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Steppingstones

NEWSLETTER OF THE DEPARTMENT OF DEFENSE
PARTNERS IN FLIGHT PROGRAM

Conservation-Reliant Species

The Endangered Species Act is built on the assumption that once recovery goals for a listed species are achieved the species can not only be delisted but will also thrive under existing regulatory mechanisms. This assumption has proven valid for the Aleutian Cackling Goose, the Brown Pelican, and the Peregrine Falcon (both the American and Arctic subspecies). For these species, it was possible to eliminate the threats that led to their listing. In the case of the Aleutian Cackling Goose, for example, it was possible to eliminate foxes from the islands where the species bred and to acquire feeding habitat in the wintering areas of Oregon and California. Following these measures, the number of geese increased from 300 to more than 130,000 birds. It could be delisted because the Migratory Bird Treaty Act provided the necessary legal authority to manage the goose through the Pacific Flyway Council, a federal-state partnership. Similarly the primary threat to the Peregrine Falcon, egg shell thinning from DDT, was sufficiently reduced when the use of DDT was banned in the United States. After impressive reintroduction efforts by the Peregrine Fund and others, the falcon has reoccupied most of its historical range and even thrives in metropolitan areas, where it feeds on pigeons and starlings and nests on building ledges and roofs. The goose, the pelican, and the falcon share basic characteristics: the threats they faced were remediable and they were sufficiently generalists to thrive in the types of habitats our species creates.

INSIDE:

Not all species are so flexible. In fact, most species require continuing species-specific intervention to survive. With appropriate intervention, they can achieve biological recovery. Whether they can be delisted is more problematic. Consider Robbins' cinquefoil, an alpine plant species of the rose family. The threat this species faced – habitat modification – would generally require at least continuing vigilance if not continuing intervention. Biologically recovering the species by increasing its distribution and numbers thus was in itself insufficient until there were assurances that the species' status would be monitored. The U.S. Fish and Wildlife Service (FWS) therefore entered into a memorandum of understanding with the land manager – the U.S. Forest Service – which agreed to maintain the habitat. A conservation organization – the Appalachian Mountain Club – also agreed to ensure that a naturalist would be present during the hiking season to monitor human interactions with the plant and to educate visitors on the species. Robbins' cinquefoil is a "conservation-reliant species." It requires species-specific management intervention for the foreseeable future.

The threats to a conservation-reliant species are not remediable either because the scale of the threat is too great or because it is recurrent. The species is at risk of extinction throughout all or a significant part of its range, absent species-specific management intervention, such as predators that cannot be removed at the necessary biological scale, or by altered ecological processes – such as wildfire – that can't be restored.

Of bird species that have been delisted – Aleutian Cackling Goose, Peregrine Falcon, Bald Eagle, Brown Pelican , Palau Fantail Flycatcher, Palau Ground-Dove, Palau Owl and Tinian Monarch – only the Bald Eagle, with its requirements for continuing management of roosting and breeding habitat, is conservation reliant. However, conservation reliance is a continuum. Some species can be maintained only in a highly controlled environment, like zoos or arboretum. The Guam Kingfisher is such a species. Other species can do very well in the wild with periodic management interventions. Consider that the numbers of Kirtland's Warblers have been steadily increasing as a consequence of the trapping of cowbirds during the breeding season and periodic habitat management to maintain the early successional stages of jack pine needed by Kirtland's Warbler for breeding. Prior to these interventions, warbler numbers were static or declining. The threshold we use for defining conservation reliance is management under existing regulatory mechanisms. Using this definition, more than 95% of all listed bird species are conservation reliant.

Does this mean such species cannot be delisted? The cinquefoil provides the answer: a conservation-reliant species can be delisted if ongoing conservation management can be reasonably assured. Such "recovery management agreements" provide a mechanism to delist species once the biological recovery goals

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Kirtland's Warbler

The Kirtland's Warbler was federally listed as endangered in 1967. It was one of the first species listed, and was done so before the Endangered Species Act (ESA) became law. The Kirtland's Warbler Recovery Team was the first such group, as was its Recovery Plan. According to the Kirtland's Warbler Recovery Plan, "The primary objective of the plan is to reestablish a self-sustaining Kirtland's Warbler population throughout its known range at a minimum level of 1,000 pairs. Attainment of this objective will allow the species to be removed from the endangered species list." The numeric goal of 1000 pairs was reached and exceeded for the first time in 2001 and has remained above that level since then. However, the Kirtland's Warbler population is not self-sustaining. Only intensive management focused on developing appropriate aged stands of jack pine and removal of parasitic Brown-headed Cowbird allows the warbler population to persist and increase. Therefore, a true self-sustaining population is not possible and the need for intensive management must continue. Kirtland's Warbler is a conservation-reliant species.

Over the last 22 years, the Kirtland's Warbler's population has seen a dramatic increase from a low of 167 singing males in 1987 to a record 1,803 in 2008. During this time, the warbler expanded its breeding range into several counties across the Upper Peninsula of Michigan. Beginning in 2007, nests were confirmed in Wisconsin and Ontario, Canada (Canadian Forces Base Petawawa). Brown-headed Cowbird control has been conducted on an annual basis since 1972. Before the introduction of cowbird control, nearly 70% of all warbler nests contained at least one cowbird egg. After cowbird control was implemented, the parasitism rate dropped to less than 7%. Kirtland's Warbler clutch size increased from 2.3 to 4.8 and the fledge rate increased from 0.8 to 2.7. However, in recent years the program has experienced periods of reduced funding and as result, the trapping program has been operating on a more limited scale, resulting in an increase in parasitism rates.

Kirtland's Warbler breeding habitat was historically created through periodic wildfires. Increased fire suppression has altered the modern fire rotation and severely limits the amount of naturally regenerated jack pine stands. This requires land managers to create jack pine plantations, mimicking the effect of wildfire. It is estimated that up to 200,000 acres of jack pine forest are required to maintain the recovery plan goal of 1,000 pairs of Kirtland's Warblers. Funds for managing jack pine forests are diminishing, and may disappear if the legal driver of the ESA is removed after delisting.

In March 2009, the National Fish and Wildlife Foundation (NFWF) selected Kirtland's Warbler as a Keystone Species under its new "Keystone Initiatives" strategy. The vision of the Kirtland's Warbler Keystone Initiative is to develop a public-private partnership that supports long-term conservation of Kirtland's Warbler through a self-sustaining endowment. The endowment would help bridge any future shortfalls in funding needed to sustain the species. To realize this vision, NFWF plans to use operating support from the U.S. Fish and Wildlife Service to implement a strategy with three major elements: 1) Establishment of a Kirtland's Warbler "Friends" group focused on raising capital for the endowment and disbursing the revenue it generates to support high-priority conservation actions that benefit the warbler; 2) Establishment of a Kirtland's Warbler fund, the endowment that would be used to help support long-term conservation of the warbler; and 3) Establishment of a partnership coordinator position.

If successful, this innovative approach may hold the recovery key for conservation-reliant species that may otherwise fail to satisfy delisting criteria without ESA protections.

- Chris Eberly,
DoD PIF Program Coordinator

Burrowing Owl Studies on Kirtland Air Force Base and Beyond: A Case Study

The Burrowing Owl (*Athene cunicularia hypugaea*) is listed by the U.S. Fish and Wildlife Service as a Species of Conservation Concern, and in New Mexico they are listed as a high responsibility species by New Mexico Partners in Flight. Declines in Burrowing Owl populations are documented throughout the west, including studies conducted in New Mexico. Several proposed mechanisms may be involved in this decline, including high predation rates, habitat loss, the decrease in burrowing mammals, drought, rearrangement of the population, and alterations in their migration and over-winter habitats. Although winter habitats are often cited as a possible cause for the decline of the Burrowing Owl, not much is known about where these owls are spending their winter.

