and wintering areas of birds from the three major breeding grounds; and (3) provide the basic information on distribution and abundance needed to begin ecological studies of spectacled eiders at sea.

Margaret R. Petersen is a biologist with the Alaska Science Center, National Biological Service, in Anchorage, Alaska.

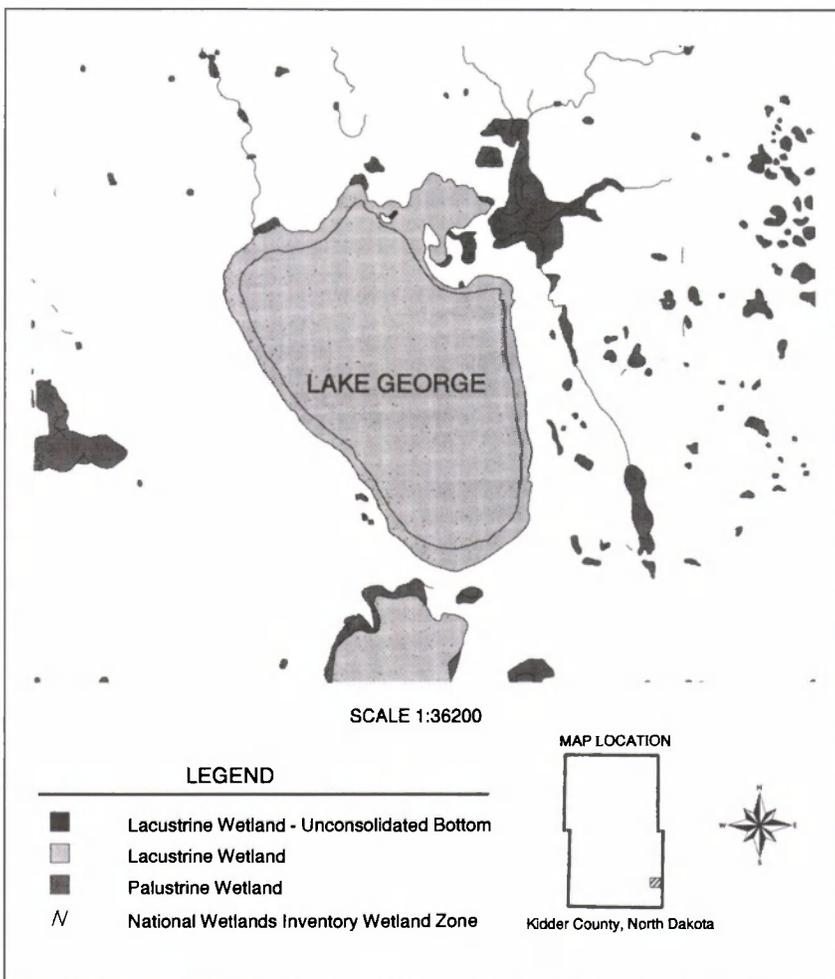
Piping Plovers Can't Hide

The northern Great Plains population of the piping plover (*Charadrius melodus*) is listed as threatened by the United States and endangered by Canada. Its conservation requires knowledge about population numbers and distribution, as well as the availability of suitable habitat. Recent data suggest that over 60 percent of the Great Plains piping plovers occur around wetlands in the Prairie Pothole area of North and South Dakota. A coordinated survey has been conducted annually since 1982 to assess the number of piping plovers in North Dakota. This survey focuses

GIS map identifying potential piping plover breeding sites around Lake George in North Dakota.

on wetlands where piping plovers are *known* to occur based on previous observations rather than on a sample of wetlands that *might* meet plover habitat requirements. Therefore, it is possible that the current survey is not counting all plovers in North Dakota.

In January 1993, biologists with the Fish and Wildlife Service's (FWS) Habitat and Population Evaluation Team in Bismarck, North Dakota, tried Geographic Information System (GIS) techniques to identify wetlands over a three-county area in North Dakota where they believed piping plovers might occur. Dan Cohan (now with the National Park Service) developed the GIS project for this area. Digital wetland data for Burleigh, Emmons, and Kidder Counties were obtained from the FWS National Wetland Inventory (NWI). Through consul-



tation with FWS Ecological Services staff in Bismarck, a model was developed to link piping plover occurrence with wetland characteristics as classified by NWI. All modeling and data processing tasks were accomplished using ARC/INFO software on a SUN UNIX computer.

The first step in the process involved combining contiguous wetland polygons (separate class zones) into a single cumulative polygon to identify wetland basins that contained at least one lacustrine system. Next, the original polygon data file was linked to the basin in order to identify specific wetland characteristics. The model was defined to select wetland basins classified as lacustrine, littoral, aquatic beds that are semi-permanently flooded or intermittently exposed and have an unconsolidated shore zone.

The modeling procedure identified 11 wetland basins as potential piping plover habitat in the three-county area. Some of the basins already were known to have plover occurrence based on previous surveys. Subsequent field surveys verified that piping plovers occurred on two wetland basins that had not been previously documented. On one of these sites, five adults and two chicks were observed. Although the process succeeded in predicting the occupancy of plovers on two previously-unknown sites, it failed to predict the occupancy of plovers on some known sites. Two of these sites were lakes with atypically high levels of emergent vegetation zone, which the model was designed to discard.

The use of GIS techniques and digital wetland data to detect potential habitat proved effective, despite being based on somewhat constraining criteria. According to current data, surveys have detected piping plovers during the breeding season on over 100 wetlands in North Dakota. These data could be used to develop a more effective model that can be applied to the entire wetland database across the Prairie Pothole region of North and South Dakota. In North Dakota alone, there are over 5,000 natural lakes with



Piping plover
USFWS photo

an average size greater than 100 acres (40 hectares). Most of these have lacustrine zones, and it is estimated that over 300 of these lakes have segments of unconsolidated shoreline, a feature important to breeding plovers.

Conservation of piping plover populations in the northern Great Plains will require a better understanding of the availability of suitable habitat. While most occurrences of piping plovers on public lands have been detected, other potential habitat on private lands remains largely undetected. Because 95 percent of the land area in North Dakota is in private ownership, it is likely that many other wetlands in the Prairie Pothole region may provide suitable habitat for piping plovers. Use of GIS technology and available digital wetland data may be the most cost effective method for predicting occupancy of such areas, creating opportunities for partnerships with landowners to recovery this bird.

