Fall 2016

Natural Selections

Department of Defense Natural Resources Program

CONTENTS

AQUATIC EDNA SAMPLING PROTOCOL FINALIZED

Blue Ridge Two-lined Salamander (Eurycea wilderae). Source: Paul Block

The National Genomics Center for Wildlife & Fish Conservation published their final protocol for environmental DNA (eDNA) sampling of aquatic organisms in streams. eDNA is DNA that a species has released into the air, water, or soil. Sampling for eDNA is a faster and less expensive approach for detecting a species' life stage, disease status, reproductive status, diet, habitat structure, and density than traditional methods. However, sampling for eDNA is a difficult process that requires scientists to follow strict protocols to avoid sample contamination. The final report provides a sampling protocol designed for detecting fish in streams. Researchers have used the protocol to collect data reported in multiple peer-reviewed journal articles and also data from over 5,000 samples; there have been no cases of field contamination while using this protocol. In addition, the report provides the following information:

- Three tips to remember before heading to the field site;
- An overview of the tools and materials that every eDNA sampling kit should include;
- Standard procedures for avoiding sample contamination;
- Guidance for choosing a sampling location at a field site;
- Guidance for troubleshooting any issues while sampling; and
- An overview about control samples and sampling objectives.

View the full report online at http://www.fs.fed.us/rm/pubs/rmrs_gtr355.pdf.

SPOTLIGHT: DRAFT DOD GOPHER TORTOISE CONSERVATION AND CREDITING STRATEGY PROPOSES NEW MODEL FOR AT-RISK SPECIES MANAGEMENT

By Ryan Orndorff, Deputy Program Director, DoD Readiness and Environmental Protection Integration (REPI) Program; Tad McCall, Program Manager, Texas A&M Institute of Renewable Natural Resources (IRNR); and Stephanie Hertz, Program Coordinator, Texas A&M IRNR

Gopher Tortoise

Under the Endangered Species Act (ESA), a species may warrant protection through listing if it is endangered or threatened throughout all or a significant portion of its range. For military installations that host such species, management requirements following a species listing under the ESA can result in restrictions to vital testing, training, and operational activities and cause costly workarounds. The gopher tortoise (*Gopherus polyphemus*) is one such species. The gopher tortoise is a long-lived, native burrowing species of the open, fire-maintained longleaf pine ecosystem in Alabama, Louisiana, Mississippi, Florida, Georgia, and South Carolina. Gopher tortoises are considered to be keystone species (a species that other species in an ecosystem depend on and, if removed from that ecosystem, could drastically impact those other species) because their burrows provide shelter to hundreds of additional species. The Western Population of gopher tortoise is already listed under the ESA as a threatened species; the Eastern Population, found in Alabama, Florida, Georgia, and South

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MESSAGE FROM THE DIRECTOR

By Alison A. Dalsimer, Program Director, DoD Natural Resources

This edition of *Natural Selections* highlights a "Top Species" theme. The species chosen are not intended to serve as a definitive list; rather, they are intended to represent the hundreds of species that DoD manages across the Military Services, in various types of natural systems, and from both the listed/at-risk and noxious perspectives. Based on expenditures, management burden, mission impacts, geographic and taxonomical spread, and – not least – availability of authors to write articles, we are highlighting the following species: whales, arroyo southwestern toad, cheatgrass, gopher tortoise, monarch butterflies, bats & white-nose syndrome, brown treesnakes, red-cockaded woodpecker, grassland birds, and feral swine.

In fiscal year 2015, of the estimated $3.5 billion spent on its Environmental Management Programs, DoD spent about $300 million managing natural resources (NR), including over $115 million on listed species, with birds, marine and terrestrial mammals, plants, and reptiles topping the list. Broadly speaking, the Military Services spent NR funds to implement projects that help ensure continued access to the land, air, and water resources needed to accomplish vital testing, training, and operational activities. Spending is all compliance driven. Because DoD spent a significant portion of these funds on listed species and their habitats, it's clear that we all benefit when management efforts prevent species' listings and when the efforts are sufficient to down-list or delist species. To help, this office intends to work closely with both internal and external partners to support activities that facilitate species recovery and that help preclude species from being listed. We will work to spread the word about these efforts to encourage information and technology transfer, and to help our programs earn the recognition and support they deserve.

On the opposite end of the spectrum lies non-native invasive species (NIS). We don't have a good handle on how much we're spending to manage, control, and eradicate NIS, but it's undoubtedly a lot. Each year, DoD is asked to provide this information to the National Invasive Species Council. We provide the direct funding DoD awards through the Strategic Environmental Research and Development Program, Environmental Security Technology Certification Program, and Legacy Resource Management Program, but that amount is likely a fairly small fraction of what's actually being spent. One thing is certain: preventing the spread of invasives is more cost effective and results in less damage than trying to control or eradicate them once they're established or widespread. The challenge, of course, is that there is no compliance driver to prevent NIS establishment… at least not yet.

Another challenge this office is working to address is training. As many of you know, the Sikes Act requires that DoD maintain an adequately trained work force to manage its NR assets. Due to travel restrictions, it has become increasingly difficult for NR professionals to maintain their certifications and keep up to date with new and evolving technologies and information. While what we can do at this level is limited, travel restrictions do seem to be easing a bit. This year, we secured endorsement letters for personnel to attend the March National Military Fish and Wildlife Association and the recent IUCN World Conservation Congress. In addition, DoD leadership will be hosting another Sustaining Military Readiness (SMR) Conference.

For those not familiar with the SMR, DoD has hosted three of these events (2009, 2011, 2013). The purpose is to bring together personnel from across the pillars – range and operations, test and evaluation, and conservation – to share ideas, information, technology, and perspectives from all quadrants that use and care for DoD lands. The next conference will be in Galt House, Louisville, KY, September 25-28, 2017. We'll send details when they are available via Chain of Command communications and through e-distributions.

Finally, I can't do it alone. If you want to raise awareness about the ways NR management efforts benefit mission activities, if you want to attend conferences and training classes, or if you simply want to see your budgets stop shrinking, then you have to help. How? By sharing information and successes…

If you completed a project that allows a training maneuver or equipment test to proceed, write it up and send it in! If you participated in a partnership that unencumbers training lands, write it up and send it in! If you collaborated with partners on or off the installation to enable mission activities, write it up and send it in! A short paragraph describing the NR activity and resulting mission benefit is enough. Make sure you get approvals before you send it. I am compiling a list of examples and accomplishments to tell the "so what?" story. If we can do a better job telling our story, we should be more successful getting support for our programs.

On a personal note, I want to welcome Megan Scanlin to the NR Program. Megan has over 13 years of environmental science and policy, NR compliance, and environmental planning experience. For the past 11 years, she supported NR programs for the Navy and Marine Corps.

Until next time, keep up the great work you all do every day! Alison

Carolina, is a candidate for federal listing and is protected under state law. If the Eastern Population becomes listed under the ESA, restrictions on military activities may become necessary at some installations and ranges.

Because of this concern, DoD is currently developing a pilot initiative that promotes off-base conservation measures that may assist in precluding the need to list a species, and will allow for future regulatory flexibility related to military testing, training, and operational activities if a species is indeed listed. Once finalized, the pilot initiative will provide natural resources managers with a framework that can be adopted to proactively address other at-risk species at DoD installations around the United States whose listing could impact mission flexibility.

