

Natural Selections

Department of Defense Natural Resources Program



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SPOTLIGHT: DCERP – ENHANCING COASTAL RESILIENCE

By Patricia Cunningham, DCERP Principal Investigator, RTI International; Susan Cohen, DCERP On-Site Coordinator, Naval Facilities Engineering Command (NAVFAC)

Critical military training and testing on lands along the nation's coastal and estuarine shorelines are increasingly placed at risk because of development in surrounding areas, man-made disturbances, changing climate, and use limitations to maintain compliance with environmental regulations. The Strategic Environmental Research and Development Program (SERDP) created and funded DCERP to address these challenges associated with sustaining military training and readiness at a U.S. Department of Defense (DoD) coastal installation while maintaining ecosystem function and health. This 10-year (2007–2017) program demonstrated the use of science in an ecosystem-based management approach, which is recommended by DoD for all military installations. An ecosystem-based management approach is unique because it recognizes the many environmental interactions within and across ecosystems, including human interactions, rather than focusing on one environmental issue, species, or ecosystem service. Ecosystem-based management within DoD incorporates military activities into resource planning, helping natural resources managers balance training needs and natural resources conservation.



Marine Corps Base Camp Lejeune (MCBCL) in eastern North Carolina hosted DCERP due to the many distinct and diverse coastal ecosystems found within its boundaries. Over 30 scientists involved in the program focused on four distinct coastal ecosystems: estuary, coastal wetlands, coastal barrier islands,

and terrestrial forests. The specialized ecosystems provide critical habitat for threatened and endangered species, as well as important lands for military training. DCERP researchers monitored changes in ecosystem function and health to assess the effects of different management practices and changes in climate. DCERP results provide actionable information to help DoD natural resources managers at MCBCL and other installations make more informed decisions to conserve species and their habitats while sustaining the military mission.

Below are some specific examples of information that DCERP gathered across the four distinct coastal ecosystems. This information will help DoD better manage natural coastal resources across its installations.

Estuary: DCERP researchers found that different amounts of rainfall impacted nutrients in the small and shallow New River Estuary (NRE), which is almost entirely encompassed by MCBCL lands. The NRE is sensitive to nutrients, particularly nitrogen, that enter the water with runoff from the surrounding watershed. These nutrients contribute to surface algal blooms and low oxygen concentrations in the estuary's bottom water, which can harm fish and shellfish communities. Algal blooms can be toxic to native species and to humans, so predicting and preventing future harmful algal blooms is critical to sustaining DoD activities in the estuary. Natural resources managers need to understand the complex interactions among rainfall, river discharge, and nutrient inputs on a watershed basis to effectively manage and maintain good water quality in the estuary.

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MESSAGE FROM THE NR PROGRAM

By Alison A. Dalsimer, Program Manager

Welcome to the winter 2018 edition of Natural Selections! In this issue we highlight some of DoD's innovative work to manage our oceans and marine resources, particularly in coastal areas. Marine resources are especially important to DoD because, unlike other federal agencies, the military relies on the world's oceans for mission-critical testing and training, as well as for deployments.

As we all learned in biology 101, over 70% of the Earth's surface is covered with water, and 96% of that water is found in oceans. According to the National Oceanic and Atmospheric Administration (NOAA), in the U.S. alone, nearly 40% of us live along a coast, with these areas contributing \$6.6 trillion to our economy. Like so many, I love being at the beach and enjoying 'sea life' pleasures, but growing coastal and global populations have consequences such as increased pollution and overutilization of ocean resources.

Similarly, warming waters, sea level rise, more frequent and intense storms, acidification, and coastal erosion are becoming the new normal – and all play a role in stressing the plants and animals that live in these systems. And even though our love of coastal areas may mean that 70% of us end up living within 100 miles of a coast by 2070, all is not doom and gloom: marine systems still teem with life, beaches still welcome us, and natural resources managers the world over are hard at work to address these difficult problems.



Wave action causes significant beach erosion along southern Onslow Beach near MCBCL. Source: Tony Rodriguez, University of North Carolina

For our part, DoD's natural resources managers are finding creative solutions to conserve marine systems for the species and for the personnel who rely on them. In these electronic pages, we highlight just a few of those efforts such as our Spotlight article describing the 10-year SERDP-funded project to holistically research Camp Lejeune's biological systems to include military, environmental, and economic impacts. The project's goal is to inform natural resources managers at Lejeune and elsewhere so they can better predict impacts and then adapt management strategies to better deal with possible future challenges.

Other highlights include efforts to reintroduce the endangered southern sea otter to DoD waters, track sea turtles along the Virginia coast, re-establish aquatic vegetation in the Chesapeake Bay, surveying coral in Guam, a report on the Coral Reef Initiative Database, which provides information to help protect and promote coral reefs (up to 75% of which are under threat from local and global stressors), and a heads up about a new guide to help DoD's natural resources managers better incorporate adaptation strategies into installation INRMPs.

With 95% of the oceans still unexplored, there is much we do not yet know about this vast resource and all it contains. Nevertheless, we strive to learn and make use of that knowledge to inform our actions. Towards that end, I hope you will find this edition of Natural Selections enjoyable and informative.