Ronald Reynolds is Supervisor of the FWS Habitat and Population Evaluation Team in Bismarck, North Dakota.

Teaching Cranes to Migrate

*H*ave you ever watched birds flying and wished you could join them? Kent Clegg had such a wish—and

Steve Clegg



Kent's desire is not to be listed in the Guinness Book of Records, but to develop a technique for introducing captive-reared whooping cranes (*Grus americana*) into the wild at sites where migration is required. Juvenile cranes learn a migration route and wintering location from their parents, but captive-reared juveniles are the only source of whooping cranes available for release in the wild to start new migratory populations. Sandhill cranes, a close relative to whooping cranes, are used as research substitutes for the rare whoopers. Reared on the Clegg Ranch, the sandhill cranes had access

he *did* join them! Kent, a contract biologist and rancher, started his adventure on the ground by leading tame greater sandhill cranes (*Grus canadensis tabida*) behind an all-terrain vehicle (ATV) or a truck. One such trip covered 61 kilometers (38 miles). In 1994, he reared six sandhill cranes and taught them to follow an ultralight aircraft (UL) in short flights near his ranch in southeastern Idaho. His experiment took off last year when he led 11 sandhill cranes on a 1,204-km (748-mile) migration flight from Idaho to New Mexico.

How can these young birds learn where to migrate and spend the winter when wild birds are not available?

This question has special urgency for the highly endangered whooping crane. The only self-sustaining wild population

nests in the Northwest Territories of Canada and winters on the Gulf Coast of Texas. The wintering area borders the Gulf Intracoastal Waterway, one of the busiest in the world. Much of the traffic involves petroleum products, and an accidental chemical spill could threaten the whooper population.

To promote the species' survival, the Canadian-United States Whooping Crane Recovery Team recommends establishing two additional, discrete wild populations. An experimental introduction is underway in Florida to start a non-migratory population. For the second additional population, the Canadian Wildlife Service and U.S. Fish and Wildlife Service (FWS) hope to start introducing a migratory population in southeastern Saskatchewan or southern Manitoba at the end of this decade.

Kent Clegg's research is funded by the FWS, Windway Capital Corporation of Wisconsin, World Wildlife Fund-Canada, and National Biological Service. The initial objectives were to determine whether: (1) young captive-reared sandhill cranes could be trained to follow an UL in migration to a specific wintering area; (2) cranes reared in a semi-wild manner would develop behavior typical of wild cranes after release at the wintering site; and (3) these birds would then return unassisted to their summering area.

The migration route began in southeastern Idaho and went south through Utah, Colorado, and New Mexico to Bosque del Apache National Wildlife Refuge. Landing locations were selected when the birds became tired, night approached, fuel supplies were low, weather became unfavorable, or the cranes scattered due to

golden eagle (*Aquila chrysaetos*) attacks. A second, faster UL accompanied them to monitor conditions ahead of the Dragonfly UL, select suitable landing sites, and protect the flock from attacking eagles. The cranes were placed in a net-covered, portable pen at night.

Migration began October 16, 1995, with 11 cranes. Crane No. 50 disappeared the first day after accompanying the plane for 86 km (53 miles) but returned to the Clegg Ranch 3 days later. The entire migration required 11 days, including 23 hours of flight time. The birds generally flew in formation off the UL wingtips to take advantage of air waves emanating from the wings. Daily distances flown varied from 43 to 217 km (27 to 135 miles) depending on wind, temperature, snow, terrain, fuel supplies, attacks by golden eagles, the stamina of the cranes, and daylight. The mean flight altitude was about 300 meters (985 feet), the highest pass traversed was about 2,590 meters (8,500 feet) above sea level, and the average flight speed was 52 km/hour (32 miles/hour).

Other than difficult flying conditions, the main problem was the five golden eagle attacks. The worst episode was on October 17 when the cranes crossed a pass in the Bear River Mountain Range. A pair of golden eagles attacked two cranes lagging about 90 meters (295 feet) behind and below the UL. One eagle struck Crane No. 41 and carried it to the ground where its carcass was later found. The second crane was last seen being pursued by the second eagle.

One day after arrival at Bosque del Apache, the eight remaining UL cranes were allowed to integrate with the wild cranes on their own and to learn appropriate behavior for survival at the wintering ground. The UL cranes were monitored

daily through the winter months by refuge personnel. In the first week after arrival, 2 UL cranes were killed by coyotes (*Canis latrans*). Two others were shot by crane hunters after leaving the refuge with a flock of wild cranes to feed in grain fields on private farmland. The four surviving UL cranes spent the winter associating with wild cranes, feeding in uplands during the day, and roosting in wetlands at night. They soon responded to the approach of humans by taking flight like the wild cranes.

The four UL cranes migrated in mid-March from New Mexico to the San Luis Valley of southern Colorado, where they stayed with other cranes of the Rocky Mountains population. In late April, they migrated north and 2 were found 53 km (33 miles) from the Clegg Ranch in mid-May. Judging from dispersal distances noted in yearling cranes in other studies, the UL cranes returned successfully to the appropriate summering area. The location of the other two birds is unknown.

Although the crane losses to golden eagles, coyotes, and hunting were disappointing, the initial results indicate that this technique has potential for establishing migratory flocks of captive-reared cranes. The research is continuing with additional sandhill cranes in 1996. Biologists hope to improve survival by modifying migration and release techniques. If the results are favorable in 1996, there are plans to test this technique with a small number of whooping cranes in 1997.

James Lewis is the FWS Whooping Crane Coordinator in Albuquerque, New Mexico.

Whooping cranes
Steve Hillebrand/USFWS



to commercial food but also fed extensively on seeds, insects, and earthworms. Capitalizing on the "following behavior" of crane chicks, Kent trained the birds to follow him as he walked, drove an ATV, or flew an UL. The chicks were led daily to fields on the ranch and allowed to forage independent of a caretaker. Group-rearing the cranes in semi-wild circumstances on the Clegg Ranch helped prepare them for release in the wild on wintering grounds. A Dragonfly UL, a single-seat, open-cockpit craft designed to tow gliders, was modified for this project.

