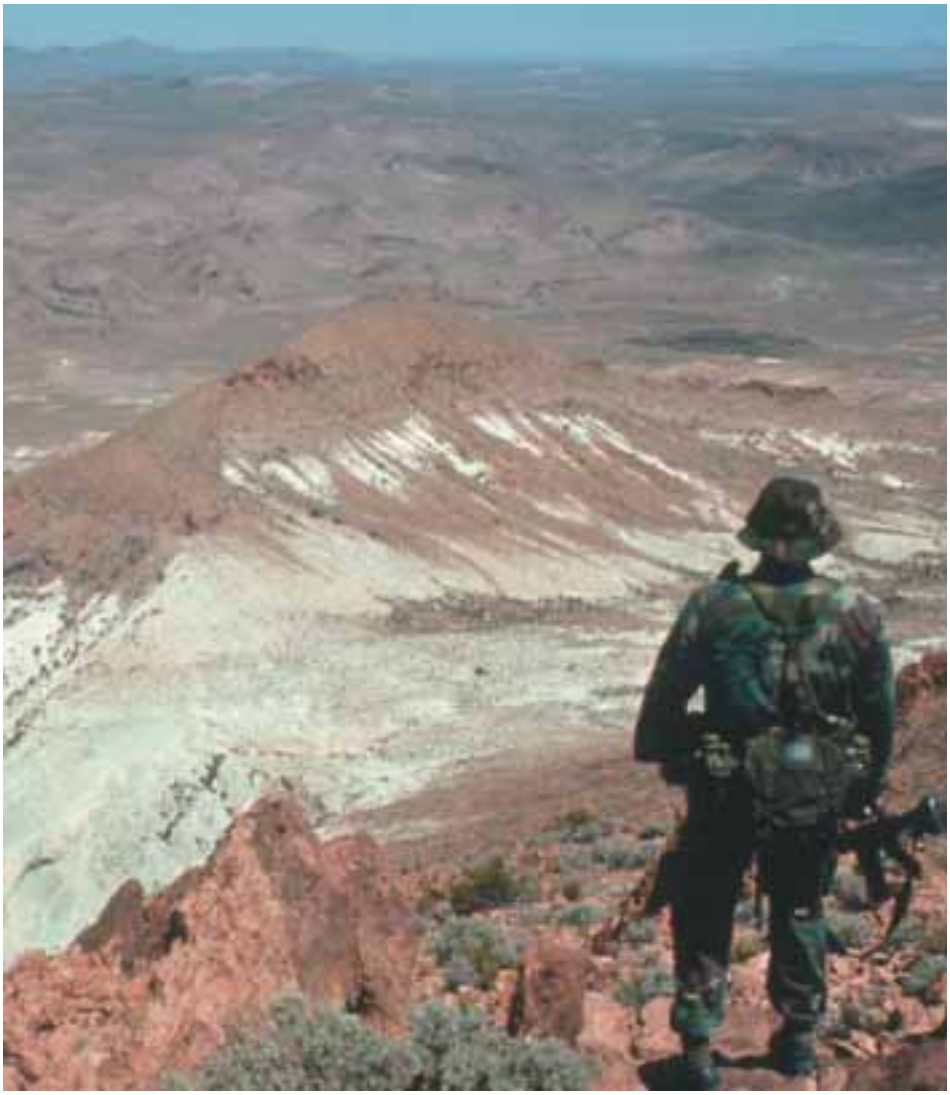
U.S. Fish & Wildlife Service

ENDANGERED Species BULLETIN

November/December 2000 Vol. XXV No. 6



The Department of Defense manages approximately 25 million acres (10 million hectares) on more than 425 major military installations throughout the United States. Access limits due to security considerations and the need for safety buffer zones have sheltered these lands from development pressures and large-scale habitat losses for years. Found throughout the country, military lands contain some of the finest remaining examples of rare native vegetative communities, such as old-growth forest, tall-grass prairies, and vernal pool wetlands. At least 300 federally listed species live on Defense-managed lands. This edition of the Bulletin *takes a look at efforts to conserve these important resources while maintaining our nation's security.*

U.S. Fish & Wildlife Service

Photo by Douglas Ripley/U.S. Air Force

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On the Cover
A soldier looks out across the U.S. Air Force's Nellis Range in Nevada, home to a number of rare species.
U.S. Air Force photo

Opposite page:
Undeveloped land at the site of the U.S. Air Force Academy supports one of the largest and most stable populations of the threatened Preble's meadow jumping mouse.
Photo by Douglas Ripley/U.S. Air Force

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

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IN THIS ISSUE

by L. Peter Boice

The Department of Defense and Endangered Species

A botanist points to a rare example of rabbitbush* (Chrysothamnus eremobius) *in the Sand Spring Area of the U.S. Air Force's Nellis Range in Nevada. Endemic to small populations on the Nellis Range and the Fish and Wildlife Service's adjacent Desert Wildlife Range, this plant and other rare species are protected under the Air Force's overall integrated natural resources management strategy.
Photo by Dr. Teri Knight/The Nature Conservancy of Nevada

The Department of Defense (DoD) has embraced its stewardship responsibilities for the rich variety of natural resources on the lands it manages, managing them for multiple use, sustained yield, and biodiversity integrity. But management decisions affecting DoD lands are directed by the fact that these lands were set aside to serve military training and testing purposes. The challenge for the DoD is to balance the need to use its air, land, and water resources for military training with the need to conserve these resources for future generations.*

A number of significant actions are affecting how the DoD manages its biological resources, which include rare animals and plants. Many of these changes will improve its management of endangered species:

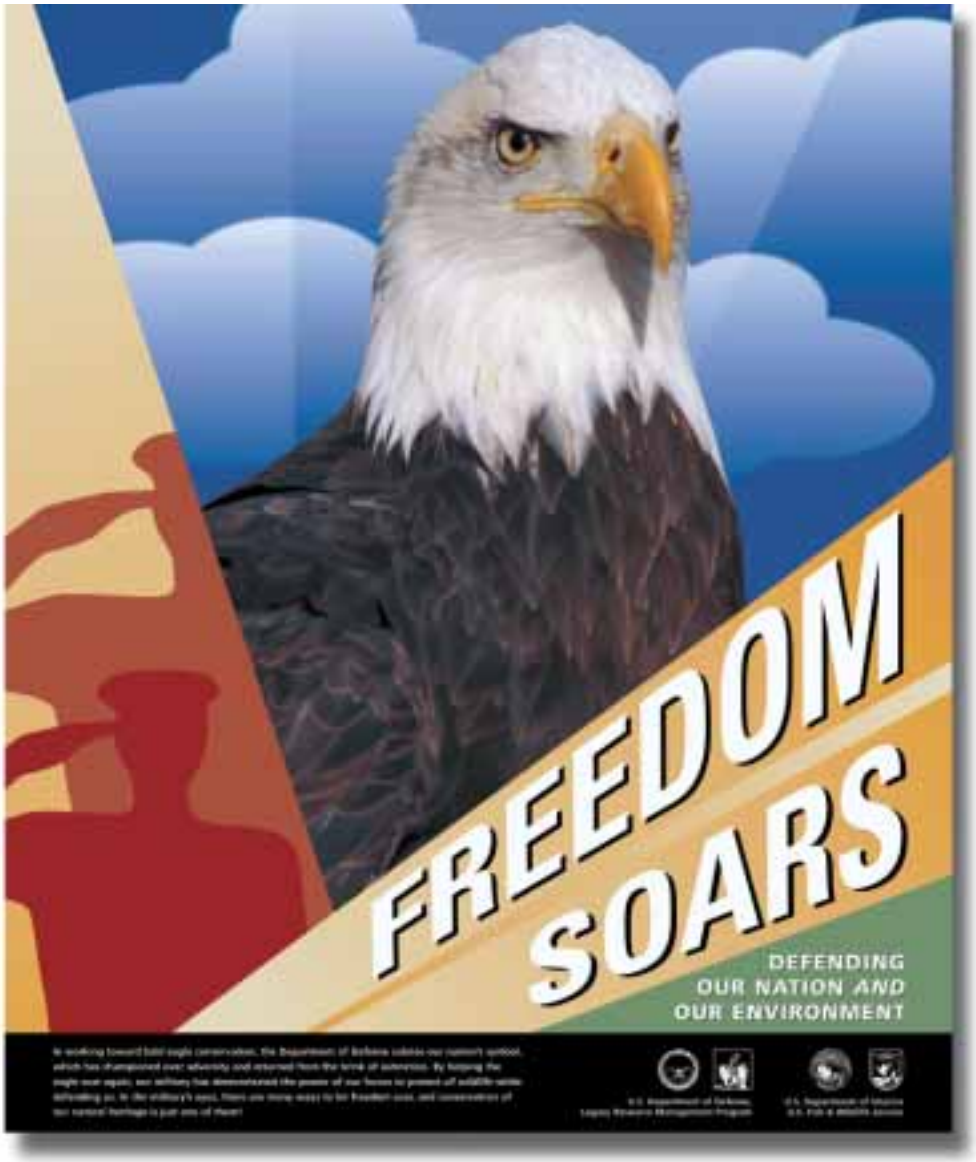
Passage of the Sikes Act amendments.

The Sikes Act authorizes the DoD to manage natural resources on military lands, and the 1997 amendments to the Act provide many opportunities for the DoD to enhance its management. All military installations with significant natural resources are required to develop and implement integrated natural resources management plans (INRMPs) in cooperation with the U.S. Fish and Wildlife Service and the appropriate State wildlife agency. The amendments also provide for public comment on these plans. The DoD's military mission is also explicitly recognized: each INRMP shall ensure "no net loss in the capability of military installation lands to support the military mission of the installation." These amendments also substantially raised the visibility of natural resources management within DoD by requiring annual reports to Congress and by giving a higher funding priority to implement natural resources projects listed in INRMPs. Because of these improvements, the INRMPs are better action plans for protecting endangered and threatened wildlife and plants than critical habitat designation while accommodating a base's military mission.

Completion of most planning level biological inventories.

The DoD has emphasized the importance of baseline resource inventories for the past 6 years. We needed to

* Boice, L. Peter. "Defending Our Nation *and* Its Biodiversity." *Endangered Species Bulletin*. January/February 1997. Volume XXII, No. 1.



Freedom Soars: DoD Salutes the Bald Eagle

In July 2000, the Department of Defense and the U.S. Fish and Wildlife Service unveiled *Freedom Soars*, a poster saluting the return of the bald eagle from near extinction. Created to recognize the recovery of the bald eagle, this poster highlights the numerous contributions made by DoD facilities and bases over the years. The front of the poster features silhouetted soldiers saluting a majestic bald eagle, while the back includes a timeline describing the recovery made by the bald eagle and a map pinpointing the 70 military bases around the U.S. that contributed to its recovery. The poster also describes six examples of the approaches that these bases have used to assist in recovery. As mentioned in the poster, "In the military's eyes, there are many ways to let freedom soar, and conservation of our natural heritage is just one of them!"

For copies of the poster, please contact your nearest military base or:
U.S. Fish and Wildlife Service
4401 N. Fairfax Drive, Rm. 420
Arlington, VA 22203.

know what resources we have and where they are so we can manage them properly. More than 75 percent of military installations have completed planning level surveys, and another 20 percent have partial surveys.

