

# Natural Selections

Department of Defense Natural Resources Program



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## THIRTY PLUS YEARS OF THE LEGACY PROGRAM

By L. Peter Boice, former Director, U.S. Department of Defense Legacy Resource Management Program

The Fiscal Year (FY) 1991 Defense Appropriations Act created the U.S. Department of Defense (DoD) Legacy Resource Management Program (Legacy Program) as Public Law 101-511 on November 5, 1990. Spearheaded by Senator Daniel Inouye (D-HI) and cosponsored by Senator Robert Kasten (R-WI), the Legacy Program's defined legislative purpose was "to promote, manage, research, conserve, and restore the priceless biological, geophysical, and historical resources which exist on DoD lands."



I assisted my then-supervisor Christina Ramsey in establishing the Legacy Program's initial framework, and later assumed full management responsibilities upon her departure from DoD in August 1991. With the exception of FY 1995, I continued to oversee the program until my retirement in June 2016. I also directed DoD's Natural Resources Program throughout this 25-year period and acted as caretaker for the Cultural Resources Program from 1996 to 2000. My focus here is on how the Legacy Program jumpstarted and then sustained many innovative natural resources initiatives.

Before the Legacy Program's creation, installation programs were dominated by a stratified approach to management, with separate forestry, land management, fish and wildlife, and outdoor recreation programs. Where plans existed, they typically lacked integration and were based on an incomplete understanding of what resources were present or of their condition.

Not surprisingly, an early Legacy Program emphasis was on developing or improving management plans and inventories. Other projects were demonstrations, intended to benefit a specific military installation but requiring a presentation, article, or fact sheet to disseminate results across DoD. The Legacy Program also allocated modest amounts to education and awareness materials.

Early projects confirmed the success of this approach, but they also demonstrated the depth of the need for additional funds. Consequently, Congress increased initial FY 1991 funding of \$10 million to \$25 million the second year, and then to \$50 million for the next three consecutive years. Much of this unprecedented funding surge went to the areas of greatest need, producing hundreds of plans and inventories.



L. Peter Boice and Alison Dalsimer study the impacts of climate change on the ecosystem in the Sonoran Desert, Arizona.

Concurrently, DoD reemphasized its three-pronged approach of Leadership, Partnership, and Stewardship by sponsoring DoD-wide and interagency collaborative partnerships. Perhaps the three most important early efforts were DoD Partners in Flight (PIF), the Mojave Desert Ecosystem Initiative (MDEI), and the DoD Biodiversity Initiative.

DoD PIF, initiated in 1991, was recently profiled in the [Natural Selections Spring 2021 issue](#).

# MESSAGE FROM THE DOD NATURAL RESOURCES PROGRAM

By Ryan Ormdorff, Director, DoD Natural Resources Program and DoD Legacy Program

## Welcome to the Winter 2022 Edition of *Natural Selections*!

This issue of *Natural Selections* celebrates and recognizes the DoD Legacy Program's three-decades-long leadership role to manage and preserve DoD's natural and cultural resources, sustain long-term conservation initiatives, and promote mutually beneficial collaborations with diverse partners. We are excited to share with you some key projects and describe how the Legacy Program has supported and funded these essential research and development projects to further conservation and natural resources management on DoD installations.

This issue begins with remarks from former and current DoD leadership and staff. The Spotlight article from L. Peter Boice details the origins of the Legacy Program and changes that have taken place over time. We also provide introductory remarks from Mr. Richard Kidd, Deputy Assistant Secretary of Defense for Environment and Energy Resilience, and McKenna McMahan, the new Program Analyst supporting the Legacy Program. DoD staff at all levels play an important role in planning, executing, and documenting successes and lessons learned for the Legacy Program and DoD. To highlight this, we're debuting a new section of *Natural Selections* to showcase a different natural resources manager (NRM) in every issue. This issue highlights some of the amazing work done by Tamara Gallentine, Natural and Cultural Resources Manager at Beale AFB.

Throughout its existence, the Legacy Program has funded projects that have significantly enhanced natural resources management. For example, "Prioritizing Species Management on DoD Lands" describes a NatureServe initiative to identify species at-risk of a federal listing determination under the Endangered Species Act (ESA). Identifying these species at-risk helped DoD target conservation actions on installations with those species, reducing the likelihood of ESA listings that could restrict military training activities. This issue also discusses some of DoD's most significant avian and herpetofaunal projects that have resulted in expansive databases to help inform species management strategies. Another recent effort to study a rapidly declining species is described in "Learning from Sparse, but Systematic Surveys to Manage Habitat for Western Monarch Butterflies on DoD Lands."

We've also highlighted some of the new executive policies that the Biden Administration has issued over the course of 2021. As displayed in those policies, the Administration is placing a strong emphasis on climate change and resilience, including adaptation and mitigation strategies to help sustain our landscapes and the missions that take place on them. Learn more about DoD's climate priorities and future direction by reading about the newly released DoD Climate Adaptation Plan (CAP). We also provide an overview of climate adaptation tools for DoD natural resources managers, such as the "Climate Adaptation for DoD

Natural Resource Managers: A Guide to Incorporating Climate Considerations into Integrated Natural Resource Management Plans" and the Defense Climate Assessment Tool (DCAT).

Some other noteworthy projects the Legacy Program has funded focus on invasive species. In "DoD Early Detection, Rapid Response Invasive Strike Teams," you can learn about an initiative to identify and treat sites that contain invasive plant species. Not only does this help to restore native species, but it also improves line-of-sight access for security. The Legacy Program also funded a unique project to counter transnational organized crime in wildlife trafficking. This highlights how illegal trade in wildlife and products made from their parts not only pushes species toward extinction but is a major national security threat that fuels organized crime worldwide. Legacy Program funding resulted in beneficial outreach pieces to increase awareness of this issue among troops overseas to try to reverse this trend.

Throughout its history, the Legacy Program has partnered with various organizations to further natural resources conservation initiatives while benefiting the military mission. Some of those partners include the National Environmental Education Foundation (NEEF) and Cooperative Ecosystem Studies Units (CESU) Network, both of which are highlighted in this issue. NatureServe, another key partner, recently finished its latest update to the "Conserving Biodiversity on Military Lands" handbook, which equips NRMs and other conservation professionals with cutting-edge information, strategies, tools, data resources, and lessons learned that can help them implement biodiversity conservation plans and mitigate impacts to listed species and species at-risk on and near U.S. military lands.

To share Legacy project results, relevant announcements, funding opportunities, external information, and more, the Legacy Program recently launched an informational listserv. More details about the listserv are included in the newsletter.

We hope you enjoy reading this issue of *Natural Selections* and learning more about the Legacy Program. We are excited to guide the Legacy Program into its fourth decade while finding new and innovative ways to sustain the military mission by managing the species and landscapes under DoD stewardship. For more information on the Legacy Program, visit <https://denix.osd.mil/legacy/>. We will publish our next newsletter in Summer 2022. Please contact [NaturalSelections@bah.com](mailto:NaturalSelections@bah.com) if you have any good DoD stories to share or would like to contribute an article.

## MEET THE NEW DEPUTY ASSISTANT SECRETARY OF DEFENSE FOR ENVIRONMENT AND ENERGY RESILIENCE

By Richard G. Kidd IV, Deputy Assistant Secretary of Defense for Environment and Energy Resilience

Hello, DoD Natural Resources Community,

I am pleased and honored to be able to work alongside all of you to protect and safeguard the nature endowments entrusted to our care, managing them in a way that preserves current and future readiness. I want to share a little bit about my personal commitment to environmental and heritage stewardship. I grew up in rural Oregon and love to spend time outside. It helps me disconnect and reenergize. Healthy natural landscapes are critical for personal well-being, as well as for the well-being of our communities and our nation. Healthy natural lands are also critical to DoD's mission success, as DoD requires high-quality lands, free of legal and environmental encumbrances, to conduct readiness activities.

I thrive in purposeful organizations and complex environments. My experiences are backed by my strong personal interest in history and environmental stewardship, cultivated through international assignments with the United Nations World Food Program and the United Nations High Commissioner for Refugees; readings on history and environmental justice and stewardship; and the understanding that community and personal identities are rooted in a sense of place.

This is my fifth assignment as a Senior Executive within the Federal Government. My areas of expertise include energy security, sustainability, strategic planning, congressional engagement, climate change adaptation, and inter-agency policy development. Previously, I held positions in the Departments of State and Energy, and two positions in the Army. Additionally, I served on assignment to the White House, where I created and led the Federal Permitting Improvement Steering Council. While these positions have been diverse, collectively they provide me with a strong background in the areas of energy efficiency, climate change, and sustainability. I am an optimist and a believer in the value of principled public service.

I welcome opportunities to provide positive, authentic leadership as the new Deputy Assistant Secretary of Defense for Environment and Energy Resilience. I look forward to working with the Military Services and the larger natural and cultural resources communities to support the defense mission and the Department's responsibility to stewardship.



*Mr. Kidd holding a juvenile gopher tortoise while visiting Eglin AFB (November 3, 2021)*

## MEET THE NEW PROGRAM ANALYST SUPPORTING THE LEGACY PROGRAM

By McKenna McMahon, Legacy Program Analyst

Hello, DoD Natural Resources Community,

To my new role, I bring experience as a contracts analyst with a background in DoD contracts and data management. I've worked in this arena for several years, and I hold a Bachelor of Science in business administration from the University of Phoenix and a Master of Business Administration in data analytics from Louisiana State University. I have worked in contracts and data management at small and large consulting firms as a proposal manager, technical writer, and contracts manager, which provided me with the opportunity to gain a well-rounded sense of each step in fiscal management processes.



*McKenna McMahon*

I come to my new position at the Office of the Secretary of Defense from a contracting firm where I worked with DoD installations and partners nationwide. I have previously had the pleasure of working with every Military Service and many federal agencies. As the new Legacy Program Analyst, I look forward to working with the Military Services to help carry out DoD's mission and foster the three principles of Stewardship, Leadership, and Partnership that guide the Legacy Program as DoD continues to use and maintain some of the nation's most treasured natural resources to enable mission support and readiness.

I invite everyone within the DoD Natural Resources community to reach out to me with concerns, ideas, or questions as they arise. You can contact me at [mckenna.n.mcmahon.ctr@mail.mil](mailto:mckenna.n.mcmahon.ctr@mail.mil) or [mcmahon@itb-inc.com](mailto:mcmahon@itb-inc.com).



*Gopher tortoise (Gopherus polyphemus) in Pinellas County, Florida. Photo by Paul Block, Navy*



## THE LEGACY PROGRAM BY THE NUMBERS (1990-2021)

By Liz Galli-Noble, Senior Program Manager, DoD Natural Resources Program and DoD Legacy Program

The following index primarily focuses on the natural resources component of the Legacy Program, although some statistics shown also include cultural resources-focused projects.

Year established: 1990. The Legacy Program was established by Congress on November 5, 1990, by Public Law 101-511, "DoD Appropriations Act," giving it the authority to provide funding to help manage and sustain natural and cultural resources.

First round of Legacy Program funding: FY 1991, \$10 million, 108 projects funded.

Years when Legacy Program projects were mostly managed by Military Service Headquarters: FY 1991 to FY 1996; ~2,000 projects funded, \$185 million.

Year only one Legacy Program project was implemented: FY 1996. Army. Mohave Desert Ecosystem Initiative, \$2.1 million.