Species Research at the Forest Service

*I*s the U.S. Forest Service (FS) a critical player in the world of endangered species? Consider that more than one-third of all federally-listed species occur on the 191 million acres (77 million hectares) of National Forests and Grasslands. From the Sonoran desert to the Arctic tundra, FS land encompasses at least 13 major terrestrial and aquatic ecosystems and represents an immense array of natural communities. In some cases, these lands contain unique blocks of native habitats and remnants of formerly abundant ecosystems. As described in the June 1994 edition of the *Endangered Species Bulletin*, the FS has an active endangered species management program.

Opposite Page

Scientists are studying fish communities in Aravaipa Creek, Arizona, with the goal of restoring native species.

Forest Service photo

But FS *research* distinguishes the agency's role in endangered species as much as the habitat it manages. The FS has conducted research on endangered species since 1973. Initially, this work focused on only a few species, but the research program has evolved considerably since that time. Rather than focusing strictly on a given species, research programs now employ an ecosystem approach that studies species within a wider context. Today's FS scientists work cooperatively in partnerships with other agency scientists, outside cooperators, and its research clients.

The FS endangered species research effort is coordinated by seven regional research stations and at the International Institute for Tropical Forestry in Puerto Rico. The following highlights provide a glimpse of the FS's national Threatened, Endangered, and Sensitive (TES) Species Research Program:

Pacific Southwest Research Station

The Pacific Southwest Research Station has the largest TES research program of the seven regional stations. The research focuses on habitat and population viability for the California spotted owl (*Strix occidentalis occidentalis*), two threatened birds—the northern spotted owl (*Strix occidentalis caurina*) and marbled murrelet (*Brachyramphus marmoratus marmoratus*)—and other species associated with mature and old-growth forests in California. The Station's scientists also study a variety of other issues, including the cumulative effects of land uses and water diversions on endangered fishes, the restoration of habitat for Hawaiian forest species, and bats in Micronesia.

Pacific Northwest Research Station

The Pacific Northwest Research Station is extensively involved in



scientific issues related to old-growth forests, the northern spotted owl, the marbled murrelet, and more than 1,000 other associated species. Significant legal issues and the work of President Clinton's Forest Ecosystem Management Assessment Team set the stage for scientists to work at the ecosystem scale to help conserve these organisms. Station scientists, working together with the Bureau of Land Management, also have prepared a regional strategy referred to as "PacFish" for restoring degraded salmon habitat.

Rocky Mountain Research Station

The Rocky Mountain Research Station addresses the needs of TFS species across the Southwest, Great Plains, and Rocky Mountains. It emphasizes research on several predatory birds associated with mature forests—the northern goshawk (*Accipiter gentilis*) and the threatened Mexican spotted owl (*Strix occidentalis lucida*)—as well as prairie species of concern, such as the endangered black-footed ferret (*Mustela nigripes*). Scientists at the station also are studying southwestern desert freshwater fish communities that include threatened trout species, such as Apache and Gila trout

(*Onchorhynchus apache* and *Onchorhynchus gilae*, respectively). Moreover, scientists are initiating research on the spotted bat (*Euderma maculatum*) and seven other bat species of concern.

Intermountain Research Station

The Intermountain Research Station TES program is focused on controversial species in the northern Rocky Mountains that include the threatened grizzly bear (*Ursus arctos*) and endangered gray wolf (*Canis lupus*). Researchers also study other carnivores, including the wolverine (*Gulo gulo luscus*), lynx (*Felis lynx canadensis*), American marten (*Martes americana*), and fisher (*Martes pennanti*).

Studies on the decline of anadromous fish stocks is also important at the Intermountain Station because the region encompasses important headwaters for many northern Rocky Mountain rivers. Forest Service scientists recently discovered a resident, non-migratory population of endangered Snake River sockeye salmon (*Oncorhynchus nerka*) in Redfish Lake, central Idaho.

North Central Research Station

The North Central Research Station, with headquarters in St. Paul, Minnesota, conducts research on TES species and vulnerable ecosystems of the central States. One of its priorities has been a long-term study of the endangered Kirtland's warbler (*Dendroica kirtlandii*). Making progress toward recovery of this species has required understanding the historical role of fire in the jack pine ecosystem, upon which the Kirtland's warbler depends. Scientists have helped develop alternative ways of managing the jack pine ecosystem on public lands, gained a better understanding of the bird's breeding habitat requirements, and examined the impact of nest parasitism by cowbirds (*Molothrus ater*). They are also working with other researchers to understand the natural history of the endangered Karner blue butterfly (*Lycæides melissa samuelis*) and the dynamics of Great Lakes coastal dune systems, which support several listed plants and animals.

Northeast Research Station

The Northeast Research Station TES program focuses on habitat restoration for the Atlantic salmon (*Salmo salar*),

FS Field Stations

**Pacific Southwest
Research Station**
P.O. Box 245
Berkeley, California
94701-0245
Tel.: 510-559-6321

**Pacific Northwest
Research Station**
P.O. Box 3890
Portland, Oregon
97208-3890
Tel: 503-326-7135

**Intermountain Research
Station**
324 25th Street
Ogden, Utah 84401
Tel: 801-625-5433

**North Central Research
Station**
1992 Folwell Ave.
St. Paul, Minnesota 55108
Tel: 612-649-5276

(California, Hawaii)

(Oregon, Washington,
and Alaska)

(Idaho, Montana, Nevada
and Utah)

(Illinois, Indiana, Iowa,
Michigan, Minnesota,
Missouri, Wisconsin)

which has been proposed for ESA listing and is a FS sensitive species. This fish is showing signs of widespread geographic decline similar to that of salmon species in the western United States. A variety of factors have contributed to the Atlantic salmon's decline, including urbanization, pollution runoff, and channelization for flood control. Juvenile fishes appear to be particularly vulnerable to habitat degradation. The research will help to restore habitats and eventually reverse the species' decline. Scientists at the Northeast station also conduct work on endangered plants and bats, such as the gray bat (*Myotis grisescens*) and Indiana bat (*Myotis sodalis*).