Establishment of regional ecosystem management initiatives.

Cooperative regional partnerships enhance communications, increase program efficiencies, and promote improved understanding among the partners. The DoD adopted the ecosystem approach as its preferred process for natural resources management in 1994. It has established a variety of important regional initiatives for such regions as the Sonoran Desert, Great Basin, Gulf Coastal Plain, Colorado Front range, Fort Huachuca (Arizona) watershed, and Camp Pendleton (California). In addition, the DoD's first official ecosystem management effort, the Mojave Desert Ecosystem Initiative, has evolved from a top-driven program one with substantial regional support from both the military and Department of the Interior agencies.

Access to better biological information.

The DoD is working with the Association for Biodiversity Information (ABI) and The Nature Conservancy to gain access to data on the location of threatened and endangered species, as well as species of concern, via a new database. The system, which is now available throughout DoD, compiled natural heritage program data at the quad-level on USGS topographic maps for selected western states. Additional states are being added to the system in 2001. In a related new initiative, the ABI and the Service will help the DoD identify "species at risk" on and adjacent to its military lands in the United States.

Use of conservation easements on non-DoD lands.

The habitats on DoD installations are often the last, best hope for imperiled species. Many surrounding lands are experiencing rapid development and other encroachments. It is important that the DoD work to cooperate on resource management for these species beyond installation fencelines. For example, the Army is aiding landowners in the establishment of conservation easements near Fort Bragg, North Carolina, to protect additional habitat for the endangered red-cockaded woodpecker *(Picoides borealis).*

Development of new tools for DoD land managers.

Two new handbooks will soon be available to the DoD's natural resources managers. The *INRMP Handbook* will help DoD managers develop and implement their management plans, while the *Joint Stewardship Handbook* will help them work with managers from the Departments of the Interior and Agriculture to manage the DoD's withdrawn and special-use lands. We have also developed new training courses oriented specifically towards the needs of military land managers, and have reviewed and endorsed additional courses developed by other federal resource management agencies.

Other changes are likely to have mixed or even negative impacts on how the DoD manages its threatened and endangered species:

Decreased spending on long-term conservation efforts.

The DoD's annual expenditures on threatened and endangered species have increased by one-half in the past 5 years to approximately $27.6 million. The Sikes Act amendments also added substantial new funding requirements. Furthermore, the number and complexity of conservation challenges have increased notably during the past decade. Yet the total amount budgeted for the DoD's conservation programs, as well as for the Army's Integrated Training Area Management program, has declined slightly in real dollar terms during this same period. This suggests that although the DoD is doing what is needed to

DoD's Legacy Resource Management Program

In November 1990, Congress passed legislation establishing the DoD Legacy Resource Management Program to provide special funds to preserve those parts of our nation's natural and cultural heritage under military control. The program assists the military in protecting and enhancing resources while supporting military readiness. Many of the products and partnerships described in this edition of the *Bulletin* are funded through the Legacy program. More information about the Legacy program and the process for submitting project proposals are available via the web at http://www.dodlegacy.org.

Observing birds on the Goldwater Air Force Range, Arizona
PHoto by Douglas Ripley/U.S. Air Force

remain in short-term compliance, it may be missing significant opportunities to improve efficiencies and reduce the potential for long-term problems.

Loss of natural resources positions.

All federal agencies are undergoing studies to identify downsizing and contracting-out possibilities. Unfortunately, although these actions may produce short-term savings, they also may result in a loss of institutional memory, expertise, and dedication. Long-term initiatives may be abandoned. For example, comprehensive ecosystem management efforts, including volunteer and partnership development, are likely to suffer. There may also be a temptation to make decisions based on potential short-term gains, rather than on long-term resource sustainability requirements.

Endangered species management on military lands remains a challenging and critical focus for DoD's resource managers. The articles in this special edition provide details on some of their more recent efforts. Success ultimately depends upon their skills and expertise, aided by the proper tools, training, and resources. Continued partnerships with the Fish and Wildlife Service and the National Marine Fisheries Service are essential elements of these efforts.

L. Peter Boice is Director, Conservation, Office of the Deputy Under Secretary of Defense (Environmental Security), Pentagon, Washington.

Safeguarding Hawaii's Endangered Stilts

by Diane Drigot

Hawaiian stilt
Photo by Robert Shallenberger

Mokapu Elementary School students planting a native plant garden at Mokapu Central Drainage Channel, which connects with Nu'upia Ponds
Photo by Diane Drigot

The Mokapu Peninsula component of Marine Corps Base-Hawaii (MCBH) is a busy military installation on the island of O'ahu. This 2,951-acre (1,195-hectare) facility also provides safe haven for some 50 species of waterbirds, shorebirds, and seabirds. Among them are all four of Hawaii's endangered waterbirds: the ae'o or Hawaiian stilt *(Himantopus mexicanus knudseni)*, 'alae keo'keo or Hawaiian coot *(Fulica alai)*, 'alae ula or Hawaiian gallinule *(Gallinula chloropus sandvicensis)*, and koloa or Hawaiian duck *(Anas wyvilliana)*.

The best stilt habitat on base is at Nu'upia Ponds Wildlife Management Area, a complex of interconnected shallow ponds and vegetated mudflats. Shoreline marshy areas, golf course ponds, and a constructed storm water retention basin also contain waterbird habitat. Management activities at MCBH have more than doubled the number of stilts counted on base from about 60 to 130 over the past 20 years. Currently, the base harbors nearly 10 percent of the state's total estimated stilt population of 1,500 to 1,800 birds (Rauzon and Tanino 1998). Increased stilt reproduction is most noted where there is deliberate manipulation of invasive plants. Two of the main species targeted for control are mangrove *(Rhizophora mangle)* and pickleweed *(Batis maritima)*.

Mangroves are not native to Hawaii. Introduced in the early 1900s, this species is now a major pest in coastal wetlands, including Nu'upia Ponds. In the early 1980s, base resource managers and community volunteers began to remove small mangroves with hand-held tools. In the 1990s, more than $2 million was spent on mechanical removal of about 20 acres (8 ha) of mangrove and associated monitoring studies (Drigot 1999). Volunteers keep mangrove regrowth in check.

Since the early 1980s, invasive pickleweed has been controlled through annual "mud ops" maneuvers by Marine Corps Assault Amphibian Vehicles (AAVs). These 26-ton vehicles are normally excluded from the wildlife reserve, but each year, just before onset of stilt nesting season, they are deliberately deployed in supervised plow-like maneuvers. The AAV vehicles break open thick mats of pickleweed, improving stilt nesting and feeding opportunities while also giving drivers valuable practice in unusual terrain. Their plowing action creates a checker-board pattern of "moats and islands" that inhibits predator (e.g., the non-native mongoose) access to stilt eggs. It also helps newly-hatched stilts find aquatic food, such as flies, larvae, crustaceans. Stilt chicks must feed themselves from birth.

Following an integrated ecosystem approach, MCBH resource managers address stilt needs in other areas while also enhancing the quality of life for military occupants. One area of focus is Mokapu's Central Drainage Channel, which funnels ground and surface water through the urbanized landscape, Nu'upia Ponds, and out into Kan'eohe Bay. More than a drainage system, this dynamic channel receives fresh surface and ground water runoff as well as tidal salt water. Fish and crustaceans enter this system, attracting native waterbirds, shorebirds, and seabirds, which regularly forage along the ditch's riparian banks.

Several barracks along this drainage ditch house Marines and Sailors. A multi-million dollar program is renovating and rebuilding barracks for active-duty

personnel, and base resource managers are working with planners to build such projects in an "environmentally friendly" way. For example, in 1999, construction began on a streamside barracks that included landscaping with native plants and a storm water retention basin to attract native waterbirds, while also implementing a Best Management Practice for storm water retention. The construction contractor, Dick-Pacific, hired Ducks Unlimited to design the basin to these specifications. One of the project features was a pond that was constructed to trap potentially muddy storm water runoff from the barracks site and the surrounding 700-acre (280-ha) drainage area. The pond was designed to give runoff water enough time to filter through the ground and slowly make its way downstream, instead of flowing quickly through the drainage channel. If no stormwater retention basin had been designed into the project, heavy rains might have caused potentially contaminated, muddy stormwater runoff to flow into Nu'upia Ponds and Kane'ohe Bay. Thus, with this basin, water quality is improved using the filtering capabilities of nature.

The pond and drainage channel are connected by culverts that allow tidal influences into the pond. When the tide rises and water moves up the channel, the basin fills, and small fish and larvae (food for the birds) enter the pond. As the tide lowers, basin water depth decreases to create a mudflat, which is attractive habitat for native birds such as stilts. At a scientist's suggestion (M. Rauzon), gravel islands were added to create nesting substrate that is reasonably secure from predators. Even before construction of the barracks was completed, the basin passed inspection by a pair of stilts that nested and hatched a clutch of three eggs on one of the new gravel islands.

Elsewhere along this channel, volunteers have helped to establish two native plant riparian gardens. Elementary school teachers have been trained and encouraged to use the area for environmental education. Students plant, weed and monitor garden progress, measure water quality, and observe stilt use of the stream habitat.

Through dedication and hard work, environmental staff, planners, contractors, community volunteers, active-duty Marines and Sailors, and state and federal advisors will continue to implement this vision of a healthier watershed.

Dr. Drigot is Senior Natural Resources Management Specialist at the MCBH.

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Hawaiian stilt nest with eggs on mudflat shaped by AAV plowing at Nu'upia Ponds
Photo by Mark Rauzon

An AAV driver plows through mudflats overrun with invasive picklewed in Nu'upia Ponds to create better nesting surface for stilts.
Photo by Diana Drigot

A Partnership for Peregrines

by Skip Ambrose and Chris Eberly

A peregrine falcon and her nestlings
USFWS photo

In 1955, the first cadet class of the U.S. Air Force Academy chose the falcon as the mascot of the Cadet Wing. The cadets felt the falcon, symbolizing speed, agility, and power, best symbolized the Air Force. This decision began an association between the Air Force and the falcon that continues today. In fact, the F-16, currently one of the Air Force's top fighter aircraft, is nicknamed "The Fighting Falcon."

Beginning in the 1950s, another falcon, the peregrine *(Falco peregrinus)*, found itself defenseless against the effects of pollution. By 1973, reproductive failure caused by the pesticide DDT reduced the American peregrine falcon *(F. p. anatum)* to the point that the Fish and Wildlife Service added it to the list of endangered species. After the use of DDT was restricted in the U.S. and restoration programs (such as nest site protection and reintroductions of captive-propagated birds) began, the species moved forward on its long road back to a secure status.

Alaska is the only state where all three North American subspecies of the peregrine falcon—American, Arctic *(F. p. tundrius)*, and Peale's *(F. p. pealei)*—nest. From a military perspective, Alaska is strategically located near the polar routes between Europe, Russia, and North America. Thus, Alaska is pivotal to both the falcon and the Air Force.