In 2005, a multi-year Legacy project began to locate Burrowing Owls on DoD installations in the western U.S., and to use stable isotopes, molecular genetics, and radio telemetry to quantify the

Juvenile Burrowing Owl with radio transmitter
Photo: Octavio Cruz-Carretero

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Burrowing Owl Studies on Kirtland Air Force Base and Beyond cont.

importance of DoD lands to Burrowing Owl populations, identify where owls breeding on some DoD installations spend the winter, and quantify land-use of migrating and wintering owls in the region. This project is conducted in collaboration by the University of Arizona and Kirtland Air Force Base, and is working with 37 DoD installations in the western U.S.
On Kirtland Air Force Base, two approaches have been taken to learn about winter habitat condition for Burrowing Owls.

Banded Burrowing Owl on Kirtland Air Force Base Photo: Octavio Cruz-Carretero

Surveys were conducted in southern New Mexico, south Texas, and Mexico to locate wintering grounds, identify suitable winter habitat, and find and understand threats to wintering populations. In addition to our surveys, a network of Mexican biologists was organized to collaborate on this initiative. In New Mexico, Texas, and Mexico, 1045 owls on their wintering grounds have been located thus far. In Mexico, owls have been observed in sixteen states and a number of habitat types, with an elevation range of sea level to 2900 meters (9514 feet) above sea level. After monitoring winter habitat for four years, much information has been gained about winter conditions for Burrowing Owls. Surveys will again be conducted during the winter of 2009-2010.

A second method was used to determine where owls that breed on Kirtland Air Force Base are actually spending their winter. Since 2006, 118 collar radio transmitter units have been attached to owls during the summer. To locate these owls during the winter months, ground surveys in New Mexico, Texas, and Mexico, and aerial surveys in a Cessna 182 over Mexico have been conducted. Encouraging results were detected in 2008 in northeastern Mexico. This area will be thoroughly searched in the winter of 2009-2010 to determine if this is a wintering ground for owls from Kirtland Air Force Base. Sixty additional radio transmitters will be attached during the 2009 breeding season, and surveys will again be conducted during the winter of 2009-2010. If owls that breed on Kirtland Air Force Base are located on their wintering grounds, we can determine if winter habitat conditions are in fact a threat to these Burrowing Owls.

For more information about this project, please visit:
http://www.cals.arizona.edu/research/azfwru/migratory_linkages_of_burrowing_owls/

- Kristin Cruz-McDonnell
Chief Biologist
Envirological Services, Inc.

Migratory Bird Monitoring Using Automated Acoustic and Internet Technologies

Each year billions of birds embark on a journey, one that takes them from the farthest reaches of South America to the U.S. and Canada, and then back again. Many of these migrant songbirds, including the brightly colored warblers and vocally enthralling thrushes, are declining in parts of their range. Factors such as habitat loss, climate change, and the impact of man-made structures occur on their wintering and breeding grounds, and at stopover sites they use along migratory pathways. Understanding the timing and geographic patterns of migration along with flock composition and abundance is crucial for creating informed and relevant strategies for policy and management. In the past, many details about migration remained unknown for a simple reason: unlike skeins of geese or kettles of hawks, much of songbird migration occurs at night. How do you track birds in the dark?

We've known for centuries that many birds give "flight calls" while flying, an audible signal of migration. Training low-powered optics on the face of the full moon allowed a visual, but limited, window into these nocturnal movements. Fifty years ago ornithologists started using radar to assess when birds were moving, their directionality, and how many were aloft over an area. But which species comprised those flocks, a key piece of information, remained a mystery. Now, based on dedicated research over the last two decades, ornithologists have revealed much of the species-specific nature of these calls; and because we know the identity of most of these calls, we can inventory which birds are passing overhead in the night sky.

DoD lands provide thousands of acres of essential habitat that many species use for breeding, wintering, and stopover sites during migration. Legacy funding from the DoD enabled the

An ARU deployed near Yuma Proving Grounds. The microphone, protected by a fuzzy windscreen, and the recording unit are mounted to a piece of rebar while lantern batteries rest on the ground. In later deployments, ARUs were shipped to and set up by base personnel, then retrieved and sent to the Lab for analysis.

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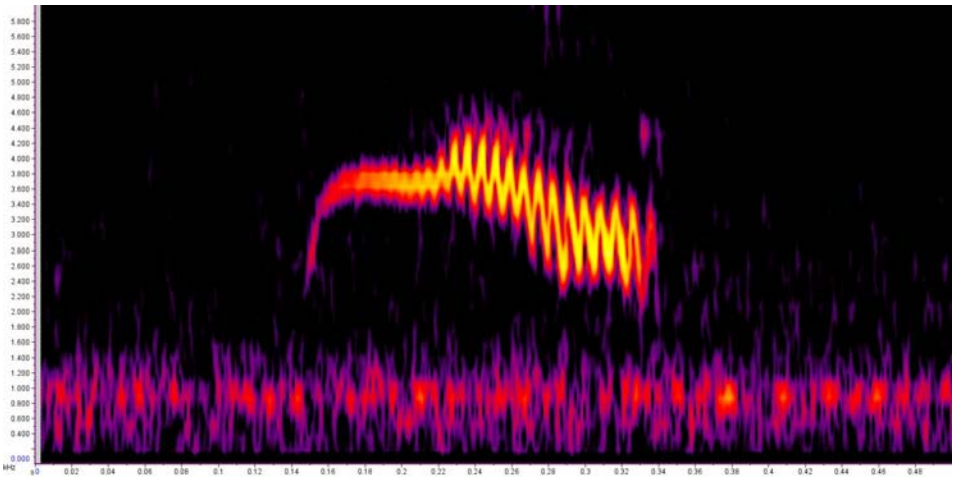
Monitoring Using Automated Acoustic and Internet Technologies cont.

Cornell Lab of Ornithology to embark on a project to use acoustic technology to track nocturnal migrants, as well as to monitor target species – those hard-to-detect birds that use remote or inaccessible habitats, or are active primarily at night (e.g. Whip-poor-will). This technology and resulting protocols can assist base personnel in their mission to identify and monitor the species using DOD lands, and when taken as a whole they could reveal an unprecedented look at migratory movements across a large region.



Flight-calls are simple notes, less than half a second long, given during long, sustained flights. Using a spectrogram, a visual representation of the sound, is often the easiest way to identify them. This Gray-cheeked Thrush call, approximately one-fifth of a second long, was recorded on 12 October 2005 above the United States Military Academy at West Point. The broad red and purple line across the bottom of the image is caused by wind and passing vehicles on Route 9 near the campus.

Base personnel on 12 DoD installations assisted by deploying Autonomous Recording Units (ARUs), recording devices that can be left unattended in any location for several months. During the course of the project, we collected nearly 60,000 hours of nocturnal sounds from NY (Fort Drum Military Reservation and West Point Military Academy), NJ (Picatinny Arsenal and Lakehurst NAS), DE (Dover AFB), and MD (Naval Air Station at Patuxent River) in the eastern U.S. In 2007 we added sites from WA (Whidbey Island NAS, Yakima Training Center), NV (Fallon NAS), CA (Vandenberg AFB and Camp Pendelton MCB), and AZ (Yuma Proving Grounds). This marks the first serious effort to track region-wide migration in the western U.S.

Sound analysis software detected 210 species from DoD lands, including a number of threatened, endangered, and special concern species such as "Yuma" Clapper Rail and "Southwestern" Willow Flycatcher in the west and Least Bittern, Upland Sandpiper, Bicknell's Thrush, and Henslow's Sparrow in the east.

As the first serious effort to track region-wide movements in the west, early analyses are providing interesting migratory trends. We found flight calling behavior in the west appears to show as much variation as the most variable sites in the eastern sites. The dominant species at the western sites, based on large call counts, were White-crowned Sparrow, Orange-crowned Warbler, and Yellow Warbler. We will continue to analyze these archived recordings, examining broad migratory pathways across the region, the timing of migration for each species and the conditions favorable for their migration.

We also turned our ARUs towards the Whip-poor-will, a poorly-known nocturnal bird despite its loud and persistent nocturnal vocalization. Many ornithologists and field observers agree that population numbers appear to be declining across the range based on nocturnal censuses carried out throughout the bird's range. Because the highest calling rates are expected during the brightest period of the month, census efforts take place during the two-week period centered on the full moon. Observers trace a pre-determined route, stopping at prescribed locations for six minutes, counting Whip-poor-will calls and noting which direction they come from. This yields a snapshot of how many birds may be present at limited locations, and gives the only currently available population estimates.