A tomato clownfish (*Amphiprion frenatus*) defends its territory in a bubble tip anemone (*Entacmaea quadricolor*) on a coral reef in Apra Harbor, Guam. Source: Lee Shannon, PhD

Before I close, one programmatic note: you may have heard that Congress directed DoD's Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (OUSD(AT&L)) to reorganize. As of February 1, OUSD(AT&L) was divided into OUSD (Research and Engineering) and OUSD for Acquisition and Sustainment (A&S). Energy, Installations, & Environment (EI&E), where the NR Program is housed, falls under USD(A&S) and is also being evaluated for reorganization. Because there will be a single Assistant Secretary of Defense for Sustainment, both EI&E and Logistics & Materiel Readiness functions will likely be combined.

While it is not yet clear where the NR Program office will be housed, it is unlikely that our office's specific responsibilities will change. As more information becomes available, I will keep you posted.... perhaps at NMFWA! As always, thank you for all the hard work each of you does to manage resources for our active duty personnel and for future generations!

DCERP researchers found that MCBCL lands contribute only a small amount (about 15%) of the nutrients reaching the estuary. Rainfall regulates the delivery of these nutrients with the freshwater flow from the New River into the estuary, and controls the subsequent likelihood of algal blooms. Using the [Estuarine Simulation Model](#) developed for the NRE, DCERP researchers assessed possible scenarios under future climate conditions. Model results indicate that water quality management in the estuary will be more challenging in the future with increasing populations, land use changes, and rising temperatures.

Coastal Barrier Island: Onslow Beach is an eight-mile long barrier island that provides a critical amphibious assault training area, habitat for numerous threatened and endangered species including shorebirds and sea turtles, and protection to the mainland from storms. DCERP researchers investigated management of and military training uses at the beach and found that these activities are not negatively impacting the island's resiliency. Instead, natural forces such as hurricanes and other storms, and rising sea level are responsible for shoreline erosion, particularly along the southern half of the island. Shoreline erosion threatens important habitat and risks DoD testing and training lands. By studying Onslow Beach, DCERP researchers can better understand overwash frequency and recovery processes, helping to explain the evolution of Onslow Beach and other barrier islands.

Researchers used a beach morphology model to generate predictions of changes in shoreline position, dune elevation, and vulnerability to flooding as the sea level rises. The results will help MCBCL predict how this important training environment will change in the future. The model scenarios also help managers understand how to better prepare for changes in sea level including moving the military training area to the more stable northern part of Onslow Beach as the southern beach becomes more frequently overwashed.

Coastal Wetlands: Salt marshes are found in the transition zone between open water and dry land along the lower estuary and the Atlantic Intracoastal Waterway that separates Onslow Beach from the mainland of MCBCL. DCERP researchers found that current military training activities have little impact on the salt marshes; however, the effects of sea level rise on estuarine salinity are altering marsh structure and function. These wetlands capture sediment from the watershed, remove

nutrients to improve estuarine water quality, serve as nursery areas for marine species, and protect installation infrastructure from erosion and storm surge. The loss of coastal wetlands from sea-level rise would put critical installation infrastructure and training grounds at-risk of flooding.



Black needlerush (Juncus roemerianus) is the predominant marsh plant in the estuary that prefers brackish water conditions (left), while smooth cordgrass (Spartina alterniflora) prefers more saline waters along the Intracoastal Waterway (right). Source: Carolyn Currin, NOAA

DCERP researchers generated predictions of the marshes most vulnerable to future sea level rise using the geospatial marsh model. Responses showing both growth and loss of salt marsh area can be seen on the [DCERP website](#). DCERP researchers studied several management options to increase the resiliency of these marshes, including developing a [suitability index](#) for installing living shorelines, fertilizing marshes to stimulate their growth, and applying dredged materials on the surface of the marshes to raise their vertical elevation to help them keep pace with the rising sea level. Over the long term, DCERP researchers expect the most cost-effective way to sustain healthy marshes is to keep infrastructure that impedes marsh migration to the uplands away from the marsh shorelines and to allow the marshes to migrate naturally.

Terrestrial: DCERP findings show that restoring longleaf pine habitat will not only benefit the endangered red-cockaded woodpecker (*Picooides borealis*), but a host of other avian species whose population densities increased when longleaf pine habitat was restored. Restoration efforts also support the overall wildlife community and plant diversity of the forest. Longleaf pine (*Pinus palustris*) savannas and flatwoods once dominated upland terrestrial ecosystems across the southeastern U.S., including MCBCL.



Longleaf pine forests of MCBCL provide habitat for endangered species like the red cockaded woodpecker, training land for the military, and carbon storage. Source: Pat Cunningham, RTI International

Today, longleaf pine savannas are intact habitat for realistic testing and training across 30 southeastern military installations. Fire is a natural part of this landscape, and current forest management practices use prescribed fire and other practices to maintain and restore longleaf pine communities. These practices provide specialized wildlife habitat, as well as important lands for military training activities. In addition, researchers used a forest landscape model to show that the standard longleaf restoration practices offer the greatest long-term carbon storage capacity when compared to other forest management options. This long-term storage capacity means that continued longleaf pine restoration could help offset carbon emissions from burning fossil fuels by removing carbon dioxide from the atmosphere through photosynthesis and storing the carbon in pine forest woody tissues.