The DoD Gopher Tortoise Conservation and Crediting Strategy (Strategy), currently under development, is a collaborative conservation effort among DoD, the U.S. Fish & Wildlife Service, and the states of Alabama, Georgia, Florida, and South Carolina. The Strategy builds off the decade-long cooperative range-wide efforts championed by the Southeast Regional Partnership for Planning and Sustainability (SERPPAS). Following the petition to list the species in 2006, SERPPAS partners worked together to develop the gopher tortoise Candidate Conservation Agreement (CCA) to leverage knowledge and conservation actions within a common approach and framework. The Strategy exists only because of the years of work under the CCA dedicated to understanding and protecting the gopher tortoise.

With the ongoing development of science-based standards and practices from the CCA, the Strategy furthers the conservation of the species by working toward a net conservation benefit for the Eastern Population. By addressing conservation needs range-wide, this initiative may help to preclude the need for listing. The Strategy focuses on high-priority conservation lands that host important gopher tortoise populations, but are not under permanent conservation management. Acquisition of such lands and management to conserve gopher tortoises will protect viable populations and the best remaining habitat, increase the size and/or carrying capacity of those viable population areas, and promote the establishment of new viable populations.

The Strategy will also provide participating DoD installations a substantial degree of regulatory predictability in the event the gopher tortoise becomes listed under the ESA. Participating installations will have available quantifiable "credits" in light of the conservation actions implemented under the Strategy. DoD natural resources managers can use these credits during ESA consultations and in concert with other conservation activities included in installation Integrated Natural Resources Management Plans to ensure current and reasonably foreseeable mission activities on the installation will continue without the need for additional restrictions.

For more information regarding the DoD Gopher Tortoise Conservation and Crediting Strategy, please reach out to Ryan Orndorff, Deputy Program Director, DoD REPI Program.

U.S. NAVY – DEFENDING FREEDOM WHILE STUDYING MARINE MAMMALS

By Danielle Kitchen, Marine Resources Specialist, Chief of Naval Operations

The U.S. Navy's mission is to operate at sea 24 hours a day, seven days a week, providing security for our nation and allies. While conducting that mission, the Navy also has a responsibility to serve as a good steward of the environment. The Navy demonstrates that commitment by complying with environmental laws, and investing in programs that minimize the effects of our activities on the environment. Federal environmental laws and regulations that apply to marine mammals and other protected marine species include the Endangered Species Act and the Marine Mammal Protection Act. To comply with these Acts, the Navy's training and testing commands conduct mitigation and monitoring to understand and minimize the potential for our actions to affect marine species.

Two humpback whales being photographed by researchers from HDR Inc. off the coast of Virginia Beach, Virginia. Chesapeake Bay Bridge-tunnel in the background. Source: Brian Lockwood (Jetski Brian)

The Navy is also a world leader in funding marine mammal research, investing over $300 million in the last decade. Much of this research focused on understanding marine mammal physiology, behaviors, species distribution, and abundance. The Navy commits funding in these areas to assist environmental planners, range operators, regulatory agencies, and other stakeholders in making informed decisions during the environmental permitting process for Navy training and testing activities.

Since 2014, the U.S. Navy and researchers at Oregon State University have been collaborating to deploy long-term satellite tracking and short-term dive behavior tags on blue and fin whales along the California coast. The project also collects whale tissue samples for genetic analyses and population structure assessments. The study's objectives are to improve understanding of the occurrence, movement patterns, foraging strategies, and residency times of these species within the Navy's west coast at-sea ranges as compared to their distribution throughout the Pacific Ocean. Through the 2016 summer field season, researchers attached 98 tags to 65 blue whales, 32 fin whales, and one Bryde's whale. Results documented over 148,000 nautical miles of whale movement, with the longest single tag duration lasting 304 days.

The Navy initiated a project in 2015 in the mid-Atlantic region off Virginia Beach, Virginia, to understand the distribution and movements of North Atlantic humpback whales during their winter migration to the Caribbean Sea. Despite humpback whale sightings off Virginia Beach, information on their specific

movements is limited, and more data are needed to assess the potential effects on this species from Navy training activities. The study's objective is to establish baseline occurrence and behavior data for humpback whales through visual surveys and satellite-linked tracking tags.

Through such monitoring and research projects, the Navy seeks to better understand and reduce the potential impact of military readiness activities on marine mammals while preserving core Navy capabilities. Data from these and other studies will enable the Navy to mitigate impacts while maintaining our statutory mission to adequately train naval forces and ensure that the equipment those forces use is adequately tested.

For more information on the Navy's marine mammal research and monitoring initiatives, please visit the U.S. Navy Marine Species Monitoring website, the Office of Naval Research, Science and Technology website, Living Marine Resources Program website, and the U.S. Navy Energy, Environment, and Climate Change website.

STEPPINGSTONES CORNER: VIEW FROM THE EYRIE

By Richard A. Fischer, PhD, DoD Bird Conservation Program Coordinator

I just returned from southern California and was fortunate to have seen and heard least bell's vireo (LBVI) late in the season before their departure to their wintering grounds in the Baja peninsula of Mexico. I was working at the U.S. Army Corps of Engineers (USACE) Prado Reservoir southeast of Los Angeles to establish field sites for riparian habitat rehabilitation that would benefit LBVI and other riparian species. USACE has proactively managed habitat for LBVI at Prado and currently has more than 400 nesting pairs in the basin. I also was at Marine Corps Base Camp Pendleton earlier in the summer, where management for LBVI along the Santa Margarita River is providing another stronghold for the species. With such robust localized populations of the vireo, is it possible to achieve rangewide recovery? How can DoD work cooperatively with USACE, and with other federal agencies, to help recover listed species? These are questions of great interest to many, and the focus of a new effort within USACE.

LBVI on Naval Weapons Station Seal Beach Detachment Fallbrook in north San Diego County, California. Source: U.S. Navy photo by Tamara Conkle

Currently, USACE and the Military Services collectively spend about $400 million annually on listed species conservation and compliance, often with little return on investment for DoD as well as the species of focus in biological opinions (formal assessment of how DoD efforts will impact species of interest). We need to investigate alternative strategies to reduce costs, enhance mission capabilities, and increase species baselines that could assist in recovery. I am Program Lead for the U.S. Army Engineer Research and Development Center (ERDC), Environmental Laboratory, Threatened and Endangered Species Team (TEST). ERDC is investigating alternative approaches and solutions to reduce costs and mission impacts, as well as to improve species conservation and recovery efforts. A big part of TEST is to develop strategic collaborations both internally, and externally, as a way to build partnerships and facilitate progress. TEST is the platform for initiating and coordinating Endangered Species Act (ESA) Section 7(a)(1)) species recovery efforts. The 7(a)(1) framework includes Conservation Planning, within USACE and with coordination among other federal agencies, and is being used to address both federally listed and at-risk species. This proactive approach allows greater control over species/management interactions (and possibly, lower costs) than the terms and conditions that typically result from increased ESA listings, or Section 7(a)(2) consultations. Increasing the use of 7(a)(1) is a major objective of the TEST program.

