

ENDANGERED SPECIES

Technical Bulletin

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

Improved Status Leads to Reclassification Proposals for Two Plant Species

The status of two plant species currently listed as Endangered has improved enough that the Fish and Wildlife Service (FWS) recently proposed to reclassify them to the less critical category of Threatened:

Small Whorled Pogonia (*Isotria medeoloides*)

A small green orchid, this species is distinguished by the five or six leaves displayed in a whorl with a yellowish-green flower in the center. It grows in fairly young forests and in maturing stands of mixed-deciduous or mixed-deciduous/coniferous forests. Populations of the small whorled pogonia occur at sites from southern Maine through the Atlantic seaboard States to northern Georgia and southeastern Tennessee. Outlying colonies have been found in the western half of Pennsylvania, Ohio, Michigan, Illinois, and Ontario, Canada.

Concerns about habitat loss led to the listing of this species as Endangered in 1982. Among the recommendations contained in the 1985 Small Whorled Pogonia Recovery Plan were searches for additional populations, protection for a sufficient number of sites, and research into the plant's life history. Since 1985, botanists have located additional populations and sought to protect a number of sites. About 60 percent of the viable sites are now secure. Many of the protected populations are on public lands, though the voluntary cooperation of private landowners and conservation organiza-

tions continues to be vital to the recovery of the small whorled pogonia. Management will benefit from the increased knowledge of the species' habitat needs.

On November 29, 1993, in accordance with criteria in the 1992 revised recovery plan, the FWS proposed to re-



photo by Susanna von Oettingen

Habitat protection and landowner cooperation have helped improve the status of this woodland orchid, the small whorled pogonia.

classify the small whorled pogonia as Threatened. Although the species is no longer believed to be in imminent danger of extinction, complete delisting is not appropriate until additional sites are protected.

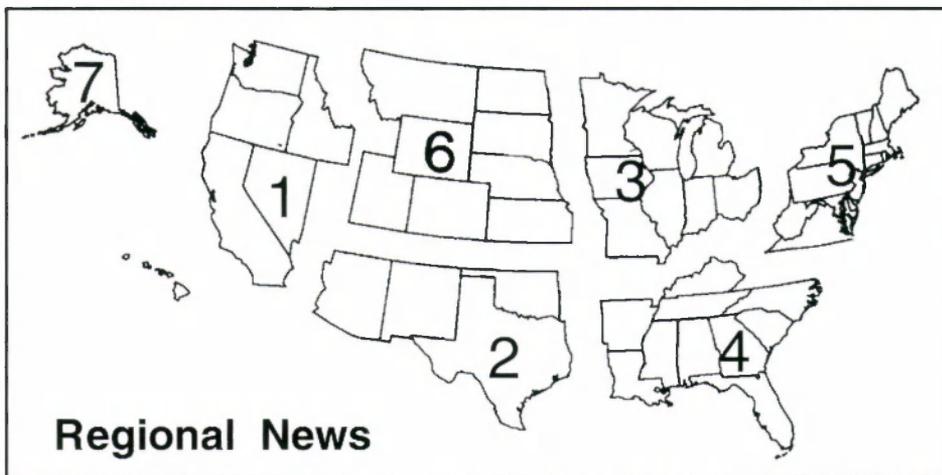
Loch Lomond Coyote Thistle (*Eryngium constancei*)

Despite its common name, this plant is not a thistle but a perennial herb in the parsley family (Apiaceae). It occurs only on the floor of Loch Lomond, a vernal lake in California. Vernal lakes and pools are an unusual habitat type forming in areas with Mediterranean climates where slight depressions underlain with an impervious soil layer fill with water after fall and winter rains. These seasonal wetlands then dry slowly during the spring and summer. The cyclic wetting and drying create an unusual ecological situation supporting a unique biota. Many plants and animals are adapted specifically to this environment and cannot survive outside the temporary pools.

In 1985, after the lake bed was partially dredged and filled, and plans were made to fill the rest, the FWS listed the Loch Lomond coyote-thistle as Endangered. At the time, the plant's habitat was also threatened by off-road vehicles, hikers, highway maintenance, and trash dumping. Subsequently, the State of California purchased the lake and, with FWS assistance, installed a split-rail fence. Both of these actions greatly reduced the potential for disturbance of the lake floor.

Because the species is now believed to be more secure, the FWS proposed November 29 to reclassify the Loch Lomond coyote-thistle as Threatened. Complete delisting is not believed appropriate at this time due to occasional vandalism, the

(continued on page 20)



Regional News

Regional endangered species staffs have provided the following news:

Region 2 - Five parent-reared whooping cranes (*Grus americana*) are in quar-

antine in preparation for shipment and release in the Kissimmee Prairie of Florida, the site of 5 surviving cranes released in February 1993. (See *Bulletin*

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

Mollie Beattie
Director
(202-208-4717)

Michael J. Spear,
Assistant Director for
Ecological Services
(202-208-4646)

Jamie Rappaport Clark, *Chief,*
Division of Endangered Species
(703-358-2171)

Marshall P. Jones, *Chief,*
Office of Management Authority
(703-358-2093)

John J. Doggett, *Chief,*
Division of Law Enforcement
(703-358-1949)

TECHNICAL BULLETIN
Editor, Michael Bender
Assistant Editor, Ann Haas
(703-358-2166)

Regional Offices

Region 1, Eastside Federal Complex, 911 N. S. 11th Avenue, Portland, OR 97232-4181 (503-231-6118); Marvin Plenert, *Regional Director*; Dale Hall, *Assistant Regional Director*; Cindy Barry and Jim Bartel, *Endangered Species Specialists*.

U.S. Fish and Wildlife Service Regions

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

Region 2, P.O. Box 1306, Albuquerque, NM 87103 (505-766-2321); John G. Rogers, *Regional Director*, James A. Young, *Assistant Regional Director*; Susan MacMullin, *Endangered Species Specialist*.

Region 3, Federal Bldg., Fort Snelling, Twin Cities, MN 55111 (612-725-3500); Sam Marler, *Regional Director*; John Blankenship, *Assistant Regional Director*; Bob Adair, *Endangered Species Specialist*.

Region 4, 1875 Century Blvd., Suite 200, Atlanta, GA 30345 (404-679-4000); James W. Pulliam, *Regional Director*; Tom Olds, *Assistant Regional Director*; David Flemming, *Endangered Species Specialist*.

Region 5, 300 Westgate Center Drive, Hadley, MA 01035 (413-253-8659); Ronald E. Lambertson, *Regional Director*; Ralph Pisapia, *Assistant Regional Director*; Paul Nickerson, *Endangered Species Specialist*.

Region 6, P.O. Box 25486, Denver Federal Center, Denver, CO 80225 (303-236-7920); Ralph O. Morgenweck, *Regional Director*; Robert E. Jacobsen, *Assistant Regional Director*; Larry Shanks, *Endangered Species Specialist*.

Region 7, 1011 E. Tudor Rd., Anchorage, AK 99503 (907-786-3542); Walter O. Stieglitz, *Regional Director*; Janet Hohn, *Assistant Regional Director*; Dave McGillivray, *Endangered Species Specialist*.

Vol. XVII, No. 9-11.) Two whooping cranes from the International Crane Foundation in Baraboo, Wisconsin, and 3 from the Fish and Wildlife Service's (FWS) Patuxent Wildlife Research Center in Laurel, Maryland, will join the 5 survivors in this effort to establish a nonmigratory flock in central Florida. Later this winter, biologists plan to release 14 "isolation-reared" young whooping cranes from Patuxent. The new arrivals are expected to join the experienced birds and learn survival techniques from them.

* * *

By December 20, 143 cranes, including 16 chicks, had reached their wintering grounds at Aransas National Wildlife Refuge on the Texas coast. This number is about the total anticipated to arrive. Biologists were unable to find six pairs that had a single chick each during surveys conducted in June at the species' breeding grounds in Wood Buffalo National Park, Northwest Territories, Canada.

* * *

The Captive Breeding Specialist Group of the International Union for the Conservation of Nature has published *A Whooping Crane Conservation Viability Assessment*, edited by Claire Mirande, Robert Lacy, and Ulysses Seal. Accomplished under contract with the FWS, the report includes priorities for research and management of wild and captive populations to maximize retention of genetic heterozygosity and minimize the risk of extinction. Estimates are that about 87 percent of the genetic diversity has survived since the population bottleneck of the 1940's.

If the annual 4.6 percent population growth of the last 50 years continues, the wild population at Aransas National Wildlife Refuge will reach 500 birds by about the year 2020. Biologists predict a very low probability of extinction (less than 1 percent) during the next 100 years. The whooping crane has the highest long-term recruitment rate—13.9 percent—of any North American crane population.

(continued on page 21)



Printed with vegetable-based ink on recycled and recyclable paper. If you do not keep back issues, please recycle the paper, pass them along to an interested person, or donate them to a local school or library.

Secretary Babbitt Addresses the Impact of Endangered Species Protection on Private Landowners

by Ken Burton

There is little evidence to support claims that the Endangered Species Act has worked widespread hardship on landowners, Interior Secretary Bruce Babbitt told the conference of the Society of Environmental Journalists at Duke University in October.

"Instead of attacking the law directly, the opponents have assembled under the banner of the Wise Use movement and concocted a new and radical concept," Babbitt said, "that any government action affecting the value of a property right automatically creates a right to compensation from the United States Treasury."

Babbitt said environmental regulations are no different in concept than planning and zoning regulations imposed across the United States virtually every day to serve various public purposes.

"And in fact, upon close examination, many planning and zoning regulations are environmental regulations — providing open space, preserving stream courses, limiting congestion and air pollution, and generally providing a more liveable environment," Babbitt said.

Babbitt noted that his hometown of Flagstaff, Arizona, has a city ordinance prohibiting property owners from cutting ponderosa pine on their land except as necessary to make space for improvements authorized by the planning and building codes. "The purpose of the ordinance is to preserve the magnificent, pine-scented landscape that enhances the value of all property, even as it limits the freedom of any individual landowner to cut down all the pine trees on his property for no reason at all," the Secretary said.

"To hear the opponents of the Endangered Species Act," said the Secretary, "habitat conservation provisions have somehow worked widespread hardship on landowners. Yet the fact is that there is little evidence supporting that claim."

For the 20 years the Endangered Species Act has been in place, and "despite the fact that more than 800 species throughout the U.S. are now protected by it," Babbitt said, not a single instance has occurred in which a landowner was so affected by the Act that he was awarded compensation for a governmental "taking" of his property through the claims court.

"Of course, the fact that, in 20 years, the Fish and Wildlife Service has never come close to a constitutional taking does not end the matter," Babbitt said. "I believe the government has a higher obligation to its citizens than simply staying out of court and away from a constitutionally protected taking. Government has an obligation to treat all citizens reasonably, to minimize the inconvenience, to apply regulations in the least intrusive and most thoughtful way."

The Secretary listed several approaches:

- The Department should use, whenever possible, public lands for the habitat necessary to protect an endangered species.

- Mitigation fees: a habitat conservation plan worked out with the City of Las Vegas provides that residential developers pay a mitigation fee which in turn goes into a fund to pay for conservation measures on lands used as tortoise reserves. "In concept," Babbitt said, "this mitigation fee is no different from a lot assessment to finance water, sewage or playgrounds."

- Sometimes, "a few thoughtful, constructive changes in our approach to land management will suffice," such as the Georgia Pacific Company's plan designed to protect the red cockaded woodpecker.

- In cases where a reasonable habitat conservation plan cannot be worked out, it may be appropriate to consider land exchanges or even outright purchase from willing sellers, Babbitt said.

Babbitt said he recognized that in some cases, delays have caused hardship



to some small landowners caught in the regulatory freeze. "It is these cases that one hears about in the press, and I am frankly very sympathetic to such complaints. At my direction, the Fish and Wildlife Service is beginning a review of this issue and is seeking improved methods... to provide more flexibility in responding to the needs of individual small landowners in the use and improvement of their property," Babbitt said.

