

# Natural Selections

Department of Defense Natural Resources Program



## CONTENTS

- 1 Spotlight: Twenty Years of Collaboration Through the Cooperative Ecosystem Studies Units (CESU) Network
- 2 Message from the Natural Resources (NR) Program
- 4 The Gulf Coast CESU: Building Multi-Disciplinary, Multi-Agency Teams to Solve Natural Resources Issues Across the Region
- 5 Strengthening Coastal Sand Dunes Through Restoration at Naval Air Station Oceana Dam Neck Annex (NASO DNA)
- 6 Desmarest's Hutia Population Abundance And Spatial Ecology
- 6 Recovering Hawaii's State Bird, The Nēnē
- 7 Military Lands In Dryland Ecosystems: Vulnerabilities and Opportunities
- 7 15th Annual Endangered Species Day
- 8 Department of Defense (DoD) Wildfire Risk Analysis
- 8 Climate Adaptation for DoD Natural Resource Managers
- 9 DoD CESU Regional Representatives
- 10 American Crocodile Surveys at Naval Air Station (NAS) Key West
- 11 Hampton Roads Winter Eagle Nest Surveys
- 12 2020 Sustaining Military Readiness (SMR) Conference
- 13 Aerial Remote Sensing Enables Better Management of DoD Coastal Lands
- 13 Announcements
- 14 Evaluating The Biodiversity of Pearl Harbor's Freshwater and Estuarine Communities
- 15 DoD Project Highlights
- 15 Fort Hood Avian Monitoring
- 16 Upcoming Events, Conferences, Workshops, and Training
- 17 Links of Interest

## SPOTLIGHT: TWENTY YEARS OF COLLABORATION THROUGH THE CESU NETWORK

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

The CESU Network is a national platform for collaborative science, technical assistance, education, and capacity building to advance natural resources and cultural heritage stewardship and knowledge exchange. The program was established, in part, as a response to a reorganization at DOI in the mid-1990s that made it more difficult for federal agencies to access scientific and technical expertise. Building upon previous successful collaborative federal and non-federal partnership models, the CESU Network embodies an innovative approach to substantially expand resident scientific and technical capacity at the federal level through formal arrangements with non-federal partners and institutions. The CESU Network is inclusive, facilitating participation by multiple federal agencies and non-federal partners (e.g., academic institutions, state and local governments, non-governmental organizations). It has developed a landscape scale approach to science and stewardship that can help agencies meet their respective missions.

Authorized by Congress under the National Parks Omnibus Management Act of 1998 (Public Law 105-391), the intent was *"the establishment of a comprehensive network of cooperative study units as will provide full geographic and topical coverage" to "conduct multi-disciplinary research and develop integrated information products on the resources of the National Park System, or the larger region of which parks are a part."* In the context of the CESU Network, the "resources" referenced in the authorizing legislation include both natural and cultural resources.



The "larger region[s]" refers to biogeographic regions where National Park Service (NPS) units are located, which includes all 50 states, the District of Columbia, and United States territories.

These areas naturally contain a myriad of protected areas and public trust resources beyond those solely under NPS or any individual agency's authorities and jurisdiction. Today, the Network is distributed across 17 regional CESUs and includes 16 federal agencies<sup>1</sup> and more than 450 non-federal partner institutions, including partners in Canada and Mexico.

Following Congressional authorization, the CESU Network executed a [national interagency memorandum of understanding \(MOU\)](#) to formally connect participating federal agencies and outline authorities, objectives, roles and responsibilities, and structural elements for the program and its governance. The MOU established the interagency CESU Council as the governing body for the program, which is made up of representatives from each participating federal agency. The Council and its NPS support staff are responsible for program policy, planning, and guidance; ensuring competition, and the review, selection, and evaluation of CESUs; the development and administration of multi-party CESU regional agreements; and general coordination, communication, and program oversight functions network-wide. In 1999, the Council established the first "pilot" CESUs - Colorado Plateau, North Atlantic Coast, Rocky Mountains, and Southern Appalachian Mountains - with a total

[continued on page 3](#)

<sup>1</sup> National Aeronautics and Space Administration; U.S. Department of Agriculture (USDA), Agricultural Research Service, Farm Service Agency, Natural Resources Conservation Service, and U.S. Forest Service (USFS); U.S. Department of Commerce, National Oceanic and Atmospheric Administration; U.S. Department of Defense, Office of the Assistant Secretary of Defense for Sustainment, and U.S. Army Corps of Engineers-Civil Works; and DOI, Bureau of Indian Affairs, Bureau of Land Management, Bureau of Ocean Energy Management, NPS, U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service (USFWS), U.S. Geological Survey (USGS), and Defense POW/MIA Accounting Agency.

# MESSAGE FROM THE NR PROGRAM

By Ryan Orndorff, Program Director

## Welcome to the Winter 2020 Edition of *Natural Selections*!

Hi, I'm Ryan Orndorff, the DoD NR Program Director. Recently, I have taken over the responsibility of publishing the *Natural Selections* newsletter. I'm excited to continue sharing with all of you the latest DoD natural resources happenings and updates.

This issue of *Natural Selections* highlights the CESU Network and showcases various projects made possible through this unique program. As you learned in the Spotlight from Tom Fish, the CESU Network supports collaborative research, technical assistance, education, and capacity building between federal and non-federal parties to support natural and cultural resources management on federal lands. I am closely involved with DoD's CESU efforts, serving as the DoD National CESU Program Manager and participating in regular meetings with the CESU Council. In this role, I represent DoD in the CESU Network Biennial National Meeting and provide DoD's annual CESU data to the host university in each region and other stakeholders. Additionally, in 2019, I began hosting monthly meetings with all DoD CESU regional representatives to discuss pertinent regional and national issues and projects. It is inspiring to see first-hand how DoD works with its federal, state, non-governmental, and university partners to expand its capacity to manage natural and cultural resources.

DoD is currently a member in all 17 regions of the CESU Network, and the Department has at least one representative (see regional representatives [here](#)) from the Military Services or U.S. Army Corps of Engineers in each region. From fiscal years (FYs) 2010-2019, DoD funded over 1,500 projects through the CESU Network totaling more than \$435 million. This has allowed DoD to reach a wide variety of specialized experts and bring that unique knowledge to help DoD manage its natural resources. Read about how these experts have been able to provide their unique skillset and knowledge to benefit CESU projects in "Aerial Remote Sensing Enables Better Management of DoD Coastal Lands" and "Evaluating the Biodiversity of Pearl Harbor's Freshwater and Estuarine Communities." Having easy access to this expertise has allowed DoD personnel to conduct research and preserve its natural resources while maintaining military mission capabilities. Additionally, using the CESU Network can provide a more streamlined process for DoD to implement projects, saving costs in the form of a reduced Network-wide overhead rate cap of 17.5%, and using the U.S. Army Corps of Engineers and Naval Facilities Engineering Command (NAVFAC) to issue and manage cooperative agreements. All of these benefits generate cost savings that can be re-allocated to other

natural resources management initiatives, technology, or even additional research hours to improve another project's outcomes as long as the project meets the goals and intent of the CESU Network.

This edition of *Natural Selections* includes examples of different ways the CESU Network is enhancing research and science on DoD installations across the country. For example, "Strengthening Coastal Sand Dunes through Restoration at NASO DNA" shows DoD's partnership with the National Aquarium making great strides in protecting the dunes along NASO DNA. The "Hampton Roads Winter Eagle Nest Surveys" article demonstrates how the CESU Network is increasing trust between DoD and state and federal agencies through collaborative efforts to meet a common goal of decreasing bird/wildlife aircraft strike hazard (BASH) incidents. "American Crocodile Surveys at NAS Key West" features the advantages of working with specialized experts in threatened, endangered, and at-risk species, one of DoD's highest priorities in land management. These are just a few of the many projects taking place through the CESU Network that are advancing DoD's mission.

If you're interested in hearing how CESUs operate from the host university perspective, I encourage you to check out "Building Multi-Disciplinary, Multi-Agency Teams to Solve Natural Resources Issues Across the Region." This article details the benefits to Texas A&M University and its students and staff in its role as a CESU host university. These benefits include professional collaboration with federal employees, increased opportunities for interdisciplinary research projects, and the development of unique skills and expertise.

I hope you enjoy reading this issue of *Natural Selections* and learning more about the CESU Network. I'm excited about the Department's ongoing CESU projects, featured in the DoD Project Highlights section, that are helping us comply with federal laws and regulations, and executive orders, and regulations; protect valuable natural and cultural resources; and minimize training restrictions and ensure mission readiness on our installations.

For more information about the CESU Network, visit [www.cesu.psu.edu](http://www.cesu.psu.edu). Our next newsletter will be published this summer. Please contact [NaturalSelections@bah.com](mailto:NaturalSelections@bah.com) if you have any good DoD stories to share.