As part of the TEST strategy, ERDC is planning for a fiscal year 2017 riparian restoration demonstration "hands-on" workshop at Prado Reservoir near Los Angeles, California and Cochiti Reservoir, near Santa Fe, New Mexico. Our objectives are to demonstrate feasibility of establishing vegetated riparian areas along reservoir shorelines and tributaries that provide both water quality protection and improvement, and habitat for regionally sensitive riparian-dependent species, such as LBVI. Our focus is on testing and demonstrating various techniques that ultimately could be used internally, and by partners, for the conservation of three listed riparian bird species (southwestern willow flycatcher, LBVI, and the western yellow-billed cuckoo). Ultimately, TEST will identify other federal and non-federal partners that could work collaboratively to reduce the stressors on listed species, build habitat, and monitor, all in the name of working toward recovery of those species where we have the collective management capabilities.

To move forward with this effort, TEST developed a geospatial database to incorporate maps of known distributions of the federally listed species along with federal landholdings. The U.S. Fish and Wildlife Service has developed Area of Influence maps that include these species' range maps. We are working now to integrate them into a geographic information system mapping effort to help with, and better refine, habitat rehabilitation site selection and possible partnering opportunities. Aside from the current focus in the southwestern U.S., TEST is exploring opportunities and partnerships for other listed and species at-risk throughout the country. If you have any ideas that might fit within this framework, please do not hesitate to contact me directly (Richard.A.Fischer@usace.army.mil).

ARROYO TOAD (*ANAXYRUS CALIFORNICUS*) CONSERVATION BY THE MILITARY SERVICES

By Robert E. Lovich, Ph.D., Naval Facilities Engineering Command (NAVFAC) Southwest-DoD Partners in Amphibian and Reptile Conservation (PARC) National Technical Representative, and Chris E. Petersen, NAVFAC Atlantic-DoD PARC National Representative

The arroyo toad (*Anaxyrus californicus*) is a small toad species that was listed under the Endangered Species Act (ESA) as endangered in 1994. It inhabits rivers and streams of coastal southern California, from Monterey County southward into northern Baja California, Mexico. The arroyo toad occurs almost exclusively in coastal streams and rivers of California and Baja California, Mexico, with a few populations in Mojave Desert drainages of the San Gabriel and San Bernardino Mountains. It grows to 5–8 cm in length (not including the length of the tail), is olive green or gray to light brown in coloration, and has dark spots and small warts. A prominent white "v-shaped" stripe crosses the top of the head between the eyes. This species is a member of the "*microscaphus*" complex of toads, and one of three species in this complex of disjunct southwestern toad species including the Arizona toad (*Anaxyrus microscaphus*: Arizona and New Mexico) and the Mexican Toad (*Anaxyrus mexicanus*: Northwestern Mexico). The arroyo toad occurs on Army, Navy, and Marine Corps installations in California.

Arroyo Toad. Source: Robert Lovich

The conservation of this species is emblematic of riparian and aquatic species in the arid Southwestern U.S., especially California. Water is scarce in these locations, despite having massive human populations and urban sprawl that require water for human populations, industry, recreation, and survival. The arroyo toad primarily inhabits broad, sandy floodplains of streams and rivers that are now filled in with sandy sediment. In these habitats, the species burrows in the dry season in the soft alluvium, and also breeds and calls from waters that are best characterized as places where the toads can be in the water, but not under the water and submerged. These sandy "sheet-flows" of shallow water are increasingly uncommon throughout the species' range as waters have been concreted, controlled, filled for reservoirs and dams, depleted by groundwater pumping, removed for aggregate by sand mining, and compromised by recreation that causes siltation of egg masses in the breeding season of late Spring and early Summer. Climate change and increased aridity in the southwest pose additional, real, documented threats to the arroyo toad.

Survey site at Las Palmas, Baja California, Mexico. Source: Robert Lovich

Survey site at San Vicente, Baja California, Mexico. Source: Robert Lovich

The arroyo toad resides at four different military installations in California, including Marine Corps Base Camp Pendleton, Naval Weapons Station Seal Beach Detachment Fallbrook, Fort Hunter Liggett, and Naval Base Coronado Remote Training Site Warner Springs. All of these installations have been heavily involved with the conservation and management of this species, and likewise have contributed heavily to the understanding of its ecology and life history. Since the arroyo toad was first listed as endangered in 1994, these installations have invested in surveying and monitoring for the species, developed peer-reviewed population monitoring, and contributed heavily to the understanding of how the species disperses and inhabits adjacent upland habitats for foraging and aestivation. In addition, installation personnel have removed hundreds of thousands of non-native invasive predatory species, hosted researchers studying the species, conducted some of the first telemetry and home range studies on the arroyo toad, and hosted focused symposia dedicated to the species. The efforts put forth by these installations for the arroyo toad are no trivial matter and have cost DoD tens of millions of dollars. Beyond the financial contributions, the installations' staff have poured countless person-hours into direct fieldwork preventing the decline of this endangered species, and simultaneously managed the species and implemented measures to avoid interfering with military training requirements.

The arroyo toad inevitably presents challenges to the military testing and training mission. Protection of its habitat is vital to its recovery. Maintaining a buffer from riparian habitats, and using identified crossings by military troops and equipment, especially during the breeding season, provides some of the needed year-round protections. Removing non-native predators, and monitoring specific projects and removing toads from within the project footprint is also beneficial to the arroyo toad. Installations are considering and pursuing offsite mitigation, but the arroyo toad's habitat is difficult to find and procure within extant populations.

As stated in Federal Register 59(241):64589–64866, down-listing of the species from endangered to threatened under the ESA is dependent on securing 20 populations of the species throughout its range in the three recovery units defined by the U.S. Fish and Wildlife Service (USFWS). This was considered achievable in recent years as USFWS pursued down-listing, but the package was withdrawn in 2015. As stated in Federal Register 80(246):79805, "…threats to the arroyo toad remain the same as at the time of listing and are ongoing, and new threats have been identified." De-listing the species completely from the ESA requires an additional self-sustaining 15 populations for a total of 35 populations in the U.S. While no new populations have been discovered on military lands since the listing of the species, DoD continues to sustain and enhance existing populations on its installations.

The senior author has worked extensively with this species. It should not be surprising that the military installations listed above contain some of the finest riparian habitats in the entire region, and arguably the densest populations of arroyo toads anywhere within their range. Somewhat surprisingly, in the less-densely populated rivers of Northern Baja California, the threats to the species are and have been largely the same. Arroyo toads face identical threats and challenges in Mexico.

San Antonio Creek located at Fort Hunter Liggett, California. Source: Robert Lovich

The security and management afforded the species in the U.S. goes well beyond managing the species, or "checking the box" for compliance. DoD is a leader in conserving the species, and the same efforts directly benefit dozens of other river and stream threatened and endangered species such as the southern steelhead, least bell's vireo, southwestern willow flycatcher, tidewater goby, and more. With a little luck in the form of rainfall to sustain the streams and rivers in the region, and persistent protections of riparian habitats by the military and its partners, the arroyo toad's recovery is achievable. DoD maintains a superior commitment to conserve and manage the arroyo toad, which provides society the rare opportunity to hear the unique and distinct call of this species in the warm night air.

If you would like more information on this species, or if you would like to participate in any DoD PARC related projects or activities, please contact Chris Petersen or Rob Lovich, or visit the DoD PARC website.