"The Endangered Species Act is working. The well publicized 'train wrecks' that we read so much about illustrate, in most every case, not deficiencies in the Act, but the willful failure of public officials to explore and use the flexible provisions of the Act that are available to protect the incomparable biodiversity of the American landscape and to accommodate the reasonable use and development expectations of landowners," Babbitt said.

Ken Burton, a public affairs specialist with the Fish and Wildlife Service, attended the October meeting. The organization Secretary Babbitt addressed, the Society of Environmental Journalists, was formed several years ago to promote professionalism in the reporting of environmental affairs. It has a membership of about 900 print, radio, and television journalists, as well as members in related fields in government and the private sector.

Taiwan and Peoples Republic of China are Warned Against Continued Trade in Rhino Horn and Tiger Parts

by Denise Henne

Pursuant to the Pelly Amendment to the Fisherman's Protective Act of 1967, Secretary Babbitt certified to President Clinton on September 7, 1993, that Taiwan and the People's Republic of China are engaging in trade of rhinoceros and tiger parts and products, thereby threatening these animals with extinction. This certification states that the trade also diminishes the effectiveness of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), an agreement among 120

countries to prohibit trade in endangered wildlife species.

On November 8, in response to the Pelly certification, the President notified Congress that unless China and Taiwan demonstrate measurable, verifiable, and substantial progress in eliminating the trade by March 1994, the United States may impose import prohibitions against them as recommended by CITES.

Rhinoceros numbers have declined 90 percent within the last 23 years to the current level of fewer than 10,000 ani-

mals worldwide, and the tiger population has fallen 95 percent during this century to about 5,000. It is believed that wild populations of these animals may become extinct within 2 to 5 years if the trade in their parts and products, which includes rhinoceros horn and tiger bones, is not immediately eliminated. Although recent actions by Taiwan and the People's Republic of China indicate that some progress has been made in addressing their rhinoceros and tiger trade, neither government has fully implemented the international standards established by CITES for controlling the trade in these critically endangered species. Rhinoceros horn and tiger bone are used extensively in traditional Asian medicines.

The Secretary made his announcement of the Pelly certification in Brussels, Belgium, where he attended the meeting of the CITES Standing Committee with Fish and Wildlife Service (FWS) staff. The Standing Committee acts on behalf of the CITES Parties between the biennial Conference of Parties. After the Secretary's announcement, the Standing Committee unanimously recommended that CITES parties consider implementing "stricter domestic measures up to and including prohibition in trade in wildlife species" against China and Taiwan for their trade in tiger and rhinoceros parts and products.

In his November 8 message to Congress, the President noted the good faith efforts made recently by China and Taiwan, but he added that these efforts have yet to effectively reduce the rhinoceros and tiger trade. Actions that would demonstrate China's and Taiwan's commitment to eliminating the trade in parts and products of these animals could include, at a minimum, (1) consolidation and control of stockpiles; (2) formation of a permanent wildlife conservation law enforcement unit with specialized train-



photo by Dusty Wissmath. African Wildlife Foundation

According to the World Wildlife Fund, the number of black rhinos (*Diceros bicornis*) in Africa has plummeted from 65,000 in 1970 to fewer than 2,000 today, which would mean this species is declining faster than any other large land mammal in recent times.



photo © Environmental Investigation Agency, World Society for the Protection of Animals

This rhinoceros horn offered for sale in Hong Kong was photographed by hidden camera.

(continued on page 20)

The Eye of the Beholder: The Image of the African Elephant

by Holly Dublin

READER SURVEY CARD ENCLOSED

IMPORTANT!

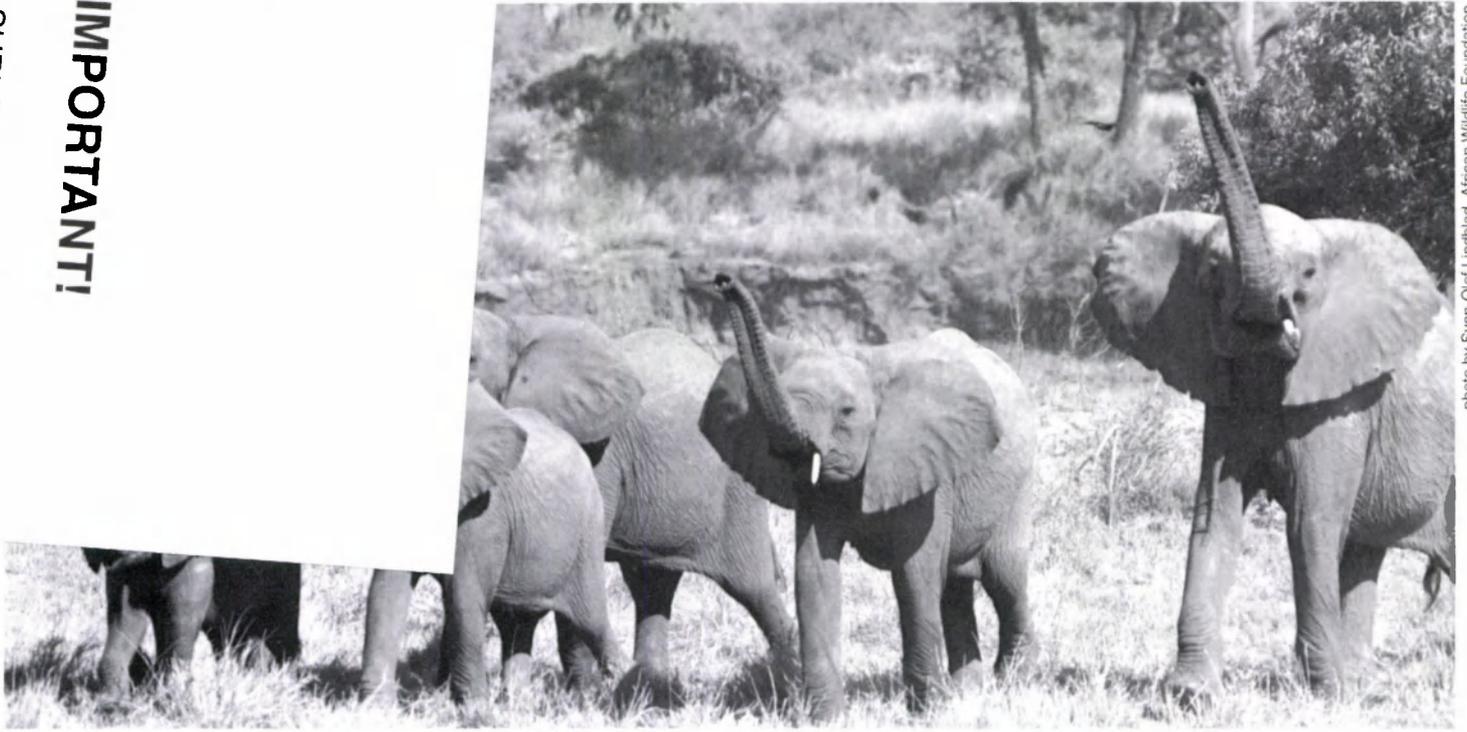


photo by Sven-Olof Lindblad, African Wildlife Foundation

No species of bird or mammal, extant or extinct, has elicited more human emotion than the African elephant (*Loxodonta africana*). In a world where most species are still unknown to the average person, something about this enormous but seemingly dignified pachyderm evokes a vast array of feelings. The African elephant is characterized by the most extreme of attitudes, and these extremes often follow the classic "north/south" split. But there are reasons, good reasons, for the gamut of opinions surrounding the species.

It is a common mistake for people living in the northern hemisphere to believe that everyone everywhere finds the same mystique in elephants. People whose entire exposure comes through television screens associate serenity and kinship with elephants. Given the enormous publicity surrounding the species over the past 5 years, it is no wonder the animal has become the "sweetheart" of the north.

Without a doubt, the African elephant possesses many admirable traits. These characteristics have never been brought to our attention more articulately and poignantly than through the writings and films of Cynthia Moss and Iain Douglas-Hamilton, both of whom have shared significant portions of their lives with elephants. These days, by simply taking the time to watch documentary television, even the average American can feel a connection with the species.

However, we must never lull ourselves into believing that all people feel the same empathy for elephants. Many neither revere elephants nor even care for them. Some people, in fact, fear and despise them. This is primarily the case for those who have to share their daily lives and often, involuntarily, their livelihoods with elephants. These individuals do not live among the elephants by choice but rather by circumstance. Today, in a growing proportion of the African elephant's range, people and elephants are

coming into conflict—a conflict brought about by the very nature of their codependence on the land and the resources sustaining them.

For a decade or more, the killing of African elephants by humans dominated our thoughts, but today the tables are turning. In many parts of Africa, attention is being drawn to the increasing destruction brought about by elephants. While the initial recovery of several elephant populations from years of unsustainable and illegal take is often viewed as a conservation success, it is only one part of a much bigger and more complex story that may spell the eventual decline of the species. While people and elephants share many of the more endearing traits of social mammals, their competition for declining land space fuels problems for both species. There is a "land hunger" in Africa, and both humans and elephants are the victims.

(continued on page 6)

In the Eye of the Beholder

(continued from page 5)

As Africa's human population continues to grow, elephants will increasingly become limited to strictly protected areas. Their future will depend, in most cases, on their ability to survive in these restricted habitats and, to a lesser extent, to coexist in other areas with human populations wherever possible. The increasing confinement of elephants in areas set aside primarily to protect other wildlife and natural attributes presents yet another challenge: how can a loss in biodiversity be avoided as elephants fulfill their role as architects and agents of large-scale vegetation change?

The challenge is to chart a strategy that guarantees the survival of elephants while meeting the needs of people who inhabit the same region. Developing and implementing this strategy will neither be simple nor without controversy. One school of thought is that we must "use" elephants or "lose" them. Use in this case means the legal take of elephants, and the sale of their ivory, on a sustainable basis. This view is primarily associated with people who share their homelands with elephants and stand to profit directly from the sale or consumption of elephant products. Not surprisingly, this ideology is an anathema to many conservationists enjoying evenings with elephants by watching them on public television. There are also people with intermediate views that accept and promote limited use of the species through such activities as trophy hunting. So where does the solution lie?

There is an undeniable inequity in our world as it relates to elephants. The people who literally have to live with elephants are rarely seen or heard by an audience broader than the local wildlife management authorities mandated with solving their elephant-related problems. Those who "live among the elephants" vicariously, through books or television screens, have significant influence. There is a need to hear and address the concerns of both groups of people.

We have learned that the task of saving elephants is not a simple one. Although many had hoped the ban on the international sale of ivory and elephant products, effective January 1990, would ensure the conservation of African elephants, this has proven to be an oversimplified solution to a complex problem. As reports of illegal killing are on the increase again in many elephant range states in Africa, we must expand our horizon and look for longer-term solutions that encompass the complexity of issues confronting both elephants and humans.

These solutions will not be easy to find, as experience has shown. The most difficult task will be to reach a consensus on how to manage African elephants. Unfortunately, however, consensus is difficult to achieve. We must start small and move toward higher and higher levels of cooperation and collaboration. From now on, we must begin to hear one another's viewpoints and respect them. There has been far too much talking and not enough listening.

The reconstruction of the African Elephant Specialist Group (AESG), part of IUCN—The World Conservation Union, has provided at least the rudimentary beginnings of a forum for both giving and receiving technical information. The focus of the AESG is on prioritizing conservation issues facing the species and formulating technically sound ideas. Implicit in this approach has been an honest attempt to reconcile past differences between experts in elephant range states and those in other regions through open dialogue, with the freedom to agree or disagree on the basis of technical, rather than emotional, grounds.

The AESG has been assisted in its auspicious new mission by generous and timely funding from the U.S. Fish and Wildlife Service, the World Wide Fund for Nature (WWF), the European Community, and the government of Germany. This assistance enabled the AESG to hold a very productive meeting in Zimbabwe in late 1992. The meeting focused on the more technical aspects of

the interaction between elephants and habitats, current elephant survey techniques, and future data needs for the conservation and management of elephants in Africa. At the next meeting, the AESG will address human/elephant conflicts, update information on elephant status and distribution, and debate any explicit technical matters that require consultation. In doing so, the AESG will lay the groundwork for further actions that may take place at the next Conference of Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which will be held in November 1994. Additionally, the AESG office in Nairobi, Kenya, has become a central repository for books, articles and current ideas; a think-tank for the review and generation of research proposals on key topics; the creative center for the compilation of AESG's newsletter, *Pachyderm*; and a meeting place for people who share an interest and concern in the fate of the African elephant.