This decade long initiative produced invaluable information on the ecosystem surrounding MCBCL. The data from this initiative benefits natural resources managers at MCBCL and at DoD installations in similar coastal settings, supplying easy-to-use decision-support tools, models, and other products that help balance training needs and natural resources. Continuing to affirm this balance on DoD lands ensures that these unique ecosystems remain healthy for the species and DoD activities that rely on them. While this summary presents DCERP findings at the ecosystem level, researchers also studied the interactions between these ecosystems. For more information on this program, the tools developed, and the benefits to DoD natural resources managers, visit the program's website: <https://dcerp.rti.org>.

SEA TURTLE TAGGING AND TRACKING IN CHESAPEAKE BAY AND COASTAL WATERS OF VIRGINIA

By: Gwen Lockhart, Naval Facilities Engineering Command Atlantic

The Lower Chesapeake Bay and nearshore areas surrounding the mouth of the bay represent one of the busiest hubs of naval activity on the East coast and host many pierside facilities, bases, vessels, shipyards, and in-water training areas. Sea turtles in the area are all listed as threatened or endangered, and can be impacted by human activities including recreational fishing, boat traffic, dredging, pile driving, and other activities that create noise and affect the underwater landscape. Understanding the location and behavior of sea turtles near these activities is vital to limiting potentially harmful interactions. Currently, our understanding of sea turtle movement and habitat use in the Chesapeake Bay and coastal Virginia waters is limited. Further data collection is needed to ensure compliance with applicable environmental laws.



After a recreational angler hooked this turtle, "Purple Heart," researchers outfitted it with a satellite tag and a PIT tag in its front flipper. A two-time Purple Heart recipient and his family released the turtle in June 2017. Source: Virginia Aquarium & Marine Science Museum

The Virginia Aquarium & Marine Science Foundation (VAQF) is working with NAVFAC Atlantic and U.S. Fleet Forces Command (USFF) to track young loggerhead, Kemp's ridley, and green sea turtles, using a combination of satellite and acoustic transmitters. To date, this USFF-funded effort has fitted 43 satellite transmitters and 72 Vemco™ acoustic tags on sea turtles in Virginia waters. The satellite tags transmit locations to a satellite that returns thousands of locations. The acoustic tags emit a signal that is recorded by a receiver as the sea turtle swims past it.



DoD researchers fitted this turtle, "Mango Tango," with a small satellite tag. It can now be tracked on seaturtle.org. Source: Virginia Aquarium & Marine Science Museum

Navy and VAQF scientists are collecting and analyzing the data. Researchers will use the resulting models to increase our knowledge of the behavior and seasonal movements of sea turtles found in this region. This information will improve our conservation of these protected species, as well as design better mitigation measures where interactions are unavoidable, allowing DoD mission-critical activities to continue while ensuring that sea turtle populations can thrive.

Sea turtle movements can be monitored in real time on the seaturtle.org website. Just follow [this link](#) to the NAVFAC-project page.

For more information on this or other projects, see the Navy's [Marine Species Monitoring Program](#).

TEAM APPROACH TO A SUCCESSFUL RECOVERY FOR CALIFORNIA'S SOUTHERN SEA OTTER

By: John Pierson, Department of the Navy, Dir. Marine Resources; Lillian Carswell, United States Fish and Wildlife Service (USFWS), Southern Sea Otter Recovery and Marine Conservation

Thirty years ago, the Navy joined forces with USFWS to help recover California's southern sea otter (*Enhydra lutris*). Decades of collaboration and shared research have resulted in a better overall understanding of the positive effects sea otters have on the nearshore marine ecosystem without compromising the Navy's ability to conduct essential national defense activities in southern California.



A southern sea otter settles down to rest in a small patch of feather boa kelp (Egregia). Source: Lillian Carswell/USFWS

People hunted the sea otter for its fur in the mid to late 1800s, which nearly led to the species' extinction. In 1915, after the sea otters were believed to be extinct, a small group of individuals were reported near Point Sur in Monterey County, California. By 1975, this small group had grown to 1,760 individuals and ranged along approximately 182 miles of the California coast. In 1977, USFWS listed the southern sea otter as threatened under the Endangered Species Act (ESA). During this process, USFWS realized that since the entire population is located together along California's coast, a major oil spill there could result in the

extinction of the species. USFWS determined that moving some sea otters to a location within their historic range but far enough away from the existing population was necessary to ensure their future vitality. USFWS identified San Nicolas Island (SNI), owned by the Navy since 1933, as the ideal location for this translocation project.



CDR Matt Pickett, NOAA (Ret) and CAPT Brian Taggart, NOAA (Ret) pilot the sea otter UAV. Source: Claudia Makeyev, Environmental Specialist NAVAIR

With conservation and national defense interests in mind, natural resources specialists, scientists, and leadership from the Navy and USFWS worked together with other partners to develop a plan for sea otter translocation. SNI is used by the

Navy for classified testing missions and defense-related activities. To ensure this mission was not impacted, Congress passed a law enabling the translocation to proceed which included regulatory exemptions for specific defense-related activities.