CHEATGRASS – INVASIVE SCOURGE OF WESTERN MILITARY TRAINING LANDS

By Douglas A. Burkett, PhD, DoD Armed Forces Pest Management Board

CG. Source: Steve Dewey, Utah State University, Bugwood.org

This is not a drill. In 1949, conservation visionary Aldo Leopold wrote about the growing scourge of invasive cheatgrass (CG) and the consequential permanent impacts to native flora and fauna, and wildfire ecology. He was right. CG, or downy brome (*Bromus tectorum*), is now the most significant invasive grass species in the Great Basin region and other areas of the western U.S. CG dominates millions of hectares of low- to mid-elevation landscapes while forcing out native plant and animal species. Early maturation and high productivity, associated changes in soil biota and nutrient cycles, and increases in fire frequency all adversely impact ecosystems affected by CG on multiple western military reservations. Increased wildfire cycles, and worse, introduction of the fire prone CG to previously non-fire adapted ecosystems, makes ecosystems favorable to invasive annual species at the expense of native perennials. CG draws soil moisture and nutrients down to very low levels, making it difficult for other plant species to compete and for native species to re-establish their population. The resulting CG-invaded areas often degrade into extensive and difficult-to-control monocultures with limited native shrub and grass cover.

On affected military lands, CG impacts readiness training because it causes increased fire probability and frequency, and associated air quality and fugitive dust problems. Wildfire spread outside of military lands becomes an expensive legal and safety liability. Likewise, degraded native habitats impact sensitive wildlife species. In particular, several raptor species and greater sage grouse habitats are under scrutiny from regulatory, political, and environmental pressures that can restrict training opportunities to particular times of the year.

Issues associated with CG are surprisingly complex. CG and other invasive grasses disrupt training scheduling and timing of live fire exercises, commonly require Endangered Species Act consultations, out-compete native species for scarce water resources, and disrupt entire ecosystems due to the ecosystem shift to fire prone landscapes that kill native flora and fauna. Some of the affected military reservations include Hill Air Force Base (AFB) (Utah Test and Training Range), Utah; Dugway Proving Grounds, Utah; Tooele Army Depot, Utah; Yakima Training Center, Washington; Hawthorne Army Depot, Nevada; Wyoming National Guard, Wyoming; and Mountain Home AFB (Saylor Creek Range), Idaho.

Unfortunately, CG management is difficult and expensive. Minimizing the spread of the seed through equipment wash-down, as well as early detection is critical. Chemical controls commonly include pre-emergent, a selective herbicide containing Imazapic. This compound is used for broadcast, backpack, or aerial applications on impact areas, or for creating firebreaks on some western ranges. Proper timing of mowing or grazing before seed production can be effective if done properly. Some promising, but expensive, bacterial and fungal-based biocontrol agents are in development and may eventually be registered by commercial sources. Sadly, due to the reproductive biology of CG, this species does not appear to be a candidate for future genetic or gene-driven control mechanisms.

Fortunately, Installation Natural Resource Management Plans, Pest Management Plans, National Environmental Policy Act documents, and ESA consultations address mission impacts from CG and other invasive grasses. In closing, DoD must constantly balance its military mission and its environmental stewardship responsibilities. Invasive species such as CG are complex, expensive, and must be properly managed to prevent additional land use restrictions from species endangerment, safety and other land management concerns, environmental group pressures, and regulatory drivers.

Additional information on military-relevant invasive species is available on the DoD Natural Resources Program's invasives website.

BASELINE FUNGAL COMMUNITY ANALYSIS AND INVESTIGATION FOR *PSEUDOGYMNOASCUS DESTRUCTANS* IN RESPONSE TO THE THREAT OF WHITE-NOSE SYNDROME AT FORT HOOD, TEXAS

By Barrett R. Clark, Biologist, Zara Environmental LLC

To further DoD's mission of investing in bat management while facing the threat of white-nose syndrome (WNS), the DoD Legacy Resource Management Program (Legacy) funded a novel research study (Legacy Project 14-766) at Fort Hood in central Texas to investigate and develop early detection protocols through environmental sampling for *Pseudogymnoascus destructans (Pd)*, the pathogenic fungus that causes WNS in affected bats. Likely introduced from Eurasia, this cryophilic (cold loving) fungus has caused the death of millions of bats since it was identified in upstate New York in 2006. Since its discovery, *Pd* and WNS have spread rapidly across North America, with reports in 32 states and 5 Canadian provinces as of July, 2016. Recently, new records of *Pd* have occurred in Oklahoma and Arkansas. Continued *Pd* expansion puts a focus on the protection of resources in adjacent states, such as Texas, that are on the threshold of the disease. Due to potential migratory connections to neighboring, affected regions, infected bats could eventually introduce the disease to healthy bats living in or migrating to unaffected areas.

A biologist collects cave soil for the analysis of subterranean fungi, including Pseudogymnoascus destructans, the pathogen that causes WNS in bats. Source: Charles Pekins, U.S. Army, Fort Hood Natural Resources Management Branch

Texas is an important region for bats in North America, and the state is home to 32 species with known migratory paths into Oklahoma and Arkansas. Some of these bats are capable of introducing *Pd* to Texas, including Fort Hood. This 214,968-acre Army training facility hosts colonies of tri-colored bats (*Perimyotis subflavus*) and cave myotis (*Myotis velifer*). In 2015, biologists sampled soil, guano, dead bats and mice, and swabs from the walls of caves that harbor these two species at Fort Hood. Laboratories at the University of Illinois and National Wildlife Health Center in Madison, Wisconsin, analyzed the samples using molecular tools to detect fungal genetic material, including a specific analysis for *Pd*.

Although none of the samples tested positive for *Pd*, researchers identified other intriguing fungi during the study, including the closely related *Geomyces* and another species of *Pseudogymnoascus*, both of which, like *Pd*, typically thrive in cooler conditions. While neither are associated with WNS, their detection highlights the priority of monitoring bats in warmer regions and demonstrates that the cool climate in Texas caves offers a comfortable refuge for *Pd*. Other detected fungi include known human pathogens and other species that are rarely reported from the environment but are sometimes found in clinical settings.

DoD's objective is to maintain mission readiness in the event of positive detection of *Pd*. Maintaining active monitoring efforts facilitates communication and planning for proactive management of resources. Being able to detect *Pd* before bats exhibit WNS symptoms will allow DoD natural resources managers to implement monitoring programs and prevention measures to advance DoD's goals described in the National Plan for Assisting States, Federal Agencies, and Tribes in Managing White-Nose Syndrome in Bats. Studies like DoD's effort at Fort Hood are crucial for contributing to the understanding of this emerging and ecologically damaging disease while filling regional information gaps on the poorly understood nature of subterranean fungal communities.

Researchers collecting samples and recording data in a cave at Fort Hood, Texas. Source: Barrett Clark, Zara Environmental LLC

ENDANGERED SPECIES ACT IMPLEMENTATION COURSE

The online Endangered Species Act (ESA) Implementation Course highlights DoD's responsibilities for complying with ESA requirements on installations. During the course, participants learn about important topics such as ESA Section 7 consultations, critical habitat designations, and major sections of the ESA. The course also explains the ways in which the ESA relates to the Marine Mammal Protection Act, National Environmental Policy Act, and Administrative Procedures Act, including creating and maintaining a complete Administrative Record.

