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ENDANGERED SPECIES

Technical Bulletin

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

Ash Meadows and Recovery Efforts for its Endangered Aquatic Species

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Ash Meadows is a wetland ecosystem in an unlikely setting, the otherwise parched Mojave Desert, about 90 miles (144 kilometers) northwest of Las Vegas, Nevada. Within a region where the annual rainfall averages less than 2.75 inches (7 centimeters) and the evaporation rate exceeds 98 inches (249 cm) annually, Ash Meadows contains approximately 30 seeps and springs with associated streambeds and terminal marshes, formed where an extensive aquifer surfaces.

This unusual ecosystem is a remnant of wetter times in the early Pleistocene Epoch, when the region was crossed by an interconnecting system of lakes and rivers. Many of the unique species and subspecies now found at Ash Meadows evolved from relict populations that became isolated as the area turned drier. Because of their restricted range and threats to their habitat, 12 plants and animals in this area have been listed as Endangered or Threatened (see *Bulletin* Vol. VII, No. 6; Vol. VIII, No. 9; Vol. X, No. 6), and another 20 are candidates for listing. All of these, except for four plants, are found only at Ash Meadows, giving this ecosystem the highest known concentration of endemic taxa in the continental United States. Endangered aquatic fauna include the Ash Meadows naucorid *(Ambrysus amargosus)*, an insect, and four fishes: the Ash Meadows Amar-

(continued on page 4)

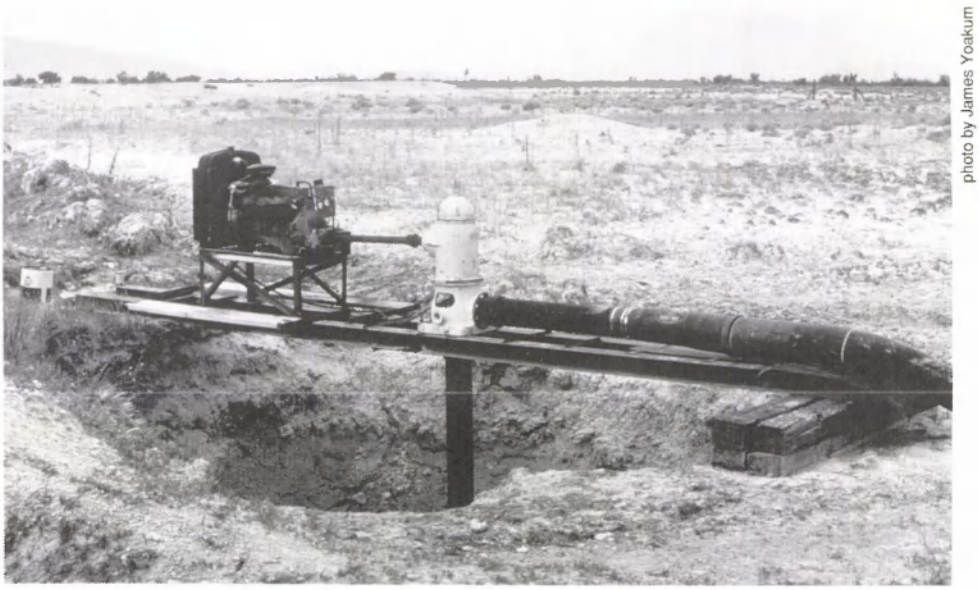

photo by James Yoakum

photo by Donald W. Sada

Two views of Jack Rabbit Spring in Ash Meadows. The top photo, taken in the 1970's, illustrates the results of over-pumping, which had obvious effects on the spring's aquatic wildlife. The bottom photo, taken in 1983 from a different angle, shows that some aquatic systems can be rehabilitated even after serious environmental damage.

Regional endangered species staffers have reported the following news:

Region 2 - The masked bobwhite *(Colinus virginianus ridgwayi)*, an Endangered subspecies of quail, is only known to survive on Arizona's Buenos Aires National Wildlife Refuge, which supports a minimum of 300 birds, and in northern Mexico, where no more than 500 birds are believed to survive. Major threats to the Mexican population include overgrazing by livestock and the replacement of native grasses with a South African grass called buffelgrass *(Cenchrus ciliaris)*. This non-native grass, which is being planted for livestock grazing, outcompetes the native Sonoran savanna grasses that the masked bobwhite depends on for food and cover.

In February, Service biologist Steve Dobrott and volunteer Michael Schroff surveyed masked bobwhite habitat on two ranches in Sonora, Mexico, in cooperation with The Nature Conservancy and El Centro Ecologico de Sonora. Five coveys, ranging in size from 7 to 14 birds, were located. A total of about 50 birds were counted, all of which were found in dense cover with ample food-bearing legumes and "maravilla" grass. Eighteen permanent vegetation transects were established within active masked bobwhite summer and winter ranges on the two ranches. This information will characterize habitats being used by the last known remaining masked bobwhites in Mexico. Biologists will use these and similar data being collected on Buenos Aires Refuge to develop a better model of the quail's habitat requirements.

* * *

Region 2 held a meeting in December 1990 with representatives from The Peregrine Fund, Texas Parks and Wildlife, Texas A&M University, and the National Audubon Society on reestablishing the Endangered northern aplomado falcon *(Falco femoralis septentrionalis)* in the United States. This bird disappeared from most of its U.S. range by 1940 and is believed to be declining in Mexico.

