University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Endangered Species Bulletins and Technical Reports (USFWS)

US Fish & Wildlife Service

Spring 2009

Endangered Species Bulletin – Spring 2009, Volume 34, No. 1

Follow this and additional works at: https://digitalcommons.unl.edu/endangeredspeciesbull

Part of the Biodiversity Commons

"Endangered Species Bulletin – Spring 2009, Volume 34, No. 1" (2009). *Endangered Species Bulletins and Technical Reports (USFWS)*. 57.
https://digitalcommons.unl.edu/endangeredspeciesbull/57

This Article is brought to you for free and open access by the US Fish & Wildlife Service at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Endangered Species Bulletins and Technical Reports (USFWS) by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

U.S. Fish & Wildlife Service

ENDANGERED Species BULLETIN

Spring 2009 Volume 34, No. 1

ENDANGERED Species BULLETIN

Telephone: 703-358-2390
Fax: 703-358-1735
E-mail: esb@fws.gov

Web site:
www.fws.gov/endangered/bulletin.html

Editor
Mike Bender

Art Director
Jennifer A. Hennessey

Photo Acquisition Assistance
Ann Haas

The Bulletin gratefully acknowledges the assistance of Krishna Gifford in producing this edition.

Contributors
Krishna Gifford
Deborah Crouse
Matt Braun
Mike Bender
Hayley Dikeman
Sarena M. Selbo
Ken Foote
Judy Jacobs
Erin Fernandez,
Juan Carlos Bravo
Jim Rorabaugh
Doug Duncan
José Antonio Dávila Paulín
Scott Richardson
Debbie Felker
Julie McIntyre
Tom Burke
Tom Czapla
Paige A. Najvar
Kathy Reshetiloff
Pete Gober
Dan Mulhern
Stephanie Weagley
Mike Hawkes
Valary Bloom
Paul Scheerer
Michael Olson
Barb Perkins
Basia Trout
Roger Root
Kevin Shelley
Jeffrey Chan
Sarah J. Converse
Andrea LaTier
Steve Morey
Carolyn Scafidi
Matthew Cimitile
Kelly Ann Bibb
Seth Willey

Cover: The San Joaquin kit fox is one of the species expected to benefit from reintroduction into restored habitats in California's Central Valley.
© Moose Peterson/Wildlife Research Photography

Opposite page: Biologists prepare to release Rio Grande silvery minnows at the mouth of Santa Elena Canyon in Big Bend National Park, Texas.
Aimee Roberson/FWS

The Endangered Species Bulletin is an on-line publication. Three electronic editions are posted each year at www.fws.gov/endangered/bulletin.html, and one highlights edition is published each year. To be notified when a new on-line edition has been posted, sign up for our list-serv by clicking on "E-Mail List" on the Bulletin Web page.

The Bulletin welcomes manuscripts on a wide range of topics related to endangered species. We are particularly interested in news about recovery actions and conservation partnerships.

Please send us your comments and ideas! E-mail them to us at esb@fws.gov.

IN THIS ISSUE

4 Thirty-five Years of the Endangered Species Act
8 A Recovery Plan Begins to Flower
10 Silvery Minnows Return to Texas
13 Recovering a Strange, Elusive Gravedigger
17 Reintroducing Rare Beetles to Ohio
18 The Cemetery and the Clover
20 Groundbreaking Research for the Nihoa Millerbird
22 Climbing the Learning Curve of Short-tailed Albatross Recovery
26 Cross-border Conservation in Sonora and Arizona
30 The Razorback Sucker: Back from the Brink
34 Stepping Up Recovery for the Houston Toad
36 Hungry Goats Restore Bog Turtle Habitat
38 A Challenging Future for the Black-footed Ferret
40 Black-footed Ferrets Return to Kansas
42 Two California Butterflies Wing Toward Recovery
44 The Newell's Shearwaters of Kilauea Point
46 Showy Indian Clover Reintroduction Project
48 Restoring the Oregon Chub
50 Corps of Engineers Aids Missouri River Wildlife
52 Central Valley Project Funds Recovery
54 Using Section 7 as a Recovery Tool
56 Hawaiian Petrel Faces Uncertain Future
58 Endangered Species Day is a Success!
61 Weird and Wonderful Wildlife Poster
62 Partners Protect Habitat for Rare Salamander

Thirty-Five Years of the Endangered Species Act

by Krishna Gifford and Deborah Crouse

A lot can happen in three and a half decades. For the U.S. Fish and Wildlife Service, the many changes, challenges, and accomplishments in the conservation of our nation's imperiled trust resources over the past 35 years have been influenced by a variety of social and natural events.

In terms of our top leadership alone, we have seen 7 Presidents (including 5 changes in political parties), 11 Secretaries of the Interior, and 8 Service Directors. It is fair to say that their natural resource management philosophies have varied significantly.

We have also witnessed many natural disasters significantly affecting the environment, including catastrophic oil spills (1976 *Argo Merchant*, Buzzards Bay, MA; 1989 *Exxon Valdez*, Prince William Sound, AK; 1990 *Mega Borg* Galveston, TX; 2000 *Westchester* south of New Orleans, LA; and, in 2005, oil and gas spills from facilities damaged by Hurricane Katrina); major hurricanes (Andrew (1992), Floyd (1999), Katrina (2005), and Ike (2008); major forest fires (summers of 2000, 2002, 2004, and 2007); and drought (1988, 2002, and 2007).

At the same time, each generation is becoming more technologically connected to each other, but less naturally connected to the fish, wildlife, plants, and habitats that the Service works to conserve for the benefit of the American people. With the rise of MTV, video games, the internet, and cell phones, we have seen our children steadily spending less time outdoors.

Still, the past 35 years have also brought significant conservation achievements:

- In 2003, the National Wildlife Refuge System celebrated its centennial. There are 548 National Wildlife Refuges (NWR) and 37 Wetland Management Districts covering more than 96 million acres (39 million hectares). Thirty-nine of these units were established in the last 10 years alone. Fifty-nine NWRs were

The Maguire daisy has recovered to the extent that it may soon be removed from the list of endangered and threatened species.

Seth Willey/FWS

established specifically for the benefit of imperiled (listed, candidate, species at risk, and other rare) species. Many other units of the National Wildlife Refuge System contribute to conservation of listed species through habitat management.

- There are 65 Fish and Wildlife Conservation Offices, 70 National Fish Hatcheries, 9 Fish Health Centers, and 7 Fish Technology Centers. Most, if not all, of these offices and facilities contribute to the management of listed species through propagation, stocking, research, habitat restoration, and other recovery efforts.
- The National Park System (NPS) encompasses 391 areas (parks, monuments, battlefields, military parks, historical parks, historical sites, lakeshores, seashores, recreation areas, and scenic rivers and trails) covering more than 84 million acres (34 million ha). Approximately 136 of these areas were established or authorized in the past 35 years. Currently, 465 imperiled species occur on NPS lands, and the National Park Service is an important partner in species conservation and recovery.
- All 50 states and 6 U.S. territories have signed and are implementing State Wildlife Action Plans that strive to keep wildlife from becoming endangered (see http://www.fws.gov/endangered/bulletin/2006/bulletin_nov2006.pdf). All 50 States have also signed cooperative agreements with the Service specifically to conserve endangered and threatened species.

The American crocodile has improved in status enough to be reclassified from endangered to the less critical category of threatened.

FWS

Andrea Raven/The Berry Botanic Garden

Efforts to improve the status of the Umpqua mariposa lily have made it unnecessary to list this wildflower under the ESA.

- Finally, the Endangered Species Act (ESA) was signed into law on December 28, 1973. On December 28, 2008, we marked its 35th anniversary. Service staff in 86 Ecological Services or Fish and Wildlife Field Offices, 8 Regional Offices, and the Washington Office, in cooperation with many public and private sector partners, currently administer and implement provisions of the ESA.

When President Richard Nixon signed the ESA, he said, "I congratulate the 93rd Congress for taking this important step toward protecting a heritage which we hold in trust for countless future generations of our fellow citizens." The Fish and Wildlife Service, along with the National Marine Fisheries Service (NMFS) for most marine species, is charged with administering the ESA. To date, with more than 1,300 listed species, only 9 (<1%) have been delisted due to extinction.

Some of our ESA successes include:

Listing: Over many years, habitat loss, excessive take, the effects of invasive species, and other threats have made it necessary to place more than 1,300 U.S. species on the national lists of threatened and endangered wildlife and plants. With the help of our public and private partners, recovery efforts for these species are underway.

Reclassification (downlisting): A total of 21 U.S. species for which the Service has the lead, and an additional 14 foreign or NMFS-lead species, have been reclassified from endangered to the less critical category of threatened. Aquatic and plant species make up the bulk of these downlistings. Some recently reclassified species include the Florida population of the American crocodile (*Crocodylus acutus*), the Gila trout (*Oncorhynchus gilae*), and the Missouri bladderpod (*Lesquerella filiformis*).

Removal from the list (delisting) due to recovery: Thirteen U.S. species for which the Service has lead, and an additional seven foreign or NMFS-lead species, have been delisted due to recovery. Included in these numbers are species representing different taxa (plants, mammals, reptiles, and birds) from around the United States – east to west coast, mountains to swamps, and Alaska to the Commonwealth of the Northern Mariana Islands. The most recently recovered species include the (West) Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*), certain populations of the bald eagle (*Haliaeetus leucocephalus*), and the Yellowstone Distinct Population Segment of the grizzly bear (*Ursus arctos horribilis*). Other species are on the brink of delisting due to recovery, including the Maguire daisy (*Erigeron maguirei*), brown pelican (*Pelecanus occidentalis*) rangewide, and Hawaiian hawk or 'io (*Buteo solitarius*).

Recovery Plans: Currently, there are 545 final recovery plans and 48 draft plans that cover 1,129 U.S species for which the Service has the lead. An additional 124 U.S. species have recovery plans under development.

Precluding the need to list: The most effective way to save a species is to conserve it before it reaches the brink of extinction. The Service's and our partners' preventive conservation efforts have

made it unnecessary to list 41 U.S. species under the ESA. Some of these species include the Warm Springs Zaitzevian riffle beetle (*Zaitzevia thermae*), blue diamond cholla (*Opuntia whipplei multigeniculata*), Umpqua mariposa lily (*Calochortus umpquaensis*), and Pecos pupfish (*Cyprinodon pecosensis*).

Section 6 Grants to States: Over the 35-year history of the ESA, the Cooperative Endangered Species Conservation Fund (CESCF, Section 6 of the ESA) has provided our state and territorial partners with over $1 billion to support collaborative conservation efforts aimed at the recovery of threatened and endangered species.

Section 7: Section 7 of the ESA generally directs all federal agencies to use their statutory authorities to conserve listed species and to consult with the Fish and Wildlife Service (and the NMFS for certain marine species) to ensure that their activities will not likely jeopardize the survival of listed species or adversely modify their critical habitats. Consultations can provide ways to implement recovery tasks by addressing threats to listed species that may result from an agency's programs and activities. In FY 2008, the Service conducted 472 formal section 7 consultations.

Conservation Agreements: In the past 35 years, the Service has signed more than 100 Candidate Conservation Agreements, 19 Candidate Conservation Agreement with Assurances, 750 Habitat Conservation Plans, and 73 Safe Harbor Agreements. These agreements provide specific incentive-based tools by which government agencies (at the federal, state, and local levels), organizations, businesses, and individuals can participate in the recovery of listed, candidate, and at-risk species. (For more information, visit www.fws.gov/endangered.)

The articles in this edition of the *Endangered Species Bulletin* attest to the benefits and accomplishments of the Endangered Species Act. While they outline some of our continuing management challenges (e.g., disease, invasive species, climate change, habitat loss, and the inherent risks facing small population sizes), the articles also highlight some of the array of tools at our disposal to meet those challenges. However, as you will see, our most effective tools for recovering and conserving imperiled species are the creativity, dedication, and sheer determination of Service staff, federal and state agencies, tribes, nongovernmental organizations, and private landowners.

The Hawaiian hawk, shown here in its juvenile white phase, is another species that may soon be delisted due to recovery.

jackjeffreyphoto.com

Krishna Gifford (krishna_gifford@fws.gov; 413-253-8619) and Dr. Deborah Crouse (debby_crouse@fws.gov; 703-358-2471) are fish and wildlife biologists with the Fish and Wildlife Service's Endangered Species Recovery Program.

A Recovery Plan Begins to Flower

by Matt Braun

The landscape on China Hill is dry and rocky, reminiscent of an artist's rendition of some far-away, desolate planet. One wonders what could ever grow in such rough terrain. But junipers and other scraggy shrubs soon catch the eye and remind you that you are indeed in the arid upper reaches of northern California.

Something magical happens here in the spring. Beginning in March, a drab hillside east of the town of Yreka pops to life with the emergence of bright pink flowers. The contrast to the surrounding landscape is vivid. It looks as if someone pinned dozens of corsages to the understated hillside.

Sharp-eyed locals who know where to look can catch a glimpse of this colorful show as they zoom through town along Interstate 5. On the other hand, some are astonished to learn about this "secret" flower. "I have been here for over 20 years," said one Yreka native who accompanied a team of Service biologists to China Hill. "I never knew this flower existed."

The plant in question is the extremely rare *Phlox hirsuita*, otherwise known as Yreka phlox. This endangered wildflower grows in small clusters no more than six inches (15 centimeters) high. Its blooms gradually change from bright pink to white, all shades equally eye-catching against the brownish geology of the region.

Dave Johnson, Tim Burnett, and Nadine Kanim, biologists with the Fish and Wildlife Service's Yreka office, have been collecting data on the phlox since March 2008. This effort formally kicked off the implementation phase for the species' recovery plan. It includes developing a monitoring system that will enable biologists to determine if the species is declining.

The biggest threat to the Yreka phlox has been urban development within the species' limited range. Because there are only five known colonies, all in the vicinity of Yreka, events such as fire, drought, and disease are also of great concern.

The data that Kanim, Johnson, and Burnett are collecting are central to the recovery plan. If the Service can show

Nadine Kanim and Dave Johnson of the FWS Yreka Office monitoring Yreka phlox on China Hill. Kanim received a 2008 Recovery Champion award for her work with this species.

Photos by Matt Braun/FWS

the plant has not declined after 10 years, and if other colonies have been secured, the plant can be reclassified as threatened, or possibly even removed from the endangered species list.

Kanim is hopeful that recovery can be achieved. "There is a lot of support in the community to recover Yreka phlox, from the local timber company, to the city and county governments, to citizens," she says. "The recovery team has identified the threats to the species, and our local partners have already made a lot of progress to protect the plant from various hazards."

Kanim notes that the Yreka phlox recovery effort is a good example of how the federal government is working with local communities to preserve a unique and precious resource.

"One of the main goals of the recovery plan is to enhance awareness of this species and to eventually involve the public in actual recovery efforts. This is a significant component of the recovery plan, and we are looking forward to getting out in the community and working with local citizens."

A key partner in the phlox recovery effort is the city of Yreka, which has purchased – or obtained through donations – nearly 75 percent of the land on China Hill. City planners hope that one day they can provide full sanctuary for the phlox. Their goal is to turn China Hill into a public park, complete with an interpretative center that will tell the story of how one small community came together to save a pretty pink flower from extinction.

Matt Braun, a public affairs specialist in the Service's Yreka office, can be reached at matt_braun@fws.gov or 530-842-5763.

Yreka phlox at China Hill.

Silvery Minnows Return to Texas

by Mike Bender

One of America's most critically endangered species, the Rio Grande silvery minnow (*Hybognathus amarus*), began to face a brighter future on December 17, 2008, with the release of more than 430,000 hatchery-raised fish into former habitat in the Big Bend region of west Texas. The U.S. Fish and Wildlife Service plans to release additional fish there over the next four years to establish an experimental, self-sustaining wild population in the lower Rio Grande.

A bucket brigade of volunteers met a Service fish transportation truck near Rio Grande Village, one of four release sites in and near Big Bend National Park. As hatchery biologists netted the fish from the truck's tanks and carefully placed them into buckets, the volunteers passed them down the line to Ray Mathews of the Texas Water Development Board, who stood two-feet deep in the river. He gently dipped the minnows into a net enclosure, where they spent a day acclimating to the river before their final release. For the first time in about 50 years, silvery minnows inhabited the waters of the Big Bend region.

Jason Remshardt of the Service's New Mexico Fish and Wildlife Conservation Office coordinated the collection, transportation, and release of the minnows. The stock for the release came from two sources: the Service's Dexter National Fish Hatchery and Technology Center in New Mexico, and the City of Albuquerque's Rio Grande Silvery Minnow Rearing and Breeding Facility, which is funded by the Middle Rio Grande ESA Collaborative Program and the State of New Mexico. These fish were not needed for the continuing silvery minnow augmentation effort in the middle Rio Grande of New Mexico.

Native to the Rio Grande system from northern New Mexico to the Gulf of Mexico, the silvery minnow was once considered one of the river's most abundant and widespread species. But extensive habitat changes have reduced its range by almost 95 percent to a reach of the middle Rio Grande near Albuquerque, New Mexico. The Rio Grande silvery minnow needs free-flowing streams in which to reproduce, and much of the river has been impounded by reservoirs. Other sections of the river are subject to drying due to withdrawals for irrigation, pumping for municipal use, and periodic droughts. Water pollution, stream channelization, and introductions of non-native fish species may also have played a part in the silvery minnow's decline.

In 2001, the Service's New Mexico Ecological Services Field Office and New Mexico Fish and Wildlife Conservation

Rio Grande silvery minnow.

Aimee Roberson/FWS

Office began working in the middle Rio Grande region near Albuquerque to maintain the species' last natural population. At times when water withdrawals caused parts of this reach to dry, biologists led rescue efforts to move the fish to wetter parts. Silvery minnow eggs that would otherwise drift downstream into Elephant Butte Reservoir and die were salvaged for captive propagation. The Service has stocked more than one million hatchery-raised Rio Grande silvery minnows back into the river in New Mexico to augment the wild population.

The draft revised recovery plan for the Rio Grande silvery minnow calls for secure wild populations at three locations throughout the species' range. In 2003, the Service began looking for suitable habitat in which to establish a second population. The next year, a team of biologists from the Fish and Wildlife Service and the National Park Service rafted the Rio Grande in the Big Bend region of Texas to evaluate habitat and conduct fish surveys.

