



Legacy Program Update

The Legacy Program is reviewing 128 proposals:

The Legacy Program is reviewing a total of 92 natural resources, 26 cultural resources, and 10 integrated (natural and cultural) resources full proposals. Legacy Staff and Service Representatives are meeting the week of October 14 to discuss and make recommendations on natural resources proposals to the Deputy Under Secretary of Defense for Installations and Environment.

Legacy Project Highlight of the Month

Legacy Project 07-346: Department of Defense Strategy to Support a Multi-Agency Bat Conservation Initiative Within the State of Utah

Of the 18 bat species in Utah, 6 of those species, or 33%, are state sensitive species. Very little information was known about the distribution or population status of bats in Utah and the information that did exist was widely scattered and often inaccessible. That lack of information made it difficult to identify and address statewide management issues related to the conservation of bats. With five Department of Defense (DoD) facilities in Utah, whose management authority extends over 1.8 million acres, it was crucial to identify the distribution, frequency of occurrence and gross-level timing to prevent encroachment and listing issues as a result of the lack of bat conservation management in Utah.



This state sensitive Fringed Myotis (*Myotis thysanodes*) was caught 12 miles from Dugway Proving Ground. Photo by Kimberly Asmus, State Biologist

[See Legacy, page 4](#)



In The News

Impacts of White-nose Syndrome to Bat Populations and Management

By Chris Dobony¹, Eric Britzke², Mark Ford², and Raymond Rainbolt¹
1 Ft. Drum
2 USACE-ERDC

White-Nose Syndrome (WNS) is an emerging wildlife health concern of unprecedented scale that has killed over one million hibernating bats. First detected in 2006 in a cave in New York, WNS has since spread throughout New England and the mid-Atlantic as far as southwestern Virginia. The syndrome is named for a distinctive white fungus, *Geomyces destructans*, appearing on the muzzles, wings, ears and tails of bats (see photo [page 7](#)). This fungus grows at temperatures from ~ 0 – 20 degrees C which corresponds to the body temperature of hibernating bats. Unfortunately, hibernating bats naturally have weakened immune systems, leaving them vulnerable to fungal growth in their epidermal tissues. Though most evidence points to

[See White-nose Syndrome, page 7](#)

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The Strategic Importance of Species at Risk to DoD

Variations on a recurring theme:

“We can’t fund species at risk.”

Say those who are struggling to make tough funding decisions.

“Why can’t we fund species at risk?”

Say those who are focused on managing vital on-the-ground natural resources.

I doubt a week goes by when I’m not faced with one or both sides of this fundamental funding dilemma. My unwavering response to all parties is that we must invest in the long-term sustainability and survivability of our irreplaceable biological resources. We especially cannot neglect those species on military lands that are most in need of our continued protection, including species at risk (SAR), and such closely related “cousins” as “species of conservation concern” and “candidates for listing.”

However, as stewards of the military’s natural resources, we need to provide our leaders with compelling reasons why it’s important for DoD to protect SAR when there are so many competing priorities for scarce resources. Hence, as important as it is to speak about the ecosystem services SAR provide to society, ranging from potential medicinal values to wildlife viewing, we need to speak more directly to DoD concerns. Below are a few thoughts to consider when advocating for increased funding for SAR.

More SAR need our protection each year. The need for action is immediate and urgent. The severe dieback in multiple bat species associated with WNS is illustrative of how rapidly circumstances for healthy species – let alone SAR – can change, and how widespread these changes may reach. Just a few short years ago, actions were underway to delist or downlist the gray bat and the Indiana bat. Now these actions are in limbo until the potential impacts of WNS are better understood. At least six other bat species are or soon may be at risk.

Protecting SAR protects the mission. With the increasing unpredictability associated with global climate change, development, and other forces, it becomes increasingly likely that additional SAR will be listed over the coming years. It is in DoD’s immediate and long-term interest to invest now in conserving SAR and their habitats to decrease the potential for future listing actions.

It’s cost effective. It requires less time and money to prevent species listings than to attempt to recover a species to achieve delisting. For example, on-the-ground measures can be conducted in a more measured manner. In addition, there are greater opportunities for ecoregion-wide planning and the potential for both multi-partner and multi-species collaborations.

It is the right thing to do. DoD lands are home to some 420 federally-listed species and more than 520 additional SAR. In dozens of cases, DoD has either the only remaining populations of a species, or the best remaining examples of a species. DoD has a moral responsibility to provide for long-term stewardship of these special resources.

It is the “DoD way.” DoD has taken a leadership role on many critical national and international environmental issues over the years. DoD must continue to embrace opportunities to be a leader in protecting our nation’s priceless biological resources.

How can you best use these and other arguments to protect SAR?

- Plan and program now for FY 2011 and future years.

- Hone your justifications to make the most compelling case possible in order to compete effectively against other important budgetary needs.
- Follow through with briefings to your budget personnel and your installation commander.
- Familiarize yourself with projects the DoD Natural Resources Conservation Program, other parts of DoD, and other federal and state agencies have funded in support of SAR and listed species. These may provide additional information to assist your justifications for funding SAR projects.

We face formidable challenges in the years ahead – and incredible opportunities – to assist in the long-term sustainability and survival of our priceless natural heritage. We all must embrace and act on these opportunities. Our children will expect nothing less.

Endangered Bats in the United States

Of 45 species of bats in the continental United States, six are listed and in danger of extinction. Three bat species in the Pacific region also are federally listed – the Hawaiian hoary bat (HI), Mariana fruit bat (GU) and the little Mariana fruit bat (GU). The endangered bat species in the continental U.S. are:



Ami Pate/NPS

Greater (Mexican) long-nosed bat – nectar-feeding (this bat is covered in Agave pollen) and insect eating bat that lives in the Big Bend area of southwestern Texas. (Photo by Ami Pate, NPS)



Gray bat - eats insects and lives in a few caves in Alabama, Kentucky, Missouri, Arkansas and Tennessee. (Photo by Merlin Tuttle, Bat Conservation International)



Lesser long-nosed bat - nectar-feeding and insect eating bat of the Southwestern U.S. (Photo by Merlin Tuttle, Bat Conservation International)



Ozark big-eared bat - only found in some caves in Oklahoma, Missouri and Arkansas. (Photo by USFWS)



Indiana bat - insect eating bat that lives in hollow trees in the summer and in the winter stays in just nine caves in the U.S. (Photo by Merlin Tuttle, Bat Conservation International)



Virginia big-eared bat - insect eating bat that lives in a few caves in Virginia, West Virginia, North Carolina and Kentucky. (Photo by John MacGregor)

Legacy, continued from page 1

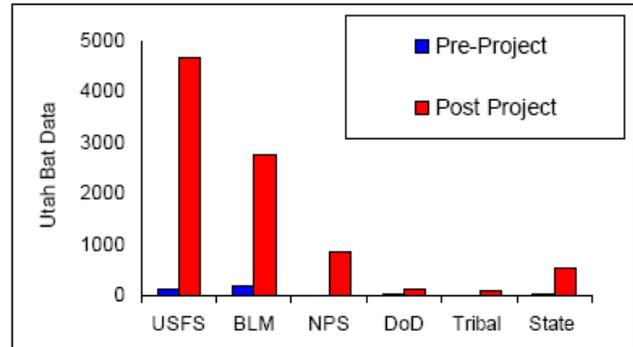
DoD, as part of a collaborative partnership of 14 individual public, private, state, federal, and commercial organizations, sought to identify the distribution, quantity, and quality of existing data on bats in Utah. That goal was a critical step in achieving the overarching objective of ensuring the conservation and management of bats in Utah. Currently, no species of bat is listed as threatened or endangered in the state and it is hoped that through sound science and conservation measures, federal listing can be precluded. Additionally, solid data on the distribution of bat species on DoD lands augments DoD's sustainable range initiatives.