At the meeting, staff from The Peregrine Fund summarized its falcon propagation and hacking activities. Thirty-seven northern aplomado falcons have been produced since the

(continued on page 7)

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Seven California Species Proposed for Listing During March 1991

California's coastal sand dune systems support several fragile, dynamic plant and animal communities. The introduction of non-native, aggressive plants to stabilize the dunes, urban and industrial development, and off-road vehicle use, have destroyed or significantly altered many of the State's coastal dune ecosystems. As a result, many of the unique plant and insect species that depend on this habitat have declined in abundance and distribution.

The Fish and Wildlife Service has proposed that seven taxa—six plants and one butterfly—native to the coastal dunes of northern and central California be listed as Endangered (F.R. 3/22/91). These species are restricted to 13 dune systems found from the mouth of the Little River in Humboldt County to near the town of Surf in Santa Barbara County. They generally persist as small, isolated populations within the coastal fore-dune and dune scrub communities, and in adjacent sandy habitats:

• **Howell's spineflower** ***(Chorizanthe howellii)***, a member of the buckwheat family (Polygonaceae), is a shaggy-haired, short (less than 4 inches or 10 centimeters), annual herb with white to rose-colored flowers. It is endemic to one dune system in MacKerricher State Park.

• **Sonoma spineflower** ***(Chorizanthe valida)***, a closely related plant, grows up to 12 inches (30 cm) tall and has flowers that are white, lavender, or rose in color. This species is found in a single dune system within the Point Reyes National Seashore. The National Park Service has fenced most of the remaining population to protect it from cattle grazing, which is allowed on the Seashore.

• **Menzies' wallflower** ***(Erysimum menziesii)*** was first collected by Archibald Menzies in the Monterey area during the Vancouver expedition of 1792-94. Today, the species occurs in scattered populations within four dune systems: Humboldt Bay in Humboldt County; Tenmile River in Mendocino County; and Monterey Bay and Monterey Peninsula in Monterey County. A member of the mustard family (Brassicaceae), this perennial herb is a low (less than 12 inches tall) succulent with basal rosette leaves. It produces dense clusters of bright yellow flowers. Although three of the four dune systems supporting Menzies' wallflower are partially owned by the State or Federal governments, this amounts to less than 10 percent of the species' habitat.

photo by Ken Berg, courtesy of the California Native Plant Society

With the exception of one Nature Conservancy preserve, all populations of Menzies' wallflower on private land are vulnerable to residential and urban development.

• **Monterey gilia** ***(Gilia tenuiflora*** **ssp.** ***arenaria)*** is an erect annual herb less than 7 inches (17 cm) tall. A member of the phlox family (Polemoniaceae), this plant forms basal rosette leaves and has a funnel-shaped, purple flower. It is restricted to isolated sites within two coastal dune scrub communities along Monterey Bay and the Monterey Peninsula. A portion of perhaps the largest population occurs on Salinas River State Beach.

• **Beach layia** ***(Layia carnosa)***, a member of the sunflower family (Asteraceae), is a succulent, winter annual. It grows up to 6 inches (15 cm) tall and has white flowers. Scattered populations of this plant are found in six dune systems between Humboldt Bay and near the town of Surf in Santa Barbara County.

• **Clover lupine** ***(Lupinus tidestromii)*** is a silky, creeping (less than 12 inches tall), perennial herb in the pea family (Fabaceae). It produces whorls of blue to lavender-colored flowers. Restricted to coastal foredunes, the species is found in scattered populations within three dune systems on the mouth of the Russian River and on the Point Reyes and Monterey Peninsulas.

photo by Gary M. Fellers

The Myrtle's silverspot butterfly population at Point Reyes National Seashore has dropped in comparison to previous years, although the cause for this decline is unknown.

• **Myrtle's silverspot butterfly** ***(Speyeria zerene myrtleae)*** is a medium-sized butterfly with a wingspan of about 2 inches (55 millimeters). The upper surfaces of the wings are golden brown with numerous black spots and lines, while the undersides are brown, orange-brown, and tan with black lines and distinctive silver and black spots. The historical range of the Myrtle's silverspot butterfly ex-

(continued on page 4)

Proposed Listings

(continued from page 3)

tends from San Mateo County north to the mouth of the Russian River in Sonoma County. Today, six populations are known in three dune systems from Sonoma State Beach to Point Reyes National Seashore (which has the largest population).

Although many of the remaining populations of these coastal dune species are on land owned by Federal, State, and local governments, all seven are threatened by one or more factors, including: residential and commercial development; off-road vehicle use; trampling by livestock, hikers, and horseback riders; overcollection; sand mining; and disposal of dredged materials from adjacent bays and waterways. In addition, numerous exotic plant species, such as European beachgrass *(Ammophila arenaria)* and sea-rocket (*Cakile* spp.), have invaded the dunes and are outcompeting the native plants (including the food plants of the Myrtle's silverspot butterfly). Without control programs, these exotic plants eventually will eliminate many of the remaining native plant populations.

California already lists four of the plant species as endangered and the other two plant species as threatened. Although the take of these species is prohibited under State law, there is no requirement for habitat protection. The National Park Service and Bureau of Land Management, which manage areas in which five of the taxa are found, will work with the Service to develop strategies to protect the species and their habitat.

Available Conservation Measures

If these species are listed as Endangered, the measures authorized under the Endangered Species Act for their conservation include: protection from adverse effects of Federal activities; restrictions on take and trafficking; the requirement for the Service to develop and carry out recovery plans; the authorization to seek land purchases or exchanges for important habitat; and Federal aid to State and Commonwealth conservation departments that have approved cooperative agreements with the Service. Listing also lends greater recognition to a species' precarious status, which encourages other conservation efforts by State and local agencies, independent organizations, and concerned individuals.