Year of legislative revision: 1997.

The Legacy Program was modified by the 1997 National Defense Authorization Act, Public Law 104-201, Section 2694 of title 10, changing the program's mission to include:

- Mandate to fund natural and cultural resources projects that support military readiness, enhance conservation objectives, and help DoD fulfill the Legacy Program's three guiding principles of Stewardship, Leadership, and Partnership.
  - New project eligibility requirements:
    - Projects must have regional or DoD-wide significance, and involve more than one Military Department
    - Projects must be necessary to meet legal requirements or support military operations
- Projects must be more effectively managed at the DoD level; and not an assigned responsibility of a designated executive agency or Military Service.

Total amount of Legacy Program funding awarded (1991-2021): +\$360 million.

Number of projects funded (1991-2021): +3,100.

Percentage funded by category (generalized over 30 years): Natural Resources: 60%, Cultural Resources: 35%, Integrated: 5%.

Number of Military Components using Legacy Program funding: 6. Air Force, Army, Defense Logistics Agency, Marine Corps, Navy, Office of the Secretary of Defense.

Number of military installations or sites funded by Legacy Program: +300.

Number of DoD programs financed by the Legacy Program: 2. DoD Natural Resources Program and DoD Cultural Resources Program.

Number of current synergistic DoD programs funding mission readiness and environmental/conservation efforts: 4. Legacy Program, Strategic Environmental Research and Development Program (SERDP), Environmental Security Technology Certification Program (ESTCP), Readiness and Environmental Protection Integration (REPI) program.

Number of CESUs currently funded by the Legacy Program (annual host university fee payments made on behalf of Military Components): 17.

Number of Military Components using CESU cooperative agreements to conduct natural resources and cultural resources projects: 5. Air Force, Army, Marine Corps, Navy, Office of the Secretary of Defense.

Number of CESU-administered projects conducted by DoD in 2010: 43 (\$15 million). Number in 2021: 269 (\$110 million).

Number of Legacy Program-funded Initiatives: +12.

MDEI, Sonoran Desert Initiative, DoD PIF, DoD PARC, Pulling Together Initiative, Coral and Marine Resources Initiative, North American Bird Conservation Initiative, NPLD, Avian Knowledge Network, Recovery and Sustainment Partnership (RASP) Initiative, Cooperative Invasive Species Management Areas, Collaborative Wildlife Protection and Recovery Initiative (CWPRI).

Number of partnerships/memberships supported by the Legacy Program: Hundreds.

The Legacy Program has allowed DoD to maintain mutually beneficial collaborations with conservation organizations, academic institutions, subject matter experts, the private sector, and local, state, and federal agencies, which include but are not limited to the NEEF, CESU National Network, National PIF, National PARC, American Bird Conservancy, Association of Fish and Wildlife Agencies, National Military Fish and Wildlife Association (NMFWA), North American Pollinator Protection Campaign, Plant Conservation Alliance, National Seed Strategy, Gulf Coastal Plain Ecosystem Partnership, National Invasive Species Council, National Audubon Society, Defenders of Wildlife, Point Blue Conservation Science, Klamath Bird Observatory, Smithsonian Institution, Wildlife Conservation Society, National Wildlife Federation, The Nature Conservancy, NatureServe, Bat Conservation International, Bird Conservancy of the Rockies.

Evolving Legacy Program Project Focus Areas by Decade:

1990s – Military Services-driven surveys, biological inventories and studies, data collection and management, ecoregion assessments, habitat restoration and enhancement; threatened and endangered species; BASH initiatives; wildland fire management; water pollution control; invasive species control; DoD conservation symposia, workshops, courses, and trainings; resource management guides, plans, handbooks, and outreach and educational materials and staff support services.

2000s and 2010s – Species at-risk, species of concern, and declining species and habitat; integrated natural and cultural resources management and planning; regional ecosystem management initiatives; data management; context and model development; readiness and range sustainment; national and regional conservation conferences, regional workshops on threatened and endangered species, and INRMP-State Wildlife Action Plan integration; communication, trainings, partnerships, and public awareness; national and international initiatives; program management; climate change; programmatic support; and strategies and tools to support mission flexibility.

2020s – Strategic priorities: mission readiness; mission priority species, threatened and endangered species, and species at-risk; wildland fire management and strategies; climate adaptation and resilience; DoD Natural Resources, Cultural Resources, and Native American Affairs programmatic support; and ongoing initiatives.

## PRIORITIZING SPECIES MANAGEMENT ON DOD LANDS

By Shara Howie, NatureServe

In the continental United States, more than 6,500 species can be considered threatened, endangered, or at-risk, and studies show that these species disproportionately reside on DoD lands. A critical role of the Legacy Program is to help provide information on what species are at-risk, where they occur, and how their presence may impact mission readiness.

To meet this need, the Legacy Program has partnered with NatureServe to better understand which species of conservation interest are likely present on DoD installations. [NatureServe](#) is the hub of a biodiversity informatics network. Through [NatureServe Network Programs](#) across the United States, we collect, curate, analyze, and communicate information on imperiled species and ecosystems. NatureServe's [Global Conservation Status](#) identifies species that are critically imperiled (G1) or imperiled (G2) globally, but are not yet listed under the ESA. Our curated information on species occurrences provides the most comprehensive data available on where imperiled species live. Because we cannot survey everywhere, NatureServe maintains a growing library of habitat models, built using advanced [predictive distribution](#) techniques and the data and expertise of our Network, which delineate where at-risk species are—and are not—likely to be found.

The collaboration between the Legacy Program and NatureServe began in 2002, when NatureServe conducted a new type of analysis that would change the way DoD installations prioritized imperiled species management. By overlaying species occurrence data with DoD installation boundaries, we identified critically imperiled and imperiled species that had no status under the ESA and occurred primarily, or exclusively, on DoD lands. This analysis helped DoD target conservation action on installations with these species, reducing the likelihood of ESA listings that could have restricted military training activities. Follow-on projects engaged installation NRM with NatureServe Network conservation professionals to develop multi-species management plans and conduct climate change assessments that were included in INRMPS.

The partnership continued in 2020 when the Legacy Program funded NatureServe to systematically identify potential priority species for DoD management by designing and implementing a species assessment framework. In addition to conservation

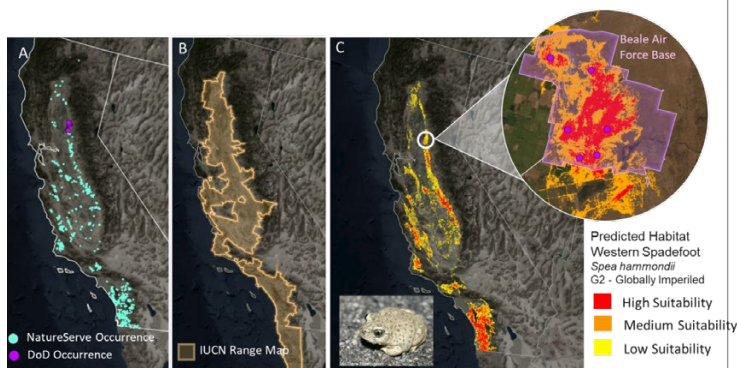


Figure 1. Previously available data for the western spadefoot (*Spea hammondi*) includes documented occurrence data from the NatureServe Network and DoD (A) and broad range maps (B). The former under-represents where the species may occur, while the latter over-predicts areas of possible occurrence. By developing habitat models (C) for this and other priority species, NatureServe is helping DoD better understand which at-risk species are likely to occur on DoD installations and where management actions can mitigate risks.

status and species occurrence data, this assessment framework considers the extent of predicted habitat occurring on DoD installations, using habitat models developed by NatureServe for 2,216 of the nation's most imperiled species. As part of this effort, NatureServe is working with DoD to refine the habitat models for species of highest DoD interest, including the western spadefoot (*Spea hammondi*), Florida pinesnake (*Pituophis melanoleucus mugitus*), and desert massasauga (*Sistrurus tergeminus edwardsii*). The result is high-resolution maps that equip installation NRMs with precise information on which areas may harbor at-risk species.

With a greater understanding of which species are at-risk, and more precise information on where those species are likely to occur, DoD can be more strategic and effective in its species and habitat conservation and management efforts. This capability ultimately allows DoD to better sustain its mission-ready force.

### NEW LEGACY PROGRAM LISTSERV

We are pleased to announce that on November 1, the Legacy Program launched an informational listserv. The new listserv functions as a tool to share information among the Natural and Cultural Resources communities, and will include the following outreach and communications-focused information:

- Legacy Program announcements
- Funding opportunities for the DoD Natural and Cultural Resources communities
- New resources available on our DENIX webpages
- Timely dissemination of outreach and educational materials and resources (e.g., publications, newsletters, webinars)
- External information (e.g., job announcements, publications, study results)

To provide a conduit for sharing information with the Natural and Cultural Resources communities, NRMs and cultural resources managers (CRMs) may send the Legacy Program information that they feel would add value to their respective communities. If you would like to be added to the Legacy Listserv mailing list, please email McKenna McMahan at [mckenna.n.mcmahan.ctr@mail.mil](mailto:mckenna.n.mcmahan.ctr@mail.mil).

### NATURAL RESOURCES MANAGER SHOWCASE

To highlight some of the exemplary work taking place at our installations across the country, the Natural Resources Program will begin showcasing a NRM in each issue of *Natural Selections*. To kick off this new section of the newsletter, we're highlighting Tamara Gallentine, the NRM/CRM at Beale AFB.

Beale AFB encompasses approximately 23,000 acres in the northern Sacramento Valley of California. To support a federally threatened species and maintain the military mission, Tamara closely coordinated with Kirsten Christopherson, Natural Resources Program Manager for the West Region at the Air Force Civil Engineer Center (AFCEC), to study Beale Lake Dam in Dry Creek. The project's focus was to remove a dam to reestablish access to spawning habitat for anadromous salmonids including Chinook salmon (*Oncorhynchus tshawytscha*) and the federally threatened Central Valley steelhead (*Oncorhynchus mykiss*).





Tamara Gallentine, 9th Civil Engineer Squadron Natural/Cultural Resources Manager, beside Beale Lake at Beale AFB. Photo by Staff Sergeant Alexandre Montes.

Dry Creek is one of three watersheds on Beale AFB. The creek flows for 33 miles from its headwaters upstream of Beale AFB and through the base in Yuba County until it finally joins the Bear River downstream. Anadromous fish, or fish that migrate up rivers from the ocean to spawn, use Dry Creek as part of their native spawning grounds. The Army installed Beale Lake Dam on Dry Creek in 1943 to provide recreational opportunities to military members. In the 1980s, when the dam was impeding passage to spawning habitat by the creek’s anadromous salmonids, Air Force personnel installed a concrete fish ladder. In 2015, the Air Force determined that the fish ladder was not fully operational due to its undersized, outdated design. AFCEC then initiated a more detailed study of this issue through a habitat assessment by U.S. Fish and Wildlife Service (USFWS) fisheries biologists.

The study identified that, while Dry Creek’s water temperatures were still cool enough to support anadromous fish, two major barriers impeded fish passage on Dry Creek: (1) Beale Lake Dam on Beale AFB and (2) the River Mile 6.2 Low Flow Crossing approximately 7.35 miles downstream from the installation boundary on private land. As a result, fishes native to Dry Creek were restricted in their ability to pass through these last remaining obstacles to access their native spawning grounds. At around the same time, a U.S. Army Corps of Engineers study found Beale Lake Dam to have an overall condition of “poor.”