The SNI population is now the fastest growing sea otter population. In addition, the SNI Navy and USFWS partnership has become a testing ground for new natural resources management technology. In February 2017, sea otter scientists collaborated with researchers testing unmanned aerial vehicles (UAVs). Preliminary results indicate that UAVs outfitted with infrared imaging cameras may improve future sea otter monitoring efforts. The opportunity to combine UAV testing with sea otters added value for all parties involved. The Navy and USFWS plan to continue working together going forward and building on the successful interagency collaboration of the translocation program.

DOD CORAL REEF INITIATIVE DATABASE

By: Lisa K. Lobel, Wheelock College; Phillip S. Lobel, Boston University

Coral reefs are beautiful, diverse ecosystems providing critical habitat for approximately 25% of marine organisms. Up to 75% of the world's coral reefs are threatened due to continued pressure from both local and global stressors. To best manage these ecosystems, DoD is gathering and mapping coral reefs as part of its responsibilities under a Coral Reef Task Force (CRTF). The CRTF is surveying underwater resources and identifying potential impacts related to mission needs, operations or development projects. These activities ensure readiness and consistent application of policy across DoD.

The 1998 [Executive Order 13089, Coral Reef Protection](#), directed federal agencies to study, restore, and conserve U.S. coral reef ecosystems. It also established the CRTF, comprised of 11 federal agencies and the governors of seven states, territories, or commonwealths with responsibilities for coral reefs. The Coral Reef Conservation Act (CRCA) of 2000 (16 U.S.C. 6401 et seq.) incorporated by reference the provisions of Executive Order 13089 and directed NOAA to prepare the National Coral Reef Action Strategy (Strategy). Published in June 2002, the Strategy builds on the initial themes and goals established by the CRTF and its working groups, including implementation plans and other information.

DoD Instruction 4715.03, *Natural Resources Conservation Program*, directs DoD to inventory biologically or geographically significant or sensitive natural resources on its properties. Information for these inventories is necessary to prepare INRMPs which are required by the Sikes Act. Establishing baseline data is the foundation of any assessment program, and will support the mapping and inventory initiative of all U.S. coral reef ecosystems. The Legacy Resource Management Program funded DoD [Coral Reef Initiative Database](#), which helps identify sensitive coral reef species and their critical habitats, and provides the latest information on threats and assessment techniques. It helps define which laws pertain directly to the reefs under DoD stewardship and how DoD responsibilities overlap with



The pink coral gardens of Palmyra Atoll in the Pacific Ocean abound with tropical fish. Source: Jim Maragos/USFWS

partner agencies. The scientific data analyses and the guide to recommended protocols for reef assessment and monitoring provide baseline data and recommendations for developing an eco-based INRMP.

The number of marine species using coral reefs for food and shelter has increased dramatically. The Coral Reef Initiative Database houses all relevant scientific information that could benefit natural resources managers responsible for managing species of special conservation status associated with coral reefs. The database provides resource information for use in decision-making regarding on-shore or near-shore activities to maintain military readiness with minimal adverse impacts to the marine environment. It provides information for locating underwater resources and identifying potential impacts related to mission needs, operations or development projects. Developing this database demonstrates DoD's commitment to sound environmental stewardship and leadership by helping safeguard irreplaceable resources and modeling respectful use of these resources while enabling the military mission.

SAV IN THE CHESAPEAKE BAY

By: Bob Murphy, Tetra Tech

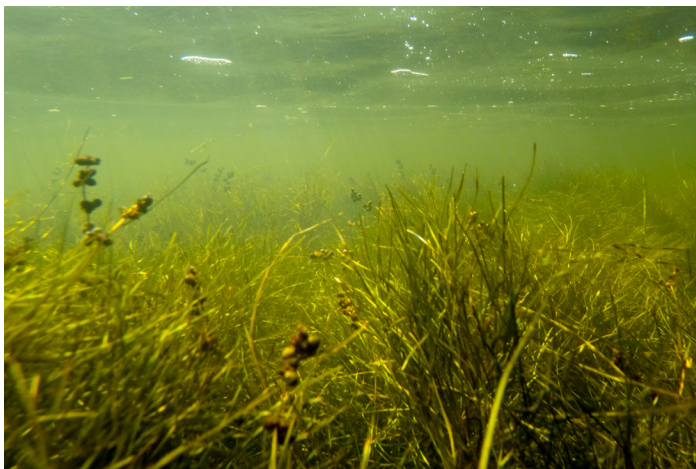
Submerged aquatic vegetation (SAV) is one of the most critical habitats found in coastal regions throughout the world, including the Chesapeake Bay and its tributaries. Underwater grasses provide essential habitat and food for a variety of fish and invertebrate species, including the blue crab and migratory waterfowl. In addition, grass beds contribute to the overall health of the Chesapeake Bay by absorbing nutrients, adding oxygen to the water, and protecting the coast by filtering sediment and dissipating waves. For all these reasons, many DoD installations in the Chesapeake region have a keen interest in managing this habitat under their jurisdiction. Installations along the Chesapeake Bay shoreline are actively losing land because of erosion, threatening shallow water SAV beds that protect shorelines and support mission readiness by preserving land and protecting the realistic environments that testing and training require.



