

ENDANGERED *Species* BULLETIN

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Human beings are the only living things that care about lines on a map. Wild animals and plants know no borders, and they are unaware of the social and economic forces that determine their future. Because many of these creatures are migratory or distributed across the artificial boundaries that we humans have drawn, they cannot be conserved without the cooperation of government, private sector, and scientific partners in each of the affected countries. Such wide-scale participation is essential for applying an ecosystem approach to wildlife conservation. This edition of the Bulletin features some examples of cooperative activities for the survival and recovery of rare plants and animals in Mexico and bordering areas of the United States.



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On the Cover

A lesser long-nosed bat feeds on the nectar of a saguaro cactus flower, at the same time gathering and depositing pollen for the next seed crop.

Photo © Merlin D. Tuttle, *Bat Conservation International*

Opposite page

The pond at Quitobaquito provides vital desert wetland habitat for unique fish, turtle, and snail species.

Photo by Sue Rutman/NPS

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

We also welcome your comments and ideas. Please e-mail them to us at esb@fus.gov.

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Conserving Wildlife of the Americas: Mexico's Strategic Role

*M*exico's geography is one of the keys to understanding why it comes fourth on the list of the world's biologically "megadiverse" nations—around a dozen countries, mostly in the tropics, that harbor some 70 percent of all the world's biological diversity (ecosystems, species, and genes).

With its northern half bordering the United States, Mexico shares arid deserts, Mediterranean scrub, and temperate forests with continental North America. In the south, tropical rainforests have penetrated northwards from South America. This arises because Mexico straddles two floristic kingdoms: the Boreal (or Nearctic), which extends across North America, Europe, and Russia, and the Neotropical, centered primarily on the Amazon basin and the Andean foothills.

Between these extremes of latitude, tropical dry forests and montane cloud forests grow in climatic zones that favor unique combinations of species from both north and south. Cacti and tropical trees dominate in the former, while oaks and sweetgums shelter tree ferns, bromeliads, and epiphytic orchids in the latter.

Marine biodiversity is also extremely high, as Mexico's coastline is washed by both the Pacific and Atlantic Oceans (with their particular complement of whales, sea turtles, dolphins, and fish), as well as the Caribbean Sea (where Mexico is host to the second largest coral barrier reef in the world), and the Gulf of California ("the aquarium of the world," with its unique ecology and

marine life). Deep marine trenches with thermal vent ecosystems independent of solar energy add to the enormous complexity of our biodiversity.

And it is precisely because Mexico's biodiversity is derived from this mix of elements from geographically distant regions that we are strategically placed to conserve an important share of the ecology and wildlife of the Americas. We are committed to act as a bridge in many ways.

To this end, Mexico's Environment Ministry has implemented special programs to conserve the ecology and environment of the northern states bordering the U.S., in active coordination with similar programs enacted by the U.S. government. In our southern states, the Mexican program of the Mesoamerican Biological Corridor seeks to ensure that the ecological functionality of tropical ecosystems shared with Central America is conserved intact, along with the huge diversity of wildlife for which they provide a habitat.

These programs, together with our increasingly effective system of Protected Natural Areas (totaling nearly 40 million acres (16,187,480 ha) in all ecosystem types), our efforts to promote sustainable



forestry and fishing activities, and our full implementation of international agreements (such as the Ramsar Convention on wetland conservation), guarantee the conservation not only of those species unique to Mexico or resident in our country, but also migratory species from the U.S. and Central and South America that depend on refuges in Mexico for their continued survival.

The United States and Mexico are proud of a very fruitful tradition of cooperation for the conservation of ecosystems and their biodiversity, a tradition that began decades ago with migratory birds and sea turtles, long before Mexico reformed and strengthened its national institutions charged with conserving nature. In the next few years, we anticipate this cooperation will become yet broader and closer, and that our achievements will be plentiful.

The establishment of “sister” parks, the return of the California condor to the Baja Peninsula, the comeback of the Kemp’s ridley sea turtle, working across broad landscapes to conserve species of common conservation concern, expansion of our protected wetland systems, bird monitoring and capacity building—these are but a few examples of how the biodiversity of the Americas can be better conserved through collaboration now and in the near future to guarantee long-term success.

Victor Lichtinger is the Secretary for the Environment and Natural Resources in Mexico.

Conservation Along the Border

by Susan D. Jewell

*F*lying, running, hopping, and swimming—back and forth daily or annually, they pay no heed to that imaginary line we know as the U.S.-Mexican border. That describes many species of birds, fish, mammals, reptiles, and an insect (the monarch butterfly) that migrate across this border, and countless more with geographic ranges that straddle it. All of these species face the usual hazards we hear so much about: development, pollution, overharvesting, disease, and nonnative invaders to name a few. But the ones that cross the border also face different conservation laws and different cultures. In the pages that follow, you'll see how some of these species are faring and how their best chances for survival will be from a contingent of caring humans on both sides of the border.

Conservation was a part of both federal governments long before “endangered species” became household words. The Convention for the Protection of Migratory Birds and Game Mammals was established between Mexico and the United States in 1936. In 1975, the Mexico-U.S. Joint Committee on Wildlife and Plant Conservation was formed to facilitate cooperation. This was consolidated with a committee that included Canada into one Memorandum of Understanding in 1996 that established the Canada/Mexico/United States Trilateral Committee for Ecosystem and Wildlife Conservation and Management (see “One Continent for All” in *Bulletin* Vol. XXIV No. 5). The Trilateral, as we call it, has brought biologists and land managers of the three North American

countries together to ease the sometimes complicated task of working across political boundaries, particularly between Mexico and the U.S. With Canada, communication and travel across the border have minimal complications, since we share a common language and an unfortified border.

The Trilateral meets once a year to report on progress of conservation activities and to bring new issues to the table. During the rest of the year, the real work continues. Some of the accomplishments that have occurred through the Trilateral have helped species that were critically imperiled in our southwestern border region, such as the black-footed ferret and the California condor. Our biologists are working with Mexican and American partners now to recover the light-footed clapper rail, the Quino checkerspot butterfly, the ocelot, and many other species. We hope to report good news with these species in the coming years.

Of critical importance in working across the border is the role of the State conservation agencies. The California Department of Fish and Game, Arizona Game and Fish Department, New Mexico Department of Game and Fish, and Texas Parks and Wildlife Department represent the States that hug the Mexican border. These agencies maintain close working relationships with the Mexican border states: Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas. Frequently, they work with the U.S. Fish and Wildlife Service toward recovery of species that are on our priority list, such as the Sonoran prong-

horn, and sometimes we depend on them to lead recovery efforts for local species at risk. For example, the Arizona Game and Fish Department is planning to reintroduce the Tarahumara frog into Arizona from stock collected in Mexico. Although this frog was extirpated from the U.S., it is not on the federal endangered species list and is not a recovery priority for the Service. Here the State biologists are playing an important role in restoring native fauna.

Although homeland security remains a national priority, federal and state agencies on both sides of the border, as well as private landowners, volunteers, Tribes, and organizations, will continue to find ways to work together within the given limits.

Susan Jewell is a biologist in the Service's Endangered Species Program in Arlington, Virginia, office and the U.S. co-chair of the Trilateral Committee's Shared Species Working Table (Susan_Jewell@fws.gov).

The Kemp's Ridley: Recovery in the Making

by Bryan Arroyo, Patrick Burchfield, Luis Jaime Peña, Les Hodgson, and Patricia Luevano

The Kemp's ridley sea turtle (*Lepidochelys kempii*) received legal protection in Mexico in the 1960s and in 1970 in the United States. As is often the case, this species' decline began many years before receiving legal protection.

A 1951 article in *Zoologica* by John Werler included notes on Kemp's ridley nesting on the Gulf Coast at North Padre Island, Texas, in 1950. Investigating that account, the late famed naturalist Archie Carr contacted Werler's source—Jessie Lawrence—and determined that Lawrence had also previously observed a nesting ridley in 1948 on Padre Island's Big Shell Bank.

These represented the only scientifically documented Kemp's ridley nests until 1963, when Henry Hildebrand of Corpus Christi, Texas, screened a 1947 film at a conference of herpetologists,

solving the mystery of where Kemp's ridleys came ashore to nest. About 40,000 turtles crawled ashore during that massive nesting aggregation known as an "arribada." The site was at Barra Coma, a sand bar roughly 2 km (1.2 mi) from the small cattle ranching community of Rancho Nuevo in Tamaulipas, Mexico.

Also in 1963, a building contractor from Brownsville, Texas, and his associates from the Brownsville Sportsman Club brought ridley eggs from Rancho Nuevo to South Padre Island and buried them in the sand to establish a second



A Kemp's ridley returns to the sea after nesting.

Photos by Bryan Arroyo



Above and following page: Artisans from the community of Tepehuajes, Mexico, produce quality ceramics inspired by sea turtles, giving them pride in protecting these vulnerable animals.

nesting colony. This was the first time the Kemp's received help outside of the agencies and nongovernmental conservation groups.

In 1966, biologists Humberto Chavez, Martin Contreras, and Dr. Rene Marquez (of Mexico's Instituto Nacional de Pesca) went to Rancho Nuevo to survey the remaining Kemp's ridley population and to establish a conservation effort for the diminishing population. In 1978, experts from Mexico and the U.S. determined that without drastic steps, the species would disappear. Students and biologists from the U.S. were sent to Rancho Nuevo to assist their Mexican counterparts at the primary nesting beach.

The number of protected nests and hatchlings doubled that first season due to increased help and equipment.

Simultaneously, a second nesting beach in the U.S. at Padre Island National Seashore was established by transferring eggs there to hatch. Once experimentally imprinted on that beach, the hatchlings were gathered up and "headstarted" (raised to larger size) at the Galveston National Marine Fisheries Service Lab for several months to lessen the number of predators that are able to eat them.