Beale AFB’s INRMP included goals and objectives to improve migration and spawning habitat for these species, but the



Beale Lake Dam, fish ladder, and pedestrian bridge on Beale AFB, California, in December 2017 (pre-construction). Pictured: Jason Gibbons and Kirsten Christopherson, AFCEC, Travis Installation Support Section. Self-timer photo by Kirsten Christopherson.

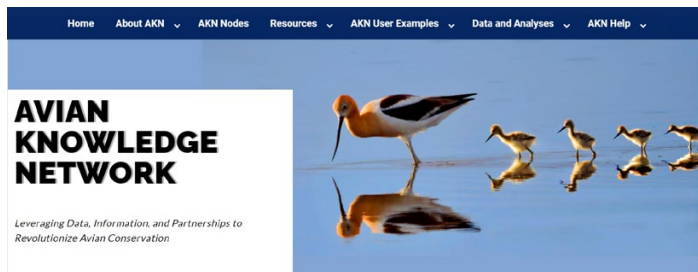
original focus was on the repair or replacement of the existing fish ladder that was not fully functional. The environmental and engineering teams at Beale AFB and AFCEC determined that the cost to repair the dam would be several million dollars more than the environmentally preferred option of removing the dam and restoring the stream and adjacent riparian zone.

To address the issue of fish passage through the installation, the Air Force partnered with USFWS. The project was planned and implemented using environmental quality funding programmed by AFCEC’s Travis Installation Support Section. USFWS engineers from Alaska and Massachusetts, with dam removal experience in their regions, surveyed an area just upstream of Beale AFB’s dam to use as a model for restored channel features such as riffles, pools, and sinuosity. They applied the survey findings to the Beale Lake site during design. After the successful completion of the Beale AFB dam removal in 2020, six miles of historic salmonid spawning habitat is once again available to these rare species upstream of the base. This effort to maintain a threatened species population on base will ensure that military training activities can continue without impediments.



Post-construction at the former Beale Lake Dam site after removal, but before seasonal rains started at Beale AFB in October 2020. The area pictured used to be Beale Lake behind the dam, and is now a rocky, seasonal stream. Photo by Brandon Honig, USFWS, Sacramento, External Affairs Office.

Another successful endeavor this team assisted with was coordinating trainings on and data uploads to the [Avian Knowledge Network \(AKN\)](#). AKN is a collaborative effort between many stakeholders to facilitate and enhance bird conservation. It contains nodes to consolidate and share knowledge and data across institutions and boundaries. The Office of the Secretary of Defense has supported AKN as the official repository for avian data, and the Legacy Program has awarded funding over multiple years to DoD PIF, AKN, and other military entities to help make AKN more robust and impactful. These efforts to train staff on AKN functionality and support additional database uploads will improve species surveys and management efforts at the installation level as well as coordinate data sharing across the Military Services, and with USFWS and DoD partners.



AKN screenshot

## NEW ADMINISTRATION, NEW EXECUTIVE POLICIES

New priorities and focuses emerge with every new Presidential Administration. Since taking office on January 20, 2021, President Biden has issued the following Executive Orders (EOs) that have impacts on natural resources management.

### [EO 13990: Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis](#)

This EO was signed on January 20, 2021. It declares that it is the policy of the Administration to follow scientific means to advance public health and the environment; mandates a review of the recent actions and policies of all federal agencies; restores national monuments; places a temporary moratorium on the Coastal Plain Oil and Gas Leasing Program; requires an account of the benefits of reducing climate pollution; revokes the permit for the Keystone XL pipeline; and revokes or reinstates various other EOs.

### [EO 14008: Tackling the Climate Crisis at Home and Abroad](#)

This EO was signed on January 27, 2021. It reaffirms the U.S. decision to rejoin the Paris Agreement; establishes the National Climate Task Force; commits to a renewed focus on environmental justice; outlines support for new clean infrastructure projects, including pausing new oil and natural gas leases on public lands; and targets the conservation of 30% of federal lands and waters by 2030. It also requires federal agencies to develop a Climate Adaptation Plan (Section 211) and a Climate Risk Analysis (Section 103).

### [EO 14027: Establishment of the Climate Change Support Office \(CCSO\)](#)

This EO was signed on May 7, 2021. It establishes the CCSO as a temporary organization within the U.S. Department of State. The CCSO is tasked with supporting bilateral and multilateral engagements to advance the U.S. initiative to address the global climate crisis. It supports the Department of State, including the Special Presidential Envoy for Climate, in U.S. efforts to elevate and underscore the commitment to addressing the global climate crisis.

### [EO 14030: Climate-Related Financial Risk](#)

This EO was signed on May 20, 2021. It directs the National Economic Council Director, National Climate Advisor, Chair of the Council of Economic Advisors, Secretary of the Treasury, and Office of Management and Budget Director to develop a government-wide strategy that addresses climate-related financial risk to the Federal Government, financial needs associated with achieving net-zero greenhouse gas emissions by 2050, and public and private economic opportunities.



## HOW FAR WE'VE COME IN 10 YEARS! DOD'S COORDINATED BIRD MONITORING AND DATA ARCHIVING INITIATIVES

By Dr. Richard A. Fischer, U.S. Army Engineer Research and Development Center and DoD Partners in Flight National Coordinator

In 1997, DoD PIF started working with the Legacy Program and a multitude of installations to collect and archive avian monitoring data in what was known at the time as the "Coordinated Bird Monitoring Database (CBMD)." In a short period, we amassed more than 1.1 million records from over 75 installations for archiving.



In 2011, I wrote an article for the NMFWA newsletter about progress in better identifying efficient and coordinated approaches to monitoring birds on DoD lands. At the same time, DoD PIF realized that, although collection of avian data across DoD lands was extensive, many datasets were still hard copies in filing cabinets or electronic files on various computer systems or backup drives. As a result, there was significant concern that much of what we knew about historical bird populations on our installations was disappearing or not readily accessible.

Since then, much has changed in the data archiving and access world. DoD is now a significant participant in the Federal Avian Data Center, as well as AKN. A partnership among the Legacy Program, U.S. Army Engineer Research and Development Center, Point Blue Conservation Science, and Klamath Bird Observatory is now not only archiving those 1.1 million records, but also working with installations from all Military Services to archive millions of additional data points.

The partnership continues to work on bulk uploading capabilities and several online analysis tools. The utility of archiving data sets, and the associated benefit to the military, is multifold: (1) archiving and uploading data to the AKN will allow installation managers to permanently archive and retrieve data sets at any time in the future; (2) NRMs can query data to look at a variety of parameters such as relative abundance of species on versus off the base, or specific locations or distribution of a species across the installation; and (3) this data, made available in the AKN, will assist NRMs in conducting installation-wide or region-wide analyses necessary for complying with the National Environmental Policy Act, Migratory Bird Treaty Act, ESA, EO 13186, and DoD Migratory Bird "Readiness" Rule when assessing potential impacts of readiness and non-readiness activities on bird communities.

In addition, the [DoD Coordinated Bird Monitoring Plan](#), published in 2012 with support from the Legacy Program, remains a valuable resource for designing and implementing avian monitoring efforts across a wide range of taxa. The plan provides information to help (1) summarize historical and current monitoring programs on DoD lands, (2) provide strong rationale for monitoring, (3) couple monitoring activities with specific management questions (and with a focus on species of concern), (4) suggest protocols for monitoring bird populations with statistically defensible methods, and (5) ensure DoD meets its legal requirements for avian monitoring. Currently, the plan provides guidance to obtain monitoring data, which is then directed to AKN for storage and access.



The Legacy Program has been instrumental in providing the means not only to improve the way we monitor bird populations, but also to manage and analyze our data in ways that help protect testing and training missions.

DoD participation in AKN at the installation level has grown exponentially, and we now have the ability to secure our data in a permanent archive. Installations interested in participating can contact Ms. Elizabeth Neipert at [Elizabeth.S.Neipert@erdc.dren.mil](mailto:Elizabeth.S.Neipert@erdc.dren.mil). For additional information on bird monitoring, or for assistance with establishing techniques to meet project objectives, please contact Dr. Richard Fischer at [Richard.A.Fischer@erdc.dren.mil](mailto:Richard.A.Fischer@erdc.dren.mil).

## DOD CLIMATE ADAPTATION PLAN

On October 7, 2021, the White House released [CAPs from each federal agency](#) as required by EO 14008, Tackling the Climate Crisis At Home and Abroad. The [DoD CAP](#) discusses how the Department will adapt to climate change and how it will align adaptation and resilience efforts with its warfighting mission. The DoD CAP ensures that the military forces of the United States retain an operational advantage under all conditions.

The DoD CAP has five lines of effort. First, DoD must integrate climate-informed decision making using actionable science into all Department processes. All other actions in this plan depend on the outcomes of this effort. Second, DoD will train and equip a climate-ready force by focusing on operating under the most extreme and adverse conditions and integrating climate adaptation concepts into existing major exercises and contingency planning. Third, DoD will ensure built and natural infrastructure are in place for mission preparedness, military readiness, and operational success in changing conditions. Installation NRMs can leverage DCAT to develop comprehensive resilience plans for their military installations. Fourth, the Department will insert climate change considerations into supply chain management to both reduce vulnerabilities and create opportunities to leverage DoD's purchasing power to advance the key technologies essential to a clean energy transformation. Finally, DoD will collaborate with other federal agencies and defense partners around the globe to enhance adaptation and resilience efforts.

Four cross-cutting enablers will allow these efforts to succeed:

- Continuous monitoring and data analytics
- Alignment of incentives to reward innovation
- Climate literacy or human capital
- Environmental justice

Climate change is a destabilizing force in the world, creating new missions and impacting the operational environment. The DoD CAP is one of the newest and most prominent resources available to help address climate adaptation efforts while maintaining mission preparedness.

## LEARNING FROM SPARSE, BUT SYSTEMATIC SURVEYS TO MANAGE HABITAT FOR WESTERN MONARCH BUTTERFLIES ON DOD LANDS

By Cheryl Schultz, Washington State University; Elizabeth Crone, Tufts University; and Stephanie McKnight, Xerces Society for Invertebrate Conservation

The monarch butterfly (*Danaus plexippus plexippus*) has experienced dramatic declines across North America. The western monarch, which winters in coastal California, declined from millions of butterflies at overwintering sites in the 1980s to a few hundred thousand butterflies by the mid-2010s. This migratory population crashed in 2018 to fewer than 30,000 butterflies. In 2020, the wintering numbers dropped by another order of magnitude, declining to just 1,914 overwintering monarchs (Pelton and McKnight 2021, Xerces Society 2021). Although analyses in 2017 predicted a quasi-extinction risk of 72 percent in 20 years (Schultz et al. 2017; Pelton et al. 2019), a count of fewer than 2,000 overwintering butterflies was a shock to scientists and the conservation community alike. By comparison, the eastern monarch population, which overwinters in central Mexico, is in less grave danger. The eastern monarch population has declined by an estimated 80 percent since the mid-1990s and has a quasi-extinction risk of 11 to 57 percent in 20 years (Semmens et al. 2016). (Continued on page 9)



Monarch butterfly (*Danaus plexippus*) at Mountain Home AFB, Idaho. Photo by Stephanie McKnight, Xerces Society

As monarch populations have rapidly declined in a single human generation, many stakeholders are wondering what they can do to help save the monarch and its milkweed host plant. Guidance to answer this question for monarchs has been developed for the eastern and central areas of the United States (see the Monarch Joint Venture's *Mowing: Best Practices for Monarchs*; the Natural Resources Conservation Service and USFWS's Monarch Butterfly Conference Report; and the Midwest Association of Fish and Wildlife Agencies' [Mid-America Monarch Conservation Strategy 2018-2038](#)). Guidance for how land managers can conserve and revive monarch populations in the western United States is less well developed (see the Xerces Society's *Managing for Monarchs in the West*; the recent [Nationwide Candidate Conservation Agreement for Monarch Butterfly on Energy and Transportation Lands](#); and the Western Association of Fish and Wildlife Agencies' [Western Monarch Butterfly Conservation Plan 2019-2069](#)). Overall, we know more about when and where monarchs occur in the landscape across the East than we do about the West.