*CESU projects cover a range of natural and cultural resource management issues. Above, students and park staff inventory resources on the National Mall. Source: Chesapeake Watershed CESU*





## THE GULF COAST CESU: BUILDING MULTI-DISCIPLINARY, MULTI-AGENCY TEAMS TO SOLVE NATURAL RESOURCES ISSUES ACROSS THE REGION

By Deborah Danford, Texas A&M University Natural Resources Institute (NRI)

CESU host universities are an integral part of the CESU Network facilitating research capacity and scientific expertise. They provide research space, administrative support, and access to university faculty, students, staff, and resources. Host universities are competitively selected by the CESU Council and are periodically reviewed for reapproval.

The Gulf Coast CESU (GC-CESU) is made up of over 70 universities, federal agencies, and other non-governmental organizations. This partnership is a platform to conduct research of mutual interest, develop educational opportunities, and provide technical assistance.

The Texas A&M University NRI has served as the host university for the GC-CESU since August 2002. As Director of the GC-CESU, it is rewarding to see partners such as DoD and NRI initiate projects, especially ones that provide educational opportunities for students and natural resources managers while meeting the core objectives of the CESU Network. In particular, the GC-

CESU recently facilitated two projects between DoD and NRI that exemplify the CESU Network's objectives: Air Force Civil Engineer Center (AFCEC) Sikes Act Support - Natural Resources Management at Air Force Installations, and Natural Resources Support at Eglin Air Force Base (EAFB), Gopher Tortoise Translocation and Monitoring.

### AFCEC Sikes Act Support – Natural Resources Management at Air Force Installations

This AFCEC-NRI partnership facilitated the recruitment of highly qualified natural resources interns from Texas A&M University to work at 11 Air Force installations throughout the United States. Retired service members pursuing a second career were also encouraged to participate in the program as interns to facilitate their career advancement. The interns supported over 328 projects, including activities identified in installation-specific Integrated Natural Resources Management Plans (INRMPs). Interns "rolled up their sleeves" to enhance Air Force capabilities through threatened and endangered species conservation, wetlands protection, invasive species control, and fish and wildlife management. As part of these efforts, interns

As one of the largest CESUs in the national network, GC-CESU serves seven states from Texas to Florida and facilitates cooperative agreements that meet the CESU Network objectives:

- ✓ define and prioritize directions for future research;
- ✓ conduct high-quality scientific research;
- ✓ provide technical assistance;
- ✓ foster cooperative educational programs;
- ✓ provide educational opportunities for students;
- ✓ deliver timely, relevant research recommendations and technical assistance needed for natural resources management;
- ✓ ensure the independence and objectivity of research;
- ✓ create and maintain effective partnerships to share resources and expertise;
- ✓ take advantage of university resources while benefiting faculty and students;
- ✓ encourage professional development of federal scientists; and
- ✓ manage federal resources efficiently.

updated inventories, monitored species populations, mapped habitats, and provided restoration assistance for implementing INRMP conservation requirements.

Interns also received insight into the Air Force's natural resources goals and objectives. They learned how to integrate natural resources management and conservation while preserving military mission requirements. The interns increased their knowledge of natural resources methodologies through practical training, hands-on learning, and first-hand field experience. The NRI researchers and educators along with installation natural resources managers mentored the interns by discussing and helping them evaluate potential career opportunities. At the completion of the internship, one intern was accepted into the Louis Stokes Alliances for Minority Participation Bridge to Doctorate program. Other interns accepted permanent positions with DoD, USFWS, USDA, and private consulting firms.



Jim Peterson (Sgt Maj. U.S. Marine Corps, Ret.), an intern at Joint Base Langley Eustis participating in wetland protection and management inventory and restoration. Source: Texas A&M University NRI



Verlon Baize, an intern, helping out with threatened and endangered species management at EAFB. Source: Texas A&M University NRI

### Natural Resources Support at EAFB, Gopher Tortoise Translocation and Monitoring

EAFB is a part of the Candidate Conservation Agreement for the gopher tortoise (*Gopherus polyphemus*). The gopher tortoise is a candidate for listing as a federally threatened species within its eastern range largely due to predation and habitat destruction. This species is extremely critical to ecosystem preservation because it digs burrows that provide habitat for over 350 species. EAFB teamed with NRI through a Sikes Act cooperative agreement awarded by the U.S. Army Corps of Engineers, Omaha District to support gopher tortoise management and conservation. The NRI's objectives were to:

- assist with a comprehensive regional planning effort to identify opportunities to prevent encroachment imposed by conservation laws;
- identify priority lands to establish easements to offset any effects of military readiness activities, and;
- provide the EAFB Natural Resources Branch with support and technical expertise to execute gopher tortoise capture, relocation, release, and monitoring at constructed enclosures on EAFB.

This collaborative partnership between DoD, NRI, USFWS, and Save Florida's Gopher Tortoises resulted in capturing more than 1,000 gopher tortoises, removing them from development properties throughout Florida, and relocating them to EAFB. Relocating the tortoises to EAFB will significantly help the installation reach its gopher tortoise population goals, possibly eliminating the need for USFWS to impose stronger protections for the species. By avoiding stronger protections for the gopher tortoise, EAFB maintains greater flexibility for mission requirements and training, and eliminates the time of cost of Endangered Species Act (ESA) consultations. This successful project continues today.



*A marked translocated gopher tortoise. Source: Texas A&M University NRI*



*Gopher tortoise recovery efforts. Source: EAFB Natural Resource Program*

These two projects illustrate how easily federal agency partners can access the scientific expertise of university and non-governmental partners through the GC-CESU. The partnerships formed through the GC-CESU are successfully developing strategies to address the region's natural and cultural resources challenges. The overall success of the CESU Network benefits everyone involved in its efforts by maintaining DoD's mission capability, preserving natural resources and habitat on DoD lands, and building the expertise of future natural resources professionals. To read about Texas A&M University NRI's involvement with another project, check out the "Desmarest's Hutia Population Abundance and Spatial Ecology" article.

## STRENGTHENING COASTAL SAND DUNES THROUGH RESTORATION AT NASO DNA

By Charmaine Dahlenburg, National Aquarium

NASO DNA is located just south of the Virginia Beach resort area and spans over 1,970 acres of highlands, marshes, coastal beaches, and sand dunes. NASO DNA's mission, which is to attain the highest level of fleet readiness by developing and providing specialized training and support services in response to fleet requirements, is dependent upon the stability of beach and dune lands along its three-mile Atlantic coastline. NASO DNA offers a number of training facilities that support the major command missions as well as an advanced sea-to-land training area. Impacts from storms and military training have resulted in dune destabilization and erosion, as well as wildlife habitat loss and degradation. Restoring the dunes helps to protect coastal areas, but it also works to sustain the military mission. Sand dunes help protect these coastal areas from high winds,

salt spray, major storm events, flooding, and erosion. Further, coastal sand dunes can absorb stress and shift or "adapt" over time, which makes the shoreline more resilient to impacts from a changing climate. The National Aquarium in Baltimore, Maryland, has a shared interest in strengthening these coastal sand dunes, which are important to their mission to inspire conservation of the world's aquatic treasures.

In 2007, NASO DNA and the National Aquarium joined forces through a CESU Network cooperative agreement to maintain the integrity of the dune structure along this beachfront area. Through this ongoing cooperative agreement, NASO DNA and the National Aquarium host annual dune stabilization events to restore coastal ecosystems along the three-mile stretch of NASO DNA. Since 2007, 1,068 volunteers and military staff have planted a combined total of 424,890 grasses and shrubs as part of this cooperative agreement. Project related activities from past events include placing habitat restoration signs along beach access points and setting up photo stations for site monitoring. Volunteers and military staff reinforce dunes by installing fences to promote rapid sand accumulation and planting vegetation that is native to the mid-Atlantic region to secure that sand in place, thus stabilizing dunes and beachfront for unique military mission activities. The National Aquarium hosted this past year's four-day community restoration event in October 2019. DoD funded the event, which resulted in personnel planting 35,000 new grasses and shrubs along the dunes.



*A service member helps to plant vegetation on the sand dunes at NASO DNA. Source: Theresa Keil*

Without natural protection from the sand dunes, the Navy's mission at NASO DNA and our national security would be in jeopardy. This joint effort has effectively protected valuable coastline to create realistic training environments and ensure military readiness, restored important species habitat, and protected facility infrastructure. The partnership has not only provided opportunities for volunteers to gain knowledge and actively engage in coastal restoration, but has also raised public awareness about natural resources conservation within their community. This CESU

Network agreement enabled the Navy to use experienced personnel from the National Aquarium to design projects, purchase materials, and lead the events. The cooperative agreement includes funding through 2022, which will allow for additional site visits and monitoring of recently restored dunes.