With funding from the Legacy Program, Dugway Proving Ground hired a biologist to conduct an exhaustive search for bat data held by federal and state agencies, universities, contractors, and non-profit groups within Utah. Dugway Proving Ground also hired a programmer to produce a web-compatible database which could store and manage all known bat data. Expert opinion workshops were held to build a GIS habitat model, which was then used to help guide data collection efforts on DoD lands.

Identification and description of state-wide data yielding invaluable trends and patterns throughout DoD training ranges and state and private recreation lands. These data substantially benefited the military through better understanding of the biological needs of bats, which directly promotes sound stewardship initiatives developed cooperatively between Utah and DoD wildlife managers.

A comprehensive, mineable geodatabase, populated with data on over 20,000 individual bats, stores all known historical bat data as well as facilitating the coordination of future data management. For each bat captured on or near DoD facilities, monitoring data (bats are identified through acoustic and mist netting surveys) is recorded in the geodatabase. Additionally, with the support of numerous partners, an Important Bat Habitat GIS model was created which identifies high-quality bat sites. Together, these steps serve as a foundation for future cooperative bat research and management efforts within Utah targeting DoD testing and training lands.

For more details about this three year effort on bats in Utah, please read the article [Utah's Legacy Bat Initiative on page 10](#).



Available data records for the six largest landowners in Utah before and after this Legacy funded project.

SERDP Project: Automated Acoustic Identification of Bats

By Joseph Szewczak
Humboldt State University

The Endangered Species Act requires the Department of Defense to manage threatened and endangered (TE) species on lands under its jurisdiction. The inventorying and monitoring necessary for managing TE bat species accrues high costs because of the specialized skills required to perform this work. In addition, TE bat species are typically rare and require greater survey effort to acquire reliable data than more common species of bats, particularly over the extensive landscapes of U.S. military installations.

This Strategic Environmental Research and Development Program (SERDP) project will develop a system to automatically and continuously monitor bats for weeks or months at a time by recording the vocalizations they produce. Processing algorithms will also be developed to automatically identify bat species from the field-collected data to assess species presence/absence, population levels, temporal movements, and acoustically gleaned demographic information.

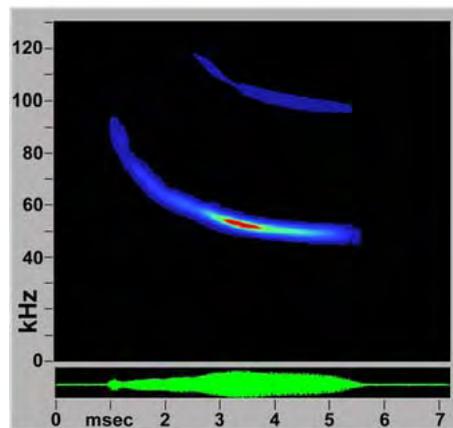
This monitoring system will use full-spectrum acoustic data to facilitate automated call identification and provide information on the ambient acoustic environment, preventing misidentifications. Field recording units will use onboard controllers to automatically trigger a recording based on selectable filters and logic to reject undesired signals. The signals will be digitized onboard and stored using a cascaded approach of RAM and high-capacity hard drives that minimize power consumption to enable unattended recording for periods of weeks or months. The automated call identification approach will simulate the decision-making capability of an expert, objective human

based on an artificial neural network with redundant verification using a fuzzy logic expert system or a multivariate decision tree. Identification algorithms will be based on independently confirmed recordings of known species and calibrated in coordination with ongoing monitoring activities using standard, accepted methods.

Automated acoustic monitoring and identification will reduce the costs of monitoring and managing rare TE bat species. Capable of operating in personnel-restricted areas, this system will provide more reliable and consistent data among surveys to reveal long-term trends of species presence/absence and abundances as compared to intermittent personnel-based surveys. The high-resolution acoustic data also will increase the accuracy and consistency of species identification for better support of environmental management and operations planning on military lands. The project is expected to be completed by the end of 2009.

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Western pipistrelle bat and a sonogram display of its echolocation call.

This article is adapted from Strategic Environmental Research and Development Program (SERDP) fact sheet Sustainable Infrastructure SI-1394.



Arnold AFB Bat Population in Danger of White-nose Syndrome

By Janae' Daniels
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Directorate of Public Affairs, Arnold Engineering Development Center

ARNOLD AIR FORCE BASE, TENN – Because Arnold Engineering Development Center's (AEDC) biologists are two of only a handful of experts who have experience with bat issues in the state of Tennessee, the U.S. Fish and Wildlife Service (USFWS) has asked them to help with a current and wide-spread issue. Biologists John Lamb and Richie Wyckoff were asked to participate in an ad hoc interagency state planning group for the arrival of White-nose Syndrome (WNS) in Tennessee.

"We thought we had more time to plan for the arrival of WNS in Tennessee, but then it jumped to Virginia this past winter and is only about 20 miles from a very important gray bat hibernation cave," Lamb explained. "So we held an emergency meeting in May, one of several that are ongoing. Since that time we have stepped up our activities as cooperating agencies."

According to Lamb, WNS has not spread to Tennessee yet, but could be expected as early as this coming winter.

"We were already doing a lot of gray bat work at AEDC," Lamb said. "Ironically it was to support taking them off the endangered species list – that won't happen now."

For example, Lamb and Wyckoff have written sections of the Draft Tennessee White-nose Syndrome Spring/Summer Strategy and will begin assisting with the fall/winter edition soon. They have also trained Tennessee Wildlife Resources Agency and USFWS biologists on techniques needed to implement parts of the plan.

They have assisted The Nature Conservancy with trapping and banding at two of their caves in Murfreesboro and McMinnville, monitored sites to get a pre-WNS population baseline, used thermal infrared video equipment to tape

gray bats emerging from caves at night to feed and have done repeated recording of bat calls with bat detectors while driving along predetermined road routes to get a baseline of species other than gray bats that may be affected by WNS.

The bottom line for bats at AEDC, according to Lamb, is there is a good possibility that these now common species could be impacted to the point that they are listed as endangered.

“We have eight species on base; three of these don’t hibernate in caves, so they will be unaffected. Four species spend the summer in forests and hibernate in caves,” Lamb explained. “Gray bats, our eighth species, hibernate and spend the summer in caves and they travel long distances between caves. I think it is possible they will be extinct within five years.”

Why should we care?

“In addition to the possibility of increased restrictions because of additional species being added to the Endangered Species Act list, bats are the primary predators of night-flying insects and many such insects rank among North America’s most costly agricultural and forest pests,” Lamb said. “These include cucumber, potato and snout beetles; corn-earworm, cotton-bollworm and grain moths; leafhoppers and mosquitoes.

“A single little brown bat (*Myotis lucifugus*) can catch more than 1,200 mosquito-sized insects in an hour. A colony of just 150 big brown bats (*Eptesicus fuscus*) can eat sufficient cucumber beetles each summer to protect farmers from 33 million of these beetles’ root worm larvae: pests that cost American farmers an estimated billion dollars annually.”

In 1976, the gray bat was listed as endangered due to dramatic declines and habitat loss.

According to Lamb, AEDC’s work with gray bats was initially to maintain compliance with the Endangered Species Act. In the 1990s they began mist netting at various areas on base to see where they gray bats occur to learn where consultation with the USFWS might be required.

“We also knew that all the gray bats we were catching couldn’t have all come from the Woods Dam where we know there is a colony,” Lamb said. “So, FWS [the Fish and Wildlife Service] asked us to go to area caves and trap them, at which time we placed uniquely numbered forearm bands [on each bat] so if we caught them on base we would know where they came from.”

“About six years ago it was my opinion, and that of most bat biologists, that their numbers had recovered sufficiently that they no longer needed to be listed,” Lamb stated.