With funding from the Legacy Program (NR 17-836 and 19-001), we conducted systematic monthly surveys throughout the western monarch breeding season at DoD installations and nearby areas in five western states from 2017 to 2019 (Vandenberg AFB, Beale AFB, NAS Fallon, Naval Weapons Systems Training Facility Boardman, Joint Base Lewis-McChord Yakima Training Center, and Mountain Home AFB). The research was designed to improve the understanding of where and when monarchs breed in the West with the goal of helping to guide on-the-ground management to sustain training, testing, and operations. We learned that patterns of summer breeding differ between monarch butterflies in the East and the West. Eastern monarchs shift their breeding range in successive northern bands throughout the breeding season (from the southern United States in states like Texas and Mississippi, to the middle range in states like Kansas and Kentucky, to the northern tier in states like Minnesota and Maine). In contrast, western monarchs expand their breeding range throughout the season. By the end of most breeding seasons (August and September), western monarch butterflies are simultaneously breeding in all states in the interior West. We used this information and other ongoing studies to develop guidance for seasonal “management windows” to manage landscapes outside of the times monarchs actively use those habitats (NR 19-001 Final report, Figure 7).



*Monarch caterpillar feeding on narrowleaf milkweed in the shade at Umatilla National Wildlife Refuge. Photo by Cheryl Schultz, Washington State University*

In addition, our study provided insight into the factors associated with the 2018 crash. Monitoring at coastal wintering sites showed a dramatic drop from November to January. Our monthly surveys throughout the breeding season demonstrated that the population had crashed before the beginning of the 2018 breeding season. As a result, we know that management of breeding habitat, including DoD lands in the interior West, was not directly associated with the crash.

We also learned about how monarchs use breeding habitat, which will help guide efforts to restore habitat in the context of a changing climate. For example, monarchs lay eggs on a variety of milkweed species in both shady and open locations. They prefer shadier areas during hot times of the year when shade is available from shrubs and nearby trees. The difference of just a few degrees between shady and open locations seems to influence where they lay eggs and where they survive to larval stages. With increasingly hot seasons, having access to milkweeds in shady locations may enhance breeding performance for monarchs and provide climate refugia for breeding monarchs. The western landscape also has a large diversity of milkweed species. Monarchs use many of these species, and their preference for different species varies by regions and seasons. Thus, as managers plan for maintenance, restoration, or enhancement of monarch habitat, managing for habitat heterogeneity by planting a diversity of milkweeds in open and in shady areas can help monarchs continue to breed throughout their breeding season in the West.

Several conservation recommendations have advanced as a result of this Legacy Program-funded research, especially the focus on early spring as a vital time in the annual lifecycle for the migratory population of western monarchs. These include programs to gain additional insight ([Western Monarch Mystery Challenge](#)), National Science Foundation-Rapid Response Research-funded research on consequences of the population crash on the migratory population, and the development of [Priority Action Zones for Western Monarch](#)—a collaborative effort that currently guides conservation planning in the West. In addition, the Legacy Program-funded research laid the groundwork to ask questions about the influence of monarch activity in urban areas in the winter and how the urban areas might contribute to monarch population dynamics in the West (Crone and Schultz 2021).

Insect populations often have wide fluctuations from year to year. As we write this, [optimistic reports](#) are starting to come in for the 2021 Thanksgiving Count, the time of the annual counts. These reports provide hope that the monarch population has the potential to bounce back from its historic low of 2,000 individuals at the overwintering sites at Thanksgiving 2020. This is both a note of optimism and of caution. A healthy migratory monarch population in the West would likely have at least 500,000 to 1 million monarchs each winter. A bounce this winter would not mean the population is out of the “risk” zone, but instead would provide critical time to plan and implement landscape-wide conservation actions for long-term recovery of the migratory monarch population across the West.

To learn more about our findings and the best management practices for managing habitat for western monarchs on DoD lands, please see products from projects NR 17-836 and 19-001 on the Legacy Program website. Articles referenced in this newsletter are in the NR 19-001 Final Report.



*Monarch pupa attached to iButton temperature logger at Beale AFB, California. Photo by Stephanie McKnight, Xerces Society*



*Monarch caterpillar at NAS Fallon. Photo by Stephanie McKnight, Xerces Society*

## CLIMATE ADAPTATION TOOLS FOR DOD NATURAL RESOURCES MANAGERS

Over the past three decades, DoD installations have experienced increasing risks from climate-driven changes in the environment, which can compromise the capacity of these lands and waters to support military readiness activities. To address these risks, DoDI 4715.03, *Natural Resources Conservation Program*, requires DoD NRM to incorporate climate adaptation strategies into installation INRMPs. With funding from the Legacy Program, the National Wildlife Federation (NWF) and Naval Information Warfare Center Pacific developed and released “Climate Adaptation for DoD Natural Resource Managers: A Guide to Incorporating Climate Considerations into Integrated Natural Resources Management Plans” in June 2019. The guide introduces installation managers to overarching adaptation concepts and principles and offers a general, yet flexible, INRMP adaptation planning process.



Army National Guardsmen lay sandbags at a flooding site in East Cape Girardeau, IL.

To supplement the guide, the Legacy Program provided funding to NWF to develop the “Commander’s Guide to Climate Adaptation for DoD Natural Resource Managers.” This resource provides DoD leadership with an overview of the full guide. It is designed to help military leadership better understand how climate impacts to DoD natural resources can pose risks to testing and training capabilities, and how installations and their NRMs can plan for these risks to enhance installation resilience and sustain military readiness.

DoD also recently released DCAT. This is a common access card (CAC)-enabled, web-based collection of scientific climate data to support research, analysis, and decision making about exposure to historical extreme weather and reasonably foreseeable climate effects. DCAT enables the Military Departments and their installation personnel to use data from past extreme weather events (e.g., hurricanes, tornado tracks) and the effects of future changes in sea levels, riverine flooding, drought, heat, land degradation, energy demand, and wildfires to produce hazard indicators. The data supports a screening-level assessment of installation vulnerability expressed as a combination of exposure (designated by DCAT) and sensitivity. This high-level assessment is useful for long-term planning and informed decision making.

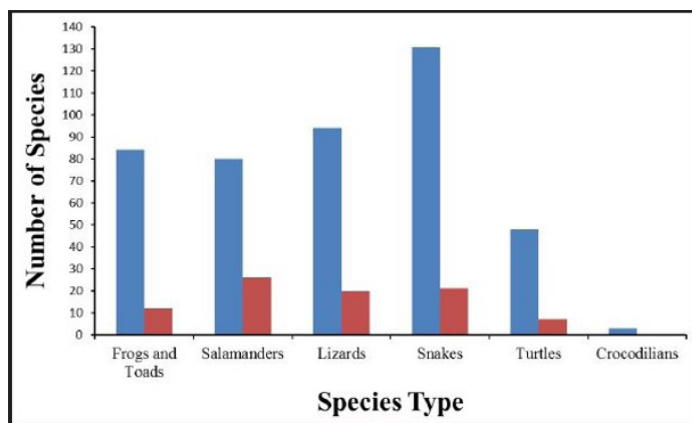
“Climate Adaptation for DoD Natural Resource Managers: A Guide to Incorporating Climate Considerations into INRMPs” and the “Commander’s Guide to Climate Adaptation for DoD Natural Resource Managers” can be found on the DENIX, NWF, and SERDP-ESTCP websites. DCAT is available with a CAC at [https://corpsmapr.usace.army.mil/cm\\_apex/f?p=118](https://corpsmapr.usace.army.mil/cm_apex/f?p=118) (CONUS/AK/HI) and [https://corpsmapr.usace.army.mil/cm\\_apex/f?p=119](https://corpsmapr.usace.army.mil/cm_apex/f?p=119) (Rest of World).

## DOD PARTNERS IN AMPHIBIAN AND REPTILE CONSERVATION HERPETOFAUNAL INVENTORY

By Chris Petersen and Rob Lovich, DoD PARC

Shortly after the DoD PARC network formed in 2009, it became clear that a DoD-wide inventory of amphibians and reptiles (herpetofauna) on military lands had never been developed and was needed. Although species inventories existed for individual military sites, these resources had not been compiled into a single database or reviewed on an agency-wide level. This lack of information prevented DoD from fully understanding the biodiversity, abundance, and distribution of amphibians and reptiles on its nearly 27 million acres of land in the United States. Three years later, the Legacy Program funded the DoD PARC Herpetofaunal Inventory project to help collect comprehensive information about species occurrence on military lands. The resulting inventory has become one of the most significant accomplishments of our network, providing the foundation for a variety of other products and hypotheses that our group members have developed (noted below).

In 2012, we began the immense, multi-year task of collecting, reviewing, and updating the amphibian and reptile species inventories for the 342 DoD installations in the continental United States with INRMPs. Our strategy was to complete each Military Service’s inventory individually before merging all datasets. We initially developed the species inventories for Navy and Marine Corps sites in 2013 and 2014, with a subsequent review and update in 2017 (Legacy Program projects 12-423 and 13-641). We updated the Air Force and Army species inventories in 2015 and 2016, respectively (Legacy Program project 13-642). During the overall effort, we produced individual reports summarizing the herpetofaunal biodiversity for each Military

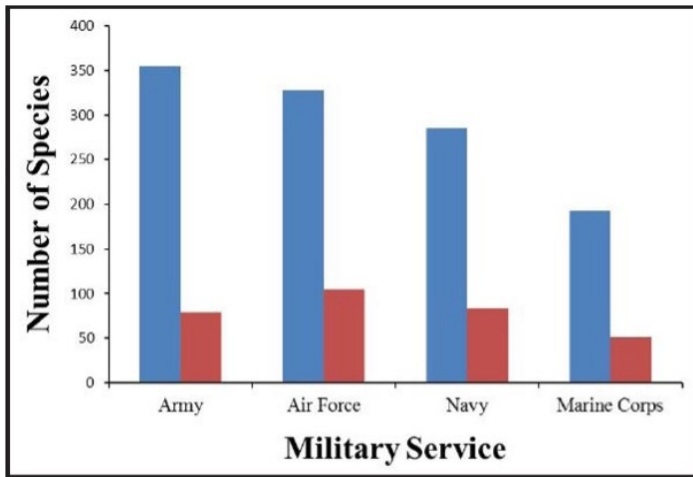


Number of confirmed (blue bars) and unconfirmed (red bars) amphibian and reptile species on DoD properties by taxonomic group.