Scientists believe that water pollution and a prolonged drought in the 1950s caused the disappearance of silvery minnows from the lower Rio Grande, including Big Bend National Park, which lies within the Chihuahuan Desert. Since that time, however, enough water to support a minnow population has remained in the river below the mouth of the Rio Conchos, a major tributary that originates in the Sierra Madre Occidental of Mexico. The quality of the Rio Grande water also has improved due to better sewage treatment, reduced mining activity, and changes in agricultural practices.

Rio Grande silvery minnows need low-velocity habitats with sandy or silty bottoms. These habitats are generally found in meandering rivers with side channels, oxbows, and backwaters. In recent decades, however, dense stands of non-native salt cedar (*Tamarix chinensis*) and giant reed (*Arundo donax*) have grown up along the Rio Grande in the Big Bend, anchoring the banks and causing the channel to become narrower and deeper. For a number of years, the

Raymond Skiles/NPS

Fish and Wildlife Service staff netted fish from the transport truck's holding tanks, placed them in buckets, and passed them down the line of volunteers to the river.

Mike Bender/FWS

One of the buckets full of fish nears its temporary acclimation pen. Left to right: Cary Carman (USGS), Aimee Roberson (FWS), Jeff Bennett (NPS), Jason Remshardt (FWS), and Ray Mathews (TWDB).

Mark Lockwood/TPWD

Rio Grande silvery minnows are eased into their new home.

Bob Pos/FWS

Rio Grande silvery minnows are propagated at Dexter National Fish Hatchery and Technology Center in New Mexico.

National Park Service has been working to enhance the habitat by reducing invasive vegetation along sections of the river. It is expensive and time-consuming work, but nature lent a hand in September 2008 with the largest flood in decades. In places, it scoured much of the remaining invasive vegetation and rearranged the river channel, creating a more natural mosaic of cobbles, gravel shoals, and sand bars. As a result, conditions improved for the return of the silvery minnow.

For Raymond Skiles, a wildlife biologist for Big Bend National Park, the reintroduction is an important step toward restoring the park's ecosystem. "It's a flagship for the dozen or so other species that are no longer here. It's great to have one of them back. This is one of a suite of species, and we hope there will be others that follow."

The Rio Grande silvery minnow in the Big Bend is designated as an "experimental, non-essential population," meaning that the loss of this population would not be essential to the species' survival. Such a designation allows more flexibility in management, which helps to make species reintroductions more acceptable to the public. The boundary of the experimental population is from Little Box Canyon downstream of Fort Quitman in Hudspeth County, Texas, through Big Bend National Park and the Rio Grande National Wild and Scenic River, to the Amistad Dam in Val Verde County, Texas. Although the experimental population boundary extends up the Pecos River to the mouth of Independence Creek, the minnows are not expected to move into the Pecos.

Aimee Roberson, a wildlife biologist with the Fish and Wildlife Service, worked on Rio Grande silvery minnow conservation from the New Mexico office until taking a position in the Alpine, Texas, office to coordinate the Big Bend reintroduction. After five years, many public meetings, and a great deal of paperwork, she said that the release day was "like Christmas." She quickly added, "But now the real work begins." That work will include additional minnow releases for the next four years, quarterly monitoring of the fish, and annual surveys to detect spawning.

At the Rio Grande Village release site, Joy Nicholopoulos, the Service's Texas State Administrator for Ecological Services, emphasized that the silvery minnow reintroduction was made possible by support from a wide array of partners. In addition to the Fish and Wildlife Service and the National Park Service, other partners include the Texas Parks and Wildlife Department, City of Albuquerque, Middle Rio Grande Endangered Species Collaborative Program, El Carmen Adam's Ranch, Texas Commission on Environmental Quality, Texas Department of Agriculture, Texas Water Development Board, Texas Farm Bureau, University of Texas-Pan American, World Wildlife Fund, The Nature Conservancy, U.S. Geological Survey, International Boundary and Water Commission (including its Mexican section, Comisión Internacional de Límites y Aguas), and other Mexican agencies (the Comisión Nacional de Areas Naturales Protegidas, Departmento de Restauración Ecologia, and Instituto Nacional Ecologia).

Nancy Gloman, the Service's Southwest Assistant Regional Director for Ecological Services, was especially pleased that young people attended the minnow release and helped with the bucket brigade. "This is why we do what we do, so that people can return in years to come, see the minnows and other wildlife, and know that we made a difference for conservation."

Mike Bender, editor of the Endangered Species Bulletin, can be reached at mike_bender@fws.gov or 703-358-2335.

Recovering a Strange, Elusive Gravedigger

by Hayley Dikeman

The American burying beetle (*Nicrophorus americanus*) is a large, vividly marked insect named for its practice of burying its food – carrion – for later consumption. Sometimes referred to as "nature's gravedigger," this oddly colorful scavenger is a natural recycler, ridding the surface of dead animals and returning them to the food web.

Historically, American burying beetles were found over most of eastern North America, including 35 states and a portion of Canada. Since the turn of the century, the species has disappeared from over 90 percent of its former range. By the late 1980s, it was known only from two locations in two states—Latimer County, Oklahoma, and Block Island, Rhode Island. In 1989, the Fish and Wildlife Service listed the American burying beetle as endangered. Although the species is still at risk, populations are now known from 55 counties in eight states. In addition, there are three captive populations, two in zoos (Saint Louis Zoo in Missouri and Roger Williams Park Zoo in Providence, Rhode Island) and one at the University of Ohio.

Biologists often refer to the American burying beetle by the nickname ABB. The prevailing theory for the decline of this species is the loss, degradation, or fragmentation of its habitat. Land use changes result in increased competition from other scavengers, such as raccoons and foxes, for carcasses of the size beetles can bury. The numbers of these vertebrate scavengers formerly were controlled by higher predators, such as wolves and large cats. Developed areas also tend to create different assemblages of carrion species, which may be fewer in number and composed of carcass sizes not favored by the ABB. It has even been suggested that the passenger pigeon (*Ectopistes migratorius*), which once numbered in the billions, was an important food source for the beetle until this bird became extinct in the early 20th century. Lastly, the increase in artificial

The American burying beetle on the right is a male, distinguishable by the rectangular red mark near the mandibles. The one on the left is a female. Female beetles have a triangular marking, although it is not clear in this photograph.

Lou Perrotti/Roger Williams Park Zoo, Providence, Rhode Island

Lou Perrotti/Roger Williams Park Zoo

American burying beetle larvae crawling on a quail carcass provided by keeper Lou Perrotti at the Roger Williams Park Zoo. A female and male adult American burying beetle were placed on the carcass. They proceeded to bury the quail, remove all the feathers, and secrete preservatives. The female then laid eggs near the prepared carcass. The parents feed each larva from the carcass, and when the larvae grow to the above size they will consume the carcass directly.

light can disrupt populations of nocturnal insects such as the ABB, reducing habitat suitability.

Feeding and Breeding

American burying beetles feed and breed on a variety of dead animals. Because carrion is a scarce and ephemeral resource in nature, the beetles must traverse large areas in search of it, aided by antennae that contain chemoreceptors (chemical sensors). By necessity, the beetles are strong fliers capable of covering substantial distances overnight. One-day movements of marked ABBs have been recorded at up to 3.72 miles (5.99 kilometers). On average, though, they move 0.8 miles (1.29 km) per day. Carrion selected by the ABB tends to be larger than that used by other burying beetles. Preferred sources are dead birds and mammals with an optimum weight of 3.5 to 7 ounces (99 to 198 grams).

For reproduction, a pair or group of ABBs will congregate on an appropriately sized carcass. Once the dominant pair is determined, it may move the carrion laterally for up to 3 feet (0.9 meter) before burial. So, how does a pair of insects bury such a large carcass? The beetles crawl under the carcass and dig the soil out from under it, slowly lowering the carrion into the soil. Then the ABBs cover the carcass with the excavated soil and create a chamber around it for rearing their brood.

The ABBs remove fur or feathers from the animal and secrete preservatives that retard bacterial and fungal growth. The female then lays eggs on or near the carcass. In a few days, a brood of three to 31 individuals hatch. Both parents typically remain with the carcass and larvae, feeding their offspring with regurgitated meat until the larvae are capable of feeding themselves. Eventually, the larvae burrow a short distance from the now-diminished carcass to pupate. New adults emerge from pupation within 30 to 45 days. Generally, the ABB produces only one brood per year, and these newly hatched adults overwinter to reproduce the following year.

Captive Conservation, Research, and Outreach

Because the American burying beetle is so rare and difficult to find in the wild, many recovery efforts have focused on learning about what conditions the beetle prefers and on growing populations in captivity for reintroduction into the wild. The Roger Williams Park and Saint Louis zoos have established the "recipe for beetle love," as the Saint Louis Zoo refers to the successful captive propagation of beetles. Zoo keepers fill a bucket with dirt and place a dead quail or rat on top, then put a male and female beetle in the bucket and let nature take its course. Once the next generation emerges, they are placed in a clear plastic box. Twice a week, they receive mealworms and wax worms to eat.

Since 1995, the Roger Williams Park Zoo has reared multiple generations of beetles and, working with the Service, has released over 1,000 pairs on the island of Nantucket, Massachusetts. In addition, the zoo has developed educational programs to spread the important message that conservation should not

discriminate, and that all creatures deserve respect. The Roger Williams Park Zoo has been featured on the Discovery Channel, the children's show "Arthur," and the syndicated show "Wild Moments," as well as in such publications as Wildlife Conservation magazine. More information about the zoo's work with the beetle can be found at http://www.rwpzoo.org/conservation/beetlerecovery.cfm.

The ABB is the first terrestrial insect with an Association of Zoos and Aquariums-sponsored Species Survival Plan. This is a significant achievement. Louis Perrotti of the Roger Williams Park Zoo, in cooperation with the Service and other zoos and experts, developed this plan to maximize the beetle's breeding success. To track individual beetles, each adult is given an identification number and its parentage is recorded. This ensures that each beetle does not breed with another beetle closer than a second cousin. Zoo keepers guide beetle breeding with a complicated formula based on each beetle's age and genetic factors.

The Saint Louis Zoo has developed a Center for Conservation of the American Burying Beetle. The zoo has produced more than 1,000 ABBs, contributed stock for reintroduction into the wild in Ohio, and conducted surveys to determine if this species survives in the wild in Missouri. (Unfortunately, their surveys so far have not resulted in locating any wild ABBs.) More information about the Saint Louis Zoo's beetle program can be found at http://www.stlzoo.org/wildcare-institute/americanburyingbeetlesinmi/ and http://www.stlzoo.org/downloads/DSCN0228.MOV.

George Keeney with Ohio State University, in cooperation with the Service, maintains a captive breeding colony for release of beetles within the state. (See the following story.)

Conservation in the Wild

In Oklahoma, research into the ABB's preferred reproductive microhabitat, specifically soil parameters, is being conducted by Dr. Amy Smith and Dr. Craig Clifford of Northeastern State University, in conjunction with Camp Gruber National Guard Training Center and the Service's Oklahoma Ecological Services Field Office. In coordination with this research, the Oklahoma

Information and educational sign on display at the Roger Willliams Park Zoo.

Lou Perrotti/Roger Williams Park Zoo

Hayley Dikeman/FWS

Kevin Stubbs of the FWS Oklahoma Ecological Services Field Office adds bait to an American burying beetle survey trap.

Department of Wildlife Conservation is working with Northeastern State University to expand this study. The Oklahoma Department of Wildlife Conservation has awarded Endangered Species Act section 6 funds to expand the microhabitat research to the Cherokee Wildlife Management Area, which is adjacent to Camp Gruber National Guard Training Center. This provides a large research area allowing for a large sample size. Preliminary findings should be available soon.

In Nebraska, Dr. Wyatt Hoback, with the University of Nebraska, is conducting multiple research projects regarding the ABB and other *Nicrophorus* species, including the effects of eastern red cedar encroachment, artificial lighting, and water loss.

Other agencies, such as the Federal Highway Commission and the Oklahoma Department of Transportation, are working with the Service to conserve ABB habitat and reduce impacts from transportation projects. The Ozark and Ouachita National Forests each developed a conservation plan with the goal of maintaining and increasing ABB populations on their respective forests.

The knowledge gleaned from better understanding this unusual creature can be applied to conserving additional invertebrates that provide nutrient recycling, pollination, and other important ecosystem services.

Hayley Dikeman, a fish and wildlife biologist in the Service's Oklahoma Ecological Services Field Office, can be reached at hayley_dikeman@fws.gov or 918-382-4519.

Reintroducing Rare Beetles to Ohio

by Sarena M. Selbo

In the summer of 2008, biologists released 228 pairs of captive-bred American burying beetles (*Nicrophorus americanus*) on the Wayne National Forest in southeast Ohio. The reintroduction of this endangered species into Ohio began in 1998 with the release of beetles from healthy populations in Arkansas. Since 2002, Ohio State University (OSU) has maintained a captive breeding colony for release of beetles within the state. Beetles for the 2008 release came from OSU and the Saint Louis Zoo, which has been producing beetles for release in Ohio since 2005. This was the largest release in Ohio and the first release of American burying beetles on the Wayne National Forest.

Reintroducing this endangered insect to Ohio has involved carefully planned matchmaking skills. Before they leave the comforts of their captive breeding facility, George Keeney, an entomologist at OSU, places one female beetle and one male in a plastic container to "get to know each other." Once the beetle pairs arrive at the reintroduction sites, we provide them with food—a dead quail. A pair of beetles is positioned on each quail and covered with a plastic plant pot. Fencing is placed over the pots to reduce competition from other scavengers.

American burying beetles then form a brood chamber and prepare the carrion for use by their offspring. Unusual for insects, burying beetles display a high level of parental care, with both males and females tending the larvae.

Two weeks after the reintroduction, we returned to the site to estimate our success rate. OSU, Forest Service, and Fish and Wildlife Service biologists carefully unearthed a subset of the burials and examined them for the presence of American burying beetle larvae. We estimated a 40 percent success rate (presence of larvae) for burials. This is very comparable to past reintroduction efforts in the state. Further monitoring through post-release trapping will indicate how successfully the beetles emerged into adulthood.

Partners in this recovery project include OSU, the Wilds (a private wildlife conservation center), the Saint Louis Zoo, the Ohio Division of Wildlife, the Forest Service, and the Fish and Wildlife Service.

Sarena M. Selbo, a fish and wildlife biologist formerly in the Service's Reynoldsburg, Ohio, office, and now in the Mountain-Prairie Regional Office in Lakewood, Colorado, can be reached at sarena_selbo@fws.gov.

Sarena Selbo/FWS

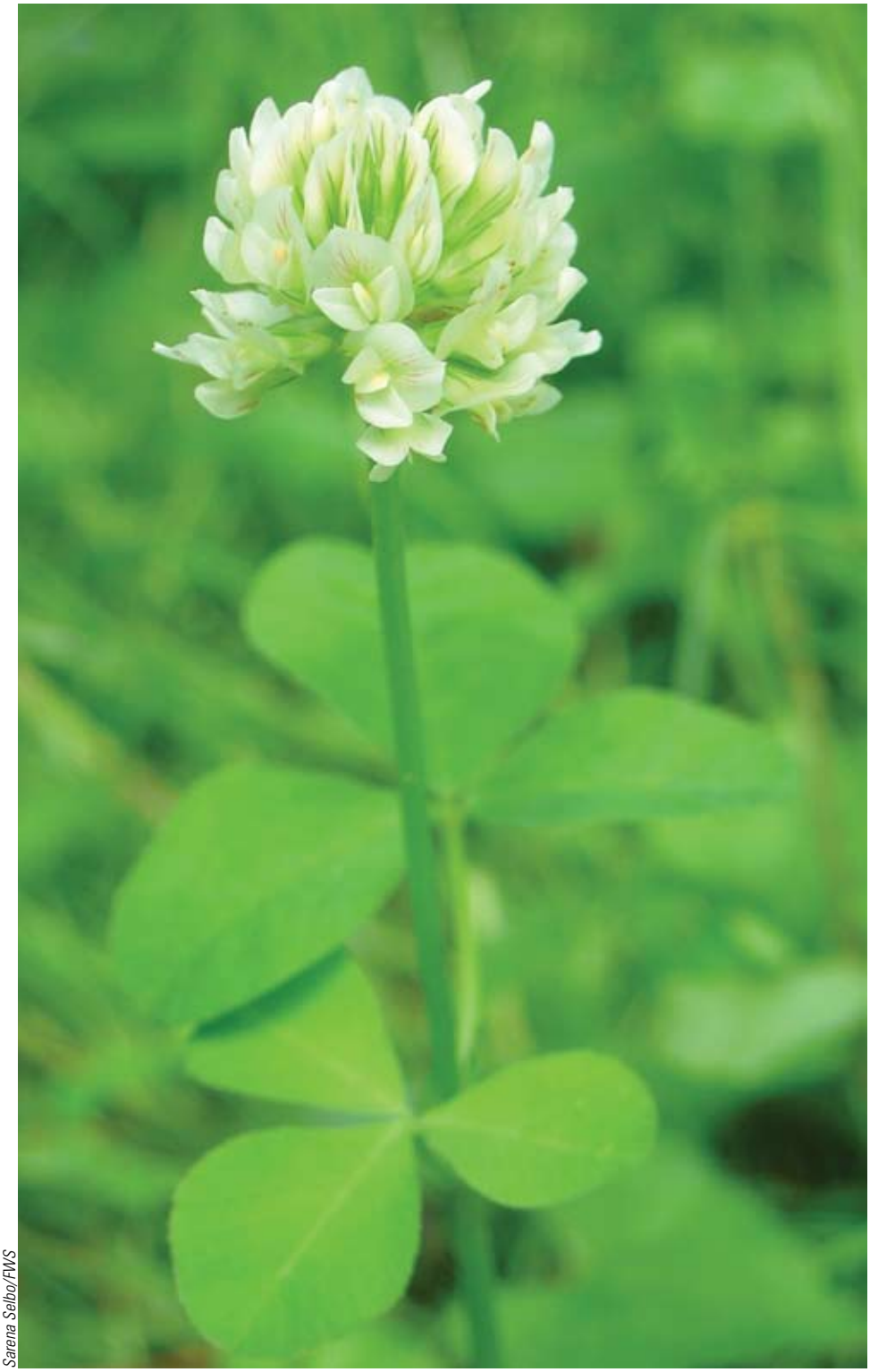
American burying beetle release.

Sarena Selbo/FWS

American burying beetles at the adult and larval stages.