“Like the Bald Eagle, we thought it was a great success story due to recovery efforts over the last 30 years. This would reduce the restriction and consultation requirements; then White-nose Syndrome changed everything.”

Announced in a July 6, 2009 press release from The Nature Conservancy, the USFWS agreed to close caves located on state lands in Tennessee. The caves will be closed for one year in an effort to prevent the spread of WNS.

The closures were effective July 1 and will temporarily close public access to all caves, sinkholes, tunnels, and abandoned mines on state land managed by the Tennessee Wildlife Resources Agency, the Tennessee Department of Environment and Conservation and the Tennessee Department of Agriculture Division of Forestry. These lands include state parks, forests, and wildlife management areas. The closure extends through May 2010.



The tri-colored bat is currently one of the most common bats in Tennessee. That could all change with White-nose Syndrome. (Photo by John Lamb)

This article was adapted from US Air Force Press Release 2009-154, July 17, 2009

White-nose Syndrome, continued from page 1

Geomyces as the causative agent of WNS, the infection could also be a secondary symptom from other unidentified biological stressors to bats.

Bats with white muzzles, dead bats on cave floors, or emergence of bats from hibernacula during mid-winter months prior to typical emergence are indicative signs of WNS. It is unknown whether affected bats emerge because they need to forage to restore prematurely depleted fat reserves or if seemingly healthy bats emerge because they were disturbed by the increase in bat activity. Regardless, bats then die as a result of cold weather exposure. Although variable among bat species, mortality rates of 70-95+% has been reported within 2 years of initial infection and afterwards. Bat-to-bat transmission is known to occur, but the roles of humans or other environmental factors in transmission cycle are unknown.



A hibernating eastern small-footed bat showing the white fungal growth on its muzzle, wings, and tail membrane that is typical of WNS infected bats.

Currently, the eastern pipistrelle, big brown, little brown, northern long-eared, eastern small-footed, and the endangered Indiana bat have been affected by WNS. Wildlife biologists are concerned that WNS will soon impact endangered gray and Virginia big-eared bats. The fact that both of these species use caves year-round raises the fear that these species may increase the likelihood of continued WNS presence or spread. The timing of WNS has postponed considerations for delisting the gray bat and it has tempered the recent findings of increasing Indiana bat populations. Concern for the viability of the Virginia big-eared bat has led to a captive holding program being developed by the U.S. Fish and Wildlife Service, the Smithsonian Institution, and West Virginia Division of Natural Resources as a hedge against extinction. Fortunately, researchers at numerous federal and state agencies, universities and non-governmental organizations are diligently working to answer basic questions about the ecology and etiology of WNS, to devise management and control guidelines, and to prepare managers in yet unaffected areas for its arrival. Because of the potential environmental consequences of a bat population collapse, WNS was even a discussion topic for a House Select subcommittee this past spring.

Fort Drum, a U.S. Army installation in northern New York, has been an important focal area for bat community research in recent years, including WNS. In conjunction with the New York State Department of Environmental Conservation, U.S. Fish and Wildlife Service, USDA Forest Service Northern Research Station and the U.S. Army Engineer and Research Development Center, Fort Drum has worked to understand how bats use forested areas and riparian/wetland zones for roosting and foraging, respectively, during the summer months both before and after WNS occurrence. Researchers have been able to document physical effects of WNS on surviving bats and Fort Drum has provided samples that are now helping scientists determine if *Geomyces* remains viable during the summer, and more importantly, if previously infected bats can transmit WNS to juveniles. Although WNS mortality is most prevalent and obvious at hibernacula, research at Fort Drum has documented how those impacts are manifested during the non-hibernation months. For example in 2007, biologists captured an average of 20 bats per net-survey site. In 2008 the rate had dropped to 9 bats, and by the summer of 2009, it had fallen to 5 bats per net-survey site. The greatest declines occurred among the most common species on the installation: the little brown, northern, and big brown bats. Only numbers of the “tree” bats, i.e., eastern red, hoary, and silver-haired bats that migrate to the South rather than hibernate locally were relatively unchanged. These trends were also mirrored by extensive acoustical monitoring performed on Fort Drum. The number of echolocation “passes” recorded per survey site from 2004-2007 averaged 140 per night, but dropped to just 43 per night by 2008. Congruent with mist-

netting results, little brown bat activity decreased approximately 50% by 2008, whereas eastern red bat activity levels have remained constant.

We believe results from Fort Drum clearly demonstrate the enormous impact WNS will have on bat communities, and subsequently on the ecological integrity of military installations. The value of bats from an ecosystem services perspective has not been fully quantified, yet we know bats are important components of the biota. Female bats may eat more than half of their body weight in insects nightly, therefore reductions in bat numbers could have serious implications for controlling insect pests to agriculture and forestry, as well as for those insects that pose human health risks. Foraging and roosting niches occupied by rapidly declining species may go unfilled or alternatively may become usurped by less affected species; either result will have unknown environmental consequences. Similarly, as WNS continues to spread, and if bat populations continue to decline, military installation managers may be further challenged by new regulatory pressures. For example, the presence of endangered Indiana bats or gray bats already adds to the complexity of managing for Mission and stewardship needs. Precipitous declines of formerly common bat species such as the little brown bat or other species may result in additional listed species, which will undoubtedly require additional modifications to training and land management activities at military installations throughout the East.

The Bat Grid

A unique approach to reliable data

By Pat Ormsbee
U.S. Forest Service

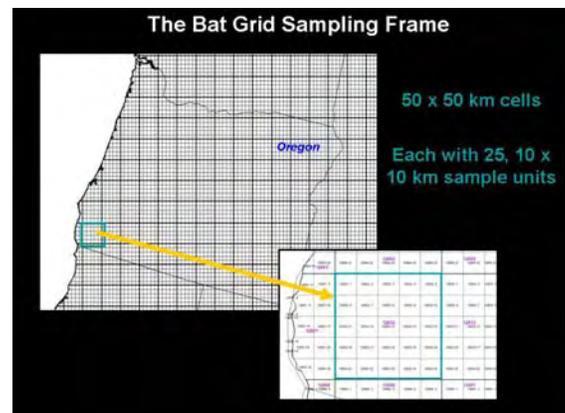
“You don’t know what you’ve got ’til it’s gone,” singer Joni Mitchell famously insisted in 1970. Now we’re trying to ensure that we do know what we have – at least with regard to bats in the Pacific Northwest – so we can do a better job of conserving them. For six years, a myriad of partners and I have been conducting a systematic inventory of bats in Oregon and Washington with carefully standardized data on species identification, location and other factors. The result is the Bat Grid.

To know what we’ve got requires collecting basic, conclusive and repeatable species data at a landscape scale so that the information can be applied to analyses of long-term trends of species distribution. Baseline data on the identification, presence and distribution of bat species are essential for developing conservation plans.

My primary partners in this effort are Professors Joe Szewczak of Humboldt State University, Jan Zinck of Portland State University and Aimee Hart of the U.S. Forest Service. Of course, we can’t do it all ourselves, so we engage professional and citizen scientists to collect the data. An emphasis on consistency in collection methods ensures the data can be confidently combined and analyzed with all other Bat Grid results.

The comprehensive inventory and monitoring program, known officially as the “The Bat Grid,” has grown dramatically since its inception in 2002. Surveys are conducted using a grid-based sampling frame of square sample units – each 6.2 miles (10 kilometers) on a side – that covers the Northwest. Our survey efforts are guided by the random selection of sample units.

We developed the Bat Grid sampling design and protocol with substantial help from statisticians and biometricians. Initially developed only for the state of Oregon, the Grid was eventually enlarged to cover adjoining states. The Forest Service, meanwhile, has expanded the sampling grid to cover all of North America and to address other species of wildlife.