The first few years of work were disappointing, with the numbers of nests declining to an all time low of 702 nests for 1985 (estimated 270 females). This species requires between 10 and 15 years to reach maturity. Almost the entire nesting population of Kemp's ridleys nested in this small, isolated stretch of beach near Rancho Nuevo. The effort began with five students led by Dr. Marquez and Dr. Peter Pritchard of the Florida Audubon Society. The Gladys Porter Zoo of Brownsville assumed responsibility for the U.S. crew in 1981, one of the few times that a nongovernmental entity has taken the lead for recovery implementation of an endangered species.

The population now appears to be expanding and is probably using historic nesting sites. Accordingly, the Mexican and U.S. teams now operate six camps in Tamaulipas and one in Veracruz, and collectively patrol more than 100 miles (166 km) of coastline several times daily to protect nesting females and eggs. In 2002, we protected more than 6,300 nests. We are on our way to achieving our goal of establishing the downlisting criteria of 10,000 females (as identified in the 1992 Recovery Plan).

Regardless of the legal protections and the potential for violation enforcement, recovery can only be achieved through the cooperation and commitment of the Tamaulipas communities. In the past, some local residents poached sea turtle eggs to sell in the lucrative black market for their supposed magical

and aphrodisiac powers. To deal with this, the traditional approach was to increase law enforcement. But such approaches can cause local resentment without effectively dealing with the problem. Instead, we pursued a nontraditional approach: addressing the need of the residents for a source of revenue to survive.

Thus was sparked the entrepreneurial spirit of the local residents. With the help of partners, the community created a beneficial economic venture that makes more money by protecting the turtles than by harming them.

The project blends the peoples' heritage with art and tourism in the community of Tepehuajes in the State of Tamaulipas. The people learned how to make ceramic items in turtle shapes and designs, such as salt and pepper shakers, wine coolers, and napkin holders. The local jurisdiction donated the lands to build the physical structure. The state donated the construction materials, engineering, and labor. Mexican university ceramic art experts spent three months training the local residents to make ceramic creations. The University of Texas at Brownsville sent expert kiln operator Nancy Slight to teach the people how to use their equipment and helped with the selection of clays.

Partners in the seafood industry and at Ocean Trust are helping with the marketing plans and development of online catalogs to serve as outlets. After almost two years of training and many trials, the artisans from Tepehuajes are producing quality ceramics. When visiting their facility, pride shines in their eyes and their commitment is unmistakable. No longer do they steal turtle eggs, fearful of prosecution and guilt.

The community is also engaged in educational efforts with children. At the La Pesca Camp, a natural history museum was built with contributions from partners. Exhibits on sea turtles emphasize Kemp's ridleys, or *tortuga lora* as they are known in Mexico. The children are learning that their beaches hold the future of the Kemp's ridleys. The children will become the leaders and residents of these communities, and with their commitment to the natural environment, the Kemp's ridley and other species will survive.

Bryan Arroyo, Assistant Regional Director/ Ecological Services, Region 2; Dr. Patrick Burchfield and Luis Jaime Peña, both Gladys Porter Zoo; Les Hodgson, Conservation Director, National Fisheries Institute; and Dr. Patricia Luevano, Tamaulipas, Mexico.

The Turtles' Friends

This project represents a unique partnership of federal, state and local government agencies in both countries; industry; conservation NGO's; and the people of the Tamaulipas coastline: Mexico's Instituto Nacional de Ecología - SEMARNAT • State Government of Tamaulipas- SEDUE • U.S. Fish and Wildlife Service • National Marine Fisheries Service • National Park Service • Texas Parks and Wildlife Department • U.S. Geological Survey • Gladys Porter Zoo • Sea Turtle Inc. • San Antonio Zoo • Aquarium of the Americas • Help Endangered Animals-Ridley Turtles (HEART) • Center for Marine Conservation • CANAINPES • National Fisheries Institute • Texas Shrimp Association • Gulf States Marine Fisheries Commission • Marco Sales • Ocean Trust • fishing and shrimping industries of Mexico and U.S. • Darden Restaurants • Penguin Frozen Foods • Contessa Foods • Ocean Garden Products • Campeche Sea Food Products • Bubba Gump Shrimp Company • Zimco Marine • Eastern Fish • American Honda Motor Company, Inc. • H.E.B. • Phillips Petroleum • API Altamira • Universidad del Noreste • Universidad Michoacana de San Nicolás Hidalgo



Conserving Cacti in México

by Ariel Rojo and
Eduardo Peters

The boojum (*Fouquieria columnaris*) has an appearance that fires the imagination. For most of the year it is leafless and looks like a giant upturned carrot. Its common name was coined by the explorer Godfrey Sykes, who found it in 1922 and said "It must be a boojum!" He was referring to the strange and mythical creature that the author Lewis Carroll called a boojum in his children's book, *The Hunting of the Snark*. The Spanish common name for this plant is cirio, referring to its candle-like appearance. It is not a cactus but a stem succulent.

Photo by Michael Bender

Some of the most attractive plants in the world are the cacti. These plants are associated mainly with deserts, though they can also be found in temperate forests and even in tropical zones. Their adaptations have caught the attention of many naturalists and scientists all around the world, and collectors appreciate enormously the great variety in their forms and flowers. The family Cactaceae, endemic to the Western Hemisphere, contains about 1,800 species. Although its origins may be in the Caribbean, diversification of cactus taxa has reached a peak in México, where 48 genera (73 percent endemic) and 850 species (85 percent endemic) are found.

One of the most amazing places where cacti have diversified is in the north of the country in the Chihuahuan Desert, the largest desert in North America, of which 80 percent is in México and 20 percent is in the United

States. This ecoregion is considered one of the most biologically rich and diverse deserts in the world, with 3,500 plant species, many of them endemic.

Threats

The cactus family is faced with growing environmental threats, including urban sprawl, expansion of the agricultural frontier, introduction of exotic species, overgrazing by cattle, uncontrolled tourism, and poaching driven by the demand of exotic plant markets. All of these threats are particularly harmful to cactus species because many of them have small populations, making them very vulnerable to extinction. Many of the genera are included on CITES (Convention on International Trade in Endangered Species) Appendix 1, and the entire family is on Appendix 2. Also, 34 percent of the species are included in the Plant Red List from IUCN (International Union for Conservation of Nature and Natural Resources). The IUCN includes 286 species and the Mexican Government includes 257 species in the NOM-ECOL-059 (México's endangered species law).

Conservation

This risky situation has prompted conservation actions at the federal, state, and local levels. Perhaps the most favorable action was the recognition of Natural Protected Areas, of which many exist in México. Along the México-U.S. border, the Pinacate and Altar Desert Biosphere Reserve, a marvelous volcanic region adjacent to Arizona, and the Cañon de Santa Elena in Chihuahua and Maderas del Carmen in Coahuila, both of them in neighboring Texas, are designated as Flora and Fauna Protection



Areas. Within interior regions we can find some other examples of protected areas with cacti relevance: the Vizcaíno Biosphere Reserve in Baja California Sur; the Colorado River Delta and Upper Gulf of California; and the Valley of the Cirios, one of the best-conserved natural treasures on Earth (with one of the most fascinating plants in the world, the Cirio or Boojum Tree) in Baja California. Near México City, the Tehuacán-Cuicatlán Biosphere Reserve in the states of Puebla and Oaxaca contains a great diversity of columnar cacti.

These actions seem to be the best approach because they encourage *in-situ* conservation. However, they do not include all the places a conservationist would like, and many endangered species do not inhabit these protected regions. Therefore, the Méxican government has been promoting, since about five years ago, the System of Units for Conservation and Management of Wildlife, known as UMAs. These units intend to revalue the wildlife—mainly its use, management, and sustainable appropriation of the resources. They are based on a management plan that incorporates activities such as censuses of the populations and demographic research about particular species. The underlying idea is to conserve the natural habitat and, at the same time, obtain some rewards from doing it. This scheme operates very well with regard to creating opportunities for hunting mule deer, turkeys, pigeons, and other game. The UMAs are focused on animals, but as an added value they conserve cacti and other species. By the year 2000, the UMAs strategy had incorporated almost 3,200 units that represent about 28 million acres (11,330,000 ha), mainly in the north of the country.

Hopefully, the increasing conservation efforts will be able to withstand the environmental degradation that the deserts in México have been suffering, and reduce the threats to their long-term sustainability.

Uses

Because of their unusual morphology and their attractive flowers, cacti are very attractive and many species have been commercialized intensively. In addition to their ornamental value, species have other uses, depending on places and cultures. Based on archaeological evidence—fossilized feces—it has been shown that cacti were consumed by humans at least 9,000 years ago. Even today, people use them as food in a great variety of dishes and presentations, for forage and fodder, as construction material to build fences, for medicinal purposes, and even in religious rituals.

There are some very specific uses for cacti. For instance, the Aztecs prized the rich red color extracted from the dried bodies of insects that were raised on cladodes (leaf-like branches) of many species of prickly-pear cacti. The cochineal dye of the Aztecs became highly prized in Europe. In the sixteenth century, Cortés was instructed to send as much of the pigment as possible back to Spain.

Future

In México, there is an increasing need to take urgent actions to protect cacti and their environments. Federal and state governments, research institutions, conservation groups, conscientious private-sector leaders, and ecotourism operators have been contributing to growing appreciation of the environment and recognizing the need for concrete conservation action. The challenge is to concentrate these efforts into real, long-standing sustainability.

Ariel Rojo and Eduardo Peters are with the Instituto Nacional de Ecología, México, which has the mission of generating technical and scientific information about environmental problems, providing human resources training, providing information, supporting decision making, encouraging environmental protection, and promoting the sustainable use of natural resources.