Southern Research Station

Native longleaf pine ecosystems throughout the South have been reduced to only 4 percent their original extent because of agricultural conversion, urban development, forest harvesting, and fire suppression. More than 200 TES species are associated with this community. Many of the species, especially rare native plants, are being studied by Southern Research Station scientists.

One species affected by the loss of mature pine habitat is the red-cockaded woodpecker (*Picoides borealis*). The population of this species was further reduced by Hurricane Hugo. (See *Bulletin* Vol. XIV No. 9.) With 15 years of red-cockaded woodpecker research in hand, FS scientists and managers helped design a crash program to save the birds. By the summer after the hurricane, 45 percent of all red-cockaded woodpecker nests on the National forest were in artificial cavities, a figure that now exceeds 66 percent. The population has recovered dramatically, with the number of adult birds up 56 percent from 1990 to 1994.

International Institute for Tropical Forestry

The International Institute for Tropical Forestry in Puerto Rico is well-known for its cooperative work with the Fish and Wildlife Service on the endangered Puerto Rican parrot (*Amazona vittata*) in Luquillo Experimental Forest (Caribbean National Forest). The parrot had all but disappeared from the wild by 1972; only 14 birds remained in a single population on a remote part of the island. Most of the bird's habitat had been destroyed by

human activity, and reproduction by the few remaining birds was impeded by predation, competition, small population size, and a lack of nesting sites.

Scientists from both agencies worked together to modify natural cavities and design artificial structures that provide safe nesting sites for the parrots. Captive birds were bred to produce young parrots, which were substituted for wild chicks in the nest to enhance genetic diversity. The wild parrot colony had grown to 45 birds when in 1989 it lost about half of the birds to Hurricane Hugo. Joint research and recovery efforts have already restored the bird to prehurricane levels.

These are but a few highlights of the nationwide FS threatened and endangered species research program. More information can be obtained directly from the research stations (see list at bottom of page).

Kberyn Klubnikin is an ecologist in Forest Environment Research working on the fish, wildlife, and rangeland research program.

Northeastern Research Station
P.O. Box 6775
Radnor, Pennsylvania
19087-8775
Tel: 610-975-4230

Rocky Mountain Research Station
240 West Prospect Rd.,
Ft. Collins, Colorado
80526-2098
Tel: 970-4981798

Southern Research Station
P.O. Box 2680
Asheville, North Carolina
28802
Tel: 704-257-4390

International Institute of Tropical Forestry
Call Box 25000
UPR Experimental Station
Grounds
Rio Piedras, Puerto Rico
00928-2500
Tel: 809-766-5335

(Connecticut, Delaware, Kentucky, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, West Virginia)

(Arizona, Colorado, Kansas, Nebraska, New Mexico, North Dakota, South Dakota, Texas, Wyoming)

(Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia)

Wildlife, People, and Contaminants

Controlling pollution has become a critical element in protecting ecosystems, including the habitats of many threatened and endangered species. Adverse impacts from contaminants to wildlife and the environment are mounting. The U.S. Fish and Wildlife Service's (FWS) Environmental Contaminants Program is responsible for identifying and preventing the harmful effects of these substances on wildlife. The program also plays a significant role in restoring natural resources degraded by contamination.

Contaminants enter the environment in many different ways. Disposal of municipal wastes, discharges from factories, or spills of hazardous materials are examples of "point source" pollution because their origin is easily identified. In other cases, the origins may not be as clear. They are considered "non-point" sources of pollution. For example, a stream can be contaminated by pesticides or by fertilizers used miles away because these chemicals can be carried by runoff or groundwater. Further, pollutants can travel long distances through the air and fall with the rain.

Many hazardous substances take decades or centuries to degrade to less harmful substances in the environment, if they degrade at all. Examples of hazardous materials that do not break down are heavy metals (such as lead or cadmium) and mercury. Persistent hydrocarbons (such as Dioxins, PCBs, or DDT) degrade very slowly, and their breakdown products often are just as harmful to aquatic organisms as the parent compounds. Even when these hazardous substances are in low

concentrations and not acutely toxic, they can cause prolonged sublethal effects. Such effects include growth impairment, lowered reproduction, central nervous system impacts, decreased sperm counts, feminization of male birds, behavioral abnormalities (such as failure to feed offspring), sex reversal in reptiles, premature births, seizures, structural abnormalities (such as birds with crossed bills, which interfere with feeding), reduced spawning in fish, eggshell thinning, and the death of bird chicks. When contaminants persist in the environment, impacts often are compounded by the processes of bioaccumulation and biomagnification, in which burdens of contaminants in animals increase with continued exposure and grow at each successive level in the food web.

To ensure that endangered species and other wildlife resources are protected, FWS Environmental Contaminant Specialists analyze permits and plans for control of nonpoint source pollution, industrial and municipal point source discharges (the National Pollutant Discharge Elimination System), and

discharge of dredge and fill material (Clean Water Act section 404 permits). Environmental Contaminant Specialists also provide technical assistance for Endangered Species Act section 7 interagency consultations.

The FWS's Contaminants and Partners for Wildlife Programs worked with farmers and the Pennsylvania Department of Environmental Protection to improve water quality in 22 miles (35 kilometers) of fenced streams and 50 acres (20 hectares) of wetlands, while providing much cleaner water for

livestock. FWS Contaminant Specialists also assisted the U.S. Environmental Protection Agency at 47 Superfund sites in Pennsylvania, helping to restore 105 river miles (169 km) and 120 acres (49 ha) of wetlands. In Illinois and Michigan, Environmental Contaminants Specialists completed a section 7 consultation on the Great Lakes Water Quality Guidance initiative. The resulting improvements will have a direct benefit to the Great Lakes Ecosystem, and this guidance will likely be used as a model for water quality development through-