Section 7 of the Act directs Federal agencies to use their legal authorities to further the purposes of the Act by carrying out conservation programs for listed species. It also requires these agencies to ensure that any actions they fund, authorize, or carry out are not likely to jeopardize the survival of any Endangered or Threatened species. If an agency finds that one of its activities may affect a listed species, it is required to consult with the Service on ways to avoid jeopardy. For species that are proposed for listing and for which jeopardy is found, Federal agencies are required to "confer" with the Service, although the results of such a conference are not legally binding.

Additional protection is authorized by Section 9 of the Act, which makes it illegal to take, possess, transport, or engage in interstate or international trafficking in listed animals except by permit for certain conservation purposes. For plants, the rules regarding "take" are different. It is unlawful to collect or maliciously damage any Endangered plant on lands under Federal jurisdiction. Removing or damaging listed plants on State and private lands in knowing violation of State law or in the course of violating a State criminal trespass law also is illegal under the Act. In addition, some States have more restrictive laws of their own specifically against the take of State or federally listed plants and animals.

Ash Meadows

(continued from page 1)

gosa pupfish *(Cyprinodon nevadensis mionectes)*, Warm Springs pupfish *(Cyprinodon nevadensis pectoralis)*, Devils Hole pupfish *(Cyprinodon diabolis)*, and Ash Meadows speckled dace *(Rhinichthys osculus nevadensis)*. A fifth fish, the Ash Meadows poolfish *(Empetrichthys merriami)*, became extinct within the past 40 years.

Threats to the Habitat

Ash Meadows has been used by humans since prehistoric times. The water, food, and shelter attracted Indians to this otherwise harsh area. With statehood in 1864, some springs and streamside land passed into private ownership; however, the agricultural use at that time was mainly at a subsistence level and had limited effects on the environment. The first significant impact occurred in the 1960's when Carson Slough, the largest marsh in southern Nevada, was mined for peat. Approximately 2,000 acres (810 hectares) of emergent wetland fish and migratory bird habitat were destroyed.

In the late 1960's, Spring Meadows Ranch, Inc., started raising cattle, alfalfa, and various other crops on 18,000 acres (7,290 ha) in the Ash Meadows area. Thousands of acres were cleared, leveled, planted, and irrigated. Springheads were excavated and streambeds channelized, some lined with concrete. Extensive pumping of the aquifer lowered the water table and reduced spring discharge, thus disrupting or even eliminating some spring ecosystems. Much vital aquatic habitat was destroyed, and native fishes were eliminated from some spring systems. For example, the speckled dace is now estimated to survive in only 1 acre (0.4 ha) of habitat compared with the nearly 600 acres (243 ha) it occupied before 1950.

These problems were compounded when a number of exotic species re-

(continued on next page)

Ash Meadows

(continued from previous page)

leased in Ash Meadows began competing with, and preying upon, native species. Mosquitofish *(Gambusia affinis)* and sailfin mollies *(Poecilia latipinna)* are now common throughout the area. Non-native crayfish *(Procambarus clarki:)*, bullfrogs *(Rana catesbeiana)*, and largemouth bass *(Micropterus salmoides)* also are present in various systems.

By 1969, the water level in Devil's Hole had fallen to a point threatening its most well-known resident, the Devils Hole pupfish, with imminent extinction. Negotiations over water use failed and the ensuing litigation went to the U.S. Supreme Court, resulting in a landmark decision in 1976 limiting the amount of water that could be pumped from the basin supplying Devil's Hole. The species' entire habitat is now restricted to a 180 square foot (16.7 square meter) submerged rock shelf.

After the Supreme Court decision, Spring Meadows Ranch determined that the amount of water it could legally remove was insufficient for its plans and offered to sell the land to the U.S. Fish and Wildlife Service. The Service declined the offer, and between 1977 and 1980 the land was purchased by Preferred Equities Corporation, a real estate development company.

Preferred Equities planned to develop the area as Calvada Lakes, a residential, recreational, and industrial complex with an anticipated population of more than 50,000. Further alteration of the springs and outflows to facilitate irrigation and/or construct municipal parks destroyed additional aquatic habitat and led to an emergency rule to list the Ash Meadows speckled dace and Ash Meadows Amargosa pupfish as Endangered (see *Bulletin* Vol. VII, No. 6). Due to the protection extended by the Endangered Species Act, the developer was then prohibited from taking actions that would harm the listed fish.

The Ash Meadows National Wildlife Refuge

In 1984, Preferred Equities sold 12,654 acres (5,125 ha) in the heart of Ash Meadows to The Nature Conservancy (see *Bulletin* Vol. IX, No. 3). The Conservancy promptly resold this land to the Fish and Wildlife Service, which used it to establish the Ash Meadows National Wildlife Refuge. With the inclusion of adjacent public lands administered by the Bureau of Land Management and future acquisitions of private lands as they become available, an Area of Management Concern of some 23,000 acres (9,315 ha) is envisioned. Devil's Hole, though within the Ash Meadows ecosystem, is not part of the refuge. This submerged limestone cavern entrance and the surrounding 40 acres (16.2 ha) have been managed by the National Park Service as an isolated segment of Death Valley National Monument since 1952.

The refuge is being managed in accordance with the Ash Meadows Species Recovery Plan, which was approved by the Fish and Wildlife Service in September 1990. Ultimately, the goal is to restore the ecosystem to the point that all of its native plants and animals, including the Endangered, Threatened, and listing candidate species, are secure and self-sustaining. Work toward this goal has already begun. For example, natural flows have been restored at some habitats, such as Jack Rabbit Spring, where the Ash Meadows speckled dace and Ash Meadows Amargosa pupfish are now reestablished. The Bureau of Land Management fenced this spring to allow recovery of vegetation and promote natural channel development.