The Cemetery and the Clover

by Sarena M. Selbo



Sarena Selbo/FWS

Congress Green Cemetery in North Bend, Ohio, is more than just the location of the President William Henry Harrison Tomb. This unique cemetery, managed by the Ohio Historical Society, is also home to an endangered plant, the running buffalo clover (*Trifolium stoloniferum*). In a close partnership with the Fish and Wildlife Service's Ohio Field Office, the Historical Society is working to improve the habitat for running buffalo clover on their cemetery property.

One of the major threats to this species is habitat encroachment by invasive, non-native plants. Congress Green Cemetery is not immune to this problem. Running buffalo clover at the cemetery is threatened by Japanese honeysuckle, wintercreeper, and periwinkle. Control of invasive species around endangered plants, such as running buffalo clover, can be a difficult and tedious task.

Each winter, an ambitious group of volunteers joins representatives from the Service and the Ohio Historical Society to remove invasive plants at Congress Green. Rakes in tow, volunteers work to pull up the invasive ground cover around running buffalo clover sites. Since the clover is dormant, this is an optimal time of year for pulling up the invasives.

The Service believes that habitat management at Congress Green will be beneficial not only by reducing competition from invasives, but also by increasing clover germination. Running buffalo clover is adapted to periodic soil disturbance (which historically is believed to have come from bison hooves), and raking may be just what the clover needs. Since management began in 2003, we have counted more clover each May.

The partnership, which also includes the Ohio Department of Natural Resources, was formalized by a memorandum of understanding. It provides for the continued protection, management, and monitoring of running buffalo clover within Congress Green Cemetery, and implements some of the activities identified in the species' revised recovery plan.

Sarena M. Selbo, a fish and wildlife biologist formerly in the Service's Reynoldsburg, Ohio, office, and now in the Mountain-Prairie Regional Office in Lakewood, Colorado, can be reached at sarena_selbo@fws.gov.

Sarena Selbo/FWS

(top): Volunteers pulling invasive weeds at Congress Grove Cemetery.

Don Morgan/FWS

Groundbreaking Research for the Nihoa Millerbird

by Ken Foote

Found only on the small Hawaiian island of Nihoa, the critically endangered Nihoa millerbird (*Acrocephalus familiaris kingi*) teeters on the brink of extinction. Its single, small population is highly vulnerable to chance events such as severe storms and droughts, accidental introduction of alien species and diseases, and population fluctuations. But new research provides hope that a second population can be established.

Fish and Wildlife Service biologists and other scientists are concerned that the Nihoa millerbird could meet the fate of its close relative, the Laysan millerbird (*Acrocephalus familiaris familiaris*). In 1923, the same year that the Nihoa millerbird was scientifically described by Alexander Wetmore, the Laysan millerbird, endemic to Laysan Island, was declared extinct. Habitat destruction by introduced rabbits (*Oryctolagus cuniculus*) led to the demise of the Laysan millerbird and several other terrestrial bird species found only on that island. With the near-complete devegetation of Laysan Island, the millerbird's insect prey disappeared, along with the bird's nesting habitat.

Nihoa Island does not have rabbits; however, in the 1980s, a non-native grasshopper (*Schistocerca nitens*) arrived on the island. This particular insect is prone to population bursts that result in major damage to the island's vegetation and the millerbird's habitat. Although millerbirds eat insects, and may add grasshoppers to their diverse diet, they can't keep this abundant invader under control. The island's remote location and rugged terrain make management of this pest a difficult challenge.

In 2006, owing to the urgency of protecting the Nihoa millerbird, the Service commissioned a ranking of potential translocation sites for this species and two other endangered birds of the Northwestern Hawaiian Islands, the Nihoa finch (*Telespyza ultima*) and Laysan finch (*Telespyza cantans*). This effort ranked Laysan Island at the top of the list for a second population of Nihoa millerbirds. Having once had its own millerbird species, Laysan was a logical choice. Moreover, a comprehensive restoration plan for Laysan Island, completed in 1998, includes a call for introducing the Laysan millerbird's closest relative, the Nihoa millerbird, in order to replace

A biologist nets a Nihoa millerbird on the remote volcanic island.

Mark MacDonald

a missing component of the island's ecosystem.

The translocation of the Nihoa millerbird from Nihoa to Laysan will thus accomplish two goals: establishing a second population of a critically endangered species (thereby reducing the threat of extinction) and contributing to the restoration of Laysan Island. Before a translocation is feasible, however, critical data on millerbird life history and habitat requirements are needed.

Mark MacDonald, a graduate student from the University of New Brunswick in Canada, leads a team that is working with the Service to collect information needed for translocations. From July through September of 2007, MacDonald and his team captured and banded Nihoa millerbirds, collected body measurements, assessed body fat and breeding condition, identified individual territories and analyzed vocalizations, conducted feeding experiments, collected fecal samples, observed behavior to determine diet composition, noted the presence and abundance of non-native grasshoppers, and sampled the insect community on both Nihoa and Laysan to assess the millerbird's potential prey base.

MacDonald's study estimated the Nihoa millerbird's population at approximately 800 individuals – a relatively high number in 40 years of low and fluctuating numbers. He believes that this could be attributed not only to high numbers of birds present during the survey period but also a larger survey area, the use of more experienced observers, or (most likely) the greater visibility of the birds during the late summer, when vegetation cover is most limited.

Using mist nets, 85 Nihoa millerbirds (60 males and 25 females) were captured and banded. Banding permits identification of previously captured birds and reduces stress that can be caused by multiple captures. Most importantly, however, banding allows individual birds to be identified in the field and enables biologists to identify pairs, map their territories, and track individual survival from year to year through repeat sightings. Photographs and measurements of wing and tail feathers were taken from each individual, as well as small feather samples for genetic analysis. Growth bars visible on the tail feathers can help scientists determine the age of the bird, and comparison of photographs and measurements with results of lab analyses will aid in finding a way to sex Nihoa millerbirds in the field. Development of these methods will ensure that the right numbers of male and female birds are moved to Laysan.

Mark Macdonald

Nihoa millerbird.

Several Nihoa millerbirds were placed in a temporary enclosure and presented with a selection of island insects. The purpose was to identify millerbird dietary preferences and see if the birds would eat in captivity. Preliminary results showed that the birds fed readily from a plastic container of prey items. Of the choices offered, they left behind only lady bugs, sow-bugs, and ants. One bird was quick to chase down fast-moving cockroaches before taking smaller, slower insects such as spiders and beetles. Another test with a male and female showed that, after a brief adjustment period, the pair fed together without hesitation.

Using an iPod and a speaker, the team played millerbird songs within the territories of all 60 banded males and recorded the responses with a microphone. These recordings were used to determine the territories of 20 males and will also be analyzed to determine if differences exist in millerbird songs across Nihoa. Preliminary spectrograph analysis of the recordings shows variety among the songs of male millerbirds, but more research is needed to determine if these differences are significant. Identifying millerbird dialects on such a small spatial scale would be a novel finding and a major accomplishment of the expedition.

Thanks to MacDonald and his team, the Service is one step closer to establishing a second population and greatly reducing the risk of extinction for the Nihoa millerbird.

Ken Foote, an information and education specialist with the Service's Pacific Islands External Affairs office, can be reached at 808-792-9535 or ken_foote@fws.gov.

Climbing the Learning Curve of Short-tailed Albatross Recovery

by Judy Jacobs

How do you establish a new seabird colony? That was the question facing the Short-Tailed Albatross Recovery Team when it convened in 2005. Although the short-tailed albatross (*Phoebastria albatrus*), or STAL, was listed in 1970 as endangered, it was initially considered a foreign species. It was not officially protected in the United States until 2000, when the listing was corrected to protect the bird's habitat in this country. So, despite the species' long tenure as a listed species, recovery planning never really got underway until the new millennium. The fact that the STAL is international in range – nesting in Japan and foraging extensively in the waters off Alaska – presents interesting challenges in recovery planning.

The short-tailed albatross is the largest, and was once the most numerous, of the three albatross species inhabiting the North Pacific Ocean. This species is further distinguished from the other two species, the Laysan (*Phoebastria immutabilis*) and black-footed (*Phoebastria nigripes*) albatrosses, by its disproportionately large, blue-tipped, "bubblegum-pink" bill and the golden neck mantle of adults.

Once nesting extensively on islands throughout the western North Pacific, the short-tailed albatross neared extinction around the turn of the 20th century, a victim of the feather trade. Like the dodo in the Indian Ocean, the short-tailed albatross was unaccustomed to land predators and had no protective behaviors that worked against human hunters. (The Japanese name for the species, *aho-dori*, literally means "stupid bird."). Between 1885 and 1903, an estimated five million short-tailed albatrosses were taken from Torishima, a major breeding colony.

An interesting feature of the species' life history may have saved it from extinction. Young albatrosses remain at sea for 5 to 7 years before returning to nest and raise young. When a few surviv-

The author (left) and Yamashina Institute for Ornithology researcher Tomoko Harada prepare to feed a short-tailed chick its daily portion of fish slurry via a caulk gun and stomach tube (2008).

Yamashina Institute for Ornithology photo

ing birds appeared at Torishima in the 1940s, they received vigorous protection. Today, the island's breeding colony has grown to more than 2,000 birds, and both the albatross and Torishima are designated as national monuments in Japan.

But the colony at Torishima is not without problems. The island is an active volcano that last erupted in 2002. Fortunately, that event occurred in August, when all the albatrosses had left for the year. Japanese scientists predict that the volcano is due for a major eruption, and next time the albatross might not be so lucky. To make matters worse, the birds nest on a steeply sloped and eroding alluvial outwash, where eggs and nests can be easily washed or blown away during monsoons and winter storms.

The only other place where short-tailed albatrosses are known to nest is an island in the Senkaku/Dioatsu group southwest of Torishima. Because Japan, China, and Taiwan dispute the ownership of these islands, they are very difficult to access. This colony was last visited by Dr. Hiroshi Hasegawa in 2001. Dr. Hasegawa, the species' patron and benefactor, has visited the Torishima colony almost every year since 1981 and written a great deal about these birds.

So, how could we set recovery goals for a species that nests on only two islands, one that is an active volcano and one that cannot be monitored? The team concluded that recovery would require establishing one or more additional short-tailed albatross breeding colonies.

Starting a new STAL colony is not unprecedented. Our colleagues at the Yamashina Institute for Ornithology in Tokyo have, over the past 10 years, successfully attracted breeding STAL to a more stable spot on the northwest side of Torishima using life-like decoys and recorded sounds from the main colony. Although safer from erosion, this second colony is still on an active volcanic island. The recovery criteria set by the team required colony establishment on a safe, protected island.

But how could this be done? Moving adults wouldn't work. These birds, which can easily negotiate trans-Pacific flights, would certainly return to their original breeding island. Moving eggs presents many other problems, such as the potential for breakage, incubation difficulties, concerns about chicks imprinting on humans, and providing proper nutrition for very young chicks. (Albatross parents feed them regurgitated stomach oil, which may contain enzymes, antibodies, or trace amounts of other ingredients essential for proper chick development.) Translocating older chicks seemed like the most feasible option.

All we know about the post-fledging behavior of translocated albatross chicks comes from a single source: the innovative experiments of Harvey Fisher, who worked with Laysan albatrosses on Midway Atoll during the 1960s. Fisher found that nearly-fledged (about 4-month-old) Laysan chicks that were moved from their hatch site on Midway to Kure Atoll or Lisianski Island returned to Midway to breed five to six years later. However, when he reciprocally exchanged much younger (4- to 6- week-old) chicks between parent birds on Eastern and

The author assists with feeding one of the young Laysan albatross chicks during the first chick translocation attempt at Kilauea Point NWR in 2006.

Brenda Zaun/FWS

Brenda Zaun/FWS

The scenic rearing site of the Laysan chicks at Kilauea Point NWR. Removal of non-native Australian pines (*Casuarina equisetifolia*) was accomplished by refuge staff prior to the chicks' arrival.

Sand Islands within Midway Atoll, most returned as breeders to the island that they had fledged from, rather than where they hatched. Thus, our working hypothesis is that albatross chicks geographically imprint on their future breeding location some time between one month of age and fledging (at about 4 months of age).

Armed with that slim knowledge, we embarked on a practice round of albatross chick translocation in early March of 2006, using the Laysan albatross as a research surrogate. We moved 10 chicks from Midway NWR (where there is a thriving colony of over half a million) to a spot on Kilauea Point NWR on the island of Kaua'i. The chicks were fed and cared for primarily by Tomohiro Deguchi, a researcher at the Yamashina Institute, and Tomoko Harada, an associate at Yamashina.

Unfortunately, March of 2006 was one of the rainiest and coldest months on record for Kaua'i. Two of the chicks died, most likely from exposure, before we could move them into shelter. Another chick died shortly after the chicks were put back out on their rearing site when the weather cleared.

The remaining seven chicks thrived. One female chick suffered an injury that made flight impossible, but Brenda Zaun, the refuge biologist at Kilauea Point, was able to find a home for this bird at the Monterey Bay Aquarium. Named Makana, the albatross now educates aquarium visitors about seabirds and the problems they face from plastic ingestion and other threats.

We were hopeful that the six remaining chicks would fledge from the refuge. However, quite close to fledging time, two more chicks suddenly died from bacterial infections. The remaining four chicks stayed healthy, growing almost too heavy to fly, but after we decreased their food, they managed to get airborne off the ground by mid-July.

In the fall of 2006, a location was chosen for the new colony site – Mukojima, an island in the Bonin chain where STAL nested historically. As with the colony started on northwestern Torishima, STAL decoys and a solar-powered sound system were set up on the chosen site.

The lessons we learned from our experiences with Laysan albatrosses in 2006 prepared us well for the following year's work. In March of 2007, we moved 10 black-footed albatrosses to Mukojima from a nearby island. We greatly improved sterile procedures and handling methods. All but one of these chicks fledged at about the same time as their wild counterparts on Mukojima.

After achieving a nine out of 10 fledging rate, we gained permission to proceed with a translocation of STAL chicks in 2008. On February 19, 10 STAL chicks about six weeks old were captured on

Southern view of Torishima volcano with eruption plume from the summit crater in 2002.

Photo courtesy of Japan Coast Guard

Torishima, placed in custom-designed transport boxes, carried up a very steep hill, and flown to Mukojima by helicopter. This project was well-publicized in Japan, and the Japanese Ministry of the Environment, *Asahi Shimbun* (Tokyo's major newspaper), and the Suntory Fund contributed to the effort.

We took extreme care in the feeding and handling of the endangered chicks. Each had its own feeding equipment, rubber gloves were used and disinfected between feeding each chick, and all feeding equipment was sterilized daily. At first, the chicks were fed a slurry of pureed squid and fish through a stomach tube. As they grew older, they were given chopped, then whole, food. Weighing and measuring was limited to once every several days. This time, our hard work paid off. All 10 STAL chicks fledged by May 25, just a bit ahead of their Torishima counterparts.

To track their movements, five of the Mukojima chicks and five of the chicks from Torishima were equipped with satellite transmitters. After spending variable amounts of time around Japan and the western Pacific, all of these birds crossed the ocean, to forage in the productive waters around the Alaska's Aleutian Islands.

We have come a long way from our initial efforts, but we're not done yet. Our plan is to continue the STAL translocations on Mukojima for four more years, in hopes that, by the fifth year, some of our 2008 fledglings will return to Mukojima as breeding birds. We also speculate that the decoys and sound system may attract other adult STAL to nest on Mukojima. Establishing a new colony is a lot of work, but it's very satisfying to play a part in the restoration of this magnificent seabird.

Judy Jacobs, an endangered species biologist in the Service's Anchorage, Alaska, office, can be reached at judy_jacobs@fws.gov or 907-786-3472.

Judy Jacobs/FWS

Three of the 10 short-tailed albatross chicks moved from Torishima relax in the sun at their rearing site on Mukojima near their parent decoys. The chicks are about 2 months of age. All 10 chicks fledged about 2 months after this photo was taken.

Cross-Border Conservation in Sonora and Arizona

by Erin Fernandez[1], Juan Carlos Bravo[2], Jim Rorabaugh[1], Doug Duncan[1], José Antonio Dávila Paulín[3], and Scott Richardson[1]

Arizona and Sonora share an amazing diversity of biological resources, including many at-risk species of mutual concern to the United States and México. About 40 species occurring in both Arizona and Sonora are on the U.S. or the México endangered species lists, or both. The Fish and Wildlife Service's México Program in Arizona has been working with many partners in both countries to inventory, monitor, conserve, and recover these species.

Red-spotted toad at Rancho Los Fresnos.

Jim Rorabaugh/FWS

In harmony with the objectives of the Wildlife Without Borders-México Program (http://www.fws.gov/international/DICprograms/mexico.htm), which is administered by the Service and SEMARNAT (México's Ministry of Environment and Natural Resources), we aim to develop projects focused on building the capacity for conserving species-at-risk in México. The following are just a few examples of our binational conservation projects conducted under the auspices of multiple international agreements, including the 1996 Memorandum of Understanding that established the Canada/México/U.S. Trilateral Committee for Wildlife and Ecosystem Conservation (http://www.trilat.org).

Fourteen of the 37 amphibian species documented in Sonora are on México's list of species-at-risk. Some, such as the Chiricahua leopard frog (*Lithobates chiricahuensis*), are on the U.S. endangered species list as well. A number of these species are thought to be declining; however, relatively little is known of their status in Sonora. As a result, we and our partners, including the Mexican non-governmental organization (NGO) Naturalia, Africam Safari Zoo of Puebla, Phoenix Zoo of Arizona, and Arizona Game and Fish Department (AGFD) have been developing and implementing a program for amphibian conservation in northwestern México. In 2008, we presented a three-day pilot workshop at Rancho Los Fresnos, owned by Naturalia and located just south of the border in the San Rafael

Valley, where biologists, students, and managers from Mexican reserves and other government offices, NGOs, and universities learned about amphibian identification, survey and monitoring techniques, diseases, threats, captive maintenance and propagation, and conservation. A similar workshop will be held in 2009, and if funding is available, in future years we will give more in-depth workshops to biologists, students, reserve and zoo staff, and veterinarians. Topics to be covered include: dry and summer rainy season survey and monitoring workshops; a captive maintenance and propagation workshop, which will include the construction of a small-scale headstarting facility and refugium pond for imperiled amphibians; and training to provide educators with the knowledge and tools to teach children.