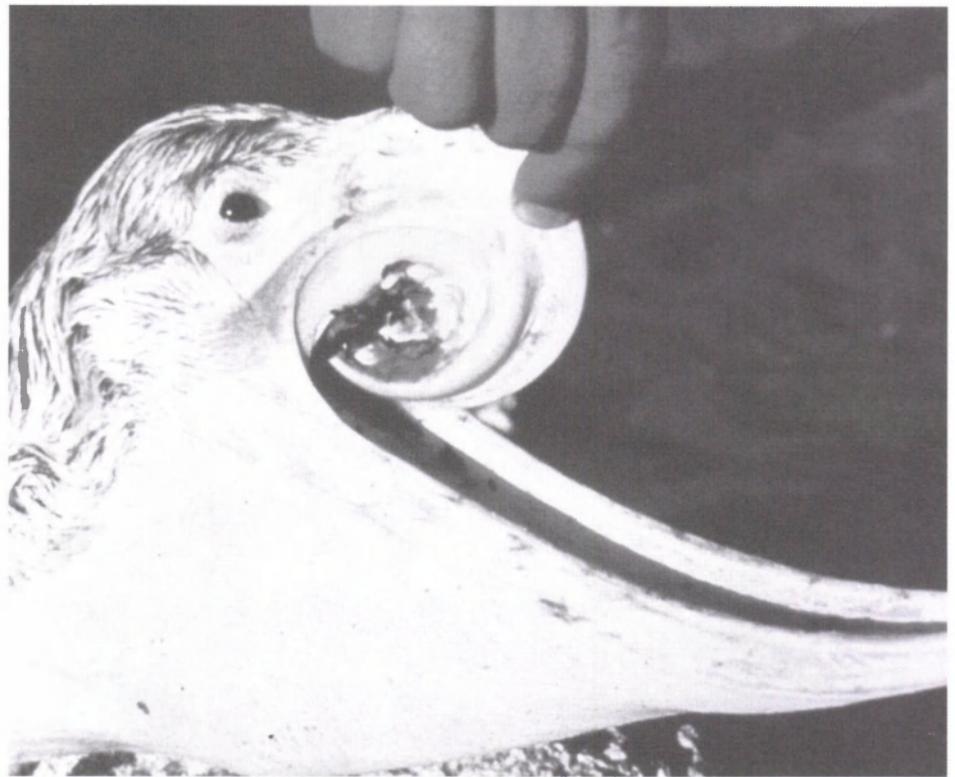


A biologist collects data for a study of eggshell thinning caused by exposure of birds to toxic substances.

Rodney F. Krey/USFWS

The severely deformed upper bill of this white pelican (*Pelecanus erythrorhynchos*) at Stillwater National Wildlife Refuge, Nevada, was probably the result of poisoning by selenium and arsenic, chemicals known to leach out of the soil in some areas of high agricultural irrigation.

USFWS Photo



out North America. In California, a multi-year investigation by the Contaminants Program contributed to new protocols that will mitigate impacts of selenium-contaminated evaporation ponds on shorebirds that feed and nest at the ponds. Use of these protocols could create as much as 2,000 acres (809 ha) of habitat for shorebirds while preserving agricultural activity.

The FWS is the only Federal agency with trustee responsibilities for both coastal and inland spills. Contaminant Specialists responded to a "mystery spill" of an extremely toxic combination of #2 diesel fuel, stearate, and aldehydes in the East Pascagoula River of Mississippi in 1995, a spill for which there was no identifiable responsible party. Of the 147 endangered brown pelicans (*Pelecanus occidentalis*) affected by the spill, FWS biologists cleaned for release over 110 birds.

Contaminant Specialists are heavily involved in the Natural Resource Damage Assessment and Restoration Program, which seeks compensation to the public and restoration of lost or injured trust resources as a result of an

oil or chemical spill. Planned use of the settlement funds includes preserving 253 acres (102 ha) of globally rare dune and swale wetlands in Indiana; establishing a 22-acre (9-ha) wildlife area on Staten Island, New York; creating 80 acres (32 ha) of new wetlands at an Ohio State Wildlife Area; creating 33 acres (13 ha) of new wetland and tidal marsh habitat in Texas; and preserving 247 acres (100 ha) of peat bog/heath habitat in Maine.

These efforts do not just aid wildlife. They help to ensure human safety and health, outdoor recreational opportunities, healthy food and water supplies, and economic prosperity. Ultimately, efforts to prevent and clean up pollution are for wildlife and people, since all living things depend for their survival on a clean environment.

Pam Matthes is Deputy Chief of the FWS Division of Environmental Contaminants in Washington, D.C.

Have a Story to Share?

see your name in print!

*Let us publish it in the **Endangered Species Bulletin!***

The *Endangered Species Bulletin* (ESB) was created in 1976 to meet the growing demand for news of developments in the endangered species program of the U.S. Fish and Wildlife Service. Current distribution of this publication numbers over 6,000, including local, State and Federal agencies, non-profit organizations, and official program contacts (both nationwide and international).

Contributors are encouraged to contact the *Bulletin* editor (703/358-2390) before preparing a manuscript to determine the length, focus, and timing of proposed articles. We welcome all submissions but cannot guarantee their publication. Manuscripts may be edited for length, style, and clarity. The *Bulletin* staff will consult with authors on all changes that may affect the content of a manuscript and authors will have an opportunity to review edited material before publication. Credit will be given for all published articles, illustrations, and photographs.

Helpful Hints:

- ✧ feature articles are generally three to five double-spaced pages in length (one and two page articles also are welcome)
- ✧ provide both common and scientific names when referencing listed or non-listed species
- ✧ provide metric equivalents for all measurements; Celcius and Fahrenheit equivalents for all temperatures
- ✧ include author's name, position, duty station, address, and telephone and fax numbers
- ✧ include photographs or line drawings whenever possible (materials will be returned to the contributor)
- ✧ submit article electronically via Internet to R9FWE_DES.BIM@mail.fws.gov
- ✧ articles can also be sent on disk to USFWS, 452 ARLSQ, Washington, D.C. 20240

The ESB is on a bimonthly printing schedule and each issue is developed around a distinct theme. Upcoming themes are listed below, and additional themes are being developed. While contributions are welcome at any time, material not received by the "Article Due" date will be held for a future issue.