*Volunteers work together to restore and protect coastal regions at NASO DNA. Source: Theresa Keil*



## DESMAREST'S HUTIA POPULATION ABUNDANCE AND SPATIAL ECOLOGY

By Dr. Israel Parker and Dr. Andrea Montalvo, Texas A&M University NRI

The Texas A&M University NRI is a committed natural resources partner to DoD in military lands stewardship. The CESU Network provides a critical foundation for NRI's stewardship efforts on dozens of DoD installations throughout North America. For example, the GC-CESU facilitated a cooperative agreement to conduct surveys and range analyses for the Desmarest's hutia (*Capromys pilorides*) at Naval Station Guantanamo Bay (NSGB). The NRI conducted the work in close partnership with the NSGB natural resources manager, George Kenny, and U.S. Army veterinarian, Captain Rachel Lawrence. These efforts support NRI's long-standing goal of providing usable information to natural resources managers while also advancing the CESU Network objective of providing quality information that supports informed decision-making for effective natural resources management.

The Desmarest's hutia (hereafter hutia) is a rodent native to the Republic of Cuba with a significant population on and around NSGB. Base personnel often refer to hutia as "banana rats" based on the shape of their prolific droppings. In recent years, NSGB has been home to a large population of hutias, which caused extensive damage to vegetation communities and installation infrastructure. The hutia vary in size and are omnivorous (but heavily herbivorous), often causing easily observable damage to native and decorative plants.



Curved hutia feces lead to the nickname "banana rat" at NSGB. Source: Andrea Montalvo

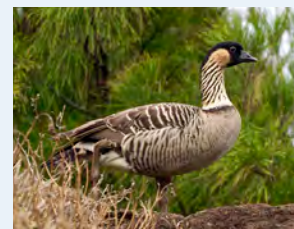
Additionally, hutia will chew on rubber and wiring found in engines, generators, and other infrastructure, requiring costly repairs or preventative actions.

However, despite these negative impacts in areas heavily populated by humans, hutias are an important element of the natural environment in Cuba. For instance, hutias are a critical food-source for the native Cuban boa (*Chilabothrus angulifer*), the local apex predator. Any management of the hutia population can have widespread impacts on other aspects of installation natural resources. NSGB is committed to appropriate management of hutia and installation ecology in the context of overall mission success. To ensure effective management of the hutia, NSGB natural resources managers sought detailed population and range use data, including movement patterns and the specific spaces occupied by the species.

NRI led efforts to collect these data. First, researchers conducted approximately 150 distance sampling surveys by driving and walking through the windward side of NSGB. Distance sampling is a widely used methodology in thousands of wildlife projects on and off DoD installations that allows researchers to calculate population by surveying animals on carefully crafted routes or transects. These surveys included documenting vegetation communities and land use types preferred by hutia. Researchers determined range use through detailed tracking of individual hutia. The team captured 13

## RECOVERING HAWAII'S STATE BIRD, THE NĒNĒ

In December 2019, USFWS down listed Hawaii's state bird, the Hawaiian goose, or nēnē, from endangered to threatened status under the ESA. The nēnē was listed as an endangered species in 1967 when its wild population shrank to fewer than 30 birds due to hunting and predators. USFWS Region



Hawaiian goose (*Branta sandvicensis*), Kilauea Point, Kaua'i. Source: Jörg Hempel

1 published the Nēnē Recovery Plan in 1983. This plan focused on maintaining wild nēnē populations by releasing captive birds, managing habitat and controlling predators, and conducting research on factors inhibiting the species' recovery. Today, the population is not only growing, but is "self-sustaining" and "well-distributed." There are now more than 2,800 nēnē with stable or increasing populations on Kauai, Maui, and Hawaii and an additional population on Molokai. The ESA has proven to be a successful species conservation tool in the case of the nēnē.

adult hutias in locations spread throughout the windward side of the installation. Researchers fitted them with collar-based Global Positioning System (GPS) units that tracked daily movements and calculated range use from the hundreds of location data points provided by the collars. Additionally, the collars documented the hutia's daily movement patterns throughout their range over the course of the day. The NRI



A captured adult hutia ready to be fitted with a GPS collar. Source: Israel Parker

researchers focused on analyzing and synthesizing the data collected through the end of 2019 to provide the foundation for a comprehensive final report.

Hutia management is an important part of NSGB's natural resources conservation and sustainability efforts, which are reflected in both the installation's Hutia Management Plan and INRMP. The



A tranquilized hutia with a newly attached GPS collar. Source: Andrea Montalvo

strong partnership between the Navy and NRI will continue providing important foundational data for the NSGB Natural Resources Office to support these plans, and it represents the type of collaboration encouraged by the CESU Network.

## MILITARY LANDS IN DRYLAND ECOSYSTEMS: VULNERABILITIES AND OPPORTUNITIES

By Osvaldo E. Sala, Arizona State University, and Sasha Reed, USGS

Several DoD installations, mainly in the midwestern to western United States, are located within dryland ecosystems. Dryland ecosystems are characterized by a lack of water. Changing climatic conditions can significantly impact dryland installations and threaten military training on these installations. For example, precipitation in most drylands is forecasted to decrease in the near future, while the unpredictability of extreme storm events is projected to increase. This pattern will result in prolonged droughts and periods of above-normal rainfall, disturbing native vegetation and directly impacting the natural environment and training activities in those areas. Natural resources managers can currently anticipate degrees of disturbance but not the climate variability that creates the disturbance.

To address how a changing climate impacts the dryland ecosystem, DoD natural resources managers and a diverse group of researchers established a cooperative agreement in the Desert Southwest region of the CESU Network involving DoD, USGS, Arizona State University, Utah State University, and the University of Arizona. The CESU Network enabled these stakeholders to leverage their combined resources and expertise to assess the vulnerability of various plants and vegetation, and to gain a better understanding of what a changing climate means for dryland ecosystems.



View of several rainout shelters in Idaho. Source: Sam Jordan

Working together, these stakeholders established a series of drought and disturbance experiments at three military installations (Orchard Combat Training Center, Nevada National Security Site, and Jornada Experimental Range), as well as on adjacent areas located within dryland ecosystems across Idaho, Nevada, and New Mexico. Specifically, the experiments simulated various combinations and intensities of drought and disturbance to determine the complex impacts on vegetation. The team simulated precipitation levels using transparent shingle rainout shelters. These shingles block incoming precipitation to mirror drought-like conditions in that area which have a probability of occurring once every 100 years. The team simulated disturbance using a spiked cylinder filled with water that is pulled over the experimental areas several times and in different directions. Researchers monitored multiple ecosystem responses to the experiments including plant productivity, community composition, presence of invasive species, diversity, soil fertility and stability, and storage.

The research team and CESU Network partners will use the outcomes from these experiments to understand the combined effects of drought and disturbance on military lands in dryland ecosystems. For example, understanding how native vegetation responds to prolonged drought enables installation personnel to plan testing and training activities and make accommodations for a changing climate to ensure mission readiness. The data collected from these experiments can also help create tools and maps to help DoD manage and adjust military activities in response to climate conditions.

## 15TH ANNUAL ENDANGERED SPECIES DAY

By David Robinson, Endangered Species Coalition

On May 15, 2020, we will celebrate the 15th annual international Endangered Species Day, an annual day of recognition introduced by the United States Senate in 2006 to raise awareness of endangered plants and animals and promote species conservation worldwide. More specifically, the purpose of Endangered Species Day is to educate the public about the importance of protecting the nation's rare, threatened, and endangered species; highlighting species recovery success stories; and demonstrating everyday actions that people can take to help protect our disappearing wildlife and remaining open spaces.



Every year, wildlife refuges, national parks, zoos, aquariums, botanic gardens, community groups, schools, and conservation organizations organize tours, exhibits, restoration projects, children's programs, field trips, and other activities on Endangered Species Day and throughout the month of May. In 2019, there were more than 300 events across the country with additional participation in 14 other countries. The DoD NR Program participated in and distributed outreach materials during the Endangered Species Coalition's Endangered Species Day events in Washington, DC, in 2018 at the United States Botanic Garden and in 2019 at the Smithsonian National Museum of Natural History. The 2020 event at the Smithsonian National Museum of Natural History will include a DoD NR Program exhibit as well.

Endangered Species Day offers military personnel and their families an opportunity to plan clean-up activities and other restoration projects for sensitive habitats that are home to rare, threatened, and endangered plant and animal species. The Endangered Species Coalition wants to highlight all DoD-related activities in the Endangered Species Day Event Directory. To register an event, even if not open to the general public, and obtain resource materials, visit the Endangered Species Day website at [www.endangeredspeciesday.org](http://www.endangeredspeciesday.org). If you have any questions, please contact David Robinson, [drobinson@endangered.org](mailto:drobinson@endangered.org).