Service (reports available on the DoD PARC DENIX website). In 2017 and 2018, we merged all of the individual Military Service inventory datasets, analyzed the data, and produced a summary report and scientific publication, [Amphibians and Reptiles of United States Department of Defense Installations](#).

Our analysis revealed that 66 percent of all native herpetofaunal species in the continental United States are confirmed present on the 415 respective DoD properties. It also showed that snake species are the most abundant herpetofaunal group found on DoD lands (131 confirmed species) and that approximately half of the military sites evaluated have at least one venomous snake species confirmed present. Army sites have the greatest number





Number of confirmed (blue bars) and unconfirmed (red bars) amphibian and reptile species by Military Service.

of species confirmed present, including federally listed, state-listed, and at-risk species. In addition, there are 24 federally listed (threatened or endangered), 55 state-listed, and 70 at-risk species confirmed present on all DoD sites.

We have kept the inventory database up to date since its inception, incorporating new field survey results and observations as the installations' natural resources personnel provide them to us. Currently, we also include observations from citizen science applications, such as [HerpMapper](#) and [iNaturalist](#), in our inventory.

The collection and analysis of the herpetofaunal inventory data greatly benefits DoD by providing a detailed "audit" of the biodiversity of amphibians and reptiles from an agency-wide standpoint. If not for Legacy Program funding of this multi-year initiative, DoD's understanding of the herpetofaunal species diversity, abundance, and distribution on military lands would be greatly diminished. As DoD NRM's plan for the future, our inventory will provide valuable information they can use to prioritize relevant conservation and management actions on their installations, while supporting planning and budget activities for many years to come. Furthermore, the inventory has proven to be extremely valuable to DoD PARC for the creation of other products such as the [Conservation Status Summary](#), a herpetofaunal Mission-Sensitive Species list, and various species fact sheets. It has also informed the selection of military study sites for SERDP proposals, ESTCP proposals, and Legacy Program research projects involving amphibians and reptiles.



The copperhead (*Agkistrodon contortrix*) is the most common venomous snake confirmed present on DoD lands in the continental U.S. Photo by Chris Petersen

## FUNDING AVAILABLE FOR ENVIRONMENTAL AND INSTALLATION ENERGY TECHNOLOGY DEMONSTRATIONS



# ESTCP

DoD, through ESTCP, supports the demonstration of

technologies that address priority DoD environmental and installation energy requirements. The goal of ESTCP is to promote the transfer of innovative technologies through demonstrations that collect the data needed for regulatory and DoD end-user acceptance. Projects conduct formal demonstrations at DoD facilities and sites in operational settings to document and validate improved performance and cost savings.

ESTCP is seeking proposals for demonstrations of innovative environmental and installation energy technologies as candidates for funding beginning in FY 2023. The solicitation requests pre-proposals via Calls for Proposals (CFP) to federal organizations and via a Broad Agency Announcement (BAA) for private-sector organizations. Pre-proposals are due March 10, 2022, by 2:00 p.m. ET.

Detailed instructions are on the ESTCP website under [Funding Opportunities](#).

DoD organizations (Service and Defense Agencies) may submit pre-proposals for demonstrations of innovative technologies in the following topic areas:

- Environmental Restoration
- Munitions Response
- Resource Conservation and Resiliency
- Weapons Systems and Platforms
- Technology Demonstrations to Accelerate Deployment of Energy and Water Efficiency and Resilience Solutions
- Energy Resilience on DoD Installations
- Solutions to Improve Space Heating and Water Heating Efficiency
- Use of Thermal Microgrids to Improve Energy Efficiency and Reduce Greenhouse Gas Emissions
- Improved Life-cycle Management of Packaged Heating, Ventilation and Air-conditioning (HVAC) Systems
- Improved Water Resilience on DoD Installations
- Installation Energy and Water
- Impact of Climate Change on DoD Buildings
- Climate Impacts on DoD Water Infrastructure
- Analyzing the Impacts of Weather Events on DoD Installations
- Improving Climate Resilience of DoD Installation and Surrounding Community Infrastructure

The BAA and CFP for federal organizations outside DoD are seeking pre-proposals for technologies in the following topic areas:

- Innovative Technology Transfer Approaches
- Management of Impacted Groundwater

- Long-term Management of Impacted Aquatic Sediments
- Detection, Classification, Localization, and Remediation of Military Munitions in Underwater Environments
- Time-series and New Site Updates to the Defense Regional Sea Level (DRSL) Database
- Improved Wildland Fire Management Tools for Testing and Training Land Utilization
- Biological Control of Non-indigenous Invasive Species Affecting Military Testing and Training Activities
- Technology Demonstrations to Accelerate Deployment of Energy and Water Efficiency and Resilience Solutions
- Energy Resilience on DoD Installations
- Solutions to Improve Space Heating and Water Heating Efficiency
- Use of Thermal Microgrids to Improve Energy Efficiency and Reduce Greenhouse Gas Emissions
- Improved Life-cycle Management of Packaged HVAC Systems
- Improved Water Resilience on DoD Installations
- Impact of Climate Change on DoD Buildings
- Climate Impacts on DoD Water Infrastructure
- Analyzing the Impacts of Weather Events on DoD Installations
- Improving Climate Resilience of DoD Installation and Surrounding Community Infrastructure

WEBINAR: ESTCP Director Dr. Herb Nelson, Deputy Director Dr. Andrea Leeson, and the ESTCP Program Managers conducted an online seminar “ESTCP Funding Opportunities” on January 20, 2022. This briefing offered valuable information for those interested in new ESTCP funding opportunities. A copy of the slides and the recording are available at <https://serdp-estcp.org/Funding-Opportunities/ESTCP-Solicitations/Webinar>.

## UPDATE TO “CONSERVING BIODIVERSITY ON MILITARY LANDS” HANDBOOK: A LEGACY OF SUPPORTING CONSERVATION PRACTITIONERS

By Shara Howie, NatureServe

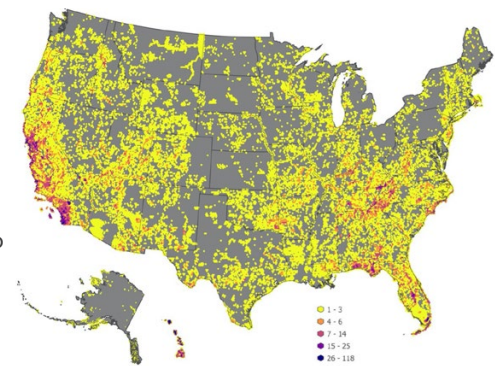
“Even as Fort Bragg worked to reconcile red-cockaded woodpecker conservation and military training needs, it became apparent that a major threat to both loomed on the other side of the base fence.” This is an excerpt from the new “[Conserving Biodiversity on Military Lands](#)” publication. Over the past 25 years, the Legacy Program has fully funded the production and two updates of “Conserving Biodiversity on Military Lands,” a handbook that supports DoD NRMs in preserving our natural heritage. Developed by NatureServe in collaboration with several other organizations including the Center for Environmental Management of Military Lands, the 2021 version provides updates to the 1996 and 2008 publications. This handbook equips NRMs and other conservation professionals with cutting-edge information, strategies, tools, data and

lessons learned that can help them implement biodiversity conservation plans and mitigate impacts to listed species and species at-risk on and near U.S. military lands.

The updated handbook draws on the expertise of biodiversity conservation professionals from across the United States, including DoD installation NRMs, non-governmental organizations, conservation professionals, academia, state and federal agencies, and others involved in biodiversity conservation research and land management. Some of the most significant changes in the 2021 handbook are adjustments to the emphasis on various conservation and DoD policy topics to ensure alignment with trends in conservation science. Other changes reflecting current DoD policies and practices include increased references to climate change implications and new perspectives on ecosystem and landscape-scale conservation.

Chapters 1-3 of the handbook provide a compelling overview of biodiversity’s importance to the military mission, and they illustrate how critical DoD lands are to the conservation of biodiversity in the United States. These chapters also summarize biodiversity conservation science issues and policies with a focus on those unique to military lands. Revisions in this section include updated information and maps that illustrate current patterns of biodiversity across the United States. Chapters 4-7 of the handbook cover the legal and policy frameworks that underpin biodiversity conservation on military lands including an in-depth discussion of the importance of INRMPs, and information on programs and opportunities DoD has developed to support natural resource management efforts. Chapters 8-11 elaborate on topics that are key to creating benchmarks, monitoring programs, and land management strategies that support effective conservation efforts.

In addition, the 2021 handbook documents 10 case studies that exemplify successful biodiversity conservation efforts on military installations around the United States. As mentioned in detail in the “Natural Resources Manager Showcase” article in this newsletter, the 2021 handbook includes a case study on the dam removal efforts at Beale AFB in the northern Sacramento Valley. At this installation, species conservation experts from the federal and private sectors collaborated to demolish Beale Dam and build a “rocky ramp” to allow fish to pass. The result was the restoration of six miles of historic salmonid spawning habitat upstream from the base, supporting an endangered species population and reducing potential impacts to Air Force training activities.



Chapter 1 of the 2021 “Conserving Biodiversity on Military Lands: A Guide for Natural Resource Managers” handbook shows the distribution of imperiled species in the United States. This map displays the number of imperiled species (assessed by NatureServe as critically imperiled [G1] or imperiled [G2] throughout their range) using a 49-square-mile-hexagon grid. This highlights the importance of regions such as Hawaii, coastal California, the Florida panhandle, the central ridge of Florida, and the southern Appalachians. Source: NatureServe Network 2021.

The Legacy Program-supported handbook has been very successful over its 25-year history. More than 5,000 copies of the 1996 version were distributed inside and outside DoD. The handbook has been used by at least three major universities, and it has been a



primary publication used in training programs for DoD NRMs. Surveys of practitioners show that they are eager to use the updated handbook to support their conservation work. The Legacy Program's leadership in keeping this valuable resource current and relevant significantly contributes to the success of conservation efforts both on and off military lands across the United States.

## THE LEGACY PROGRAM AND THE COOPERATIVE ECOSYSTEM STUDIES UNITS NETWORK

By Thomas E. Fish, U.S. Department of the Interior

CESUs function as “virtual” organizations, linking federal agencies and nonfederal institutions to increase access to specialized technical and scientific expertise. CESUs employ a unique institutional arrangement that fosters innovation, interdisciplinary problem solving, co-production of “usable knowledge,” and collaborative learning for participating federal and nonfederal partners. DoD has been an active federal partner in the CESU Network since 2000. In keeping with other federal agencies, DoD was eager to engage the vast community of CESU partner organizations and their diverse subject-matter expertise to enhance its resident natural and cultural resource management capacity.



*Texas A&M Natural Resource Institute (NRI) Project Specialist, Alison Lund, performing a field survey for the Lower Keys marsh rabbit (*Sylvilagus palustris hefneri*) at Naval Air Station Key West. Source: Texas A&M NRI*

L. Peter Boice, former Legacy Program and Natural Resources Program Director, championed the initial enrollment and expansion of DoD participation across the 17 regional CESUs. The DoD Natural Resources Program supports coordination for DoD nationally, including serving on the national interagency CESU Council, along with regionally assigned staff representing DoD in each CESU. In addition, the Legacy Program provides funding on an annual basis for DoD to contribute to host university support in each CESU. This financial backing to the host universities is crucial because it enables DoD and other federal agencies to carry out projects that make it easier to comply with federal laws, regulations, and EOs; protect valuable natural and cultural resources; and minimize training restrictions and ensure mission readiness on DoD installations.