Species in the cactus genus *Ariocarpus* are often called “living rocks” for their inconspicuous appearance. Most are endemic to México, but *A. fissuratus* (above) extends northward from México into parts of southwestern Texas.

Photo by Michael Bender

Black-footed Ferrets

Thrive in Mexico

by J. Michael Lockhart,
Jesus Pacheco, Rurik List,
and Gerardo Ceballos



A captive-reared black-footed ferret peeks out of her new burrow home after release in northern Chihuahua, Mexico.

Photo by J. Michael Lockhart/FWS

Far right: Dianne Devison (Curator, Toronto Zoo, Canada) and Jesus Pacheco (Biologist, University of Mexico) release captive-reared black-footed ferrets on the "El Cuervo" prairie dog colony in northern Chihuahua, Mexico, in November 2002.

Photo by J. Michael Lockhart/FWS

In September of 2002, biologists from the University of Mexico (UNAM) were unexpectedly treated to a thrilling sight: the discovery of the first wild-born black-footed ferret (*Mustela nigripes*) kits in Mexico. These kits were the offspring of captive-reared ferrets reintroduced into northern Chihuahua, Mexico, in the fall of 2001 (see "Black-footed Ferrets Return to Mexico" in *Bulletin* Vol. XXVII No. 2). They are an exciting and highly significant step in the recovery of this critically endangered species.

The black-footed ferret is a carnivore that requires relatively large, healthy prairie dog colonies for survival. Few high quality reintroduction areas remain anywhere in North America, and the black-tailed prairie dog complexes found near Janos, Chihuahua, are among the best. The El Cuervo prairie dog colony alone is more than 15,000 hectares (37,065 acres) in size and overlays part of a large grassland basin on the eastern edge of the spectacular Sierra Madre range. It is the largest contiguous colony of black-tailed prairie dogs found in North America today.

In all, 91 ferrets were released in northern Chihuahua in 2001, and an additional 69 were reintroduced on adjacent areas of the El Cuervo complex in 2002. Follow-up population surveys were conducted in September 2002 (to document long term survival and production of ferrets released in 2001) and December 2002 (to examine short-term survival of additional ferrets released in October and November of 2002). The El Cuervo colony is vast, and much associated habitat was not accessible during the 2002 surveys. Still, initial survey results were promising, with at least 26 ferrets documented during the

2002 surveys, of which nine were wild-born. Observations of 23 additional "unknown" ferrets suggest that survival and production levels may be higher than detected.

All captive-bred reintroduced ferrets are tagged with two passive integrated transponder chips under the skin of their necks and rumps, and are therefore individually identifiable. Transponder reader devices are placed over the burrow entrances in which ferrets are found. The ferrets that were observed passing through working transponder readers and displaying no numerical readings were judged to be wild born kits, which lack transponder tags. Many other ferrets did not pass through transponder readers, or may have passed through them when biologists were not present, and they constitute the unknown ferrets.

Monitoring, trapping, and tagging will be intensified in 2003 to get more accurate data on survival and reproduction of the Mexican ferret population. The Mexico project is the eighth ferret reintroduction effort in North America. Since 1991, seven other reintroduction programs have occurred across six western states. Thus far, the success of those efforts has been mixed. In Montana and Wyoming, the introduced disease sylvatic plague has compromised reintroduction success and only small numbers of ferrets persist. However, on two reintroduction areas in South Dakota, where sylvatic plague is not present, black-footed ferret populations appear to be relatively large and self-sustaining, with no fewer than 250 animals in the wild today. Another reintroduction effort on lands overlying an area of western Colorado and eastern Utah also appears

to be making good progress, with a minimum of 34 animals detected on one core release area in 2002 and documented wild production every year since 2000. Yet another reintroduction effort in northwestern Arizona has had moderate success in recent years and has experienced at least two successive generations of wild born kits.

Although the black-footed ferret recovery program has experienced remarkable success since 1987 (when only 18 animals were known to exist), ultimate recovery of the species is far from certain. Black-footed ferret recovery depends on the successful establishment of viable populations spread over the species' historical range. Few suitable reintroduction areas exist today, primarily due to habitat loss resulting from conversion of native prairies into cultivated lands and extensive prairie dog poisoning programs over the last century. Sylvatic plague is perhaps the greatest obstacle to ferret recovery, with devastating impacts on both prairie dogs and ferrets. Only a few potential ferret reintroduction sites in South Dakota and Chihuahua are currently isolated from the effects of plague.

Establishment of a wild ferret population in Mexico, and in the other best remaining habitats of North America, is

essential to species recovery. "Excess" kits produced in South Dakota and Mexico could soon help start ferret populations in other recovering habitat areas across the Great Plains and desert grasslands of the western U.S. and Canada. Fostering the establishment and growth of wild ferret populations while simultaneously improving habitat conditions to promote future recovery opportunities is the foundation of a pending revision of the Black-footed Ferret Recovery Plan, scheduled for completion in 2003.

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Many helping hands

The development of a black-footed ferret reintroduction project in Mexico (and elsewhere) is possible only through the combined efforts and contributions of a myriad of program partners in Canada, Mexico, and the U.S. Black-footed ferrets available for release are primarily produced at six Species Survival Plan facilities, including: the Toronto Zoo, Canada; the National Zoo's Conservation and Research Center, Virginia; the Louisville Zoo, Kentucky; the Cheyenne Mountain Zoo, Colorado; the Phoenix Zoo, Arizona; and the U.S. Fish and Wildlife Service's National Black-footed Ferret Conservation Center in Wyoming. Excess ferrets released in Mexico were provided by all SSP facilities and an experimental pen breeding facility in New Mexico operated by the Turner Endangered Species Fund. The El Paso Zoo provided logistical support and staff to assist in the release of ferrets in Mexico. In addition, many agency and private partners associated with the Black-footed Ferret Recovery Implementation Team provided technical and field assistance to the Mexico program. Field reintroduction and monitoring efforts in Mexico are accomplished through the help of many staff biologists and students from the University of Mexico. Finally, the cooperation of the Jeffers Ranch and the peoples and Ejidos of El Cuervo, Casa de Janos, and San Pedro in northern Chihuahua have been essential to the successful implementation of this recovery effort in Mexico.



As with many endangered species, progress and eventual success of the black-footed ferret recovery program hinges on the considerable talent, energy, and committed resources represented in the many involved agencies, Tribes, conservation organizations, zoos, and other private interests. Only through such combined partnerships is there hope of restoring such an elegant and integral species to the North American grasslands and desert plateaus in which it belongs.

California Condors

Return to Mexico

by Denise Stockton



A condor given the name *Xewe dines* on some road kill in its flight cage in Mexico prior to its release.

Photo by John Stockton

After a lengthy absence, California condors (*Gymnogyps californianus*) have returned to Baja California. The largest bird in North America is now soaring the skies over Mexico for the first time in more than 60 years. The site chosen for this historic event is situated approximately 125 miles (210 kilometers) south of the California border in a remote area of the Sierra San Pedro de Martir National Park at an altitude of about 8,200 feet (2,500 meters).

The first three birds were released on October 9, 2002, with approximately 70 dignitaries, including biologists, zoologists, and other interested parties from both sides of the border, watching excitedly. However, the birds decided it was not a good day to fly. They remained in the flight pen oblivious to the open door and freedom. With only a handful of biologists present, the next day turned out to be a better one in which to take wing. This release is the first step in a long-term effort to reestablish condors in Mexico. It is also a step closer to the goal of the California Condor Recovery Program, which is to establish additional self-sustaining populations in historic condor range through the release of captive-reared birds.

The California Condor Recovery Program is managed by the U.S. Fish and Wildlife Service in cooperation with the U.S. Forest Service, the California Department of Fish and Game, the Zoological Society of San Diego, the Los Angeles Zoo, the Peregrine Fund, and the Ventana Wilderness Society. They are now joined by their Mexican partners, which include the Mexican federal government office of the Secretary of the Environment and Natural Resources (SEMARNAT), the Instituto Nacional de

Ecología and the Comisión Nacional de Áreas Naturales Protegidas, and the nongovernmental organization, Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE). The Baja site is being managed by these cooperating Mexican organizations and assisted by the San Diego Zoological Society.

“Day after day we hear about species that are endangered or become extinct. Very few times do we receive news of a recuperation and conservation effort,” said Dr. Exequiel Ezcurra, President of the Instituto Nacional de Ecología. “This is why this day gives us reason to rejoice; 60 years have passed without condors in Mexico, and today we will see these birds open their wings where their ancestors once did.”

“Working hand in hand, across international boundaries with our Mexican partners, our effort to reintroduce California condors into Mexico represents a truly binational, holistic approach to restoring an endangered species throughout its historical range. The strong commitment of the condor management community in the U.S. and Mexico will help to insure the success of this long-term project,” states Marc Weitzel, Project Leader for the Service’s Hopper Mountain National Wildlife Refuge Complex and a member of SEMARNAT’s Technical Committee for the Reintroduction of the California Condor.

California condors are scavengers that have soared over mountainous areas of California since prehistoric times, but their numbers declined drastically in the 20th century. This was due in part to habitat loss, shooting, lead poisoning, and toxic substances used to poison predators. Condors were listed as an

endangered species in 1967. In 1982, the condor population reached its lowest level of 22 birds, prompting Service biologists to start collecting chicks and eggs for a captive breeding program. In 1992, the Service, through the Hopper Mountain Refuge, began releasing California condors back into the wild. Currently, the Service and its partners manage 74 condors living in the wild in California, Arizona, and now Baja California, Mexico. There are 126 birds in captivity at the breeding facilities for a total of 200 condors in existence.