Sampling SAV populations provides critical information for installation natural resource managers. Source: Bob Murphy, Tetra Tech

There are approximately 250 military installations along the shores of the Chesapeake Bay and its tributaries. Many of these (e.g., U.S. Army Garrison Fort Belvoir) include SAV surveys within their INRMPs. Installation natural resources managers are particularly interested in characterizing the species composition and extent of the SAV beds along their shorelines. This is largely due to the Sikes Act, which requires DoD to protect and conserve natural resources through the development and implementation of INRMPs.

Many installations across all Military Services have supported efforts over the past 20 years to restore SAV beds along the shores of DoD property. These efforts include the planting of SAV beds in the Chesapeake and the development of coated SAV seeds to improve germination rates. These efforts began in the 1990s and have achieved mixed results. For example,



SAV in the Severn River Sanctuary in Anne Arundel County, Md. Source: Will Parson/ Chesapeake Bay Program

longtime efforts at Langley Air Force Base (AFB) in Virginia led to the creation of eelgrass (*Zostera marina*) beds that persisted for several years but then died off. However, the failed beds at Langley may have successfully seeded nearby eelgrass beds in Back River, Virginia, that persist today. At the start of the SAV restoration process, teams monitored water quality to determine whether areas could support SAV growth. An unanticipated benefit to this effort, even for sites deemed unsuitable for SAV restoration, is a greater data set of water quality available for use by the Chesapeake Bay Program monitoring team and state agencies.

In 2016, managers mapped the largest area of SAV Bay-wide since annual surveys began in the 1970s, with an estimated 97,668 acres of underwater grasses. The increase in SAV habitat is due to several factors, including better wastewater treatment (nutrient reduction), and stormwater controls (sediment reduction), and DoD's commitment to the Chesapeake Bay Program SAV recovery goals: improving water clarity, planting underwater grasses, protecting existing grass beds, and enhancing underwater grass-related education and outreach.

The continued growth of SAV beds in the Chesapeake Bay improves water quality; creates important underwater grassy areas where fish, mussels, and other animals can thrive; and helps stabilize sediment (the solid fragmented material such as silt, sand, gravel, and chemical precipitates that has settled to the bottom of the Bay). These benefits create the realistic habitat that DoD relies on for testing and training while ensuring the continued health of the natural resources that DoD is committed to conserving.

ACTIVE DUTY NAVY UNITS IN GUAM SUPPORT UNDERWATER NATURAL RESOURCES SURVEYS AND ENVIRONMENTAL COMPLIANCE

By: Lee Shannon, PhD Marine Ecologist, NAVFAC Engineering and Expeditionary Warfare Center

In July of 2017, the Naval Base Guam (NBG) Environmental Office coordinated with Andersen AFB, to assess aquatic natural resources for Joint Region Marianas. Combined military-civilian dive teams completed over 20 hours of dive surveys in Apra



An active duty Navy diver supports measurement of a large coral colony (Porities rus) located in Apra Harbor, Guam during a natural resources survey in August 2017. Source: Lee Shannon

Harbor and nearshore waters at Haputo, Piti, and Asan beaches to study the marine environment around Guam. This assessment provided critical information about the health of coral reefs to DoD natural resources managers.

Dr. Lee Shannon, a marine ecologist with NAVFAC, led the effort to document coral growth on the wharf faces of inner Apra Harbor, search Navy submerged lands for evidence of crown-of-thorns starfish outbreaks, and determine the impact of a severe coral bleaching event on the crown-of-thorns starfish. Coral bleaching occurs when corals are stressed by changes in conditions such as temperature, light, or nutrients and they turn completely white. Fleet divers from the NBG and dive teams from the Explosive Ordnance Disposal Mobile Unit Five (EODMU5) Marianas Detachment completed multiple dives to record high resolution images and videos of bleached coral heads and crown-of-thorns starfish within Navy submerged lands. These images enabled Dr. Shannon to determine the total coral coverage and species distribution within the inner harbor.

EODMU5 provided a platoon of divers to determine the condition of corals at Western Shoals, while other divers completed unmanned underwater vehicle operations, which were essential to getting images of areas within the Inner Apra Harbor where water visibility was too low for a traditional visual survey. In addition to the underwater surveys, MH-60S Seahawk helicopters from HSC-25 "Island Knights" completed the first rapid aerial coral bleaching photographic survey of the reefs where the depth of water was too shallow for diving.



Aerial photo taken over a shallow reef flat in Apra Harbor, Guam, from a Navy MH-60S helicopter assigned to HSC-25 'Island Knights' in August 2017. Source: Lee Shannon



Explosive ordnance disposal technicians assigned to EODMU-5 help repair a damaged coral reef in Apra Harbor. Source: U.S. Navy Mass Communication Specialist 3rd Class Alfred A. Coffield

Cooperation between and support from Servicemen and women at NBG and Andersen AFB made these surveys possible. Dr. Shannon, a Commander in the Navy Reserves and qualified EOD Diving Officer, used his prior military experience to facilitate the support of the active duty sailors. Furthermore, the activity duty units also benefited from the surveys by using the operations as a training opportunity. Partnering with active duty personnel helped the Navy achieve its larger goals of natural resources management and capital improvements construction on the installation while lowering the cost of commercially contracting all the work. Combining the active duty mission requirements with environmental stewardship was a win-win for all participants.