Opportunities for partners to network across the diverse community of organizations often bring together individuals and institutions that would otherwise not interact with one another. Such opportunities promote new connections and sharing of ideas and mutual interests that can lead to future collaborations for impactful science, stewardship, and educational activities. This also aligns with DoD authorities and management priorities best served through coordinated actions with other federal and state agencies and allied conservation organizations. Supported activities encompass work specific to a given species, ecosystem, or challenging management issue that might occur at one site or across a multistate region. Projects

often involve students, who benefit from exposure to real-world problems—conducting research and fieldwork side by side with agency scientists, managers, and technical staff; establishing connections with potential mentors and employers; and gaining hands-on experience to inform their professional development and career directions. For more information on the CESU Network and the Legacy Program's supporting role, review the [Natural Selections Winter 2020 issue](#).

## DOD PARTNERSHIP WITH THE NATIONAL ENVIRONMENTAL EDUCATION FOUNDATION SUPPORTS CONSERVATION EFFORTS FOR INSTALLATIONS AND THE PUBLIC

Nancy Smith, National Environmental Education Foundation

For more than two decades, DoD and NEEF have worked together to improve the quality of our environment and health. Through Legacy Program funding, NEEF and DoD provide support to military installations for projects that improve the quality of public lands and preserve natural and cultural resources. This enables NRMs to complete small, installation-specific projects that may not otherwise occur due to budget or staffing limitations.

Most of these projects take place on NPLD, the nation's largest single-day volunteer event for public lands, which occurs on the fourth Saturday of every September. Since 1999, the Legacy Program has provided over \$3 million to NEEF to support more than 560 NPLD projects on military lands.

In 2018 and 2019, DoD NPLD projects brought out 1,629 volunteers who helped restore and maintain approximately 3 million square feet of land, remove more than 6,793 pounds of trash, and plant 67,890 trees and native plants. The projects not only contributed to invaluable conservation actions on both sides of military installation boundaries, but they also created spaces that connect military personnel and their families to nature.

In 2018, Fort Hood hosted an NPLD event for volunteers to create a publicly accessible native pollinator grassland and garden to showcase the many native species of birds, butterflies, and bees and how they work together to support a healthy grassland ecosystem. Visitors can witness firsthand how the landscape changes from month to month. For the past five years, Naval Facilities Engineering Systems Command Hawaii has hosted volunteers for several NPLD projects including repurposing an abandoned caretaker's quarters into a traditional nature sanctuary for service members, their families, and the public.

Impactful projects like these continue through the enduring partnership between DoD and NEEF. This relationship was further supported by Maureen Sullivan, Deputy Assistant Secretary of Defense for Environment, who served on NEEF's esteemed Ex-Officio board from 2016 until her retirement in 2020. Her commitment to the agency's goals combined with a dedication to a healthier environment guided and enriched our work together.

## SUPPORTING U.S. MILITARY STRATEGIES TO COUNTER TRANSNATIONAL ORGANIZED CRIME IN WILDLIFE TRAFFICKING

By Dr. Heidi Kretser, Wildlife Conservation Society

The illegal trade in wildlife and products made from their parts not only pushes species toward local, regional, and potentially global extinction—it is also a major national security threat that fuels organized crime worldwide. Primary contributing factors to wildlife trafficking and other conservation crimes include lack of public awareness about the problem, weak governance and enforcement systems, corruption, increased trade routes, and rising demand in many markets.



The Wildlife Conservation Society (WCS), a non-governmental organization that seeks to combat wildlife trafficking as part of its global mission, began working with the Legacy Program in 2009. The initial goal was to decrease the demand for wildlife products by U.S. military personnel stationed abroad. At first, WCS trained U.S. military personnel, who were scheduled for deployment to Afghanistan or Iraq, by educating them on the legal and environmental impacts of the wildlife trade. Over

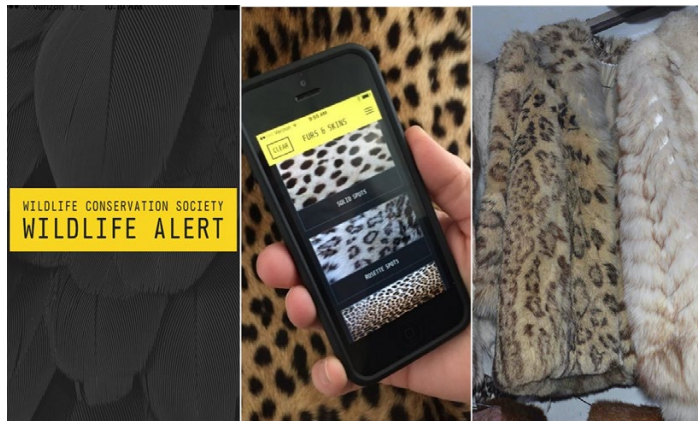


*In-theater training at Bagram Air Base. Source: WCS Afghanistan Program*

the next decade, with funding from the Legacy Program, we progressed from raising awareness to creating partnerships across the military to counter transnational wildlife trafficking.

WCS worked closely with military partners to convey the core message of not purchasing products made from threatened and endangered wildlife. We integrated that theme with a larger message describing how efforts to counter transnational organized crime must include a comprehensive approach to addressing wildlife trafficking. Integrating this approach into actions to combat the illegal trafficking of humans, drugs, ammunition, cultural artifacts, and natural resources is necessary for a simple reason: these activities co-occur, and the same organized crime syndicates perpetuate them.

Some notable products from our efforts to counteract wildlife trafficking include an award-winning video, [Caught in the Crosshairs](#), narrated by actor Edward Norton, and the mobile app Wildlife Alert, versions 1.0 and 2.0, which users have downloaded more than 3,000 times. Myriad other training resources have also helped prepare military personnel for cooperation with allies and partners to build skills and resources



*The Wildlife Alert app uses a decision-tree style approach to enable military personnel performing custom duties to identify products made from threatened and endangered species. Source: Wildlife Conservation Society*

for strategic, intelligence-led law enforcement operations to counter wildlife trafficking and other conservation crimes.

WCS has trained more than 25,000 military personnel at Fort Drum, West Point, military readiness conferences, and other pre-deployment and in-theater locations. We have distributed materials to all military installations in the United States as well as to all Command Centers. Our work inspired a revised definition of counter transnational organized crime to include illegal trade in natural resources and wildlife in the National Defense Authorization Act for FY 2015. The Deputy Assistant Secretary of Defense for Counternarcotics and Global Threats recognized the efforts of WCS in that process.

Transnational organized crime in wildlife trafficking continues to pose significant threats to wildlife and remains a major national and global security challenge. Through a decade of work with DoD, WCS raised awareness of wildlife trafficking to reduce the potential for military personnel to inadvertently contribute to the problem. We also highlighted the opportunities for DoD to apply intelligence-led enforcement strategies to disrupt wildlife trafficking as part of a larger approach to counter international crime. These successes are foundational for conservation organizations, national governments, and DoD in tackling transnational organized crime in partnership with law enforcement agencies.



*Clouded leopard (Neofelis nebulosa). Source: stock photo*



## SECRETARY OF DEFENSE ENVIRONMENTAL AWARDS

DoD established the annual Secretary of Defense (SecDef) Environmental Awards in 1962 to honor individuals, teams, and installations for their outstanding achievements and innovative environmental practices. DoD announced the 2021 award winners on Earth Day, April 22, 2021. This year's Natural Resources Conservation, Large Installation award winner is Eglin AFB, Florida! One of Eglin AFB's most noteworthy accomplishments was developing a strategy for gopher tortoise conservation. Through an FY 2020 Memorandum of Agreement with the Florida Fish and Wildlife Conservation Commission and Florida Fish and Wildlife Foundation, Eglin AFB became the primary recipient site for gopher tortoise populations that alternative energy production from non-DoD entities had displaced across Florida. During FY 2019 and 2020, Eglin AFB's NRM and conservation partners moved more than 2,300 gopher tortoises to the installation, and Eglin AFB is on track to reach its goal of receiving a total of 6,000 tortoises by 2023. Increasing gopher tortoise populations on base could help sustain population numbers and prevent the species from being listed as threatened or endangered under the ESA.



*The Eglin Natural Resources Team tags a gopher tortoise by drilling holes on the corners of its shell before releasing it into its new home deep within the base's range.*

*The first approximately 250 tortoises were released into their 100-acre environment after being rescued from urban development at their previous home in south Florida. Increasing gopher tortoise populations on base could prevent the U.S. Fish and Wildlife Service from listing the species on the threatened and endangered species list.*



The Office of the Assistant Secretary of Defense for Sustainment (OASD(S)) signed out the [2022 SecDef Environmental Awards Request for Nominations and Guidance](#) in November 2021. The 2022 awards cycle will recognize achievements from October 1, 2019, through September 30, 2021 (FY 2020-FY 2021) in nine award categories. Two natural resources awards will be presented this year: Natural Resources Conservation (Small Installation) and Natural Resources Conservation (Individual/Team). Nominations for the 2022 SecDef Environmental Awards are due to OASD(S) by February 25, 2022. For more information on the SecDef Environmental Awards program, including information about the 2021 winners and honorable mentions, visit the awards program website at <https://denix.osd.mil/awards/>.

## DOD EARLY DETECTION, RAPID RESPONSE INVASIVE SPECIES STRIKE TEAMS

By Steven Manning, Invasive Plant Control, Inc.

One of many concerns for installation NRMs continues to be the emergence of invasive species. In 2012, the Legacy Program awarded Invasive Plant Control, Inc. (IPC), funding for project 12-622, DoD Early Detection, Rapid Response Invasive Species Strike Teams—A Pilot Project, to address this issue by creating a team to rapidly identify and control invasive plant species. The pilot was modeled on IPC's mobile strike teams and the National Park Service's Exotic Plant Management Teams, which are highly trained teams that identify and treat sites with invasive plant species. The DoD Early Detection, Rapid Response (EDRR) Strike Team model provided installations with a team of professionally trained staff members, who offered an A-to-Z service, from the control of invasive species to the restoration of the impacted habitat with desirable native species. Project deliverables included a review of current invasive species management plans; on-the-ground invasive species control; habitat restoration using native species; onsite training for local stakeholders; assistance in developing Cooperative Invasive Species Management Areas; support using the Early Detection and Distribution Mapping System (EDDMaps), which is an online tracking tool that served as a pilot for installations; and a standard operating procedures manual for the proposed DoD EDRR Strike Team.



*This autumn olive located inside Arnold Air Force Base often grows close to rare species of native plants. Selective control methods allow the strike team to protect desirable species. Source: IPC*

Over three years (Legacy Program projects 12-622, 13-622, and 14-622), the DoD EDRR Strike Team initially controlled 16 invasive species on 203.6 acres on four DoD installations representing each Military Service. At Fort Detrick, the team protected the installation's newly planted trees by controlling invasive vines that impact tree sapling survival. The team also worked at the Forest Glen Annex to control invasive trees, shrubs, and vines along a railroad corridor to improve line-of-sight access for security. At NAS Patuxent River, the team controlled six invasive plants including Callery pear and Chinese privet. At MCAS Cherry Point, the team controlled wisteria growing along the forest edge and encroaching on a housing area. Control and maintenance of this site at MCAS Cherry Point will enable regeneration of native tree species, provide survivability of



*Many invasive species can be controlled using smaller handheld tools like this brush cutter with rotary blade allowing for easier transport for the mobile strike teams. Source: IPC*

mature forest edge trees, limit tree injury or death, and address safety concerns. Finally, at Arnold AFB, the team controlled loblolly pines at Salt Well Hollow, a Second World War German prisoner-of-war camp, in the barrens of Middle Tennessee. Loblolly seedlings can create monocultures in grasslands, threatening the already endangered/endemic species of this unusual plant community (i.e., Eggert's sunflower).