Hopper Mountain has an agreement with the reintroduction project in Baja for the long-term loan of surplus field equipment. Mike Stockton, one of the refuge's condor biologists, drove the first of the much needed equipment (scopes, tripods, backpacks, etc.) down to Baja the last week of October. Stockton's arrival coincided with the delivery of a travel trailer that had been in use by Hopper Mountain field biologists and was no longer needed. The Mexican biologists had been living out of tents for months and were very pleased with their new accommodations.

Stockton was able to experience firsthand the challenges that the Mexican

biologists face as they get this infant program off the ground. A steady supply of carcasses to feed the condors is still being worked out, so in the meanwhile road kill and the occasional dead horse or steer donated from a neighboring ranch will have to do. The steep terrain, while perfect habitat for the condors, is proving to be a problem for the biologists on the ground trying to track the movements of the released birds. This became evident when the newly released birds moved down low into areas where the biologists couldn't follow, and they became concerned when the condors were not coming back up to the feeding site. It was decided to trap all of the birds even though one of them was adjusting well to the area. They plan to rerelease them for short periods of time until they become accustomed to the area. Two all-terrain vehicles that the Hopper Mountain Refuge sent should assist considerably with this situation.

Stockton spent the rest of the week with biologists sharing condor management experiences and extending an invitation to visit the Hopper Mountain NWR Complex. Juan Julian Vargas Velazco and Maria Catalina Porras Pena, the Mexican biologists, came to Hopper

Mountain in early February 2003 and joined refuge biologists in observing, feeding, and tracking condors on refuge and at off-refuge sites. From time to time over the next few years, refuge biologists will travel south to give technical support to the program in Baja.

Hopper Mountain NWR has been managing California condors for more than 10 years, and has worked closely with recovery program partners to develop and refine condor management methods. It is this wealth of firsthand knowledge that the refuge biologists will be sharing with their Mexican counterparts. Stockton was greatly impressed with the people he met during his stay in Mexico, "Everyone is 100 percent behind returning the California condor to this part of their historic range, from the local ranchers to the dedicated professionals and everyone else I came in contact with. I look forward to working with them again."

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Service biologist John Stockton and Mexican biologist Juan Julian Vargas Velazco track released condors in Mexico.

Photo by John Stockton

Nightly Wings, Nectar Sips

by Rodrigo A. Medellín and
Steve Walker



Lesser long-nosed bats are important pollinators for saguaros and agaves, such as this *Agave palmeri*.

Photo © Merlin D. Tuttle, Bat Conservation International

We reached the cave entrance at around 5:00 p.m. At that time, hardly anyone was around the impressive cliff, with striking overhanging vegetation, that contained one of the most species-rich caves in all of México. A young boy approached us and asked for one peso in exchange of him telling us about *los murciélagos que viven en la gruta* (the bats that live in the grotto). One of us hurriedly dug for the coins and gave them to the self-confident child.

The boy started telling us about how important bats are to maintaining the surrounding forest by pollinating the flowers of the ceiba trees, morning glory trees, agaves, and many other species, and dispersing the seeds of some soft-fleshed fruits, including those of the garambullo columnar cactus (*Myrtillocactus geometrizans*). The bright-eyed boy also emphasized the importance of some of the other bat species in the cave, such as the insectivorous Mexican free-tailed bats (*Tadarida brasiliensis*) that roost there by the thousands. He mentioned not only that bats feed on important insect agricultural pests, but also that they provide rich organic fertilizer in the form of guano.

After the 10-minute lecture, the boy's mother joined us. She explained that she and her son, together with a few other people from the nearby town, had been designated cave stewards after having participated in an environmental education program presented by a coalition of scientists and educators from the National University of México and a U.S.-based organization, Bat Conservation International. She was referring to the *Programa para la Conservación de los Murciélagos Migratorios de México y*

Estados Unidos (PCMM), or Program for the Conservation of Bats of México and the United States. She also explained how, as recently as two years ago, children used to throw rocks at the bats and sell fossils (limestone imprints of vegetation) to tourists, and how this activity slowly but steadily was destroying the cliff the people in town are so proud of. Today, the children earn money by telling tourists about bats and their important ecological roles and economic benefits.

La Gruta, near the western México town of Ciudad Hidalgo, in the same region as the world-famous monarch butterfly winter roosts, is one of the 15 lesser long-nosed bat (*Leptonycteris curasoae*) roosts the PCMM has been monitoring for up to seven years. The lesser long-nosed bat is listed by the U.S. as endangered and by México as threatened. Although the species can be found roosting in groups of up to 200,000 in some of the summer maternity colonies in the Sonoran Desert (see "A Bat Boom at Fort Huachuca" in *Bulletin* Vol. XXV, No. 6), many colonies have been dramatically depleted. This is primarily due to lack of knowledge about their role as pollinators and seed



Rodrigo Medellín (right) explains to 5th and 6th graders at Ciudad Hidalgo, Michoacán, México, about the bats at La Gruda, the cave near their school.

Photo by Brian Keeley, Bat Conservation International

dispersers on which so many plant species depend, or about the destruction of their habitat (which includes primarily dry tropical forests and deserts).

The PCMM works on a combination of research, environmental education, and conservation actions (such as the protection of roost sites) to determine and counter the causes that have harmed the bats. Eleven teams from universities, nongovernmental organizations, and government agencies are working to document the biology of this and other migratory species, and to determine their conservation needs. Some of the questions that we are addressing are: How far do the bats migrate each summer? What are the geographical/ecological factors determining their reproductive patterns? Do all lesser long-nosed bats migrate? This last question has sparked an interesting debate. We know there are two reproductive pulses in this species: one in the summer in the northern part of the species' distribution (the Sonoran Desert), and one in the winter in the dry tropical forests of western and southern México. We also know that at least some bats remain behind in central and southern México when most females are giving birth in Sonora and Arizona.

Migration is not a clear-cut pattern in which all bats move as a flock from one location to the other. Rather, migration is an evolutionarily adaptive response to selective pressures that are determined by when and where food is available. All habitats go through seasonal peaks of food availability. In some habitats, like the Sonoran Desert, food is virtually absent during the winter. But other habitats, such as dry tropical forests, contain food throughout the year in variable abundance, depending on the year, the region, and certain aspects of the habitat. That way, in the summer, when resources are scarce in the dry tropical forest, some bats are able to remain behind while others carry out the long migration to the north, where such foods as the flowers and fruits of the saguaro, cardon, and organ pipe giant cacti are plentiful.

This rather complex ecological cycle is slowly being pieced together with other conservation components as part of the species' recovery plan. Environmental education is a key long-term component that yields results soon after its initial application, but it needs to be extended in time to reach successive generations of people. Some caves have

management plans in place, and all caves we have been monitoring show signs of bat population stability, a good initial step toward monitoring improvements in the population status throughout the species' range. The first results are encouraging, both in terms of the biology of the species and the response of local inhabitants that have adopted the cause of bat conservation. We hope the future will be one of plentiful, continuous, and widespread resources and undisturbed roosts for the welfare of our shared bat species, ecosystems, and ecological processes.

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California Red-legged Frog: Jumping to Survival

by Douglas M. Krofta



California red-legged frog
Russell Smith, Los Angeles Zoo

Once made famous by Mark Twain in “The Celebrated Jumping Frog of Calaveras County,” the California red-legged frog (*Rana aurora draytonii*) is considered the largest native frog in California. During the mid to late 1800s, their large size and abundance led these frogs to become a regular on restaurant menus. As overharvesting decreased the population, non-native bullfrogs were imported to subsidize the human appetite for frog legs. Once naturalized, the bullfrogs voraciously consumed any living organism around, including red-legged frog tadpoles, metamorphs, and adults. In addition to predation by bullfrogs and other non-native species, red-legged frog populations continued to decline in over 70 percent of their historic range from habitat loss and alteration due to urban and agricultural development. Consequently, the California red-legged frog was listed as federally threatened on May 23, 1996.

In 1997, a partnership developed to save the remaining population of southern California red-legged frogs, all located on The Nature Conservancy’s Santa Rosa Plateau Ecological Reserve (Reserve) in southern California. The primary members included Carole Bell, reserve manager for The Nature Conservancy; Russell Smith, Curator of Reptiles for the Los Angeles Zoo; and the U. S. Fish and Wildlife Service. Our team is working with many other scientists and nonscientists to facilitate the non-native species eradication program and red-legged frog recovery effort.

Following the El Niño event in the winter of 1998, the frog population, which once numbered in the hundreds, had dwindled to three individuals—all males. The last female was believed lost

to predation during the preceding winter. The partnership team began discussing options for recovering this population, which included evaluating the translocation of frogs from other extant populations.

Concurrently with these recovery efforts, Dr. Brad Shaffer of the University of California at Davis, in cooperation with the Biological Resource Division of the U. S. Geological Survey, analyzed tissue samples of red-legged frogs collected from many of the known populations throughout California and Oregon to investigate the across-subspecies and inter-subspecific genetic relationships. From Dr. Shaffer’s preliminary results, we learned that the population on the Reserve was significantly different genetically from any other population sampled in California.

Our sights turned to two recently confirmed populations of red-legged frogs in north-central Baja California, Mexico, near the town of Colonet, approximately 250 kilometers (156 miles) south of the border and approximately 410 kilometers (256 miles) from our population at the Reserve. Based on ecological information collected at these sites, we believed that these populations warranted further investigation, including tissue collection for a genetic analysis. In the spring of 2000, we began developing a plan to obtain approval from the Mexican government for a two-part study. The first phase would be to survey, obtain population estimates, collect tissue samples from the two documented populations, and survey for additional populations. The tissue would then be analyzed, and if it genetically matched the population at the Reserve, we would start the second phase. This

Russell Smith (left) handles a California red-legged frog collected from Rio Santo Domingo in Baja California, Mexico, while Eric Mellink (right) assists.
Douglas Krofta, USFWS





Russell Smith (left), Erik Mellink (center), and a graduate student (right) prepare to survey for frogs in Rio San Telmo in Baja California, Mexico.