Air Force training activities in Alaska increased significantly in the early 1990s. Much of this training involves very low-level and high-speed flights, a combination with the potential to disturb many wildlife species, including nesting falcons. Due in part to its special connection with falcons, the Air Force has worked with the Service since the early 1980s to minimize or eliminate impacts

The U.S. Air Force's F-16 aircraft is nicknamed the "Fighting Falcon."
U.S. Air Force photo

of Air Force activities on the American peregrine falcon in Alaska.

Through the interagency consultation process outlined in section 7 of the Endangered Species Act (ESA), the Air Force and the Service identified major peregrine nesting areas in proposed Air Force training locations. The Air Force agreed to a protective "no-fly" zone of 2 miles (3.2 kilometers) horizontal distance and 2,000 feet (610 meters) above nest level in these dense nesting areas. Additionally, the Air Force is monitoring several nearby peregrine populations that fall outside the protected areas. This monitoring effort, which has continued since 1995, shows that the protective zones appear to provide adequate protection in the densest nesting areas and that the incidental loss of nestlings outside these zones is below the levels originally anticipated.

Most people assume it is the responsibility of the Service to protect and restore listed species; however, the ESA extends this mandate to *all* federal agencies. The Air Force has accepted its responsibilities under the law and contributed significantly to the recovery of peregrine falcons in Alaska.

In addition to the assessment of impacts of low-level aircraft and sonic booms on nesting falcons, the peregrine survey effort funded by the Air Force in Alaska is one of the largest and most successful in North America. During the past 5 years, over 125 peregrine nest sites have been located annually and checked for breeding success and productivity. Another study, this one using the latest in satellite transmitter technology, provided heretofore unknown information about the migration routes and wintering areas of peregrine falcons. Biologists in Alaska, funded by the Air Force and working in conjunction with biologists in Greenland funded by the U. S. Army, deployed the first satellite transmitters small enough to be carried aloft by peregrine falcons.

By 1999, North American peregrines had recovered to the point that the Service removed them from the list of threatened and endangered species. The knowledge gained by the Air Force research projects was important in the recovery process, and will continue to be valuable to the Air Force as it assists the Service in planning and implementing a 5-year post-delisting monitoring plan for the American peregrine falcon.

In addition, the peregrine remains on the Boreal (Alaska) Partners in Flight/Audubon Watchlist as a species of management concern. Peregrine habitat management will also be incorporated into Air Force integrated natural resource management plans, in collaboration with the Department of Defense's Partners in Flight program.

Rather than making a minimal effort to comply with the law, the Air Force actively pursued programs to help recover the American peregrine falcon. Perhaps the long association and connection between the Air Force and its mascot, the falcon, provided the impetus for this effort. And maybe the Air Force in Alaska simply wanted to do the right thing.

Skip Ambrose is a Wildlife Biologist with the Fish and Wildlife Service's Northern Alaska Ecological Services Office in Fairbanks, Alaska. Chris Eberly is Program Manager for the Department of Defense's Partners in Flight program in The Plains, Virginia.

The first peregrine falcon ever fitted with a satellite telemetry unit.
Photo by Skip Ambrose/USFWS

by Ronnie Sidner

A Bat Boom at Fort Huachuca

A lesser long-nosed bat swoops down to feed on, and at the same time pollinate, the flower of a Palmer agave.
Photo © Merlin D. Tuttle/Bat Conservation International

Springtime in southern Arizona brings the spectacular blooming of the saguaro cactus *(Carnegiea gigantea)* to the Sonoran Desert. At the same time, two species of nectar-feeding bats migrate in from Mexico. One of these is the lesser long-nosed bat *(Leptonycteris curasoae)*, an endangered species. It arrives in the low elevation desert community in April, gives birth in May, and raises its single young through June. During this period, the species feeds on the nectar and pollen of flowering saguaros and organ pipe cactus *(Stenocereus thurberi)*, contributing to the successful pollination of these succulents.

In June and July, the cacti offer fruit that provide nutrition and moisture to untold numbers of desert creatures. Lesser long-nosed bats and their growing young eat the fruit and disperse the seeds, providing another service in the reproductive cycle of the cactus. In July, the bats move higher in elevation toward the arid grasslands of southeastern Arizona, where they enlist the help of the U.S. Army at Fort Huachuca. There the bats change their diet and feed on the nectar and pollen of "century plants," primarily the species known as the Palmer agave *(Agave palmeri)*.

Historically, lesser long-nosed bats were known to inhabit two cave roosts on Fort Huachuca, but little was known about their population numbers. Collection reports from the 1950s-1970s listed no more than 20 individuals at either of the roosts. However, visitors had reported exit flights of large bat colonies at one of these sites, known as the "PY" roost. After the lesser long-nosed bat was placed on the endangered species list in 1988, the Army immediately began assessing the status of the bat at all roosts on the fort, and began determining ways to protect the bats and their potential food plants.

Across the fort, biologists conducted surveys of potential roosts and initiated a monitoring program. From the beginning, they used low-disturbance methods to perform research at roost sites. This meant that only a single bat biologist

ventured into roosts when bats were present, and only a brief visit to the interior was undertaken when necessary to determine bat presence and species identity. Dim, red lights, night vision goggles, or infrared lights were used inside roosts, and bats were not captured inside their roost caves.

Most estimates of population numbers were performed outside of the roosts by an observer who counted individual bats as they exited the cave for the evening foraging flight. When bats were not present, roost sites were searched for bone material. From skeletal evidence, biologists discovered that a third cave on the post was used by lesser long-nosed bats at some time in the past. Skeletal material also was found during the initial survey at the PY roost, but only one live bat was observed there during the first 6 years of monitoring. This site is a large cave that has been popular with recreational cavers. Protection for the bats requires that the potential roost sites be closed from May through October when bats are present, but the sites can be reopened after the bats migrate south in the fall.

Before 1991, the Army began many other protective actions at Fort Huachuca, such as removing obstructions at cave entrances, posting closure signs, and fencing roost sites and the roads leading to them. Following these actions, there was an immediate increase in numbers of cave myotis *(Myotis velifer)*, an insect-feeding bat that shares the roosts of lesser long-nosed bats.

The Army, in coordination with the Fish and Wildlife Service, soon took action to prevent damage to agaves at Fort Huachuca, thus ensuring a continued food supply for the endangered bats. Because there are two species of nectar-feeding bats on the fort, it was necessary to document that lesser long-nosed bats used these plants for food. This was accomplished by photographing and netting both species as they foraged at the Palmer agave flowers.

Biologists determined bat feeding rates at the agaves on Fort Huachuca by counting the number of feeding strikes during 15-minute periods. Upon analysis, bat feeding rates varied among years, even when the numbers of bats in southern Arizona appeared to be relatively stable. On the fort, average foraging rates during one 4-year period ranged from 1 to 53 feeding strikes per 15 minute period. It was possible one year for an observer to simply invest 15 minutes of patience at any blossoming agave on the fort to be guaranteed an exciting display of bat feeding at the flowers.

Each year, 6 to 14 exit counts have been conducted outside each roost to determine the period of roost occupancy and the maximum number of bats residing at any roost. We have been pleased to note sustained growth in population numbers of both the cave myotis and the endangered lesser long-nosed bat. In the past 2 years, lesser long-nosed bats recolonized the old PY roost and increased in abundance to more than 70 times the maximum number of bats first observed (before protective actions were initiated). In 1999, bats also remained at the roost until the first week in November, the latest date this species has been recorded anywhere in the U.S.

Overall, bat population numbers at protected roosts at Fort Huachuca have stabilized or increased over the past 10 years, and we are hopeful that the recovery of bats and their desert food plants will continue.

Dr. Sidner is an independent consultant at Fort Huachuca, Arizona.

Mountain and grassland habitats are conserved for a variety of wildlife species at Fort Huachuca.
Photo by Robert Anderson

Seabees Renovate Habitat for Endangered Birds

by Rebecca M. K. Hommon and Donna Stovall

Photo by Donna Stovall/USFWS

Answering a request from Donna Stovall, manager of the Fish and Wildlife Service's national wildlife refuges on the Hawaiian island of O'ahu, a Navy team recently created some critical mudflat habitats for endangered water birds on the shores of historic Pearl Harbor. These West Loch mudflats are home to a number of Hawaiian waterbirds, including four endangered species and a variety of migratory waterbirds. The endangered waterbirds include the koloa or Hawaiian duck *(Anas wyvilliana)*, the ae'o or Hawaiian stilt *(Himantopus mexicanus knudseni)*, the 'alae-ke'oke'o or Hawaiian coot *(Fulica americana alai)*, and the 'alae'ula or Hawaiian moorhen *(Gallinula chloropus sandvicensis)*. While munitions are loaded or unloaded around the corner at the pier on the West Loch Naval Magazine, the birds safely go about their routine, protected from human interference by an Explosive Safety Quantity Distance Arc that limits land uses in the area.

Hawaiian moorhen
USFWS photo

The site is a 5-acre (2-hectare) pond within the Honouliuli Unit of the Pearl Harbor National Wildlife Refuge. This refuge was created as a mitigation measure to replace muddy habitat lost when Honolulu's "reef runway" was built. While the underlying land and water is owned by the Navy, the refuge is managed by the Fish and Wildlife Service. Over the years, the Honouliuli Unit has provided decreasing value to waterbirds because of the increasing growth of invasive plants and weeds. Service staff had attempted to create clear spaces by changing the water levels, however it wasn't enough to make the area suitable habitat for waterbirds. "Many of the mounds in the pond were too large and high to be affected by water level manipulations," said Donna Stovall. Additional work with heavy equipment was needed to create conditions favorable for certain plants, insects and other organisms that provide food for the birds.

In August 2000, Navy Construction Battalion Unit 413 (CBU-413), a Seabee unit, answered the Refuge Manager's request for help and at the same time benefitted from some real-life training. Two Seabee heavy equipment operators maneuvered a bulldozer and grader to sculpt the bottom of the pond. Putting their Navy engineering skills to work in this training exercise, EO2 Charles Stinson and EO1 Michael Bradley reshaped some of the mounds into islands, removed others, and constructed a drainage system according to a restoration plan designed by the refuge staff. In the end, the team had created critical mudflats for foraging, islands for stilt nesting, and channels to easily direct water to all parts of the pond.

This project was another demonstration of the Navy's strong partnership with the Service's national wildlife refuges in Pearl Harbor. For years, sailors and their families have volunteered numerous weekend hours creating new habitats, food sources, nesting and foraging areas, and clearing away vegetation and trash at the James Campbell and the Honolulu units of the Pearl Harbor Nation Wildlife Refuge Complex. These voluntary efforts now allow 5,000 third-graders and others who visit the refuges to get a closer look at the visiting and resident waterbirds, shorebirds, and waterfowl, improving public understanding of the contributions of Pearl Harbor to the island's ecosystem.

According to Stovall, "This joint venture once again demonstrates the strong partnership between the Navy in Hawaii and the Fish and Wildlife Service. Without the Navy's help, we would not have the additional acreage of habitat needed to support Hawaii's native birds as well as the migratory birds that visit each year."

Rebecca M. K. Hommon is the Regional Counsel for Navy Region Hawaii, and is based in Pearl Harbor, Hawaii. Donna Stovall is the manager of the Oahu National Wildlife Refuge Complex.