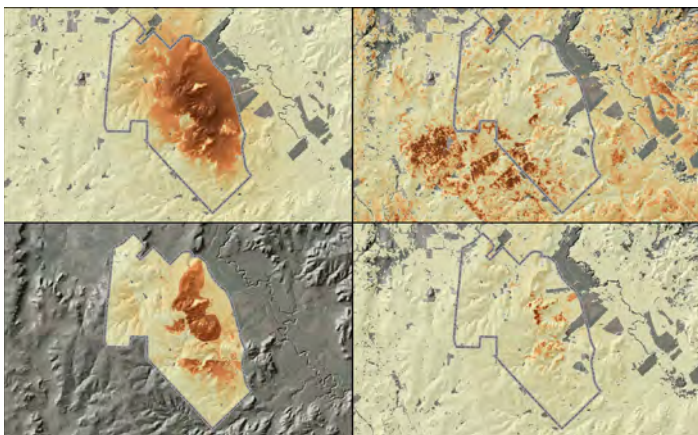
## DOD WILDFIRE RISK ANALYSIS

By Andrew Beavers, Center for Environmental Management of Military Lands (CEMML), Colorado State University

DoD is facing increasing wildfire threats on land critical to the military mission. Wildfires not only threaten DoD mission capabilities, but also can cause extensive damage to natural and cultural resources on these lands. Managing wildfires has become more challenging due to the increase of organic material per acre, or fuel load, resulting from a century of fire suppression. This increased fuel load, coupled with a changing climate, has caused fires that burn more intensely and spread more quickly than in the past. Additional factors, such as an increase in invasive species, may also alter the pattern, frequency, and intensity of fires. Understanding the impacts of these factors and assessing fire risk is necessary to effectively support fire mitigation efforts on installations.

Since 2005, CEMML has worked through several CESU agreements with the U.S. Army Installation Management Command, U.S. National Guard Bureau, AFCEC, and dozens of installations to establish a DoD fire risk methodology applicable to installations with frequent wildfire occurrence and a dynamic landscape. The CESU Network offers DoD access to specialized university resources, including cutting edge capabilities and technologies to support an independent and objective fire risk methodology.

Fire risk is best analyzed using a combination of factors such as when and where fires start, fire behavior (e.g., how quickly the fire spreads, where it burns, how much heat it generates), and the infrastructure, assets, and natural and cultural resources that the fire may impact on military lands. Historical fire data is often an unreliable resource for risk assessments due to limited availability, few details about fire behavior, and insufficient information about the large and damaging wildfires that are often of greatest concern to DoD. The amount of flammable material present, or fuel loading, is commonly equated with risk but is not an accurate predictor, as it only represents information about potential fire spread and heat output. A holistic approach accounting for the full breadth of risk factors is necessary to accurately evaluate wildfire risk.



These images show examples of fire risk outputs. Clockwise from top left; fire frequency, high intensity fire probability, integrated fire hazard (combining fire frequency and intensity), and wildfire risk. The darker coloring is more/worse fire/risk. This installation contained robust fuels in the southwest, but the lower fire probability and lack of valued resources there led to low risk. This is a prime example of why fuels alone are not enough to estimate risk. Source: Andrew Beavers

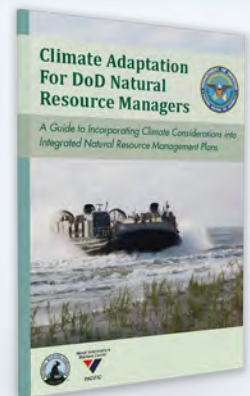
## CLIMATE ADAPTATION FOR DOD NATURAL RESOURCE MANAGERS

Over the coming decades, DoD installations will experience significant risks from climate-driven changes in the environment, which could compromise the capacity of these lands and waters to support military readiness activities. To address these risks, DoD Instruction (DoDI) 4715.03, *Natural Resources Conservation Program*, requires DoD natural resources managers to incorporate climate adaptation strategies into installation INRMPs. With funding from the DoD Legacy Resource Management Program, the National Wildlife Federation and Naval Information Warfare Center (NIWC) Pacific developed and released the *Climate Adaptation for DoD Natural Resource Managers: A Guide to Incorporating Climate Considerations into Integrated Natural Resource Management Plans* in June 2019. The purpose of this guide is to help installation managers implement the climate requirements in DoDI 4715.03.

DoD Directive 4715.21, *Climate Change Adaptation and Resilience*, defines climate adaptation as an adjustment in natural or human systems in anticipation of or response to a changing environment in a way that effectively uses beneficial opportunities or reduces negative effects. More generally, adaptation actions should reduce climate-related vulnerabilities or enhance resilience. Therefore, this guide introduces installation managers to overarching adaptation concepts and principles, and is structured around a generalized, yet flexible, INRMP adaptation planning process. A PDF version of the guide, planning worksheets, and example worksheets can be accessed [here](#).

A full-day training session on the Climate Adaptation for DoD Natural Resource Managers guide will take place on Monday, March 9 during the National Military Fish and Wildlife Association (NMFWA) 2020 Annual Meeting and Training Workshop in Omaha, Nebraska. Participants must [sign up](#) for this course as part of their NMFWA registration. This training will introduce participants to climate adaptation planning in the context of installation natural resource management and INRMPs. The course will describe the principles of effective adaptation and offer a summary of how climatic shifts may affect the various INRMP program elements.

Through hands-on team exercises, the training will provide step-by-step instructions to the INRMP adaptation planning process. *NOTE: this course was provided at the 2019 NMFWA Annual Meeting and Training Workshop. Please do not sign up if you have taken this course in the past.*



For more information about the upcoming NMFWA Annual Meeting and Training Workshop, see the Upcoming Events, Conferences, Workshops, and Training section toward the end of this newsletter.



The DoD fire risk methodology uses a Monte Carlo probability analysis through software developed by CEMML. The Monte Carlo approach produces estimates of many potential outcomes and produces metrics in real-world units such as flame length, burn probability, and resistance to containment efforts. These components account for variability in where and when fires start, changes in vegetation over time, broad-scale land management actions, and the installation's weather patterns. DoD uses the risk methodology based on these and other metrics for decision-making at individual installations.

DoD has applied this fire risk methodology at 38 Army, Army National Guard, and Air Force properties to date. Quantifying potential outcomes, as opposed to subjective estimates, allows for the comparison and analysis of various fire threats. Fire managers use these comparisons to quantify potential benefits and make informed decisions to decrease fire risk. The risk methodology has helped installation personnel prioritize fuels management and site firebreaks, conduct strategic planning, and make funding allocations.

The results of this project have accurately predicted the location of at least one major fire and are routinely used by DoD to make informed decisions regarding fire management. At Camp Bowie, Texas, fire risk data showed the installation boundary with areas of heavy pinyon juniper, which can burn with great intensity, was not a major fire threat because fires were unlikely to ignite or burn into that area. This knowledge about the fire pattern saved Camp Bowie money by avoiding unnecessary fuels reduction. At Fort Indiantown Gap, Pennsylvania, installation personnel used data to measure the risk reduction value of the prescribed burn program. At Saylor Creek Air Force Range, Idaho, and Yakima Training Center, Washington, personnel used data to map and explain the potential for very large and rapidly spreading fires. These activities not only minimized high intensity fire risk, but they also help to conserve species and preserve the country's military heritage for future generations. All of these benefits together support and enable the military mission.

Fire can be a necessary component of ecosystem function in some habitats, such as the longleaf pine forests that support red-cockaded woodpeckers and gopher tortoises. Fire supports regeneration of native plants, which improves overall habitat quality, but it is not without risk to ecosystems. For example, fires can cause short-term mortality and habitat loss that diminish already fragile species populations. Data from the fire risk methodology provide information that DoD can analyze and understand which natural resources benefit from low intensity fire but suffer losses from high intensity fire. The data are critical for DoD to appropriately manage its natural resources within these areas for positive outcomes.

The data that DoD have obtained from this project would not be available without the university partnerships made possible through the CESU Network. DoD is making better and more efficient decisions to mitigate the fire threat and decrease impacts to critical training areas. Fire risk analysis is a critical tool as DoD works to anticipate for and adapt to a future in which wildfires are likely to be both more common and more threatening.

## DOD CESU REGIONAL REPRESENTATIVES

DoD has at least one Military Service or U.S. Army Corps of Engineers representative in each of the 17 CESU regions. These representatives are DoD's point(s) of contact in each region and serve as the "hub of communications" on CESU matters. For example, the regional representatives convey specific project needs to the DoD National CESU Program Manager, Ryan Orndorff, and the host university at semi-annual regional meetings. The regional representatives also distribute relevant information (e.g., solicitations/data calls, new partner information, meeting announcements) to all stakeholders in the region.