Douglas Krofta, USFWS

phase would include collecting live frogs to bring back to the Los Angeles Zoo and Reserve, raise them in captivity for several months to quarantine them, grow them to maximize survivability size, and then release them into the wild population on the Reserve.

As part of the process to gain approval from the Mexican government, we presented our proposal to the Canada/Mexico/United States Trilateral Committee for Wildlife and Ecosystem Conservation and Management in 2000, and then updated in 2001 and 2002. The Trilateral Committee endorsed our proposal and we were granted preliminary approval to begin the permitting process. To facilitate our proposed project, we forged a partnership with Dr. Eric Mellink of the Center for Scientific Research and Higher Education (CICESE) in Ensenada, Baja California, who expressed an interest in our project and wanted to join our team. Dr. Mellink had previously worked on many cross-border projects, including several with the Fish and Wildlife Service, and was able to bring valuable assistance and knowledge to the team.

In August of 2001, Russ Smith and I met with Dr. Mellink in Ensenada to start the first phase. We confirmed and surveyed the two previously documented

localities along Rio San Telmo, south of Colonet, and documented a sizable new population in Rio Santo Domingo, near the town of Colonia Vicente Guerrero. We collected a total of eight tissue samples from the three populations.

Dr. Mellink was instrumental in this survey and collection effort by: 1) gathering historical and current information concerning frog localities for northern Baja California to focus our survey; 2) accompanying us on our survey and allowing us to work under his general scientific Mexican collection permit; 3) housing the tissue at his laboratory at CICESE; and 4) obtaining the necessary permits to export the tissue from Mexico.

The tissue samples were imported into California in April of 2002 and sent to Dr. Shaffer's laboratory for genetic analysis. In December, the tissue was analyzed with the results suggesting that the three populations in Mexico were genetically similar to the population at the Reserve.

We are now focusing on the second phase of the project for the Fall of 2003. This phase, if endorsed by the Trilateral Committee and Mexican government, will include: 1) conducting more detailed surveys of the populations in Mexico to

ascertain population estimates; 2) collecting and exporting live specimens to raise at the Los Angeles Zoo and the Reserve; 3) releasing the collected specimens into the wild once they have been sufficiently quarantined and grown; and 4) repeating the effort annually until the resident U.S. population is self-sustaining.

This survey and recovery effort in southern California and Baja California for this beleaguered frog would not be possible without the collaborative efforts of the partner institutions in both countries. With this continued cooperation, we have a chance to recover at least the population and genetic line of the California red-legged frog on the Sant Rosa Plateau Ecological Reserve, and work toward recovering the subspecies as a whole in southern California.

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Binational Conservation Grows from the Ground Up

by Tracy A. Scheffler



The star cactus produces a yellow flower, green to grayish-red fruits, and glossy dark brown seeds.

Photo by Charlie McDonald/USDA Forest Service

M.C. (Master en Ciencias) Jose Guadalupe Martínez Avalos, Universidad Autónoma de Tamaulipas, surveying for star cactus in Tamaulipas, Mexico. Through his leadership, botanists in Mexico and the United States are conducting binational surveys.

Photo by Chris Best/USFWS



As the survey team moves slowly through the brush, it appears to be stalking an imaginary lizard. Instead, its members are looking for the star cactus (*Astrophytum asterias*), an endangered plant found in the low elevation semi-arid thorn shrub of the lower Rio Grande valley in the United States and Mexico. Surveys for the star cactus are difficult; it is well camouflaged in its rocky surroundings by its small size, dull green color, and low growth form. Botanists from the U.S. and Mexico survey for the star cactus to gather information about the species' abundance, range and distribution, biology, ecology, and threats. They will use this information to determine appropriate management strategies for the species. In doing so, these botanists are fostering the beginning of a collaborative binational effort to recover the star cactus.

The star cactus is one in a diverse assemblage of species that spans the border between the U.S. and Mexico within the Tamaulipan biotic province. This cactus typically grows in gravelly clay or loam soils, partially shaded by other plants or rocks. Although historical records are scarce and somewhat controversial, most botanists agree that the species once occurred in Hidalgo, Starr, Zapata, and possibly Cameron counties in South Texas, and in the States of Nuevo Leon and Tamaulipas in northern Mexico. In 1993, when the species was listed as endangered, one population was known in Starr County, Texas, and one in Tamaulipas, Mexico. The federal listing, followed by the State of Texas listing in 1997, led to additional surveys that located several previously unknown populations in the

U.S. and Mexico. This species, however, is still considered rare and vulnerable to extinction.

In the wild, the star cactus is threatened by both too much and too little attention. Cactus smuggling is the most direct threat. According to Benito Trevino, a native plant expert in Starr County, star cactus specimens from the wild are worth \$500 to unscrupulous collectors in international markets, even though legal and inexpensive specimens are readily available from nurseries that grow the species from seed. Accidental collection by licensed peyote (*Lophophora williamsi*) harvesters also poses some danger to the star cactus due to the two species being somewhat similar in appearance. Another major concern is habitat modification. Root plowing, road construction, and oil and gas seismic exploration and pipeline construction can kill the cactus directly or fragment its populations. Trampling of star cactus by cattle may increase the risk of potentially lethal fungal infections, and competition with invasive exotic grasses planted for cattle forage may occur. In addition, the suppression of natural fire cycles has altered star cactus habitat by allowing encroachment by brushy vegetation.

Information sharing between the U.S. and Mexico is critical to an overall conservation strategy for borderland species like the star cactus. During the past decade, informal binational surveys by botanists in federal and state agencies, non-governmental organizations, and academic institutions have been conducted. Building on these efforts, rare plant experts from the Texas Parks and Wildlife Department, U.S. Fish and Wildlife Service, Nature Conservancy,



The star cactus is a greenish-brown, slightly dome-shaped, smooth, spineless plant that grows up to about 15 centimeters in diameter and up to 7 cm in height.

Photo by Chris Best/USFWS

Valley Land Fund, Native Plant Project, Valley Nature Center, Texas Department of Transportation, Texas A&M University, University of Texas, South Texas Community College, English Nature, Pronatura Noreste, Biotica A.C., Universidad Autonoma de Tamaulipas, Universidad Autónoma de Nuevo León, and Universidad Autónoma Agraria Antonio Narro attended a Lower Rio Grande plant conference in Brownsville, Texas, in 2002, to advance cross-border conservation efforts.

Meanwhile, Loretta Pressly of the Service has spent the past year and a half tackling a recovery plan for star cactus. When information on an endangered or threatened species is scarce, a recovery plan is crucial to synthesize information gaps about the species' biology, ecology, and threats; identify partners and stakeholders; mobilize funds and staff; guide consultations on federal projects within the species' range; inform the general public; and provide an initial recovery strategy. The plan will also provide a springboard for making the U.S./Mexico collaboration formal through the formation of what the Service plans to be a binational borderland plant recovery team that will focus on a variety of listed, candidate, and rare species.

For the star cactus, a multi-faceted approach to recovery is taking shape. While surveys and plans for a recovery team are advancing, progress will also be made developing seed banks and populations of star cactus in botanic gardens to provide security against extinction in the wild. These populations may also be used for genetic, population biology, and community ecology research, as well as for experimentation on transplantation and reintroduction methodologies. In both countries, promoting conservation on private land will be an important component of recovery. Misconceptions about the implications of the Endangered Species Act on private lands are slowly being reversed in southern Texas as state, federal, and non-governmental agency personnel work with landowners who value rare plants. Upgraded educational programs for interested landowners will include information on federal and state laws, species identification, and voluntary programs available to assist landowners in conserving listed species on their land. Increased local law enforcement to protect star cactus from illegal harvesting is also necessary. In Mexico, community projects that offer economic incentives to local residents may advance conservation on private land.

Recovery of an endangered species is a complex process, and the star cactus will not be an exception. Even if it were, there is still the simple biological reality that most members of the cactus family are known for their slow growth rates. This means that no matter what we do, star cactus recovery cannot happen overnight. Fortunately for this elusive little desert gem, there are partners on both sides of the border who are interested in star cactus conservation. For this species, binational collaboration is not just a fancy idea, it is a seed that has already been planted.

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Aquatic Life in the Sonoran Desert

by Glen Knowles



Sonoyta mud turtle.

Photo by Jim Rorabaugh/USFWS

Nestled in one of the driest parts of the Sonoran desert, a pair of unique and fragile aquatic ecosystems straddles the border between the United States and Mexico: Quitobaquito Springs and the Rio Sonoyta. These permanent water sources have been a focal point of human migration and occupation for thousands of years and still are today. Biologists in the U.S. and Mexico are working together to protect a unique aquatic fauna that depends on these ecosystems.

The Quitobaquito spring snail (*Tryonia quitobaquitae*), the Quitobaquito pupfish (*Cyprinodon eremus*), and the Sonoyta mud turtle (*Kinosternon sonoriense longifemorale*) are endemic to the aquatic ecosystems of the Rio Sonoyta basin, where they persist as small remnant populations. These ecosystems include the springs and pond at Quitobaquito, stream habitat in the Rio Sonoyta, and another spring complex south of the Rio Sonoyta at Quitovac.