CLIMATE SMART FOR INRMPS – HELPING PLAN FOR THE FUTURE

By: Bruce Stein, Chief Scientist, National Wildlife Federation (NWF)

Impacts from extreme weather events pose significant risks to mission readiness by degrading the ability of DoD lands and waters to support training, testing, and other essential functions. To manage these risks, DoD is funding an effort by the NWF and Navy Space and Naval Warfare Systems Command (SPAWAR) to tailor existing adaptation planning approaches to the specific needs of military installations. The effort will create an adaptation guide and associated training course designed to help natural resources managers better understand and reduce risks.

This effort builds on the [Climate-Smart Conservation](#) guide, which NWF collaboratively developed with partners, including an interagency workgroup. The U.S. Coral Reef Task Force and National Oceanic and Atmospheric Administration (NOAA) have successfully applied the climate-smart planning framework in several marine initiatives and for [selected national marine sanctuaries](#). The new DoD adaptation guide is specifically designed to provide managers with options and best practices for incorporating adaptation considerations into INRMPS. A project advisory group consisting of representatives from each Military Service at the installation and headquarters levels is assisting in the development of the adaptation guide.



To be broadly effective, the guide and associated training will be flexible and non-prescriptive, and applicable across terrestrial, freshwater, and marine resources. There are, however, special adaptation-related issues associated with coastal and marine environments. For example, sea-level rise is a key concern for coastal installations and a key factor in adaptation planning. The guide will help managers account for this important risk in natural resource plans, and point to reliable sources of information, including recent SERDP-funded research that provides installation-specific sea-level projections.

Understanding the needs, constraints, and challenges of installation managers in increasing resilience is key to developing a useful and effective adaptation guide for DoD. The project team is seeking input and engagement from military natural resources practitioners. Participants attending past National Military Fish and Wildlife Association (NMFWA) climate change workgroup meetings have provided valuable input, and the project team will seek further engagement and input from that group at the 2018 NMFWA annual training workshop in Norfolk, Virginia. Those unable to attend that meeting, or interested in directly contacting the project team to provide input, can contact Bruce Stein (steinb@nwf.org) or Dawn Lawson (dawn.lawson@navy.mil).

DOD PIF UPDATE

By: Rich Fischer, PhD, DoD Bird Conservation Program Coordinator

Mr. Joe Hautzenroder, Director of the Environmental Planning and Conservation Division, NAVFAC Headquarters, retired in January. Joe was responsible for the genesis of DoD Bird Conservation and PIF. DoD PIF, a significant component of the Office of the Secretary of Defense Natural Resources Program, has flourished under Joe's direction, providing significant leadership and guidance for management of migratory birds and their habitats in support of the DoD testing and training missions.

In 1991, Ms. Jacqueline Schafer, Assistant Secretary of the Navy, Infrastructure and Environment, appointed Joe as the liaison for the Navy and DoD to help advance the very successful PIF Initiative. With great vision, Joe initiated DoD PIF and assembled a group of DoD natural resources managers who collectively worked together to build a bird conservation program that now links DoD installations across the country.

Joe's vision and leadership was integral in developing and leading many conservation programs, and he spent his entire career dedicated to supporting the DoD mission through the conservation and stewardship



Joe Hautzenroder proudly displaying his new DoD PIF jacket. This jacket was a retirement gift provided by the DoD PIF Steering Committee. Source: Tammy Conkle

of over two million acres of Navy resources. For example, he led the development of the DoD Migratory Bird "Readiness Rule," co-founded the Navy Conservation Program, and played a significant part in establishing the Navy Bird/Animal Aircraft Strike Hazard (BASH) program to reduce risks for air and ground strikes from birds and other wildlife. His efforts on Navy BASH keep aviators and ground personnel safe, minimize costly aircraft damage, and ensure mission capability for Navy installations. He also used his leadership and experience with DoD PIF to help establish the DoD Partners in Amphibian and Reptile Conservation program.

Joe also helped influence DoD conservation policy. He worked alongside the other Military Services to amend the Sikes Act; contributed to advancements in policies related to the ESA, Clean Water Act, and Migratory Bird Treaty Act; and participated in the DoD Conservation Committee and other Military Service collaborative efforts. Aside from developing DoD PIF, some of Joe's most noteworthy efforts included facilitating the development and implementation of INRMPS, and establishing Navy's conservation metrics.

Joe has been a tremendous leader and mentor to hundreds of DoD natural resources professionals. His leadership, professionalism, and expertise will be missed both within and outside of DoD, but we wish him a long and enjoyable retirement! Thank you, Joe!

ANNOUNCEMENTS

ESA Implementation Online Training Course

The ESA Implementation Online Training Course highlights the DoD Components' responsibilities for complying with ESA requirements on installations. During the course, participants learn about important topics such as [ESA Section 7 consultations](#), critical habitat designations, and major sections of the ESA. The course also explains how the ESA relates to the [Marine Mammal Protection Act](#), [National Environmental Policy Act](#), and [Administrative Procedure Act](#), including creating and maintaining a complete Administrative Record.

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



Red-cockaded woodpecker. Source: public domain.

This course is approved by DoD, the Military Services, and the Deputy General Counsel (Environment, Energy & Installations), and is now part of the Naval Civil Engineer Corps Officers School (CECOS) curriculum at <http://www.netc.navy.mil/centers/csfe/cecos/CourseDetail2.htm#tab69>.