Invasive species can radically change landscapes and make training, testing, and operations difficult or impossible for military personnel. While species and control measures differ, most installations have similar management challenges concerning invasives. Legacy Program funding allowed us to test and prove our technique for controlling invasive species and restoring native plants to installation landscapes. The DoD EDRR Strike Team offers a successful tool to increase installation NRMs' knowledge of invasive species and engage in the control and restoration of infested areas. This program can be expanded in the future to other regions or military installations with invasive species, which could help native species survive.

*Continued from page 1*

## THIRTY PLUS YEARS OF THE LEGACY PROGRAM

Its importance in conserving listed and at-risk species cannot be overstated. More than 40% of DoD's threatened and endangered species expenditures have been on birds, and many of these species have shown steady population declines for more than 30 years. DoD PIF's Strategic Plan, adopted in 1994 and updated twice to reflect changing circumstances, has been a model for identifying priority projects for Legacy Program funding.

The MDEI, established in response to a White House emphasis on ecosystem management, was one of eight such regional efforts announced in 1994, and the only one that relied completely on new funding. The MDEI's ongoing focus was to enhance coordination and cooperation among DoD's four major Mojave installations—Edwards Air Force Base (AFB), Naval Air Weapons Station China Lake, National Training Center Fort Irwin, and Marine Corps Air Ground Combat Center Twentynine Palms—as well as with surrounding landholders. Its comprehensive set of data layers has proven to be an invaluable and enduring planning tool. MDEI also is one of four Legacy Program-supported efforts to receive a "Hammer Award" from the White House's National Partnership for Reinventing Government for its innovative approach to ecosystem management.

The Biodiversity Initiative was DoD's response for accomplishing biodiversity conservation goals on military lands while supporting the military readiness mission. Collaborating with The Nature Conservancy, DoD brought together a team of experts to document the tools and approaches available to NRMs. The resulting guide, "Conserving Biodiversity on Military Lands: A Handbook for Natural Resource Managers," published in 1996 and revised a decade later, remains a valuable resource for agencies, universities, and other land management entities. A new update has just been released by NatureServe (see Update to "[Conserving Biodiversity on Military Lands Handbook: A Legacy Supporting Conservation Practitioners](#)"). A complementary "DoD Commander's Guide" was the first of at least a half dozen resources describing the importance of key conservation principles for military leaders.

As alluded to earlier, I was only tangentially involved with the Legacy Program in FY 1995, when our office temporarily benefited from the services of a soon-to-retire Army National Guard lieutenant colonel. I focused my efforts on two major initiatives—updating DoD Instruction (DoDI) 4715.3, *Environmental Conservation Program*, in 1996 and coordinating passage of paradigm-shifting amendments to what would be called the "Sikes Act Improvement Act."

The results of those complementary efforts have been far-reaching. The 1996 issuance established both ecosystem management and biodiversity conservation as DoD-wide goals and required the development and implementation of integrated natural (and cultural) resources management plans. The Sikes Act amendments of 1997 added important legal authority by requiring that the Military Services program funds to both develop and implement integrated natural resources management plans (INRMP). Previously these plans had been discretionary.

These non-Legacy Program successes proved vital to the Legacy Program's long-term survival. We almost lost the program in FY 1996 due to proposed federal budget cuts. Legacy Program funding dropped from \$50 million to about \$2.5 million in just one year. If we had not made large outyear commitments to the MDEI, the Legacy Program probably would not have survived.

Fortunately, with the support of the Deputy Under Secretary of Defense for Environmental Security, Sherri Goodman, Jim Van Ness (our program attorney) and I were able to convince Congress to reset the program at a lower but still important funding level that remained at around \$10 million per year for close to a decade. Unfortunately, "mandatory" cuts in later years further reduced funding to its current level.

The resulting Legacy Program amendments that passed in FY 1997 were key to focusing the program's future direction. Funds were limited to efforts necessary "to meet legal requirements or support military operations." Among activities explicitly emphasized were ecosystem-wide management plans, wildlife studies to help ensure the safety of military operations, and control of invasive species. Although the Legacy Program could no longer fund most installation-specific projects, it retained flexibility to focus on far-reaching efforts that directly supported military needs.

The Legacy Program successfully stimulated viable natural resources management programs at many installations during its first five years. Efforts since then have emphasized regional, national, and topical (e.g., invasive species, pollinators, bats, amphibians, reptiles) projects.

A full accounting of the many initiatives introduced or supported by the Legacy Program since its reboot is beyond the scope of this article. Some, such as DoD Partners in Amphibian and Reptile Conservation (DoD PARC), National Public Lands Day (NPLD), and the CESU Network, are discussed elsewhere in this issue.

Other efforts merit mention here. For example, following the success of the MDEI and with newly established policies promoting ecosystem management on military lands, the Legacy Program initiated a Gulf Coastal Plains partnership focused on Eglin AFB and Tyndall AFB; a study of the Great Basin's Nevada installations; and a Sonoran Desert ecosystem initiative, as well as efforts in the Colorado Front Range and Puget Sound.

The Legacy Program also organized a series of 10 regional workshops to promote cooperation and identify potential



multi-partner projects that would benefit from startup funding. Half of these workshops focused on regional threatened and endangered species topics, the other half on projects that would benefit both DoD's INRMPs and new state wildlife action plans. In total, the Legacy Program supported more than 60 projects identified through these workshops.

When appropriate, Legacy Program projects have reached across international boundaries in support of sound natural resources management. An early effort was a rapid ecological assessment of all biological resources in the Panama Canal Zone. Completed shortly before the region was returned to Panama's control, this assessment ensured that Panamanians had a full understanding of the wealth of resources that had been protected while under U.S. control. (The Legacy Program funded a similar effort for the Zone's cultural resources.)

More than a decade ago, the Legacy Program funded a five-year study of the burrowing owl to prevent its listing under the ESA, a move that could have restricted military operations on dozens of installations. The study, which included 39 military bases, as well as lands managed by 31 partners in the United States, Canada, and Mexico, won the 2013 Presidential Migratory Bird Federal Stewardship award.

Invasive species control associated with military operations overseas has been a Legacy Program focus since its origins. An early collaboration focused on innovative measures to enhance the detection, control, and eradication of the brown tree snake from Guam and to prevent its unwitting transportation elsewhere. Another program provided a guidebook of best management practices for decontaminating in-theater vehicles and equipment before their transfer to other locations.

DoD also cooperated with the Wildlife Conservation Society to develop and disseminate materials to improve service member awareness of how to prevent illegal wildlife trade in protected species, a growing concern during the height of the U.S. presence in Iraq and Afghanistan.

Many Legacy Program projects have provided military-centric tools to aid DoD in managing its key resources. Among these are an invasive species toolkit; conservation law enforcement training; a national assessment of the presence and extent of amphibian fungal disease; and enhanced procedures to assist the Bird/Wildlife Aircraft Strike Hazard (BASH) team. Focused funding has encouraged installation-specific efforts on topics such as controlling invasive weeds and improving pollinator habitats. Other projects have focused on marine resources, including a coral reef conservation guide and tools to decrease the threat of collisions to both manatees and whales.

For the past decade, the Legacy Program has contributed to understanding and managing what is probably our world's greatest challenge, climate change. One project assessed the vulnerability of birds and vegetation on military lands to risks such as sea-level rise. Another developed and provided training for a climate adaptation guide for DoD resource managers.

Finally, recent projects highlight that, despite its limited funding, the Legacy Program has been able to continue supporting key cooperative partnerships such as DoD PARC, DoD PIF, the CESU Network, and NPLD. It has also funded a range of exciting new projects including a study of snake fungal disease, a Central California Coast joint venture to protect at-risk bird species, a survey of at-risk plant and invertebrate species on Guam, an analysis of the return on investment for DoD's endangered species conservation efforts, an aerial reconnaissance of listed bat species, and an initiative to conserve the western population of the monarch butterfly.

Reflecting back to that day in August 1990 when I first assumed management responsibilities for the Legacy Program, I saw then the exciting possibilities to substantially improve the management of DoD's irreplaceable natural and cultural resources. Yet, I never dreamed that more than 30 years later, the Legacy Program would not only survive but exceed my wildest dreams. To this day, it continues to lead the way in implementing successful new collaborative natural resources partnerships.

Of course, none of this would have been possible without the wisdom, innovation, and persistence of hundreds of dedicated NRMs and contractors within DoD, and the collaboration of countless others from federal and state governmental agencies, nongovernmental organizations and universities, and volunteers from all walks of life. The Department owes them its sincere thanks.

*L. Peter Boice is an occasional freelance writer when he isn't traveling, practicing nature photography, hiking, running, taking courses he never dared take, discovering hidden secrets of his ancestors, reading and watching Nordic Noir, and enjoying the grandkids. He may be contacted at: [mdroadrunner32@hotmail.com](mailto:mdroadrunner32@hotmail.com).*

## LEGACY PROGRAM PROJECT HIGHLIGHTS

The following are summaries of recently completed Legacy Program projects that the natural resources community may find interesting and useful. Explore these and additional projects on the [Natural Resources Legacy Project Deliverables](#) page on DENIX.

1. Legacy Program #NR 15-774: Assessment of Stream Crossing Impacts to Ephemeral Streams on Military Lands

Point of Contact (POC): [Jeremy Shaw](#), Colorado State University

The study of roads on military training areas gathered information about impacts on the health of ephemeral stream riparian ecosystems and stream flow rates. The findings have facilitated strategic planning and sustainable management of natural resources on military lands for better infrastructure in downstream riparian zones.

2. Legacy Program #NR 15-784/16-784: Threats and Vulnerability Assessments for High Priority Species at-Risk on or Near DoD Lands

POC: [Shara Howie](#), NatureServe

This study conducted an analysis in cooperation with DoD and USFWS to produce a nationwide list of Species at-Risk (SAR) by Military Service and an assessment of these species by DoD installation. Proactive conservation of SAR can preclude the need to list those species under the ESA, which is beneficial to the military in maintaining its lands for training, testing, operations, and other purposes.

3. Legacy Program #16-788: DoD Wildfire Hazard Assessment

POC: [Andrew Beavers](#), Colorado State University

Through an analysis of 10 wildfire metrics, the cross-branch triaging process identified 13 installations with high wildfire hazard, including nine from the Army, three from the Air Force, and one from the Marine Corps. An additional 31 installations were assigned to the moderate wildfire hazard

category. Identifying installations with high and moderate wildfire hazards will increase the ability of national wildland fire managers to focus resources and make data-driven wildfire management decisions.

4. Legacy Program #16-804: Enhanced Monitoring of Imperiled Bat Species on DoD Installations Using Aerial Acoustic Technology

POC: [Dr. Emma Willcox](#), University of Tennessee

This study determined that using acoustic detectors aerially in conjunction with ground-based detectors yields a better sample of bat species presence in all sample locations. As a result, new monitoring techniques may provide military installation managers with a more effective strategy to monitor populations and determine the presence of threatened, endangered, and at-risk bat species.