We used our acoustic technology to learn about nightly, seasonal, and geographic calling patterns. Not only will our results inform observer-based techniques, our goal is to develop new protocols using only acoustic technology. Using a recording from Ft. Drum Military Reservation our software detected 411,629 calls across 46 nights, even finding distant birds. We showed birds called more frequently with increased moonlight, but we found calls even on the darkest nights of the lunar cycle, suggesting surveys could take place throughout the month, doubling the window to detect birds. Further, these recordings allowed us to examine these patterns with a precision not possible from human observations alone.

Acoustic technology is becoming an efficient, cost effective means for expanding survey efforts on DoD lands. Acoustic monitoring provides tools to monitor migratory activity by species, contributes to more accurate population estimates for target species, and provides information for more accurate environmental risk assessments and resource management plans. Additionally, an acoustic monitoring network documents migratory phenomena that are unobservable by other means and enables studies that extend beyond the boundaries of DoD installations.

The authors thank the DoD Legacy Resource Management Program for funding the project, our DoD site contacts for logistical support and the CLO Bioacoustics Research and Conservation Science Programs.

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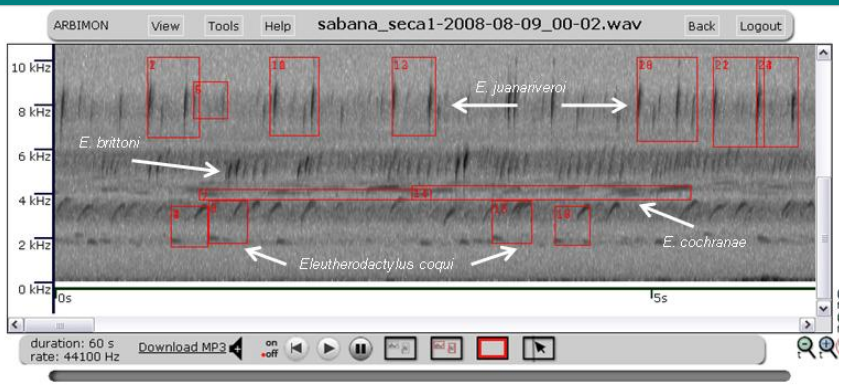
Automated Biodiversity Monitoring

New communication and computer technologies are providing opportunities to improve biodiversity monitoring. In the past, we have depended on individual observers collecting data with point counts, mist nets, or transects, but these observations are often limited in their temporal and spatial coverage. Furthermore, few observers have stayed in the field for 24 hours, let along all year around. Even if this was possible, we still cannot clone the expert birder, and have them make observations simultaneously in many places. Fortunately, many of these limitations can now be overcome.



In this recording from Sabana Seca, Puerto Rico species specific algorithms have automated the identification of three species frogs. We are presently working on algorithms for the fourth species and for the bird species in the area.

Approximately two years ago, the Automated Remote Biodiversity Monitoring Network (ARBIMON) of the University of Puerto Rico was established to address this challenge. The team includes students and professors from biology, computer science, and electronic engineering. The major goal of the project has been to develop software and hardware to conduct continuous long-term biodiversity monitoring. Initially, we have focused on acoustical monitoring (e.g. birds, amphibians, and insects), and recently we have incorporated camera traps for mammals. In the near future, we hope to be conducting aquatic monitoring using hydrophones to detect marine mammals and fish, and cameras to study reef communities (e.g. coral bleaching).

We have designed two hardware systems for monitoring: portable and permanent stations. The portable stations run off a 12v 12amp battery, and make recordings using a microphone, a preamp, a single board computer, and a voltage regulator. The computer is programmed to record 1 minute of audio every 10 minutes, but this setting can be modified by the user. With this setting we record 144 1-minute recordings per day, and the battery lasts for approximately four days. The recordings are stored on a USB memory stick, which makes it easy to transfer files. As with any recording system, the area that is sampled will depend on the organisms producing the sound. For example, hummingbirds will only be detected close to the microphone, a single coqui frog in Puerto Rico can be detected at approximately 50 m, and airplanes will be detected at a much greater distance. The advantage of the portable stations is that they are less expensive and can be moved around to sample different habitats.

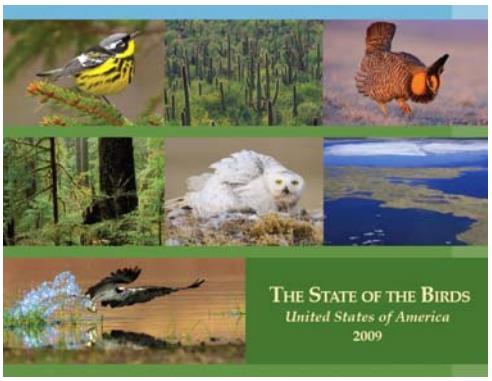
A permanent biodiversity monitoring station located on the Pohakuloa Training Area in Hawaii.

The permanent stations differ in that they are powered by a solar panel and car battery, and they are connected to a base station through a Yagi antenna for data transfer (Fig. 1). The base station includes a receiving antenna connected to the local network, and a laptop computer and external hard drive for local backup. Once the files are stored locally they are forwarded on to the project server in Puerto Rico where they are stored, processed, and displayed on the project website, virtually in real-time. We presently have permanent recording stations in Puerto Rico, Pohakuloa Training Area (PTA) on the Big Island in Hawaii, and Fort Huachuca, Arizona. In PTA, the system sends the files 27 miles to the base station at the Hawaiian Preparatory Academy in Waimea, and in Fort Huachuca files are sent to the base station at Cochise College. From the base stations, data are forward through the internet to Puerto Rico. Soon we will establish more stations in Hawaii at Schofield Barracks on Oahu.

The recordings from the portable and permanent stations are permanent records that are accessible to the public, and the software that we are designing will help convert the raw recordings into useful monitoring data. Our main goal is to automate species identification so that each recording is accompanied with a list of species present. Recently, we have made a major breakthrough in automating species identification using Hidden Markov Models (HMM). The first step is to identify regions of interest (ROIs), and to do this we have developed an algorithm that automatically marks all acoustic events above background (see figure above). Next, an expert associates the acoustic events (i.e. notes) that make up an individual call, and this is repeated with a number of examples of a species' call. This information is then used to create a filter that feeds automated marked regions (ROIs) to the HMM. Our first species identification model was done with the common coqui frog (*Eleutherodactylus coqui*). Twenty random calls were used to train the system, then >20,000 1-minute recordings were processed in 30 minutes. Inspection of 100 random recordings showed that the model correctly identified the presence or absence of this species with a high level of accuracy (>90%). The system did not detect individuals when there were only one or a few individuals far from the microphone or during heavy rain events. Presently, we are working on a web interface that will allow any user to develop and test species identification models for additional species.

-T. Mitchell Aide, Carlos Corrada-Bravo, and Carlos Milan, ARBIMON, University of Puerto Rico

U.S. State of the Birds



Secretary of the Interior, Ken Salazar, released the first ever comprehensive report on bird populations in the United States. The report, *The U.S. State of the Birds*, synthesizes data from three long-running bird censuses that have been conducted by thousands of citizen scientist and professional biologists. Some of his findings include:

- One-third of the nation's 800 bird species are endangered, threatened, or in significant decline due to factors such as habitat loss, invasive species, and other threats
- More than one-third of all U.S. listed bird species occur in Hawaii and 71 bird species have gone extinct since human colonization on the islands
- At least 39% of the U.S. seabirds are declining
- Half of all coastally migrating shorebirds have declined
- More than 75% of birds that nest only in aridlands are declining and 39% of all aridland birds are species of conservation concern
- Grassland birds are among the fastest and most consistently declining birds in North America; 48% are of conservation concern and 55% are showing significant declines
- Of the 19 native resident game bird species, 47% are species of conservation concern and 2 are federally endangered
- Of 310 forest-breeding birds nationwide, 22% are species of conservation concern, including 11 federally listed as endangered or threatened
- At least 161 coastal refuges may be at risk due to ongoing and predicted sea level rises

Successes:

- The success of waterfowl management coordinated continentally among Canada, the U.S., and Mexico has lead to the upward trend of wetland bird species
- Joint Ventures have been highly effective at leveraging scarce funds to conserve millions of acres of wetlands and other wildlife habitat
- Endangered California Condors and Aplomado Falcons have been reintroduced to areas in the U.S. where they had been extirpated; today, 174 condors are flying free and are increasing each year
- Wild Turkeys were close to extinction in the early 1900s but have increased 8.9% per year since 1968 in response to reintroduction programs, management, and forest regeneration

For more information or to view the full report, visit http://www.stateofthebirds.org/pdf_files/State_of_the_Birds_2009.pdf

Bird Phenology Revival

Bird phenology is linked with weather patterns and other events that occur on breeding and wintering grounds. Due to the recent climate changes, bird populations and conservation strategies have been negatively influenced. The North American Bird Phenology Program (BPP) is a 120 year old monitoring and recording program designed to track the arrival and departure times of birds across North America. BPP provides information that will improve our understanding of the distribution, migration, and abundance of birds and will help us understand how these factors will be impacted from the recent climate change. BPP efforts are focused on the digitization of the data since data is currently stored on six million handwritten Migration Observer Cards that date back from the early 1880s to WWII. The bulk of the cards represent the efforts of a network of observers who recorded migration arrival dates in the spring and fall. This project revival is intended to connect past patterns with current trends, thus providing valuable comparisons over a long span of time.

For more information see http://www.pwrc.usgs.gov/bpp/ and http://www.usgs.gov/newsroom/article.asp?ID=2164

The American Ornithologists' Union Update

The American Ornithologists' Union is pleased to announce a new web page for the Check-list of North and Middle American birds. The check-list is now in a searchable database. Users can browse the full list of species as well as search by scientific/common name, family, or order. Users can also download the entire list or their search results in an Excel compatible text file. Species names in the search results table are linked to the respective Birds of North America account, if an account is available online. The new check-list page also has a link to the committee's main web page, the seventh Check-list and supplements, pending and prior proposals, and guidelines for submitting a proposal.

For more information:

- Web page for the Check-list of North and Middle American Birds— http://aou.org/checklist/north/
- The Birds of North America web page— http://bna.birds.cornell.edu/bna/
- North American Classification Committee's main web page— http://aou.org/committees/nacc/index.php3

A Monitoring Update

Significant progress has been achieved in recent years to better identify an efficient, coordinated approach to monitoring avian resources on DoD lands. Monitoring has historically been done without much consideration for techniques that match specific objectives, and sometimes without a clear articulation of what management question is being targeted. With limited budgets and resources, it is imperative that DoD maximize the effectiveness of any monitoring project, including the archiving and analysis of monitoring data. The Department of Defense Partners in Flight Research and Monitoring Working Group, in conjunction with the U.S. Geological Survey (USGS) and U.S. Army Engineer Research and Development Center (ERDC), has been actively working via the DoD Legacy Resources Management Program to develop and implement a plan for Coordinated Bird Monitoring (CBM) on all DoD lands. The product of this effort is the soon to be published DoD CBM Plan that will make strides to (1) summarize historical and current monitoring programs on DoD lands, (2) provide strong rationale for monitoring, (3) couple monitoring activities with specific management questions (and with a focus on species of concern), (4) suggest protocols for monitoring bird populations with statistically defensible methods, and (5) insure that DoD meets its legal requirements for avian monitoring.

Having a plan for monitoring without a means of implementation would be short-sighted. As such, we currently are working under a new Legacy-funded effort with several installations to develop a monitoring program that will answer specific management questions. For example, recent changes in Fort Benning's military training mission have sparked concern for the maintenance and long-term integrity of vital habitat for birds and other species. Fort Benning (GA) is undergoing major changes in its organizational structure as a result of Base Realignment and Closure and other DoD initiatives. The net result of these actions is an extensive construction initiative that will support a significant increase in range and training land requirements across the entire spectrum of weapons systems and training strategies. Consequently, a significant amount of the landscape and bird habitat likely will be affected as construction projects begin and new ranges become operational. In accordance with several laws and regulations, such as the Migratory Bird Treaty Act (MBTA) and the Migratory Bird Rule, Fort Benning needs to address and monitor intentional and incidental takes of birds protected under the MBTA. Monitoring birds not only addresses regulatory compliance but is expected to provide crucial habitat information that will inform future decisions about important management issues. A sampling design and methods for monitoring birds is in development for Fort Benning to support both regulatory requirements and ecological purposes on the installation. Similar efforts are being done on Little Rock Air Force Base (AR) and the Fort Wainwright Donnelly Training Area (AK).

Avian inventory and monitoring data are important to DoD for compliance with a variety of Federal laws and regulations. The CBM Plan clearly shows that avian data collection efforts have been extensive. However, the location of many of these datasets is unknown and their long-term availability is questionable. Most of these datasets are either still in hardcopy form buried in filing cabinets, or as electronic files stored on various computer systems or backup drives. As computers are replaced and personnel retire or move to other jobs, the likelihood of these data remaining retrievable decreases. As more time passes from data collection to retrieval and archiving, the probability increases that these data will be permanently lost. Many of these data sets provide some of the only known baseline avian inventory data for installations. The DoD CBM Plan, as well as the recently signed MOU with USFWS, stresses the importance of depositing inventory and monitoring data into national repositories. A companion Legacy-funded effort to the CBM plan was also initiated this past year by ERDC. Objectives are to identify, obtain, and archive historical and new avian monitoring data in the "Coordinated Bird Monitoring Database" (CBMD). The CBMD is maintained by the USGS National Biological Information Infrastructure (NBII) program. It is meant to be used in combination with the eBird program (for entering fairly simple observations) and the Avian Knowledge Network (for storing a reduced set of monitoring variables), both administered by the Cornell Laboratory of Ornithology. These databases will insure that inventory and monitoring data sets are collected and permanently preserved in long-term repositories so that they are not lost. Associated tools will also ensure that our data are available for various analyses (e.g., trends, assessment of relative importance of installation lands for a species).

Oriente Warbler
Photo: Chris Eberly

The utility of archiving data sets, and hence benefit to the military, is multifold: (1) Archiving and uploading data to the CBMD and AKN will allow installation managers to permanently archive and retrieve data sets at any time in the future; (2) natural resources managers can query data to look at a variety of parameters such as relative abundance of species on versus off the base, or specific locations or distribution of a species across the installation; and (3) these data, made available in the AKN, will assist natural resources managers in conducting installation-wide or region-wide analyses necessary for complying with NEPA, MBTA, ESA, EO 13186, and Migratory Bird Rule, when assessing potential impacts of readiness and non-readiness activities on bird communities. Please contact Dr. Richard Fischer (Richard.A.Fischer@usace.army.mil) if you can contribute data to this archiving effort.

-Dr. Richard A. Fischer, Research Wildlife Biologist,
U.S. Army Engineer Research and Development Center,
Environmental Laboratory

Site Profile: NWS Seal Beach, CA

Naval Weapons Station Seal Beach

Location: Orange County, California
Land Size: 5,000 acres
Mission: Provides fleet combatants with ready-to-use ordnance. Vital strategic point of munitions supply for the San Diego-based ships of the Pacific Fleet.
Bird Conservation Region: Coastal California (BCR 32)

A California Least Tern (Sternula antillarum browni) hovers momentarily before plunging into the water to snatch a small fish from Anaheim Bay. A short distance away, ordnance is being loaded onto a Navy ship. This, in microcosm, reveals the dual importance of Naval Weapons Station Seal Beach. It is a "stopover" point, not only for tens of thousands of migrating shorebirds, seabirds, and waterfowl, but also for Navy ships homeported in San Diego to load and unload munitions as they prepare for training and overseas missions.

Naval Weapons Station (NAVWPNSTA) Seal Beach is the HQ for Navy Munitions Command CONUS West Division and its detachments, which provides fleet combatants with ready-for-use ordnance. It is a vital strategic point of munitions supply for the San Diego-based combatant ships of the Pacific Fleet and hosts 836 military and 507 civilian and contract personnel. The station was originally commissioned in 1944, at the height of World War II, as a Naval Ammunition and Net Depot. Located approximately 26 miles south of the Los Angeles urban center, the station comprises 5,000 acres of land located on the Pacific coast within the city of Seal Beach in Orange County, California. About 911 acres within the southwest portion of the station have been designated as the Seal Beach National Wildlife Refuge (SBNWR), one of the last natural wetlands preserves surrounded by highly developed urban and commercial areas.