Using bulldozers and other earth-moving machinery, Navy Seabees created habitat for the endangered Hawaiian stilt.
Photos by Donna Stovall/USFWS

Hawaiian ducks
USFWS photo

The Air Force Academy's Mouse

by Dana Green,
Brian Mihlbachler, and
Douglas Ripley

Researchers weigh a Preble's meadow jumping mouse.
U.S. Air Force photos

Nearly a half century ago, the U.S. Air Force acquired 18,500 acres (7,485 hectares) along the Front Range of the Colorado Rocky Mountains for the site of its Air Force Academy. This once sparsely populated area has since become one of the fastest growing places in the United States. As a result, the Air Force Academy, like many military lands, is becoming an island of biodiversity within a sea of urban development.

The main animal of concern now at the Air Force Academy is the Preble's meadow jumping mouse *(Zapus hudsonius preblei)*, a small brown rodent with a conspicuous dark dorsal band, large well-developed hind legs and feet, and an extremely long tail. This subspecies only occurs in foothill riparian systems from southeastern Wyoming to central Colorado in the North Platte, South Platte, and Arkansas River watersheds. In Colorado, biologists have documented the subspecies currently in seven counties, with one of the largest and most stable populations occurring at Monument Creek on the Air Force Academy.

The Academy commissioned the Colorado Natural Heritage Program (CNHP) to conduct a baseline inventory of small mammals at the facility in 1994. That survey resulted in capture of the Academy's first known Preble's meadow jumping mouse, which at that time was a listing candidate. Recognizing the rarity of the find and the implications for management, the Academy, in partnership with the CNHP, conducted an intensive survey in 1995 to identify the extent of the mouse's occupied habitat on Academy lands and provide a baseline population estimate. The study indicated that the Academy was home to a significant mouse population and important contiguous habitat for the species along Monument Creek and its tributaries. As a result, the Academy entered into a partnership with the CNHP for an ongoing study of the mouse to provide the information necessary to develop management and conservation strategies. Field work began in the summer of 1997 and has continued every year since then. With the listing of the Preble's meadow jumping mouse as threatened in 1998, the U.S. Fish and Wildlife Service became a formal partner in the field research on the Academy grounds.

The Academy's natural resources manager is a member of the Preble's Meadow Jumping Mouse Science Advisory Team, a group of scientists and managers dedicated to compiling the best science available to support the conservation of the species throughout its range. An Academy representative also holds a position on the executive committee for a habitat conservation plan (HCP) under development for El Paso County, Colorado. Through the HCP process, the Academy will coordinate with nonfederal entities in the development of conservation strategies for the mouse on a regional basis.

At the request of the Service, the Academy's natural resources manager is representing the Air Force on the Preble's Meadow Jumping Mouse Recovery Team, which is charged with developing a plan to restore to the species to a secure status. When complete, the recovery plan will be incorporated into the Academy's Integrated Natural Resources Management Plan, and will provide the guidance and specific

conservation strategies for the mouse and its habitat on Academy lands.

The Air Force also has entered into a formal conservation agreement with the Service for management of the Preble's meadow jumping mouse and its habitat at the Academy. This agreement outlines a 5-year strategy to accommodate the maintenance and repair of existing Academy infrastructure within the species' habitat. The Academy then initiated formal consultation under section 7 of the Endangered Species Act on a programmatic basis for its conservation management plan and the conservation agreement. The biological opinion provided by the Service on the Academy's conservation management plan significantly reduced the regulatory burden on both the Academy and the Service by removing the need for section 7 consultations for each instance of regular maintenance.

The management approach taken by the Air Force Academy demonstrates the benefit of initiating inventories and developing management plans well before regulatory requirements demand compliance. By recognizing the conservation needs of this rare species early, the Academy was able to initiate research and management strategies 3 years prior to listing. This placed the Academy in a leadership role as conservation initiatives developed on both a regional and a rangewide basis.

Both the Air Force and the Service hope that the programmatic agreement concept developed in this process will have application throughout the country. It clearly has the added advantage of placing both the Air Force and the Service in a partnership that recognizes a common conservation goal, rather than a strictly regulatory one. The benefits of such an approach mean easier compliance with the Endangered Species Act and better conservation for listed species.

Dana Green is the former natural resources manager at the U. S. Air Force Academy and currently manages the conservation program for the 21st Aerospace Wing at Peterson Air Force Base, Colorado. Brian Mihlbachler is the natural resources manager at the Air Force Academy. Douglas Ripley is the natural and cultural resources program manager for the Air Force at the Pentagon, Washington, D.C.

The Palos Verde Blue: An Update

by Rudi Mattoni and
LTC Nelson Powers

Palos Verdes blue butterfly
Photo by Michael Ann Malzone and Zia Mehr/U.S. Army

When the last known habitat of the Palos Verde blue butterfly *(Glaucopsyche lygdamus paloverdesensis)* was destroyed in 1983, most observers feared the species had become extinct. Fortunately, however, a single colony survived without notice at the Defense Logistic Agency's Defense Fuel Support Point (DFSP) in San Pedro, California. The colony's eventual discovery in 1994 made it possible to plan for the eventual recovery of this unique creature.

The DLA facility contains an "island" of habitat in a regional sea of development and urbanization. Captive-reared butterflies produced since the 1994 rediscovery have been used to augment the existing colony and reintroduce the Palos Verde blue into another fragment of habitat. (See "Rediscovery of the Palos Verde Blue Butterfly" in *Endangered Species Bulletin* Vol. XIX No. 6, and "Teaming Up for PV Blues" in *Bulletin* Vol. XXII No 2.) The success of this project, led by a group of dedicated scientists, volunteers, and other partners, is due in part to funding support from the Legacy Resource Management Program. This program was established by Congress to provide funds for preserving natural and cultural resources on Department of Defense lands.

In 1994, a three-phase conservation program that ensures uninterrupted operation of the facility's military mission was developed in coordination with the Fish and Wildlife Service. The first phase of this conservation program focuses on field studies of the butterfly population, the second involves the breeding program, and the third centers on habitat conservation. The following is a brief update on the progress of the Palos Verde blue recovery effort.

Field Studies

Population monitoring, initiated in 1994, is conducted by standard transect walks throughout the butterfly's flight period in the spring. The total count in the wild was an estimated 214 individuals in 1994, increasing to 646 in 1999, followed by a reduction to 411 in the year 2000. The reasons for the fluctuation in numbers are not known at this time. However, the data revealed a complex metapopulation structure for the animal, with the densest subpopulations shifting among three centers during the 7-year study. Further study of movement of individuals showed that females are highly sedentary in comparison with males. The results are important to our adaptive management program.

In 2000, Palos Verde blues were reintroduced to a nearby natural area, known as the Chandler preserve, that has been set aside for conservation by the local community. The reintroduction resulted in 306 individuals emerging from pupae set out in the field. The butterflies were observed to mate, and females deposited eggs on over 1,000 larval food plants across the 6 acres (2.4 hectares). Although success cannot be gauged for several seasons, no further releases will be attempted until the next generation can be evaluated. Food plant establishment is encouraging and additional planting is underway.

Breeding Program

In the meantime, the captive rearing program has been refined to the point where virtually any number of individuals can now be produced. Anticipated costs of less than $5.00 per individual are forecast, down from the current $25.00. This year, 117 adults emerged from 629

pupae and were released at an apparently suitable but unoccupied site at DFSP. A second group of pupae were set out at the Chandler site. The remaining pupae were held as the residual breeding stock for 2001. A total of 968 pupae resulting from the 2000 breeding cycle are available for release and further breeding next year. The most significant event was the ease with which mating occurred in the captive population.

Habitat Conservation

Through the year 2000, over 17 acres (7 ha) at the DFSP have been enhanced by plantings of native vegetation. These have included attempts to establish 37 of the 63 extirpated plant species in order to reestablish, as closely as possible, the plant community found there historically. Mass propagation of most plant species for restoration of the habitat can now be done with ease. Over 12 individuals of *Catalina crossosoma* have been established and are now fruiting. Only two individuals of this endemic plant were present on the mainland prior to our efforts. Increasing plant diversity is the keystone of the program.

All efforts have involved several volunteer organizations. These groups donated significant help, from the labor of clearing non-native vegetation and nursery propagation to fine-scale work in captive rearing of the butterflies. In addition, educational programs have been developed involving Audubon YES (Youth Environmental Service) and the local Conservation Corps. Teaching institutes developed in cooperation with the UCLA Graduate School of Education for K-12 teachers demonstrate the utility of butterflies as teaching tools at those grade levels. Lastly, the site is used for conservation biology coursework for UCLA classes at both graduate and undergraduate levels.

Rudi Mattoni teaches at the University of California at Los Angeles. LTC Powers is a Staff Entomologist in the Environmental and Safety Policy section, Defense Logistics Agency, Ft. Belvoir, Virginia.

Volunteers clear an area at Army site in San Pedro, California, for replanting with host and food plans for the Palos Verdes blue butterfly.
Photo by Michael Ann Malzone and Zia Mehr/U.S. Army

Resarch into determining optimal conditions for rearing Palos Verdes blue butterflies has resulted in good breeding success.
Photo by Zia Mehr/U.S. Army

Navy Saves Old Growth for Murrelets

by Walter Briggs and Carolyn Lackey

Thanks to the Navy, a nesting colony of marbled murrelets *(Brachyramphus marmoratus)*, a bird listed as threatened in the Pacific Northwest, has been protected at the Jim Creek Naval Radio Station in Snohomish County, Washington. This installation, situated on approximately 4,800 acres (1,950 hectares) of land, provides communication support for the Pacific Naval Fleet and habitat for the rare seabird.

The station's marbled murrelet nesting colony is located in approximately 250 acres (100 ha) of old growth forest on land the Navy purchased in 1950. To reduce acquisition costs at that time, the Navy bought the land but not the timber. In 1992,

Juvenile marbled murrelet at its nest
Photo by John and Karen Hollingsworth

through the Department of Defense (DoD) Legacy Resource Management Program, the Navy purchased the remaining timber in this old growth forest to preserve it for the future. In 1995, the U.S. Fish and Wildlife Service recognized the importance of this forest by designating it as critical habitat for the marbled murrelet.

The marbled murrelet, a bird about the size of a robin, is the only seabird to nest in old growth forest. Unusual characteristics, such as its flight process, makes it very unique when compared to other seabirds. The murrelet has small, pointed wings that have little drag underwater and allow the bird to "fly" beneath the surface to catch fish. In the air, however, the small size of the wings reduces their lift, making it necessary for the bird to fly with a very rapid wing beat just to stay aloft. Since the size of its wings does not allow it to create an air cushion to slow itself down like most other birds, the murrelet goes into a dive, turns upside down, and stalls when it wants to land. At the moment it stalls in flight, it must be located next to a tree limb that is at least 7 inches (17 centimeters) in diameter in order to land. Marbled murrelets do not build nests; instead, they make shallow depressions in the moss that grows on large, old limbs, and lay a single egg.

The marbled murrelet was listed as threatened in 1992. The next year, natural resources personnel at the installation began conducting surveys for this elusive bird. Because murrelets are so difficult to detect, the use of radar detection was recently established to complement survey techniques. Survey results currently reveal approximately 12 birds (six pairs) nesting in the old growth forest on the east side of Lower Twin Lake at Jim Creek Naval Radio Station.