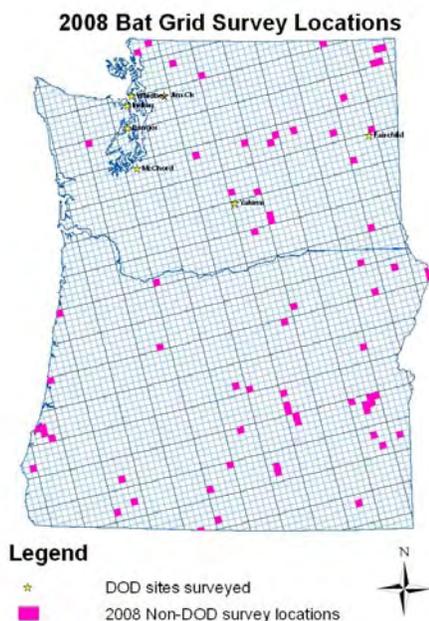
The Bat Grid sampling frame is a wall-to-wall GIS generated grid covering North America. Fifty x fifty km cells are used to distribute sample unit selection across the region. Each cell is comprised of 25 sample units. One to several 10 x 10 km sample units are selected from within each cell.

A standardized protocol includes three methods for identifying bats: morphology, acoustics and genetics. Bat Grid surveyors (“Gridders”) take direct measurements of the key physical characteristics of captured bats, but recent research has shown that morphology alone cannot reliably discriminate some very similar species from one another. Therefore, we also sample genetic and acoustic characteristics.

Szewczak, a biologist and acoustics specialist, has developed SonoBat software that Gridders use to analyze and catalog the full-spectrum acoustic characteristics of bat calls, both from captured bats and from unknown bats in flight. The software includes a library of calls for each species to aid in identification.

He notes that recognizing bats by their calls is much more difficult than identifying bird species by their songs. “In addition to needing bat detectors just to listen in on the chatter,” he said, “the way that bats use sound renders the calls of one species much more like those of another than is true of birds.”

“Birds sing to proclaim where they are and who they are, and they have undergone selective pressure to be different from one another.” Bats, on the other hand, use echolocation calls to obtain information about their environment and, “to the bane of bat biologists, this information-acquisition function of bat calls provided no selective pressure to be different from any other species. As a result, discerning many bats by their calls entails teasing out subtle acoustic characteristics.”



Bat Grid survey locations for 343 surveys conducted in 2008. Twenty percent (67) of all surveys were conducted on DoD facilities.

Szewczak and his lab at Humboldt State and collaborator Stuart Parsons of the University of Auckland (New Zealand) continue to evolve the SonoBat hardware and software. “Right now,” he said, “we can correctly classify 70 to above 90 percent of high-quality recordings of the species in an area. We are working to improve our classification rate and automate recording and classification.”

In fact, he said, “we envision a future of noninvasive bat surveying using ‘digital mist nets.’”

Genetics is the Bat Grid’s third method of identification, thanks to Zinck, the team’s geneticist. She has developed genetic markers to identify species using either wing biopsies or guano. Genetic analysis is particularly important when assessing roost sites where nobody’s home, since identification can be obtained from guano piles left behind. That is the beauty and promise of Zinck’s work, as it will help permit “non-invasive, range-wide surveys – the next step in furthering our understanding of [bats].”

She notes that the biggest impact of the Bat Grid is that it is “collaboratively building a huge archive of data that, because it was collected in a systematic way, allows researchers to investigate questions across longer periods of time and greater geographic areas than ever before.”

Collaboration is key to implementing the Grid, and the list of partners includes state and federal agencies, universities, non-government organizations and individuals. The DoD Legacy Program (Legacy Project No. 08-390), U.S. Bureau of Land Management, the Forest Service, National Fish and Wildlife Foundation, Oregon Department of Fish and Wildlife and Bat Conservation International’s North American Bat Conservation Fund have been primary funders of the project. And in-kind contributions from Portland State University, Humboldt State University and volunteer surveyors exceed \$100,000 a year.

The Bat Grid’s abiding success is due largely to the enthusiasm and continuing participation of both professional and citizen scientists. We selectively provide equipment and free training that covers capture techniques and species

identification, acoustic recording and analysis, and collection and storage of genetic samples. Experienced participants are paired with novice workers to provide guidance and support beyond the training sessions, an essential part of ensuring credible data collection. An important result of this blend of field training and mentoring is a growing cadre of competent bat biologists who are dedicated to informed bat conservation in the Northwest.

The Bat Grid provides annual training and refresher sessions in key locations around the region. And all Gridders are provided with standardized data sheets, survey protocols and data standards. The importance of unwavering standardization is the program's basic mantra. So far, we have trained more than 100 surveyors in Oregon and Washington, and another 40 in Idaho, Montana and South Dakota.

This kind of careful, consistent data collection year after year may not be terribly exciting for some, but the results are critical. If I spend the rest of my career – year after year – collecting good baseline data on bats, I feel I will have made a valuable contribution to bat conservation. There's no other program anywhere in the world that is collecting this type of comprehensive information on bats over such a large area.

Besides, says Aimee Hart, my long-time assistant, "There is something special about people who love bats. The camaraderie and the sense of adventure captivate everyone. It is really special to spend time in the outdoors at night, especially when you are contributing to something so important."

Pat Ormsbee, based in Eugene, Oregon, is a Bat Specialist for the USDA Forest Service Region 6 in the Pacific Northwest. This article first appeared in and is adapted from the Spring 2008 issue (Vol. 26, No. 1) of BATS Magazine (Bat Conservation International, www.batcon.org) and was written with the assistance of Judith McHugh, Public Affairs Officer for the Willamette National Forest.

More on this story at: http://seattletimes.nwsourc.com/html/outdoors/2009860734_bats14m.html#



Kurt Aluzas (USFS) and Cameron Bishop (USACE) prepare to get a call from a captured *Myotis* bat during a Bat Grid survey on Bangor NSB.

Utah's Legacy Bat Initiative

By: Joel Diamond¹, Lauren Wilson², and Robert Knight²

¹ General Dynamics Information Technology

² Dugway Proving Ground, Dugway Utah

Nationwide more federally listed species occur per acre on Department of Defense (DoD) lands than on any other federally managed lands. DoD facilities provide habitat for approximately 420 federally listed species and over 550 species at risk. The high occurrence of threatened, endangered, and species at risk on DoD lands result in an increased need to manage these lands for ecological integrity and recovery (DoD 2005) while ensuring our Armed Forces can train and test to standard. The presence of these species has the potential to limit DoD activities on many facilities, and in many instances has, served as the catalyst for large-scale management of habitat across DoD and adjacent lands. In North Carolina (Fort Bragg), the Army has created partnerships with adjacent land owners to sustain gene flow between fragmented populations of the red-cockaded woodpecker allowing training to take place on previously protected habitat. To limit the impacts of encroachment by human population expansion and commercial development in Colorado, the DoD has partnered with The Nature Conservancy on the Front Range ecosystem management project. To maintain and stimulate habitat and population growth of the desert tortoise, the DoD and multiple partners have begun an ecosystem-scale management of the species in the southwestern U.S. In Florida, Eglin Air Force Base has been praised – “a model for the nation” – for its natural resources management program (DoD 2005). DoD land managers in Utah seek to mirror these ecosystem-scale management methods by focusing on at-risk bat species on DoD and adjacent lands. Bats are often cited as an indicator of ecosystem health, and thus proactive management of bat communities provides a basis for ecosystem-level biological management (Adams 2003).