"Partnerships in Conservation"

NAVWPNSTA Seal Beach and the SBNWR share a unique co-existence. Founded by an act of Congress in 1972, the refuge buffers the station's ordnance supply operations from the surrounding metropolitan area while the station insulates the refuge from the encroachment of new development. NAVWPNSTA Seal Beach and the United States Fish and Wildlife Service (USFWS) maintain an ongoing stewardship program for preserving sensitive ecosystems and enhancing beneficial wetlands habitat for migratory, endangered, and threatened bird species. The local community has a strong commitment and a vested interest in protecting these wetlands. Since 1996, the non-profit Friends of the Seal Beach National Wildlife Refuge have been active in numerous restoration and educational programs that support and enhance the Natural Resources Program.

This unique relationship between the Navy, the Seal Beach National Wildlife Refuge and the Friends of the Seal Beach National Wildlife Refuge, forms a "three-legged stool" of conservation programs at NAVWPNSTA Seal Beach.

> *"The esprit de corps between the Navy and the Fish and Wildlife Service to protect America's natural heritage is an inspiration to me and our entire volunteer organization."*
>
> *-Tim Anderson*
> *President, Friends of the Seal Beach NWR*

Effective Land Use and Management

With a large portion of the station encumbered by explosives safety areas, agricultural outlease programs have proven vital to the viability of the station. The Natural Resources Program oversees two agricultural outleases that encompass over 2,500 acres.

The agricultural program has a three-pronged benefit to the station. First, the program supports the station mission through the avoidance of fire and security hazards. Secondly, lessees manage the area for farming that, if unused, would cost over $250,000 annually to mow and maintain. Finally, the program generates significant annual income for the Department of the Treasury. From that income stream, critical personnel and project funding are received each year that support a sustainable agricultural program.

Examples of projects that have been funded through the agricultural outlease program in the past few years include:

Avian Predator Monitoring—Provided better insight into spatial and temporal movements of avian predators (hawks, owls, falcons, etc.). This information is utilized by operators to determine best location and timing of mission activities.

Herpetological Survey—Survey results updated baseline information and identified areas of importance for station reptiles and amphibians.

Windbreak/Dustbreak Planting and Maintenance—Ongoing program to plant native trees and shrubs in strategic locations to minimize dust impacts on neighbors resulting from agricultural and military activities. These strips of native habitat provide food and shelter for migratory and resident birds.

Burrowing Owl Management Plan—Plan outlined best management practices and suggestions for enhancing the population of this "Species at Risk" that are symbiotic with military mission. Proactive management of this species may help prevent its listing as an endangered or threatened species and preclude impact to the military mission, while restoring the population of a once common resident species.

Additionally, the Natural Resources Program has worked with and encouraged the agricultural lessees to develop and implement innovative strategies to reduce water and pesticide use. Both current lessees have areas that have been certified "organic" with zero chemical pesticide use.

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Site Profile: NWS Seal Beach, CA (cont.)

Fish and Wildlife Management
As an oasis of open space and habitat in a sea of development, NAVWPNSTA Seal Beach is a critical home and migratory stopover for numerous species of wildlife. Designated as an Important Bird Area by the National Audubon Society, hundreds of thousands of waterfowl and shorebirds utilize the station's salt marsh and adjacent uplands as a refueling point during migration. Additionally, several endangered, threatened, and at-risk bird species use the station as a breeding site including the federally endangered California Least Tern and Light-footed Clapper Rail. These species, as well as the California state-endangered Belding's Savannah Sparrow, and the California Species of Special Concern Burrowing Owl all nest on the station. Other special status species, such as the Brown Pelican and Western Snowy Plover, federally endangered and threatened respectively; use the station for feeding and roosting.

Ongoing programs continue to pulse the health of these populations through regular monitoring and observations.

NAVWPNSTA Seal Beach is home to several state and federally-listed special-status species including (clockwise from center): Light-footed Clapper Rail, Western Snowy Plover, California Least Tern, Western Burrowing Owl, and Belding's Savannah Sparrow.

Innovative Programs
Fishing Line Recycling Program—NAVWPNSTA Seal Beach has implemented a monofilament fishing line recycling program. This voluntary program has been advertised to local fishermen and will prevent potentially deadly encounters with sea birds, sea turtles, and marine mammals.

Salt Water Weed Control Pilo*t Study*—The Natural Resources Program piloted a project to prevent the degradation of a federally endangered California Least Tern breeding site by noxious invasive weeds. The study utilized three different salt treatments to determine the strategy that best controlled weeds, but did not impact tern reproduction. Use of these strategies will reduce the amount of chemical herbicide being used on the breeding site by over 90%.

Burrowing Owl Active Relocation Program— NAVWPNSTA Seal Beach protects the last remaining coastal breeding pairs of Burrowing Owls in a three-county area. Many of these owls are breeding in drainages for mission critical ordnance magazines. To prevent potential impacts to military mission, artificial burrows have been constructed and maintained in an open field adjacent to the magazines. Over the past two years, owls have increasingly used the artificial burrows thereby minimizing the risk of impeding the military mission.

In addition, a ground-breaking strategy to improve the at-risk population of Burrowing Owls by rearing young in an in situ enclosure is proving more successful than traditional hard-release techniques. Without this technique, the Burrowing Owl population at NAVWPNSTA Seal Beach (the last breeding population in a three-county area) would be extirpated. Preserving this at-risk species will reduce the likelihood of future listing as a threatened or endangered species, thereby preserving maximum flexibility for the station's mission.

"Eyes on the Colony" Program—For the past seven years, the Natural Resources Program has teamed with the Seal Beach National Wildlife Refuge and the Friends of the Seal Beach National Wildlife Refuge and developed an extremely effective volunteer program to prevent predation on the breeding colony of California Least Terns. Volunteers oversee the tern colony in four-hour shifts during daylight hours seven-days-a-week and provide timely notification of the presence of predators. This program has drastically reduced the number of diurnal predation events over the past five years. The program has been so successful that it has become a regional model that is now being implemented with similar success at other tern colonies up and down the California coast.

Invasive Species Control and Pest Management
Rodenticide usage limited during peak raptor migration—NAVWPNSTA Seal Beach hosts hundreds of hawks, eagles, falcons, and owls during migration each year. Agricultural and ruderal fields provide the necessary prey for these raptors. To avoid potential secondary poisoning of these birds, the use of bait rodenticides is curbed during the winter season.

Invasive Snail Surveys and Removal—During a routine survey several years ago, biologists discovered an established population of the invasive Common Periwinkle (*Littorina littorea*) within the wetland. Native to Europe, this snail species is larger than several native species and outcompetes for food and habitat. The Natural Resources Program supported researchers from the University of California, Davis and the Smithsonian Institution to implement an aggressive program to survey for and remove this species before it impacts a greater portion of the salt marsh.

MWR Beach and Shoreline Clean Up and Noxious Weed Removal
Station personnel and community volunteers take a vested interest in the health of the local ecosystem. The best indicators of this commitment are the robust responses to various community events such as beach clean-ups and other programs that support the local flora and fauna. For the past five years, NAVWPNSTA Seal Beach has teamed with the Long Beach Aquarium of the Pacific and other local volunteer groups to perform an "Endangered Species Protection Event" each Spring. The focus is

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Site Profile: NWS Seal Beach, CA (cont.)

on preparing habitats for the upcoming breeding season of the local migratory and endangered species. Examples of these programs include trash cleanup in and around the marsh habitat of the light-footed clapper rail and weed removal from the California Least Tern nesting site.