Regional representatives serve as a reference for DoD natural resources staff by regularly communicating regional issues about CESU processes and activities to the DoD National CESU Program Manager. Some regional representatives have been working with the CESU Network for several years and are quite knowledgeable about the CESU cooperative agreement process. These individuals commonly provide tips and advice to new Military Service personnel who may be trying to establish a CESU agreement for the first time.

The following is a list of DoD representative(s) for each CESU region:

- Alaska: Matt Sprau ([matthew.h.sprau.civ@mail.mil](mailto:matthew.h.sprau.civ@mail.mil))
- Californian: Kim O'Connor ([kimberly.oconnor@navy.mil](mailto:kimberly.oconnor@navy.mil))
- Chesapeake Watershed: Chris Petersen ([chris.petersen@navy.mil](mailto:chris.petersen@navy.mil))
- Colorado Plateau: Robert Knight ([Robert.N.Knight.civ@mail.mil](mailto:Robert.N.Knight.civ@mail.mil))
- Desert Southwest: Vanessa Shoblock ([vanessa.m.shoblock@navy.mil](mailto:vanessa.m.shoblock@navy.mil)) and Mike Lewis ([Michael.G.Lewis@usace.army.mil](mailto:Michael.G.Lewis@usace.army.mil))
- Great Basin: Robert Knight ([Robert.N.Knight.civ@mail.mil](mailto:Robert.N.Knight.civ@mail.mil))
- Great Lakes-Northern Forest: Ray Rainbolt ([Raymond.E.Rainbolt.civ@mail.mil](mailto:Raymond.E.Rainbolt.civ@mail.mil))
- Great Plains: Zach Rigg ([zachary.rigg@us.af.mil](mailto:zachary.rigg@us.af.mil))
- Great Rivers: Zach Rigg ([zachary.rigg@us.af.mil](mailto:zachary.rigg@us.af.mil))
- Gulf Coast: James Parker ([james.m.parker116.civ@mail.mil](mailto:james.m.parker116.civ@mail.mil))
- Hawaii-Pacific Islands: Kapua Kawelo ([hilary.k.kawelo.civ@mail.mil](mailto:hilary.k.kawelo.civ@mail.mil)) and Jennifer Horeg ([Jennifer.Horeg@fe.navy.mil](mailto:Jennifer.Horeg@fe.navy.mil))
- North Atlantic Coast: Ray Rainbolt ([Raymond.E.Rainbolt.civ@mail.mil](mailto:Raymond.E.Rainbolt.civ@mail.mil))
- Pacific Northwest: Jeffrey Foster ([jeffrey.r.foster.civ@mail.mil](mailto:jeffrey.r.foster.civ@mail.mil))
- Piedmont-South Atlantic Coast: Chris Petersen ([chris.petersen@navy.mil](mailto:chris.petersen@navy.mil))
- Rocky Mountains: Alan Anderson ([alan.b.anderson@usace.army.mil](mailto:alan.b.anderson@usace.army.mil))
- South Florida-Caribbean: Michael Andrejko ([michael.andrejko@us.af.mil](mailto:michael.andrejko@us.af.mil))
- Southern Appalachian Mountains: Alan Anderson ([alan.b.anderson@usace.army.mil](mailto:alan.b.anderson@usace.army.mil))

To sign up and receive relevant information from the DoD CESU regional representatives for one or multiple CESU regions, visit and login to the Common Access Card (CAC)-restricted side of the DoD Environment, Safety and Occupational Health Network and Information Exchange (DENIX) at <https://authoring.denix.osd.mil/nr/cesu/subscription/>.

## AMERICAN CROCODILE SURVEYS AT NAS KEY WEST

By Chris Petersen, NAVFAC Atlantic

One of the many advantages to using the CESU Network is establishing partnerships with universities and non-governmental organizations that have specialized expertise with threatened, endangered, or at-risk species. In 2015 and 2019, NAVFAC worked with the South Florida-Caribbean CESU to establish a cooperative agreement with the University of Florida (Department of Wildlife Ecology and Conservation) to conduct American crocodile (*Crocodylus acutus*) surveys at NAS Key West, Florida. These surveys support the management and conservation of the species and contribute to the objectives of the CESU Network. Properly managing and conserving threatened and endangered species can help to de- or down-list those species under the ESA, which helps to maintain access to training areas and testing ranges on military installations.

The American crocodile is a coastal crocodilian, a group that includes alligators, caimans, and crocodiles, and occurs primarily in extreme southern mainland Florida and the northern region of the Florida Keys. USFWS federally listed this species as endangered in 1975 and reclassified it to threatened status in 2007. A major threat to the American crocodile is habitat loss due primarily to rapidly growing human populations along coastal areas. Increased sightings of crocodiles on NAS Key West's airfield generated interest in conducting surveys to better understand the crocodile's spatial distribution and breeding habits on the installation. This information not only benefits the management and conservation of this species, but it also supports the installation's INRMP.



*The American crocodile located in mangrove habitat on NAS Key West. Source: Chris Petersen*

The project research team consisted of personnel from both the University of Florida and the Navy. The CESU Network provided a dynamic avenue for the Navy to engage with a specialized project leader as well as other experts in the field. The principal investigator for this project, Dr. Frank Mazzotti, is a global expert in crocodilian ecology and has over 40 years of expertise researching and monitoring these species. Dr. Mazzotti designed the field survey techniques, worked closely with numerous graduate students who helped collect data, and reviewed and analyzed all the information gathered during the study. Personnel from the NAS Key West Public Works Department and NAVFAC also played a critical role in this project. Naval personnel provided input on the study methodology, contributed staff time to oversee and participate in data collection, and reviewed all work plans, reports, and deliverables.



*Senior Natural Resources Specialist, Chris Petersen, helps capture and collect data. Source: University of Florida*

The research team conducted spotlight surveys at night, both by land and boat, around accessible water bodies on NAS Key West and its annexes. When the team observed a crocodile, they recorded its location using a GPS. When circumstances allowed, the team captured crocodiles by hand, tongs, or snare and recorded several body measurements. The team also conducted nesting surveys to determine if the species is breeding on the installation and to develop a habitat suitability map. The habitat suitability map identifies areas on the installation that are biologically valuable to the species, such as feeding, basking, and nesting sites. These data can help installation personnel make important conservation decisions and minimize impacts to areas that would result in further habitat loss. In 2020, the team will perform additional surveys and develop an American crocodile management plan for NAS Key West.



*The research team prepares to collect data from a captured American crocodile on NAS Key West. Source: Chris Petersen*

The partnership between the Navy and University of Florida has provided important data to support the conservation and management of the American crocodile on NAS Key West. It also exemplifies how DoD uses the CESU Network to develop partnerships with universities that have specialized expertise with threatened, endangered, or at-risk species. This project provided valuable ecological information on a federally listed species, directly supported the NAS Key West INRMP, and helped natural resources personnel properly manage the installation's ecosystem to sustain military readiness. Installation personnel can also incorporate these data into National Environmental Policy Act (NEPA) documents to help the Navy make better-informed decisions on proposed actions on NAS Key West in the future.



## HAMPTON ROADS WINTER EAGLE NEST SURVEYS

By Michael Wright, NASO

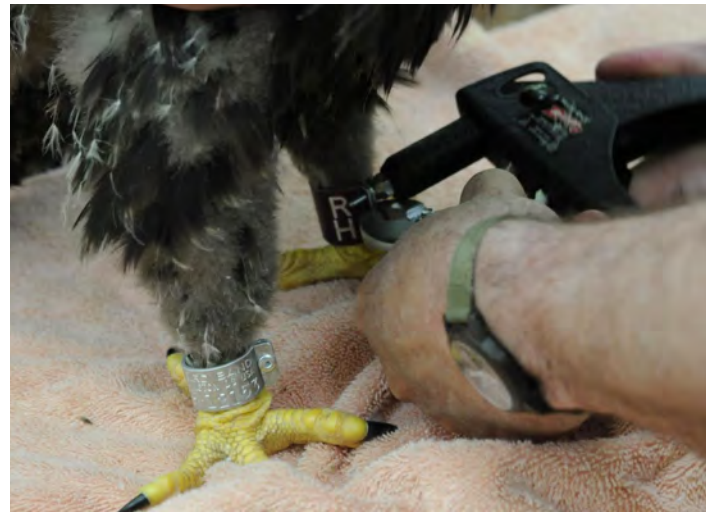
The bald eagle (*Haliaeetus leucocephalus*) population in North America has increased significantly over the past 30 years. One of the densest populations of bald eagles is located within the Chesapeake Bay region. As populations of bald eagles continue to grow, conflicts with human activities inevitably become more frequent. For example, eagle collisions with military and civilian aircraft is an issue that natural resources managers face in the Mid-Atlantic region. This BASH issue raises important concerns related to military readiness and human safety. However, BASH management specific to the bald eagle has proven to be difficult due to a lack of information concerning the bald eagle's behavior and habitat in the Chesapeake Bay region.