Many bat populations in North America are thought to be declining (Stebbing 1980, McCracken 1988, Richter et al. 1993, Tudge 1994, Altingham 1996). The International Union for Conservation of Nature (IUCN) lists 10% of microchiroptera species as threatened (Mickleburgh et al. 2002). The combination of slow reproduction, natural rarity, and genetic isolation make bats susceptible to population and range declines (Racey and Entwistle 2003). Of 45 bat species in the United States, seven are listed as federally endangered and 19 are former candidates for listing (Code of Federal Regulations 1991; USFWS 2008). Of Utah's 18 species, 6 are Tier II species of concern (species at risk) in Utah's Wildlife Action Plan (WAP) (UDWR 2005). Bat species and communities have been used widely as indicators of ecosystem health. The primary threat to these indicator species is not habitat degradation, loss, or direct disturbance, but rather the lack of information on species temporal and spatial distributions (UDWR 2005). Legacy Program funding in 2007, 2008, and 2009 provided the basis for data consolidation, establishment of the current status of bat data in Utah, creation of habitat use models, a statistically and biologically sound bat monitoring protocol and a DoD-specific-species risk assessment. These five products have facilitated ecosystem- scale bat management across Utah, and on DoD testing and training lands specifically.

Bat species in Utah have been sampled by federal and state agencies, universities, contractors, private researchers, and non-profit groups since 1906. These existing data were scattered among federal, state, private, and university information holdings making large-scale questions of bat ecology and management difficult to address. To deal with that issue, biologists at Dugway Proving Ground in cooperation with members of the Utah Bat Conservation Cooperative (UBCC), an organization comprised of members from 14 separate land and resource management agencies, consolidated and organized all existing bat data in Utah into a centralized geodatabase (BATBASE). To date, the BATBASE data set is the result of 16 types of contributors, over 150 observers, 13,876 events, and 28,629 individual bat records. This data consolidation represents a 1000% increase in the available bat data in Utah. The wide scale of contributors to the BATBASE dataset and the UBCC provide a level of collaboration that is rare in wildlife management. Once the data had been consolidated, we used it to establish the current status of knowledge concerning bat taxa in Utah.



Townsend's Big-Eared Bat is held by a biologist for processing. This species is listed as a Species of Concern or Tier II species by the Utah Division of Wildlife Resources and occurs on DoD lands in Utah. (Photo by Ryan Swan, U.S. Army Dugway Proving Ground)

We then used the BATBASE data set to estimate the current status of bats in Utah. This data set provided a further base for protocol development, species habitat modeling and DoD-specific risk assessment and mitigation planning. The patterns observed in the data set indicate that a protocol for monitoring bat populations should be fitted to the distribution of the bat species of interest. These data also show that a monitoring protocol needs to take into account underrepresented locations and vegetative cover types, thus alluding to important associations of bat species and environmental factors. These data results provide a list of managerial monitoring needs via unsurveyed areas and recorded locations of sensitive species or communities. Finally, these findings indicate that there is a need to assess ecosystem scale associations between bat species and habitat associations. By evaluating the relationship between bat diversity, density, and habitat associations, we have begun a new stage in bat habitat evaluation. The data set provides the basis of understanding needed to implement an occupancy-based model. A first for much of the western US, this approach will allow state-wide species at risk management targeting habitat most suitable for SAR occupation and exploitation.

In response to the data deficiencies recognized through the consolidation, evaluation of current status and habitat modeling, we developed an occupancy- based bat monitoring protocol that also took into account current research and efforts being conducted in other western states. Our methods were selected for implementation, which provide sufficient data and statistical power to adequately assess the status of bats in Utah. The first year of the proposed monitoring protocol produced a simple occupancy model that will be used to determine the covariate relationships of

species. Further iterations of the protocol will allow for population-level evaluation of bat species in Utah, and even estimations of population growth, decline, or stabilization. This protocol maintained the proactive management of bat species in Utah. The protocol established a data set which complemented the Legacy-funded efforts discussed throughout this article and provided the data structure needed for a comprehensive risk assessment for bats on DoD lands.

The DoD risk assessment indicated that DoD facilities provide habitat for four of the six SARs to include the Townsend's big-eared bat, fringed myotis, big-free-tailed bat, and spotted bat. Habitat for Townsend's big-eared bat and the fringed myotis consist primarily of cavern roosts (mines and caves) and crevices (rocks and trees) and foraging and watering habitat that include drier woodlands (including pinyon-juniper) and edge habitats along water adjacent to and within a variety of wooded habitats (WBWG 2005 and 2005b). The big-free-tailed bat is a crevice rooster; protection of crevice habitat, cliff and canyon habitat will benefit this species. The very limited records of the spotted bat on DoD lands indicate that this species is utilizing the foraging and watering areas on DoD lands. The active management of roosting, foraging, watering and migratory habitat on all public lands in Utah, to include public land withdrawn for military purposes, will therefore aid in the long-term sustainability of bat populations in Utah, and reduce operational impacts to sensitive bat species while providing for the planning and execution of mitigation measures allowing for the uninterrupted accomplishment of the military mission on each installation.



Biologist Lauren Wilson looking for wing damage on a Pallid Bat using field technician Ryan Swan's headlamp. A wing score is recorded for each bat captured to gather baseline data on wing damage in case WNS ever ends up in Utah. (Photo by Nick Brown, Hill Air Force Base)

In summary, biologists at Dugway Proving Ground and members of the UBCC have created an ecosystem-scale bat management program. We used the consolidation of historical bat data to create an estimate of the current status of bats. We then used the current status of bats as a basis for bat species and community habitat associations. The findings from habitat models provided a basis for a statewide covariate-based bat monitoring protocol. These stages of data consolidation, defining the current status of data, habitat modeling and a bat monitoring protocol were then used to create an ecosystem-level management plan for bats on DoD and adjacent lands. This framework has led to the creation of a proactive, self-sustaining ecosystem-scale management program for bat species in Utah which complements the military mission. By completing three focused years of Legacy-funded baseline efforts – often the hardest and most expensive part of ecosystem-wide

management systems – bat management in Utah can now be maintained at a sustainable and manageable level of effort every two to three years by agency biologists and volunteers. The Legacy Program has been an invaluable member in our Utah efforts to reduce the potential of individual species declines and decrease the potential of DoD lands serving as the sole refuge for at-risk bat species. We believe this will prove invaluable to long-term support to the military's mission not only on the military installations located in Utah but potentially wherever at risk bat species are found. The DoD Legacy Program support to this project serves as a crucial example of sound science supporting sustainable range management while fully meeting DoD stewardship goals and objectives on DoD ranges and test grids.

Project Point of Contact:

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Bat survey and management at Fort Hood, Texas

By Charles E. Pekins
Wildlife Biologist, Natural Resources Management Branch
Fort Hood, Texas

Bats are economically and ecologically important components of a landscape. Insectivorous bats are primary consumers of nocturnal invertebrates, keeping crop and forest pest populations in check. Bats are also primary pollinators of night-blooming plants, including many cacti and agave species. Despite their importance, bats face threats from wind energy development, White-nose Syndrome, anthropogenic roost destruction, and reduction of foraging habitat. Unless endangered, bats are often not included in DoD natural resource management plans and analyses. Further, bats remain largely understudied on most installations. Herein, I briefly discuss the proactive approach to bat (Order Chiroptera) survey and monitoring undertaken by the Natural Resources Branch at Fort Hood, an 88,000 ha (217,000 ac) Army installation in north-central Texas.

We conducted baseline, planning-level surveys to document and understand the bat fauna at Fort Hood. The surveys were conducted for 2-3 hours after sunset during spring, summer, and fall at 164 riparian sites during a 4-year period. Our assumption was that bats use riparian corridors for feeding, drinking, and travelling, behaviors well-documented in published literature. Sites were selected such that ponds, major rivers, creeks, and their tributaries were sampled across the entire installation. We deployed mist nets, harp traps, and acoustic recording/monitoring equipment to document and record bat presence, feeding activity, bat passes/calls (indirect measure of bat activity), species identification, sex determination, age determination, reproductive status, and morphometric measurements. Using these techniques, we documented six of seven predicted species (2 cave/crevice species, 3 forest species, and one cave/forest species).