Quitobaquito Springs flows from fractured granite and gneiss rock of the Quitobaquito Hills in Organ Pipe Cactus National Monument, just on the Arizona side of the U.S./Mexico border. The two largest springs are capped and conducted into a manmade stream channel, which flows about 800 feet (244 meters) south to a small pond about a half acre (0.2 hectares) in size. About a mile (1.6 kilometers) south across the border from Organ Pipe Cactus National Monument, in the Mexican state of Sonora, lies the Rio Sonoyta. The Rio Sonoyta drainage originates on Tohono O'odham tribal lands in Arizona and Sonora and ends at the Sea of Cortez near the town of Rocky Point, Sonora. In the 1800s, water was probably much more extensive in

the Rio Sonoyta; many springs occurred at what is now the town of Sonoyta.

Today, permanent surface water occurs only in a few short reaches of no longer than a mile (1.6 km) over about 20 miles (32.2 km) of stream course.

The Quitobaquito spring snail is a tiny, 0.06 inch long (1.5 mm) aquatic snail that belongs to the Hydrobiidae family. The Hydrobiidae is composed of numerous endemic populations in springs and seeps throughout the southwestern U.S. The Quitobaquito spring snail is found only in Quitobaquito and two nearby springs. Little is known about the snail, although it appears to require hard substrates and moderately flowing water. Quitobaquito Springs offers both these requirements in the manmade channel that flows from the spring source to the pond.

The endangered Quitobaquito pupfish is a small fish, typically about 1.2 inches (3 cm) long, that can live up to 3 years. Silvery in color, with darker vertical bars on their sides, males turn an iridescent light- to sky-blue during the spring breeding season. Pupfish are well suited to desert environments, where high evaporation rates can create water with high salinity levels and high temperatures. They can tolerate salinity levels ranging from normal tap water to water twice as salty as seawater and water temperatures as high as 113 degrees Fahrenheit (45 degrees Celsius). They occur only in the pond and channel at Quitobaquito Springs, and in a short perennial reach of the Rio Sonoyta about a mile (1.6 km) long, just across the border from the pond at Quitobaquito, on the Pinacate and Gran Desierto Biosphere Reserve. Organ Pipe Cactus National Monument monitors the

Biologists from the U.S. and Mexico collecting data on Sonoyta mud turtles in the Rio Sonoyta.

Photo by Ami Pate/NPS



population in Quitobaquito, estimated to be stable at about 3,500 fish. No population data exists for pupfish in the Rio Sonoyta, though they appear to be abundant where they occur.

Highly aquatic, Sonoyta mud turtles spend a good deal of time creeping slowly and methodically along the bottom of pools looking for food. They eat algae, aquatic insects, fish, and frogs. Sonoyta mud turtles may live as long as 40 years and take 5 to 6 years to mature. Small but reproducing populations occur in the pond at Quitobaquito, two reaches of the Rio Sonoyta (one near the town of Sonoyta and another near the village of El Papalote just across the border from Quitobaquito) and in a spring complex to the south of the Rio Sonoyta at Quitovac.

Like so many aquatic habitats in the southwest, the Rio Sonoyta and Quitobaquito are threatened ecosystems. The major threat to these systems is groundwater withdrawal. The Rio Sonoyta valley has extensive amounts of irrigated agriculture that utilizes water from underground wells. Likewise, most of the water supply for the town of Sonoyta, as well as the nearby border town of Lukeville, comes from the groundwater aquifer. Continued groundwater pumping could completely dry the river. The introduction of exotic species, agricultural pesticide use, and destruction from ever-increasing human activities related to illegal border traffic are also threats. Hydrologic investigations of Quitobaquito Springs indicate that groundwater pumping miles away in the Rio Sonoyta valley could lower water tables and ultimately drain the pond.

In 2002, the Arizona Game and Fish Department began working to develop a conservation agreement for the Sonoyta mud turtle, which is a candidate for listing under the Endangered Species Act. The Department formed the Quitobaquito and Rio Sonoyta Working Group to help develop the agreement. The working group consists of representatives from the Arizona Game and Fish Department, the U.S. Fish and Wildlife



Service, the National Park Service (Organ Pipe Cactus National Monument), the Pinacate and Gran Desierto Biosphere Reserve, the Institute of Environment and Sustainable Development in Sonora, and the University of Arizona. Together, the group is developing a conservation strategy and agreement for Quitobaquito and the Rio Sonoyta. Because the snail, pupfish, and turtle are all dependent on the same habitat, the group is developing a habitat-based strategy that addresses the conservation of all three species. The agreement will focus on addressing the threats to the ecosystem, continuing research, and expanding educational outreach. Through this collaborative effort, the team hopes to preserve these unique aquatic habitats for generations to come.

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Top: The pond at Quitobaquito Springs.

*Photo by John Crossley
www.americansouthwest.net*

Bottom: Male Quitobaquito pupfish in breeding colors.

Photo by Martin Ravn Tversted

Jaguar Conservation in the Borderlands

by Sarah E. Rinkevich and
Keith Bashum



Rancher Warner Glenn photographed this jaguar near the New Mexico/Arizona border, proving the presence of the species within its original range in the United States.

Photo © Warner Glenn

*I*t may surprise many people that the jaguar (*Panthera onca*), the largest cat found in the Western Hemisphere, is native to the United States as well as Central and South America. It was believed to be extirpated from this country until 1996, when rancher Warner Glenn photographed an adult jaguar in the extreme southwestern part of New Mexico. After the sighting, local ranchers, other stakeholders, and state and federal resource managers formed an innovative group called the Jaguar Conservation Team. The team meets twice a year to discuss recent sightings, management issues, education, and jaguar research.

Studies of the current distribution of jaguars in the Mexican State of Sonora have identified three populations. The northernmost population is located approximately 135 miles (218 kilometers) south of the international border. Because these animals are capable of moving considerable distances, it is very likely that jaguars will continue to wander north into New Mexico and/or Arizona as long as the northern Sonora population remains viable. Livestock ranching is the main source of income in Sonora, and its ranching community has the perception that jaguars are the main cause of cattle mortality. At the same time, jaguars are considered a priority species for conservation by the Mexican government. Researchers are extremely interested in reducing jaguar mortalities while developing a strategy for sustainable ranching. Thus, an ecological study using the capture and radio-collaring of jaguars to monitor their movements and interactions with cattle has been initiated. This type of research should

provide crucial information for efforts to conserve jaguars and their habitats in the United States.

Jaguars occupy a diverse habitat ranging from tropical rain forests to arid deserts. Specifically, this feline inhabits brush, forested areas, jungles, swamps, and arid mountainous scrub. Its historical range extends from southwestern North American (Arizona, New Mexico, and Texas) through central Mexico to Central and South America, as far south as northern Argentina. The Jaguar Conservation Team is developing a document that identifies important habitat areas and characteristics within the U.S.

A more recent sighting confirmed that jaguars can still be found in the southwest. On January 25, 2002, the Fish and Wildlife Service was informed that another jaguar had been detected and photographed in southern Arizona approximately 5 miles (8 km) north of the U.S./Mexico border. Jack Childs, a lion tracker who holds a federal Endangered Species Permit for collecting

photographs and hair samples, said the picture was taken on December 9, 2001. When the story broke in the local newspapers, ranchers in southern Arizona expressed concern that the federal government would begin to restrict land use practices. Hearing of these concerns, the Jaguar Conservation Team formed an outreach subcommittee. The subcommittee conducted 10 outreach meetings in various communities throughout Arizona and New Mexico in November of 2002. Its aim was to locate landowners who might fear changes due to the presence of the jaguar, answer their questions, and solicit their advice and assistance in creating strategies for conserving the jaguar. The meetings featured a video presentation by Jack Childs, followed by a panel discussion among various members of the Jaguar Conservation Team and other stakeholders. Each meeting featured ample time for open discussions aimed at encouraging participation by local residents.

When the jaguar was originally listed as an endangered species, it was believed to be extirpated from the U.S. and therefore was not given protection in this country under the Endangered Species Act. A year after the 1996 sighting, the Service extended the endangered status to the jaguar throughout its range, including the American Southwest. Rangewide, the reasons for the decline of this species were deliberate persecution, excessive and illegal hunting, over-exploitation for the fur industry, and predator control programs. Further, timber and brush clearing have degraded and destroyed jaguar habitat. Continued clearing of habitat, destruction of riparian areas, and fragmentation or blocking of corridors could prevent jaguars from recolonizing previously inhabited areas. In Arizona, the jaguar's gradual decline was concurrent with predator control associated with the settlement of land and the development of cattle industry.

The Jaguar Conservation Team continues to meet twice a year, most

recently in January 2003 in Wilcox, Arizona. The team was treated to a presentation by a local elementary class on their knowledge of jaguar biology and conservation efforts. These fourth graders had just finished a four-week module on the jaguar developed by the education subgroup of the Jaguar Conservation Team. The Service considers the Jaguar Conservation Team's emphasis on education activities to be extremely valuable to the conservation of this species in the American Southwest.

Sarah Rinkevich is an Endangered Species Biologist in the Service's Albuquerque Regional Office (email sarah_rinkevich or call 505/248-6663). Keith Bashum, a participant in the Student Career Experience Program (SCEP), is in the U.S. Army Reserves, and since co-writing this article he has been deployed to the Middle East.

Adult male jaguars weigh an average of 200 pounds, but they may exceed 300 pounds. Females weigh an average of 150 pounds. The name "jaguar" is derived from an American Indian word meaning "the killer that takes its prey in a single bound."

Corel Corp. photo



Corridors for Migration

by Mac Donaldson

The beautiful Cienega Valley in southern Arizona is a perfect example of a viable international wildlife corridor. Located within 20 miles (32 kilometers) of the U.S./Mexico border, it boasts a 9-mile (15-km) long perennial stream and is home to a rich variety of plants and animals, including five endangered species, three threatened species, and innumerable migratory birds. The heart of this corridor is the newly created Las Cienegas National Conservation Area. This intermountain grassland has important ties to habitats in northern Sonora and Chihuahua in Mexico through a similarity of soils, elevation, and annual rainfall.