The target is still moving, and there are many obstacles to be tackled. All solutions have a beginning, and we can only hope that—given productive dialogue and a willingness to hear one another—we are standing at the threshold of understanding the way forward. This truly magnificent species deserves our time, our concern, and our continued efforts on its behalf.

Dr. Dublin is the Co-chair of IUCN's African Elephant Specialist Group.

The opinions expressed by Ms. Dublin are not necessarily those of the Fish and Wildlife Service. Her article is part of an effort by the Bulletin to explore some of today's more challenging wildlife conservation issues by soliciting material representing independent viewpoints. If you would like to contribute by proposing an article, write the Editor, Endangered Species Technical Bulletin, U.S. Fish and Wildlife Service, 320 ARLSQ, Washington, D.C. 20240, or call 703/358-2166. See Bulletin Vol. XVIII, No. 4, for style guidelines.

Partnership for Pachyderms

by Mary Maruca

What do elephants and architecture have in common? If you answered with the word "keystone," you're right. The keystone — a wedge-shaped piece at the crown of an arch that holds the other pieces in place — has become an apt metaphor for elephant conservation. In an era increasingly concerned about the complex interrelationships shaping the natural environment, the elephant is conspicuous for its ability to terraform the landscape through which it moves, converting woodlands to grasslands, dispersing seeds, and creating waterholes. Innumerable species depend on the continuance of the elephant's biological patterns for the maintenance of habitat. They thrive in the elephant's shadow, so to speak.

However, the African elephant's ability to function as a keystone species became severely threatened during the decade of the 1980's. Wide-spread illegal ivory trade decimated populations. From an estimated 1.2 million, numbers dropped to fewer than 600,000. As the legislative body of the world's third largest consumer of ivory products, the United States Congress responded to this decline in 1988 by enacting the African Elephant Conservation Act, supporting the conservation programs of African countries and upholding CITES. In so doing, the Congress chose the quintessential animal through which to address biodiversity, creating keystone legislation for a keystone species.

Integral to the effectiveness of the African Elephant Conservation Act was the African Elephant Conservation Fund, established by the Act as a funding source to assist range countries with their elephant conservation priorities. Administered by the Fish and Wildlife Service, through the Department of the Interior, a grant program supported by the Fund has proven to be an easily mobilized, on-the-ground operation capable of responding quickly to immediate needs. For relatively small sums of money, the program has enabled range countries to implement their highest priority projects aimed at maintaining the critical role of elephants as a keystone species.

Since its initial funding in 1990, the grant program has supported 33 projects in 11 of the 34 range countries with African elephant populations. Key criteria consistent throughout the program's several years of operation have helped identify viable projects and contributed to success. First, the host country must have demonstrated commitment to elephant conservation, expressed through (1) its establishment of local elephant management programs, (2) the dedication of its own economic resources, within budgetary constraints, to elephant conservation, and (3) its availability as a participant in elephant projects.

Secondly, to qualify for funding, projects must fit within the parameters established by a range country's elephant conservation plan. Early on, the Fund recognized the context this could provide for project planning, and dedicated resources to assist range countries wishing to develop such plans. All countries within the current range of African elephants have plans in place. This effort has given elephant conservation visibility at the highest levels of government, helped establish national priorities, and provided target goals against which individual projects can be evaluated.

It has also enabled the grant program to work in partnership with range countries, responding to their own priorities rather than intervening to set priorities for them. From the start, the intent of the program has been not to dictate conservation priorities, but to work within the priorities already established by host countries meeting African Elephant Conservation Act criteria. Elephant conservation plans have helped this to occur effectively. Also, the availability of the plans to other bilateral donors has made it possible for those interested in elephant conservation to become familiar with specific projects and coordinate assistance.

Third, the Fund's capability to generate contributions from the private sector, other governments, non-government organizations, and the host country remains one of its greatest assets. Money donated from various sources is pooled to improve opportunities for key elephant populations. More than \$2 million have been generated as matching funds. Although there is not enough money to fund every project, the program attempts to balance the needs of elephant conservation throughout the species' range. With partners, the Fund cooperates on projects from Senegal in the west to Tanzania in the east and Namibia in the south.

Recognizing that conservation needs expressed in elephant conservation plans

(continued on page 8)



Photo by Limblad/African Wildlife Foundation

Partnership for Pachyderms

(continued from page 7)

far exceed available funding, the grant program has sought to supply the operational needs of projects capable of continuing their work once set-up funds have been provided. This has translated into financial support for anti-poaching activities and status surveys requested by range countries. Recently, however, as elephant populations have begun to stabilize, the focus has shifted somewhat — from requests to fund anti-poaching efforts to projects addressing human/elephant conflicts as elephants begin to return to parts of their former range. One priority for the current allocation is the selection of projects that concentrate on elephant conservation while benefiting rhinoceros populations. Once again, inherent in this effort is recognition of the elephant's role as a keystone species upon which the well-being of other species depends.

Perhaps one of the most complicated and most innovative projects funded by the pro-

gram to date has involved the translocation of an estimated 1,000 elephants in Zimbabwe. During the drought of 1991-1992, the government of Zimbabwe determined that elephant population levels in Gonarezhou National Park exceeded the carrying capacity and, if left unmanaged, could lead not only to species decline in that area but also to significant habitat loss. The demise of local sheep and cattle during the drought provided the Zimbabwean wildlife department with an opportunity to negotiate with ranchers for the benefit of native species. The result was agreement to work cooperatively, creating tracts of open rangeland to meet the needs of translocated elephants and other species.

Once again, the grant program responded in conjunction with other matching funding sources, doubling the benefits to the species. The grant covered such essentials as helicopters and other equipment needed to herd and tranquilize the animals. The ranchers receiving the animals provided transport costs.

The successful Zimbabwean translocation effort holds promise as a manage-

ment approach to herd reduction when numbers exceed an area's normal carrying capacity, and may serve as a model for other countries within the species' range. It also leaves open the possibility that populations on the decline in some countries feasibly may be restocked with translocated groups. Although not all the results are in, this creative use of funding not only has made the future brighter for the Gonarezhou elephants but also for the other species that depend on them.

All in all, the African Elephant Conservation Fund has become an important vehicle through which money for the conservation of a keystone species reaches on-the-ground projects that take into account not simply the elephant but also the complex environment it shapes. The grant program is proving to be an effective partnership, one acknowledging Aldo Leopold's injunction that "the first precaution of intelligent tinkering" is keeping all the pieces — especially when one of the major pieces happens to be elephants.

Mammoth or Elephant Ivory? Forensics Provides the Key

by Edgard O'Neil Espinoza and Mary-Jacque Mann

Due to threats posed by habitat loss and overexploitation, importation of African elephant (*Loxodonta africana*) ivory was prohibited in 1989. Imports of ivory from Asian elephants (*Elephas maximus*) had already been banned for similar reasons. Immediately after the 1989 ban took effect, U.S. ports began receiving large shipments of carved "mammoth" or "mastodon" ivory instead of the usual African elephant ivory.

Although U.S. Fish and Wildlife Service (FWS) wildlife inspectors at ports of entry strongly suspected that these shipments were actually illegal elephant ivory, there was no analytical technique available to test the importers' claims. The FWS Division of Law Enforcement therefore requested the assistance of the newly established Clark R. Bavin Na-

tional Fish and Wildlife Forensics Laboratory in Ashland, Oregon. Scientists at the facility were asked to develop a reliable, non-destructive method to differentiate the ivories of mammoths and modern elephants.

Mastodons, mammoths, and modern elephants are all members of the Proboscidea order of mammals. Mammoths lived during the Pleistocene Epoch and have been extinct for approximately 8,000 to 10,000 years. Mastodons coexisted with mammoths for part of the Pleistocene, occupying a different niche before becoming extinct themselves. Although there were several species of mammoth, the "woolly" or "hairy" mammoth (*Mammuthus primigenius*) from the Alaskan and Siberian tundras is the only known source of commercially significant

extinct proboscidean ivory. Despite occasional claims that mastodons have contributed to the ivory trade, mastodon ivory has not survived the millennia with enough preservation for commercial uses.

The woolly mammoth roamed Siberia and other parts of northern Asia, Europe, and North America. Early humans probably pursued the mammoth and other game across the Bering land bridge to the new world. Published descriptions of frozen mammoth carcasses found in Siberia date back to the eighteenth century. These frozen remains portray a powerful animal about 12 feet in height weighing up to 15,000 pounds (slightly larger than an African bull elephant), bearing deeply curved tusks that measured as much as 16 feet in length. The woolly mammoth

(continued on next page)

Mammoth or Elephant Ivory?

(continued from previous page)

was well protected from its frigid tundra environment by extra fat reserves and two thick layers of hair.

Woolly mammoth ivory has been in significant commercial demand for centuries, and the trade may have existed as early as the Roman era. From 1809 to 1910, 6,000 metric tons of ivory were "mined" from the Siberian tundra, the equivalent of tusks from an estimated 46,000 mammoths. Over the last 350 years, approximately 7,000 tons of mammoth ivory have been imported into China. Current predictions estimate that 550,000 tons of mammoth tusks have yet to be recovered from a single 1,000-kilometer coastal strip between the Yana and Kolyma rivers in Siberia.

Contrary to popular opinion, most commercially significant mammoth ivory is preserved rather than fossilized (*i.e.*, petrified). This preservation is credited to the frozen tundra environment in which the ivory has been buried for thousands of years. Carved and polished mammoth ivory is nearly indistinguishable from carved and polished elephant ivory. Both ivories have a creamy color and a unique "texture" or pattern of stacked chevron-like lines in cross-section. This pattern of lines, called the Schreger Pattern, is found only in proboscidean ivories. Analysis of the Schreger Pattern is the basis of a method developed by FWS Forensics Laboratory scientists to distinguish mammoth from modern elephant ivory.

Proboscidean tusks are actually modified maxillary incisors (front upper teeth). Like any mammalian tooth, tusks are permeated by microscopic structures called dentinal tubules. Proboscidean dentinal tubules are unique because they are sinusoidal (wavy). The Schreger Pattern is actually an illusion of crossing shadow lines created by the wavy underlying microscopic dentinal tubules. When examined by scanning electron microscopy, the dentinal tubules are shown to be more tightly packed in mammoth ivory than in elephant ivory.



The woolly mammoth abounded in northern latitudes during the Pleistocene. This mount is a composite from several sets of skeletons uncovered near Fairbanks, Alaska, during the gold-mining days at the turn of the century. Mammoth tusks weighed up to 600 pounds per pair.

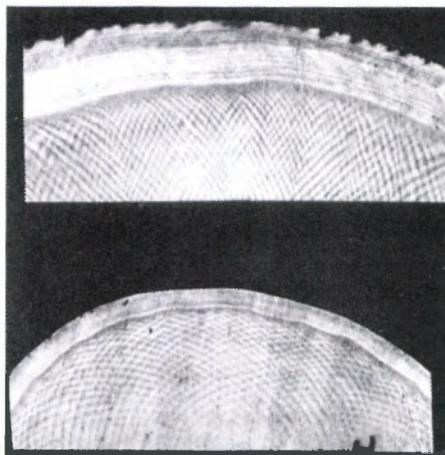
The angles that appear at the intersections of the Schreger lines in mammoth ivory are therefore consistently smaller (more acute) than those of elephant ivory. Using a protractor, FWS Forensics Laboratory scientists measured hundreds of Schreger Pattern angles from known samples of elephant and mammoth ivories. Statistical analysis of these measurements revealed that mammoth ivory angles averaged 73 degrees while the angles of elephant ivory averaged 124 degrees.