Military training occurs in this old growth forest but is limited to navigation/orientation courses where only foot traffic is allowed. All proposed projects at the station are reviewed and must pass a site approval process to identify potential impacts on the environment. In order to avoid a conflict with listed species and their habitat, project locations and scopes of work may be adjusted. For example, a planned hiking trail originally had been routed through occupied murrelet habitat. However, to minimize disturbance to the species, the trail was rerouted to a more suitable area.

Marbled murrelets have continuously nested in this old growth forest since they were first detected there in 1993, and the Navy's conservation efforts will allow the rare birds to continue as an integral part of this ecosystem.

Adult marbled murrelet on nest
Photo by John Deal

Walter Briggs is a Forester with the Naval Facilities Engineering Command, Northwest Engineering Field Activity, in Poulsbo, Washington. Carolyn Lackey is a Natural Resources Specialist with the Naval Facilities Engineering Command, Chesapeake Engineering Field Office, at the Washington, D.C., Navy Yard.

The Army Reaches Out

by Bert Bivings

Educating the public about their mission is an important responsibility for all government agencies. It is especially important for the armed services. They need to inform people about how military lands are managed because of the necessary public access restrictions and the importance of conserving vital wildlife habitats on military lands.

The U.S. Army Forces Command, based in Fort McPhearson, Georgia, conducts training on about 2 million acres (0.8 million hectares) across the nation. It also has aggressive and effective programs to manage habitat for the recovery of federally listed species and other wildlife.

Because conservation efforts on Army training lands are largely unknown to the public, Forces Command launched a computer-based program in 1999 to teach elementary school students about endangered species management on Army installations. The program targets third grade students at schools that are close to Army posts. It is also available by request to any school that would like to increase its awareness of threatened and endangered species and what can be done to protect them.

Entitled "Wildlife Success Stories and Wildlife in Trouble," the program was a collaborative effort involving Dr. Billy Higginbotham, an extension wildlife specialist at Texas A&M University; Dr. Bert Bivings, a wildlife biologist at Forces Command; and the many biologists who work at Forces Command installations. The program package includes a read-only memory compact disk (CD ROM) and teacher workbook. Forces Command also has two self-contained, mobile units that provide four personal computers and a large visual display to illustrate key conservation messages. Dr. Higginbotham developed the original program for Texas in 1993, while Dr. Bivings and installation biologists adapted the text to address species important to Forces Command lands.

Force Command's educational program features the desert tortoise and other species.
U.S. Army photo

The Wildlife Stories program is both educational and entertaining. It features six species that are threatened or endangered and six others that illustrate wildlife management successes. Threatened and endangered species include the golden-cheeked warbler *(Dendroica chrysoparia)*, black-capped vireo *(Vireo atricapillus)*, red-cockaded woodpecker *(Picoides borealis)*, sage grouse *(Centrocercus urophasianus)*, Mexican spotted owl *(Strix occidentalis lucida),* and desert tortoise *(Gopherus agassizii)*. The success stories feature the white-tailed deer *(Odocoileus virginianus)*, American alligator *(Alligator mississippiensis)*, wild turkey *(Meleagris gallopave)*, wood duck *(Aix sponsa)*, and two species that are approaching removal from the threatened and endangered species list, the bald eagle *(Haliaeetus leucocephalus)* and greenback cutthroat trout *(Oncorhynchus clarki stomias)*.

By providing elementary students with facts about threatened and endangered species, Forces Command hopes to enhance understanding of the importance of wildlife management on Army installations across the United States. For more information or copies of this program, contact Bivings by e-mail at bivingsb@forscom.army.mil or call (404) 464-7659. For details on how to modify this program for your particular region, contact Dr. Higginbotham by e-mail at b-higginbotham@tamu.edu or call (903) 834-6191.

Bert Bivings is a Wildlife Biologist at the Headquarters, U.S. Army Forces Command, in Fort McPherson, Georgia.

On Guard for Endangered Plants

by Neal Snyder and Steve Lai

With enough imagination, the flowers of Hawaii's 'ohai bush *(Sesbania tomentosa)*, an endangered plant in the pea family (Fabaceae), can be said to resemble tiny hermit crabs in scarlet Bonaparte hats. Alien or non-native plant species threaten to engulf the 'ohai, which is now practically non-existent in the wild. But it has found a strong ally in the Hawaii National Guard.

The Guard carries out realistic military training on 34 sites throughout the Hawaiian islands, while also promoting sustainable practices in land use and protecting a wide variety of plant and animal species. Training lands support 33 rare, threatened, or endangered species and five distinct habitat types, ranging from lava flows to old-growth rain forest. They are among Hawaii's richest lands in terms of biodiversity and present some of the most challenging endangered species problems in the United States.

The Guard's Kanaio Training Area is home to one of the last two wild 'ohai populations on the island of Maui. Only 13 individual plants are known to exist in the wild at the training area, according to Trae Menard, the Hawaii Guard's field ecologist. His group is working to protect those plants and to regenerate the original population by cultivating more than 1,200 for planting into the wild.

The Guard has also installed 2 miles (3.2 kilometers) of fence to prevent feral goats and deer from feeding on the plant, and has set out rodent traps around the plants to prevent rats and mice from eating the 'ohai fruit and seeds. Through a selective weeding campaign, aggressive species that compete with the 'ohai are removed, while those that provide shade and help retain soil moisture can remain.

Sesbania tomentosa
Photo by Greg Koob

Since 1998, Menard's team has made significant progress towards restoring 25 of Hawaii's rare or endangered plant species on four different islands. Most of the endangered plants that Menard works with are found in high-elevation dry forests. "Everyone talks about saving the rain forests," Menard says, but he explains that dry forests in Hawaii are "among the most endangered ecosystems in the world." One threat comes from invasive alien grasses, such as fountain grass, that are highly flammable. Once a stand of this non-native grass catch fire, it "wipes out the ecosystem."

In 1999, the Hawaii Guard's environmental office completed the propagation phase of its native plants management program. Collecting seeds from reproducing wild individuals, enhancing germination, and rearing seedlings for out-planting are part of a strategy to increase genetic diversity and maintain a large seed source within greenhouse nursery reserves.

Menard's team hopes to finish an out-planting and re-seeding program in 2002. Already, 850 individuals of native and endangered species have been out-planted, and about 3,500 native and endangered plants have been reared at the Kanaio Training Area.

Neal Snyder is a Senior Planning Specialist (J.M. Waller Associates, Inc.) at the U.S. Army Environmental Center (USAEC) in Maryland. Captain Steve Lai is an Environmental Awareness Manager at Fort Ruger, Hawaii.

by Mike Wicker

A Military Solution to an Environmental Problem

The impoundment caused by Rains Dam inhibited feeding, migration, and breeding of several aquatic species by reducing downstream flows.
Photo by Tom MacKenzie/USFWS

On December 1, 1999, combat engineers from the Marine Corps Air Station at Cherry Point, North Carolina, used C-4 plastic explosive to blast a very large hole in the 250 feet (76 meter) long, 12 feet (3.7 m) high Rains Dam on the Little River. Three more days of blasting reduced the 71-year-old dam to rubble.

A contractor working under the direction of the North Carolina Division of Water Resources cleared the site of broken concrete and other debris. The exposed mud flats were then planted with bald cypress *(Taxodium distichum)* and Atlantic white cedar *(Chamaecyparis thyoides)*, with help from the North Carolina State University Department of Horticulture. The dam's owner was a partner in the removal project.

Before its demolition, Rains Dam blocked access to 49 miles (79 kilometers) of spawning habitat for six species of anadromous fish. The removal of the dam restored this area as important spawning and rearing habitat. Anadromous fish that are benefitting as a result are alewife *(Alosa pseudoharengus)*, American shad *(Alosa sapidissima)*, hickory shad *(Alosa mediocris)*, Atlantic sturgeon *(Acipenser oxyrhynchus)*, striped bass *(Morone saxatilis)*, and an endangered species, the shortnose sturgeon *(Acipenser brevirostrum)*. This project complemented two other dam removal projects (Quaker Neck Dam Removal and Cherry Hospital Dam Removal), which restored access to 1,000 miles (1,610 km) and 54 miles (87 km) of anadromous fish spawning habitat, respectively.

Removal of the Rains Dam may benefit other species as well. Populations of two endangered freshwater mollusks, the dwarf wedgemussel *(Alasmidonta heterodon)* and the Tar spinymussel *(Elliptio steinstansana)*, have been found in the Little River approximately eight miles (13 km) upstream of the project area. Additionally, populations of the dwarf wedge mussel have been found downstream of the Rains Dam in the Little River and its tributaries. These species require flowing water and had been extirpated from the 28-acre (11-hectare) lake impounded by the Rains Dam. Removal of the dam will allow these species to reoccupy 11 miles (18 km) of the Little River and restore genetic exchange between upstream and downstream populations that had become isolated from each other.

Other rare animals that benefit from the project are listed below.

Fish: The Carolina madtom *(Noturus furiosus)* appears to be a declining species throughout its range. This species requires flowing water, and removal of the dam increased the available habitat.

Amphibian: A good population of the Neuse River waterdog *(Necturus lewisi)*, a large salamander, still remains in the Little River, and dam removal increased its habitat.

Mussels: The Atlantic pigtoe *(Fusconaia masoni)*, yellow lance *(Elliptio lanceolata)*, yellow lampmussel *(Lampsilis cariosa)*, green floater *(Lasmigona subviridis)*, triangle floater *(Alasmidonta undulata)*, notched rainbow *(Villosa constricta)*, and squawfoot *(Strophitus undulatus)*. The removal of the dam increased and improved their habitat, and allowed the opportunity for genetic exchange among populations. Most of these species are only found above the previous reservoir for this dam. The North Carolina Wildlife Resources Commission's Non-Game Program considered dam removal essential for the long-term survival and health of these rare mussel species.

Prior to the dam's removal, this project had been proposed as a high priority environmental restoration project by the U.S. Fish and Wildlife Service's Coastal Program. To achieve this important goal, Coastal America, a multi-agency private/public partnership, stepped in to help. Coastal America provided a framework for the military to work with state and federal agencies, non-governmental organizations, and the public. Such dam removal projects are typically multi-disciplinary efforts that must address engineering, biological, legal, and social issues beyond the capabilities of any single agency, or public group. Partners in this project included the Service, U.S. Marine Corps, U.S. Army Corps of Engineers, National

Fish and Wildlife Foundation, and the owners of the dam and adjacent lands. The North Carolina Department of Environment and Natural Resources led the team effort. Using the Coastal America framework allowed individual partners to contribute in their areas of strength, thus creating a very effective synergy for river restoration.

Mike Wicker is the Service's Albemarle/Pamlico Coastal Program Coordinator in Raleigh, North Carolina.

Post-event note: In October 2000, the Rains Dam project team received the Coastal America Partnership Award for 2000 and the U.S. Marine Corps Demolition Team received a Special Recognition Award. These awards recognize the participants' contributions for improving our coastal environment.