ISSUE DATE	ARTICLE DUE DATE	ISSUE THEME
November/December 1996	October 15, 1996	Biological linkages
January/February 1997	November 30, 1996	Partnerships with DOD
March/April 1997	December 27, 1996	Native plant conservation

Because of its increasingly diverse audience, the ESB is seeking to diversify and expand its coverage of endangered species issues. To be successful, we need your help. Material on a wide range of topics relating to endangered species is welcome and may be technical or popular in nature. We are particularly interested in success stories and news about species recovery (both the development of recovery plans and their implementation). Material also is needed on interagency consultations; Habitat Conservation Plans; other cooperative ventures with Federal and State agencies, conservation organizations, business, and private landowners; changes in a species' status; and threats to habitat.



Region 1

Geographic Information System The Fish and Wildlife Service's (FWS) North Pacific Coast Ecoregion is using geographic information system (GIS) technology to support information needs of many activities. Foremost among these activities are the development of habitat conservation plans (HCPs) and implementation of the President's Forest Plan. GIS provides a means to collect, analyze, and report data on the locations of species and the landscape features that may affect wildlife, such as land cover, elevation, road density, and land ownership.

Through cooperative efforts with State and other Federal agencies, the Pacific Coast Ecoregion has access to detailed computerized information documenting the known locations of threatened and endangered species including, but not limited to, the northern spotted owl (*Strix occidentalis caurina*), bald eagle (*Haliaeetus leucocephalus*), and marbled murrelet (*Brachyramphus marmoratus marmoratus*). By creating computerized maps of project areas, the GIS database can identify species locations that are inside of, or close to, a proposed project. This information can be used in habitat conservation planning and watershed analysis on Federal Lands to focus efforts on specific species of interest and identify opportunities to minimize impacts before projects are initiated.

By using computer models based on GIS, the Pacific Coast Ecoregion has been able to predict the ability of an HCP to sustain viable spotted owl sites over the course of a habitat conservation agreement and compare the projected impacts of alternative land management strategies. In a similar fashion, the technology is being used to provide biologists and managers with quantitative information describing the possible impact on

both spotted owls and people that would result from the release of large areas of private lands currently regulated under the Endangered Species Act. This analysis involves integrating geographic and descriptive information about land ownership, spotted owl locations, spotted owl habitat, and Federal land use allocations under the President's Forest Plan.

Port Blakely Habitat Conservation Plan On July 19, 1996, the FWS issued a 50-year permit to Port Blakely Timber Company authorizing incidental take of northern spotted owls, marbled murrelets, bald eagles, and peregrine falcons (*Falco peregrinus*) associated with the company's tree farm in Grays Harbor and Pacific Counties in southwest Washington. Port Blakely submitted an HCP to the FWS and the National Marine Fisheries Service for timber management activities affecting 7,486 acres (3,030 hectares) of commercial second-growth trees. Management according to the proposed HCP will produce a net increase in the older forest that provides some of the habitat characteristics needed for spotted owl roosting, foraging, and dispersal. Under this HCP, Port Blakely will increase the total acreage of trees in this older condition by 90 percent over the 50 years covered by the plan. This is especially noteworthy, since very little spotted owl habitat remains

in southwest Washington. The HCP is an ecosystem-based forest management plan that attempts to provide for all species that use the habitat types in the plan area.

Woodland Caribou (*Rangifer tarandus caribou*)

In April 1996, 19 woodland caribou were translocated from British Columbia to the Selkirk Mountains of northeast Washington as part of a recovery effort for this endangered species. It is aimed at improving the number and distribution of woodland caribou within the Selkirk Ecosystem Recovery Area, which encompasses northeast Washington, northwest Idaho, and southeast British Columbia. The caribou project is a cooperative effort involving the FWS, Washington Department of Fish and Wildlife, U.S. Forest Service, British Columbia Ministry of Environment, and Idaho Department of Fish and Game. Since their release in April, the relocated caribou have traveled throughout the recovery area, some joining the caribou that were still present within the ecosystem. At least one calf has been born and there have been two deaths, with predation being the suspected cause. This year's translocation effort is the first phase of a 3-year project. An estimated 20-24 caribou will be introduced in each of the next 2 years.



Biologists examine caribou as part of translocation project.
Madonna Luers/WA Department of Fish & Wildlife

Southern Sea Otter (*Enhydra lutris nereis*) FWS staff from the Ventura Field Office, California State Office, and the Portland Regional Office recently held a public hearing on a draft revision of the recovery plan for the southern sea otter. Concerns were expressed by some attendees about a provision that could remove southern sea otters from the list of threatened species if the current population level of 2,377 reaches 2,650.

Although this issue can be highly emotional, the 20 individuals who testified at the hearing provided well-considered comments and information. The hearing's two sessions, both held in Monterey, California, on July 18, were attended by 60 individuals. Local and regional news media showed interest in this issue and presented balanced accounts of the hearing. CNN's story typified the coverage, clearly presenting the rationale for both sides of the issue. The business-like tone of the hearing was due to long-standing working relationships among the FWS, Southern Sea Otter Recovery Team, and other interested parties.



Southern sea otter floating in a bed of kelp.
USFWS photo

Hayun Lagu (*Serianthes nelsonii*) In early August, staff from the Guam Division of Aquatic and Wildlife Resources, Guam National Wildlife Refuge, U.S. Air Force, and Guam Division of Forestry erected a fence around the last remaining adult tree of this endangered species on the island of Guam. The fence is designed to protect seedlings from browsing by non-native deer and feral pigs.

Recovery efforts at this site suffered a setback in July with the death of the only sapling and 10 of the 15 seedlings. The causes of death could not be determined, but the timing coincided with a severe infestation of introduced mealybugs and possible stress from dry weather.

In January 1996, the above agencies and the University of Guam planted 12 seedlings in 3 ungulate-proof enclosures on Andersen Air Force Base and the Refuge. As of August, nine of the seedlings were still alive. Although only a single adult *S. nelsonii* remains on Guam, 120 occur on the neighboring island of Rota.