The species predicted to occur, but not detected in our surveys is a migratory forest species that overwinters in central Texas. Besides basic scientific data, we also collected valuable data that is useful for management decisions/analyses (species presence and vegetative description of sample site). Currently, we dovetail these data into other management program data, such as wetlands, for a powerful, multi-pronged approach to natural resource management and protection while ensuring maintenance of the Army mission.

Identification, protection, and management of major/minor roosts are another component of our management effort. Fort Hood occurs on a karst landscape with over 600 caves, springs, sinks, and rockshelters (cave-like features on canyon slopes). Although small groups of bats occur in many of the features, several karst sites are critical for the long-term survival of cave/crevice dwelling bats, especially colonial species. We protect and manage a maternity site for 18,000-20,000 cave myotis (*Myotis velifer incautus*), a federal species of concern. Because maternity caves are very rare on karst landscapes, we consulted with Bat Conservation International, and subsequently installed bat-friendly cupola gates on the two entrances to the cave.

The gates protect the bats from anthropogenic disturbance while maximizing bat flow during nightly emergence. We use 0-lux cameras, infrared illuminators, and a thermal imager to conduct monthly emergence counts. We use automated data loggers to record cave microclimate (temperature and humidity) daily during the course of a year. Using these data, we are able to track month-to-month, as well as, year-to-year population and microclimate trends at the cave. We also restored and now monitor two abandoned cave myotis roosts. Both caves historically had several thousand bats; however, the caves were abandoned partly due to vegetation which blocked the entrances and partly from anthropogenic roost disturbance. Despite having a suitable microclimate, the bats have yet to reoccupy the two caves. At



Cave myotis, *Myotis velifer incautus*, emerging from a maternity cave and staging in a bat-friendly cupola gate at Fort Hood, Texas. (Photo by John Peck)

all three roosts, we keep woody and herbaceous vegetation cut short in a 7-m perimeter around the entrances, thereby giving bats ample flight space to emerge and gain elevation above the forest.

We monitor the microclimate and we conduct monthly bat counts at two other caves used by hibernating bats, and at two rock shelters used by bats during the warm season and migration. We use the data from these four sites as an indicator for similar karst sites on Fort Hood that we do not monitor, but are likely to have bats during some point of the year (night roosts, bachelor roosts, migratory roosts, etc.).



Eastern red bat (*Lasiurus borealis*) recovering from mist-net capture and processing, Fort Hood, Texas. (Photo by Charles E. Pekins)

Another component of our management effort is communication with the public about Army stewardship. We conduct outreach to schools, community groups, soldiers, and civilians about the importance of bats to the Fort Hood landscape and what the Army is doing to ensure their long-term viability. Most of this outreach is designed to allay fears and debunk myths associated with bats, while communicating what the public can do to help. We sponsored two Eagle Scouts who built 16 four-chambered bat houses capable of providing ample roosting spaces for approximately 3,000 bats that use Military Operations in Urban Terrain (MOUT) training sites at Fort Hood. Active duty and Reserve soldiers use the MOUTs for pre-deployment training. We also partner with universities and non-profit organizations to further the understanding, management, and protection of bats, their roosts, and the landscapes upon which they depend. Finally, we share our data and findings through publications, articles, and presentations.

By taking a proactive approach to bat management based on the public trust doctrine, we are able to demonstrate responsible management of natural resources while ensuring Fort Hood remains a premier power projection platform. We recommend that other DoD installations strive to understand, protect, and manage their bat fauna before this misunderstood yet important resource continues to decline.

Did You Know?

Traditional burning of bright bonfires at summer's end was common around Halloween. The fires were meant to ward off bad energies and soften the chilly air. The bonfires' brilliant light often attracted plentiful insects as well as their natural predator, bats. As such, bats were a common sight at these fall festivals, and are therefore connected with Halloween's magical theme. Happy Halloween!



Did You Know?

In 1856, the U.S. Congress passed an act giving American citizens the right to peaceably take possession of any unclaimed island containing bat guano (raw manure). This came in handy during the Civil War (1861-1865), helping the Confederates make their gunpowder (using extracts from guano).

Training, Announcements & Events of Interest

Workshops, Interagency Training Announcements and Future Events of Interest to the Conservation Community



SPONSORED! 39th North American Symposium on Bat Research: November 4-7, 2009 in Portland, OR. The North American Society for Bat Research (NASBR) is a society dedicated to the promotion and development of the scientific study of bats (Chiroptera) in all its branches, including conservation and public education. The society holds an annual meeting called the North American Symposium on Bat Research, for professional bat researchers from throughout North America, with occasional attendees from Europe, Asia, Africa, and Central and South America. To register visit: https://secure1.securewebexchange.com/nasbr.org/39_registration/register.php

SPONSORED! Applied Plant Conservation Training: December 7-12, 2009 in Berkeley, CA. This six-day workshop will cover the following topics: legislative protection and regulatory obligations for plant recovery, population evaluation, demography, population viability analysis, plant conservation genetics, restoration and management (ex-situ and in-situ) inventory and monitoring techniques, tools and partnerships, and more. Participants will receive pragmatic tips, information resources, contact lists, and a unique opportunity to have questions answered by experts in the field. **Space is limited to 35 attendees and registration is filling fast, so register now!** For registration and more information contact Anna Strong, Center for Plant Conservation at: Anna.Strong@mobot.org.

SPONSORED! Strategic Management of Invasive Species in the Southeastern United States Workshop: December 7th-11th, 2009 in Chapel Hill, NC. This five-day invasive species course for installation personnel and their strategic partners in the southeastern United States (NC, SC, GA, FL, KY, TN, AL, and MS) is sponsored by the Legacy Program. The workshop will provide participants with the knowledge and resources that will enable them to improve land stewardship by building partnerships and effectively addressing invasive species problems. Invasive terrestrial plants of the southeast will be emphasized. Science and management experts will address pressing ecological issues and explain key components of an invasive species management strategy. Participants will also learn about local, state, and federal invasive species initiatives and regional partnership opportunities. Registration is available online at: <http://invasiveplantcontrol.com/registration.cfm>. Please contact Steven Manning at steve@ipc-inc.org to be placed on a list to receive notices about this workshop.

SERDP/ESTCP Annual Technical Symposium & Workshop: The Partners in Environmental Technology Technical Symposium & Workshop will take place December 1-3, 2009 in Washington, DC. This event is sponsored by the Strategic Environmental Research and Development Program (SERDP), DoD's environmental science and technology program, and the Environmental Security Technology Certification Program (ESTCP), DoD's environmental technology demonstration and validation program. This comprehensive technical symposium and workshop will feature 11 technical sessions and 5 short courses. Technical sessions will highlight research and innovative technologies that assist DoD in addressing increasingly complex environmental and mission sustainability challenges. Short courses on select technologies in the environmental restoration and munitions management areas will offer unique training opportunities on recent advancements in science and technology. For the most up-to-date information about the Symposium, visit www.serdp-estcp.org/symposium. If you have any questions, please e-mail partners@hgl.com or call the Symposium contact line at 703-736-4548.

10th National Conference on Science, Policy, and the Environment: The New Green Economy: January 20-22, 2010 in the Ronald Reagan Building and International Trade Center in Washington, DC. The National Council for Science and the Environment's National Conference engages leading thinkers and doers from a diversity of disciplines, sectors, and perspectives in a structured conversation about the meaning of the green economy and how investments in green education, research and jobs can help to solve both the economic and environmental crises. For more details and registration visit: <http://ncseonline.org/conference/GreenEconomy/>.