Through case studies from the Army, Air Force, and U.S. Marine Corps, course participants learn strategies for facilitating regulator and stakeholder cooperation while protecting natural resources to ensure no net loss in mission capability. Specific case studies include red-cockaded woodpecker management on Army lands, a U.S. Fish and Wildlife Service (USFWS) consultation for U.S. Marine Corps build-up on Guam and the Mariana Islands, and Air Force coordination with a USFWS liaison to manage forest structure and expand red-cockaded woodpecker colonies.

This course is approved by DoD, and all instructional materials have been reviewed and approved by the Military Services and the Deputy General Counsel (Environment, Energy & Installations).

The course is available online to those with access to the secure side of the DoD Environment, Safety and Occupational Health Network and Information Exchange.

RECOVERY STATUS OF THE RED-COCKADED WOODPECKER

By Jacqueline J. Britcher, Chief, Endangered Species Branch, Fort Bragg

Red-cockaded woodpeckers (RCWs) were once common throughout the biologically diverse longleaf pine ecosystem, which covered approximately 90 million acres across the southeastern U.S. before European settlement occurred in the 1700s. RCWs are the only species that create nest cavities in live pines that are typically over 80 years old; this is a unique adaptation in a forest maintained by frequent fires from lightning strikes, where dead pines typically do not last very long. A collection of cavity trees used by a group of RCWs is called a cluster. Active clusters represent a potential breeding group (pbg), solitary bird, or perhaps a captured territory. Over 20 other species use RCW cavities including fox and flying squirrels, kestrels and screech owls, skinks, bats, wood ducks, titmice, red-bellied and red-headed woodpeckers, and other cavity nesters. Cavities are a critical limiting resource and because they also support a significant amount of other wildlife, the RCW is considered an umbrella species. It is also an "indicator species" for healthy, older-growth, fire-maintained longleaf pine ecosystems.

Kestrel chick, a species that nests in enlarged RCW cavities. Source: Endangered Species Branch (ESB), Fort Bragg

SMALL PROJECTS, BIG IMPACTS: PROMOTING MONARCH CONSERVATION THROUGH NPLD DOD LEGACY-FUNDED INITIATIVES

National Public Lands Day (NPLD) is a program coordinated by the National Environmental Education Foundation (NEEF), and is the nation's largest single-day volunteer effort to benefit public lands. For the last 23 years, NPLD has brought together thousands of volunteers to help restore the country's public lands. In 1999, DoD joined NEEF and the NPLD partnership and, for the past 17 years, has funded 360 projects through the Legacy Resource Management Program (Legacy). Of the 360 Legacy-funded projects, 214 of them focused on pollinators. Each year, DoD installations can request up to $6,500 per project for materials, equipment, and supplies to implement NPLD efforts at military installations. In 2015, approximately 200,000 volunteers worked at over 2,500 sites across the nation. Some of the projects this year and in previous years provided benefits for monarch butterflies.

Monarch Butterfly. Source: U.S. Fish and Wildlife Service

Monarch butterflies are an iconic pollinator. Their annual migration across the U.S. and into Mexico helps pollinate a wide variety of native plants, including the 100 milkweed species on which they rely for breeding. In recent years, habitat loss has caused populations to decline by approximately 90 percent, leading to calls to list the species under the Endangered Species Act. Preventing further Monarch declines sustains the plants they pollinate and helps maintain the integrity of the landscape on which our soldiers depend for realistic training and testing activities. A few highlights:

- Joint Base San Antonio partnered with nearby Lackland Elementary School to create an interpretive rain garden with over 200 native plants. The garden helps prevent erosion, runoff, and flood damage while providing habitat to migrating monarch butterflies. In addition, students use the garden to complement lesson plans centered on the importance of pollinators to local ecosystems.
- The Marine Corps Ground Combat Center built raised bed pollinator gardens featuring several species of native milkweed to support monarchs as they travel through the Mojave Desert on their way to Mexico.
- Volunteers planted pollinator gardens at Joint Base San Antonio, Fort Bragg, Redstone Arsenal, and Langley Air Force Base (AFB) featuring hundreds of native plants to attract monarchs and other pollinators. These gardens serve as important pollinator habitats and learning tools for local communities.

Going forward, DoD intends to reevaluate its focus on pollinators, which has been in place for the last 15 or so years. Although we have not yet decided what the future focus will be, our thoughts are to promote efforts that maximize the educational and restorative aspects for both natural and cultural resource projects.

To learn more about NEEF and NPLD, to see how DoD is involved, or to find a site near you, visit https://www.neefusa.org/public-lands-day. Maybe next year, you too can host or volunteer for an event!

Volunteers participate in a tree-pruning class at Malmstrom AFB, Montana during the two-day NPLD celebration in 2015. Source: Dr. Elin Pierce, Natural Resources Manager, Malmstrom AFB

Bird's eye view of longleaf pine, from inside RCW cavity. Source: ESB, Fort Bragg

Longleaf pine forests continued to disappear as a result of timber and pine resin harvesting, urbanization, agriculture, and species conversion. Fire suppression stopped forest generation and created dense pine/hardwood forests, which are not high quality RCW forage, and changed species composition. As virgin pine forests disappeared (only 2-3 percent remains), RCWs declined. The species was listed as endangered under the United States List of Endangered Native Fish and Wildlife, in October 1970, and is currently listed throughout its range as Endangered under the 1973 Endangered Species Act. It is no surprise that the RCW, like many other unique and rare species, now primarily occurs on federal lands, including DoD installations. With new management tools, including artificial cavities, translocation of birds to stabilize and expand populations, and emphasis on ecosystem level management, RCWs have recovered significantly.

DoD has played a substantial role in the recovery effort for RCWs since the species currently occurs on 14 installations (9 Army, 4 Air Force, and Marine Corps Base Camp Lejeune). The U.S. Fish and Wildlife Service's (USFWS's) 2003 RCW Recovery Plan identified 39 designated recovery populations that included 12 primary core populations requiring 350 pbgs, and one with 1000 pbgs; 10 support core populations (250 pbgs), and 16 essential support populations (25-100 pbgs). Out of these, DoD is responsible for four primary and eight essential support populations. USFWS's RCW Recovery Plan set a goal to down-list the RCW to threatened by 2050, with de-listing planned for 2075.

RCW on a longleaf pine. Source: Mike Stewart

DoD restricted training to create protective measures for the RCW across installations, and used these restrictions as a call to action for expanded research and collaborative efforts to conserve the RCW. Other partnerships aim to restore the longleaf pine ecosystem overall, which provides relief for DoD populations meeting certain recovery milestones. As stated by Will McDearman, USFWS RCW recovery coordinator, DoD is currently leading recovery efforts; 4 of the 13 primary core populations (including 3 installations) have successfully attained and are surpassing population size objectives. The number of active clusters for 2015 includes 504 on Eglin Air Force Base in Florida; 488 on Fort Bragg in North Carolina and Sandhills East population; 441 on Fort Stewart in Georgia; and 375 on Fort Benning in Georgia (only the Apalachicola National Forest in Florida has a larger population with 576 active clusters).

Because of DoD's natural resources management and partnership efforts, military training constraints at those installations are now significantly lower. With DoD prioritizing stewardship and conservation, as well as strategic partnerships to advance longleaf pine restoration, there is great hope for the recovery of the RCW and many other rare and native species associated with this diverse ecosystem.