Region 2

Whooping Crane (*Grus americana*) Fourteen whooping crane eggs were collected in Canada's Wood Buffalo National Park in late May. This year, the collection was limited to whooper pairs not represented or poorly represented in the captive breeding flocks. This pick-up is the last scheduled for several years because captive propagation centers are fully stocked and able to produce the number of young cranes needed for the continuing whooper reintroduction project in Florida. Forty-four wild pairs were confirmed nesting in Canada, and 30 chicks were seen during mid-June surveys, along with adults still incubating at 4 nests. These numbers are lower than the record of 1995, when 49 pairs made 51 nesting attempts and 45 chicks were counted in June.

Regions 2 and 4 of the FWS, in cooperation with the Florida Game and Fresh Water Fish Commission, began an experiment in 1993 to reestablish a nonmigratory whooping crane population in Florida's Kissimmee Prairie south of Orlando. The captive-reared whooping cranes are released at 5 to 9 months of age. The rates of first-year survival for released birds have been increasing as rearing and release techniques have been modified. The principal cause of death has been predation by bobcats. In the first 3 years, 35 percent

of the birds were killed in the first 3 months after release as they attempted to learn survival in the wild.

This year, however, only 4 percent of the birds have been lost in the first 3 months after release. Fifty-six cranes survived and at least 4 pairs have formed. The oldest pair, consisting of 4-year-olds, built 7 nests and nest platforms, chased other cranes from the area, and were observed copulating, although egg production has not been confirmed. First egg production typically begins at 4 years of age. Annual releases and evaluation of the project will continue for several years.

Masked Bobwhite (*Colinus virginianus ridgwayi*) For the past 30 years, the Patuxent Wildlife Research Center (now the Patuxent Environmental Science Center, a facility of the National Biological Service or NBS) has maintained the captive breeding flock for this endangered subspecies. Because captive propagation of the masked bobwhite is no longer considered a research task, NBS has withdrawn from the program. Between April 30 and May 14, 657 masked bobwhites were shipped to a new propagation facility at the Buenos Aires National Wildlife Refuge in southern Arizona. The FWS has assumed the task of rearing bobwhites at this facility for release on the refuge.



Masked bobwhite
John & Karen Hollingsworth©

Region 3

Fat Pocketbook Pearly Mussel (*Potamilus capax*)

Researchers contracted by the Missouri Department of Conservation recently discovered three live specimens of the endangered fat pocketbook pearly mussel, a species formerly thought to be extirpated from Missouri, in Bel Fountain Ditch in the Missouri Bootheel. An adult, gravid (pregnant) female and two younger specimens were discovered on a mussel bed along with other species of mussels. The gravid female is being kept at Southwest Missouri State University, where Dr. Chris Barnhart is seeking to identify the host fish upon which the larvae of this endangered mussel depend. The presence of younger fat pocketbook pearly mussels at the discovery site suggests that the species is successfully reproducing at the locality.

Mead's Milkweed (*Asclepias meadii*) Two new populations of the threatened Mead's milkweed were discovered this spring on rhyolite glades in southcentral Missouri. One small population is on Wildcat Mountain in Taum Sauk State Park. A much larger population was found on Profit Mountain within the Missouri Department of Conservation's Ketcherside Mountain Conservation Area.

Region 4

West Indian (Florida) Manatee (*Trichechus manatus*) After 4 months of research, scientists have concluded that the die-off that claimed 158 endangered manatees this spring (see *Bulletin* Vol. XXI, No. 3) was caused by a red tide outbreak. State, Federal, and international researchers examined every available piece of physical evidence and based their conclusion on a series of bioassay experiments. Manatees are thought to have ingested red tide toxins either while feeding on sea grasses or by inhaling toxins in waters having high red tide concentrations. Researchers had not seen red tide concentrations of this magnitude since 1982, when a similar manatee die-off occurred in this same area.

Before the 1996 die-off, population estimates placed Florida's manatee population at 2,600; however, a record 304 manatees died of various causes during the first 6 months of this year, including 206 in southwest Florida (158 of which were caused by red tide). The loss of over 10 percent of the population will have a significant impact on manatee recovery efforts.

Region 5

Piping Plover (*Charadrius melodus*) The FWS Northeast Regional Director has approved a final revised recovery plan for the Atlantic Coast population of the piping plover. The new plan, based on increased knowledge of plover biology and management needs, establishes population and productivity goals for four recovery units within the species' Atlantic Coast breeding range. Long-term agreements to protect and manage breeding habitat and maintain wintering habitat will be sought under the plan. Appendices to the new recovery plan contain (a) guidelines for managing recreational activities in plover breeding habitat to avoid direct mortality, harassment, and/or harm; and (b) guidelines for preparation and evaluation of permit applications for incidental take of piping plovers.

From June through August 1996, the Fish and Wildlife Service published the following listing actions under the Endangered Species Act (ESA):

Final Listing Rules

Four plant species native to the Hawaiian Islands were listed as endangered. Three of these plants are endemic to the small, uninhabited island of Nihoa:

Amaranthus brownii—an annual herb in the family Amaranthaceae. Fewer than 40 individuals remain.



Amaranthus brownii
drawing by Yevonn Wilson-Ramsey, reprinted from *Manual of the Flowering Plants of Hawaii*

Pritchardia remota—a fan-leaved palm in the family Arecaceae. Only about 680 of these trees are known.

Schiedea verticillata—a perennial herb in the pink family (Carvophyllaceae). This species numbers fewer than 200.

Although Nihoa is protected as part of the Hawaiian Islands National Wildlife Refuge, its endemic plants are vulnerable because of their limited range and small numbers, competition from a non-native plant that has become established on the island, the possibility of other accidental introductions (including rats and mice), and impacts of unauthorized visitors on Nihoa's fragile environment. The final rule listing these plants as endangered species was published in the August 21 *Federal Register*.

The fourth recently-listed Hawaiian plant, endemic to the privately-owned island of Ni'ihau, is another species of palm:

Pritchardia aylmer-robinsonii—a tree that grows to about 50 feet (15 meters) in height. A single wild population of only two individuals remains.

The habitat of *P. aylmer-robinsonii* has undergone extreme alteration due to past and present land management practices, including agricultural use and the introduction of non-native animals. It was listed as endangered in the August 7 *Federal Register*.