Mike Wicker, left, speaks to a public gathering on hand to witness the demolition of Rains Dam.
Photo by Tom MacKenzie/USFWS

The three photos above show, from top to bottom, the Rains Dam site before, during, and after removal. The dam was a barrier to fish attempting to migrate upstream to breed.
Photos by Hugh Heine/US Army Corps of Engineers

The endangered Tar spinymussel, left, is one of the species that may benefit from the removal of Rains Dam.
Photo by Richard Biggins/USFWS

Terns Share Naval Surface Warfare Center

by Jim Sartain

The Naval Surface Warfare Center's Coastal Systems Station (CSS) at Panama City, Florida, promotes a natural resources program that delicately balances its military mission and conservation issues. In 1994, for example, the CSS recognized a need to protect the least tern *(Sterna antillarum)*, a species listed by the state of Florida as endangered.

Least terns are ground nesting birds that need open sites upon which to lay their eggs, and they found the flat, gravel-topped roofs of buildings at the CCS to their liking. Facility managers took action to protect the birds by installing a one foot (30 centimeter) high fence around the "A" wing roof of Building 110 to prevent chicks from falling the four stories to the ground. Later, the "chick fence" was expanded to include three additional wings. In 1998, the CSS went a step further by placing wood shipping pallets on the roof to provide the chicks cover from their natural predator, the fish crow *(Corvus ossifragus)*. Two years later, the CSS replaced the wooden pallets with more durable plastic pallets and funded a contract to replace the roof of wing "A".

The CSS Natural Resources Manager (NRM) reviews every incoming contract at the facility to evaluate potential impacts on endangered, threatened, and special interest species. During the review for re-roofing Building 110, the NRM made three recommendations to protect the terns: 1) all work had to be accomplished between September 1 and April 1 of each year to avoid the nesting season; 2) regardless of the type of roof planned, it had to be covered with at least one inch (2.5 cm) of very small, smooth river gravel; and 3) the chick fence and plastic pallets had to be repositioned upon completion.

In addition to the re-roofing, all unnecessary equipment, antennas, and flight-hindering obstacles were removed. As a result of these actions, the facility saw an increase in the number of nesting pairs on the "A" wing roof from two pairs in previous years to four pairs in 2000.

The CCS is using the media, pamphlets, intranet, and internet to educate military, civilian, and contract personnel about the least tern and its environment. In addition, the facility now restricts access to roof locations during nesting periods. Thanks to the Navy's efforts, the total population of least terns at the CSS (including all buildings) rose from 39 nesting pairs in 1999 to 64 pairs in 2000. By taking steps today for this state-listed bird, the CCS hopes to make a federal listing unnecessary.

Jim Sartain is the Natural Resource Manager at the Naval Surface Warfare Center, Coastal Systems Station, in Panama City, Florida.

Plastic pallets held down by sand bags provide cover for least erns nesting on a rooftop.
Photos by Jim Sartain/U.S. Navy

Gopher Tortoise Research at Camp Shelby

by Deborah M. Epperson

The gopher tortoise *(Gopherus polyphemus)*, a reptile native to the southeastern United States, is declining in number throughout its range, primarily due to the degradation and loss of its habitat.

In 1987, the Fish and Wildlife Service listed gopher tortoise populations west of the Mobile and Tombigbee rivers in Alabama as threatened. This presented a challenge to public land managers, particularly the military; the Camp Shelby Training Site in southern Mississippi contains the largest population of gopher tortoises in the threatened portion of the species' range.

In 1995, the Mississippi Military Department entered into an agreement with the Mississippi Department of Wildlife, Fisheries and Parks to initiate research on the gopher tortoise. The project, funded by the Defense Department's Legacy Resource Management Program, will evaluate potential military impacts on the gopher tortoise. Areas of study include population structure, reproductive success, hatchling survivorship, and the prevalence of upper respiratory tract disease. This disease has been a major factor in the decline of the threatened Mojave population of the desert tortoise *(Gopherus agassizi)* and could threaten the survival of the gopher tortoise, too.

Deborah M. Epperson is with the Mississippi Natural Heritage Program in the Mississippi Department of Wildlife, Fisheries and Parks.

Gopher tortoise
Photo by Harold Waalquist/USFWS

A Tale of Two Organisms

by Dennis Teague and Douglas Ripley

The Florida perforate lichen, an endangered species, was first found growing on the sand dunes at Eglin Air Force Base, Florida
Photos by Douglas Ripley/U.S. Air Force

The 464,000 acres (188,000 hectares) of Eglin Air Force Base, located on the Gulf of Mexico along Florida's northwest coast, provide habitat for a diverse range of critical species. Perhaps none of Eglin's 11 threatened or endangered species is more interesting from both historical and biological perspectives as the Florida perforate lichen *(Cladonia perforata)*. In 1993, *Cladonia perforata* had the distinction of being the first lichen to be placed on the federal endangered species list.

Lichens are largely terrestrial organisms formed by a mutual association between two totally separate organisms, usually an alga and a fungus. Approximately 3,800 species of lichen have been recognized in the United States, but only two currently are protected under the Endangered Species Act.

Cladonia perforata was discovered growing on the sand dunes of Eglin AFB by George Llano, an airman serving at the base during World War II. It was later found at several other Florida populations on the Atlantic coast and on the Lake Wales Ridge of central Florida. The exact location of the Eglin AFB population was lost for many years until it was rediscovered in 1989 by botanists Dr. Gerould S. Wilhelm and Dr. James R. Burkhalter. After the rediscovery, the Florida Natural Areas Inventory (FNAI) surveyed the area to determine the size and natural boundaries of the population. The FNAI also discovered two small, previously unknown fragmentary populations several miles west of the main population. Subsequent biological inventories by the FNAI at Eglin AFB have played a very important role in helping the Air Force manage the natural resources entrusted to its care.

All *Cladonia perforata* habitats are subject to significant natural disturbance from high intensity fires or hurricanes. The vulnerability of the small populations to such disturbances, coupled with the loss of potential habitat due to development, were important factors in the listing of this species as endangered. The Eglin AFB population suffered a major setback in 1995 when the extremely high winds and storm surges of Hurricane Opal struck the Gulf Coast at Santa Rosa Island. Two of the three populations at Eglin AFB were destroyed and the largest was reduced by over 70 percent. With Air Force support, researchers Rebecca Yahr (who at the time was with the Archbold Biological Station in Lake Placid, Florida) and Paula DePriest (of the Smithsonian Institution's National Museum of Natural History) began a series of small-scale experimental reintroductions of the lichen to characterize the best transplantation sites and protocols.

At first, DePriest and Yahr found that reintroducing the lichen into former habitat was an extremely complicated and difficult task. However, continuing research by Yahr, now with Duke University in North Carolina, revealed several important factors influencing the

growth and habitat preferences of the species, and she has suggested new techniques that may yet help to reestablish the lichen populations at Eglin AFB. The Air Force and U.S. Fish and Wildlife Service consider this reintroduction project an important element in the long term recovery of *Cladonia perforata* in northwest Florida. We are hopeful that the most recent project will reestablish two populations of *Cladonia perforata* to replace those lost to habitat damage during Hurricane Opal.

The remnants of the original larger population of *Cladonia perforata* appear to be doing well 5 years after Hurricane Opal. Impacts from the storm opened up sandy areas that are suitable for recolonization by the species. The area where the surviving population exists is accessible to the public, and we are emphasizing the development of new management techniques for improved protection of the species. The upcoming 2001 Eglin Integrated Natural Resource Management Plan will provide direction for *Cladonia perforata* site protection, monitoring protocols, and public education. This increased emphasis on protection should reduce human impacts on the species.

The Air Force's careful attention to *Cladonia perforata* highlights many elements of a successful endangered species program. After documenting the species through a comprehensive biological inventory, the Air Force's partnerships with scientific organizations, regulatory agencies, and individual researchers helped it to meet its responsibilities under the Endangered Species Act without interfering with its primary military mission. The Air Force is committed to meeting both the spirit and the intent of the act. Reconciling conservation and military requirements can be challenging, and the Air Force's experience with this endangered lichen demonstrates the importance of working cooperatively with the Service and other interested parties.

Dennis Teague has been an endangered species biologist at Eglin AFB since 1991. Douglas Ripley is the natural and cultural resources program manager for the Air Force headquarters at the Pentagon, Washington, D.C.

The Birds of Fort Hood

by Ben Ikenson

The black-capped vireo, one of Fort Hood's endangered birds
Photo by The Nature Conservancy

If Steven Spielberg ever needs a set location for another epic war picture, Fort Hood, Texas would likely serve well. As one of the largest heavy artillery training sites in the country, Fort Hood conducts live weapons fire and aviation training and houses 544 armored tanks. Built to destroy and engineered to withstand severe combat, tanks like the M1-A2 Abrams boast such features as guided missile launchers and Global Positioning Systems (GPS). They also weigh between 50 and 80 tons. Paved roads can buckle and crumble apart like tea cookies beneath the treads of these mechanical behemoths. It's not surprising then that a substantial portion of the 220,000-acre (89,000-hectare) Army base resembles barren, scorched battlefields with ruts as deep as trenches.

But there is another side to Fort Hood, a softer and gentler side where, instead of the deafening roar of artillery fire, birdsong fills the air. Fort Hood contains essential nesting habitat for two endangered neotropical migratory songbirds, the golden-cheeked warbler *(Dendroica chrysoparia)* and the black-capped vireo *(Vireo atricapillus)*. As part of its responsibility under the Endangered Species Act (ESA), the Army manages 66,000 acres (26,700 ha), more than 25 percent of the land on base, for the recovery of these two endangered species. The base also provides a haven to wintering bald eagles *(Haliaeetus leucocephalus)*, occasional visiting whooping cranes *(Grus americana)* and peregrine falcons *(Falco peregrinus)*, and a variety of other rare and endemic plant and animal species.

Krishna Costello of the Fish and Wildlife Service thanks Lieutenant Ilian, a tank commander at Fort Hood, for his help in conserving the rare birds living at the base.
Photo by Ben Ikenson/USFWS

To ensure that base activities would not jeopardize endangered species, the Army entered into interagency consultation with the Fish and Wildlife Service under section 7 of the ESA. In 1993, the Service issued a "no jeopardy" Biological Opinion (BO). Following the issuance of the BO, Fort Hood contracted with The Nature Conservancy of Texas for further research and monitoring of the birds. In conjunction with Service and Army biologists, Conservancy researchers are compiling the most comprehensive body of information on the birds to date.

Every March, black-capped vireos and golden-cheeked warblers migrate from their wintering grounds in Mexico and Central America to the protected habitat primarily along the east side of Fort Hood. Some birds even use the same nest sites they occupied in previous years. The vireos prefer nesting in patchy or clumped scrubby vegetation that has a leaf cover extending to the ground; warblers build nests in mature oak-juniper woodlands, stripping the bark of Ashe junipers for building materials.

Unfortunately, populations of both birds have been in decline for decades. Black-capped vireos, which once ranged as far north as central Kansas during the

breeding season, are now confined to central and west Texas and northern Mexico, with only a few tiny, scattered, remnant populations in southern Oklahoma and north Texas. Warblers breed only in the fast-disappearing habitat of central Texas. The vireo made its way onto the endangered species list in 1987; the golden-cheeked warbler followed suit in 1990.