A young volunteer assists in planting native flowers during a National Public Lands Day event

Education Inside and Outside the Fenceline

National Public Lands Day Events—The Natural Resources Program has organized and hosted National Public Lands Day events each of the past five years. The goal of these events has been to remove noxious invasive weeds and replace them with native flowers and shrubs along the perimeter of the wetland. These restoration areas are critical refugia for threatened and endangered species during high tide events. Each year, an average of over 200 volunteers from scout groups, local businesses, and the local community have participated in these successful events. Funding for these programs has been made possible through Legacy grants.

Supported Eagle Scout Projects—The station has supported a number of Eagle Scout projects over the past two years that have benefited the Natural Resources Program. Some examples of these projects include: Storage container construction adjacent to nature center; Repair of electric fence surrounding Least Tern breeding site; and Construction of a wheelchair-accessible trail for monthly tours and special events.

Sustainability Faire—Each year, the station teams with local businesses and organizations to promote sustainable practices. Station employees, military, and local school groups participate in this spring-time tradition.

Community Relations and Support

Commitment to Improving and Sharing our Knowledge of Local Environmental Issues—The Natural Resources Program strives to strengthen its bonds with other local, state, and national resource agencies and organizations to maintain the cutting-edge information required to ensure a viable program. This is primarily accomplished by active participation in a number of organizations and their associated meetings, trainings, and symposia. Examples include:

Department of Defense Partners in Flight—Local Natural Resources staff act as a liaison for regional military installations, providing pertinent information on bird conservation programs to counterparts at military installations.

National Military Fish and Wildlife Association—Participate in working groups and annual training meetings for this network of military natural resources professionals.

California Burrowing Owl Consortium—Active participation and presentations to statewide and local working groups dedicated to the preservation of this at-risk species.

Local University/Organization Research Programs—NAVWPNSTA Seal Beach hosts a number of local researchers whose results provide much needed updates to baseline data:

California State University Long Beach—Round Stingray Telemetry Study

University of California Santa Barbara—Trematode Parasites in California Horn Snails

Point Reyes Bird Observatory— Development of Shorebird Monitoring and Censusing Tool

Nature Observation platform at Naval Weapons Station Seal Beach provides a spectacular view of one of the last vestiges of pristine salt marsh habitat in southern California.

Seal Beach National Wildlife Refuge (NWR) Plans and Initiatives—The Navy Natural Resources Program is supporting the Seal Beach NWR in the development of its Comprehensive Conservation Plan (CCP), a long-range planning and management document to ensure its needs match those of the station. In addition, the development of an MOA between the station and the NWR (scheduled for completion in FY09), will better define roles and responsibilities for the respective organizations.

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Site Profile: NWS Seal Beach, CA (cont.)

Volunteers at the 2008 National Public Lands Day event celebrate after planting over 500 native plants in an area previously choked by noxious invasive weeds. These volunteer events showcase the station's support and commitment to the natural resources program.

Friends of Seal Beach National Wildlife Refuge—As active partners in natural resource management and education, the Friends of Seal Beach National Wildlife Refuge spearhead a number of important projects that benefit both the station and the refuge. These include:

Monthly High and Low Tide Avian Surveys—Maintain a baseline of information on migrant and resident bird populations.

Clapper Rail Platform Maintenance—Volunteers assist in the construction and long-term maintenance of the floating platforms used by clapper rails for nesting and shelter.

Monthly Refuge Tours—On the last Saturday of each month docents lead community members on a tour of the station's marsh and upland habitat.

Special Bird Tours (Audubon, local universities, etc.)—Bird tours are most popular during the winter and spring and fall migration.

Outreach Programs that emphasize cooperative management by U.S. Navy and U.S. Fish and Wildlife Service—Volunteers visit local schools and scout groups to discuss the importance of protecting the coastal salt marsh habitat.

Environmental Enhancement

Quarterly Environmental Coordinators Meetings—As a part of the installation Environmental Management System (EMS), building environmental coordinators and supervisors attend quarterly meetings to emphasize important environmental issues including the importance of natural resource conservation. These regular trainings provide a forum for operators to voice questions or concerns for upcoming operations.

Nature Trails Provide for Wildlife Viewing and Exercise—Construction and improvement of trails and observation areas provide access for wildlife viewing and exercise. Interpretive signage is in place and agricultural funding has been secured to increase the number of interpretive signs along the newly constructed trails.

Mission Enhancement

Implementation of the INRMP Saves the Installation Restoration Program $30,000 and 12-months—On-station biologists implement the Integrated Natural Resources Management Plan (INRMP) at NAVWPNSTA Seal Beach and conduct regular monthly surveys to determine location of protected and endangered species. In preparation for the cleanup of Installation Restoration sites 42, 44/45, and 57, regulators were concerned that the action would have an adverse impact on Burrowing Owls. However, robust survey results indicated that the owls did not utilize these areas, and regulators waived the requirement. Costs associated with performing the time consuming, four-step protocol surveys for the Burrowing Owl were negated resulting in a cost savings of up to $30,000 and a minimum 12-month timeframe, allowed the removal actions to be completed in a timely manner without delay.

Burrowing Owl Artificial Burrow Placement and Maintenance—NAVWPNSTA Seal Beach protects the last remaining coastal breeding pairs of Burrowing Owls in a three county area. Many of these owls are breeding in drainages for mission critical ordnance magazines. To prevent potential impacts to military mission, artificial burrows have been constructed and maintained in an open field adjacent to the magazines. Over the past two years, owls have increasingly used the artificial burrows thereby minimizing the risk of impeding the military mission. Preserving this at-risk species will reduce the likelihood of future listing as a threatened or endangered species preserving maximum flexibility for the station's mission.

Spill Program Ensures Protection of Natural Resources—The Natural Resources Program also spearheads the spill response program and ensures that station personnel are trained and equipped to respond to an accidental release immediately and effectively to prevent impacts to wildlife and their habitat. Planning, hosting, and participating in local and regional trainings such as Facility Response Team training, Shoreline Cleanup Assessment Team (SCAT) with local regulators and participation in regional plans such as the Area Contingency Plan and Sensitive Sites ensure that working relationships are galvanized.

An Eye To The Future

Since its humble beginnings over 60 years ago, NAVWPNSTA Seal Beach's dual roles as a cornerstone to the military mission and a natural resources trustee in southern California have become intricately interwoven and symbiotic in their nature. Though only encompassing 5,000 acres, station personnel take pride in their regional importance in both the military and ecological arenas.

The Natural Resources Program at NAVWPNSTA Seal Beach is taking lessons-learned from innovative programs and research to plan for the long-term sustainability of both the natural resources and the military mission at NAVWPNSTA Seal Beach.

Two of the most pressing issues that are being addressed are those of encroachment and global climate change. The station's location present challenges in both arenas.

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Site Profile: NWS Seal Beach, CA (cont.)

The Natural Resources Program continues to work shoulder-to-shoulder with military operators and planners to develop innovative strategies to ensure that neither our role as wildlife stewards nor our role in the military mission is sacrificed by these over-the-horizon challenges.

This synergistic approach will ensure that Naval Weapons Station Seal Beach will remain a small, but mighty force in the future.

-Bob Schallmann,
Conservation Program Manager

Excerpt from Station
Environmental Policy Statement

"Naval Weapons Station Seal Beach is a significant natural resources trustee and is committed to protecting our environment and conserving our natural resource heritage for present and future generations.
Our role as a trustee heightens our environmental commitment and affects every action, operation, and person on board the Weapons Station."
-Captain Jon Kurtz
Commanding Officer

California Least Tern
Photo: U.S. Fish & Wildlife Service

Conservation-Reliant Species (cont.)

have been achieved. An agreement must include both a biological and a legal component. First, it must set out the biological requirements necessary to maintain the species' population and distribution. In addition, it must detail the legal authority of the conservation manager to take the management actions and an acceptance of the obligation to do so. The agreement, in other words, is a contract between FWS and a federal, state, or tribal agency, or a nongovernmental organization that has both the expertise and the legal authority to assume responsibility for ongoing management of a species following delisting. The legal agreement must be in place prior to the proposal to delist and there must be a demonstrated record of success. That is, the management actions identified in the agreement have been achieved. Given that demonstration, delisting is possible. The nature of the agreements will vary depending on the threats to and ecological requirements of species. The following requirements are needed: 1) Biological goals tied to a recovery plan, 2) Management actions reflecting the risks facing the species, 3) Adaptive Management strategies that ensure the Recovery Management Agreement is evaluated and revised regularly, 4) A defined duration, and 5) Assurances by the conservation manager of its ability to implement the agreement.