The DoD Natural Resources Program's (NR Program's) webinar series provides a forum for sharing information on natural resources topics and projects. The series features monthly presentations on a wide array of natural resources topics, such as feral cats, species at-risk on DoD lands, and monitoring amphibians using environmental DNA. Visit the DoD Natural Resources Program web portal for information on upcoming webinars. The next presentation in the DoD NR Program webinar series, scheduled for November 30, will be *Integrated Climate Change and Threatened Bird Population Modeling to Mitigate Operations Risks on Florida Military Installations* (SERDP, RC-1699).

The Readiness and Environmental Protection Integration (REPI) program's webinar series features best practices, tutorials and knowledge sharing on REPI partnerships that support the military mission and accelerate the pace and rate of land conservation. Unless otherwise noted, all webinars begin at 1pm ET. Visit REPI's web portal for information on upcoming webinars. The next REPI webinar, scheduled for December 7, will describe roadblocks and opportunities for enhancing Sentinel Landscape Partnership implementation between agencies.

A COLLABORATIVE MISSION: CONSERVING MIGRATORY GRASSLAND BIRD POPULATIONS

By Jason Hill, PhD., and Rosalind Renfrew, PhD., Vermont Center for Ecostudies

With funding from the DoD Legacy Resource Management Program (Legacy), the Vermont Center for Ecostudies (VCE) implemented a multi-year project to gain a deeper understanding of the events affecting migratory birds on military installations. Specifically, the VCE study examined the full life-cycle of three grassland bird species: upland sandpiper (*Bartramia longicauda*), eastern meadowlark (*Sturnella magna*), and grasshopper sparrow (*Ammodramus savannarum*). Although these species live on large expanses of grasslands on DoD installations, including training ranges and testing areas, previous studies have predominantly focused on the three to four month long breeding season. Learning about these birds' entire life cycle is important because, as a result of agricultural expansion and intensification, among other threats, their

populations have declined an estimated 50-80 percent over the last 50 years. In the face of alarming losses of habitat elsewhere, DoD lands are increasingly vital for these species.

A grasshopper sparrow wearing color bands (black over aluminum on the right, green over green on the left) and a light-level geolocator (clear stalk visible on the bird's back) at Camp Grafton, North Dakota. Source: Jason Hill

The Sikes Act requires military installations with significant natural resources to develop Integrated Natural Resources Management Plans (INRMPs). INRMP implementation enables installation natural resources managers to plan for and manage at-risk species and their habitats to sustain military training and testing environments. However, protecting migratory grassland bird species can be complicated because these birds may visit hundreds of individual private and public properties during migration, and the wintering areas of different grassland bird breeding populations are poorly known.

Through the Legacy funded project, *Migration Ecology and Connectivity of At-Risk Grassland Birds*, VCE biologists are tracking the migration routes and wintering areas of these three grassland bird species for the first time. Researchers are using sophisticated light-recording tags, Global Positioning System (GPS) data loggers, and solar-powered satellite tags to record precise location data for birds to help natural resources managers understand the entire annual cycle of migratory birds across their breeding range. The VCE teams deployed tags on breeding birds during the summers of 2015 and 2016 at seven DoD installations across the species' breeding ranges: Camp Grafton, North Dakota; Camp Ripley, Minnesota; Fort McCoy, Wisconsin; Fort Riley, Kansas; Joint Base Cape Cod, Massachusetts; Westover Air Reserve Base, Massachusetts; and Naval Air Station Patuxent River, Maryland. Once the birds leave these installations, VCE's tracking devices allow biologists to determine where and when these migrants travel, and what lands they use until the next breeding season.

A color-banded eastern meadowlark at Konza Prairie, Kansas carries a GPS tag on its lower back (antenna visible behind the bird's left foot). Source: Jason Hill

VCE biologists have started analyzing the data, and are already making some important discoveries about grassland birds on DoD lands. Their data will help guide DoD's conservation efforts and provide recommendations for ways to partner with other DoD and non-DoD entities to ensure a shared responsibility for the well-being of these species. For example, one upland sandpiper spent a month at the Baltimore Washington International Thurgood Marshall Airport after leaving its breeding grounds at Westover Air Reserve Base in Massachusetts. Both airfields have active avian control programs to reduce air strikes. They can coordinate to determine if these birds pose an airstrike risk and, if so, when and where such strikes might occur. Ideally, they may standardize their efforts so that one airfield will not effectively "undo" conservation efforts of another. Aircraft strikes with wildlife pose a serious and occasionally deadly threat to pilots, and can cause millions of dollars in damage to military aircraft.

VCE's work has the potential to link management and conservation actions across DoD installations and migratory bird routes in other regions to reduce risks and ensure the safety of military pilots while helping imperiled grassland birds.

An upland sandpiper surveys its territory at Fort Riley, Kansas. Source: Jason Hill

HOW TO MANAGE FERAL SWINE: A LESSON FROM DECISION ANALYSIS

By Matthew Brondum, Risk and Decision Scientist, U.S. Army Corps of Engineers (USACE)

Most people outside of the southeastern U.S. tend to chuckle when they hear the term "wild pig." Perhaps this is because the term is foreign to them. Perhaps they have never encountered a 200-pound boar in nature. This is unfortunately not the case for many of those near DoD installations across the southeastern U.S.

Feral Swine. Source: O'ahu Natural Resources Program

Invasive wild pigs, or feral swine, are a concern to DoD because they attack soldiers during training activities, act as vectors for over 37 parasites, and impact local flora and fauna by destroying habitats and disturbing native species through rooting activities, competition, and predation. Feral swine occur in 39 states and cause an estimated $1.5 billion in economic damage annually. Managing feral swine is no task for the faint of heart. Buddy Goatcher, who has over 40 years of experience in managing feral swine with USACE and U.S. Fish and Wildlife Service, says that one of the biggest problems land managers have in managing feral swine is choosing the right eradication technique. There are many different criteria to consider spanning financial, social, and environmental realms, and each eradication technique performs differently under different

scenarios. Goatcher teamed up with the USACE Risk & Decision Science team to apply quantitative decision science methodologies to help alleviate this issue.

The DoD Legacy Resource Management Program funded a project, *Invasive Wild Pigs - Best Practices and Decision Support Tools*, to create a model to aid DoD natural resources managers in management technique selection for managing feral swine. Researchers developed this model based on a survey and asked feral swine experts throughout the country to score management techniques based on a variety of criteria. Criteria included financial costs, impact to non-target species, and social considerations. Researchers developed scoring methods for these criteria, and built them into the model with user-inputted weights, which allowed for site-specific implementation. For example, if a land manager is not concerned about the financial costs associated with implementing a countermeasure, they can assign a low score for those criteria. The model outputs a dashboard, which allows DoD natural resources managers to see a prioritized side-by-side comparison of the countermeasures, and what criteria influenced those scores. This tool gives DoD natural resources managers a full picture of tradeoffs that are often difficult to quantify, leading to management plans tailored to site-specific concerns.

Fact sheet on managing feral swine on DoD lands: *Bringing Home the Bacon: Feral Swine and DoD*.