"The major threats these birds are facing," says Service biologist Krishna Costello, "include habitat loss due to urban and agricultural development in both their wintering grounds and their breeding grounds. And nest parasitism by brown-headed cowbirds."

Brown-headed cowbirds *(Molothrus ater)* are so named because of their association with cattle, which keep grasses cropped to lengths that make it easy for the birds to snatch insects. Originally, cowbirds evolved with the presence of bison. When bison were nearly exterminated, cowbirds adapted to survival around cattle. One of the cowbird's peculiarities is that it lays eggs in the nests of other birds, which then expend parental care on cowbird young at the expense of their own. Ultimately, the nesting success of many species of native songbirds has been reduced.

"Historically, the impact of parasitism was limited," said Fort Hood Endangered Species Program Manager John Cornelius. "The cowbird effect on other birds were localized so long as they were associated with wandering herds of bison. But now, cowbirds are adapted to livestock. The livestock are extremely widespread across the landscape. The ecological niche for the cowbird vastly expanded with this land-use change so that cowbird numbers have increased, and they began to impact bird species across their entire range, not just locally. This has led to significant declines in a number of songbird species. Cowbirds have been documented parasitizing more than 220 species of other birds."

Without active brown-headed cowbird population management, Fort Hood is no sanctuary from nest parasitism. In fact, cowbirds are common on base due to a 200,000-acre (81,000-ha) long-term grazing lease with the Central Texas Cattleman's Association.

"We began monitoring the black-capped vireo in 1987," said Cornelius. "After 2 years of observing parasitism above 90 percent, and extremely poor productivity, we calculated statistically that the bird would become locally extinct within 10 years without immediate intervention."

Cowbirds are lured into this trap through an opening in the top.
Photo by Ben Ikenson/USFWS

Fortunately, this has not been the case. In 1989, after intensive research on the ecology and management of cowbirds, the team at Fort Hood began installing cowbird traps at locations throughout the base where cows tend to concentrate. About the size of a single-car garage, the mesh-covered traps lure cowbirds in—using food, water, and decoys—through a narrow slit in the top of a wood frame. Once in, the birds cannot get out. Female cowbirds are euthanized, while males and the few non-target birds are released unharmed.

The cowbird trapping has yielded solid results. In 2000, studies revealed that nest parasitism had been reduced to less than 10 percent basewide. "Now," said Cornelius, "parasitism is low, productivity is high, and Fort Hood is very likely serving as a source population for vireo production."

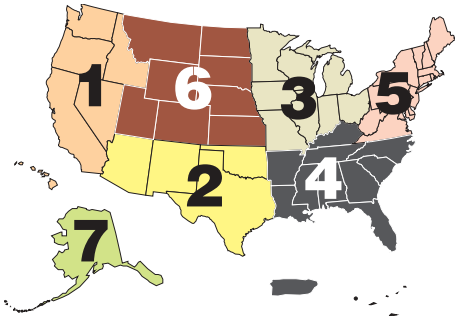
Currently, 33 traps on base and 27 traps on adjoining private properties continue to thwart the cowbird threat. The successful trapping effort is also being expanded into other portions of the vireo's range.

As far as the threat of habitat loss, Costello emphasized that essential habitat must be protected. Recovery plans for both species identify goals of attaining viable populations throughout the birds' ranges. The habitat on Fort Hood is critical to achieve these goals. Other critical areas in central Texas include the Balcones Canyonlands National Wildlife Refuge, the Balcones Canyonlands Preserve (managed by the City of Austin), and the Government Canyon State Natural Area.

"So far," said Costello, "Fort Hood has followed the guidelines and requirements of the 1993 Biological Opinion and an updated 2000 BO to a tee, and in the process has produced extraordinary research and management strategies that can be applied to warbler and vireo issues range-wide. The birds are benefitting from a very good working relationship we have with the Garrison Commander and the Natural Resource staff."

Balancing its military mission with environmental stewardship, Fort Hood has set its sights on safeguarding and defending even more than the lives of our nation's human inhabitants.

Ben Ikenson is a Writer/Editor for the Service's Albuquerque Regional office.



Regional endangered species staffers have reported the following news:

Region 1

Oregon spotted frog
Photo by Laura Todd/USFWS

Oregon Spotted Frog *(Rana pretiosa)* The U.S. Fish and Wildlife Service, Oregon Department of Fish and Wildlife, and the Willamette National Forest have completed a Conservation Agreement for the Mink Lake Basin spotted frog population in the Three Sisters Wilderness. The agreement covers monitoring, site protection, public education, habitat surveys, evaluation of potential impacts from recreation activities, and identifying Spotted Frog Conservation Areas within the basin. Balancing recreation demands with the needs of rare species will be a key component of the project.

Giant Garter Snake *(Thamnophis gigas)* The giant garter snake, a non-venomous species listed as threatened, has been studied on Colusa National Wildlife Refuge (NWR) in California since 1996. Refuge staff and the U.S. Geological Survey's Biological Resources Division field station in Dixon are using radio telemetry and mark-recapture techniques to study the garter snake's habitat use in relation to wetland restoration. A non-native species, the bullfrog *(Rana catesbeiana)*, is a suspected predator of young garter snakes. Bullfrogs were collected for a pilot study examining the effects of introduced predators on snake populations.

Image Omitted

Giant garter snake
USFWS photo

Biologists closely observed radio-marked garter snakes to determine when the females were beginning to give birth and scheduled bullfrog collection to coincide with this period. Thirty bullfrogs were collected from late July to early August of 2000. Each frog was measured, sexed, and examined for stomach contents. In addition to numerous crayfish and invertebrates, two of the frogs had consumed small garter snakes. The frogs that had consumed the young snakes were among the smallest frogs collected. The Service hopes to further investigate the relationship between the non-native bullfrogs and the garter snakes within the Central Valley region.

Southwestern Willow Flycatcher *(Empidonax traillii extimus)* Researchers from the San Bernardino County Museum in California have conducted flycatcher surveys at Pahranagat NWR in southern Nevada in 1998, 1999, and 2000. Yearly monitoring of nesting and habitat preference continues to indicate that the Pahranagat NWR contains the most productive native habitat for this endangered subspecies in Nevada, based on the high density of successfully nesting birds found within a relatively small area. During the 2000 nesting season, 31 southwestern willow flycatchers fledged successfully from 42 chicks hatched. Of the 23 nests constructed, all but 3 were located in a 50+ year-old cottonwood/willow gallery less than 20 acres (8 hectares) in size. Only one nest was successfully parasitized by brown-headed cowbirds *(Molothrus ater)*, resulting in one cowbird fledgling. Most of the unsuccessful nests were abandoned for unknown reasons, but successful renesting usually followed.

Southwestern willow flycatcher
Photo © B. Moose Peterson/WRP

As in previous years, the proportion of flycatchers nesting in native cottonwood/willow habitat was much higher than in non-native salt cedar *(Tamarix* sp.*)*. Even though salt cedar habitats are available on the refuge, only one nest was found in salt cedar, and it resulted in only one fledgling.

Submitted by LaRee Brosseau of the Service's Portland, Oregon, Regional Office.

Region 4

Alabama Sturgeon *(Scaphirhynchus suttkusi)* An Alabama sturgeon being held at the Marion Fish Hatchery, a facility run by the State of Alabama, died September 19, leaving only a single Alabama sturgeon in captivity. The sturgeon's cause of death is under review. The last remaining captive Alabama sturgeon is still alive and has been treated for a possible viral infection. It has apparently recovered fully.

The Alabama sturgeon was listed as an endangered species on June 5, 2000. Only a few have been caught despite more than 4,000 hours of professional fishing. The goal is to find more fish and establish a captive breeding population to produce stock for eventual reintroduction into the wild.

Submitted by Connie Dickard in the Service's Daphne, Alabama, Field Office

Boulder Darter *(Etheostoma wapiti)* In August 1999, personnel from the Service's Cookeville, Tennessee, Ecological Services Office; several national fish hatcheries; Tennessee Wildlife Resources Agency; and Conservation Fisheries, Inc., (CFI), placed approximately 3.5 tons (3,175 kilograms) of limestone slabrock above and below the Interstate 65 bridge crossing the Elk River in south-central Tennessee to provide natural spawning substrate for the endangered boulder darter. In conjunction with this effort, personnel from CFI surveyed the site prior to habitat augmentation and documented the presence of three boulder darters at the bridge crossing.

Boulder darter

Photo courtesy of Conservation Fisheries Inc.

In August 2000, CFI personnel, assisted by individuals from the national fish hatcheries, returned to the site. They released tagged boulder darters as part of a new study being funded by our Cookeville Office and surveyed the slabrocks for use by the species. A survey of the site the day following the release resulted in the discovery of 3 tagged and 13 non-tagged boulder darters. Most of the boulder darters were found to be using the slabrocks placed in the Elk River in 1999. This is the largest concentration of boulder darters ever found at one location. The slabrocks were also being used by several other darter species, as well as madtoms. As a result of this success, additional spawning substrate will be placed at suitable locations in the Elk River in the near future.

Submitted by Tyler Sykes of the Service's Cookeville, Tennessee, Field Office.

Region 5

Bat Protection Between July 18 and 23, 2000, the Service's West Virginia Field Office, in partnership the West Virginia Division of Natural Resources' Non-Game Wildlife and Natural Heritage

Bat cave gate nearing completion

USFWS photo

Program, constructed two angle iron gates at the entrances of Hoffman School Cave and Minor Rexrode Cave in Pendleton County, West Virginia. The gates will permanently protect two large summer and winter colonies of the endangered Virginia big-eared bat *(Corynorhinus townsendii virginianus)* and a significant hibernaculum of the endangered Indiana bat *(Myotis sodalis)* from human disturbance. Hoffman School Cave, designated critical habitat, is essential to the recovery of the Virginia big-eared bat.

Under contract with our West Virginia Office, Roy Powers of the American Cave Conservation Association designed the gates and directed their construction in the field. In addition to personnel from our West Virginia office, Service personnel key to the project came from the Canaan Valley NWR, Ohio River Islands NWR, and the Washington, D.C., Public Affairs Office. Other participants came from U.S. Forest Service, a private consultant (Sanders Wildlife), and National Speleological Society grottos (chapters) in Virginia, West Virginia, Pennsylvania, and Maryland.

Submitted by William A. Tolin, Endangered Species Specialist in the Service's West Virginia Field Office.

ON THE WEB

A wealth of information on military agencies and their endangered species programs is available on the Internet. Here are some websites to get you started:

Department of Defense—To learn more about DoD's natural resources conservation program, see the Conservation section of the Defense Environmental Network & Information eXchange (DENIX) web site:
https://www.denix.osd.mil/denix/Public/ES-Programs/Conservation/conservation.html

Many of the products and partnerships described in this Bulletin are funded through the DoD Legacy Resource Management Program. More information about the Legacy program and the process for submitting project proposals are available via the web at this address:
http://www.dodlegacy.org

Army–To learn more about the Army's environmental accomplishments, including conservation of endangered and threatened species, see:
http://aec.army.mil/prod/usaec/op/update/updates.htm

Air Force—For more information on the Air Force's environmental program, visit their web site:
http://www.af.mil/
or their environment and safety site:
http://www.safmi.hq.af.mil/saf-miq/miq.htm

Navy—The Department of the Navy's environmental web site is at this address:
http://web.dandp.com/enviroweb/index.html
From there, you can go to the U.S. Navy or the U.S. Marine Corps' environmental web sites.