Bats are another animal group at risk in this region. Because they provide significant ecological services, such as pollination and seed dispersion, their conservation is critical to the health and function of natural systems. Information on the distribution and status of many bat species in Sonora remains scarce, although there are some exceptions. For example, the lesser long-nosed bat (L*eptonycteris curasoae*), listed as threatened by México and endangered by the U.S., has been the subject of long-term monitoring at the El Pinacate y Gran Desierto de Altar Biosphere Reserve. To add to this and other bat survey efforts in Sonora, in 2008 we conducted a bat inventory with Naturalia at the organization's recently established Jaguar Reserve in Sonora. The survey provided baseline information to the reserve manager and training in bat survey techniques to local university students. Through our initial efforts, we documented the presence of 12 bat species, including the lesser long-nosed bat, and the students became proficient in mist-netting and handling techniques, as well as bat identification. In 2009, we will expand the bat inventory and training program to include both of Naturalia's reserves in Sonora.

Jim Rorabaugh/FWS

Masked bobwhite.

Many reptiles and fishes of the Sonoran desert are also at risk. To address their conservation, we have been working closely with the Alto Golfo de California y Delta del Río Colorado and Pinacate Biosphere Reserves. For example, in conjunction with the reserves, the Mexican NGO Pronatura Noroeste, and our U.S. partners, we are developing a program to conserve the flat-tailed horned lizard (*Phrynosoma mcallii*) in México, where it is listed as threatened. The species is the subject of a multi-agency conservation agreement and strategy in the U.S, and that strategy includes assisting with the species' conservation in México. Our binational team recently secured funding to implement this program, which will result in the development of a Mexican management strategy, an environmental education and outreach campaign, and training in monitoring techniques for students, government agencies, and NGOs in México.

In conjunction with the Pinacate Reserve, the University of Arizona, AGFD, and others, we are imple-

Craig Miller, Northern Jaguar Project

University of Sonora students, Erin Fernandez, and Scott Richardson conducting bat surveys at the Jaguar Reserve in Sonora, June 2008.

menting a conservation plan for the endemic and at-risk species of the Río Sonoyta, a rare lowland desert stream and spring system in northwestern Sonora and southwestern Arizona. This system supports the Sonoyta mud turtle (*Kinonsternon sonoriense longifemorale*), a candidate for listing by the U.S.; the longfin dace (*Agosia chrysogaster*), a fish listed by México as threatened; and the Quitobaquito pupfish (*Cyprinodon eremus*), which is listed by the U.S. as endangered. With funds from the Service's Preventing Extinction Program, we recently created three ponds in Sonora, one at the Pinacate Reserve headquarters, one at the Intercultural Center for the Study of Deserts and Oceans (CEDO) in Puerto Peñasco, and one at a high school in the town of Sonoyta, to serve as refugia for pupfish and longfin dace. The ponds not only help us meet recovery tasks identified in the pupfish recovery plan, but are also being used as tools to educate students, biologists, and the public about the importance of our unique desert aquatic resources. We are also implementing other facets of the Río Sonoyta conservation plan, such as species monitoring, and are working with the municipal government of Sonoyta, the Pinacate Reserve, and others to incorporate conservation measures for at-risk species into the design of a proposed wastewater treatment facility.

In addition to the aforementioned projects, we are working with partners

Flat-tailed horned lizard in the Gran Desierto, Sonora.

Jim Rorabaugh/FWS

Erin Fernandez/FWS

A hoary bat (*Lasiurus cinereus*) trapped at the Jaguar Reserve.

in Sonora to monitor, research, conserve, and (in some cases) reestablish many other at-risk species. Among these species are the masked bobwhite (*Colinus virginianus ridgwayi*), cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*), Sonoran pronghorn (*Antilocapra americana sonoriensis*), Mexican and narrow-headed gartersnakes (*Thamnophis eques* and *T. rufipunctatus*), Gila topminnow (*Poeciliopsis occidentalis*), Tarahumara frog (*Lithobates tarahumarae*), lowland leopard frog (*Lithobates yavapaiensis*), and Chiricahua leopard frog. We have also been assisting the owners of three ranches by conducting general biological inventories to inform management decisions, as well as—in one case—to support the owner's application to become a federally recognized reserve.

Although biodiversity around the world faces such enormous threats as climate change, habitat loss, introduced species, and disease, we hope that our binational conservation work will allow Arizona and Sonora to conserve their unique and amazingly diverse biological resources for generations to come. For more information, please feel free to contact us at the addresses listed below.

Erin Fernandez[1], México Program Coordinator (fish and wildlife biologist); Juan Carlos Bravo[2], Northwest México Representative; Jim Rorabaugh[1], México Program Supervisor (supervisory biologist); Doug Duncan[1], fish biologist; José Antonio Dávila Paulín[3], Assistant Director; and Scott Richardson[1], fish and wildlife biologist.

[1]201 N Bonita Avenue, Suite 141
Arizona Ecological Services – Tucson Office
U.S. Fish and Wildlife Service
Tucson, Arizona 85745
520-670-6150

[2]Naturalia, A.C.
Quinta Blanca #46-a, Col. Las Quintas
Hermosillo, 83240, Sonora, México
juancarlos_bravo@naturalia.org.mx
www.naturalia.org.mx
www.naturalia.org.mx/jaguardelnorte/JAGUAR.html

[3]Reserva de la Biosfera Pinacate y Gran Desierto de Altar
Carretera 8, Km. 51, Puerto Peñasco, Sonora, México

The Razorback Sucker: Back from the Brink

by Debbie Felker, Julie McIntyre, Tom Burke, and Tom Czapla

As far back as 3 to 5 million years ago, a unique-looking fish with an abrupt, sharp-edged hump behind its head swam the Colorado River and its tributaries. Once widespread and abundant, the razorback sucker (*Xyrauchen texanus*) is now extremely rare in the wild.

The razorback sucker is a large-river fish found only in the Colorado River Basin. Since the early 1900s, the widespread installation of dams, removal of water for human use, and introduction of non-native sport fish have significantly altered the character of the Colorado River. These changes contributed to the decline of the razorback sucker and three other fish species that exist nowhere else on earth: the humpback chub (*Gila cypha*), bonytail (*Gila elegans*), and Colorado pikeminnow (*Ptychocheilus lucius*).

Valued as food by Native Americans, early settlers, and miners, razorback suckers can live for over 40 years and grow to over 3 feet (0.9 meter) in length. Adults can reproduce at 3 to 4 years of age. Playing an important ecological role, razorback suckers eat insects (including fly and mosquito larvae), plankton, and decomposing plant matter on the bottom of the river.

Albert Lapahie, a wildlife technician with the Navajo Nation Department of Fish and Wildlife, holds a razorback sucker that used the fish passage at the Public Service Company of New Mexico weir on the San Juan River. The passage has allowed 22 razorback suckers, 29 Colorado pikeminnows, and more than 87,000 other native fish to move upstream since 2003.

San Juan River Basin Recovery Implementation Program photo

Life history

The razorback sucker evolved in warm-water reaches of larger rivers of the Colorado River Basin from Wyoming to Mexico. These fish move around among adult, spawning, and nursery habitats to complete their life cycle. Spawning occurs during high spring flows when razorback suckers migrate to gravel bars to lay their eggs. Larvae drift from the spawning areas and enter backwaters or floodplain wetlands that provide a nursery environment with quiet, warm, and shallow water.

Research shows that young razorback suckers can remain in floodplain wetlands where they grow to adult size. As they mature, razorback suckers leave the wetlands in search of deep eddies and backwaters where they remain relatively

sedentary, staying mostly in quiet water near shore. In the spring, razorback suckers return to the spawning bar, often quite a long distance away, to begin the life cycle again.

Range and Habitat

The Colorado River Basin is divided into upper and lower basins at Lee's Ferry, Arizona. The Upper Colorado River and San Juan River Basin Endangered Fish recovery programs span rivers in Colorado, Utah, Wyoming, and New Mexico, including Lake Powell. The Lower Colorado River Basin overlaps with Arizona, Nevada, and California, and includes Lake Mohave, Lake Mead, and Lake Havasu. The Lower Colorado River Basin is managed primarily by the Lower Colorado River Multi-Species Conservation Program and the Lake Mohave Native Fish Work Group.

Fish habitats throughout the Colorado River Basin are extremely varied, ranging from high mountain streams to red rock canyon walls in northern areas and to large reservoirs and warm, turbid, swift-flowing reaches with shifting sand and marshy borders in southern portions.

Throughout the Colorado River Basin, partnerships of local, state, and federal agencies, American Indian tribes, water and power interests, and environmental groups are working to conserve and recover the endangered fishes. This major undertaking involves restoring and managing stream flows and habitat, boosting wild populations with hatchery-raised native fish, and reducing negative interactions with certain non-native fish species. The goal is to achieve natural, self-sustaining wild populations that no longer require protection by the Endangered Species Act.

Management and Recovery Actions

Managing water to provide adequate instream flows. Water resources are managed in accordance with state water laws, individual water rights, and interstate compacts. Within these frameworks, recovery actions include water leases and contracts, coordinated water releases from upstream reservoirs, efficiency improvements to irrigation systems, and reoperation of federal dams and reservoirs to provide flow and temperature regimes designed to benefit all four endangered fishes.

Construction projects. Fish passages at low-level diversion dams and fish screens to keep fish from becoming trapped in irrigation canals have been built at nearly all major diversion dams

Mike Montagne, manager of the Ouray National Fish Hatchery near Vernal, Utah, releases a razorback sucker.

Steamboat Pilot/Today

FWS

Biologists capture fish to monitor reproduction, growth, survival, and abundance. Results are used to assess the effectiveness of management actions and adjust recovery efforts through adaptive management.

on the Upper Colorado, Gunnison, and San Juan rivers. The recovery programs are working to complete the remaining fish screens needed in the Upper Colorado River and San Juan River basins. During 2007, the Service also constructed six ponds on the Imperial National Wildlife Refuge about 50 river miles (80 kilometers) above Yuma, Arizona. The ponds, which total about 80 surface acres (32 hectares), are being stocked with razorback suckers and bonytail, and will be managed as native fish refugia.

Propagation and stocking. Ten hatchery facilities and multiple riverside ponds produce the fish used to stock wild razorback sucker populations. Since 1996, about 197,100 subadult razorback suckers have been stocked in the Upper Colorado River system, and since 1994, about 52,700 subadult or adult razorback suckers have been stocked in the San Juan River. From 1997 to the present, about 90,000 razorback suckers have been released into the Colorado River below Parker Dam, with 20,012 razorback suckers stocked throughout the Lower Colorado Basin in 2007 alone.

The stocking efforts are showing success:

- Stocked razorback suckers are moving among the Green, Colorado, and Gunnison rivers, suggesting that razorback suckers may eventually form a network of populations or subpopulations.
- Stocked razorback suckers are behaving as wild fish. They have been recaptured or observed in reproductive condition at spawning sites in the Green, Colorado, and San Juan rivers and, based on captures of larval fish, are reproducing in the wild in the Green, Gunnison, Colorado, and San Juan rivers.
- Razorback sucker larvae are surviving through the first year in the Green, Gunnison, and San Juan rivers, based on captures of juveniles. Numbers of larvae collected from the Green River in 2007 were the highest ever recorded.
- Along the Colorado River downstream of the Grand Canyon, Lake Mead is one of the most unique habitats in the entire Colorado River Basin because it has a self-sustaining population of razorback suckers. Over the last 12 years, Lake Mead has supported a population of 250 to 500 adults, with sustained recruitment for at least 30 years.
- South of Lake Mead is Lake Mohave, which contains the most genetically diverse adult populations of razorback suckers. There had been a very large population in the reservoir shortly after impoundment, but these fish were not recruiting and were projected to die-off due to old age around the turn of the century. Today, the old wild population is estimated to number fewer than 50 fish, but there now are roughly 1,500 repatriated adults on the spawning grounds providing thousands of larvae annually for rearing and stocking throughout the lower basin.
- Approximately 1,500 adult razorback suckers congregate in the river near Needles, California, to spawn. In 2008, razorback suckers stocked in the Colorado River at Laughlin, Nevada (30 miles, or 48 km, upstream of Needles), and in the Bill Williams River, Arizona (50 miles, 80 km, downstream of Needles), were found in the

Colorado at the Needles spawning bar within 10 days of release.

Addressing non-native fish management challenges. Over the past 100 years, more than 70 non-native fish species have been introduced into the Colorado River Basin. We now know that predation and competition by these non-natives are serious threats to the listed native species. For example, research has found non-native fish prey upon razorback sucker eggs and juveniles up to 12 inches (30 centimeters) in length. The recovery programs are removing the most problematic non-native fishes from the rivers and preventing others from entering the river system in areas inhabited by endangered fish. These actions recognize the dual responsibilities of state and federal wildlife agencies to conserve native fish species while providing sportfishing opportunities.

Research and monitoring. The recovery programs monitor reproduction, growth, survival, and abundance of endangered fish in the wild. Studies of the roles of predators (birds and non-native fish), improving physical conditioning of fish prior to stocking, maintaining genetic quality, and age structure continue. The results are used to track progress and adjust recovery efforts as needed through adaptive management.

Reaching out to local communities. Enhancing public awareness and support for endangered fish recovery is important to achieving success. Among our innovative educational programs are interpretive exhibits at visitor centers, annual water festivals, outreach at conferences, providing endangered fish for aquariums in local classrooms, and student tours of fish passage facilities.

Debbie Felker, information and education coordinator, and Tom Czapla, propagation coordinator, Upper Colorado River Endangered Fish Recovery Program, can be reached at debbie_felker@fws.gov or 303-969-7322, ext.227, and tom_czapla@fws.gov or 303-969-7322, ext. 228. Julie McIntyre, a fish and wildlife biologist in the Service's Southwest Regional Office, can be reached at julie_mcintyre@fws.gov or 505-248-6507. Tom Burke, a fish and wildlife biologist with the Bureau of Reclamation, can be reached at the address and number below.

Razorback suckers prefer warm-water reaches of large rivers, such as the scenic San Juan River in northern New Mexico and southeast Utah.

FWS

Programs Working to Recover the Razorback Sucker

- *Upper Colorado River Endangered Fish Recovery Program*
  Established in 1988. Working to recover humpback chub, bonytail, Colorado pikeminnow, and razorback sucker in the Colorado River and its tributaries in Colorado, Utah, and Wyoming.
  P.O. Box 25486, DFC
  Denver, CO 80225
  303-969-7322
  coloradoriverrecovery.fws.gov

- *San Juan River Basin Recovery Implementation Program*
  Established in 1992. Working to recover Colorado pikeminnow and razorback sucker in the San Juan River and its tributaries in Colorado, New Mexico, and Utah.
  2105 Osuna Road NE
  Albuquerque, NM 87113
  505-761-4745
  southwest.fws.gov/sjrip

- *Lower Colorado River Multi-Species Conservation Program*
  Finalized in 2005. Working with over 50 entities to restore habitat and address the needs of listed species in the Lower Colorado River. As a 50-year conservation project covering 26 aquatic and terrestrial species, this program represents the largest, longest-term federal/state partnership plan in the United States.
  Program Office: 702-293-8577
  http://www.lcrmscp.gov/

- *Native Fish Work Group*
  Established in 1991. A seven-agency team, spearheaded by the U.S. Bureau of Reclamation, to replenish Lake Mohave's older razorback sucker population with young adults.
  Tom Burke
  U.S. Bureau of Reclamation
  Boulder City, Nevada
  702-293-8310

Stepping up Recovery for the Houston Toad

by Paige A. Najvar

Hidden beneath the sandy soils of the ecologically unique "Lost Pines" region of central Texas resides one of the state's most imperiled species. The Houston toad (*Bufo houstonensis*) is a small, greenish-brown, speckled amphibian that can be distinguished from other toads by the high-pitched, trill-sounding call that males emit during breeding choruses each spring. It depends on the forests of loblolly pine (*Pinus taeda*) and various hardwood trees it inhabits for migrating, hibernating, and feeding. Ephemeral water sources serve as breeding sites.

In 1970, the Fish and Wildlife Service listed the Houston toad as an endangered species, in large part because of landscape fragmentation and destruction caused by urban development and agricultural conversion. Given its status as a rare and naturally restricted species, the Houston toad has long been known to be particularly vulnerable to anthropogenic changes in its habitat. After decades of habitat loss, intensive, range-wide survey efforts led by Texas State University in the past few years detected the species in only six counties.

One of the largest remaining Houston toad populations occurs within Bastrop State Park in Bastrop County, Texas. In the other five counties, breeding choruses have been few, and the number of males heard calling during any given chorusing event have ranged from only 5 to 20. In fact, only about 100 males were heard chorusing outside of Bastrop State Park during the 2008 breeding season. This indicates a substantial decline in the Houston toad's status since the last range-wide surveys conducted by Texas Parks and Wildlife Department in the late 1980s and early 1990s. Given ongoing habitat loss throughout its range, recent Texas drought conditions, and dwindling populations, we now fear this species could face extinction in the wild within the next several years unless intensive recovery efforts are undertaken.

Houston toad.

Paige A. Najvar/FWS

Paige A. Najvar/FWS

A Houston toad breeding pond on Jim Small's property in Bastrop, Texas. Jim has a Safe Harbor Agreement in place with the Fish and Wildlife Service for his 836-acre property.

Headstarting

We are working with Texas State University and the Houston Zoo to ward against extinction of the Houston toad through headstarting. This practice involves easing individuals of an imperiled species through the most vulnerable stages of their life-cycle (i.e., eggs, tadpoles, and juveniles), when many would die naturally or be eaten by predators.

Although it is a new concept for Houston toad recovery, headstarting has proven to be a successful management tool for other species, such as the Chiricahua leopard frog (*Lithobates chiricahuensis*) and some sea turtle species. The Houston toad has an enormous reproductive potential, with the greatest mortality in the early stages of its life cycle. We believe headstarting may be an effective way to increase the number of Houston toads that successfully develop into adult toads and reproduce. Initial headstarting efforts for the Houston toad began in 2007 when a portion of three Houston toad egg strands were removed from the wild and transferred to the Houston Zoo for captive rearing.

Safe Harbor Agreements

Since 2003, the Service and the Environmental Defense Fund (EDF) have partnered with several private landowners to develop and implement Safe Harbor Agreements for the Houston toad in Bastrop County. Under the agreements currently in place, landowners are managing over 1,900 acres (770 hectares) to enhance or restore habitat for the Houston toad.

In addition to providing additional habitat for the Houston toad, a by-product of these Safe Harbor Agreements is the increased interest of private landowners in partnering with the federal government for endangered species conservation. Such agreements serve to alleviate landowners' concerns about sound management that may attract endangered species to their properties or increase their populations if they are already present. In a state where 94 percent of the land is privately owned, Safe Harbor Agreements build trust with ranchers and other private landowners, and actively engage them in endangered species recovery. (For more information on Safe Harbor Agreements, visit http://www.fws.gov/endangered/factsheets/harborqa.pdf.)