The Las Cienegas National Conservation Area conserves grassland and riparian habitats used by a variety of wildlife.

Photos courtesy of Bureau of Land Management

In the 1980s, under the visionary leadership of the then Bureau of Land Management director for Arizona, Dean Bibles, a series of land exchanges took place to protect the landscape between the Coronado National Forest along the Mexico border and the Catalina/Rincon mountain forest complex from commercial development. The result was a migratory corridor of mountains and valleys with hydrological reserves in place to facilitate the movement of a great variety of species. Today, this public land is used for wildlife conservation and compatible ranching and recreational activities.

Human migration is one of many factors at work in the Cienega Valley. International smuggling of contraband and undocumented workers does have impacts upon the landscape. In this part of Arizona, few of these impacts are expected to be detrimental to wildlife and their habitat over the long term. Human migration has occurred in this region for a long time, just as wildlife crosses the same international borders.

Probably the most publicized large mammal that uses these migratory paths is the jaguar (*Panthera onca*), which models well the necessity for wildlife corridors. This large cat has been photographed in recent years in Arizona near the Mexico and New Mexico borders. Although the jaguar's closest established population is in northern Mexico, a large amount of suitable habitat exists in the southwestern U.S. The ability of these cats to travel distances through habitat corridors could enable them to repopulate parts of Arizona and New Mexico, restoring a part of our wildlife heritage that has been missing from this region for over 50 years.

Unfortunately, such migratory pathways can be blocked by large structures such as railroad lines, interstate highway systems, and sprawling housing developments. At present, the Cienega drainage from the Canelo Hills to the Pantano drainage at the base of the Rincon Mountains has few of these potential impediments. Housing development around the towns of Sonoita and Elgin here in southern Arizona is still kept dispersed enough by the existence of viable cattle ranching operations. The Union Pacific Railroad and Interstate 10 run parallel to one another with high bridges over two distinct canyons that facilitate the movement of wildlife.

The borderlands in the southwestern United States have unique habitats, wildlife, and opportunities. Those opportunities can be enhanced or degraded as mankind so chooses. Let's hope the larger vision will prevail.

Mac Donaldson and his family operate the Empire and Cienega Ranches in southern Arizona under a permit from the Bureau of Land Management.

Pronghorn Races Against Extinction

by Ben Ikenson

At the U.S./Mexico border in southwestern Arizona, the old “Peligroso/Danger” signs dangling from the barbed wire facing Mexico do little to stop a furtive flood of foot traffic through the unforgiving Sonoran Desert. In fact, this was the grim scene where 14 undocumented immigrants tragically perished in May 2001.

Although humans are ill equipped for the harsh conditions of the desert, Sonoran pronghorn (*Antilocapra americana sonoriensis*) may be even less equipped for the widespread consequences of human activity in a region where moisture is already a rare commodity. In conjunction with habitat fragmentation and degradation, extended periods of low rainfall are presenting serious problems for the Sonoran pronghorn, which was listed as endangered in 1967.

A goat-like animal often mistaken for a relative of the African antelope, the Sonoran pronghorn is one of five subspecies within the unique Antilocapridae family. As much an icon of the Sonoran Desert as the buffalo was of the prairie grasslands, thousands of pronghorn likely once graced the landscape in small bands, roaming vast expanses of the Sonoran Desert.

Because of overhunting in the early 20th century, along with livestock overgrazing, new diseases introduced through cattle, and ever-increasing habitat fragmentation, the subspecies now numbers fewer than 500. There are three isolated populations: two in Mexico and one confined to federal lands in the United States, including Cabeza Prieta National Wildlife Refuge in Arizona, where Fish and Wildlife Service

biologist John Morgart tracks and monitors the herd.

Creatures that occupy the Sonoran Desert have evolved over time to survive under notoriously austere conditions. To travel long distances following rainfall across a landscape teeming with hungry predators, the pronghorn adapted two distinctive survival techniques: great speed and a pair of large eyes positioned for a wide-ranging view of potential predators. However, these evolutionary attributes may not be enough; the dwindling pronghorn who gaze with such vision upon the landscape are blind to an onslaught of threats that may be impossible to outrun.

All three populations of Sonoran pronghorn have been forced to contend with roads, fencing, and railroad tracks. Border fencing and Mexico’s Highway 2, which parallels the border, have divided the U.S. population from Mexico’s northernmost population on the El Pinacate Biosphere Reserve. Farther south, the largest population of around 300 individuals—more than 60 percent of the pronghorn’s entire number—is isolated by the Gulf of California on one side and Mexico’s Highway 8 on the other.

Border-dwelling pronghorn are challenged by the ongoing legacy of human and drug trafficking. Not only are the animals disturbed, but also a net-



A pronghorn fawn rests among broken joints of cholla cactus.

Photo by George Andrejko, Arizona Game and Fish Department

work of makeshift roads now litter both sides of the border. John Hervert, a wildlife program manager for the Arizona Game and Fish Department, has observed some of the long-lasting deterioration caused by these illegal roads. "On more heavily used roads, the hydrology is being altered to the detriment of plants," he says. "At first glance, you can see how a road crushes plants or cuts through the natural flow of vegetation. But even worse is what you cannot see right away. The movement of water in slightly sloping desert valleys is

Corel Corp. photo



very slow, and heavily used roads will effectively divert moisture away from lower level vegetation." In short, pronghorn forage dies where roads cut across the land.

Additionally, livestock overgrazing has taken a toll on native vegetation, particularly in Mexico's El Pinacate Reserve, where hungry livestock deplete the greenery and make the inland soils especially vulnerable to erosion. Much of the native vegetation that pronghorn graze is fading away at an accelerating pace. "We suspect that livestock grazing can significantly alter the equilibrium of the plant community, evidence of which exists on both sides of the border," says Hervert. "The dominance of creosote in certain areas is a good example of how the relative balance in the native plant ecology has been upset."

Even hearty desert critters need a minimum of water for survival. Although adult pronghorn can absorb moisture from a variety of plants, growth of their preferred nutrient- and moisture-rich forage coincides with the rainfall the animals would instinctively follow if not for the barrage of obstacles now scattered throughout their range.

The region's prolonged drought has significantly diminished the animal's success at nurturing young. The better forage a mother can access, the more nutrients she can divert to her fetus. After birth, the mother is better equipped to provide nutritious milk during the critical nursing stage. If malnourished, a fawn is likely to die.

Unfortunately, the Sonoran pronghorn is now running neck-and-neck with extinction. Along with range fragmentation and habitat degradation, continued drought conditions have seriously exacerbated problems for the pronghorn. The most recent aerial survey, conducted in December 2002, puts pronghorn numbers in the U.S. at only about 21 individuals, down from an estimated 138 a year earlier.

While over 8 years of monitoring have shown that dry conditions often result in low fawn recruitment, 2002 was the first

year adult animals have died in large numbers due to drought. From the first of June to mid-August 2002, 80 percent of the radio-collared pronghorn died from drought related causes.

To prevent the pronghorn's extinction and eventually restore it to a secure status, Morgart heads a recovery team that includes scientists from both sides of the border. In the U.S., the Fish and Wildlife Service, the Arizona Game and Fish Department, Organ Pipe Cactus National Monument, Bureau of Land Management, Air Force, Marine Corps, and University of Arizona are working for the pronghorn. Recovery team members from Mexico include the El Pinacate Biosphere Reserve and the Instituto del Medio Ambiente y el Desarrollo Sustentable de Estadio de Sonora. The team's ultimate goals are to increase Sonoran pronghorn numbers and to improve and expand their current range.

"It's all been a cooperative effort," Morgart says. "We're collaring animals to track them. We're working with our counterparts in Mexico. We're sharing our research and discussing ideas."

Experimental techniques are also part of the process. For example, John Hervert and his colleagues from the Arizona Game and Fish Department have been hauling water tubs to remote areas on the wildlife refuge, where they have tracked pronghorn activity. Carrying large containers of water across the desert in 105-degree temperatures is proof of their dedication.

The adjacent Barry M. Goldwater Range, a military training ground used by the Air Force, plans to fund a forage enhancement project on its land. It is negotiating with the Bureau of Reclamation to drill two test wells as a source of water for the forage enhancement project. By supplying moisture during below-average rainfall, biologists hope to increase the quantity and quality of forage.

The recovery team has proposed several additional actions in a recent Supplement and Amendment to the 1998



Final Revised Sonoran Pronghorn Recovery Plan. The recovery plan is posted at <http://endangered.fws.gov>, and a draft copy of the 2002 Supplement and Amendment is found at <http://arizonaes.fws.gov>.

There is now an emergency recovery strategy in place: 1) new wells and existing wells will be used to provide water for an above-ground sprinkler system to create small areas of forage enhancement; 2) part of the population will be placed in a semi-captive breeding enclosure where they will be protected from predators and provided water and forage (every attempt will be made to prevent habituation to humans); and 3) water will be deposited in temporary structures in key areas during future droughts.

"It may be a long, hard road to recovery ahead," says Morgart, "but the shorter road leads only to extinction."

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In the past, before Sonoran pronghorn numbers became so low, the subspecies could survive periods with little rain, but now it needs supplementary water to survive extended droughts.

USFWS photo

The Masked Bobwhite at Buenos Aires NWR

by Brian Czech



Endangered Species on the National Wildlife Refuge System

The National Wildlife Refuge System Improvement Act of 1997 states that the Refuge System will provide for the conservation of "biological integrity, diversity, and environmental health." This law complements the Endangered Species Act (ESA), which called for the conservation of species and the ecosystems upon which they depend. Pursuant to the ESA, 57 national wildlife refuges have been created expressly for the purpose of conserving federally listed threatened and endangered species. Many more of the 536 refuges also play a significant role in species conservation, and approximately 181 listed animals in the United States reside in whole or in part on refuge lands. In this edition of the *Bulletin*, we launch a series of features on selected endangered and threatened animals found on refuges.