NatureServe Wants Your Feedback on the SeedSmart Web Application: Climate-Smart Native Plant Management

NatureServe developed SeedSmart, the first of its kind, all-in-one web application to help natural resources managers make land restoration decisions. Compatible with any smartphone or web browser, SeedSmart makes it possible for natural resources managers to find out basic information about sites they want to restore.



The tool helps answer questions, such as which species are native here; what are the important soil characteristics I should know about; and which plants will be more likely to thrive under changing climatic conditions?

NatureServe is beta-testing SeedSmart through July 2018 and would like your feedback. The application is available at seedsmart-beta.natureserve.org. For feedback on the user's SeedSmart experience, click on the "Contact Us and Send Us Feedback" link on the [SeedSmart webpage](#), or e-mail seedsmart@natureserve.org.

DOD PROJECT HIGHLIGHTS

The following are summaries of a few projects that DoD installation natural resource managers may find of interest. Find more projects on the Natural Resources page of the DoD Environment, Safety and Occupational Health Network and Information Exchange (DENIX) site.

DoD Legacy Project 12-610: Assessing the Importance of Wetlands on DoD Installations for the Persistence of Wetland-dependent Birds in North America

This project identified DoD installations that provide optimal habitat for several wetland-dependent bird species to ensure that population declines do not curtail the military mission and reduce readiness, and to enable DoD to better manage wetland-dependent bird habitat. Researchers used field sampling data collected from 1999-2012 to develop habitat models that predict the distribution of 10 species of secretive marsh birds within DoD installations across the continental U.S. Researchers then used these models to rank important DoD installations for these species based on their wetland habitat. This work represents a vital first step towards identifying, predicting, and ultimately conserving the most valuable wetland habitats on DoD installations for a suite of wetland-dependent birds, and therefore a step toward proactive management of these species.



U.S. Marines team with the base environmental office each year to tear up the mud within the Nuupia Pond Wildlife Management Area and wetlands at Marine Corps Base Hawaii to help preserve the living conditions of wildlife in the areas. Source: DoD photo by Lance Cpl. Matthew Bragg, U.S. Marine Corps

DoD Legacy Project 13-604: Identifying Migratory Routes and Wintering Grounds of Burrowing Owls that Breed on DoD Installations Throughout the Western U.S.

This project determined the migratory habits and wintering grounds of the burrowing owl, an endangered species found on several western DoD installations. The project team worked with over 20 partners in the



The burrowing owl only stands 9-11 inches tall and lives in underground burrows. Source: Gary Eslinger/USFWS

western U.S. and Canada to deploy geolocators and satellite platform terminal transmitters (PTTs) on 308 breeding burrowing owls at 17 study sites (DoD installations and other sites) in 10 states and provinces. Detailed information from the geolocators and satellite PTTs on the migratory timing, migratory routes, and wintering locations of burrowing owls that breed throughout North America has helped define DoD's management responsibility for ensuring the persistence of burrowing owls.

ESTCP RC-201204 eDNA as a Tool for Inventory and Monitoring of Aquatic Vertebrates

DoD lands include six threatened or endangered amphibian species and 23 threatened or endangered fish species, creating potential constraints on training and resource management. These species pose unique challenges for inventory and monitoring due to the difficulty of thoroughly surveying aquatic environments. An efficient alternative to traditional field surveys is the use of eDNA to detect species presence. The project team developed and validated eDNA sampling protocols for a variety of aquatic species, including frogs, salamanders, fish, and disease-causing pathogens. Techniques used during this demonstration are helping inform ongoing natural resource management activities, including development of species-specific endangered species management plans, ESA consultations with USFWS, and early detection and control of invasive aquatic species that may prey on or hybridize with native species.



An aquatic invasive species crew member takes environmental DNA samples out in the field. Environmental DNA uses genetics to look for invasive species in water samples. Source: USFWS

SERDP RC-2205: Assessing Changing Climate Impacts for DoD Installations in the Southwest U.S. During the Warm Season

Over the past 60 years there have been important long-term changes in the atmospheric conditions during the period of the annual monsoon in Southwestern U.S. These changes threaten infrastructure and operational capabilities on many DoD installations in the region. This project produced a robust methodology to determine how warm season extreme weather events in the Southwest will change with respect to occurrence and intensity. Natural resource managers can easily adapt this model to predict extremes in the warm season for other regions of the U.S. and the world. DoD managers can greatly minimize impacts to infrastructure and training using this model to predict the timing and location of extreme warm weather events.

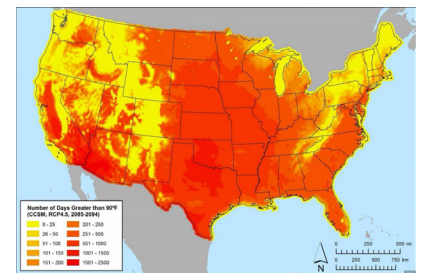


Image showing number of days greater than 90°F from SERDP RC-2205. Source: SERDP

UPCOMING EVENTS, CONFERENCES, WORKSHOPS, AND TRAINING

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

March 26-30, Norfolk, VA

Held in conjunction with the North American Wildlife and Natural Resources Conference (above), the NMFWA annual 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. The workshop will include a DoD Natural Resources Program policy update, and multiple technical and informational sessions on topics including endangered and at-risk species, invasive species, and migratory birds.