Big brown bat (*Eptesicus fuscus*). Photo by Paul Block, Navy.

5. Legacy Program #NR 16-822: Maximizing the Efficacy of Intra-Installation Translocations to Mitigate Human-Rattlesnake Conflicts

POC: [Jayme Waldron](#), Marshall University

Study results showed that home-range size was positively associated with the proportion of high-risk habitats within home ranges. This indicated that high-risk habitats were of low quality, forcing the eastern diamondback rattlesnake (*Crotalus adamanteus*) to use larger ranges for resource selection. Results will be used to write management protocols that address human-rattlesnake encounters and help lessen interruptions to training activities by helping to maintain continued access to training areas.

6. Legacy Program #NR 17-818: Gopher Tortoises and Test Ranges: Developing an Understanding for the Wildlife-Habitat Relationships of This Novel Habitat

POC: [David G. Price](#), Virginia Polytechnic Institute and State University

The study found that most gopher tortoises tend to prefer grassy and shrubby test range habitat over wooded areas. The study also found that gopher tortoise habitat range was much smaller than previously reported. This research can inform management plans to improve ecological conditions that promote population growth while minimizing impacts to the military mission.

7. Legacy Program #18-844: Managing Invasive Ants on DoD Lands in Hawaii

POC: [Paul Krushelnycky](#), University of Hawaii

To help control invasive ant species populations, researchers experimented with several pesticides on known invasive ant populations on military installations in Hawaii. The study found that different pesticides helped reduce the invasive ant populations without negatively impacting native pollinator species.

8. Legacy Program #18-846: Dormant Season Burning Impacts to Migratory Bats

POC: [William Ford](#), Virginia Polytechnic Institute and State University

Study results suggest fire use that varies in space, time, and frequency provides a diverse landscape pattern of mesic deciduous habitat within a larger pine forest matrix. This supports a diverse bat community during the dormant season and in a manner compatible with range management activities. Installations that use prescribed fire to manage their landscapes serve as a benefit to non-hibernating, migratory bats. Dormant season burning does not appear to have a negative impact, and there is evidence that current range management on military lands in the Coastal Plains dormant season contributes positively to migratory bat conservation.

9. Legacy Program #NR 18-860: Conservation Banking Training Course

POC: [Alidra Creamer](#), USFWS

This course fosters collaboration among regulators, bank and other mitigation sponsors, and users, ensuring that all entities thoroughly understand conservation banking policy to facilitate the establishment of banks and in-lieu fee programs on the ground. Activities by and on military installations impact wetland resources and species that are regulated. Conservation banking provides a way to offset those impacts on a large scale, which is beneficial to DoD in terms of cost and time efficiencies as well as species recovery.

10. Legacy Program #SAP-GCWA-20: Oak Regeneration Under Varying Treatment Regimes: Management Guidelines and Implications for At-risk Avian Species

POC: [Jinelle Sperry](#), U.S. Army Engineer Research and Development Center-Construction Engineering Research Laboratory

This study found that seedling density was lower and the proportion of stems browsed was higher on thinned plots compared to control or wildfire plots. The results, in combination with a literature review of the current state of knowledge, suggest that oak regeneration on military installations will likely require a suite of management strategies. Mechanical thinning prescriptions would benefit from secondary management strategies including prescribed fire, herbivore control, and/or shrub management. Understanding the impacts of military land management on oak recruitment is critical for DoD land managers when developing appropriate forest management programs on installations that harbor at-risk and endangered wildlife species that are dependent on oak habitats.



## UPCOMING EVENTS, CONFERENCES, WORKSHOPS, AND TRAININGS

### **National Invasive Species Awareness Week**

February 28–March 4, 2022

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

### **North American Wildlife and Natural Resources Conference**

March 14-18, 2022

Spokane, Washington

The 87th North American Wildlife and Natural Resources Conference will bring together natural resources professionals from all sectors to exchange knowledge and best practices on issues such as endangered species, migratory birds, and landscape management through workshops and meetings. The event serves as the annual forum to set conservation policy in North America and includes conference sessions, workshops, and more than 150 separate meetings and functions.

### **National Military Fish and Wildlife Association (NMFWA) Annual Meeting and Training Workshop**

March 14-18, 2022

Spokane, Washington

Held in conjunction with the North American Wildlife and Natural Resources Conference (above), the NMFWA annual meeting and training workshop is the primary event where installation NRMNs meet to discuss key concerns and opportunities, recent policy and legislative changes, ongoing activities and recent accomplishments, and emerging issues and potential new challenges.

### **Mountain Lion Workshop**

April 4-7, 2022

Hood River, Oregon

This workshop is held every three years and is sanctioned by WAFWA. The workshop provides a forum where leading mountain lion managers and researchers share research results, management strategies, and emerging issues in mountain lion management throughout North America.

### **National American Regional Association of the International Association for Landscape Ecology Annual Meeting**

April 11-14, 2022

Virtual

Efforts within the field of landscape ecology often blend design science, sustainability science, and creative conservation. This annual meeting brings together leaders in landscape ecology who are dedicated to preserving and protecting natural resources, including educators and practitioners in the fields of geology, ecology, biology, geography, urban and regional planning, and landscape preservation and design.

### **Naval Civil Engineer Corps Officers School (CECOS) Natural Resources Management and Compliance Training Course**

August 8-11, 2022

Wright-Patterson AFB – Dayton, Ohio

This course offers instruction in specific natural resource laws, regulations, policies, EOs, DoDIs, and other guidance, noting Service-specific requirements. It is recommended that the following personnel take this course: primary duty [NRMNs, CRMNs, and related personnel, environmental lawyers (or lawyers in that capacity), Civil Works NRMNs (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.

### **DoD Natural Resources (NR) Program Webinar Series**

Virtual

The NR Program hosts webinar presentations from Legacy project principal investigators, NR Program partners, and other stakeholders on relevant topics for the Military Services, federal and state agencies, non-governmental organizations, and other interested groups. Webinars are held every four to eight weeks. To join the mailing list to receive notifications about these webinars, contact DoDNatRes@bah.com.

### **Strategic Environmental Research and Development Program (SERDP) & Environmental Security Technology Certification Program (ESTCP) Webinar Series**

Virtual

The SERDP and ESTCP Webinar Series promotes the transfer of innovative, cost-effective, and sustainable solutions developed through projects funded in five program areas. The webinar series targets DoD and Department of Energy practitioners, the regulatory community, and environmental researchers with the goal of providing cutting edge and practical information that is easily accessible. Most webinars will feature two 30-minute presentations and interactive question and answer sessions.

### **Readiness and Environmental Protection Integration (REPI) Program Webinar Series**

Virtual

The REPI Webinar Series highlights best practices and provides knowledge sharing tutorials on REPI partnership efforts that support military missions, accelerate the rate of conservation, and promote military installation and community resilience.

## LINKS OF INTEREST

### DoD Natural Resources Program

DoD's Natural Resources Program provides policy, guidance, and oversight to manage natural resources on approximately 25 million acres of military land, air, and water resources. Visit the Natural Resources Program website for more information on DoD's natural resources initiatives, policy updates, presentations, and links to other conservation and natural resources sites.

### DoD Legacy Resource Management Program

Congress established the DoD Legacy Resource Management Program (Legacy Program) in 1990 and modified it under the fiscal year 1997 National Defense Authorization Act. The Legacy Program funds natural and cultural resources projects that support military readiness and enhance conservation objectives. Projects eligible for Legacy Program funding must have regional or DoD-wide significance and involve more than one Military Service; be necessary to meet legal requirements or to support military operations; be more effectively managed at the DoD level; and not be an assigned responsibility of a Military Service.

### DoD Environment, Safety and Occupational Health Network and Information Exchange (DENIX)

The DENIX Natural Resources website is another resource that provides access to natural resources information. Specifically, the website includes DoD Legacy Resource Management Program fact sheets and reports, as well as other natural resources materials.

### Armed Forces Pest Management Board (AFPMB)

AFPMB recommends policy, provides guidance, and coordinates the exchange of information on pest management throughout DoD. Its mission is to ensure that environmentally sound and effective programs are in place to prevent pests and disease vectors from adversely affecting natural resources and DoD operations.

### Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP)

SERDP and ESTCP are independent DoD research programs that use the latest science and technology to develop innovative solutions to DoD's environmental challenges. They promote partnerships and collaboration among academia, industry, the Military Services, and other federal agencies that support military readiness, compliance with legislation and policy, and natural and cultural resources management.

### Readiness and Environmental Protection Integration (REPI)

Under REPI, DoD partners with conservation organizations and state and local governments to preserve land around military installations to combat encroachment. REPI promotes innovative land conservation, which preserves the military's ability to train and test on its lands now and into the future.

### Cooperative Ecosystem Studies Units (CESU) Network

DoD participates in the CESU Network, which is a national consortium of federal agencies, tribes, academia, state and local governments, and non-governmental organizations working together to provide research, technical assistance, and training to federal agencies and their partners. The CESU Network also provides managers with the adaptive management approaches necessary to preserve installation natural and cultural resources.

### DoD Partners in Flight (PIF)

DoD PIF consists of natural resources personnel from military installations across the United States and works collaboratively with partners throughout the Americas to conserve migratory and resident birds and their habitats. In addition, DoD PIF supports and enhances the military mission through proactive, habitat-based management strategies that help protect birds on DoD lands and maintain healthy landscapes and training lands. Visit the DoD PIF website for fact sheets, reports, and other materials with information about DoD's migratory bird conservation efforts.

### DoD Partners in Amphibian and Reptile Conservation (PARC)

DoD PARC is a 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. Visit the DoD PARC website for information about herpetofauna management projects on DoD lands.

### DoD Pollinator Initiatives

Visit this website for an overview of pollinators and why they are important to DoD. The website also contains information on how people can help protect pollinators and their habitat, including fact sheets, technical reports, and how-to guides.

### DoD Invasive Species Outreach Toolkit

This toolkit has materials to help DoD natural resources managers communicate with agencies, organizations, and the public about invasive species issues on DoD lands. Specifically, the tool kit includes modifiable outreach materials, such as posters, brochures, reference cards, and a PowerPoint presentation.

### Conserving Biodiversity on Military Lands: A Guide for Natural Resource Managers

The DoD Biodiversity Handbook contains a thorough introduction to biodiversity and how it is essential to support the military mission. It also details the scientific, legal, policy, and natural resources management contexts for biodiversity conservation on DoD lands, and includes 10 case studies with practical advice from DoD natural resources managers.

### DoD PARC Photo Library, DoD PIF Photo Library, and DoD Natural Resources Photo Library

Visit these three websites to share pictures, news, information, and ideas with the DoD Natural Resources, DoD PARC, and DoD PIF communities. Please review the [photo policy](#) and [photo submission instructions](#) to contribute your images. In addition, account users can download photographs for reports, PowerPoint presentations, and educational materials.

### DoD Chesapeake Bay Program (CBP)

DoD was one of the first federal departments to be formally involved in the Chesapeake Bay Watershed restoration effort. Military installations in Maryland, Pennsylvania, Virginia, New York, West Virginia, and the District of Columbia play an important role in defending and preserving the Bay. DoD-funded efforts advance the goals and outcomes of the Bay and further the ability for DoD to test, train, and operate in the watershed.





# DOD NATURAL RESOURCES PROGRAM

**Enabling the Mission, Defending the Resources**

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## **DoD Natural Resources Program Support**

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