In response to the continued decline of the Houston toad, we are building on our initial Safe Harbor program by working with EDF to develop a regionally based programmatic Safe Harbor Agreement that will encourage non-federal landowners throughout the Houston toad's nine-county range to take part in Houston toad conservation.

Landowners enrolling in the programmatic agreement may choose to conduct a variety of conservation activities, including brush management, forest enhancement and restoration, prescribed burning, breeding pond creation or enhancement, and red imported fire ant (*Solenopsis invicta*) control to benefit the Houston toad on their properties. We hope that by providing Safe Harbor assurances, private landowners will also be more likely to participate in head-starting efforts by allowing access to their properties for egg collection, juvenile releases, and survivorship monitoring.

Despite the remaining obstacles, we remain optimistic that these endeavors and other conservation activities will lead to recovery of the Houston toad as its habitat improves.

Paige Najvar, a fish and wildlife biologist in the Service's Austin, Texas, Office, can be reached at paige_najvar@fws.gov or 512-490-0057, ext. 229.

Hungry Goats Restore Bog Turtle Habitat

by Kathy Reshetiloff

During the hottest months of last summer, 19 workers labored every day to remove woody vegetation that invaded a 5-acre (2.2 hectare) wetland in Carroll County Maryland. But these workers were not your typical Fish and Wildlife Service staff. They were goats, and their affinity for woody vegetation made them superb partners in restoring this wet meadow, which is important habitat for a rare reptile, the bog turtle (*Clemmys muhlenbergii*).

In Maryland, where the species listed as threatened, bog turtles are known to occur in Cecil, Harford, Baltimore, and Carroll counties. Besides illegal collection for the pet trade, the primary threat to bog turtles is the loss of the wetlands on which they depend. Saturated, spring-fed wetlands, such as bogs, fens, wet meadows, sedge marshes, and pastures with soft muddy areas, provide the habitat these turtles require for feeding, breeding, and hibernation. Development, shifts in land use, woody plant succession, and encroachment of invasive plants contribute to the loss or alteration of bog turtle habitat.

Michelle Eversen/FWS

One hypothesis suggests that, prior to settlement by Europeans, bog turtle wetlands were grazed by large herbivores, such as bison, that helped to maintain the open canopy and pockets of muddy substrate. Over the last century, the abundance of bog turtles in pastured wetlands indicates that grazing cattle have been instrumental in maintaining the openness of wetlands needed for habitat. In the absence of grazing, most shallow wetlands give way to woody vegetation or dense thickets of exotic invasive plants like multiflora rose (*Rosa multiflora*).

Some bog turtle wetlands have been overgrazed by cattle, so habitat restoration work included stream fencing, pasture management, and creating alternative water resources for livestock. Other bog turtle wetlands have been overgrown with woody shrubs, small trees, and invasive plants. Restoration of these overgrown wetlands typically requires labor intensive removal of vegetation using physical, mechanical, and chemical treatments.

In 1997, the New Jersey Division of Fish and Wildlife's Endangered and Nongame Species Program began to experiment with livestock grazing to control woody vegetation in bog turtle

Julie Slacum/FWS Chesapeake Bay Field Office

Goats help to clear vegetation, improving habitat for the bog turtle.

wetlands. Since then, prescribed grazing has been successful in bog turtle sites in North Carolina, Georgia, Virginia, New Jersey, New York, and Pennsylvania.

Cattle are most adept in grazing on and controlling grasses, but goats are woody vegetation specialists. They can control species such as young red maple (*Acer rubrum*) trees and multiflora rose. In 2007, the Maryland Department of Natural Resources, in partnership with the Fish and Wildlife Service's Chesapeake Bay Field Office, the Maryland Cooperative Extension Service, and the federal Natural Resources Conservation Service, experimented with prescribed grazing with goats on two wetland sites that did not contain bog turtles at the time but did show records of occurrence from the 1990s either at or near the sites. After the goats began their work, both sites showed a significant reduction in multiflora rose, with the goats also feeding on red maple saplings. The goats left an obvious browse line at both sites.

Service biologists next decided to try prescribed grazing at a current bog turtle site. Due to the ability of goats to escape enclosures, six-strand high-tensile electric fencing was installed during the winter of 2008. A run-in shelter was added because of the small size of the goats.

With permission from the landowner, the goats were introduced to the wetland site on July 19, 2008. They browsed on multiflora rose, red maple, and Russian olive (*Elaeagnus angustifolia*), working their way from the upland/wetland edge inward until their removal on September 19. The goats will probably be used for at least another year or two.

Photos were taken at nine monitoring stations approximately every two weeks. Five vegetation plots were established and data characterizing vegetation cover will be collected. If this experiment proves to be effective, goats may be used on other bog turtle wetland sites as a low-impact approach to control unwanted woody trees and invasive plants.

More than 97 percent of bog turtle wetlands occur on private lands, so the recovery of this species will depend heavily on the voluntary assistance of landowners. Since 1997, various habitat restoration techniques have been completed at 17 wetlands on private lands in Maryland totaling more than 150 acres (60 ha).

In addition to the private landowner, partners in the 2008 project included the Fish and Wildlife Service, Natural Resource Conservation Service, and Environmental Defense Fund. The U.S. Department of Agriculture holds a permanent easement for the wetland portion of this property.

For more information on this project, contact Julie Slacum (julie_thompson@fws.gov; 410-573-4517) at the Service's Chesapeake Bay Field Office in Annapolis, Maryland.

Kathy Reshetiloff, a writer/editor in the Chesapeake Bay Field Office, can be reached at kathryn_reshetiloff@fws.gov or 410-573-4582.

A Challenging Future for the Black-footed Ferret

by Pete Gober

The black-footed ferret (*Mustela nigripes*) is a small, weasel-like animal with a long, slender body marked by black feet and a black mask. Once feared to be extinct, it is among our nation's rarest animals. Black-footed ferrets depend almost exclusively on prairie dogs, which provide food and shelter.

Historically, black-footed ferrets occurred across a very large area of central North America, wherever prairie dogs existed, from southern Canada to northern Mexico. Over the past century, prairie dogs, along with ferrets, were vastly reduced in number by the conversion of native prairie habitats to cropland, the poisoning of prairie dogs to reduce forage competition with domestic livestock, and a non-native disease (sylvatic plague). Prairie dogs no longer occur in the large, unbroken colonies that once extended for miles, their range having been reduced by over 95 percent. Accordingly, recovery efforts for the ferret must adapt to difficult circumstances.

In 1979, the black-footed ferret was widely presumed to be extinct after the last few individuals from a population in South Dakota died in captivity without successfully breeding. Fortunately, this presumption proved wrong in 1981 when a small population was discovered near Meeteetse, Wyoming. The wild population succumbed to disease a few years later, but not before biologists had taken a few into captivity. Those ferrets formed the basis of a new captive-breeding population that has so far produced more than 6,000 young. Six facilities, including five zoos affiliated with the American Zoological Association, now maintain separate, intensively managed captive ferret populations totaling approximately 240 animals that produce animals for reintroduction into the wild.

Since 1991, more than 2,000 ferrets have been released at 17 sites across the western United States and Mexico. These sites include locations in eight of the 12 states within the species' historical range. Additional reintroduction efforts are planned for the future, including an effort in Canada in 2009. At present, ferret numbers in the wild total over 1,000 individuals in the fall of each year with perhaps half that many surviving to breed each spring. Although the species will not be recovered until larger numbers of ferrets exist in the wild and

One of the world's three ferret species, the black-footed ferret is the only one native to North America.

Dan Mulhern/FWS

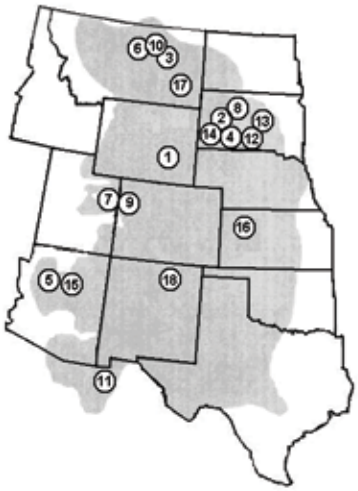
routine reintroduction efforts are no longer necessary, we can point to significant progress. Several ferret reintroduction sites are largely self-sustaining, and more animals occur in the wild than in captivity. Still, these milestones collectively result in only about 20 percent of the numbers required to meet the recovery plan goals.

For the past 27 years, many diverse partners have contributed to ferret recovery. The U.S. Fish and Wildlife Service coordinates overall recovery efforts and operates the National Black-footed Ferret Conservation Center in Colorado, where most captive ferrets are located. The Wyoming Game and Fish Department was instrumental in early captive breeding efforts. This agency and seven of its counterparts have supported reintroduction efforts in their states. Additionally, reintroduction efforts have been supported by the National Park Service, the Bureau of Land Management, the U.S. Forest Service, the Fish and Wildlife Service's National Wildlife Refuge System, several Native American Tribes, various conservation groups, and private landowners. The Black-footed Ferret Recovery Implementation Team and its predecessors have met routinely for more than 25 years to coordinate recovery efforts.

Some of the most challenging obstacles limiting ferret recovery have been successfully addressed, including the development of captive breeding and field reintroduction techniques. Nevertheless, providing enough quality prairie dog habitat to support a larger number of ferrets in the wild remains problematic. Because many people consider prairie dogs a pest species, these animals remain subject to routine poisoning, which reduces or eliminates potential ferret habitat. Incentive programs to conserve prairie dogs where appropriate and control them in other areas will be necessary to achieve ferret recovery in the working livestock landscape of the western U.S.

Additionally, the quality of potential ferret habitat is limited by disease. Sylvatic plague, which was introduced from overseas via flea-infested rats, is lethal to both prairie dogs and ferrets. The recent development of several management tools to ameliorate the impact of this disease has been useful in maintaining some reintroduced ferret populations. More research and field testing of these techniques is underway.

Despite the radically altered environment that reintroduced ferrets face today, the recovery of this species is within reach. All the pieces of the management puzzle necessary to achieve recovery have been identified and have proven successful in the field. The challenge is for continued ferret and prairie dog management efforts to complete the job.



Probable historical range of the black-footed ferret (shaded) and current reintroduction sites. The locations of reintroduction sites are portrayed in their chronological order of implementation as follows: 1) Shirley Basin, WY (1991); 2) Badlands National Park, SD (1994); 3) UL Bend NWR, MT (1994); 4) Conata Basin, SD (1996); 5) Aubrey Valley, AZ (1996); 6) Fort Belknap Indian Reservation, MT (1997); 7) Coyote Basin, UT (1999); 8) Cheyenne River Indian Reservation, SD (2000); 9) Wolf Creek, CO (2001); 10) BLM "40 Complex", MT (2001); 11) Janos, Chihuahua, Mexico (2001); 12) Rosebud Indian Reservation, SD (2003); 13) Lower Brule Indian Reservation, SD (2006); 14) Wind Cave NP, SD (2007); 15) Espee Ranch, AZ (2007); 16) Logan County, KS (2007); 17) Northern Cheyenne Indian Reservation, MT (2008); and 18) Vermejo Ranch, NM (2008).

Status of the black-footed ferret in the wild

SITE (YEAR INITIATED)	PRAIRIE DOG SPP.	FERRETS RELEASED	MINIMUM FALL POPULATION	ESTIMATED BREEDING ADULTS
Shirley Basin, WY (1991)	Wtpd	277	196	98
UL Bend NWR, MT (1994)	Btpd	208	13	7
Badlands NP, SD (1994)	Btpd	175	20	10
Aubrey Valley, AZ (1996)	Gpd	173	66	33
Conata Basin, SD (1996)	Btpd	150	292	146
Ft. Belknap Ind. Res., MT (1997)	Btpd	167	0	0
Coyote Basin, UT (1999)	Wtpd	200	25	13
Chey. River Ind. Res., SD (2000)	Btpd	189	150	75
BLM 40-complex, MT (2001)	Btpd	95	3	3
Wolf Creek, CO, (2001)	Wtpd	209	16	8
Janos, Mexico (2001)	Btpd	282	13	7
Rosebud Ind. Res., SD (2003)	Btpd	99	30	15
Lower Brule Ind. Res., SD (2006)	Btpd	62	14	7
Wind Cave NP, SD (2007)	Btpd	49	Recent release	No data
Espee Ranch, AZ (2007)	Gpd	44	Recent release	No data
Logan County, KS (2007)	Btpd	24	Recent release	No data
N. Cheyenne Ind. Res, MT (2008)	Btpd	8	Recent release	No data
Vermejo Ranch, NM	Btpd	53	Recent release	No data
Total		**2464**	**838**	**422**

Wtpd (white-tailed prairie dog) **Btpd (black-tailed prairie dog)**

Pete Gober, the project leader of the Black-footed Ferret Recovery Program, can be reached at pete_gober@fws.gov or 605-224-8693, ext. 224.

Black-footed Ferrets Return to Kansas

by Dan Mulhern

Dan Mulhern/FWS

Black-footed ferret.

On December 31, 1957, the last known live black-footed ferret (*Mustela nigripes*) in the State of Kansas was seen near the town of Studley. Nearly 50 years later, on December 18, 2007, ferrets returned to Kansas. The reintroduction marked the beginning of an experimental effort that we hope will allow ferrets to make Kansas prairies their home again.

The story began in October 2005, when a handful of ranchers in Logan County approached the Fish and Wildlife Service to offer their ranchlands for ferret recovery. Our initial excitement at this proposal was tempered with a healthy dose of skepticism. After all, ferrets require prairie dogs (*Cynomys* sp.) for survival, and many people have tried diligently over the last century to eliminate prairie dogs. In fact, a 1901 Kansas law authorizes townships to forcibly require prairie dog eradication, with or without the landowner's consent. Some counties, including Logan, have assumed this authority on a county-wide basis.

We conducted a habitat assessment on our cooperators' prairie dog complexes and found they contain very high-quality habitat for black-footed ferrets. It is a much smaller area than traditional ferret release sites in northern or western states, which typically comprise tens of thousands of acres of prairie dogs on federal or tribal lands. However, many of those sites have been hit by sylvatic plague, an introduced disease that is fatal to both prairie dogs and ferrets. One big advantage of the Kansas site was the absence of plague in resident mammals. Another key ingredient was the opportunity to forge a recovery relationship based entirely on privately owned land, including land owned by The Nature Conservancy.

As expected, our reintroduction plan was not met with widespread acceptance in the local community. Many people didn't want anything that would result in areas of uncontrolled prairie dogs. There were also fears of what an endangered species might mean to the local area.

We addressed one concern by using an experimental recovery permit to conduct this work, with the Service assuming liability for any ferrets accidentally killed. The prairie dog maintenance issue is more difficult, but part of the plan provides a mix of agency and private money to assist with prairie dog control for landowners surrounding ferret release sites. As one of our partners pointed out, "It's a sad fact that if you want to maintain prairie dogs, you have to be willing to kill some." We and our partners are willing to kill some prairie dogs for the greater good of maintaining a core complex adequate to support ferrets.

We finally got word in December 2007 that a small number of ferrets were still available for release in Kansas if we could make the arrangements in time. After a whirlwind of activity and contacts, a van carrying 24 captive-bred black-footed ferrets left northeast Colorado for Kansas, arriving on December 18. The animals had been reared at three different U.S. breeding facilities and one in Canada, and had been "finished" at outdoor pre-con-

Dan Mulhern/FWS

A black-footed ferret gains its freedom in Kansas.

ditioning pens at the Service's National Black-footed Ferret Conservation Center near Wellington, Colorado, where they learned to hunt prairie dogs on their own.

The first ferret released seemed reluctant to accept the burrow chosen for it, but after a brief investigation of the surface it finally disappeared underground. We knew we had chosen a good location when two agitated prairie dogs popped out of that same hole and raced off between onlookers' feet to find a safer refuge. I suppose it was their opinion we had just ruined the neighborhood.

We conducted nighttime surveys in March 2008, yielding proof that some of our released animals were alive and well, and providing hope that kits might be produced. A survey in August confirmed our best hopes: four different litters were located containing at least nine wild-born kits. We released almost 40 new ferrets in October 2008 to help jump-start the population.

After five years, we'll make an assessment to determine if the experiment seems headed in the right direction. By that time, we hope that ferrets are still persisting in reasonable numbers and reproducing successfully. If they do not do well in Logan County, any remaining animals can be captured for relocation to a better site.

The key to success is the prairie dog, without which the ferret will fail. If it becomes impossible to maintain sufficient acreages of prey, we will have to abandon the reintroduction and remove any remaining ferrets. In this event, Kansas will not only lose the chance to help recover an extremely rare animal but will have significantly reduced its prairie biodiversity. Scientists have verified over the years that myriad plants and animals occur in higher densities and numbers in a prairie dog colony than on similar habitats in the absence of prairie dogs. The micro-ecosystem created within a prairie dog colony is incredibly complex and diverse, allowing creatures like burrowing owls (*Athene cunicularia*) and swift foxes (*Vulpes velox*) to thrive.

Kansas has the opportunity to demonstrate concern for its own natural heritage and play a small part in bringing one our nation's most endangered mammals back from the brink of extinction. The Service is proud to partner with the landowners who had the foresight to take the first step in this process.

Dan Mulhern, a fish and wildlife biologist in the Service's Kansas Ecological Services Field Office, can be reached at 785-539-3474, ext. 109.

The ferret reintroduction site in Kansas.

Dan Mulhern/FWS

Two California Butterflies Wing Toward Recovery

by Stephanie Weagley

The Palos Verdes and El Segundo blue butterflies are small, colorful creatures that survive on pockets of habitat within highly urbanized southern California. Conservation partners are helping the Fish and Wildlife Service make progress toward the recovery of these endangered species.

Palos Verdes Blue

In 1980, the Service listed the Palos Verdes blue butterfly (*Glaucopsyche lygdamus palosverdesensis*) as endangered. It based this action on threats from development and weed management practices that remove native vegetation, including locoweed, which was thought to be the butterfly's only host plant. Biologists feared that the butterfly became extinct in 1983 when the habitat supporting the only known population was developed. Much to everyone's surprise, a population was discovered in 1994 on a previously unknown host plant, deerweed, at the U.S. Navy's Defense Fuel Support Point in San Pedro, California. This provided a second chance to save the species from extinction. Soon, a captive-rearing facility for the Palos Verdes blue was established on the Naval facility.