North American Wildlife and Natural Resources Conference

March 26-30, Norfolk, VA

This conference brings 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 will provide attendees with a better understanding of various solutions to current conservation issues, and methods for coordinating with other agencies on natural resources conservation efforts.

American Ornithological Society 2018 Meeting

April 9-14, Tucson, AZ

This conference gives ornithological professionals, amateurs, and students an opportunity to gather and discuss the recent climate-driven decline of endangered and migratory bird species. More importantly, the conference will facilitate discussion of new avian research to help conserve and protect these endangered and migratory bird species.

Northeast Association of Fish & Wildlife Agencies Annual Conference

April 15-18, Burlington, VT

This event attracts over 500 natural resources professionals in the fields of wildlife biology, fisheries and fisheries management, education, and law enforcement. The event provides opportunities for education, discussion, and exchanging of ideas. Highlights include over 50 workshop sessions, keynote speakers, poster displays, and social networking events.

Earth Day

April 22, Global

Since 1970, Earth Day has been the worldwide celebration of saving the planet. Join the 22,000 partners in 192 countries working to promote environmental conservation across our planet. Volunteer for the globe. Find an event near you or host one yourself!

World Migratory Bird Day

May 13, Global

World Migratory Bird Day celebrates the many ways in which birds matter to the earth, to ecosystems, and to us. Some bird species provide practical solutions to problems, such as the need for insect and rodent control. Others disperse seeds, helping to re-vegetate disturbed areas, or help pollinate flowering plants, trees, and shrubs. This year's theme will focus on stopover sites across the Western Hemisphere and the Caribbean that are important to migratory birds. DoD lands have long served as Steppingstones of Migration! So, join or host an International Migratory Bird Day event near you.

Endangered Species Day

May 19, Nationwide

Recognize the national conservation efforts to protect our nation's endangered species and their habitats. Celebrate and HELP save the planet one species or habitat at a time! Join the many zoos, aquariums, botanic gardens, wildlife refuges, conservation groups, national parks, museums, and schools throughout the country holding tours, open houses, special presentations, exhibits, milkweed plantings/butterfly garden installations, habitat clean-ups/other restoration events, children's activities, and more on May 19. You can also volunteer for or host an event near you!

Joint Meeting of Ichthyologists and Herpetologists

July 11-15, Rochester, NY

The Joint Meeting of Ichthyologists and Herpetologists is an annual meeting of three scientific societies – the American Society of Ichthyologists and Herpetologists; the Herpetologists' League; and the Society for the Study of Amphibians and Reptiles – to share current research and network with professional peers.

Western Association of Fish & Wildlife Agencies Annual Conference

July 12-18, Eugene, OR

The Western Association represents 19 U.S. states, 3 Canadian provinces, and 1 Canadian Territory. Its annual conference will feature speakers and workshops that promote sound natural resources management and partnerships at all levels to conserve wildlife for the use and benefit of all citizens.

Conservation Medicine and Diseases of Amphibians and Reptiles Course

July 29-August 4, Portal, AZ

This unique course will introduce students in veterinary medicine, wildlife science, conservation ecology, and biology to a variety of topics relevant to field and laboratory health issues of amphibians and reptiles. The course will include both formal lectures by experts in the field, along with hands on laboratory and field procedures.

Sustaining Military Readiness Conference

August 13-16, St. Louis, MO

Join DoD colleagues and partners to share lessons learned and best practices to support military readiness and enhance DoD capabilities. Representatives from installations and commands; state and local government; communities and industry; and more can discuss emerging challenges and new opportunities to enhance and support our military.

Association of Fish & Wildlife Agencies Annual Meeting

September 9-12, Tampa, FL

The 108th annual meeting of the Association of Fish and Wildlife Agencies is a forum for conservation leadership that brings together more than 700 leaders from fish and wildlife agencies and conservation groups nationwide to discuss conservation policy and management issues and accomplishments. Attendees include key decision makers in the field of fish and wildlife, including directors, assistant directors, program managers, and others involved in fisheries, wildlife habitat, law enforcement, legal affairs, industry, and public affairs (information and education).

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 (Legacy 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.

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.

Legacy Program Tracker

The DoD NR Program funds high priority natural and cultural resources projects that have regional, national, and/or multi-Military Service benefits through the Legacy Program. The Legacy Program Tracker houses fact sheets and reports with information about methods and results for completed Legacy-funded projects. Natural resources managers can use information from these materials and apply it to similar projects or improve upon completed projects.

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.

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. DoD's CESU projects have netted savings of approximately \$33 million through combined efforts and a pre-negotiated, lower overhead rate for federal agencies. The CESU Network also provides managers with the adaptive management approaches necessary to preserve installation natural resources.

DoD Partners in Flight (PIF)

DoD PIF consists of natural resources personnel from military installations across the U.S. 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, Power Point presentations, and educational materials such as brochures and posters.





DOD NATURAL RESOURCES PROGRAM

Enabling the Mission, Defending the Resources

www.dodnaturalresources.net

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

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