Final Reclassifications

Two species have been reclassified from endangered to the less critical category of threatened:

Maguire daisy (*Erigeron maguirei*)—a perennial, herbaceous plant in the composite family (Asteraceae). This species is native to sandstone canyons and mesas in Utah. At the time it was listed as endangered, the Maguire daisy was recognized as a subspecies endemic to the San Rafael Swell of Emery County. Recent taxonomic studies, however, have combined it with another formerly-recognized subspecies found in the Capitol Reef area of Wayne County. Although the Maguire daisy remains vulnerable to habitat damage from mineral development, certain recreational activities, and livestock trampling, the increased numbers resulting from the taxonomic revision allowed the FWS to upgrade the species' status on June 19 from endangered to threatened.

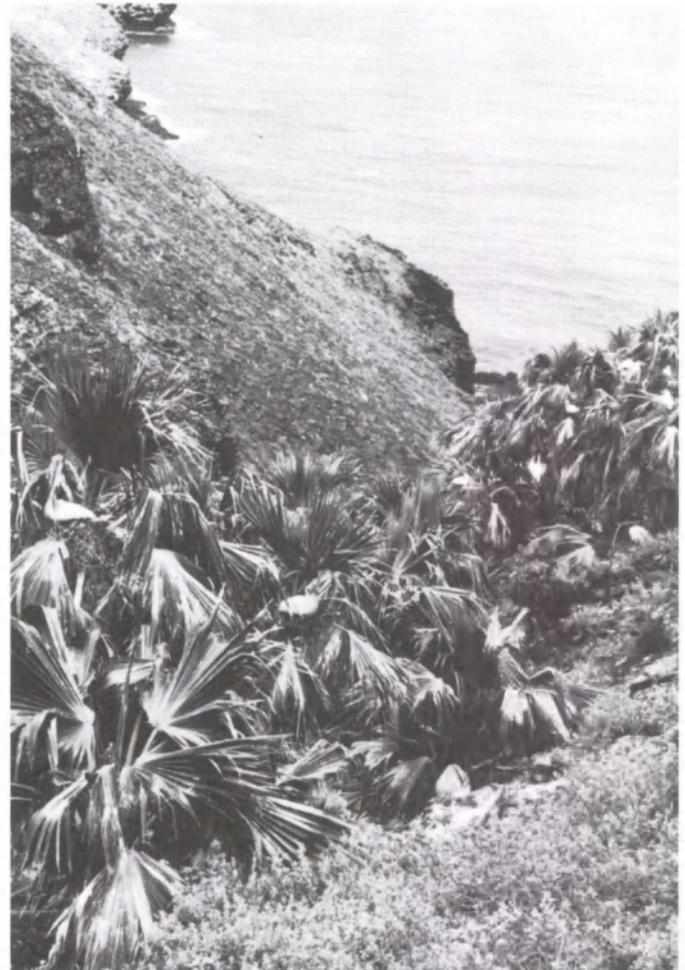
saltwater crocodile (*Crocodylus porosus*)—the largest species of crocodile, reaching lengths of well over 20 feet (6.1 meters). It inhabits estuaries, mangrove swamps, and the tidal portions of rivers in a range that stretches from southwestern India throughout Southeast Asia and Pacific islands, as far east as Fiji and as far south as the northern coast of Australia. Overexploitation for the skin trade and persecution as an undesirable animal led to the original listing of the saltwater crocodile as an endangered species, except in Papua New Guinea (where its status is considered stable).

In Australia, numbers have increased due to improved crocodile management and regulation of the

skin trade. As a result, the Australian saltwater crocodile has been reclassified under the ESA to the category of threatened. The final rule, published in the June 24 *Federal Register*, included a provision that allows the importation of saltwater crocodile skins from Australia into the United States in accordance with terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora. This reclassification does not affect the status of saltwater crocodiles elsewhere within the species' range.

Proposed Delisting

A plant currently listed under the ESA as Lloyd's hedgehog cactus (*Echinocereus lloydii*) was proposed June 14 for removal from the endangered species list. A recent taxonomic review presented evidence that *E. lloydii* is not a distinct species or subspecies but rather a hybrid of two common species, *Echinocereus coccineus* and *Echinocereus dasyacanthus*. As such, it would not be eligible for ESA protection.



Pritchardia remota
Elisabeth Cummings

BOX SCORE

Listings and Recovery Plans as of August 31, 1996

GROUP	ENDANGERED		THREATENED		TOTAL LISTINGS	SPECIES W/ PLANS
	U.S.	FOREIGN	U.S.	FOREIGN		
 MAMMALS	55	252	9	19	335	40
 BIRDS	74	178	16	6	274	72
 REPTILES	14	65	19	15	113	31
 AMPHIBIANS	7	8	6	1	22	11
 FISHES	65	11	40	0	116	72
 SNAILS	15	1	7	0	23	18
 CLAMS	51	2	6	0	59	43
 CRUSTACEANS	14	0	3	0	17	4
 INSECTS	20	4	9	0	33	20
 ARACHNIDS	5	0	0	0	5	2
ANIMAL SUBTOTAL	320	521	115	41	997	313
 FLOWERING PLANTS	407	1	92	0	500	292
 CONIFERS	2	0	0	2	4	1
 FERNS AND OTHERS	26	0	2	0	28	17
PLANT SUBTOTAL	435	1	94	2	532	310
GRAND TOTAL	755	522	209	43	1,529*	623**

TOTAL U.S. ENDANGERED: 755 (320 animals, 435 plants)

TOTAL U.S. THREATENED: 209 (115 animals, 94 plants)

TOTAL U.S. LISTED: 964 (431 animals, 529 plants)***

*Separate populations of a species listed both as Endangered and Threatened, are tallied twice. Those species are the argali, leopard, gray wolf, piping plover, roseate tern, chimpanzee, green sea turtle, saltwater/Nile crocodile, and olive ridley turtle. For the purposes of the Endangered Species Act, the

term "species" can mean a species, subspecies, or distinct vertebrate population. Several entries also represent entire genera or even families.

**There are 424 approved recovery plans. Some recovery plans cover more than one species, and a few species have separate plans covering different parts of their ranges. Recovery plans are drawn up only for listed species that occur in the United States.

***Four animals have dual status.

ENDANGERED
Species
BULLETIN

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

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