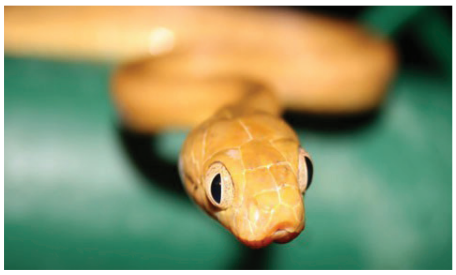
HOW DOD IS USING COMPREHENSIVE MANAGEMENT TO CONTROL ONE OF THE WORLD'S MOST IMPACTFUL INVASIVES: THE BROWN TREESNAKE

By Kimberly Alles, Consultant, Booz Allen Hamilton, and Stephen M. Mosher, Naval Facilities Engineering Command Marianas

When faced with a novel problem, one must find novel solutions. That is exactly the case on Guam where DoD natural resources managers work to control the brown treesnake (BTS) population. Since its accidental introduction after World War II, BTS have devastated the Guam ecosystem, causing the disappearance of 10 forest bird species and significantly reducing populations of 17 lizard species. The snakes pose a significant threat to the native ecosystem in Guam, as well as to the neighboring islands and Hawaii. Affected military installations on Guam experience the full impact of BTS through the degradation of the lands that DoD relies on for realistic testing and training operations. Preventing the spread of BTS to other Pacific islands is critical to habitat conservation and the continuation of DoD operations. Additionally, the snakes are a health hazard to residents, having bitten hundreds of people. Small children and infants are especially vulnerable to the snake's mild venom.

The nocturnal, arboreal nature of BTS requires natural resources managers to continue research and create new techniques to control the BTS population on Guam. Some of these research and management efforts include the following:

- A Navy-funded effort enables U.S. Department of Agriculture-Wildlife Services (USDA-WS) to implement an integrated pest management approach to control BTS through the deployment of thousands of snake traps, hundreds of bait stations, and nighttime spotlighting efforts to remove BTS. In fiscal year 2015, trapping intercepted 4,301 BTS and nighttime spotlighting captured 978 BTS on Andersen Air Force Base and Naval Base Guam. This long-term operational control program—active since 1993—highlights DoD's commitment to preventing the spread of BTS.
- USDA-WS also uses 16 canine teams to inspect aircraft, equipment, cargo, household goods, munitions, and vehicles. Preventing the spread of BTS off of Guam via the DoD transportation network is critical. Economic analysis estimates that introduction could cause $593 million to $2.14 billion in yearly damages on Hawaii alone.
- A recently completed pilot study funded through DoD's Environmental Security Technology Certification Program examined the effectiveness of aerially-delivered baits in controlling BTS at a landscape level. Results indicate that aerial bait distribution can help control BTS in areas inaccessible to other management techniques. Aerial bait application could be especially critical in forested areas adjacent to cargo areas, helping to prevent BTS from dispersing outside Guam.



BTS. Source: U.S. Department of Agriculture (USDA)

Striker, a USDA BTS detector dog. Source: Senior Airman Katrina M. Brisbin/Released

Aerial application of BTS bait. Source: Dan Vice, USDA, Animal and Plant Health Inspection Service Wildlife Services

DOD LEGACY-FUNDED ENVIRONMENTAL DNA PROJECTS

Environmental DNA (eDNA) is DNA that a species has released into the air, water, or soil. eDNA is a particularly useful tool in aquatic systems where the highly sensitive, efficient, and low-impact technique can improve monitoring efforts by lowering costs, reducing stress to sensitive species, and improving detection probabilities. DoD funded the following eDNA projects through the Legacy Resource Management Program:

- Project 12-616, *Monitoring Amphibian and Reptile Populations Using eDNA*, aimed to develop protocol and test the effectiveness of eDNA sampling for the Arizona treefrog, northern Mexican gartersnake, the non-native predator American bullfrog, and the amphibian pathogenic chytrid fungus, *Batrachochytrium dendrobatidis,* at Fort Huachuca, Arizona. Results indicated that sampling for eDNA is an effective way to detect all species, but that researchers need to adjust their methods when sampling for eDNA depending on the species of interest.
- Project 15-782, *eDNA-KIT: A Web-Based Toolbox for Putting eDNA Into Practice*, is an ongoing study that aims to create an online toolkit for researchers to obtain information about eDNA sampling including protocols and guidelines. Sharing this information will encourage the use of eDNA to detect species and further development of the technique
- Project 16-786, *Using eDNA to Improve Detection and Shorten Survey Time Frames for Endangered Fairy Shrimp*, is an ongoing study focused on developing methods for studying endangered fairy shrimp species using eDNA techniques. Establishing an eDNA protocol would reduce costs, time delays, and data uncertainty associated with traditional survey methods, allowing DoD to more effectively manage these imperiled species and ensure uninterrupted testing and training.

NATURAL RESOURCES DOCUMENTS

Highlighted here are reports, fact sheets, spreadsheets, and presentations found on the Natural Resources page of the DoD Environment, Safety and Occupational Health Network and Information Exchange. These documents are designed to provide direct benefit to the mission and installation natural resources managers by providing knowledge and results of high priority natural resources efforts.

DoD EDRR Invasive Species Strike Teams: A Pilot Demonstration Year 3, Fact Sheet, Guidebook, and Conference Exhibit and Presentation (Legacy 14-622)
The DoD Early Detection Rapid Response (EDRR) Strike Team provides natural resources managers with the education, ground tools, and staff needed to restore native habitat and species in ecosystems invaded by nuisance species. In the project's third year (2014), Strike Teams worked with natural resources managers on five installations including Naval Air Station (NAS) Patuxent River, Maryland; Fort Detrick, Maryland; the Arnold Engineering Development Center, Tennessee; NAS Cherry Point, North Carolina; and Camp Rilea Oregon Air National Guard, Oregon to further develop previous treatments by monitoring and maintaining the sites. EDRR teams worked with each site individually to provide management planning, mapping, on-the-ground selective invasive species management, partnership building, and targeted trainings.

Assessing the Importance of Wetlands on DoD Installations for the Persistence of Wetland-Dependent Birds in North America–Technical Note (Legacy 12-610)
Researchers from the University of Idaho, U.S. Geological Survey, Nebraska Game and Parks Commission, and U.S. Fish and Wildlife Service collected data to model and rank over 350 DoD installations in the continental U.S. based on their relative value to 11 priority species, including the ridgeway's rail, clapper rail, king rail, Virginia rail, sora, common moorhen, purple gallinule, American coot, least bittern, American bittern, and pied-billed grebe. Additionally, researchers identified DoD installations that are most valuable to wetland-dependent birds to ensure military personnel make proactive and scientifically sound decisions to reduce their impact on this imperiled natural resource. Furthermore, DoD installations with wetlands that are most valuable to wetland-dependent birds will be able to incorporate this information into their integrated natural resource management plans, further increasing their military readiness.

Status and Distribution Modeling of Golden Eagles on Southwestern Military Installations and Overflight Areas: Assessing "Take" for this Sensitive Species At-Risk Year 2, Fact Sheet, Report, and Interpretive Poster (Legacy 13-631)
This project continued in its second year to refine and increase the precision of the status and distribution of nesting golden eagles within and adjacent to DoD-managed lands in the southwest. Researchers used data from the Nevada Department of Wildlife and the Arizona Game and Fish Department's Nongame Branch to develop robust golden eagle nest habitat models on four Bird Conservation Regions (BCR) in the southwestern U.S. Additionally, researchers conducted surveys across the landscape within each BCR, and completed repeated visits to collect demographic parameters associated with nest occupancy and nesting success. Along with collaborative efforts, the project team monitored an additional 286 potential nesting locations with repeated visits to produce demographic models. These models provide natural resources managers and military personnel with information on the spatial, temporal, and demographic characteristics of golden eagle across the southwest to make informed decisions on rapid assessments of golden eagle status and distribution within specific landscapes, while maintaining flexibility in military activities with Bald and Golden Eagle Protection Act compliance.