The Palos Verdes blue butterfly now benefits from a second captive-rearing facility established in 2007 at America's Teaching Zoo at Moorpark College, California. This new facility serves as another vital step towards the recovery of the butterfly, which is named for its home, the Palos Verdes Peninsula in Los Angeles County.

A diverse array of partners are assisting the Service in the recovery of the Palos Verdes blue, including the U.S. Navy, U.S. Defense Logistics Agency, California Department of Fish and Game, The Urban Wildlands Group, Palos Verdes Peninsula Land Conservancy, and many other local organizations.

Recovery work underway includes habitat restoration at the Linden H. Chandler Preserve and other areas located on the Palos Verdes Peninsula.

Palos Verde blue butterfly.

© Moose Peterson/Wildlife Research Photography

For example, the city of Rancho Palos Verdes is developing a habitat conservation plan with preserve areas suitable for reintroduction of the butterfly. Such cooperative efforts will provide more locations where captive-reared butterflies can be released.

El Segundo Blue

In June 2007, the El Segundo blue butterfly (*Euphilotes battoides allyni*) was spotted fluttering among beachgoers at two Los Angeles County beaches – places where it had been absent from the public's eye for decades. The natural resurgence of this butterfly along the coastal bluffs in Redondo Beach and Torrance is something wildlife experts never expected.

Also listed as endangered, the El Segundo blue butterfly is found only along the southeastern shores of Santa Monica Bay. Known populations exist on coastal dune habitat adjacent to Los Angeles International Airport, on the Chevron Refinery in El Segundo, at Malaga Cove in Torrance, and now two new sites along the beach in Torrance and Redondo Beach. The largest population inhabits the airport dunes.

In many ways, the reappearance of the butterfly at Redondo Beach and Torrance has been a surprise. First, previous scientific studies indicated the butterfly was relatively sedentary and typically did not fly distances farther than 200 feet (60 meters). The new sightings, however, challenge that notion. To arrive at its newfound locations, the El Segundo blue most likely flew 1,000 feet (305 m) across backyards from its nearest known habitat, thereby demonstrating that its dispersal capabilities are greater than once thought. Furthermore, this location may indicate that the species can naturally recolonize sites containing the native coastal dune vegetation upon which it depends.

Habitat restoration has played a key role in this butterfly's return. Since 2003, native vegetation reintroduction along the coastal bluffs of Redondo Beach and Torrance has been conducted by residents, conservationists, government officials, and representatives from two nonprofit groups, The Urban Wildlands Group and the Los Angeles Conservation Corps Science, Education, and Adventure Lab program. The removal of non-native vegetation and the restoration of native scrub plants, such as coast buckwheat, California sunflower, deerweed, prickly pear cactus, and lupines, continue to this day. Restoration of coast buckwheat has been especially important because the El Segundo blue butterfly depends on this plant at each of its four life stages (egg, larva, pupa, and adult).

Despite these efforts, habitat modification and destruction remain a threat to the El Segundo blue. Coast buckwheat faces serious competition from vegetation that is not native to the coastal dunes ecosystem, including certain acacia, grass, and iceplant species. Therefore, if not actively managed, even habitat that is not threatened directly by development is still likely to become degraded and unsuitable for the El Segundo blue butterfly.

The previously known population sites for the El Segundo butterfly are off-limits to the public. Although protection and management activities have taken place with varying degrees of intensity over the past decade and are important for future recovery goals, no occupied sites have permanent protection. The butterfly remains in danger of extinction due to habitat loss and modification, limited range, small population numbers, and inadequate protection.

With the resurgence of the El Segundo blue butterfly at the two Los Angeles county beaches, however, we are hopeful that, if continuing conservation is ensured, this tiny creature can someday fully recover.

Stephanie Weagley, an information and education specialist in the Service's Carlsbad, California, Fish and Wildlife Office, can be reached at stephanie_weagley@fws.gov or 760-431-9440.

El Segundo blue butterfly.

Ann Dalkey/ Palos Verdes Peninsula Land Conservancy, Director of Science Programs

The Newell's Shearwaters of Kilauea Point

by Mike Hawkes

Kilauea Point National Wildlife Refuge, located on the northern tip of the island of Kaua'i, is the only unit of the entire National Wildlife Refuge System that can boast the presence of nesting Newell's shearwaters (*Puffinus auricularis newelli*).

To date, only four nests of this burrow-nesting bird have been found, but refuge biologist Brenda Zaun remains optimistic. "Conducting population studies of this species is extremely difficult," she says. "Looking for their hidden burrows is like looking for a needle in a haystack, and you have to be careful not to destroy the haystack during the search. I suspect there are more here; I just haven't found them yet."

Newell's shearwater chick.

Brenda Zaun/FWS

Listed as threatened in 1975, this endemic Hawaiian seabird is small with black and white plumage. Like many seabirds, the Newell's shearwater comes to land only to breed and nest, raising a single chick each year. Burrows excavated by the birds serve as nest cavities. Most of the world's populations of Newell's shearwaters nest in colonies along steep mountain ridges and valleys in the interior of Kaua'i. These areas are largely inaccessible to humans but not to non-native predators, such as feral cats, pigs, and rats. The birds feed at sea during the day, fly to their inland burrows after dark, and return to sea well before dawn.

Seabird experts believe that perhaps 90 percent of Newell's shearwaters nest on Kaua'i. Some of the other main Hawaiian Islands may have very small populations, but they have not been confirmed. Based on recent surveys, the population on Kaua'i appears to be declining.

So why would a species that nests in remote mountain habitats nest at a coastal refuge? "The individuals nesting at the refuge are very likely descendents of Newell's shearwaters that were brought here 30 years ago as eggs and cross-fostered by the much more common wedge-tailed shearwater (*Puffinus pacificus*)," Zaun explains.

In the late 1970s, a bold experiment was conducted over a three-year period. The highly successful experiment took 90 Newell's shearwater eggs from their mountain burrows and carefully transported them to the refuge at Kilauea

Mike Hawkes/FWS

Brenda Zaun, a biologist Kilauea Point NWR, releases a Newell's shearwater from the "Save Our Shearwaters" program.

Point, where they were placed under incubating wedge-tailed shearwaters. Of these, 67 chicks fledged. Zaun and others believe that at least some of those birds returned and nested at the refuge, and the nesting individuals known today are most likely progeny from those original birds.

Until a few years ago, very little was known about the nesting habits and behavior of Newell's shearwaters. Using non-invasive monitoring equipment, Zaun has been able to increase exponentially our knowledge of the species. With an active infrared camera system at the burrow entrances and passive integrated transponders (PIT) tags on the adults, she was able to learn when the birds arrive on land, the length of courtship and nest preparation prior to egg laying, the length of incubation and individual incubation shifts, the length of the chick rearing period, feeding strategies, and the degree of parental investment during the reproduction period.

The infrared camera system has proven to be an invaluable resource, especially at two artificial nest boxes. This setup facilitates monitoring and ensures that the equipment is effective. The camera system records everything that momentarily breaks an invisible infrared beam across the burrow entrance. Species photographed at the burrow entrance include feral cats, rats, Hawaiian geese, small passerines, geckos, and spiders. The photos of cats and rats have reinforced the belief that maintaining predator control at Kilauea Point is paramount to protecting Newell's shearwaters and other native species that nest on the refuge.

Although these seabirds fly to and from land during darkness and nest almost exclusively in remote areas inaccessible to people, the Kaua'i community is well aware of Newell's shearwaters. For decades, people have been finding them on the island's roadways, yards, and ball parks. Unfortunately, the fledglings have a strong attraction to lights and will exhaust themselves flying around them before coming to ground, often colliding with buildings, trees, and utility lines along the way.

Three decades ago, Hawaii's Department of Land and Natural Resources began the "Save our Shearwaters" Program. The program uses community support to help save injured or stranded birds. People who find a live bird are encouraged to pick it up and take it to the nearest fire station for the appropriate care. More than 31,000 Newell's shearwaters and other seabirds have found their way back to the sea thanks to this unique program.

Currently, the U.S. Fish and Wildlife Service, the state of Hawaii, and private organizations are working on a plan to minimize the negative impacts that lighting and other attractants have on the shearwaters, with the hope of providing safer routes for the birds to travel from the mountains to the sea and back again.

Mike Hawkes was the manager for the Kaua'i National Wildlife Refuge Complex before becoming the manager at Buenos Aires National Wildlife Refuge in Arizona. He can be reached at 520-823-4251 x102 or mike_hawkes@fws.gov.

Newell's shearwater adult.

Brenda Zaun/FWS

Showy Indian Clover Reintroduction Project

by Valary Bloom

The showy Indian clover (*Trifolium amoenum*), a tall native annual, is an endangered wildflower that was once widespread in coastal grasslands within the counties surrounding San Francisco Bay, California. In 1994, after almost all known populations were extirpated due to habitat loss, the Fish and Wildlife Service listed this species as endangered. The single remaining wild population grows in the front yard of a private residence in coastal Marin County. But in July 2006, Diana Immel (a rare-plant ecologist) and the Service's Sacramento Field Office reintroduced the showy Indian clover to Point Reyes National Seashore (PORE) in Marin County, California.

FWS

We took this step toward the species' recovery in coordination with the National Park Service, which manages PORE. The reintroduction will reduce the risk of extinction by spreading populations over additional locales that are protected in perpetuity on public land.

The reintroduction site at Point Reyes, known as D Ranch, is undisturbed coastal prairie with soils and plant communities similar to the adjacent E Ranch, where J. Burtt Davy collected the species in 1900. In the fall of 2006, we planted hand-prepared seeds in small groups along 12 transects following environmental variables (aspect, elevation, moisture) at six different locations spread over a wide area. A monitoring trip in June 2007 revealed that over half of the 728 planted seeds germinated. The rest were eaten by snails, insects, and possibly small mammals. Other plants were eaten later by larger mammals, such as rabbits, gophers, deer, and elk. Plants that survived herbivory were subject to desiccation due to low rainfall.

Seventy-seven plants survived to the end of the growing season, and all but one

of those produced flower heads. Although seeds had not completely developed by the time of our monitoring visit, we estimated future seed production using data from a previous study. Over half of the expected seed production (449 seeds) was expected from one area (transect 9) that differed from the other transects by having a relatively higher elevation and a gentler slope.

A second year of funding in Fiscal Year 2008 enabling Ms. Immel another year of monitoring at PORE. Germination was extremely low in winter 2007/2008 and, by June 2008, only transect 9 produced plants with flowers. In October 2008, she returned to the site to conduct supplemental seeding at seven of the most successful transects. Though rainfall was low in early winter 2008/2009, February 2009 has so far proved normal to above average in that regard, providing hope for improved 2009 seed set. Also, as *Trifolium amoenum* seeds can remain viable in the soil for many years, any seeds that do not germinate this year have the potential to contribute both genetically and numerically to the population in the future. Monitoring for flowering plants and estimated seed set is planned for approximately May 2009, at which point future actions will be determined.

This was intended as a pilot project to determine microhabitats most suitable to *Trifolium amoenum* survival and seed production. The project may gain additional funding in future years to supplement the existing seedbank at sites where fitness was highest. Its true success will be revealed in the next few years when we can more accurately determine the additional contributions to the seedbank and resulting germination rates. The project, funded by the Service's Sacramento Fish and Wildlife Office, exemplifies a mutually beneficial partnership with the National Park Service.

We hope that with refined site selection and more typical rainfall, the populations of this endangered plant will flourish.

FWS

Showy Indian clover habitat.

FWS

Rare-plant ecologist Diana Immel examines a showy Indian clover bloom.

Valary Bloom, a fish and wildlife biologist in the Service's Sacramento Fish and Wildlife Office, can be reached at valary_bloom@fws.gov or 916-414-6600.

Restoring the Oregon Chub

by Paul Scheerer

Oregon chub (*Oregonichthys crameri*) are small minnows endemic to the Willamette Valley of western Oregon. They were formerly common and distributed throughout the valley in off-channel habitat, such as beaver ponds, oxbows, stable backwater sloughs, and flooded marshes. In the last 100 years, these habitats have been drastically reduced due to changes in seasonal flows resulting from the construction of dams, channelization of the Willamette River and its tributaries, and draining of wetlands for bottomland agriculture. This loss of habitat, combined with predation by introduced non-native game fishes, led to a sharp decline in Oregon chub abundance and a restricted distribution. In 1993, the U.S. Fish and Wildlife Service listed this species as endangered.

The previous year, the Oregon Department of Fish and Wildlife initiated studies to describe the distribution and abundance of the Oregon chub, its historic habitats, and the aquatic assemblages in these habitats. At the time of listing, only nine populations were known to exist, and the species was found in only two percent of its historical range. In the past 17 years, biologists have conducted extensive surveys of nearly 1,000 off-channel (not connected to a river) habitats. In addition, a major recovery effort has focused on releasing Oregon chub into suitable isolated habitats within the species historical range. These actions have increased the known distribution of Oregon chub throughout the Willamette Basin.

Oregon chub are found almost exclusively with native species. They are rare where there are non-native predatory game fishes, such as largemouth bass, bluegills, and crappies. Several populations of Oregon chub have been extirpated, or declined dramatically, when non-native fish invaded or were illegally introduced.

The Oregon Chub Recovery Plan was completed in 1998. It states that, in order to downlist the species from endangered to threatened: 1) there must be 10 populations of Oregon chub containing at least 500 adults, 2) all 10 populations must be stable or increasing in abundance for five years, and 3) at least three populations must be located in each of the three recovery areas outlined in the plan.

In 2007, we met these criteria. Currently, there are 34 populations of Oregon chub in the Willamette Basin. Twenty of these populations, including eight introduced populations, totaled 500 or more fish. Fourteen populations have

An adult Oregon chub.

Pau Scheerer

exhibited a stable or increasing population trend for the past 5 years, with at least three populations located in each of the three recovery areas.

In 2007, the two most abundant chub populations were introduced populations that occur on private properties. Cooperation of private landowners has been instrumental to progress towards the species' recovery and has resulted in several habitat restoration projects and reintroductions into suitable habitats on private lands. A programmatic Safe Harbor Agreement is being prepared to facilitate future introductions of Oregon chub at additional locations on private lands. (For more information on Safe Harbor Agreements, a conservation incentive program for landowners, visit http://www.fws.gov/endangered/fact-sheets/harborqa.pdf.)

Twenty of the 34 Oregon chub populations have a low probability of annual floodplain connectivity. Most are isolated from each other due to the location of their habitat, the reduced frequency and magnitude of flood events, and the presence of migration barriers, such as impassible culverts and permanent high beaver dams. Based on the threats posed by non-native fish, and the loss and fragmentation of suitable Oregon chub habitats, current recovery strategies have focused on managing Oregon chub populations in isolation. But this approach has potentially severe genetic consequences. At present, genetic exchange among Oregon chub populations is believed to be minimal. Isolating populations that would normally experience gene exchange can result in a general decline in genetic diversity within a population and a corresponding increase in genetic divergence among different populations.

In response to this concern, the Oregon Department of Fish and Wildlife teamed up with the Fish and Wildlife Service's Conservation Genetics Laboratory to conduct a population genetics study. Although the results are preliminary, only one population showed evidence of a genetic bottleneck, and population structuring was consistent with the recovery areas defined in 1998.

The next logical approach to Oregon chub recovery is to integrate floodplain connectivity into conservation actions, allowing genetic exchange among populations. Unfortunately, non-native fishes remain one of the greatest threats to the Oregon chub. The floodplain connectivity needed to that ensure the genetic exchange could permit populations of non-native fishes to gain access to Oregon chub populations. Unauthorized introductions of non-native species remain another potential threat.

Recent river flow management plans have sought to restore floodplain processes by altering discharge from dams to mimic historical flows regimes, where practical, and reconnecting floodplain habitats. Future recovery efforts will aim to integrate habitat that is connected to the floodplain, research ways to reduce the adverse effects associated with non-native fishes, and maintain genetic diversity. We believe we can build on the successes we have already achieved.

Paul Scheerer, a biologist with the Oregon Department of Fish and Wildlife's Native Fish Investigations Project, can be reached at 541-757-4263, ext. 257, or paul.scheerer@oregonstate.edu. For more information on the project, visit http://oregonstate.edu/Dept/ODFW/NativeFish/OregonChub.htm.

A habitat restoration project for the Oregon chub on private land (top, during restoration; bottom, after project completion).

Pau Scheerer

Pau Scheerer

Corps of Engineers Aids Missouri River Wildlife

by Michael Olson and Barb Perkins

The Missouri River flows for 2,300 miles (3,700 kilometers) from its headwaters in Three Forks, Montana, to St. Louis, Missouri. The U.S. Army Corps of Engineers is charged by Congress to manage the river for social and economic benefits. The Corps' Missouri River Endangered Species Office at its Gavins Point Project in Yankton, South Dakota, has taken that charge one step further. It envisions "a sustainable ecosystem capable of supporting thriving populations of native species while providing for current social and economic values."

The Missouri River Recovery Program is aimed at restoring an ecosystem that has been highly altered due to the construction and operation of

Pallid sturgeon.

U.S. Army Corps of Engineers

the mainstem dams in the upper basin and the construction of the bank stabilization and navigation project located on the lowest 750 miles (1,210 km) of the river. Recovery of the endangered least tern (*Sterna antillarum*), piping plover (*Charadrius melodus*), and pallid sturgeon (*Scaphirhynchus albus*), and the Missouri River itself, would not be possible without the commitment, partnership, and leadership provided by the Corps. In the early 1990s, the Fish and Wildlife Service recognized that the job of monitoring these species on the Missouri River system was much more work than we could perform, so we turned to the Corps for assistance and support.

The Corps – specifically, Casey Kruse and his staff – worked to develop and implement one of the most comprehensive and geographically challenging endangered species monitoring and recovery programs ever imagined. This program annually implements nearly $100 million for recovery actions ranging from research and monitoring to habitat construction and captive propagation support.

This program coordinates the monitoring of more than 2,500 miles (4,020 km) of reservoir shoreline and hundreds of river miles. Researchers annually monitor more than 1,000 least tern adults and 500 tern chicks, as well as 1,200 piping plover adults and 1,000 chicks that call the Missouri River home. This effort includes hiring and training dozens of summer employees, placing cages over (or physically moving) at-risk nests, and weekly surveys of bird productivity. The office also has developed the first comprehensive monitoring plan and population assessment for pallid sturgeon on the Missouri River.