However, very little is known about the habitat requirements and preferences of the native species or of the competing exotics. Additional information is needed to guide further rehabilitation efforts. At this time, management is focusing on preventing further habitat degradation. After more research, efforts at restoration can be safely undertaken. A research team of biologists from the Reno Field Station of the National Fisheries Research Center-Seattle, Ash Meadows National Wildlife Refuge, and the Nevada Department of Wildlife has been assembled to conduct habitat restoration studies for the area's aquatic wildlife.

The currently available fish habitat includes barren concrete ditches, irrigation ditches with gravel bottoms and straight earthen sides, dense bulrush marshes, overgrown stream beds, a few remaining natural springs, and open pools. Stream size varies from barely 6 inches (15 cm) wide and 3 inches (8 cm) deep to more than 15 feet (5 m) wide and 3 feet (1 m) deep. The springheads vary from springs with no pool and outflows of less than 1 gallon per minute (5 liters per minute) to large excavated pools 40 feet (12 m) in diameter with outflows of more than 3,500 gpm (13,265 lpm). Water temperatures vary seasonally from freezing (in distal outflows, during winter) up to 88°F (31°C) at springheads. Current research includes investigations into population dynamics to determine seasonal use of the available habitats by species and age class.

Studies on the aquatic wildlife of Ash Meadows are not limited to fishes. The Ash Meadows naucorid is an insect about one-quarter of an inch (0.5 millimeters) long found in the gravel of riffles. Its distribution, life history, and habitat requirements are virtually unknown. Recent work by the research team has shown the naucorid to be more widely spread than previously believed. Investigation into its distribution, life history, and habitat requirements continues.

Once the habitat requirements and preferences of Ash Meadows' native aquatic animals are known, restoration efforts can accelerate. These efforts may incorporate habitat rehabilitation and management strategies

(continued on page 6)

African Elephant Proposed for Reclassification to Endangered

photo by Mimi Westervelt

African elephant bulls sparring

A proposed rule to reclassify the African elephant *(Loxodonta africana)* under the Endangered Species Act from Threatened to the more critical category of Endangered was published March 18 by the U.S. Fish and Wildlife Service. If the rule is approved as proposed, it will apply to all populations except those in Botswana, Zimbabwe, and South Africa, where the species will retain its current classification of Threatened.

African elephant numbers are believed to have fallen more than 50 percent over the past decade, and the rate of loss continues at about 8 percent per year. In 1979, the total elephant population in Africa was approximately 1.3 million, but it is estimated that fewer than 600,000 remain. The intensive illegal killing of elephants to supply the ivory market is the most immediate threat. Over the long term, however, the species also faces habitat destruction and fragmentation due to agricultural development, urbanization, and desertification.

Concern for the African elephant has been building for some time. It was first given Endangered Species Act protection in 1978, when the species was listed as Threatened. This action, along with placing the elephant on Appendix II of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), regulated the importation of ivory into the U.S. but did not result in a reversal of the elephant's decline. In 1988, Congress passed the African Elephant Conservation Act, which provided a mechanism for funding major elephant conservation projects (see related story in this edition) and authorized the President to place a ban on ivory imports. Such a ban was announced in June 1989 (see *Bulletin* Vol. XIV, No. 6). The U.S. then reinforced this action by voting with the majority of CITES Parties to transfer the African elephant to CITES Appendix I, thereby prohibiting commercial ivory trade among signatory countries. In fact, the U.S. was one of the countries that proposed the transfer of the African elephant from Appendix II, which allows for a regulated trade, to Appendix I.

The March reclassification proposal was in response to a petition from several animal protection and conservation organizations to list the African elephant rangewide as an Endangered species. After conducting a status review, the Service decided to propose reclassifying all populations as Endangered except those in Botswana, Zimbabwe, and South Africa, which would remain listed as Threatened. The Service believes that populations in these countries are being managed under effective conservation programs and that their numbers are stable or increasing.

Permits for the import of Endangered species are available only for scientific and/or conservation purposes. For Threatened species or populations, import permits also are available for zoological exhibition, other educational purposes, and — under certain circumstances — regulated sport hunting trophies. The rationale for trophy imports is that the money

(continued on next page)

Ash Meadows

(continued from page 5)

to favor native species over the unwanted exotic species. We anticipate that through a combination of habitat manipulation, trapping, and (possibly) chemical treatment, exotic species can be extirpated from many, if not all, of the spring systems and that self-sustaining populations of the native fishes can be successfully reestablished.

* * *

Copies of the Ash Meadows Species Recovery Plan can be purchased by writing the Fish and Wildlife Reference Service, 5430 Grosvenor Lane, Suite 110, Bethesda, Maryland 20814; or call toll-free at 1-800-582-3421. (In Maryland, call 1-301-492-6403.)

African Elephant

(continued from previous page)

spent for licenses and other fees provides a source of funds for conserving the species as a whole. Regulated sport hunting is not considered to be a significant factor in the decline of the African elephant. Trophy imports would only be permitted from countries with sound elephant management programs.

The reclassification proposal, which was published in the March 18, 1991, *Federal Register*, contains details and background information. Comments on the proposed rule are welcome, and should be sent to the U.S. Fish and Wildlife Service, Office of Scientific Authority, 725 Arlington Square, Washington, D.C. 20240, by July 16, 1991.

The decision on reclassification may follow the terms of the proposal, but the Service emphasizes that new data received during the comment period could lead to a final rule that is substantively different. In particular, the final rule could retain the current Threatened classification over a larger region, or it could extend the proposed Endangered classification to additional populations. Substantive changes would require the Service to propose the rule again.