As soon as the Schreger Pattern angle method for differentiating mammoth and elephant ivories became available, incoming shipments of carved "mammoth" ivory were shunted to the FWS Forensics

Laboratory by FWS wildlife inspectors. The first shipment originated from Hong Kong and contained 500 carved objects. FWS Forensic Laboratory scientists identified all 500 objects as being modern elephant in origin. The next Hong Kong shipment contained 400 "mammoth" pieces, 200 of which had actually been carved from elephant ivory. The following shipment of 600 items contained 597 mammoth ivory carvings and only three elephant ivory carvings. The other 1989 shipments were genuine mammoth in origin.

A booklet outlining the simple, non-destructive Schreger Pattern angle measurement method was written by FWS Forensics Laboratory scientists and published by the World Wildlife Fund in 1991. This booklet also contains methods for the identification of the other types of natural and man-made materials appearing in the ivory trade.

It is interesting to note that since reliable identification methods have been applied to the ivory trade, FWS Forensics Laboratory scientists and wildlife inspectors have observed that the legal commerce in carved "ivory" objects has gradually shifted from mammoth tusks to include bone, warthog tusks, and hippopotamus teeth.



Measuring the angles formed by lines that make up the Schreger Pattern allows wildlife inspectors to distinguish mammoth ivory (top) from elephant ivory (bottom).

Edgard Espinoza and Mary-Jacque Mann are with the Clark R. Bavin National Fish and Wildlife Forensics Laboratory.

Recovery of the Black-footed Ferret: Looking Back, Looking Forward

by Jerry Godbey and Dean Biggins

One of the rarest mammals in the world, the black-footed ferret (*Mustela nigripes*) is a small, secretive, nocturnal carnivore that depends on prairie dogs (*Cynomys* spp.) for 90 percent of its diet and shelter. In 1967, the ferret was one of the first animals listed as an endangered species in the United States. During the more than 25 years since that time, government agencies, the private sector, conservation organizations, companies, and zoos have helped advance ferret recovery. Nevertheless, the future presents several challenges. Thus, from time to time, there is value in stepping back, reviewing the past, evaluating the lessons learned, and planning for the future.

History

The decline of the black-footed ferret is tied to the decline of the prairie dog. Because of persecution by humans and

the effects of a presumably introduced disease (sylvatic plague), prairie dogs, the primary food source for black-footed ferrets, have declined in number by about 98 percent since the early 1900's. As the prairie dogs diminished, so did the ferrets. Small populations were studied from 1964 to 1974 in South Dakota and at the Fish and Wildlife Service's Patuxent Wildlife Research Center in Laurel, Maryland, but they eventually disappeared. Many people feared the species was extinct until 1981, when a population of ferrets was discovered near Meeteetse, Wyoming. In 1985, however, canine distemper — a disease fatal to ferrets — nearly wiped out the population. During the following 18 months, only 18 of the original 127 black-footed ferrets were taken in for captive breeding.

Plague also worked to destroy the ferret's habitat at Meeteetse by reducing the prey base. By 1992, plague had caused a 90 percent decline in Meeteetse

prairie dogs and stopped any plan to reintroduce black-footed ferrets there. However, the last Meeteetse ferrets did provide stock for a successful captive breeding program. There are now more than 250 breeding adults in the program at various facilities throughout the country. During 1991-1993, the captive population supplied 187 "surplus" animals for reintroduction in Wyoming's Shirley Basin. Although some animals released in the Shirley Basin lived through the winter each year of the reintroduction, overall survival has been low due to wide dispersal and predation.

It's Difficult To Be A Black-footed Ferret

Tests conducted during the 1991-1992 releases indicated that ferret predation by coyotes (*Canis latrans*), badgers (*Taxidea taxus*), and other predators was high. The 1991 release indicated an 86 percent loss of introduced animals within 90 days for the Shirley Basin population, compared to a 17 percent loss for a similar 90-day period in the wild Meeteetse population. In 1992, 26 percent of the released animals were lost to predation in just 18 days.

Dispersal from the release site also was recognized as a problem. Individuals that disperse far away from the release areas not only leave the best prairie dog habitat and expose themselves to predation, but are possibly lost to future mates. Wide variability in dispersal appears characteristic of cage-raised ferrets. In 1992, animals raised in prairie dog burrows within outdoor pens remained at the release site 4 to 6 times longer than cage-raised animals.

Problems Facing Ferret Recovery

Genetic variability in the current black-footed ferret population is known to be low, and additional loss of variation

(continued on page 13)



Wyoming Game and Fish Department photo

black-footed ferret

Reaching Out in Wyoming: A Black-footed Ferret Success Story

by Mary Maruca

Amigo is a children's book about a boy named Francisco, whose family cannot afford to own a dog. Francisco finds unexpected companionship in the company of a prairie dog, whose own family has warned him against forming an attachment to a human child. But the boy and the prairie dog do hit it off and, contrary to the advice of all their favorite relations, they become fast friends.

Moral of the story? From at least one perspective, it epitomizes the complementary relationship possible in nature—animals of different sorts finding ways to accommodate each other. However, in the adult world most of us are familiar with, such accommodation can be more difficult to come by, and may indeed require more negotiation skills than those needed by a small boy and a friendly prairie dog eager for companionship.

Take the case of the black-footed ferret. This member of the weasel family has suffered by its close association with prairie dogs. At different times during their long history of contact with humans, prairie dogs have been regarded as akin to weeds. Perceived as competitors for forage, these burrowing rodents have been shot, trapped, poisoned, and dispossessed of habitat until the "towns" that once covered millions of acres from Canada to Mexico have been reduced to approximately 2 percent of their original range. Indeed, since passage of the Endangered Species Act, two out of the five prairie dog species have been listed as Threatened or Endangered. All in all, this has spelled bad news for ferrets, which take more than 90 percent of their diet from the ranks of their prairie dog neighbors.

As prairie dogs declined, so did ferrets. What was thought to be the last population of ferrets came to light in South Dakota in 1963. When that population died out in the late 1970's, the species was thought to be extinct. Then, in 1981, a ranch dog killed a black-footed



photo © Wendy Shattil / Bob Rozinski

Prairie dogs are the main food source for black-footed ferrets. These young black-tailed prairie dogs were photographed at the Rocky Mountain Arsenal, Colorado.

ferret near Meeteetse, Wyoming. Research subsequently documented a population of more than 120 animals nearby. However, after an outbreak of canine distemper almost wiped out the Meeteetse ferret population, the last 18 were captured between 1985 and 1987 for the captive breeding program. Captive ferrets now range in number between 240 and 350 animals.

If one were simply to look at the numbers, it might appear that the hero of the story would be the captive breeding program. Yes, the ferret population has surged in this artificial environment, but a captive breeding facility offers nothing like the wild natural attractions of Meeteetse. If ferrets were truly to recover, they would have to be reestablished in the wild. But more than sound biology and a protective law were required to make that particular effort a success, especially in a part of the country where prairie dog towns were regarded as a sure sign of deteriorating rangeland, and where private landowners seldom felt comfortable with Federal intervention in

their ranching practices. So what was the next step for ferrets and ranchers? Was it conceivable that "Feds" and landowners, potentially facing each other from opposite sides of the fence, could find a way to meet at the same fence post and become amigos after all?

The Black-footed Ferret Advisory Team provided the model, representing not only the Fish and Wildlife Service, which has responsibility for ferret recovery, but State, local, and private interests also. The Wyoming Game and Fish Department served as the mediator at the local level. Representatives went door to door, contacting landowners, alerting them to developing plans, and sharing ideas. The presence of the well respected Game and Fish Department forestalled some of the potential for tension. Jack Turnell, manager of the Pitchfork Ranch near Meeteetse, also did yeoman's work as the spokesperson for local interests on the Advisory Team. He was a central presence as long as Meeteetse was considered a possible reintroduction site. But when a

(continued on page 12)

Reaching out in Wyoming

(continued from page 11)

bout of sylvatic plague struck the prairie dog population that otherwise would have supported the ferrets, the reintroduction site shifted to Wyoming's Shirley Basin, where local rancher Bill Ellis became an influential part of the Shirley Basin/Medicine Bow Working Group.

According to Bill Ellis, if the Endangered Species Act had not been a factor in the ferret issue, anyone could have come into the community with "a sack of black-footed ferrets and asked if they could have been dumped out on people's lands, and the ranchers would have said 'yes.'" The Endangered Species Act made the difference in attitude, according to Ellis. Even though ranchers held no hard feelings toward the ferrets, the authority of the Act made them feel the government could step in, impose changes on their lives, and give them no voice in the reintroduction process. Contributing to the Shirley Basin/Medicine Bow Working Group as a spokesperson for ranching interests helped Ellis change that perception. He decided to get involved early on when the switch to Shirley Basin was made, because getting involved not only made him part of the process on his own

terms, but also part of the solution. Although he represented landowner interests, he spoke from his own perspective. "I had to make decisions and stand by them," he observed, explaining that he provided input based on what he thought livestock owners could live with.

His main concern about the process of reintroduction was that it not interfere either with the business of ranching or the lifestyle of the ranchers. To protect both of these, he and others attending the meetings wanted the management plan guiding ferret reintroduction to specify the maximum number of ferret workers that could be in the field at any one time. "People here are used to a solitary life," Ellis said. "Even if agencies have people out every day doing their jobs and not bothering anybody, we still know they're out there. It wears on nerves." Six people at any one time was the maximum eventually specified in the plan.

Developing the management plan took approximately a year from start to finish—all in all, a quick timetable for creating such a document, considering the number of interests involved and the variety of individuals consulted. Oil, gas, coal, recreation, and livestock interests were all involved in the decisionmaking process. Ellis believes it was "the quality of people in the meetings that made

them work." Common sense and sensibility helped resolve most conflicts. "Nothing remains to be worked out," Ellis said. "It's all running smoothly." Part of the plan's smooth functioning may have had to do with the team's efforts to foresee the possibility of future problems. A process for amending the plan was included in the completed document.

Steve Brockmann, who works with the ferret reintroduction program in the Fish and Wildlife Service's Cheyenne, Wyoming, Field Office, indicated that the designation of reintroduced ferrets as a "nonessential experimental population" allayed ranchers' concern that accidentally killing a ferret would result in Federal prosecution. The experimental population provision of the Endangered Species Act promotes public acceptance of reintroduction by authorizing additional flexibility in the management of released animals and their habitat. Essentially, the reintroduced population's status as "nonessential" made all existing land practices acceptable. It took away much of the concern associated with the provisions of the Endangered Species Act. This was the message that Bill Ellis shared with his fellow ranchers — that compromise was possible, and that ranchers in conjunction with the Federal government could accomplish what they needed to accomplish without sacrifice.

Ferret reintroduction probably won't stop with Wyoming. Proposals to establish experimental populations in South Dakota and Montana have already appeared in the *Federal Register*. Bill Ellis even has a few thoughts on how the process of reintroduction might go more smoothly in these States. "Get involved," he advises other ranchers. "That's the best way to watch out for your interests."

"This works," he says, referring to the management plan he helped develop and the reintroduction process that resulted. "It's a great example of Federal, State, and local groups sitting down and successfully hammering something out."

Mary Maruca is Chief of the Branch of Correspondence and Information, Office of Administration, Fish and Wildlife Service, Washington, D.C.



Wyoming Game and Fish Department photo

Wearing masks while handling ferrets minimizes the risk of transmitting disease to the animals.

Recovery of the Black-footed Ferret

(continued from page 10)

in the future is unavoidable. Only 8 of the 18 original animals captured at Meeteetse for the captive breeding program were believed unrelated enough to be considered genetic founders. Abnormal physical features (including webbed feet, kinked tails, short tails, oddly formed teeth, and internal hemorrhaging in kits) have been seen in some captive-born animals. Characteristics that favor survival and reproduction in captive animals may be different from those contributing to fitness of free-ranging ferrets.

Captivity can affect animals in other ways, too. The unnatural cage environment may not help develop critical behavioral skills, a problem currently receiving research attention. Behavior is determined by environmental and genetic influences, but behaviors can be altered if a critical influence is absent or distorted.