In addition to monitoring efforts, the Corps has committed to the construction and restoration of hundreds of acres of new emergent sandbar habitat, development and implementation of a comprehensive predator control plan, and implementation of an ambitious education and outreach program. An adaptive management program that integrates all aspects of the recovery program with Missouri River basin stakeholders is also underway. This critical piece of the recovery effort will allow for the integration of public values into future recovery decisions, and permit recovery actions, including flow changes, to move forward. All of these activities are closely coordinated with the Service.

The professionalism of Kruse and his staff has given a new sense of optimism for recovery of the Missouri River ecosystem. This optimism is shared by all involved in the recovery program, including the Service, the Corps, eight states, 28 tribes, and non governmental stakeholders.

Corps personnel use a set of guiding principles to shape their program:

- Science - incorporate objective, fact driven investigations, constructive debate, and peer review;
- Transparency and access - offer transparency and universal access to tools and data;
- Consensus-building - use fair processes and strive for consensus on conclusions and proposals;
- Inclusiveness - use collaboration to foster inclusiveness; and
- Accountability - meet schedules, maintain professional responsibilities, and provide quality products.

In addition to Missouri River recovery efforts, the Corps offered office space for two of our most important Missouri River positions, including the Missouri River Natural Resources Committee Coordinator. In this position, Wayne Nelson-Stastny works hand in glove with staff at the Corps' office on issues of mutual importance.

The Service recently recognized the Corps staff in the Yankton Office as a "Recovery Champion" for its ongoing efforts to advance recovery of the Missouri River listed species. Service Director H. Dale Hall said of the 16 recipients, "The Recovery Champion award not only recognizes the exceptional conservation accomplishments of the honorees, it also provides the public with a unique opportunity to learn about endangered species conservation. These Recovery Champions are extraordinary conservationists dedicated to protecting and restoring our nation's wildlife and ensuring that future generations of Americans enjoy the natural treasures we experience today."

There are great days ahead for the Missouri River Recovery program thanks to the continued hard work of our partners in the Corps' Yankton Endangered Species Office.

Michael Olson, the Service's Missouri River coordinator, can be reached at 701-250-4481 or michael_olson@fws.gov. Barb Perkins was a public affairs specialist in the Service's Lakewood, Colorado, Regional Office until she retired recently.

Montana Fish, Wildlife & Parks crew with three pallid sturgeon captured in a single netting during broodstock collection in North Dakota.

Central Valley Project Funds Recovery

by Basia Trout

Over many decades, wildlife and its habitats have declined significantly in the Central Valley of California. To help mitigate this loss, the Bureau of Reclamation and the Fish and Wildlife Service co-manage two programs that contribute to the recovery of threatened and endangered species: the Central Valley Project Conservation Program (CVPCP) and the Central Valley Project Improvement Act (CVPIA) Habitat Restoration Program (HRP).

With about $3.5 million available for funding each year, these programs have provided more than $30 million to various organizations and agencies to complete

Valley elderberry longhorn beetle.

Jon Katz and Meghan Gilbart

over 130 projects since 1996. Established under separate regulatory and legislative authorities, the CVPCP and HRP share the same objective: to benefit federally listed species affected by the Central Valley Project (CVP) in California.

The CVP is one of the nation's major water developments. It protects California's Central Valley from water shortages, improves Sacramento River navigation, produces electric power, protects against floods, provides opportunities for recreation and water quality enhancement, and delivers water to farms, homes, industries, and the environment. At the same time, it has had inevitable impacts on the valley's wildlife.

Each year, the CVPCP and HRP receive and evaluate conservation project proposals under a single integrated process. The programs are guided by a technical team composed of biologists and managers from Reclamation, the Service, and the California Department of Fish and Game. Potential projects are ranked based on established priorities related to species affected, critical habitats, and geographic areas. Proposals considered for funding under both programs are grouped into four categories: habitat protection, habitat restoration, research, and other projects described below.

The programs have limited funding and therefore rely heavily on contributions by project partners. In fact, project applicants are highly encouraged to seek complementary sources of funding.

Twelve to 15 projects are funded annually. Approximately 50 percent of the funds go toward the protection of habitats through fee title acquisition or conservation easements. For example, in 2004 the programs contributed funding to purchase a conservation easement on the 3,185-acre (1,290-hectare) Forster Ranch in San Joaquin County. Partners included the Bureau of Land Management and The Nature Conservancy. This property supports important vernal pool and grassland habitats, and such endangered species as the vernal pool tadpole shrimp (*Lepidurus packardi*). The project was considered urgent, as urban and vineyard development surrounded the property.

About 20 percent of program funds go toward habitat restoration. In 2004, for example, funding was provided to River Partners, a not-for-profit conservation organization, to restore and enhance 226 acres (91 ha) of riparian habitat on the Drumheller Slough Unit of the Sacramento River National Wildlife Refuge in Glenn County. Restoration activities included planting a variety of native plant species, reducing non-native plants, integrating native grasses with woody plants, and preserving existing native plants. Species that benefit from this project include the threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) and numerous neotropical migratory bird species.

Another 20 percent of program funds are directed toward targeted research activities that address status, habitat needs, and behavior of specific listed species affected by the CVP. In 2004 and 2005, the CVPCP partnered with the Endangered Species Recovery Program at California State University, Stanislaus, and provided funding towards a three-year project to reintroduce the endangered San Joaquin kit fox (*Vulpes macrotis mutica*) into vacant or restored lands in the San Joaquin Valley. Genetic and behavioral studies are being conducted on potential source populations and individual foxes to determine which are most suited for successful reintroduction.

Finally, the CVPCP and HRP contribute about 10 percent of funds for other activities such as public outreach and education, development of land management plans, and captive breeding and reintroduction that promote conservation of CVP-affected species and habitats. For example, the programs have contributed more than $2 million toward the construction of breeding pens, riparian habitat restoration, and captive breeding and release of the riparian brush rabbit (*Sylvilagus bachmani riparius*), a critically endangered mammal in the San Joaquin Valley.

John Thomson

John Thomson

Drumheller Slough in California's Central Valley before (top) and after habitat restoration.

Over the last 11 years, the CVPCP and HRP have provided an excellent source of funding for crucial projects that protect and restore many listed species of California's Central Valley. These programs are making an important difference in helping to recover species whose habitat has been, and continues to be, subject to degradation, destruction, and fragmentation.

Basia Trout, a natural resource specialist in the Bureau of Reclamation's Northern California Area Office and a member of the CVPCP/HRP Technical Team, can be reached at 530-528-0512 or btrout@mp.usbr.gov. Program Managers for the CVPCP/HRP are John Thomson (Bureau of Reclamation) and Caroline Prose (Fish and Wildlife Service). John can be reached at 916-978-5052 or jthomson@mp.usbr.gov; Caroline can be reached at 916-414-6575, or caroline_prose@fws.gov.

Using Section 7 as a Recovery Tool

by Kevin Shelley,[1] Deborah Crouse,[2] Jeffrey Chan,[1] Sarah J. Converse,[3] Andrea LaTier,[1] Steve Morey,[4] and Carolyn Scafidi[1]

Section 7 of the Endangered Species Act (ESA) is one of the most important provisions of this landmark law. Specifically, section 7 (a)(1) charges federal agencies with aiding in the conservation of listed species, and section 7 (a)(2) requires agencies to consult with the Fish and Wildlife Service (or NOAA-Fisheries for most marine species) to ensure that any projects or activities they fund, authorize, or carry out are not likely to jeopardize the continued existence of listed species or adversely modify designated critical habitat.

Section 7 consultations typically occur in the Service's network of Ecological Services field offices. Managing an increasing number of section 7 consultations in a time of diminishing resources has become a challenge faced by many field offices. In this environment, striving to reduce negative impacts as much as possible in every consultation can lead to consultation backlogs that cause project delays, increase costs, capture Congressional and media attention, and fuel public dissatisfaction.

Despite these risks, biologists know that negotiating changes in federal projects can soften the impact on listed species or their habitat and add long-term benefits, thereby providing more opportunities for species recovery. But these negotiations take investments of time, which is increasingly scarce.

An example of this dilemma was the situation recently faced in western Washington State. Located at the southern end of the Seattle metro area of Puget Sound, one of the nation's fastest growing urban centers, the Service's Washington Fish and Wildlife Office (WFWO) is also surrounded by over 5 million acres of national forests and parks. With the 1999 listing of the bull trout (*Salvelinus confluentus*) as a threatened species and a 40 percent reduction in staff levels over the past decade, consultations for the Coastal-Puget Sound bull trout population overwhelmed the field office and created unprecedented backlogs.

Roger Tabor/USFWS

Bull trout in the Quinault River, Washington.

There was also a growing concern among biologists that the pressure to reduce the consultation backlog was causing conservation opportunities to slip away. By 2006, it became clear that a "first in, first out" approach to managing the workload was no longer sufficient. Managers realized they needed a more sustainable approach to overcoming the backlog if they were to maximize bull trout conservation.

A Team Approach

In January 2007, WFWO managers committed to the development of a science-based structured decision-making process to assist in prioritizing consultation projects based on their conservation value. This idea caught the attention of the Service's National Conservation Training Center (NCTC) and resulted in its selection as a case study at the Rapid Prototyping Workshop in July 2007. Dr. Mike Runge of the U.S Geological Survey (USGS), Dr. Tony Starfield (Professor Emeritus, University of Minnesota), and Donna Brewer (NCTC) led the workshop. Dr. Sarah Converse (USGS) and Dr. Steve Morey (Service, Region 1) were lead consultants in the western Washington case study, and Dr. Deborah Crouse (Service, Washington Office) was the facilitator.

The WFWO invested in a week-long workshop to create a prototype decision-making framework. Beyond ranking projects by conservation value, the framework included a means of allocating staff time on each project to maximize the office's conservation output. Work on the effort continued after the workshop. Eventually, more than 25 people with expertise in structured decision-making, population ecology and modeling, education and training, bull trout recovery, section 7 consultation, database development, geographic information systems, records management, administrative

support, and management contributed to the effort.

The Objective

As the first step in developing a structured decision-making framework, the team set its objective: "to maximize the total conservation benefit from bull trout consultations within the WFWO while completing all consultations within regulatory timeframes."

The team recognized that any solution must be nimble enough to respond to rapid changes in workload volume and complexity. Accordingly, the process was constructed to anticipate and recognize priority consultations, and then, using regulatory timelines and the existing staffing level, optimize the time to be devoted to each consultation by using a workload allocation model.

The Process

To prioritize consultations, the team needed to find a way to predict the potential improvements in bull trout conservation that might result from negotiated changes in a project. They captured this additional conservation value in an index called the Potential Value (PV) of a consultation.

Soliciting input from a panel of ESA section 7 experts and performing a statistical analysis on the panel's work, the team developed a predictive model of PV. The model integrates factors such as project type and scale, the adequacy of the proposed conservation measures, and the potential to influence the project, such as the inclusion of Best Management Practices. The model also integrates bull trout population and habitat characteristics in the vicinity of a project and ultimately generates a PV score for each project on a 0 to 20 scale.

To illustrate, highway construction projects, which often exacerbate the existing threats to bull trout, can offer more opportunity to negotiate improvements than, for example, habitat restoration projects. Therefore, highway construction projects tend to be assigned a higher PV.

The proportion of a consultation's PV that is achieved depends on the time spent on the consultation. Using input from the panel, the team developed a mathematical relationship to describe the degree of PV that biologists gain as they negotiate beneficial changes in a project over time. The panel's input illustrated that, at some point, the time spent working a consultation yields diminishing returns. On average, modeled results suggest the first 64 hours of dedicated work on an informal consultation yielded 80 percent of the PV. The subsequent 64 hours yielded only 19 percent of the remaining PV.

Workload Allocation

Once projects are prioritized, it is necessary to allocate staff time to the office's entire workload so that conservation benefits are maximized. The Workload Allocation model integrates the expected PVs of consultations within the field office's workload, the relationship between the time spent on a consultation and realized PV, the number and type of consultations, and the number of biologists available to do the work. With these inputs, projects are assigned either short or long handling times. Those with greater PV are more likely to be assigned longer handling times.

Bull trout and whitefish in the Quinault River, Washington.

Roger Peters/USFWS

A New Paradigm

Use of the structured decision-making process at the WFWO is producing some important insights that are changing the way biologists view the ESA section 7 workload. Traditionally, they assumed that conservation benefits accrued in proportion to the time invested on each project. They now realize that focusing on individual projects can lead to "over-working" an individual consultation, which results in diminishing returns and reduces the office's total conservation accomplishment. These insights, and the office's proactive use of structured decision-making, contributed to WFWO's manager, Ken Berg, being awarded the Service's 2008 Science Leadership Award for his support of the use of this and other science-based management tools.

Recognizing this cost of over-working a consultation has motivated biologists toward a new paradigm: to conclude low-PV consultations as efficiently as possible in order to concentrate on projects with a higher PV. They also are becoming more adept at prioritizing their time on the key aspects of high-PV projects that produce the maximum conservation benefit and are refining the information needed to initiate and conclude consultations. In the end, everyone expects that prioritizing consultations according to their PV will lead to greater conservation for each dollar invested and a better workload balance.

[1]USFWS Region 1, Western Washington Fish and Wildlife Office, Lacey, Washington (kevin_shelley@fws.gov, 360-753-4325; jeffrey_chan@fws.gov, 360-753-9542; andrea_latier@fws.gov, 360-753-9593; carolyn_scafidi@fws.gov, 360-753-4068).
[2]USFWS Region 9, Arlington, Virginia (debby_crouse@fws.gov, 703-358-2471).
[3]USGS Patuxent Wildlife Research Center, Laurel, Maryland (sconverse@usgs.gov, 301-497-5635).
[4]USFWS Region 1, Portland, Oregon (steven_morey@fws.gov, 503-231-6108).

Hawaiian Petrel Faces Uncertain Future

by Matthew Cimitile

Editor's note: This edition of the Bulletin features several examples of progress in recovering Hawaii's endangered birds. The following article points out, however, that significant challenges remain.

They were said to have darkened the skies as large flocks flew overhead. Hawaiian petrels (*Pterodroma sandwichensis*) are remarkable seabirds that travel as far as the Aleutian Islands in Alaska to obtain food for their young, and then return each year to the Hawaiian Islands to breed. While bird enthusiasts hope to hear the rhythmic vocalization of a petrel or spot it returning to its colony after a long foraging trip at sea, researchers probe the mysteries surrounding this species. What is its preferred breeding habitat? Where does it go at sea? Has its diet and foraging range changed over time? What is its impact on the surrounding ecosystem? Answering these and many other questions will help protect the Hawaiian petrel, but for some of its colonies, time may be running out.

Now a rare sight, Hawaiian petrels are restricted to high-elevation regions on several of the main islands. The birds nest in burrows within remote areas of forests and on the high slopes of volcanoes. Their dwindling habitat has resulted in a drastic population decline for a bird that may once have numbered in the hundreds of thousands or even millions. Today, an estimated 19,000 individuals remain, and the species is listed as endangered. Continued habitat modification, the spread of invasive species, and predation by non-native mammals threaten the remaining colonies. Their story is part of the greater biological destruction taking place on the Hawaiian Islands, endangering much of the biodiversity that remains.

According to the American Bird Conservancy, one-third of the birds found on the U.S. endangered and threatened species list occur only in Hawaii. An astonishing 344 species of plants and animals found in Hawaii, from snails to trees, are listed as endangered or threatened, more than in any other state. As development proceeds at a dizzying pace and natural communities are overrun by non-native plants and animals, many of the endangered species are on the brink of disappearing.

One example is the po'ouli (*Melamprosops phaeosoma*), a Hawaiian honeycreeper. This forest bird species has not been seen since 2004, and biologists

Ornithological radar for studying endangered seabirds in Kalalau Valley, Kaua'i.

Jim Denny

do not know if it survives. An attempt by conservationists to breed the bird in captivity did not succeed. Driven from its preferred habitat, the po‘ouli became restricted to a cold, wet area where it slowly declined. Researchers now suspect this area was secondary habitat at best, not capable of supporting the population. Such cases reveal that some modern bird habitats on the islands may be quite different from their natural habitats in the past.

The po‘ouli is just one example of species decline due to ecosystem modification. Biodiversity loss is compounded as ecological relationships among different organisms deteriorate. Pollination rates and dispersal of plants have changed due to lower bird populations. Consequences from a reduction in nutrient flow from the ocean to the forests because of seabird declines are still being determined. Decreases and extinctions of certain species have resulted in the decline of entire ecological communities. As Jonathan Price, assistant professor of geography at the University of Hawaii-Hilo, says, “We are dealing with ecosystems that are just unraveling.”

The drastic change of Hawaii’s environment since human arrival has focused attention on preserving and restoring the islands’ natural history. Over the past 30 years, paleontologists Helen James and Storrs Olson of the Smithsonian Institution have uncovered and described around 40 extinct bird species that once inhabited the islands. Many more are still to be described. Their research has not only given a glimpse into the past life that existed on these islands but has laid out a picture of what Hawaii should look like, giving conservationists a baseline from which to tailor programs for conserving biodiversity.

“In order to create a healthy forest for these species, we need to understand what was the functional ecology of the past,” said James. This means identifying what a natural Hawaiian ecological community consisted of and preserving and restoring these communities.

For the petrels, current observations indicate their natural habitat is high-elevation regions. But ancient bird bones belonging to the species have been uncovered from the coast to the mountains on many of the islands. It appears that, like other species of Hawaiian birds, the petrels were driven out of their natural homes and now congregate on the diminishing areas of habitat that remain.

Erecting fences to keep out non-native ungulates, shielding streetlights to avoid blinding the birds and collisions, and maintaining existing colonies will assist in the struggle to protect the petrels. Encouraging these seabirds to breed in predator-free areas and restoring former habitat for colonies may help them extend their range.

“If I think things are looking better, it’s because many people and many resources are focused on preserving this and other species,” said Dr. Nick Holmes of the Kaua‘i Endangered Seabird Recovery Project. “And the new information that science is providing plays a key role in helping to achieve effective conservation because it supplies invaluable context for interpreting what’s important.”

A Hawaiian petrel takes off after being picked up by the Kaua‘i Save Our Shearwaters program.

Jim Denny

But, said Holmes, the trends of habitat loss, encroachment by non-native plants, and predation by introduced mammals threaten to undo conservation efforts. Greater assistance from federal, state, and local governments to prevent the introduction and spread of invasive species is needed. In addition, public outreach and education on the unique natural wonders of the islands, and the problems they face, helps to generate public support for the long-term efforts necessary for healthier ecological communities in Hawaii.