Regional News

(continued from page 1)

propagation effort began in 1983. Thirteen were retained for breeding stock and 24 were released at hack sites in south Texas. Seventeen of the falcons were successfully reared to fledging age at the sites. Northern aplomado falcons have been seen in south Texas on 22 occasions since January 1989. No nesting has been confirmed, but the initial release efforts were designed primarily to test hacking techniques for this bird.

The Peregrine Fund's total breeding flock, which is housed outside Boise, Idaho, stands at 35 birds. The Fund is attempting to "double-clutch" these birds, which involves removing the eggs to induce the female to lay another set. Using this method, a female in captivity can be induced to lay up to 8 eggs per year. The goal is to attain hacking levels of 50 birds per year as quickly as possible and to release 500 birds by the year 2000. Recovery efforts in the near future will concentrate on building the breeding flock and hacking birds in Matamoros, Mexico, and at the Laguna Atascosa National Wildlife Refuge in Texas.

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Region 3 - Region 3's Divisions of Wildlife Resources and Endangered Species cooperated in providing $10,000 to the Indiana Department

(continued on page 9)

Grant to Combat Elephant Poaching in Zimbabwe is Announced

A grant of $104,500 to help equip wildlife rangers in Zimbabwe's Zambezi Valley, where organized poachers killed 100 African elephants *(Loxodonta africana)* in 1990, was announced recently by the U.S. Department of the Interior. The grant will be made to the African Safari Club of Washington, D.C., under authority of the African Elephant Conservation Act of 1988. The African Safari Club is contributing another $61,600 to the project. Motorola, Inc., Xerox Corporation, and Jason Empire, Inc., also are contributing products to the project at reduced cost.

Poachers crossing the Zambezi River from Zambia have already virtually eliminated the black rhinoceros *(Diceros bicornis)* from the Zambezi Valley. Armed with automatic weapons, they are now turning to elephants. About 11,000 elephants live in the Zambezi Valley; there are about 65,000 elephants in all of Zimbabwe.

Zimbabwe's wildlife rangers are well trained but lack basic equipment needed to carry out extended patrols in the bush. For example, the two-channel, hand-held radios used by rangers to communicate with each other and their headquarters are not secure from monitoring by poachers. The new grant will replace these with 24 state-of-the-art six-channel programmable units, which will allow security-coded transmissions. Motorola's International Markets Division is providing the units in cooperation with the African Safari Club. Xerox Corporation is cooperating with the African Safari Club to supply facsimile and copying equipment urgently needed by the Zimbabwe Department of National Parks and Wild Life Management. Jason Empire, Inc., of Overland Park, Kansas, will provide 40 wide-angle binoculars for presentation to Zimbabwe anti-poaching personnel under an African Safari Club award program.

The grant will also provide basic field equipment for Zimbabwe's wildlife rangers including flashlights, batteries, tents, sleeping bags, compasses, and other items needed for extended operations in remote areas.

The grant is the second to be made in 1991 under the African Elephant Conservation Act. Altogether, $770,000 in Congressionally appropriated funds, plus matching grants from the private sector and foreign governments, will be made available to support elephant conservation projects in Africa this year. In 1990, the Department of the Interior provided $350,000; matching grants brought the total to more than $800,000 in funding for conservation projects in five African nations.

Forest Service and The Nature Conservancy Join Forces to Conserve Biological Diversity

Christopher Topik
National Endangered Plant Program Manager
U.S. Forest Service

On January 15, 1991, the U.S. Department of Agriculture's Forest Service and The Nature Conservancy signed a memorandum of understanding to work together to inventory, maintain, and improve biological diversity on national forests and other lands, including lands owned or managed by the Conservancy. This agreement serves to strengthen both organizations' ability to conserve and enhance the Nation's biological diversity. John Sawhill, president of the Conservancy said, "The effectiveness of the agreement lies in its scope. Conservancy and Forest Service personnel will be working together at all levels to protect plant and animal diversity throughout the United States." The Conservancy has similar general agreements with the Department of the Interior's Bureau of Land Management and the Department of Defense.

The Forest Service manages 191 million acres (77 million hectares) of forests and grasslands, an area larger than Texas, from subarctic Alaska to tropical Puerto Rico. These lands provide habitat for at least 194 Threatened or Endangered species, along with another 2,254 species designated by the Forest Service as "sensitive" (i.e., listing candidates and other species of special concern that are receiving priority attention from the Forest Service).

The Nature Conservancy, a private international organization committed to preserving biological diversity, protects 5.12 million acres (2.07 million ha) throughout the United States, Canada, Latin America, and the Caribbean. The Forest Service's lands and the Conservancy's preserves are among the Nation's most important reservoirs of biodiversity. The Conservancy also provides extensive data and scientific support through a network of natural heritage programs. (For more details on these heritage programs, see *Bulletin* Vol. XV, No. 3.)

Many of the cooperative activities will focus on protecting Threatened, Endangered, and sensitive plant and animal species. Among the projects planned under the agreement are: inventorying and surveying fish, wildlife and plant species on the national forests and grasslands; identifying specific areas for research; monitoring ecological change; conserving and restoring important habitats; developing environmental education programs; and developing and implementing management plans for individual national forests.

Many cooperative projects are already under way. One such project is in the San Bernardino National Forest near Los Angeles, California. Forest Service and Conservancy biologists have developed a habitat management guide for at least nine areas with pebble plains—a rare, fragile, "cushion-plant" dominated habitat type with unstable soils that supports eight sensitive plant species. In the past, this habitat type has been damaged by off-road vehicles and urban development. The management guide, using an ecosystem approach, will help conserve these areas.