Consider the Hawaiian Coot, a threatened species. Threats to the coot and other Hawaiian waterbirds include loss of habitat, predation from rats, cats, and mongoose. Refuges have been established and management techniques to mitigate the threats developed. Population numbers are near recovery goals. The island-wide distribution of predators, unpredictability of water availability and recurrence of invasive plant species make it necessary that management actions be continued indefinitely. Management actions in the recovery plan include control of predators (rats, cats, mongoose), maintenance of water levels and vegetation removal. These conservation actions are being conducted and as a result, population numbers for Hawaiian Coots are approaching recovery goals. Additionally there are opportunities for conservation partnerships. The U.S. military, Hawaii Department of Forestry and Wildlife Resources and others all have an interest in seeing the coot delisted. Thus enlisting them as participants in a Recovery Management Agreement to facilitate delisting seems possible once the recovery goals have been achieved.

Conservation reliance need not be forever. With new technologies or larger budgets, threats that once could only be managed could be removed, thus providing the opportunity for delisting a species without the need for a Recovery Management Agreement. One such opportunity lies on San Clemente Island, home to the San Clemente Loggerhead Shrike and San Clemente Sage Sparrow. The single owner status (U.S. Navy), size of the island (35,840 acres) and the nature of the threat (nonnative species and habitat loss) raise the possibility of restoring habitat and completely eliminating the nonnative species.

Managing for conservation-reliant species will require a paradigm shift in our conservation planning. Conservation partnerships will be increasingly essential as a fundamental tool in our management toolbox.

- J. Michael Scott,
Research Scientist, U.S. Geological Survey
Leader, Idaho Cooperative Fish and Wildlife Research Unit

Where do they come from and where do they go? Unraveling the mysteries of migratory connectivity: A Case Study

As the skunk cabbage emerges and tree buds begin to burst, migratory songbirds start settling onto breeding territories fresh off their long migrations from tropical wintering grounds. It's an age old tradition – each spring millions of migratory songbirds leave their warm tropical wintering grounds and travel thousands of miles to breed in North America. Most travel by night and face untold dangers on the way, but, remarkably, the majority return to the grounds near to where they hatched or bred the year before. Likewise, at the end of their breeding period they will point south and return exactly to the same territory in the tropics where they spent the previous winter. Despite the fact that they know exactly where they have come from and where they are going, we haven't a clue. This seemingly simple problem has fascinated recreational birders and scientists alike since Aristotle.

Long-term bird banding projects in North America have provided a wealth of knowledge, but they have not been helpful at finding out where birds spend the winter, in part because there are few similar efforts in the tropics where birds can be recaptured. Our research, which takes place both in the Caribbean Basin and on DoD-owned lands in the United States, is trying to answer these questions by harnessing the latest technologies to understand how wintering and breeding populations are connected. Far from simply solving a tricky ecological puzzle for its own sake, our research may add new and important information about how to better manage and conserve populations of migratory birds throughout the annual cycle. After all, how can you truly manage a species when you only see it for about three out of the twelve months of the year.

Hooded Warbler Tail
Photo: Colin Studds

Tailing migrating birds throughout the year

Molt – the annual growth of new feathers – is one of the most significant events in the life of a migratory bird. Each year at the end of the breeding season, adult birds drop their old flight feathers –wing and tail feathers – and grow new ones near to the site where they raised their young. Feathers are made of keratin, a material that is rich in the element hydrogen. Most hydrogen has one proton, (remember high school chemistry!), but a small fraction of hydrogen in the environment has two, making it a little heavier. This heavy isotope becomes more common from northern to southern latitudes, so the further south a bird molts its feathers, the more of the heavy isotope of hydrogen the feather will contain. Once the isotope is incorporated into the feather it remains stable and holds that isotopic signature for the life of the feather. Recognizing the existence of this pattern was a major breakthrough for scientists. For the first time, they could capture a bird once, at any time of the year, collect a tail feather, and after some lab analysis, determine the rough latitude at which the bird grew that feather – typically near its breeding ground.

Geolocator, about the size of a penny
Photo: Colin Sudds

Shedding new light on migration

A newly developed technology – archival data tags – promises to provide even more exciting information about the sites that migratory birds visit after they leave breeding areas such as DoD lands. The technology is startlingly simple. The data tag, which weighs about 1.2 grams, attaches to the bird with a small harness, is outfitted with a solar sensor and a memory chip powered by a small battery. Each day, the solar sensor is programmed to sense the timing of sunrise and sunset and to record the highest point of the sun during the day, known as the solar azimuth. From these two pieces of information, the archival tag computes the latitude and longitude of the bird. This data is stored on the memory chip and can be retrieved if the bird is recaptured later on, giving a detailed, year-long record of movements during fall migration, the tropical winter, and the return trip to the breeding grounds on spring migration. That's the catch though – the tag has to be retrieved. In contrast to isotopes which require only one capture to pluck a feather – a sort of organic archival data tag – this geolocator requires the bird to be recaptured the following year so that the data can be downloaded off of the chip. A team of researchers, led by Bridget Stutchbury of York University placed archival data tags on Wood Thrushes breeding in Pennsylvania and found that most birds wintered in small region of western Nicaragua. Surprisingly however, the thrushes followed different migratory routes between their breeding and wintering areas. Some birds crossed the Gulf of Mexico en route to the tropics, while others traveled inland through Texas and Mexico before arriving at the winter site.