Diseases also pose threats to the ferret recovery program. The potential effect of canine distemper is evident from the Meeteetse experience. Currently, only short-term vaccine is available, and no protection exists for young born in the wild. Plague in prairie dog populations may be equally serious as a loss of prey, but little is known about the direct effects of plague on black-footed ferrets.

Although some potential ferret reintroduction sites have been identified, few suitable areas that are large enough still exist. Past and ongoing prairie dog poisoning programs, conversion of prairie dog towns to agricultural or urban uses, and the introduction of sylvatic plague have greatly reduced the prairie dog's geographic distribution. Unfortunately, nearly 130 other grassland animal species are associated with the prairie dog and may suffer related declines.

The Human Factor

The human dimensions of the ferret recovery program are as complex as any other facet. Philosophies and person-

alities of professionals working within the ferret program vary widely, and lively debates have been common. Identifying problems and re-examining mistakes can help us avoid repeating them, both in the ferret program and in other programs focusing on endangered species. In our opinion, the following are some of the most important lessons to emerge from the past 25 years of ferret conservation efforts:

First, avoid "putting all your eggs in one basket." Captive breeding and translocation of ferrets from the Meeteetse

gered species recovery. Federal agencies are required by the Endangered Species Act to do everything they can to ensure the survival of the species. State agencies, communities and individuals may not agree with this. Discussion, understanding, and compromise are of paramount importance.

Conclusion

A great deal of agency cooperation and teamwork has been expended in the ferret recovery effort. No single agency or

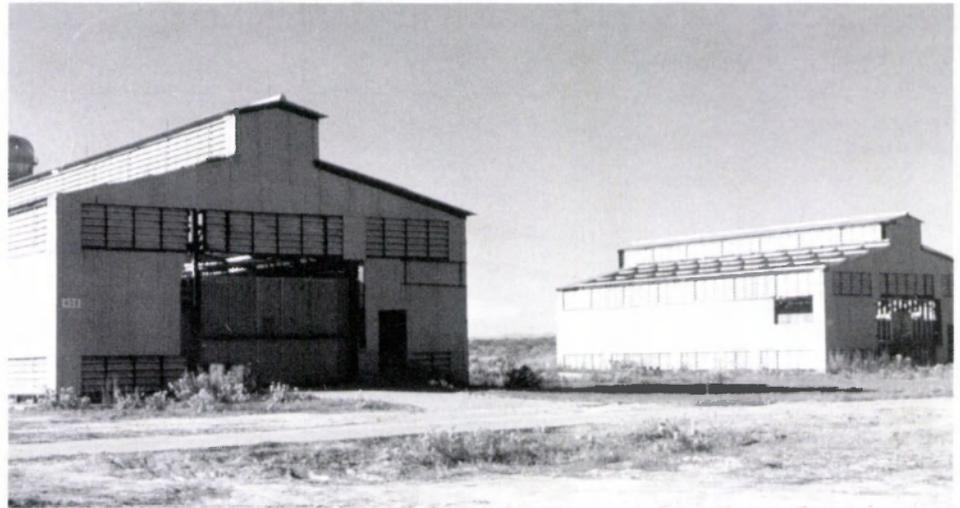


photo by Jerry Godbey, National Biological Survey

Ferret training facilities in Pueblo, Colorado: Formerly implement sheds where the U.S. Army stored large machines, these 5000 square-foot buildings have been converted to prairie dog towns, where captive-bred black-footed ferrets—which may not recognize their prey—learn to hunt.

population should have begun earlier. Reintroductions also need to be in various locations.

Second, don't "re-invent the wheel." In several cases involving both research on free-ranging ferrets and management of captive ferrets, too little attention was paid to failures and successes during previous work at South Dakota and Patuxent.

Third, resist "preservation paralysis." At Meeteetse, realization that the small ferret population might be the last in existence motivated a protectionist attitude that restricted aggressive management options and decreased the options now available for the ferret program.

Finally, it is important to address the concerns of all parties involved in endan-

group of individuals has the expertise or resources to be successful on its own. Within the ferret program, outstanding examples of cooperation have been demonstrated in the private sector, including ranchers, conservation organizations, companies and zoos. We hope this cooperation not only continues but grows. We remain grateful to the many cooperators and contributors for their support.

Jerry Godbey and Dean Biggins are with the National Biological Survey, National Ecology Research Center, in Fort Collins, Colorado.

Listing Proposals — October/November 1993



The Winkler cactus is a small, globose species that produces attractive pink or peach-colored flowers. It was described and named by Dr. Kenneth Heil in honor of Agnes Winkler, who discovered the cactus in the early 1960's.

Eleven species — seven plants and four animals — were proposed by the Fish and Wildlife Service during October and November 1993 for listing as Threatened or Endangered. If the listing proposals are approved, Endangered Species Act protection will be extended to the following:

Six California Chaparral Plants

Protection for six plant taxa associated with southern maritime chaparral, a distinctive plant community found only along the coast of southern California and northern Baja California, Mexico, was proposed October 1. The four plants most vulnerable to extinction were recommended for listing as Endangered:

- Del Mar manzanita (*Arctostaphylos glandulosa* ssp. *crassifolia*) - a shrub in the heath family (Ericaceae) with white flowers and dark red bark;
- Encinitas baccharis (*Baccharis vanessae*) - a fall-blooming shrub in the aster family (Asteraceae);
- Orcutt's spineflower (*Chorizanthe orcuttiana*) - a low-growing, yellow-flowered annual in the buckwheat family (Polygonaceae); and

- short-leaved dudleya (*Dudleya blochmaniae* ssp. *brevifolia*) - a low-growing, white-flowered succulent in the stonecrop family (Crassulaceae).

Because the danger to the other two plants is not as immediate, they were proposed for listing as Threatened:

- Del Mar sand aster (*Corethrogyne flaginifolia* var. *linifolia*) - an erect perennial herb bearing flowers containing violet ray florets and yellow disk florets; and
- big-leaved crown-beard (*Verbesina dissita*) - a low-growing shrub with yellow flowers, and another member of the aster family.

Southern maritime chaparral is a low growing, relatively open plant community frequently restricted to sandy coastal terraces, and has high species diversity. Approximately 85 percent of this habitat has been lost to agriculture and urbanization. Most of the remaining 15 percent is on private property in San Diego County, and is subject to further habitat modification or fragmentation. The situation facing southern coastal chaparral in northern Baja California is much the same.

Winkler Cactus (*Pediocactus winkleri*)

Thought to be one of the rarest cacti in the U.S., this species is known from 6 populations totalling about 3,500 plants on 200 acres (800 hectares). All of the sites are in south-central Utah on habitat administered by the Bureau of Land Management (BLM) and at a site on the adjacent Capitol Reef National Park.

Because of its rarity and attractive appearance, the Winkler cactus is prized by many hobbyists. In one area, an estimated 80 percent of the plants have been taken by collectors in the past 10 years. Additionally, off-road vehicles and livestock have destroyed many cacti and degraded their habitat. Cattle grazing is allowed within the park as well as on the BLM land. In light of these threats, the FWS proposed October 6 to list the Winkler cactus as Endangered.

Flat-tailed Horned Lizard (*Phrynosoma mcallii*)

One of seven species of horned lizards in North America, *P. mcallii* is distinguished by its long, slender head spines, a dark vertebral stripe, and — as its common name indicates — a flattened tail. It is found in sandy flats and valleys of the western Sonoran Desert from the Coachella Valley south through the Imperial Valley, California, and in the vicinity of the Colorado River delta, the Gran Desierto, and Bahia de San Jorge in Mexico and Arizona.

Approximately 40 percent of the lizard's habitat in California has been converted to agricultural or urban uses, or was inundated by the creation of the Salton Sea in 1905-1907. Over 20 percent of the habitat in Arizona and Mexico has been lost to similar uses. Most of what remains is fragmented and degraded. An estimated 95 percent of the current suitable habitat in California and 35 percent in Arizona is threatened

(continued on next page)

Listing Proposals

(continued from previous page)

by further agricultural and urban development, off-road vehicle use, geothermal energy development, sand and gravel mining, road construction, and construction of utility corridors, as well as pesticide spraying of ant populations — the primary prey of the flat-tailed horned lizard. Because of these threats, the FWS proposed November 29 to list the species as Threatened.

Two Georgia Fishes

Two small, colorful fishes endemic to the Etowah River system in northern Georgia were proposed October 18 for Endangered Species Act protection:

- **Etowah darter** (*Etheostoma etowae*) - a small, brown or grayish-olive fish with small, dark spots just below the lateral line. Breeding males have a greenish-blue breast. This species was proposed for listing as Endangered.

- **Cherokee darter** (*Etheostoma sp.*) - a white to pale yellow fish with olive-black lateral bars and a row of small, dark dorsal saddles. Once confused with another fish, the Cherokee darter is now recognized as a distinct taxon, and a formal scientific description is being prepared. Believed to be in somewhat less danger than the Etowah darter because of a wider distribution, the Cherokee darter was proposed for listing as Threatened.

Both fishes inhabit clean, free-flowing streams with rocky substrates, and neither can survive in impoundments.

The Etowah River system once supported a significant diversity of aquatic wildlife, but many of its animals are now rare. Species from this system already listed as Endangered or Threatened include one fish and five mussels. Another nine species from the system — one mussel, five fishes, and three aquatic snails — are candidates for listing. Much of the historical habitat has been modified or degraded by impoundments, siltation, and pollution. Dams not only block the river flows

but also fragment populations and alter downstream water temperatures. The degradation of water quality comes from municipal and industrial discharge sites, and non-point sources such as runoff from agricultural and silvicultural operations.



photo by E.D. Cashatt

Hine's Emerald Dragonfly (*Somatochlora hineana*)

Bright emerald-green eyes, a metallic green thorax, and creamy-yellow lateral stripes make this wetland insect a distinctive species. It once occurred in Indiana and Ohio, but the only currently known populations are in three counties in the Chicago, Illinois, metropolitan area and in Door County, Wisconsin.

The primary threat to Hine's emerald dragonfly is the loss or degradation of its habitat. This species occurs around shallow, springfed streams with associated wet meadows and cattail marshes. Within its limited range, the insect's wetland habitats are subject to: draining or filling for agricultural, recreational, and industrial development; pesticide drift and runoff; and ground water contamination from a wide variety of sources.

Because of the species' restricted range, low numbers, and vulnerability, the FWS proposed October 4 to list Hine's emerald dragonfly as Endangered.

* * *

Available Conservation Measures

Among the conservation benefits authorized for Threatened and Endangered plants and animals under the Endangered Species Act are: protection from adverse effects of Federal activities; restrictions on take and trafficking; a requirement that the FWS develop and carry out recovery

plans; authorization to seek land purchases or exchanges for important habitat; and Federal aid to State and Commonwealth conservation departments with cooperative endangered species agreements. Listing also lends greater recognition to a species' precarious status, encouraging other conservation efforts by State and local agencies, independent organizations, and concerned individuals.

Section 7 of the Act directs Federal agencies to use their legal authorities to further the purposes of the Act by carrying out conservation programs for listed species. It also requires these agencies to ensure that any actions they fund, authorize, or carry out are not likely to jeopardize the survival of any Endangered or Threatened species, or to adversely modify its designated Critical Habitat (if any). When an agency finds that one of its activities may affect a listed species, it is required to consult with the FWS to avoid jeopardy. If necessary, "reasonable and prudent alternatives," such as project modifications or rescheduling, are suggested to allow completion of the proposed activity. Where a Federal action may jeopardize the survival of a species that is *proposed* for listing, the Federal agency is required to "confer" with the FWS (although the results of such a conference are not legally binding).

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

Nile Crocodile Reclassified from Endangered to Threatened

by Ann Haas

Recognizing the improved status of the Nile crocodile (*Crocodylus niloticus*) in response to conservation measures, the Fish and Wildlife Service (FWS) reclassified the species throughout its range from Endangered to Threatened, effective October 21, 1993. The special rule for the Zimbabwe population of the Nile crocodile, already classified as Threatened, remains in effect, allowing the importation of trophies and skins directly into the United States.