The Navy needed better data to manage BASH, natural resources, air operations, and military construction requirements, and considered several potential partners to help collect the data. The Chesapeake Watershed region in the CESU Network provided access to leaders in bald eagle research at installations in the Mid-Atlantic region. Through a competitive process, the Navy entered into a CESU cooperative agreement with the College of William & Mary's Center for Conservation Biology (CCB) in 2015. The Navy selected the CCB for their expertise in Mid-Atlantic bald eagle research and efforts in maintaining the state's eagle nest locator database.

The Mid-Atlantic naval facilities involved in this Chesapeake Watershed CESU agreement were NASO, NASO DNA, Naval Auxiliary Landing Field Fentress, and Naval Support Activity Hampton Roads Northwest Annex. Nest surveys and habitat delineation efforts occurred on and within 2,640 feet surrounding each installation. Data collection efforts for this project included delineating bald eagle nesting habitat through geographic information system analysis and surveying bald eagle nest locations through winter aerial flights. Additionally, researchers banded and tracked 12 eagle hatchlings from nests in southeastern Virginia, not located on Navy property, using a GPS to survey communal bald eagle nest locations.



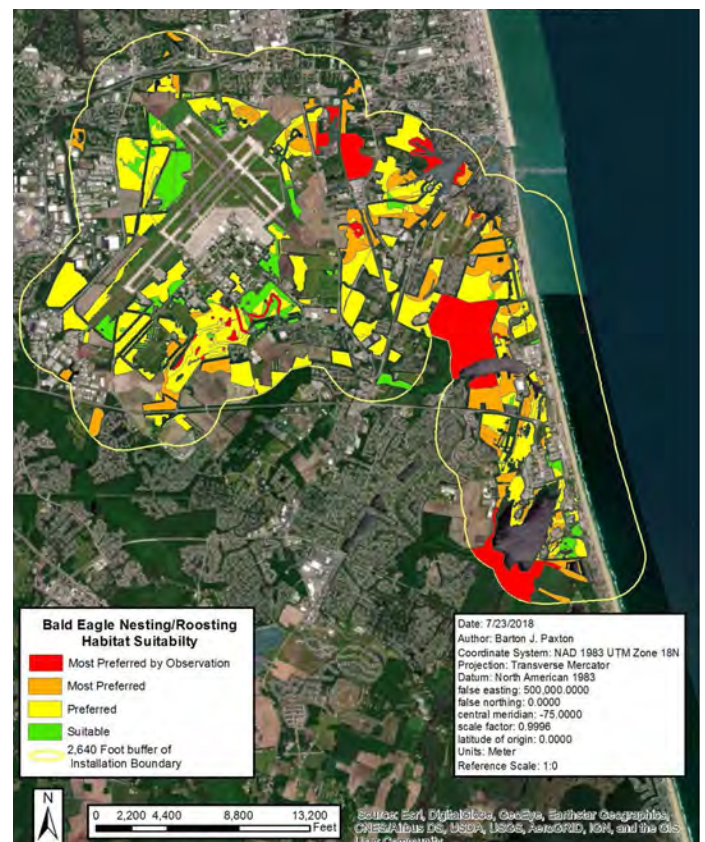
Shane Lawler, a certified arborist and experienced eagle handler, ascending a tree on NASO to capture bald eagle hatchlings for banding and biological data collection. Source: NASO Natural Resources Staff



Bald eagle being fitted with leg bands. Source: Reese Lukei

The initial surveys resulting from the 2015-2017 CESU agreement successfully identified 6,135 acres of bald eagle habitat on Navy property and 3,925 acres within the surrounding area. These surveys identified three new undocumented eagle nests and eight new undocumented communal roosting sites. The project team also collected data on additional communal roosting sites located outside of the focal study area. Data from these surveys are publicly available to help with research needs, conservation efforts, and military mission planning.

These data have been particularly useful to DoD's natural resources conversation and military readiness efforts. For example, survey data is critical to support management strategies to minimize BASH incidents with eagles. It is hypothesized that eagles born on or near the airfield are



Bald eagle nesting and roosting habitat suitability, delineated on NASO and NASO DNA. Source: Barton J. Paxton



less likely to be injured due to a BASH incident. However, survey results confirmed a 2017 BASH incident at the Norfolk International Airport (Norfolk, VA) with an eagle from the NASO 2016 eagle nest. Without this study, the origins of the eagle struck during the BASH incident would have been unknown.



Bald eagle hatchlings from NASO 2016 nest. Source: Reese Lukei

Data collected in this study also documented newly built bald eagle nests occurring simultaneously with routine military operations. This documentation reduced ESA Section 7 Consultation requirements and military operation down-time. These data have also reduced delays in the development of NEPA documents for military mission projects.

The survey effort has led to other partnerships outside of the CESU Network and has increased trust between DoD and both state and federal regulatory agencies. The Navy is now partnering with the state of Virginia (represented by the Virginia Department of Game and Inland Fisheries) and USDA - Wildlife Services as part of a team of professionals investigating bald eagle and other raptor BASH issues in Virginia and the Chesapeake Bay region.

In 2018, the Navy and CCB renewed their CESU agreement to fund a base year with up to four option years for continued nest survey and eagle banding efforts. Researchers have already identified two additional nests within the buffered areas adjacent to Navy land, totaling five nests identified since the project began in 2015. This CESU agreement enables DoD to continue to manage and decrease BASH incidents within the Chesapeake Bay area, which in turn improves human safety for military and commercial flights while also protecting bald eagles.

## 2020 SMR CONFERENCE

The 2020 SMR Conference will take place August 10-13, 2020, at the Grand Hyatt San Antonio, Texas. This conference explores the interdisciplinary nature of preserving and enhancing military capabilities. Testing, training, and environmental communities from installations will attend the conference. Attendees will share lessons learned and best practices; participate in a broad spectrum of training workshops; and set the course for new and improved partnerships to connect missions, resources, and communities in support of the National Defense Strategy.

The 2020 SMR Conference will continue to advance the objectives outlined in the National Defense Strategy; identify solutions to address the notable increase in encroachment threats impacting our military installations, ranges, and airspace; and outline strategies to modernize and enhance DoD's range infrastructure. Sessions will encourage participants to focus on comprehensive, off-installation collaboration to relieve restrictions on military activities and enhance commander flexibility through new and innovative partnerships. Members of the testing and training community, natural and cultural resource managers, land use planners, and encroachment program managers are encouraged to attend and actively participate in this event. More details regarding the schedule and specific workshops will be available in the coming months. For more information and to register for the event, visit the [event website](#). There is no registration fee for DoD personnel.

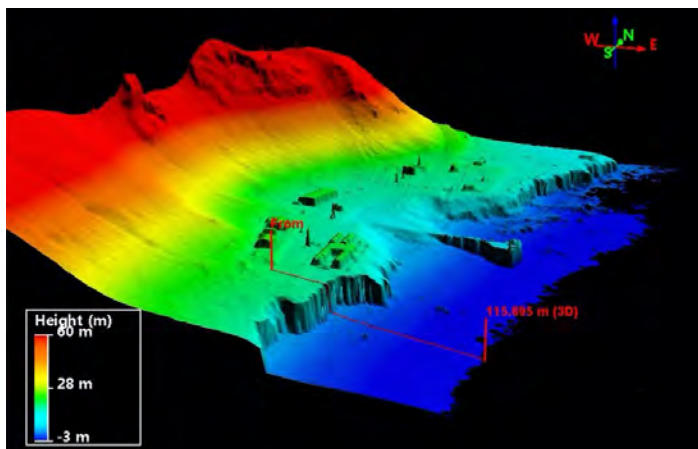
A promotional graphic for the 2020 Sustaining Military Readiness Conference. The background is a night-time photograph of a river with colorful umbrellas and lights. The text is overlaid on the image. At the top, it says "Save the Date" in a script font. Below that, in large, bold, white letters, is "AUGUST 10-13 | 2020". Underneath that, in a smaller white font, is "San Antonio, TX". To the right of the date, there is a circular seal of the Department of Defense. To the right of the seal, the text "Sustaining Military Readiness Conference" is written in a large, white, serif font. Below that, in a smaller, orange, sans-serif font, is "Restoring Readiness Through Planning and Partnerships". At the bottom, in a small white font, is "Join your colleagues to share lessons learned and best practices to support and enhance military readiness. Learn more at [smrconference.org](#)".