UPCOMING EVENTS CONFERENCES, WORKSHOPS, AND TRAINING

The Wildlife Society 23rd Annual Conference
October 15-19, Raleigh, NC
The Wildlife Society's annual conference is one of the largest gatherings of wildlife professionals, students, and supporters in North America. The conference features more than 500 learning opportunities on wildlife management, research, and techniques through a wide variety of symposia, contributed papers, panel discussions, workshops, contributed posters, and field trips.

Annual Meeting of the Raptor Research Foundation
October 16-20, Cape May, NJ
Celebrate the 50th anniversary of the Raptor Research Foundation at this meeting in Cape May, a world-renowned raptor migration site in eastern North America, during the peak of raptor migration. The 2016 conference will feature three plenary lectures by leaders in the field of raptor research and conservation: migration authority Ian Newton, trailblazing raptor ecologist Carol McIntyre, and master of Middle East raptor conservation, Yossi Leshem.

Natural Areas Conference
October 18-21, Davis, CA
The 2016 Natural Areas Conference will explore strategies and tactics that resource and natural areas managers can employ to prepare for and respond to climate change. The conference will explore themes such as connecting ecological restoration and adaptation, assisted migration, tree planting, prescribed fire and wildland fire use, native plant materials, meadow and stream restoration, pollinators, and carbon and biomass markets.

United Nations Framework Convention on Climate Change
November 7-18, Marrakech, Morocco
The 22nd annual United Nations Framework Convention on Climate Change Conference of Parties will continue negotiations of the international climate change agreement introduced at last year's conference, with the hope of cementing a global plan for combatting climate change by curbing global warming, sea-level rise, and emissions.

National Invasive Species Awareness Week
TBD, Nationwide
Each year during National Invasive Species Awareness Week federal, state, local, and tribal officials meet with non-governmental organizations, industry, and stakeholder groups to address invasive species to examine laws, policies, and creative approaches to prevent and reduce invasive species threats to our health, economy, environment, and natural resources including special places. Attend events in the U.S. Capitol and around Washington, DC, or host your own event that explores local problems and solutions to invasive species.

World Wildlife Day
March 3, Global
The United Nations designated World Wildlife Day to celebrate and raise awareness of wild animals and plants, drawing attention to the threats that endangered species face from habitat loss, poaching, and the pet trade.

2017 National Military Fish & Wildlife Association Annual Training Workshop
March 6-10, 2017, Spokane, WA
The National Military Fish & Wildlife Association and the Wildlife Management Institute annual training workshop is the primary annual event where installation managers meet to discuss DoD-specific natural resources topics. The workshop will include a DoD Natural Resources Program policy update, Military Service breakout sessions, and multiple technical and informational sessions. Relevant and important topics to DoD natural resources management include endangered and at-risk species, invasive species, climate change, and migratory birds.

Sustaining Military Readiness Conference
September 25-28, 2017, Louisville, KY
Please look for information about this event in our next issue, Winter 2016-2017.

LINKS OF INTEREST

AFPMB
The Armed Forces Pest Management Board recommends policy, provides guidance, and coordinates the exchange of information on pest management throughout DoD. Their mission is to ensure that environmentally sound and effective programs are in place to prevent pests and disease vectors from adversely affecting DoD operations.

CESU Network
The Cooperative Ecosystem Studies Unit (CESU) Network is a national consortium of federal agencies, tribes, academic institutions, state and local governments, and non-governmental conservation organizations working together to support research, technical assistance, education, and capacity building. There are 17 CESUs which link DoD and other federal agencies, a host university, and partner institutions. One of the benefits of joining a CESU is a reduced, Network-wide Finance and Administration (i.e., overhead) rate of 17.5% for federal agencies.

DENIX
The DoD Environment, Safety and Occupational Health Network and Information Exchange Natural Resources home page is an electronic environmental network and information exchange that provides access to natural resources information, such as Executive Orders, policies, guidance, Integrated Natural Resources Management Plans, fact sheets, and reports.

DoD Biodiversity Handbook
The DoD Biodiversity Handbook contains 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 resources managers through 17 case studies.

DoD Invasive Species Outreach Toolkit
This site provides education and outreach materials 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 also is included.

DoD Legacy Resource Management Program Tracker
The DoD Natural Resources Program funds high priority natural and cultural resources projects that have regional, national, and/or multi-Military Service benefits through the DoD Legacy Program. The Legacy Tracker lets users download fact sheets and reports for completed Legacy-funded projects.

DoD Natural Resources Program
DoD's Natural Resources Program provides policy, guidance, and oversight for management of natural resources on all land, air, and water resources owned or operated by DoD. The website offers information on DoD's natural resources initiatives, programs, presentations, and links to other DoD conservation and natural resources sites.

DoD PARC
DoD Partners in Amphibian and Reptile Conservation (PARC) is an inclusive partnership dedicated to the conservation and management of herpetofauna (reptiles and amphibians) and their habitats on military lands. DoD PARC membership includes natural resource specialists and wildlife biologists from the Military Services and individuals from state and federal agencies, museums, universities, and environmental consultants.

DoD PARC Group and Photo Site, DoD PIF Photo Library, DoD Natural Resource Photo Library
The three sites are designed to share pictures, news, information, and ideas with the DoD Natural Resources, DoD Partners in Amphibian and Reptile Conservation, and DoD Partners in Flight communities. Members may use the websites to download photographs for reports, Power Point presentations, and educational materials such as brochures and posters. There is also a forum for posting questions to group members, a calendar listing upcoming events, and a library where reports and documents are stored.

DoD Partners in Flight
The DoD Partners in Flight Program supports and enhances the military mission while it works to develop cooperative relationships to ensure a focused and coordinated approach for the conservation of resident and migratory birds and their habitats.

DoD Pollinator Initiatives
This website provides an overview of pollinators and the reasons they are important to DoD. It contains fact sheets and technical reports, how-to guides, resource lists, and more describing some of the simple ways that people can help pollinators and their habitats.

REPI
Under Readiness and Environmental Protection Integration (REPI), DoD partners with conservation organizations and state and local governments to preserve buffer land and habitat around military installations and ranges as a key tool for combating encroachment. By promoting innovative land conservation solutions, REPI supports the military's ability to train and test at its lands now and into the future.

SERDP and ESTCP
The Strategic Environmental Research and Development Program (SERDP) and the Environmental Security Technology Certification Program (ESTCP) harness the latest science and technology to improve environmental performance, reduce costs, and enhance and sustain mission capabilities. They are independent DoD programs managed from a joint office to coordinate the full spectrum of efforts, from basic and applied research to field demonstration. SERDP and ESTCP, in conjunction with the Legacy Program, support readiness, quality of life, adherence to legal mandates, and responsible environmental stewardship of natural and cultural resources.

DOD NATURAL RESOURCES PROGRAM

Enabling the Mission, Defending the Resources

www.dodnaturalresources.net

http://twitter.com/#!/DoDNatRes

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