Natural Resources Compliance: January 26-29, 2010, in Honolulu, HI and May 11-14, 2010 in Jacksonville, FL. This Natural Resources Compliance course offers instruction in specific natural resource laws, regulations, policies, Executive Orders, DoD Instructions, and other guidance, noting Service-specific requirements. The course

addresses stewardship, preservation, and process; fish, game, and wildlife management laws; protection of wetlands, waterways, and other protected ecological areas; forest and land use management laws; Sikes Act and INRMP; and inter-service cooperation. The course includes a practical exercise, half day tour of a DoD or Coast Guard natural resource site and guest speakers. It is recommended that this course be taken by: Primary duty (Natural and Cultural Resource Managers and personnel, environmental lawyers or lawyers in that capacity), Civil Works Natural Resource Managers (U.S. Army Corps of Engineers), Natural Resources Law Enforcement personnel, and environmental staffs.); collateral duty personnel (non-natural resources specialists responsible for natural resources management and compliance with Federal laws and DoD policy); and personnel having a direct or indirect impact on natural resources during the performance of their duties. This course is approved by the Inter-Service Environmental Education Review Board (ISEERB). There are no tuition costs for this course. It is a 4-day course, from 0730 - 1600 everyday. For more information or to register, please visit:

<https://www.netc.navy.mil/centers/csfe/cecos/>

2010 DoD Pest Management Workshop: Operational Pest Management, New Confrontations with Old Foes:

February 8-12, 2010, Naval Air Station, Jacksonville, Florida. This workshop will include several symposia, vendor displays, social events and an outstanding Plenary Session. Registration for the workshop is electronic: please visit <http://www.afpmb.org/workshopregistration> and complete the online form. A general information page, including workshop agenda and lodging information for the Tri-Service Workshop is now available on the Armed Forces Pest Management Board's web site: <http://www.afpmb.org/meetings/TriService2010/info.htm>.

Migratory Bird Conservation: A Trust Responsibility: February 22 - 26, 2010, National Conservation Training Center, Shepherdstown, WV, (Course Code: ECS2102). Enacted in 1918, the Migratory Bird Treaty Act (MBTA) is an enduring cornerstone of the nation's wildlife conservation laws. This course is designed to give participants a working knowledge of the legal and conservation implications of the MBTA, with special attention to the responsibilities of the Fish and Wildlife Service, through all of its programs, for migratory bird conservation. Partnerships, resources and initiatives which address migratory bird conservation are explored in detail, providing participants an excellent overview of how they can further implement migratory bird conservation. Who should attend: Biologists, natural resource professionals and law enforcement personnel responsible for implementing and administering Federal agency actions that have potential for impacting migratory birds. Length: 4.5 days/ 36 hours (2 College credits available for completing this course.) The course includes a field trip with bird walk and mist-netting demonstration.

The participant will be able to:

- Examine the significant historical events leading to the passage of the MBTA and the four migratory bird conventions and apply this knowledge to strengthen your program activities;
- Determine a statutory migratory bird, understand 'take' and the Service's responsibility and challenges in implementing and enforcing the MBTA and other related bird conservation regulations;
- Explore the existing bird initiatives, resources and partnerships which have been developed to address migratory bird conservation nationally and in your region;
- Determine what permit or regulation applies to a given scenario and which activities require an MBTA permit;
- Develop a proposal for incorporating migratory bird activities at your location.

To register visit the online registration site (<http://training.fws.gov/learn/courses.htm>) and type the course code (ECS2102) in the search box to proceed with registration.

Contacts: For registration: Brenda Hooper, NCTC Phone: 304/876-7449 (brenda_hooper@fws.gov). For content: Karene Motivans, Course Leader, NCTC Phone: 304/876-7458 (karene_motivans@fws.gov)



Recent Natural Resources Documents Online

Reports, Fact Sheets, Photos, Videos



This section highlights recently uploaded reports and factsheets on the Legacy Tracker or on the DENIX website. For Legacy related products, please visit https://www.dodlegacy.org/Legacy/intro/ProductsList_NU.aspx. All Legacy products and many more are available at <https://www.denix.osd.mil/portal/page/portal/denix/environment/NR>. In addition to these two websites, bird-related products are also posted on <http://www.DoDPIF.org>.

COMING SOON! Invasive Species Guidebook for Department of Defense Installations in the Delaware River Basin: (Legacy 08-328) This reports provides a guide for invasive plant species identification, management techniques, how to guide on preventing recurring invasive species and restoring historical plant communities, forming cooperative partnerships to achieve management goals and case studies.

COMING SOON! Grassland Restoration and Management Plan for the Repatriation of the Regal Fritillary Butterfly (*Speyeria idalia*): (Legacy 08-392) In 2007-2008, the Pennsylvania Department of Military and Veterans Affairs Wildlife Office entered into an agreement with multiple landholding agency partners to restore native grasslands within an effort to repatriate the regal fritillary butterfly (*Speyeria idalia*). In an attempt to conserve this rare butterfly species an effort to repatriate (return a native species to an area from which it has been extirpated) regal fritillaries to landholdings having a historic occurrence or probable occurrence was proposed. The objectives of the project are to establish native warm-season grassland habitat to benefit a multitude of species including, but not limited to, the regal fritillary, and to establish a long-term sustainable breeding populations of regal fritillaries outside of Department of Defense managed lands.

Pollinators Fact Sheets: What Can You Do To Help and The Facts About Pollinator: Both of these factsheets can now be found at ([https://www.denix.osd.mil/portal/page/portal/NaturalResources/OtherConservationTopics\(A-H\)/EcosystemServicesandEcosystemManagement](https://www.denix.osd.mil/portal/page/portal/NaturalResources/OtherConservationTopics(A-H)/EcosystemServicesandEcosystemManagement)) and at <http://dodpollinatorworkshop.com>

Fact Sheet: Migratory Bird Monitoring Using Automated Acoustic and Internet Technologies: (Legacy 06-245) Acoustical methods play a prominent role in avian monitoring efforts because many birds can be heard more reliably and at much greater ranges than they can be seen; however several limiting factors may reduce the effectiveness of acoustic techniques. We address the limiting factors of observers monitoring birds acoustically and of protocols monitoring birds that may be missed by traditional observation methods and provide solutions and sample data that enhance DoD's capacity to monitor avian resources on and around DoD lands and analysis and summary of these data. (<https://www.denix.osd.mil/portal/page/portal/NaturalResources/FishandWildlife/Birds>)

Removal of Invasive Fire Prone Grasses to Increase Training Lands in the Pacific: (Legacy 07-362) Determine the effectiveness of three different methods in reducing the surface fuel loads in a guinea grass (*Panicum maximum*) dominated community, thereby reducing susceptibility to sustained fires. Three control treatments were tested including mechanical removal, herbicide application and grazing using cattle to reduce the fuel loads at Marine Corps Training Area Bellows (MCTAB), on the island of O'ahu, Hawai'i. Information on the cost of the various control treatments and their long-term effectiveness in maintaining reduced fuel loads would also benefit land and resource managers in the Pacific Islands where guinea grass and frequent fires are problematic. ([https://www.denix.osd.mil/portal/page/portal/NaturalResources/OtherConservationTopics\(I-Z\)/InvasiveSpeciesInvasiveSpeciesManagement](https://www.denix.osd.mil/portal/page/portal/NaturalResources/OtherConservationTopics(I-Z)/InvasiveSpeciesInvasiveSpeciesManagement))

Did You Know?

Some tropical bats engage in elaborate courtship displays. For example, male epauleted bats sing and flash large fluffs of white shoulder fur to attract mates, while male crested bats perform a spectacular display by expanding long hairs on top of the head, similar to a peacock spreading its tail. At least a few tropical species are monogamous, sharing hunting and family duties. Vampire bats even adopt orphans, unusual for any wild animal.