## AERIAL REMOTE SENSING ENABLES BETTER MANAGEMENT OF DOD COASTAL LANDS

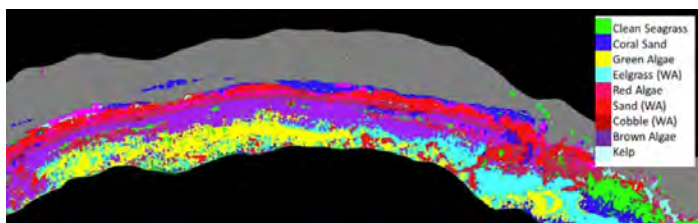
By Dr. Jennifer Ayers, NIWC Pacific

DoD relies on strategically placed island and coastal military training and testing sites to maintain coastal and international security. However, most of these environments are ecologically sensitive areas and federal laws require DoD to closely monitor and mitigate any potential impacts from its activities. These obligations frequently require costly and extensive field surveys. This project focuses on two of these coastal field sites: San Clemente Island, California, and Marine Corps Base Hawaii, Oahu, Hawaii. San Clemente Island is the Navy's only ship to shore firing range, and Marine Corps Base Hawaii offers near shore maneuver training, energy generation and storage, artificial intelligence experimentation, expeditionary logistics, and partnerships necessary for the Asia-Pacific Rebalance. This project, funded by the Environmental Security Technology Certification Program (ESTCP), demonstrates the use of aerial remote sensing to meet DoD's environmental monitoring requirements over broad areas, at high resolutions, and with reasonable costs. The project lead, NIWC, used a CESU cooperative agreement as the vehicle to get the ESTCP funding to its university partner.



Example of a lidar-derived digital elevation model along a portion of the San Clemente Island coastline. The image seamlessly covers the land-sea interface, enabling greater understanding of the relationship between upland watersheds, erosion, and marine habitat conditions. Maximum water penetration achieved was about seven meters. Naval Ordnance Test Station Pier can be seen jutting into the ocean. Source: NIWC

A team of government (NIWC and Naval Research Laboratory) and Scripps Institution of Oceanography scientists carried out the remote sensing. The team used an aerial remote sensing package that included a topographic/bathymetric lidar and hyperspectral camera to map coastlines and habitats at San Clemente Island, California, and Marine Corps Base Hawaii, Oahu, Hawaii. Land-to-sea mapping supports an ecosystem-level understanding of the relationship between upland watersheds, erosion, and marine habitat conditions. The data gathered enabled the creation of high-resolution, seamless land-to-sea Digital Elevation Maps (DEMs).



## ANNOUNCEMENTS

### Funding Available for Environmental and Installation Energy Technology Demonstrations

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 2021. The solicitation requests pre-proposals via Calls for Proposals to federal organizations and via a Broad Agency Announcement (BAA) for Private Sector organizations. *Pre-proposals are due March 5, 2020 by 2 p.m. ET.*



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

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

- Environmental Restoration
- Munitions Response in Underwater Environments
- Resource Conservation and Resiliency
- Weapons Systems and Platforms
- Building Level Energy Storage Systems
- Enhanced Energy Resiliency
- Energy Efficiency Technology Demonstrations Integrated with Utility Energy Service Contracts
- Enhanced Installation Water Resiliency
- Innovative Technology Transfer Approaches

**The BAA and Call for Proposals for Federal Organizations Outside DoD** are seeking pre-proposals for technologies in the following topic areas:

- Innovative Technology Transfer Approaches
- Management of Contaminated Groundwater
- Long Term Management of Contaminated Aquatic Sediments
- Detection, Classification, Localization, And Remediation of Military Munitions in Underwater Environments
- Enhanced Biosecurity and Strategic Mobility with Improved Brown Tree Snake Control
- Coastal Total Water Level Model Comparative Assessment
- Building Level Energy Storage Systems
- Enhanced Energy Resiliency
- Energy Efficiency Technology Demonstrations Integrated with Utility Energy Service Contracts
- Enhanced Installation Water Resiliency

Example of a preliminary habitat map generated from the remote sensing data. The map enables natural resource managers to better manage and track changes in their submerged lands. Source: NIWC

Natural resources managers at coastal DoD installations will use the land-to-sea DEMs and habitat maps to detect geographic and habitat changes from upland areas out into the shallow water. Specifically, natural resources managers will use these maps to determine if there is a correlation between environmental changes and DoD's testing and training activities. This tool provides a powerful capability for DoD to manage the balance between its mission and environmental requirements.

Going through the CESU Network was beneficial to the project because it allowed DoD to bring aboard specialized university scientists to carry out the work. Using a CESU agreement is faster and less costly than using a traditional government contract to team up with a university partner.

## EVALUATING THE BIODIVERSITY OF PEARL HARBOR'S FRESHWATER AND ESTUARINE COMMUNITIES

By Yin-Phan Tsang, University of Hawaii at Manoa

Estuaries are unique ecosystems that form where freshwater from a stream meets ocean water. They are typically found in discrete basins that have partial surface connectivity with the open ocean and are subject to tidal flux. Streams serve as the source of freshwater supplying nutrients, and the mouths typically create the semi-enclosed basins that form estuaries. Approximately 50 semi-enclosed water bodies are considered estuaries throughout the main Hawaiian Islands. The mix of inland nutrients and water input make estuaries particularly productive aquatic systems that serve as important nursery and breeding habitat for freshwater and marine species.

At least 50 native Hawaiian fishes are estuarine inhabitants or occasional visitors. Many estuaries in Hawaii serve as the migratory pathway for Hawaii's five species of indigenous gobies as they migrate upstream and downstream to complete their life cycle. Three of

the Hawaiian gobies, *Awaous guamensis*, *Lentipes concolor*, and *Sicyopterus stimpsoni*, are good climbers. Their post-larvae use estuary flooding as a cue to return from ocean to streams, and use their mouths or pelvic disks to climb waterfalls. Currently, there is no standardized method to survey these important habitats at the stream mouth and estuary.

Pearl Harbor contains the only remaining tidal flat habitat on Oahu, Hawaii. This tidal flat habitat has stream and spring water supplied from one of the largest stream networks in the state. In 2000, R.A. Englund conducted a biodiversity study of aquatic species at these nearshore habitats of Pearl Harbor including streams, springs, and wetlands, but no further monitoring or surveying has occurred since then. It is critical for the Navy and Air Force to have current information and an understanding of the habitats and biodiversity on their lands so they can plan and make sound management decisions to support both natural resources and mission capabilities in Hawaii.

In 2018, Joint Base Pearl Harbor-Hickam and the University of Hawaii at Manoa entered into a cooperative agreement through the Hawaii-Pacific Islands region of the CESU Network to conduct an extensive biological survey, which would build off the previous survey results from 2000 and provide habitat information on the estuaries at Pearl Harbor to improve natural resources management. The Tsang Stream Lab at the University of Hawaii at Manoa works with the Oceanic Institute and with assistance from state biologists on this project, which is an ideal collaborative team for conducting these activities. This project also examines current survey methodology to establish a standard protocol for surveying estuaries. The project used both traditional survey methods (e.g., minnow traps, cast nets, fishing poles, underwater cameras) and Environmental DNA (eDNA) methods to gather biodiversity data. Environmental DNA refers to the collection of a bulk sample containing DNA from an assemblage of organisms. In the aquatic environment, organisms that live or come into contact with a body of water leave trace amounts of their DNA. Researchers can extract and analyze the DNA to determine species presence/absence at the sample locations. At the conclusion of the first year of this three-year study, there were 41 unique species found via traditional methods that were not found in the previous study conducted in 2000. This finding could be attributed to differences in sampling efforts at downstream and upstream survey locations. So far, this study has identified roughly 44 fish species and a total of 64 aquatic species through traditional methods alone.

The outcome of this effort will be a substantial contribution to aquatic research in Hawaii, as well as other similar ecosystems. The updated information will establish a baseline on the current environmental condition of streams and estuaries at Pearl Harbor. This survey is expected to better define the important conservation areas for natural resources management at Joint Base Pearl Harbor-Hickam.

Funding this project through the CESU Network allowed for significant savings on administrative tasks. By reducing these costs, DoD was able to invest more resources in research and technology, and also advance the project more quickly. Working through a CESU agreement allowed for access to experts such as Hawaii state aquatic biologist, Glenn Higashi, and geneticist, Mark Renshaw at the Oceanic Institute. The timeliness of the project results enables DoD to better manage estuaries and the species within them, avoid species listings under the ESA, and more fully sustain the military mission.



Neal Hazama casting as part of this CESU project.  
Source: Aurelia Gonzalez and Mariah Baker



Neal Hazama (right) and Aurelia Gonzalez (left) surveying on the boat, taking eDNA water samples, measuring water quality, and conducting traditional surveys. Source: Aurelia Gonzalez and Mariah Baker



A barred jack (*Carangoides ferdau*) captured during a survey. Source: Aurelia Gonzalez and Mariah Baker



## DOD PROJECT HIGHLIGHTS

Following are a few project summaries that DoD installation natural resources managers may find of interest. Find more projects on the Natural Resources page of the [DENIX](#) site.