The first national forest conservation data center was jointly established by the two organizations at the Forest Service's Tallahassee office, which administers three national forests in Florida. This center, under the direction of plant ecologist Dr. Joan Walker, uses natural heritage program methodology and computer systems to monitor Threatened, Endangered, and sensitive species, and their occurrences and management.

Another cooperative effort is taking place at the Shawnee National Forest in Illinois. Both organizations are working with the Illinois Department of Conservation's Division of Natural Heritage and the Morton Arboretum to restore prairie habitat through the use of prescribed burning. An environmental education program is informing local residents about prairie flora and fauna and is explaining successional changes. This project will help restore the Threatened Mead's milkweed *(Asclepias meadii)*, among other prairie plants in this area.

Working together, the Conservancy and the Forest Service hope to enhance their conservation efforts. Both agencies look forward to expanding their partnership for maintaining America's biodiversity.

photo by Don Kurz

Three of the four known remaining populations of Mead's milkweed* (Asclepias meadii) *east of the Mississippi River are within Shawnee National Forest in southern Illinois, where the U.S. Forest Service, The Nature Conservancy, U.S. Fish and Wildlife Service, Illinois Department of Conservation (Division of Natural Heritage), and Morton Arboretum are involved in a large-scale restoration and recovery effort. This project includes genetic research, tissue culture, cross-pollination trials, and 700 acres (280 hectares) of habitat restoration.

Regional News

(continued from page 7)

of Natural Resources in response to a challenge grant proposal by The Nature Conservancy. The proposal was for a survey of the proposed Patoka River National Wildlife Refuge in Pike and Gibson Counties, Indiana. Survey costs are being shared by the Conservancy, State, and Service. The Patoka River valley has a unique geological history but it has not had a detailed survey for rare plants or unique plant communities that botanists believe may be present. The information from this survey also will assist in the preparation of an environmental impact statement for establishing the Patoka River Refuge.

* * *

Region 4 - An experimental gate has been installed in Collier's Cave, a Tennessee Valley Authority (TVA)-owned cave in northwestern Alabama, to protect habitat of the Endangered gray bat *(Myotis grisescens)*. These bats historically used Collier's Cave as a maternity site, but they have virtually abandoned it due to severe vandalism. The gate, about 20 feet (6 meters) wide and 11 feet (3 m) high, was designed by Roy Powers of the American Cave Conservation Association and built by individuals from the Association, Auburn University, TVA, and the Fish and Wildlife Service, along with private citizens. It differs from other bat cave gates by not having large windows for the bats to fly through and by being located totally within the dark zone of the cave. However, the angle iron gate does not impede air flow and should not affect passage of the bats.

Construction of the gate required nearly a week of dawn-to-dark labor by 7 to 10 individuals. If the bats accept a full gate in the dark zone, the range of management options for protecting gray bat populations will be increased. If the bats have not returned to the cave after a few years, the gate will be modified, probably by installing hinged panels, and the situation will be reassessed.

* * *

Taxonomic and population status information is being gathered on the longnose darter *(Percina nasuta)*, a Category 2 listing candidate that occurs in Arkansas, Oklahoma, and Missouri. This fish is morphologically variable and may actually represent a group (complex) of up to four closely related taxa. Some form of this fish occurs in the Ouachita, Arkansas, Little Red, and White River Systems of Arkansas; in Lee Creek in Arkansas and Oklahoma; and in the St. Francis River in Missouri. The U.S. Forest Service has funded a study to determine the taxonomic and population status of this species complex in river systems within the Ouachita and Ozark National Forests, and the Fish and Wildlife Service has funded a similar taxonomic study of the form occurring in the Spring and Strawberry Rivers (which are both tributaries of the White River). The Arkansas Game and Fish Commission also is making a special effort to determine the population status of this species in selected streams while conducting other fishery assessment work. The results of all of these independent studies are expected in 1992, and should enable the Fish and Wildlife Service to make a determination on the need for protection of any or all forms in the longnose darter complex.

* * *

The paleback darter *(Etheostoma pallididorsum)*, listed as a Category 3C species in the Service's latest (January 6, 1989) Animal Notice of Review, is known from headwater streams of the Caddo River System and from Mayberry Creek, a tributary of the Ouachita River in Arkansas. (The Service assigns Category 3C to taxa that were once considered for listing but are now believed to be more abundant and/or widespread, and are therefore not in need of listing.) This fish has been under review by the Service for a number of years. Loss of spawning areas is the major threat facing the species. A small fish, the paleback darter spawns in small springs and spring seeps that are frequently found in pastures and only flow during the wet months.

With one exception, all of the darter's known spawning sites are on private land. One of the better spawning sites is in a roadside ditch at Caddo Hills High School, north of Glenwood, Arkansas. Darters swim from Collier Creek into the ditch and a spring seep when there are heavy rains. However, the site is potentially threatened by ditch maintenance and by culverts, which seem to block water flow and darter movement.

To determine the extent of use of the spring seep and the ditch by the paleback darter, and to gather additional information on the species, Dr. John Harris (a biologist from Little Rock, Arkansas), Dr. Henry Robison (from Southern Arkansas University), and Ms. Betty Cochran (from the U.S. Forest Service in Glenwood, Arkansas) initiated a study of the area in October 1990. To assist their study, the researchers enlisted volunteers from the Caddo Hills High School biology class. The students are using traps that capture darters as they move up the seep. Over 700 darters have been collected since November 1990 and information has been gathered on size and spawning condition. A limited number of darters have been taken for food habit studies by the primary investigators, and seven have been placed in an aquarium for observation of breeding behavior. The remainder of those captured have been released in the seep run. Larval darters have been observed in the spring seep as early as February.