Photo of the Month

Capturing the beauty of our natural resources



October 2009 Photo of the Month Winner!

Koa butterfly (*Udara blackburnii* - one of only two butterflies native to Hawaii), sitting on the flower of Hawaii's endemic, endangered *Sanicula mariversa* plant.

Submitted by *Natural Selections* reader: Kapua Kawelo, Biologist,
Oahu Army Natural Resources Program, Honolulu, HI



Did You Know?

Little Did You Know Conservation Could Be So Much Fun!



Important Facts About Bats! More than 900 species of bats occur worldwide; they are most abundant in the tropics. Bats are second only to rodents in numbers among mammals and comprise about one-fifth of all mammal species.

Worldwide, bats vary in size from only slightly over two grams (0.07 ounce—about the weight of a dime) to more than 1.5 kilograms (more than 3 pounds). The large "flying foxes" of Africa, Asia, Australia, and many Pacific islands may have a wingspan up to two meters (6 feet). United States bats vary in size from less than three grams (0.11 ounce) to 70 grams (2.5 ounces). The largest United States bat, the greater mastiff bat (*Eumops perotis*) occurring from central California south into Mexico, has a wingspan of approximately 55 centimeters (22 inches).

Bats are the only true flying mammals, and their maneuverability while capturing insects on the wing is astonishing. Bats belong to the mammalian order Chiroptera, which means "hand-wing." The bones present in a bat's wing are the same as those of the human arm and hand, but bat finger bones are greatly elongated and connected by a double membrane of skin to form the wing.

Bats are primarily nocturnal, although many fly early in the evening, sometime before sunset. Occasionally, especially on warm winter days, they are observed flying during daylight hours.

Most female bats produce only one offspring per year, although some species give birth to three or four babies at a time. Most United States bats breed in autumn, and the females store sperm until the following spring when fertilization takes place. Pregnant females may congregate in maternity colonies in buildings, behind chimneys, beneath bridges, in tree hollows, caves, mines, or other dark retreats. No nests are built. Births typically occur from May through July. Young bats grow rapidly and are able to fly within three weeks. Weaning occurs in July and August, after which the nursery colonies disperse. Bats live relatively long lives for animals of their small size, some as long as 30 years.

Bats prepare for winter around the time of the first frost. Some species migrate relatively short distances, whereas certain populations of the Mexican free-tailed bat may migrate up to 1,000 miles (1,600 km). Bats in the northern United States and Canada may hibernate from September through May. Hibernation for the same species in the southern part of their range may be shorter or even sporadic. Some may fly during warm winter spells (as big brown bats may in the northeastern part of the United States).

In response to a variety of human activities, direct and indirect, several bat species in the United States have declined in number during the past few decades. Chemical pesticides (particularly the use of persistent and bioaccumulating organic pesticides) may have decreased the insect supply, and contaminated insects ingested by bats may have reduced bat populations. Many bats die when people disturb summer maternity roosts and winter hibernacula. Vandals and other irresponsible individuals may deliberately kill bats in caves and other roosts. Even the activities of speleologists or biologists may unintentionally disturb hibernating bats, which depletes fat reserves needed for hibernation.

Modification and destruction of roost sites may have decreased bat numbers. Sealing and flooding of mineshafts and caves and general quarrying operations may inadvertently ruin bat harborages. Forestry practices have reduced the number of hollow trees available. Some of the elimination of natural bat habitat may also contribute to bats roosting in buildings.



Did You Know? Despite their notoriety, vampire bats make up only a small portion of all bats (there are only three species), and they live only in Latin America. With the exception of three species of nectar-feeding bats that live along the Mexican border of Arizona and Texas, all bats in the United States and Canada are insectivorous. Source: Bat Conservation International. Photo: Adrian Warren

Portions of this month's Did You Know? are excerpts from: <http://www.extension.org/faq/790> and <http://www.fws.gov/Endangered/bats/biology.htm>

Links of Interest on the Web

Useful URLs



Bat Conservation International: <http://www.batcon.org> BCI, based in Austin, Texas, is devoted to conservation, education and research to protect bats and their ecosystems around the world.

DoD Legacy Resource Management Program: <https://www.dodlegacy.org> DoD program that provides funding to natural and cultural resource projects that have regional, national, and/or multi-Service benefit. The Legacy Tracker lets you download fact sheets and reports for completed Legacy funded projects.

DoD TER-S Document Repository: http://www.nbio.gov/portal/community/Communities/Ecological_Topics/Threatened_&_Endangered_Species/DoD_TES_Document_Repository/ A compilation of DoD Threatened and Endangered Species (TES) documents and data made available online through NBII. The information contained within these documents is considered "gray" literature (i.e., not peer reviewed).

Biodiversity Handbook: <http://www.dodbiodiversity.org> On this website you will find a thorough introduction to biodiversity and how it applies to the military mission; the scientific, legal, policy, and natural resources management contexts for biodiversity conservation on DoD lands; and practical advice from DoD natural resource managers through 17 case studies. A Commander's Guide to conserving biodiversity on military lands is also available.

DoD Partners in Flight: <http://www.dodpif.org> The DoD PIF Program supports and enhances the military mission while it works to develop cooperative projects to ensure a focused and coordinated approach for the conservation of resident and migratory birds and their habitats.

DoD Pollinator Workshop: <http://dodpollinatorworkshop.com> Provides an overview of the 2009 NMFVA workshop on pollinators. Many useful resources available including factsheets and technical reports, pocket guides to identifying pollinators, and links to other websites on pollinators.

DoD Invasive Species Outreach Toolkit: <http://www.nistoolkit.com> In order to help installation natural resource managers protect the natural resources on our nation's military lands, the Legacy Program developed the Invasive Species Outreach Toolkit. The Toolkit is an education and outreach tool to help DoD land managers communicate about invasive species. It contains modifiable outreach materials such as posters, brochures, reference cards, and a PowerPoint presentation. A list of resources to help identify information and funding sources is also included.

DENIX: <https://www.denix.osd.mil> DENIX is an electronic environmental bulletin board that provides access to environmental information, such as Executive Orders, policies, guidance, INRMPs, fact sheets, and reports.

DoD Partners in Flight: <http://www.dodpif.org> The DoD PIF Program supports and enhances the military mission while it works to develop cooperative projects to ensure a focused and coordinated approach for the conservation of resident and migratory birds and their habitats.

Cooperative Ecosystem Studies Unit Network CESU): <http://www.cesu.psu.edu/> This network of 17 cooperative units provides research, technical assistance, and training to federal resource and environmental managers. DoD is a member of 12 units of the Cooperative Ecosystem Studies Units National Network.

DISDI Portal: <https://rsgis.crrel.usace.army.mil/disdicac> (DoD only, CAC required) The DISDI Portal offers high-level geospatial data on DoD's installations, providing strategic maps of installations and information on how to access more detailed data. IVT data forms the foundation for the DISDI Portal, which is accessible to DoD staff with a common access card.

PARC - Partners in Amphibian and Reptile Conservation: <http://www.parcplace.org/> Partners in Amphibian and Reptile Conservation (PARC) is an inclusive partnership of individuals and entities dedicated to the conservation of amphibians and reptiles (i.e., herpetofauna) and their habitats as integral parts of our ecosystem and culture through proactive and coordinated public/private partnerships.

Strategic Environmental Research and Development Program (SERDP): <http://www.serdp.org/> SERDP identifies, develops, and transitions environmental technologies that relate directly to defense mission accomplishment.

Environmental Security Technology Certification Program (ESTCP): <http://www.estcp.org/> A DoD program that promotes innovative, cost-effective environmental technologies through demonstration and validation at DoD sites.



Contact Us

Who we are and where to find us!



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