The Nile crocodile is the largest of the three African species of crocodiles and among the largest worldwide, reaching a length of up to 7 meters (23 feet). Its upper surface ranges from yellow to dark olive, and its lower surface is usually uniformly light and without dark blotches. Unlike the other African species, the African slender-snouted crocodile (*Crocodylus cataphractus*) and the dwarf crocodile (*Osteolaemus tetraspis*), the Nile crocodile either completely lacks or has only small bony plates in the belly scales (Brazaitis, personal communication). Thus, the skin of the Nile crocodile is utilized to

produce a high quality leather and has historically been one of the mainstays of the commercial crocodile leather trade (Brazaitis, 1973).

The Nile crocodile lives in a range of aquatic habitats, including rivers, lakes, and swamps. It may even occur in salt water. A major predator and opportunistic feeder, the Nile crocodile occupies many niches on land and in water (Cott, 1961.) It is a significant component of the food web and ecology of the region it inhabits, first feeding on insects and crustaceans, then fish and small mammals, and finally, as an adult, killing and consuming large mammals, thereby helping to control populations of herbivores such as antelopes, waterbucks, lechwes, zebras, and warthogs. The crocodile may take domestic goats and cattle, and, as a scavenger, it also eats carrion. Because of its large size, the Nile crocodile has been known to attack humans, generally after learning to associate them with sources of food (such as fish-cleaning stations) or by mistaking people for prey, if they bathe in the early evening or morning

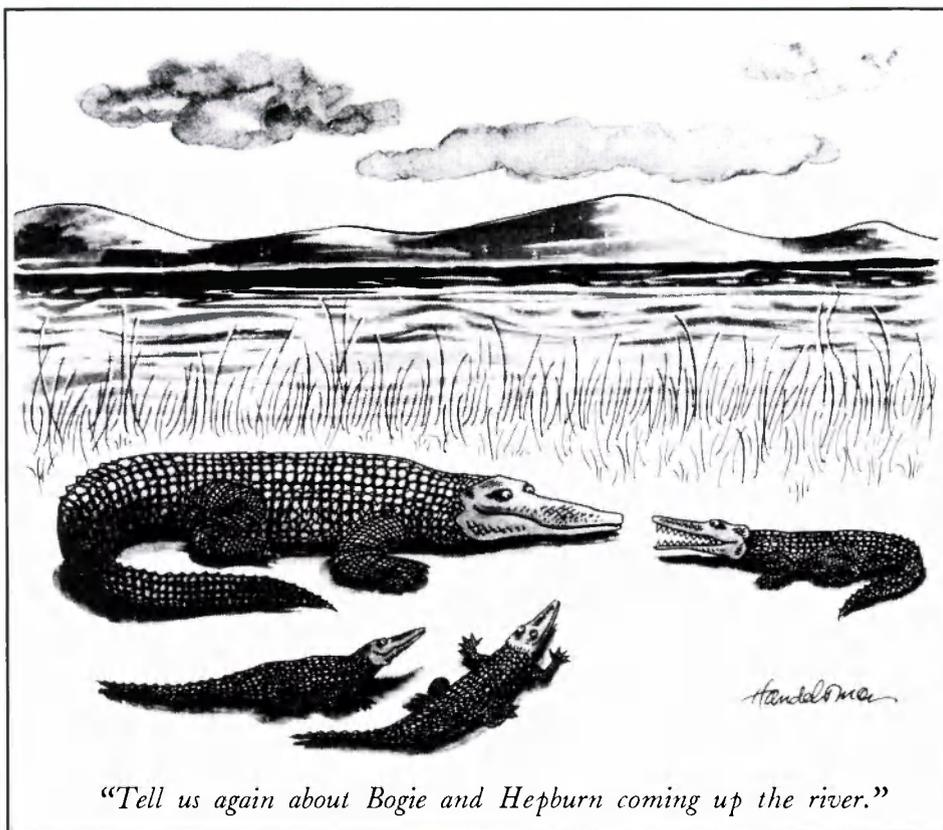
when the reptile hunts (Brazaitis, personal communication).

The Nile crocodile's intricate food web shows, in part, interspecific competition and reciprocal predation (Cott, 1961). In particular, the Nile monitor lizard (*Varanus niloticus*) preys heavily on the eggs of Nile crocodiles and, presumably, African pond or mud turtles (*Pelusios*). In turn, the crocodile preys on both species, and all compete for freshwater crabs. Further, the crocodile and monitor take frogs, while the turtle takes tadpoles (Cott, 1961).

The Nile crocodile is ecologically important in benefiting commercially valuable fish. Crocodiles take *Clarias* (airbreathing or "walking" catfish), which prey on desirable *Tilapia* (mouthbrooder fish), including its fry and eggs. By controlling these predator fish, the Nile crocodile helps ensure the survival of *Tilapia* as food for people.

A species whose ancestors date back more than 200 million years, the Nile crocodile once occurred throughout Africa and as far north as Syria. According to Dr. Roy McDiarmid of the National Museum of Natural History, the Nile crocodile has also been reported to occur in the Comoros and Seychelles Islands. It is now confined mainly to the upstream regions of the Nile, tropical and southern Africa, and Madagascar.

Early this century, bounties were paid for Nile crocodile hides, and in the 1950's and 1960's, wholesale slaughter of the animals for the commercial hide business threatened many accessible populations with extinction (Hutton, 1988). Nile crocodile numbers also declined because of habitat alteration — such as clearing forests and draining wetlands — and killing to eliminate threats to humans, livestock, and the fishing industry. In 1970, the species was listed as Endangered. In 1975, when the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) came into force, the Nile crocodile



drawing by Handelsman © 1991 The New Yorker Magazine

(continued on next page)

Nile Crocodile Reclassified

(continued from previous page)

dile was listed on Appendix I in view of its widespread decline.

CITES is an international conservation treaty, now signed by 120 countries, to regulate trade (import, export, and re-export) in animal and plant species listed on its three appendices, using a system of permits. While allowing sustainable trade, CITES is designed to prevent trade from threatening the survival of species. Trade in Appendix I species is most strictly regulated because their biological status in the wild is most precarious; trade for primarily commercial purposes is prohibited. Trade in Appendix II species is allowed if both the exporting and importing countries have issued the proper permits.

Nile crocodile populations have generally recovered to the point at which they are increasing or at least stabilized, thanks to years of protection and additional habitat created by impoundments. Zimbabwe's protection of the Nile crocodile and the U.S. import restrictions under the Endangered Species Act have helped the species recover. Range countries have recognized the value of the crocodile to the riverine ecosystem and as a source of sustainable economic benefit, especially through ranching for controlled harvest of skins.

Crocodile Ranching and Export Quotas

Zimbabwe was the first country to develop data about its wild populations of Nile crocodiles and the first to have its proposal for managing the species by ranching accepted by CITES. In ranching operations, some eggs are taken from the wild and reared in captivity. In turn, some of the hatched young are returned to the wild. Ranching has been successful for the Nile crocodile because the animals grow quickly in captivity, particularly during their early years.

In 1984, CITES officials meeting in Belgium devised a quota system as an alternative to ranching, allowing countries to utilize wild populations of Nile croco-

diles. Under the quota system, Nile crocodile populations in nine African countries — Cameroon, Congo, Kenya, Madagascar, Malawi, Mozambique, Sudan, Tanzania, and Zambia — were transferred from Appendix I to Appendix II, subject to export quotas established by agreement of the Parties. In 1986, the Botswana population was added.

In 1987, export quotas were renewed for all 10 countries, and the CITES Secretariat began its species survey in eastern and central Africa and Madagascar. Also in 1987, the FWS reclassified Zimbabwe's ranched and wild populations of Nile crocodiles under the Endangered Species Act from Endangered to Threatened.

At the 1992 CITES Conference of Parties in Kyoto, Japan, Nile crocodile populations in Botswana, Ethiopia, Kenya, Malawi, Mozambique, Tanzania, Zambia, and Zimbabwe were listed on Appendix II under ranching provisions. Populations in Madagascar and Somalia remained on Appendix II under the quota system, although the quota for Somalia is zero at least through 1994. Populations in South Africa and Uganda were transferred from Appendix I to Appendix II with export quotas.

Literature Cited

Brazaitis, P. 1973. The Identification of Living Crocodylians. *Zoologica*. 58:59-101.

Cott, H. B. 1961. Scientific Results of an Inquiry into the Ecology and Economic Status of the Nile Crocodile (*Crocodylus niloticus*) in Uganda and Northern Rhodesia. *Transactions of the Zoological Society of London*. 316-321.

Groombridge B. and L. Wright. 1982. The IUCN Amphibia-Reptilia Red Data Book (Part 1: Testudines, Crocodylia, Rhynchocephalia). 345-354.

Hutton, J.M. 1988. The Status and Distribution of Crocodiles in Kenya in 1988. Annex 1 in: Amendments to Appendices I and II of the Convention Proposals Submitted to Resolution on Ranching; Proponent—Kenya.

Final Listing Rules

Final rules extending Endangered Species Act protection to four species — two plants and two animals — were published in October and November 1993:

- **Star Cactus (*Astrophytum asterias*)** - a small, strikingly attractive plant native to subtropical grasslands and shrublands of the Lower Rio Grande Valley. Habitat modification and collecting for the cactus trade have reduced this cactus to two known sites, one in Starr County, Texas, and one in Tamaulipas, Mexico. Because of continuing threats, the species was listed October 18 as Endangered.

- **Beach Jacquemontia (*Jacquemontia reclinata*)** - a perennial vine in the morning-glory family (Convolvulaceae) endemic to coastal barrier islands in southeast Florida from Miami northward to Palm Beach County. The vast majority of its habitat has been destroyed by urban development. The remaining populations are small, fragmented, and vulnerable to invasions of exotic plant species. On November 24, the beach jacquemontia was listed as Endangered.

- **Giant Garter Snake (*Thamnophis gigas*)** - a non-venomous snake restricted to wetland habitats in portions of California's Central Valley. Due to extensive habitat loss and fragmentation, and the effects of introduced predators, the species is extirpated, or nearly so, throughout two-thirds of its original range. The potential for further habitat loss led the Fish and Wildlife Service to list the giant garter snake on October 20 as Threatened.

- **Oregon Chub (*Oregonichthys crameri*)** - a small fish that historically inhabited sloughs, overflow ponds, and other backwater habitats throughout the Willamette River drainage in Oregon. Habitat modification resulting from dam construction has eliminated the species from 98 percent of its former range. The remaining populations are reduced to an 18.5-mile (30-kilometer) stretch of the Middle Fork Willamette River system. Because of continuing threats, the Oregon chub was listed October 18 as Endangered.

New Plan Outlines Steps to Recover Endangered Fishes of the Colorado River System

by Connie Young

Four Endangered fish species endemic to the Colorado River system are expected to benefit from a new 5-year Recovery Action Plan completed October 15, 1993, by the Fish and Wildlife Service (FWS). The plan calls for protecting river flows, building fish passageways around dams, and releasing limited numbers of hatchery-reared native fish into the wild. It was the result of a multi-agency program to recover the Colorado squawfish (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), bonytail chub (*Gila elegans*), and razorback sucker (*Xyrauchen texanus*) while allowing for future water development.

Along with the plan is an agreement among State and Federal agencies, environmental groups, and water user organizations clarifying how section 7 of the Endangered Species Act will be applied to new and existing water development projects in the upper Colorado River Basin. Completion of actions identified in the plan will be considered by the FWS in its review of new and existing water projects that require a Federal permit.

"Research has shown us what needs to be done; we're now going to begin aggressively implementing actions needed to recover the fish," said John Hamill, an FWS biologist who directs the Recovery Program for Endangered Fish of the Upper Colorado River Basin (Recovery Program). "We will use the Recovery Action Plan to keep the Recovery Program accountable for actions that need to be accomplished to recover the fish."