This study will continue in an effort to document movement of the darters out of the spring seep and to determine the impact of the culverts on that movement. A side benefit is

(continued on page 10)

New Publications

Balancing on the Brink of Extinction: The Endangered Species Act and Lessons for the Future, edited by Kathryn A. Kohm (former editor of the University of Michigan's *Endangered Species UPDATE*), is a collection of essays that focus on two basic questions: What have we learned about conserving rare plants and animals since passage of the Endangered Species Act of 1973, and where should we direct future efforts? The books 21 essays are grouped into four sections: an overarching look at the Federal endangered species program, examinations of program components (e.g., interagency consultation, recovery), challenging areas of implementation (e.g., water rights, pesticide regulation, predator control), and the broader approaches to conserving ecosystems and bio-diversity. Contributors include Congressman John D. Dingell, Lynn A. Greenwalt (former Director of the Fish and Wildlife Service, now with the National Wildlife Federation), Michael J. Bean (Environmental Defense Fund), William Reffalt (Wilderness Society), and Faith Campbell (Natural Resources Defense Council). The 316-page book is available for $34.95 (cloth) or $22.95 (paper), plus $3.00 shipping, by writing Island Press, Box 7, Covelo, California 95428; or order toll-free at 1-800-828-1302.

Reptiles and Amphibians of the Cimarron National Grasslands, Morton County, Kansas, by Joseph T. Collins and Suzanne L. Collins of the University of Kansas, was published recently by the U.S. Forest Service, which is responsible for managing this area of public land in the southwestern corner of the State. The 60-page booklet contains a species account for 31 reptiles and amphibians known from the Cimarron Grasslands (including 6 taxa listed by the State of Kansas as threatened species), along with a bibliography and 40 color photographs. This publication was funded and cosponsored by the U.S. Forest Service, Kansas Department of Wildlife & Parks, Kansas Herpetological Society, and KPL Gas Service. It is available for $7.00 (postpaid) from the U.S. Forest Service, Cimarron National Grasslands, PO. Box J, Elkhart, Kansas 67950.

Regional News

(continued from page 9)

the involvement of the students and the awareness they have gained about a rare species.

* * *

The Service's Asheville, North Carolina, Field Office staff met with biologists from the Virginia Cooperative Fish and Wildlife Research Unit and the North Carolina Wildlife Resources Commission in March to discuss a 2-year study of the dwarf wedge mussel's *(Alasmidonta heterodon)* life history on the upper Tar River in north-central North Carolina. One of the best remaining populations of this Endangered mussel exists in the upper Tar River. The study's primary objectives are to determine the dwarf wedge mussel's fish host, its spawning period, and its habitat preferences. The life history of the other mussels that coexist with the dwarf wedge will also be studied. This information is essential to managing and conserving the species.

* * *

Region 5 - The Service has prepared a fact sheet on the Endangered dwarf wedge mussel, with emphasis on New England populations. The fact sheet summarizes the mussel's life history and population status, provides general information on recovery efforts, and notes what the public can do to help. Copies may be obtained by writing the Fish and Wildlife Service, New England Field Office, 22 Bridge Street, Concord, NH 03301, or by calling (603) 225-1411 or FTS 834-4411.

* * *

New Jersey's bald eagle *(Haliaeetus leucocephalus)* population appears to be well on its way to recovery. Results of the 1990 nesting season indicate that the recovery goal of 10 nests is attainable within the next 5 years. In the 1990 season there were at least six pairs on territories, possibly as many as eight, with five pairs building nests. Five young successfully fledged. This was the first time since 1959 that New Jersey had more than one productive eagle nest. Two possible factors that may hinder future growth in the eagle population are unintentional human disturbance of nesting pairs and contamination of eagles by DDE and PCB's. Peregrine falcons *(Falco peregrinus)* and ospreys *(Pandion haliaetus)* in New Jersey are showing high levels of DDE, PCB's, and several heavy metals. The peregrine's eggshells have experienced an average 14 percent reduction in thickness from the norm, while the osprey's egg shells have averaged a 10 percent reduction. Nesting failure is known to occur when eggshell thickness is reduced by 17 percent. Although there are no data for the bald eagle, environmental contamination and shell thinning are serious concerns since the bird has proven to be susceptible in the past.

* * *

New England Field Office and Region 5 staff attended an eastern peregrine falcon recovery meeting in Roanoke, Virginia, the first held in 2 years. The biggest challenge facing the recovery effort is for each of the involved States to assume greater responsibility for the recovery effort, following the withdrawal of The Peregrine Fund from the east. This in turn presents a challenge to the Ser-

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Regional News

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vice to provide more coordination among the States to help maintain consistency in their recovery programs.

* * *

The New England Field Office organized the first meeting of botanists from all of the New England States and New York to review Federal listing candidates. The meeting took place March 20-21 in Amherst, Massachussetts, and included participants from Federal and State agencies, The Nature Conservancy and other private environmental groups, and consultants. The group evaluated the status of 70 plant species and discussed additions to the Service's Plant Notice of Review (published February 21, 1990). Recommendations from the meeting will be used when a revised Notice is published next year. In addition, the status of the Endangered small whorled pogonia *(Isotria medeoloides)* was discussed; the group recommended that the recovery plan for this species be revised.

* * *

The tiger beetle recovery group met in March to discuss and revise the draft recovery plan for the two tiger beetles that were listed as Threatened in October 1990. The plans, which should be ready by the fall of 1991, will likely focus on habitat protection for both the northeastern beach beetle *(Cicindela dorsalis)* and the Puritan tiger beetle *(Cicindela puritana)* and on reintroduction for the northeastern beach beetle.