Matthew Cimitile, an environmental journalism graduate student at Michigan State University, can be reached at 813-368-9560 or cimitile@msu.edu

Endangered Species Day Is A Success!

by Kelly Ann Bibb and Seth Willey

Endangered Species Day, recognized by Congress since 2006 as the second full-week Friday in May, is a time to learn about endangered species, celebrate successes in their recovery, and gain a greater appreciation for what it takes to conserve a species and its habitat.

In May 2008, endangered species recovery biologists in the Fish and Wildlife Service's Southeast Region decided to make May 16 a day of celebration and fun. They joined their communities and partners to recognize continuing efforts and accomplishments made on behalf of the region's 322 listed species. Service personnel made this day memorable for everyone they reached, accomplished some recovery actions during the celebration, and had fun recharging the passion for wildlife they share with the public. Here are some highlights:

An ivory-billed woodpecker educates students at the Audubon Park Zoo in New Orleans.

FWS

The Lafayette, Louisiana, Field Office celebrated Endangered Species Day at the Audubon Zoo in New Orleans, May 16 to 18. About 4,500 people attended. The zoo did a television spot promoting activities at the zoo and encouraged people to attend. On May 16th, the Louisiana Department of Wildlife and Fisheries presented a display on manatee conservation. The Service targeted school groups with some hands-on activities and distributed information packets for teachers. The Louisiana Black Bear Conservation Committee also ran an activity called the Bear Maze. An exhibit-based, listed species scavenger hunt created by the Service was a hit with zoo education staffers.

The Service's Arkansas Field Office celebrated Endangered Species Day May 9 and 10 at the Museum of Discovery in Little Rock, in partnership with ECO, a non-profit conservation organization. Approximately 1,500 children and several hundred adults attended. The Service gave talks to school groups on topics such as freshwater mussel conservation and received radio, television, and newspaper coverage in response. The event was a great opportunity for outreach to the citizens of Arkansas about imperiled species of their own state.

The Mississippi Field Office celebrated at the Mississippi Museum of Natural Science on May 16 and 17. School groups and visitors heard presentations by

Service staff and the Noxubee National Wildlife Refuge (NWR) "Friends" group on the Louisiana black bear, red-cockaded woodpecker, and the illegal wildlife trade (with an emphasis on sea turtles and alligators). One station at the exhibit included a trivia game on Mississippi's endangered species. Museum educators did "Creature Feature" talks, complete with live animals, including the indigo snake and gopher tortoise. The American alligator was featured as a recovered species. The Service saw at least 500 students and enjoyed sharing recovery stories with many other museum visitors.

Endangered Species Day was also a big celebration in the Caribbean. Activities were conducted in multiple locations with Service recovery biologists and NWR biologists working together. At Vieques NWR, talks about listed species were provided to local elementary school students, and Service staff led a group of Girl Scouts through hiking trails and acquainted them with bats at night. Another night-time activity took place at Culebra NWR, where a group of students and community members patrolled sea turtle nesting sites with Service staff.

In Cabo Rojo NWR, talks about endangered species were provided to students from two schools located close to the refuge. They also planted about 50 native trees at the refuge, including endangered species such as *Eugenia woodburyana*, *Goetzea elegans*, and *Cresentia portoricensis*. In Sandy Point NWR on St Croix, the Service patrolled a sea turtle nesting site with a group of students and community members and saw three nesting turtles. In Gabia Commonwealth Forest, Coamo, personnel from Puerto Rico (PR) Department of Natural and Environmental Resources, PR National Parks, and the Service provided talks about endangered species to two schools. The same afternoon, a group of almost 40 students participated in the release of Puerto Rican crested toad tadpoles. We also planted 50 native trees, including the endangered *Eugenia woodburyana*. Students and community members got hands-on experience joining the Service and its local partners in conducting recovery actions for endangered species. "We are ready for the next year!" said Carlos Pacheco, a Service recovery biologist in Boqueron.

The Asheville, North Carolina, Field Office's May 17th event was another success. It had 12 children from the local high school's eco-club paddling the Toe River looking for an endangered mussel, the Appalachian elktoe. John Fridell, the Service's elktoe expert, was along on the trip, as were members of the local watershed group. A local rafting company, Loafer's Glory, donated equipment and shuttle services. The Service provided snorkel gear and other viewing equipment. The group located two elktoes, one of which was found by a student. "We wanted to give students an opportunity to see first-hand the biodiversity found in the river, especially the endangered species found in their own backyard. It's one thing to talk about a river, it's another to feel the cold water around your legs, watch the fish around your feet, and see the big sky above. I hope, at the end of the day, everyone on the trip had a deeper appreciation for the Toe River," Fridell said. "From a science education standpoint, I think it was great

Students in the Asheville, North Carolina, area, paddle the Toe River in search of the Appalachian elktoe.

FWS

FWS

Students help to release Puerto Rican crested toad tadpoles at Gabia Commonwealth Forest in Puerto Rico.

that the students got to experience the river first-hand with professional biologists. Perhaps it will encourage them to think about career possibilities," said Mountain Heritage High School science teacher Gabrielle Riesner.

In eastern North Carolina, the Pocosin Lakes NWR, Alligator River NWR, and the entire red wolf recovery program celebrated at the Walter B. Jones, Sr., "Partnership for the Sounds" Visitor Center in Columbia. They put up displays for Endangered Species Day featuring the red wolf, red-cockaded woodpecker, and sea turtles.

The Frankfort, Kentucky, Field Office's celebration on May 16th also went well. Groups represented at the event included the East Kentucky Power Cooperative, Federal Highway Administration, Kentucky Transportation Cabinet, Kentucky State Nature Preserves Commission, and the Service. Bernheim Arboretum and Research Forest grew the plants used that day. All in attendance helped to plant endangered Short's goldenrods back into their native habitat. A total of 125 plants were placed at the Beaver Creek Mitigation Site. There was an article on the event in the *Lexington Herald-Leader* the following Saturday.

The Panama City, Florida, Field Office held a poster contest involving local schools. A peer-teaching-peer approach was used, where students learned from their classmates. A select number of children learned from a Service mentor, then went back to school and taught their classmates. The schools, teachers, and kids were great. The resulting artwork was fantastic and the winner's work was displayed in a local department store. "Each student who participated pledged to protect endangered species and the places they call home for the benefit of people and the world. The students who participated in the celebration are the leaders of tomorrow and will be responsible for species conservation, so it is vitally important for them to connect with the species that are found in their own backyard," said Janet Mizzi, Deputy Field Supervisor at the Panama City Office.

The Service's Southeast Regional Office in Atlanta celebrated in conjunction with our Georgia Field Office at several locations. Endangered Species Day was combined with Career Day at Montgomery Elementary School. We tailored classes about our red wolf program and Louisiana black bear recovery efforts. The kids were very excited and participated in the fun activities, including a follow-up coloring contest. We celebrated with the Dunwoody Nature Center concurrent with their annual Dream Gardens Tour, and brought in listed species for a plant-themed Endangered Species Day. In the afternoon, we took Endangered Species Day to all first graders and their teachers at Austin Elementary.

The Warm Springs Fish Hatchery in Georgia also celebrated with a month-long coloring contest and displays at the hatchery that included educational materials on endangered species.

The Charleston, South Carolina, Field Office combined its celebration with International Migratory Bird Day on May 10th, in Ravenel. The wood storks was one of the endangered species featured during that event. The county park also expressed interest in being the permanent venue for this celebration in the future.

"Our celebration of Endangered Species Day was an opportunity to showcase success stories of partnership, vision, and dedication that have allowed us to make progress in recovering species." said Sam. D. Hamilton, the Service's Southeast Regional Director. It was the Region's first celebration of this day, and Service volunteers reached a very large audience. We extend gratitude to everyone in the Service and all partners who helped.

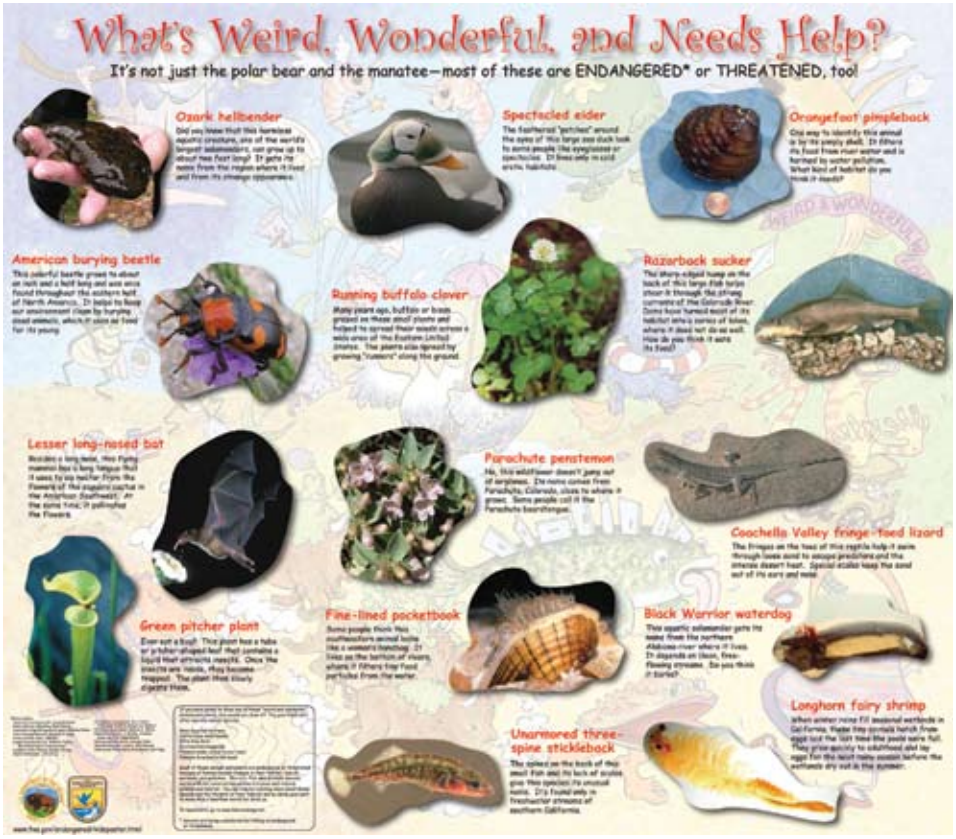
Endangered Species Day celebrations were not limited to the Southeast. For example, the Service's Mountain-Prairie Regional Office in Denver, Colorado, organized a program highlighting some of that region's recovery efforts. The festivities included a presentation on Wyoming toad recovery, complete with live Wyoming toads, a presentation on gray wolf recovery in the northern Rockies, and a video ("Predators, Prey & People" by Wyoming Game and Fish) on cooperative conservation efforts to recover grizzly bears and wolves in Wyoming. The Regional Office also took the opportunity to announce the proposed rule to delist the Maguire daisy (*Erigeron maguirei*), a perennial herb of the sunflower family that occurs in Utah. Approximately fifty people participated in the celebration.

Kelly Ann Bibb, the Service's Southeast Recovery Coordinator in Atlanta, Georgia, can be reached at 404-679-7132 or kelly_bibb@fws.gov. Seth Willey, the Service's Mountain-Prairie Regional Recovery Coordinator in Denver, Colorado, is available at 303-236-4257 or seth_willey@fws.gov.

Chris Davidson of the Service's Conway, Arkansas, office gives a presentation to students at the Museum of Discovery in Little Rock.

FWS

Weird & Wonderful Wildlife!



What does a Black Warrior waterdog look like? How about a fine-lined pocketbook, orangefoot pimpleback, or spectacled eider?

Aimed at kids and the young at heart, our newest endangered species poster, "Weird & Wonderful Wildlife," highlights 14 species with odd-sounding names from around the country. Most are endangered or threatened, while a few are candidates for listing under the Endangered Species Act. Several of these listed species, the razorback sucker and American burying beetle, are featured in this edition of the Endangered Species Bulletin.

Our artist imagined what they might look like based on their names, so one side of the poster is a collage of fanciful illustrations. The other side features photos of the plants and animals, accompanied by a few "fun facts."

Go to http://www.fws.gov/endangered/kidsposter.html, and see if you can match the artist's illustration with the actual image. Have fun!

*Note: For a **single** copy of the poster, call 1-800-344-WILD. Bulk quantities can be purchased ($35.00 for a package of 25) by calling 303-236-1975 and asking for item number FW7002.*

Partners Protect Habitat for Rare Salamander

by Roger Root

The recovery of one of California's most imperiled species, the endangered Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*), took a dramatic step forward in May 2007 when a key 55-acre (22-hectare) property supporting this species was acquired through the collaborative efforts of the Wildlife Conservation Board, the Trust for Public Land, the California Department of Fish and Game (CDFG), and the U.S. Fish and Wildlife Service.

The Santa Cruz long-toed salamander occurs only along a 25-mile (40-kilometer) stretch that spans the coastal region of southern Santa Cruz and northern Monterey counties. For many years, the property near Watsonville in Santa Cruz County was a top conservation priority for the Service and CDFG. It contains a pond that provides important breeding habitat for the Santa Cruz long-toed salamander and the threatened California red-legged frog (*Rana aurora draytonii*). The property supports a variety of habitats, including rare coastal terrace prairie, thriving oak woodlands, annual grassland, coyote bush scrub, arroyo willow riparian, sedge-dominated wetland, and redwood forest. The southwestern pond turtle (*Clemmys marmorata pallida*) and yellow warbler (*Dendroica petechia brewsteri*) are two other riparian species that will benefit directly from this effort. Acquisition of the property, near other important habitat in the Ellicott National Wildlife Refuge, also fits into a larger, continuing multiple-partner planning process for the entire Watsonville Slough watershed.

The acquisition will contribute to the recovery of the Santa Cruz long-toed salamander by protecting potential upland habitat from development. It will also provide an opportunity for habitat enhancement, such as the creation of additional breeding ponds for the salamander, California red-legged frog, and other sensitive species. Future management of the property will include research and environmental education.

The property was acquired by The Trust for Public Land for $1.8 million. The Wildlife Conservation Board contributed $1.55 million, and the Service provided the other $250,000 through the Cooperative Endangered Species Conservation Fund's Recovery Land Acquisition grant program.

David Pereksta

Roger Root, Assistant Supervisor for the South Coast Division of the Service's Ventura Fish and Wildlife Office, can be reached at 805-644-1766, ext. 336, or roger_root@fws.gov.

U.S. FISH & WILDLIFE SERVICE CONTACTS

WASHINGTON D.C. OFFICE Washington, D.C. 20240

Rowan Gould, Acting Director

Bryan Arroyo, Assistant Director for Endangered Species
Gloria Bell, Deputy Assistant Director of Endangered Species

Claire Cassel, Chief, Division of Partnerships and Outreach	703-358-2390
Martha Balis-Larsen, Chief, Office of Program Support	703-358-2079
Nicole Alt, Acting Chief, Division of Conservation and Classification	703-358-2105
Rick Sayers, Chief, Division of Consultation, HCPs, Recovery, and State Grants	703-358-2106

http://www.fws.gov/endangered

PACIFIC REGION—REGION ONE Eastside Federal Complex, 911 N.E. 11th Ave, Portland OR 97232

Hawaii and other Pacific Islands, Idaho, Oregon, Washington, Robyn Thorson, Regional Director 503-231-6118
http://www.fws.gov/pacific

SOUTHWEST REGION—REGION TWO P.O. Box 1306, Albuquerque, NM 87103

Arizona, New Mexico, Oklahoma, and Texas Benjamin Tuggle, Regional Director 505-248-6282
http://www.fws.gov/southwest

MIDWEST REGION—REGION THREE Federal Bldg., Ft. Snelling, Twin Cities MN 55111

Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin Thomas O. Melius, Regional Director 612-715-5301
http://www.fws.gov/midwest

SOUTHEAST REGION—REGION FOUR 1875 Century Blvd., Suite 200, Atlanta, GA 30345

Alabama, Arkansas, Louisiana, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Florida, Tennessee, Puerto Rico, and the U.S. Virgin Islands Sam Hamilton, Regional Director 404-679-7086
http://www.fws.gov/southeast

NORTHEAST REGION—REGION FIVE 300 Westgate Center Drive, Hadley, MA 01035

Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia Marvin Moriarty, Regional Director 413-253-8300
http://www.fws.gov/northeast

MOUNTAIN-PRAIRIE REGION—REGION SIX P.O. Box 25486, Denver Federal Center, Denver CO 80225

Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming Stephen Guertin, Regional Director 303-236-7920
http://www.fws.gov/mountain-prairie

ALASKA REGION—REGION SEVEN 1011 E. Tudor Rd., Anchorage, AK 99503

Alaska Geoff Haskett, Regional Director 907-786-3542
http://www.fws.gov/alaska

PACIFIC SOUTHWEST—REGION EIGHT 2800 Cottage Way, Sacramento, CA 95825

California and Nevada Renne Lohoefner, Regional Director 916-414-6464
http://www.fws.gov/cno

ENDANGERED Species BULLETIN

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

BOX SCORE

Listings and Recovery Plans as of April 3, 2009

GROUP	ENDANGERED U.S.	ENDANGERED FOREIGN	THREATENED U.S.	THREATENED FOREIGN	TOTAL LISTINGS	U.S. SPECIES W/ PLANS
MAMMALS	69	256	13	20	358	55
BIRDS	75	179	15	6	275	85
REPTILES	13	66	24	16	119	38
AMPHIBIANS	14	8	11	1	34	17
FISHES	74	11	65	1	151	101
SNAILS	24	1	11	0	36	30
CLAMS	62	2	8	0	72	70
CRUSTACEANS	19	0	3	0	22	18
INSECTS	47	4	10	0	61	40
ARACHNIDS	12	0	0	0	12	12
CORALS	0	0	2	0	2	0
ANIMAL SUBTOTAL	409	527	162	44	1,142	467
FLOWERING PLANTS	572	1	143	0	716	633
CONIFERS	2	0	1	2	5	3
FERNS AND OTHERS	26	0	2	0	28	28
PLANT SUBTOTAL	600	1	146	2	749	664

TOTAL U.S. ENDANGERED: 1,009 (409 animals, 600 plants)
TOTAL U.S. THREATENED: 308 (162 animals, 146 plants)
TOTAL U.S. LISTED: 1,317 (571 animals**, 746 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.

** Eleven U.S. animal species and five foreign species have dual status.