Highlights of the plan include the following:

- In-stream flows will be targeted for protection in the Colorado, Gunnison, Dolores, Green, Yampa, White, Little Snake and Duchesne Rivers. The most significant changes are in the Green River downstream of Flaming Gorge Dam, and in the Gunnison River below Blue Mesa Dam. On a trial basis, water from these

two dams is being released to mimic historical high spring flows and lower, more stable flows the rest of the year. State and Federal biologists are monitoring effects on endangered fishes.

- Selected dikes, levees, and other barriers to critical wetlands or flooded bottomlands will be removed or altered, making the sites available for use by Endangered fish. Young native fish that use these nutrient-rich areas grow rapidly and become large enough to then fend for themselves in the river. Wetlands targeted for enhancement include the Ouray National Wildlife Refuge on the Green River in northern Utah, a site on the Colorado River near Moab, Utah, and the Escalante State Wildlife Area on the Gunnison River downstream from Delta, Colorado.

- Fish ladders and other passageways will be built to allow Endangered fish to reach more of their historical range. For example, construction is set to start in 1995 on a fish ladder at Redlands Diversion Dam on the lower Gunnison River

and on passageways around agricultural diversion structures on the Yampa River.

- Guidelines are being developed by the FWS and the States of Colorado, Utah, and Wyoming to address the stocking of non-native fish in upper Colorado River Basin lakes and reservoirs. These guidelines will be aimed at minimizing the risks to Endangered fish from predation, competition, and disease associated with non-native species while providing sport-fishing opportunities.

- Recovery Program participants will assist agencies outside the program in evaluating and reducing potential harm to Endangered fish from such environmental contaminants as selenium, petroleum derivatives, heavy metals, and uranium.

- Raising limited numbers of Endangered fish in hatcheries to be stocked in the wild will be evaluated. In 1994, for example, razorback suckers will be stocked in some of the species' historical habitat in the Gunnison River, where

(continued on next page)



Three boys pose with a 17-pound Colorado River squawfish they caught in the Green River in the early 1920's. Colorado squawfish once grew to lengths of nearly 6 feet and were called "white salmon" by early settlers. Now endangered, these fish are found nowhere but in parts of the Colorado River Basin.

Fish and Wildlife Service photo

New Plan

(continued from previous page)

none has been found in recent years. Biologists will evaluate the results of this action over the following 2 years. Also, a plan to reintroduce bonytail chubs throughout the upper Colorado River Basin will be developed by 1995. Bonytails are nearly extinct in the wild.

The viability of the stocking approach is uncertain, however. Hatchery-raised Endangered fish previously stocked in the Colorado River downstream of Lake Powell have not survived. Biologists want to ensure that stocking will be successful before continuing.

Addressing the Impacts of Federal Actions

Section 7 of the Endangered Species Act prohibits Federal agencies from taking actions likely to harm listed species or adversely modify any designated Critical Habitat. If a Federal agency finds that an activity it plans to authorize, fund, or carry out may affect a listed species, that

agency must consult with the FWS. After consultation, the FWS renders a Biological Opinion on the proposed activity. If it finds that the action would likely jeopardize the listed species or adversely modify Critical Habitat, the FWS must identify any possible "reasonable and prudent alternatives." The FWS is responsible for assessing the impacts on Endangered Colorado River fishes from any water projects that require section 7 consultation. In the January 29, 1993, *Federal Register*, the FWS proposed to designate Critical Habitat for the four Endangered Colorado River fishes (see *Bulletin, Vol. XVIII, No. 2*), and a final decision is expected by March 1994.

Under the new agreement, the FWS will determine if enough progress has been made toward restoring the Endangered fish to allow implementation of the Recovery Action Plan to serve as a reasonable and prudent alternative in any jeopardy Biological Opinion. If not enough progress is being achieved, Biological Opinions for new and historic projects will identify which actions in the Recovery Action Plan must be completed to avoid jeopardy.

Without this section 7 agreement, operators of existing water projects would have sole responsibility to offset any harm their projects could cause Endangered fish.

"The agreement represents a significant departure from the traditional approach to section 7 consultation on water development projects," Hamill said. "Instead of relying on project sponsors to offset the impacts of a project, the Service will consider the accomplishments of the Recovery Program. This approach has benefits both for water developers and Endangered fishes."

Recovery Program participants are the Fish and Wildlife Service; U.S. Bureau of Reclamation; Western Area Power Administration; States of Colorado, Utah and Wyoming; Colorado River Energy Distributors Association; water developers; and environmental organizations.

For more information, call the FWS Denver Regional Office at (303) 236-2985.

Connie Young is the Information and Education Coordinator for the Colorado River Recovery Program in the FWS Denver Regional Office.

Diseases Cited in California Sea Otter Deaths

Concerned that the growth rate for the California population of the southern sea otter (*Enhydra lutris nereis*) was not achieving the success of the species elsewhere, the recovery coordinator enlisted the expertise of the National Wildlife Health Research Center to determine the cause of death for the 22 marine mammals found dead during 1992.

"Despite the small sample size, we found the frequency of fatal infectious disease unusually high in comparison with other endangered or threatened species," said Dr. Nancy Thomas, veterinary pathologist at the Madison, Wisconsin, health laboratory. "The deaths of 10 animals were attributable to infectious or parasitic diseases."

During the 1980's, southern sea otter recovery efforts focused on developing

the recovery plan and implementing the highest priority tasks—minimizing threats and risks of oil spills and minimizing incidental take in fishing gear. Through Region 1, the recovery program coordinator recommended standards of operation for offshore oil development and coastal tanker traffic and initiated the sea otter translocation program as the cornerstone task to minimize oil spill risk. California State legislation prohibited gillnet fishing in waters 30 fathoms and less, reducing the level of incidental take to nearly zero. In 1989, a new recovery team was established to review and revise the 1982 southern sea otter recovery plan. Despite these initiatives, the growth rate of the California sea otter population has been well below that of most of the

populations in Washington, Alaska, and Canada.

Infectious diseases identified in southern sea otters included coccidioidomycosis, aberrant acanthocephalan parasite migration, and protozoal encephalitis.

Three sea otters from San Luis Obispo County were diagnosed as dying from coccidioidomycosis, also known as San Joaquin Valley fever, which is caused by the fungus *Coccidioides immitis*. The organism grows in its vegetative (hyphal) form in the soil, infecting humans and animals most commonly via windblown spores. Animal-to-animal transmission is a rare event. Endemic to certain areas of the southwestern United States, particu-

(continued on page 20)

Diseases Cited in Sea Otter Deaths

(continued from page 19)

larly the Central Valley of California, this disease is only sporadically reported in other areas of the State. Every year since 1971, a few cases of human coccidioidomycosis were reported in San Luis Obispo County; however, there were dramatic increases in such cases in 1978 and 1992. One sea otter found in San Luis Obispo County in 1976 had this disease, although as far as we know it is not a common diagnosis as a cause of morbidity or mortality in the animals.

Five sea otters—1 adult and 4 immature—were diagnosed as dying from aberrant acanthocephalan parasite migration into the abdominal cavity. While certain species of acanthocephalans are normal inhabitants of the intestinal tract of sea otters, the aberrant migrating acanthocephalans are larval stages that have passed through the intestinal wall and attached to many abdominal organs. Parasitologists at the University of Nebraska have tentatively identified the migrating acanthocephalans as belonging to a group that usually infects birds—primarily gulls or scoters—and may be transmitted through ingestion of anomuran sand crabs. Although this problem has rarely been cited in individual sea otters in the past, it may be emerging as a potentially significant population health problem.

Two sea otters found convulsing on a beach in San Luis Obispo County were found to have encephalitis caused by a protozoal parasite, not definitely identified to date. This is a newly identified problem in the otters.

Causes of death in 12 sea otters included emaciation or mating wounds or both (7), various types of trauma (4), and intestinal perforation with twisting of the intestine (1). These causes of mortality have been reported in sea otters in the past.

“When monitoring the status of Endangered, Threatened, or candidate species, we are constantly challenged with early detection of insidious threats,” said

Carl Benz, wildlife biologist at the Ventura, California, field office. “Because of the support of the National Wildlife Health Research Center, the Service can be attentive to the problem of infectious and parasitic diseases and their threat to the recovery of the southern sea otter and the health of the nearshore ecosystem.”

Necropsies of southern sea otters at the National Wildlife Health Research Center in 1993 have documented some of the same disease problems, including coccidioidomycosis, acanthocephalan peritonitis, and protozoal encephalitis. The Center will continue comprehensive necropsies in order to provide important information to aid the recovery of this Threatened species.

Material for this article was provided by Dr. Lynn Creekmore, Wildlife Disease Specialist, and Dr. Nancy Thomas, Endangered Species Pathologist, both of whom are with the National Wildlife Health Research Center in Madison, Wisconsin. The Center is a unique Federal research facility dedicated to research, diagnosis, and prevention of disease in free-ranging wildlife. Carl Benz, the FWS Southern Sea Otter Recovery Program Coordinator from 1979 to 1993, also provided material. Mr. Benz is now executive secretary to the recovery team and Assistant Supervisor of the FWS Ventura, California, Office.

Reclassification Proposals

(continued from page 1)

possibility of erosion from logging within the lake watershed, and the potential damage or destruction of the single population from chance events.

* * *

The reclassification proposals recognize the improved status of these plants. Even if reclassified, however, both species will continue to receive Endangered Species Act protection until they are fully recovered. With the continued cooperation of Federal and State agencies, conservation organizations, and concerned landowners, the FWS will work to restore both plants as secure, self-sustaining members of their ecosystems.

Taiwan and China Warned

(continued from page 4)

ing; (3) development and implementation of a comprehensive law enforcement and education action plan; (4) increased law enforcement penalties; and (5) prompt termination of amnesty periods for illegal holding and commercialization.

The FWS is participating in two CITES delegations to China and Taiwan, as well as to Korea. The first is to provide technical assistance, and the second is to evaluate their progress between now and the upcoming March 1994 CITES Standing Committee meeting. In addition, the United States is sending its own delegation, consisting of FWS CITES and law enforcement experts, and staff from the Department of Justice, to help these countries make progress in ending the trade. The FWS is also participating with the Department of Interior's Office of Policy Analysis in an interagency task force led by the National Security Council to assist China and Taiwan in eliminating their illegal wildlife trade and to evaluate their progress by the March 1994 deadline.

Denise Henne is with the Branch of Correspondence and Information, Office of Administration, Fish and Wildlife Service, Washington, D.C.

Regional News

(continued from page 2)



Fish and Wildlife Service photo

whooping cranes at Aransas National Wildlife Refuge, Texas

The report is available for \$35 from the Captive Breeding Specialist Group, Species Survival Commission, IUCN—the World Conservation Union, 12101 Johnny Cake Ridge Road, Apple Valley, Minnesota 55124.

* * *

Region 3 - The FWS East Lansing, Michigan, Field Office met recently with the Michigan Department of Natural Resources to provide input to the State's lake sturgeon (*Acipenser fulvescens*) conservation plan. Before the plan is implemented, several issues need to be addressed, including stock translocation policy, egg viability studies, and the collecting and analyzing of contaminant data. A wildlife ecosystem risk assessment will also need to be developed. The FWS has considered the lake sturgeon a category 2 listing candidate since 1982.

* * *

The FWS Bloomington, Indiana, Field Office participated in developing a Memorandum of Understanding (MOU) for the construction of transportation projects within the karst region (a limestone region with sinkholes, under-

ground streams, and caves) in the State of Indiana. This issue was prompted by potentially harmful impacts of highway construction on the environment of karst fauna, particularly the northern cavefish (*Amblyopsis spelaea*), a category 2 listing candidate. Signatories to the MOU are the Indiana Department of Transportation, Indiana Department of Natural Resources, Indiana Department of Environmental Management, and FWS.

Under the MOU, all sinkholes, caves, underground streams, and other karst features in the area will be located, and surface and subsurface drainage patterns will be identified, prior to the design phase of any transportation project. The data will be used as a tool to plan project alignments that avoid as many karst features as possible. Any drainage directed to these features will be filtered using a variety of techniques currently being tested. Hazardous materials traps will be installed on all projects. Water quality entering a karst feature will be monitored and maintained at an established standard. Finally, strict erosion control specifications for the construction phase of each project will be established.