* * *

This spring, surveys were conducted for the Endangered Delmarva fox squirrel *(Sciurus niger cinereus)* by the Service on several national wildlife refuges on the eastern shore of Chesapeake Bay and by the Maryland Department of Natural Resources on State-owned land. Nest boxes have been, or are being, installed at several selected sites that have been designated by the Delmarva fox squirrel recovery team as "benchmarks." At Chincoteague Refuge, where nest boxes have been installed for some time, a record total of 51 fox squirrels were observed in the boxes, including 3 litters totalling 5 young-of-the-year. At Eastern Neck Refuge, where nest boxes have not yet been installed, a total of 329 trap days yielded only 4 fox squirrels. However, two of these were immature, indicating that fox squirrels reproduced last year and the young successfully survived the winter. Trapping at Blackwater Refuge and on State wildlife management areas is still underway and results are not yet available, but recently installed nest boxes at one State-owned site yielded two adult females and three young-of-the-year. A full report will be available soon.

* * *

Region 6 - The public review periods for the Wyoming toad and autumn buttercup draft recovery plans recently ended. Only one population is known for each of these species and both are on land owned by The Nature Conservancy. The Endangered Wyoming toad *(Bufo hemiophrys baxteri)* historically inhabited a 30 square mile (78 square kilometer) area around Laramie, Wyoming, but now occupies only about 2 square miles (5 square km). The reasons for the precipitous decline of the Wyoming toad are unknown, but may be the result of insecticide spraying, changes in agricultural practices, increased predation, disease, or climatic changes. Recovery efforts will emphasize protecting and expanding the toad's existing habitat, conducting research on the toad's biology and limiting factors, captive propagation, and reintroduction. The Service is preparing a draft environmental assessment for a proposed 2,500-acre (1,000-ha) national wildlife refuge that would encompass all of the toad's known habitat.

The Endangered autumn buttercup's *(Ranunculus acriformis* var. *aestivalis)* distribution is limited to perennially moist soils along the Sevier River in Utah. This plant is primarily threatened by grazing and trampling by livestock, although changes in the area's hydrology due to agricultural development also may be a potential threat. The recovery plan calls for the protection of current populations and potential habitats from livestock grazing, surveys to locate additional plants, and research on the plant's biology and ecological requirements.

* * *

Region 8 - Biologists from the National Ecology Research Center (NERC) and California Department of Fish and Game have conducted spring and fall counts of the Threatened southern sea otter *(Enhydra lutris nereis)* population annually since 1982. Fall counts have been consistently lower than spring counts, probably because the larger and thicker distribution of kelp canopies in the fall makes it more difficult to locate sea otters.

The fall and spring counts both indicated that the sea otter's numbers were increasing until 1990. The spring 1989 count was 1,856 sea otters, but the following spring only 1,680 otters were counted—a decline of about 10 percent. Environmental conditions and survey methods were comparable between years and no cause for a population decline was identified. NERC biologists speculate that the count may have been low due to variability within the survey method and not to a population decline.

In the fall 1990, 1,636 sea otters were counted, an increase of 2.3 percent over the fall 1989 count. Although the rate of increase was down slightly from the rate in the previous fall, it was still positive. This supports the NERC biologists' hypothesis that the spring 1990 census was less accurate than previous counts. Biologists anxiously await the results of the spring 1991 census, which will start in mid-May.

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(continued on page 12)

Regional News

(continued from page 11)

Region 9 - The Service has published a new report to Congress, "Wetland Losses in the United States 1780's to 1980's." The report documents historical wetland losses from colonial times to the 1980's using data compiled from a variety of sources. The report estimates that in the 1780's, the area that is now the United States contained 392 million acres (159 million ha) of wetlands, of which 221 million acres (89 million ha) were in the conterminous 48 States. It concludes that the conterminous 48 States have lost an estimated 53 percent of their original wetlands over the past 200 years. On average, this means that they have lost over 60 acres (24 ha) of wetlands every hour between the 1780's and the 1980's. California lost the largest percentage of its original wetlands (91 percent), while Florida lost the most acreage (9.3 million acres or 3.8 million ha).

Copies of "Wetlands Losses in the United States 1780's to 1980's" can be obtained from the Service's Publications Unit, Room 130 - ARLSQ, Washington, D.C. 20240.

BOX SCORE
LISTINGS AND RECOVERY PLANS

Category	ENDANGERED U.S.	ENDANGERED Foreign Only	THREATENED U.S.	THREATENED Foreign Only	LISTED SPECIES TOTAL	SPECIES WITH PLANS
Mammals	55	249	8	22	334	29
Birds	73	153	12	0	238	67
Reptiles	16	58	18	14	106	25
Amphibians	6	8	5	0	19	6
Fishes	53	11	33	0	97	49
Snails	4	1	6	0	11	7
Clams	38	2	2	0	42	30
Crustaceans	8	0	2	0	10	5
Insects	11	1	9	0	21	12
Arachnids	3	0	0	0	3	0
Plants	190	1	60	2	253	125
TOTAL	457	484	155	38	1134*	355**

Total U.S. Endangered	457	(267 animals, 190 plants)
Total U.S. Threatened	155	(95 animals, 60 plants)
Total U.S. Listed	612	(362 animals, 250 plants)

* Seperate 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.

** There are 283 approved recovery plans. Some recovery plans cover more than one species, and a few species have seperate 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:	53 fish & wildlife 39 plants
Number of Cooperative Grant Agreements signed for the African Elephant Conservation Act:	7
Number of CITES Party Nations:	110

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ENDANGERED SPECIES

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