The endangered species posters in the "We're Saving a Few Good Species" series produced by the U.S. Marine Corps and the U.S. Fish and Wildlife Service are no longer in production, but can be viewed online; see them at
http://endangered.fws.gov/education/marines.htm

From August through October of 2000, the Fish and Wildlife Service published the following proposed and final Endangered Species Act (ESA) rules in the *Federal Register*. The full text of each action can be accessed through our website: http://endangered.fws.gov**.**

Proposed Critical Habitat Rules

Critical Habitat Critical habitat, as defined in the ESA, is a term for a geographic area that is essential for the conservation of a listed species. Critical habitat designations do not a establish a wildlife refuge, wilderness area, or any other type of conservation reserve, nor do they affect actions of a purely private nature. They are intended to delineate areas in which federal agencies must consult with the Service to ensure that actions these agencies authorize, fund, or carry out do not adversely modify the designated critical habitat. Within designated critical habitat boundaries, federal agencies are required to consult only in those areas that contain the physical and biological features necessary for the species' survival and recovery; many developed areas within the boundaries no longer contain suitable habitat. Maps and more specific information on critical habitats are contained in the specific *Federal Register* notice designating each area. For more information on critical habitat designations in general, go to the website for our Endangered Species Listing Program (http://endangered.fws.gov/listing/index.html) and follow the link, "About Critical Habitat."

California Red-legged Frog *(Rana aurora draytonii)* On September 11, the Service proposed to designate critical habitat for the endangered California red-legged frog within an overall area of about 5.4 million acres (2.2 million hectares). About 40 percent of this area is in public ownership and managed by either federal, state, or local government entities. The remainder of the acreage is in private ownership. The lands are located within the following 31 counties: Alameda, Butte, Calaveras, Contra Costa, El Dorado, Fresno, Kern, Los Angeles, Mariposa, Marin, Merced, Monterey, Napa, Plumas, Riverside, San Benito, San Diego, San Joaquin, San Mateo, San Luis Obispo, Santa Barbara, Santa Clara, Santa Cruz, Sierra, Solano, Sonoma, Stanislaus, Tehama, Tuolumne, Ventura, and Yuba. Developed areas within these zones that no longer contain specific habitat features the frog needs are not being proposed as critical habitat.

This native amphibian is widely believed to have inspired Mark Twain's fabled short story, "The Celebrated Jumping Frog of Calaveras County." The largest native frog in the western United States, it can reach up to 5 inches (12.5 centimeters) in length. California red-legged frogs breed in aquatic habitats such as streams, ponds, marshes, and stock ponds. During wet weather, they may move through upland habitats. The species' decline is attributed to the spread of exotic predators such as bullfrogs *(Rana catesbeiana)*, and changes that have fragmented habitat, isolated populations, and degraded streams.

Riverside Fairy Shrimp *(Streptocephalus woottoni)* On September 21, the Service proposed to designate critical habitat on approximately 12,060 acres (4,880 ha) for the endangered Riverside fairy shrimp, a small crustacean unique to vernal or ephemeral pools in southern California. These lands encompass portions of Orange, Riverside, Los Angeles, Ventura, and San Diego counties in southern California.

Riverside fairy shrimp
Photo © B. Moose Peterson/WRP

Vernal pools are seasonal wetlands that fill with water during fall and winter rains. They are home to many plants and animals that, in turn, form a valuable part of the food chain for a wide array of animals, including birds of prey, shorebirds, migratory waterfowl, frogs, toads, salamanders, and pollinating insects. Vernal pools were once abundant throughout most of the Central Valley and coastal areas of southern California but have declined significantly due to urban development and agricultural conversion, alterations of vernal pool hydrology, off-road vehicle activity, livestock overgrazing, and other land uses.

Spruce-fir Moss Spider *(Microhexura montivaga)* On October 6, the Service proposed to designate critical habitat in the southern Appalachian Mountains of North Carolina and Tennessee for the endangered spruce-fir moss spider. This tiny spider is related to the more commonly known, and much larger, tarantulas of the southwestern United States. The spruce-fir moss spider is a classic example of a native species declining because of the introduction of an invasive species. In this case, a non-native insect, the balsam wooly adelgid *(Adelges picea)*, was accidentally introduced into the United States from Europe. The infestation has resulted in a massive die-off of Fraser fir *(Abies fraseri)* trees throughout the Southern Appalachian Mountains, and in turn, the destruction of the spruce-fir moss spider's habitat. Loss of trees results in increased light and temperature and decreased moisture on the forest floor, causing the moss mats upon which the spider depends to dry up and become unsuitable habitat.

The area proposed as critical habitat includes areas, at elevations of 5,400 feet (1,645 meters) and higher, on Grandfather Mountain in Avery, Caldwell, and Watauga Counties, North Carolina; Mount Collins, Clingman's Dome, and Mount Buckley in Swain County, North Carolina, and Sevier County, Tennessee; Mount LeConte in Sevier County, Tennessee; and Roan Mountain in Avery and Mitchell Counties, North Carolina, and Carter County, Tennessee. All proposed areas, with one exception, are within the Great Smoky Mountains National Park and the Pisgah and Cherokee National Forests. One proposed area on Grandfather Mountain is privately owned, but it is being managed by The Nature Conservancy through a cooperative agreement with the landowner.

Bay Checkerspot Butterfly *(Euphydryas editha luestherae)* The Service proposed on October 16 to designate some 26,180 acres (10,600 ha) within 15 units in San Mateo and Santa Clara counties as critical habitat for this endangered butterfly. Included in the proposal are grasslands containing stands of dwarf plantain *(Plantago erecta)*, the bay checkerspot's primary larval host plant, as well as areas that provide corridors for the butterfly to travel between habitats. Serpentine soils, unusual soils high in magnesium and low in calcium, are a strong indicator of potential habitat value for the butterfly.

Bay checkerspot butterfly
USFWS photo

Residential and commercial development, invasive non-native plants, and air pollution threaten the survival of the bay checkerspot butterfly. It has continued in a long-term decline that leaves it with only about four core sites and an uncertain number of satellite populations. A famous population at Stanford's Jasper Ridge Biological Reserve is considered extinct by researchers, and the only core population in San Mateo County is severely reduced.

Final Critical Habitat Rules

Alameda Whipsnake *(Masticophis lateralis)* On October 3, the Service designated seven areas in California's Alameda, Contra Costa, Santa Clara, and San Joaquin counties as critical habitat for the threatened Alameda whipsnake. These areas encompass about 406,600 acres (164,150 ha), although developed lands withing these boundaries that no longer provide the ecological characteristics needed by the snake will not be subject to the requirement for federal interagency consultation.

Image Omitted

Alameda whipsnake
Photo by Karen Swaim

The Alameda whipsnake, a non-venomous species, is sooty black in appearance, with distinct yellow-orange stripes running down each side. It can reach a length of up to four feet (1.2 meters) and feeds almost exclusively on lizards. Residential, commercial, and recreational development, and certain fire suppression activities are the main threats to the Alameda whipsnake.

San Diego Fairy Shrimp *(Branchinecta sandiegoensis)* On October 23, the Service designated approximately 4,025 acres (1,630 ha) of vernal pool habitat in Orange and San Diego counties, California, as critical habitat for this small freshwater crustacean. The recovery of the San Diego fairy shrimp will depend on the ability of the Service to work effectively with the military, local jurisdictions, and other stakeholders in this region to conserve the vernal pools and implement the species' recovery plan.

Coastal California Gnatcatcher *(Polioptila californica californica)* A total of approximately 513,650 acres (207,890 ha) in Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties, California, were designated as critical habitat for the coastal California gnatcatcher on October 24. Lands designated are under private, state, and federal ownership, with federal lands including lands managed by the Fish and Wildlife Service, the Bureau of Land Management, Department of Defense, and U.S. Forest Service. Areas already covered by legally operative Habitat Conservation Plans, however, were exempted from the critical habitat designation.

Final Listing Rules

California Tiger Salamander *(Ambystoma californiense)* The Service published a final rule on September 21 listing the Santa Barbara County population of the California tiger salamander as endangered. This population faces serious immediate threats to its survival from habitat loss and fragmentation due to agricultural and urban development.

The Santa Barbara County population is separated from all other California tiger salamander populations by the La Panza and Sierra Madre mountain ranges. The salamander exists in only six areas in Santa Barbara County, five of which are undergoing rapid conversion from oil and grazing lands to agricultural and urban development.

Steelhead *(Oncorhynchus mykiss)* Based on a determination by the National Marine Fisheries Service, which has primary ESA jurisdiction for most marine species, the Evolutionarily Significant Unit (ESU) of steelhead in northern California was listed on September 7 as threatened.

Steelhead
Photo © B. Moose Peterson/WRP

Colorado Butterfly Plant *(Gaura neomexicana* ssp. *coloradensis)* A short-lived perennial herb in the family Onagraceae, this plant grows within a small area in southeastern Wyoming, western Nebraska, and north-central Colorado. Non-selective spraying of herbicides, haying and mowing at certain times of the year, some water development, conversion of native habitats for crop cultivation, competition from non-native plants, and urbanization are the main threats to the Colorado butterfly plant. On October 18, the Service published a final rule listing this plant as threatened.

BOX SCORE

Listings and Recovery Plans as of December 31, 2000

GROUP	ENDANGERED U.S.	ENDANGERED FOREIGN	THREATENED U.S.	THREATENED FOREIGN	TOTAL LISTINGS	U.S. SPECIES W/ PLANS**
MAMMALS	63	251	9	17	340	47
BIRDS	78	175	15	6	274	76
REPTILES	14	64	22	15	115	30
AMPHIBIANS	10	8	8	1	27	11
FISHES	70	11	44	0	125	90
SNAILS	20	1	11	0	32	20
CLAMS	61	2	8	0	71	44
CRUSTACEANS	18	0	3	0	21	12
INSECTS	33	4	9	0	46	28
ARACHNIDS	12	0	0	0	12	5
ANIMAL SUBTOTAL	379	516	129	39	1,063	363
FLOWERING PLANTS	564	1	141	0	706	554
CONIFERS	2	0	1	2	5	2
FERNS AND OTHERS	26	0	2	0	28	28
PLANT SUBTOTAL	592	1	144	2	739	584
GRAND TOTAL	971	517	273	41	1,802*	947

TOTAL U.S. ENDANGERED: 971 (379 animals, 592 plants)
TOTAL U.S. THREATENED: 273 (129 animals, 144 plants)
TOTAL U.S. LISTED: 1,244 (508 animals***, 736 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.

**There are 530 approved recovery plans. Some recovery plans cover more than one species, and a few species have separate plans covering different parts of their ranges. Recovery plans are drawn up only for listed species that occur in the United States.

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

ENDANGERED Species BULLETIN

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