* * *

Researchers from the FWS National Fisheries Research Center in LaCrosse, Wisconsin, found many freshly-dead mussels buried under sand on the bottom and along the shoreline of the Mississippi



Fish and Wildlife Service photo

The Higgins' eye pearly mussel is one of several endangered mollusks affected by the 1993 midwest flood.

River near LaCrosse. Two Endangered Higgins' eye pearly mussels (*Lampsilis higginsii*) were among the dead found. It is possible the mussels were killed by massive sedimentation and substrate disturbance from the 1993 floods.

* * *

Region 4 - Biologists conducting a status survey of the flatwoods salamander (*Ambystoma cingulatum*) in Florida found only one population east of the Suwannee River. Although historical records for this listing candidate exist for 5 counties in northeast and north-central Florida, the Osceola National Forest was the only locality outside the Florida panhandle where the species was found during the survey. Biologists from the Florida Natural Areas Inventory observed flatwoods salamanders at 39 of 111 wetlands they examined. Using estimates of

(continued on page 22)



photo © John G. Parris

gravid female flatwoods salamander captured at an ephemeral pond breeding site

Regional News

(continued from page 21)

potential migration distances from breeding ponds as a means of defining population limits, the survey verified the presence of 34 breeding populations.

Flatwoods salamanders historically occurred in low, wet, pine flatwoods and grass-dominated savannas of the southeastern coastal plain from Alabama to southern South Carolina. Rangewide status surveys continue. These surveys target breeding ponds because they represent discrete locations that can be sampled efficiently. The typical breeding pond in Florida was found to be a small, shallow, ephemeral pond with an open canopy composed primarily of pond cypress (*Taxodium ascendens*) and slash pine (*Pinus elliottii*), with an occasional blackgum (*Nyssa sylvatica* var. *biflora*). These ponds generally filled with water in late autumn or early winter, and began to dry in April and May with the onset of the growing season. Pond bottoms were firm and relatively devoid of leaf litter but covered by a combination of grasses, sedges, rushes, and herbaceous vegetation. Crawfish burrows were common, but large, predatory fish were absent due to the isolation and ephemeral nature of the ponds.

Threats to the salamander include habitat conversion for agriculture, silviculture, and real estate development; herbicide and fertilizer application; erosion resulting from road construction; and bait harvesting. The elimination of native ground cover vegetation and the ditching and draining of breeding ponds may have extirpated the flatwoods salamander from many private timberlands. Native ground cover has been eliminated by fire suppression and the resultant shrub invasion, the establishment of pine plantations with dense stocking rates and closed canopies, and soil alteration during mechanical site preparation.

* * *

Region 5 - Staff from the FWS regional and field offices are continuing their participation in the New England

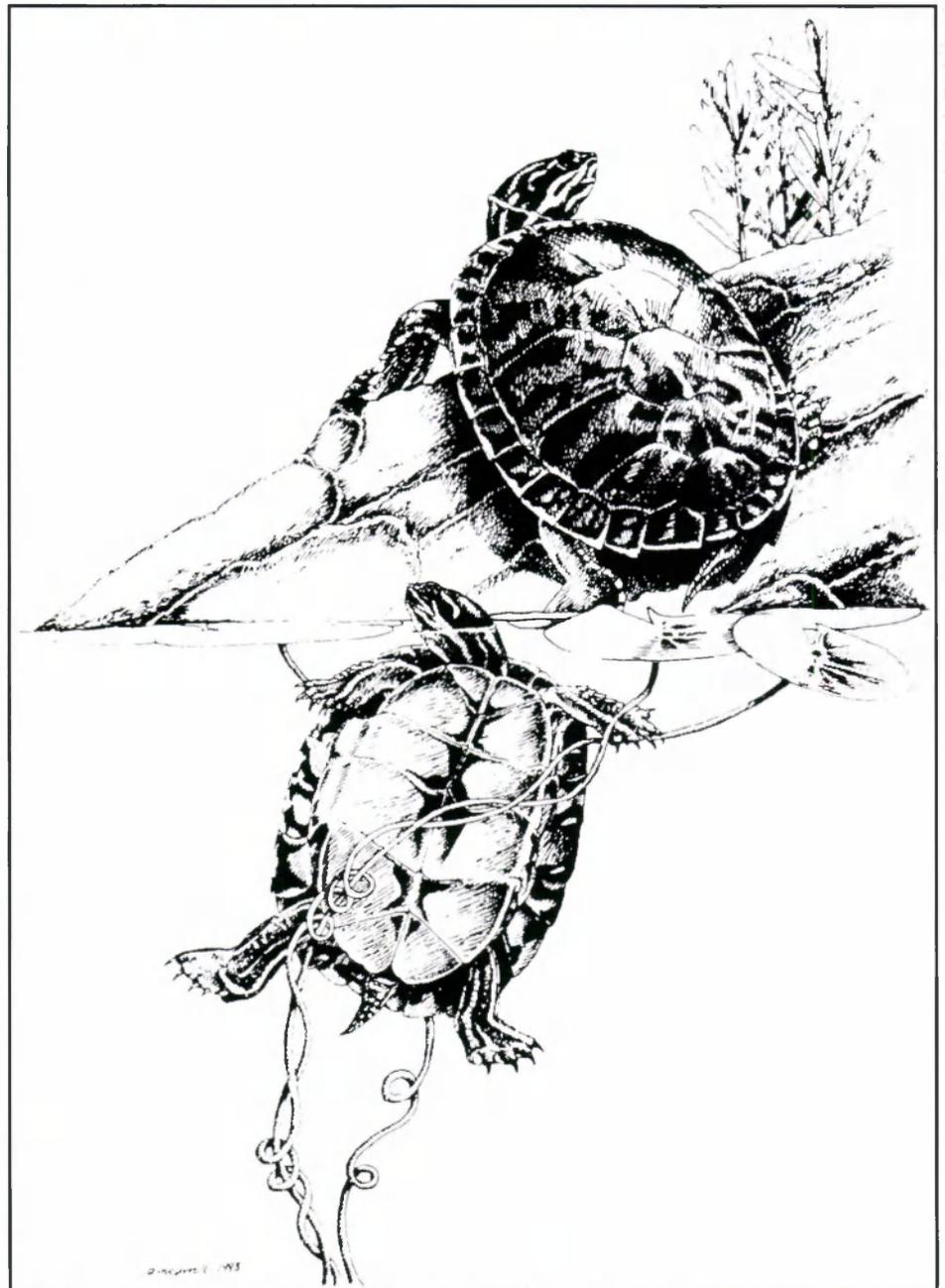
Plant Conservation Program (NEPCoP), a voluntary alliance of 68 private institutions and government agencies, organized in 1991 to promote the survival and recovery of New England's endangered flora. NEPCoP is a prototype for a nationwide tier of regional programs to bridge the gaps between national, State, and local plant protection programs.

With the goal of protecting plants and their natural habitats, NEPCoP aims to develop consistent approaches in different States regarding such issues as taxonomy, habitat management, status determinations, and reintroduction.

A Regional Advisory Council, including FWS staff, oversees these policies and all regional elements. State task forces, the heart of the program, survey plant populations, suggest management strategies, and collect seed for banking and propagation.

The need for plant conservation on a national and regional level has been highlighted by the fact that about 50 percent of the species listed under the Endangered Species Act are plants. Of New England's 2,000 native plant species, about 500 may be in trouble. Because

(continued on next page)



drawing by David Carroll

Plymouth redbelly turtles

Don't Forget!

Forget that April 15 is Tax Day.

Forget your best friend's birthday.

Forget the summer of '42.

Just don't forget to fill out your *Bulletin* mailing list response card.

Why?

Because you wouldn't want to miss a single issue of the *Endangered Species Technical Bulletin*, would you?

Think about it—you get information on listed, proposed, and candidate species, the latest on regional activities, and challenging accounts of endangered species research, all brought to you on a bimonthly basis thanks to the accuracy of the mailing label printed on the back cover of each *Bulletin* issue.

But what if you've moved recently and failed to let the *Bulletin* staff know? Chances are changes haven't been made to your mailing address, and you're not getting the endangered species information you deserve on a timely basis.

Also, since the mailing list is maintained at Federal expense as a courtesy to readers, the *Bulletin* staff need to make sure those on the list want to continue receiving the publication.

So take a moment to tear out the response card provided below and indicate whether you wish to continue to receive the *Bulletin*. Also make desired changes to your mailing address. If the address is incorrect, print your correct address in the space provided on the card. Then return the postage-paid card no later than May 1, 1994. If it has not been received by that date, your name will be removed from the mailing list.

And then how would you know what was going on with the Peters Mountain mallow, the Kootenai River white sturgeon, the Last Chance townsendia, the spectacled eider...

Regional News

(continued from previous page)

listed plants on privately owned lands do not receive the same protection under the Act as listed animals, voluntary cooperation for plant protection is essential.

Public education will play an increasingly important role in enlisting volun-

tary cooperation for plant conservation. The New England Wild flower Society, an affiliate of NEPCoP, has begun a 10-year project to create the New England Garden of Rare and Endangered Plants at its botanical garden in Framingham, Massachusetts. In addition to providing the public an opportunity to see rare plants, the Society will begin an intensive education effort regarding habitat conser-

vation and the importance of maintaining plant diversity. The FWS New England field offices anticipate assisting with this education and outreach effort.

* * *

The Plymouth redbelly turtle (*Pseudemys rubriventris*) was the first freshwater turtle in the United States

(continued on page 24)

Regional News

(continued from page 23)

listed as an Endangered species. Since its listing in April 1980, extensive research and recovery actions have greatly changed the status of the species, located only in Massachusetts. Once considered a separate subspecies (*P. r. bangsi*), the Plymouth redbelly is now regarded instead as a disjunct population, isolated by more than 250 miles from other redbelly turtles in seven coastal plain States to the south.

Measures being taken to increase hatching success include finding the nests and protecting them with wire screens. In 1993, Dr. Terry Graham (a professor who has been studying the Plymouth redbelly since 1969) and two Worcester State College biology students located and protected 71 redbelly nests. A total of 675 hatchlings emerged from the nests in August, September, and October. Dr. Graham and his students marked most of the hatchlings and released them into the nearest pond. Continuing a tradition begun in 1985, these recovery cooperators retained a number of hatchlings (153 in 1993), which they provided to a host of volunteer organizations for "head-starting" over the winter. The head-started turtles should grow rapidly and be less vulnerable to predation when they are released next June. Since 1985, 810 head-started hatchlings have been released into

Category	ENDANGERED		THREATENED		LISTED SPECIES TOTAL	SPECIES WITH PLANS
	U.S.	Foreign Only	U.S.	Foreign Only		
Mammals	55	251	9	22	337	37
Birds	73	153	17	0	243	73
Reptiles	17	63	18	14	112	30
Amphibians	6	8	5	0	19	9
Fishes	61	11	39	0	111	62
Snails	12	1	7	0	20	26
Clams	50	2	6	0	58	40
Crustaceans	11	0	2	0	13	4
Insects	17	4	9	0	30	15
Arachnids	4	0	0	0	4	0
Plants	326	1	78	2	407	178
TOTAL	632	494	190	38	1,354*	474**
Total U.S. Endangered	632		(306 animals, 326 plants)			
Total U.S. Threatened	190		(112 animals, 78 plants)			
Total U.S. Listed	822		(418 animals, 404 plants)			

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

** There are 377 approved recovery plans. Some recovery plans cover more than one species, and a few species have separate plans covering different parts of their ranges. Recovery plans are drawn up only for listed species that occur in the United States.

Number of CITES Party Nations: 120

February 2, 1994

16 Plymouth County ponds and one river. If these young turtles eventually enter the breeding population and nest

successfully, the prognosis for recovery appears bright. A revised recovery plan will be available by spring 1994.

January/February 1994

Vol. XIX No. 1

ENDANGERED SPECIES

Technical Bulletin

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

FIRST CLASS
POSTAGE AND FEES PAID
U.S. DEPARTMENT OF THE INTERIOR
PERMIT NO. G-77