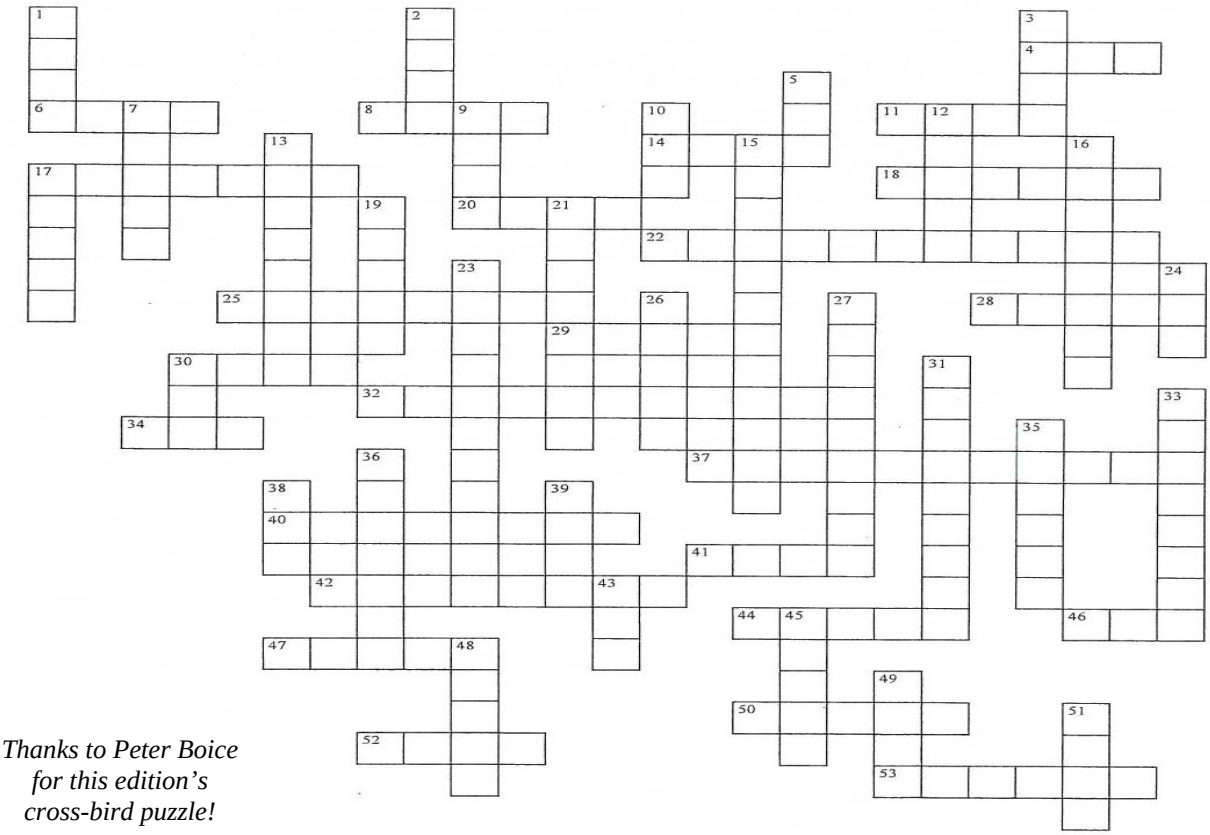
The tour of duty

Thanks to support from the DoD Legacy program, we have a field research team, archival data tags and mist nets in hand ready to start unraveling the mysteries of migratory connectivity. Starting at Fort Stewart in Georgia and heading north to the Patuxent Naval Air Station in Maryland, Fort Leonard Wood in Missouri, then off to NIOC Sugar Grove in West Virginia, Picatinny Arsenal New Jersey, Westover Air Reserve Base in Massachusetts, and finally Ethan Allen Firing Range in Vermont, we hope to have captured hundreds if not thousands of birds visiting from the tropics. Next summer will do another tour of duty, revisiting the bases from 2009 to recapture returning Wood Thrushes with their archival data tags and to visit new DoD lands to capture more unsuspecting migratory birds to collect their tail feathers. Combined with sampling we are doing on the wintering grounds (supported by International Programs of the US Forest Service and the Smithsonian Institution), we hope to be able to connect the dots between birds breeding on DoD and where they winter.

- C.E. Studds and P.P. Marra,
Smithsonian Migratory Bird Center,
National Zoological Park

Cross-Bird Puzzle

Birds of a Feather



Thanks to Peter Boice for this edition's cross-bird puzzle!

ACROSS

4 It came before the chicken?
6 May be made of sticks or stones, or many other materials
8 Some of their actions don't suit DoD
11 From tiny acorns grow
14 They used to be international
17 A high flyer or an autograph hound's need

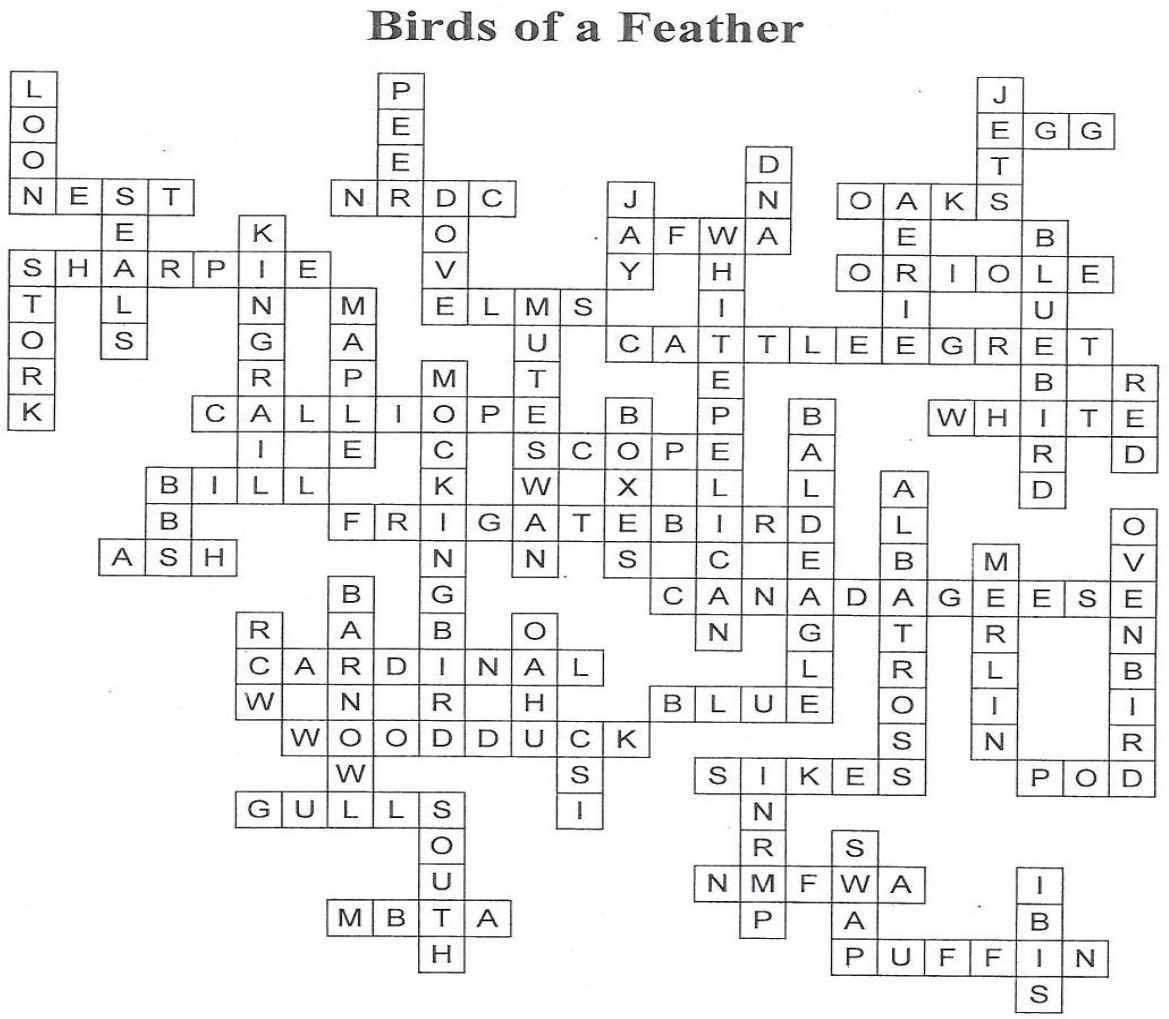
18 The most famous is #8
20 Decimated by a Dutch disease
22 Linked to livestock worldwide
25 Our smallest Hummer is very fuel efficient
28 A patriotic color in many bird names
29 Extremely useful for viewing water birds
30 Comes before an Act, or a bird
32 It's magnificent! It has the longest wings relative to weight
34 Commonly used for bats
37 Its resident populations get messy underfoot
40 A type of sin, or someone leading a flock
41 A patriotic color in many bird names
42 A living decoy?
44 DoD's fundamental natural resources management legislation: _____ Act
46 A group of whales
47 Laughing, herring and ring-billed
50 25 years of working for DoD natural resources
52 Integrative bird conservation legislation
53 The opposite of exhale

DOWN

1 Its song might drive you crazy
2 15 years of protecting government resource managers
3 Vulnerable to BASH or to AFC East opponents
5 Can be used to identify bird snarge
7 Navy and Monk may be found on DoD beaches
9 Symbol of peace, or a Smithsonian researcher
10 Blue, green or Stellar
12 Eagles nest here
13 Secretive royal marsh bird?
15 A major BASH hazard?
16 A poster species for nesting boxes
17 Endangered harbinger of a pending delivery?
19 This red leaf is prominent in Canada
21 This large introduced bird isn't really quiet
23 Has more songs that American Idol?
24 A patriotic color in many bird names
26 Artificial habitat for bluebirds and wood ducks
27 Mostly delisted, but still protected
30 An important survey
31 Curse for an Ancient Mariner
33 Our hottest bird
35 A small swift magician
36 Farm-based night hunter
38 DoD has spent>$70M on its recovery
39 Home to MCB Hawaii, Scholfield Barracks, Hickam and Pearl Harbor
43 Vegas, Miami or NYC
45 If you have significant natural resources you have one
48 Many birds head here for the winter
49 Each state has one for its wildlife
51 An ACC mascot

See page 15 for answers

Cross-Bird Puzzle Answer Key



CONTRIBUTING TO THE DOD PIF NEWSLETTER IS EASY!

Want to highlight bird conservation efforts on your installation?
Have a great bird image you just have to share?
Send your ideas and images to Chris or Alison.

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