The masked bobwhite (*Colinus virginianus ridgwayi*) is a subspecies of northern bobwhite found primarily in grassy, level areas in the Mexican state of Sonora and in the Altar and Santa Cruz Valleys of southern Arizona. It may never have had a wide distribution in Arizona, being limited to desert grasslands in the southern part of the state, but it was probably present in other valleys and at higher densities prior to the conversion of grasslands to desert scrub caused by overgrazing of cattle (Hollon 1966). The species has been imperiled throughout its range for most of the past century.

Buenos Aires National Wildlife Refuge in southern Arizona was established primarily for the purpose of masked bobwhite conservation, and it encompasses nearly the entire remaining U.S. range of this bird. Conservation efforts on the refuge have included the release of pen-reared chicks and subadults, livestock removal, and habitat improvement with encouraging results.

Population estimates are hard to come by for the masked bobwhite, partly because of the diminutive size and cryptic habits of the bird, but also because quail biologists in the Southwest do not typically discuss populations in terms of individuals. Instead, they discuss population status as numbers of coveys, according to Ron Engel-Wilson, Gamebird Specialist with Arizona Game and Fish Department. The recovery goal, however, is to establish and maintain a viable self-sustaining population of at least 500 birds on the refuge.

Bill Kuvelsky, Wildlife Biologist at Buenos Aires NWR, says refuge biologists classify about 127,000 acres (59,690 hectares) as bobwhite habitat, including about 55,000 acres (22,260 ha) that do

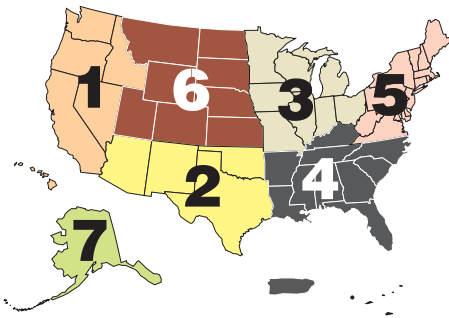
not appear to be occupied by the bobwhite. The carrying capacity for quail at Buenos Aires is probably in the thousands in a typical year. However, the Sonoran region is characterized by great variability in annual precipitation, which is one of the most important factors affecting quail populations (Guthery 1988). Carrying capacity is also affected by fire. In some years, therefore, carrying capacity at Buenos Aires might be higher or lower by an order of magnitude.

Kuvelsky estimates the refuge's current population at 500. Historically, reproduction at Buenos Aires has been practically negligible, with most of the population consisting of survivors from the ongoing raise-and-release program. However, there are recent indications of reproductive success. If this trend continues, with the habitat provided on the Buenos Aires NWR, the masked bobwhite will have a relatively secure future in the United States.

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Regional and field office endangered species staffs have provided the following news:

Region 2

Sonoran Tiger Salamander (*Ambystoma tigrinum stebbinsi*) A recovery plan for this endangered salamander was completed and made available to the public in January 2003. The Sonoran tiger salamander, which is endemic to the San Rafael Valley of southeastern Arizona, is threatened by introduced exotic predators (such as nonnative bullfrogs) and other subspecies of tiger salamander, a virulent disease caused by an iridovirus, small population size, limited distribution, and other factors. The key recovery actions recommended in the plan include maintaining and enhancing habitat, control of exotic predators, reducing disease transmission, limiting the collection of salamanders, public education, and continued coordination among interested and affected parties.

The recovery plan was developed in partnership with the Arizona Game and Fish Department and leading experts on the salamander, in close coordination with a Participation Team composed of ranchers and other residents in the areas where the salamander occurs, agency biologists and representatives, environmentalists, and other interested or affected parties. The Participation Plan describes ways in which recovery actions should be implemented and coordinated to ensure recovery of the salamander while minimizing economic and social costs. The Sonoran Tiger Salamander Recovery Plan is available at <http://arizonaes.fws.gov>.

Reported by Jim Rorabaugh in the Fish and Wildlife Service's Phoenix, Arizona, Ecological Field Office.

Holy Ghost Ipomopsis (*Ipomopsis sancti-spiritus*) The final recovery plan for the Holy Ghost ipomopsis, an endangered plant known from only one site in the Sangre de Cristo Mountains of north-central New Mexico, became available to the public on February 4, 2003. This plant is a short-lived herbaceous perennial plant in the family Polemoniaceae. It grows to about 2 feet (0.6 meter) in height and has beautiful, showy pink flowers. A single population of an estimated 2,500 plants survives on about 200 acres (80 hectares) along a U.S. Forest Service road. Impacts from road maintenance, recreation, and catastrophic forest fire are immediate concerns for the small population. Much of the ipomopsis's remaining suitable habitat is threatened by the direct and indirect effects of residential development and maintenance projects in the Santa Fe National Forest.

The final recovery plan calls for restoring the Holy Ghost ipomopsis to a secure status through continued federal protection and management, research to understand its biological and ecological needs, and establishment of four more populations in suitable habitat in the upper Pecos River Basin. The final plan was signed by the U.S. Fish and Wildlife Service, U.S. Forest Service, and state of New Mexico, and they are already working together to select the first site for reintroduction. The plan is posted on the Service's southwest regional web site at <http://southwest.fws.gov>.

Reported by Wendy Brown, Endangered Species Recovery Biologist.

Region 5

Bald Eagle (*Haliaeetus leucocephalus*) The Service's Chesapeake Bay Field Office in Annapolis, Maryland, completed formal consultation with the Federal Highway Administration (FHWA) for the replacement of the Woodrow Wilson Bridge in accordance with section 7 of the Endangered Species Act (ESA). This federally owned bridge is part of the I-95/495 interstate highway or Capital Beltway linking Maryland and Virginia over the Potomac River. The bridge serves to transport hundreds of thousands of local commuters in the Washington metropolitan area to work each day, and it is an essential transportation corridor for travelers and interstate commerce between Maine and Florida. The Service has determined that land clearing, use of

haul roads, ferrying barges, and construction activities for this \$2.4 billion project will adversely affect a nesting pair of bald eagles within the project action area. The FHWA initiated consultation with the Service in September 1999 and a biological opinion (BO) was rendered in April 2000. The FHWA's implementation of the "reasonable and prudent measures" provided in the BO, in concert with terms and conditions required by the Service after consultation with the Army Corps of Engineers on an interrelated project (National Harbor), allowed for the successful nesting and rearing of 10 young by this eagle pair over four consecutive years. The FHWA also implemented a bald eagle conservation program designed to conserve nesting and foraging habitat for these eagles by conveying 84 acres (34 ha) of shoreline and shallow-open water habitat from the Correctional Corporation of America to the National Park Service for the long term protection of bald eagles.














The FHWA reinitiated consultation with the Service on December 19, 2002, to assess the impacts of the bridge project on bald eagles after new information was obtained pertaining to nest relocation, increased nest productivity, and design plan changes. The Service completed a second and final BO in February 2003.

Karner Blue Butterfly (*Lycaeides melissa samuelis*) The Service's New York Field Office completed formal ESA section 7 consultation with the Federal Aviation Administration regarding the Saratoga County Airport Master Plan Update. The Saratoga County Airport is the site of the largest population of the endangered Karner blue butterfly in New York. The 5-year Master Plan Update includes a variety of projects associated with airport operations and maintenance. Part of the plan involves clearing about 70 acres (28 ha) for obstruction removal, and these cleared areas will be reseeded with native grasses and flowers to create additional habitat for the butterflies. The plan also includes management agreements with the New York State Department of Environmental Conservation to avoid and minimize adverse impacts on the butterfly and its habitat.

Reported by Mary Ratnaswamy of the Service's Chesapeake Bay Field Office.

BOX SCORE

Listings and Recovery Plans as of April 14, 2003

GROUP	ENDANGERED		THREATENED		TOTAL LISTINGS	U.S. SPECIES W/ PLANS
	U.S.	FOREIGN	U.S.	FOREIGN		
 MAMMALS	65	251	9	17	342	52
 BIRDS	78	175	14	6	273	77
 REPTILES	14	64	22	15	115	32
 AMPHIBIANS	12	8	9	1	30	14
 FISHES	71	11	44	0	126	96
 SNAILS	21	1	11	0	33	22
 CLAMS	62	2	8	0	72	57
 CRUSTACEANS	18	0	3	0	21	13
 INSECTS	35	4	9	0	48	29
 ARACHNIDS	12	0	0	0	12	5
ANIMAL SUBTOTAL	388	516	129	39	1,072	397
 FLOWERING PLANTS	570	1	144	0	715	572
 CONIFERS	2	0	1	2	5	2
 FERNS AND OTHERS	26	0	2	0	28	28
PLANT SUBTOTAL	598	1	147	2	748	602
GRAND TOTAL	986	517	276	41	1,820*	999

TOTAL U.S. ENDANGERED: 986 (388 animals, 598 plants)

TOTAL U.S. THREATENED: 276 (129 animals, 147 plants)

TOTAL U.S. LISTED: 1,262 (517 animals**, 745 plants)

* Separate populations of a species listed both as Endangered and Threatened are tallied once, for the endangered population only. Those species are the argali, chimpanzee, leopard, Stellar sea lion, gray wolf, piping plover, roseate

tern, green sea turtle, saltwater crocodile, 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.

** Nine animal species have dual status in the U.S.

ENDANGERED Species BULLETIN

*U.S. Department of the Interior
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