### **Legacy Project SAP-GCWA-19: Assessment of Golden-cheeked Warbler (GCWA) Population Genetic Structure and Genetic Recovery**

The GCWA is a localized bird, nesting only in central Texas. The species is threatened by habitat loss and cowbirds preying on their nests. The GCWA breeds in select juniper trees, making its habitat and breeding ground limited in size. USFWS listed the GCWA as endangered in 1990, and ESA protections have facilitated the increase of GCWA populations on military installations in recent years. The Recovery and Sustainment Partnership (RASP) initiative, established in June 2018 via an MOU between DoD and DOI, addresses mission and readiness impacts related to the ESA and listed species management requirements on military installations and ranges. This MOU established a committee to develop species action plans (SAPs) to address DoD priority species, resolve issues and conflicts, and work toward achieving stated goals. The RASP developed a SAP for the GCWA in 2019 that identified population structure and genetics as key elements to the species' recovery. Additionally, the SAP revealed a significant gap in population genetic studies for the GCWA.

The CESU Network supported this project to help implement this SAP. The primary benefit of the CESU involvement is principal investigator, Dr. Giri Athrey from Texas A&M University. Dr. Athrey applied his 10 years of ornithological experience to assess the genetic diversity, structure, and population size variability of the GCWA. Preliminary results show that low population numbers, limited habitat availability, and a lack of connectivity with populations on public and private lands have resulted in limited genetic diversity within the species gene pool. These data will help DoD and DOI determine appropriate management strategies to improve the genetic diversity within GCWA populations. This project will also reveal new resources, focused on the biology and DNA of the GCWA, which DoD and DOI can use to monitor GCWA populations in the future.

### **Strategic Environmental Research and Development Program (SERDP) RC18-1358: Using Remotely Sensed Data and Light-level Geolocator Technology to Inform Off-post Landscape-scale Conservation Planning for a Migratory Species**

In addition to learning more about the GCWA's genetic population diversity and recovery, DoD is also currently tracking GCWA migration data to learn more about the species' survival, habitat use, reproduction, and other behaviors. The GCWA is an early migrant bird in both spring and fall. It arrives in Texas in March, completes its nesting season by August, and then migrates through the mountains of eastern Mexico. The CESU Network has been instrumental in facilitating the collection of migration data for this project by allowing SERDP to team with Louisiana State University students who helped capture GCWA, fit them with geolocators, and then release them to identify migration patterns. These collected data will help researchers construct models that identify GCWA habitat at the highest risk of decline. These models will account for changes in topography, climate, and vegetation that impact the GCWA population. Ultimately,

data from this project will help CESU partners develop tools to lead multi-agency GCWA conservation efforts.

### **SERDP RC-2635: Leptospirosis in Endangered Island Foxes and California Sea Lions: Outbreak Prediction and Prevention in a Changing World**

Leptospirosis is a bacterial disease that causes a wide range of major health impacts in humans and animals. Many military personnel are at high risk for contracting and quickly spreading leptospirosis due to favorable conditions for the bacteria to grow (i.e., warm climate, high annual rainfall). Recently, researchers discovered an outbreak of the same strain of bacteria that causes leptospirosis in the endangered island foxes on Santa Rosa Island, California. The island fox is native to six of the eight Channel Islands of California. Several subspecies of the island fox are currently at risk of being listed as threatened or endangered under the ESA due to predation and habitat degradation. A disease outbreak could result in devastating impacts on the already stressed species with such a small and isolated habitat range.

A concurrent, long-term effort is currently underway on the bacteria ecology in California sea lions to understand how demography and environmental conditions interact to drive disease exposure and impact. The CESU Network has enabled SERDP to connect researchers at the University of California, Los Angeles (UCLA), with partners at the NPS, the Marine Mammal Center, and the National Marine Fisheries Service's (NMFS) National Marine Mammal Laboratory to conduct this work. Specifically the UCLA team is working with NPS to learn about the disease ecology of *Leptospira* in island fox populations, and UCLA researchers are partnering with the Marine Mammal Center and NMFS' National Marine Mammal Laboratory to study *Leptospira* in California sea lions. The outcomes from this study can help to project impacts, and assess prevention and control strategies for *Leptospira* bacteria under changing conditions to prevent catastrophic impacts to threatened and endangered species.

## FORT HOOD AVIAN MONITORING

The CESU Network brought experts from the University of Illinois together with personnel at Fort Hood to support the Adaptive and Integrative Management (AIM) program. The AIM program focuses on managing at-risk species that could impact the military mission at one of the largest military bases in the United States, Fort Hood. The program is also responsible for complying with wildlife protection laws and disseminating best management practices to maintain mission readiness. Under this CESU agreement, the AIM team completed a three-year avian point count study at over 350 grassland locations across Fort Hood. Faculty from the University of Illinois are currently analyzing the data to identify trends in declining mission-sensitive species. This project also supported the first official Audubon Christmas Bird Count on the installation in 2016, which has become an annual event to collect important data through volunteer efforts. The value of the CESU Network is well demonstrated by this work at Fort Hood where technical experts, DoD personnel, and volunteers are partnering to ensure mission readiness and natural resources conservation.

## UPCOMING EVENTS, CONFERENCES, WORKSHOPS, AND TRAINING

### North American Wildlife and Natural Resources Conference

March 8-13, Omaha, Nebraska

The 85th 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 8-13, Omaha, Nebraska

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 natural resources managers meet to discuss key concerns and opportunities, recent policy and legislative changes, ongoing activities and recent accomplishments, and emerging issues and potential new challenges. This year's training will include courses on DoD Participation in the Federal Avian Data Center: The Who, What, Where, When, Why and the How; Climate Adaptation for DoD Natural Resource Managers; Unmanned Aircraft Systems Utilization in Conservation Resource Management; Advanced Endangered Species Act Topics; Innovations in Invasive Species Management; The Migratory Bird Treaty Act: Recent Changes and Interpretation; and Project-Level Climate Change Adaptation Planning for Natural Resource Managers.

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

March 23-26, Colorado Springs, Colorado and June 8-11, Camp Lejeune, North Carolina

This course offers instruction in specific natural resources laws, regulations, policies, Executive Orders, DoD Instructions, and other guidance, noting Military Service-specific requirements. The course addresses stewardship, preservation, and process; fish, game, and wildlife management laws; protection of wetlands, waterways, and other ecological areas; forest and land use management laws; Sikes Act and INRMPS; and inter-service cooperation.

### Earth Day

April 22

Earth Day 2020 marks 50 years of this event. Each year on Earth Day, events such as cleanups, rallies, presentations, and teach-ins take place all over the world. The theme for Earth Day 2020 is climate action because our changing climate presents an enormous challenge and vast opportunities to shape the future of humanity and the life-support systems that make our world habitable.

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

May 10-14, Toronto, Ontario, Canada

Efforts within the field of landscape ecology often combine 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.

### National Invasive Species Awareness Week Part II – Local Events and Awareness

May 16-23

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.



The poster features a stylized illustration of a mountain landscape with a river and trees on the left, and the NISAW logo on the right. The logo consists of the acronym 'NISAW' in large, bold, black letters, with 'NATIONAL INVASIVE SPECIES AWARENESS WEEK' in smaller, black, all-caps letters below it. The background of the poster is a photograph of a person in a red jacket and black pants standing on a rocky outcrop, looking out over a vast, open landscape under a clear sky. The text on the poster is in a clean, sans-serif font.

**NISAW**  
NATIONAL INVASIVE  
SPECIES AWARENESS WEEK

**INVASIVE SPECIES  
IMPACT EVERYONE**

Feb. 24-28: Advocacy & Education  
May 16-23: Local Events & Awareness

[NISAW.org](https://www.nisaw.org)  
[#nisaw](https://twitter.com/nisaw) [#invasivespecies](https://twitter.com/invasivespecies)



## LINKS OF INTEREST

### DoD Natural Resources Program (NR Program)

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

### 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. Their 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 and mission capabilities, quality of life, 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.

### DoD Biodiversity Handbook

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 17 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 such as brochures and posters.





# DOD NATURAL RESOURCES PROGRAM

**Enabling the Mission, Defending the Resources**

[www.denix.osd.mil/nr](http://www.denix.osd.mil/nr)

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

## **Program Director, DoD Natural Resources**

Ryan Orndorff: [ryan.b.orndorff.civ@mail.mil](mailto:ryan.b.orndorff.civ@mail.mil)

## **DoD Natural Resources Program Support**

[DoDNatRes@bah.com](mailto:DoDNatRes@bah.com)

## **Natural Selections**

Natural Selections is written and published by Booz Allen Hamilton with funding awarded by the DoD Legacy Resource Management Program under Washington Headquarters Services contract number HQ0034-18-F-0670.

All written information contained in Natural Selections is public and not copyrighted.

Information and ideas for future articles are always welcome. Please send comments and suggestions to: [NaturalSelections@bah.com](mailto:NaturalSelections@bah.com).

