

Natural Selections

Spring 2011

Department of Defense Natural Resources Program



NEW!

DoDI 4715.03,
14 February 2011

The recently updated DoD Instruction provides procedures for developing, implementing, and evaluating effective natural resources management programs at installations, i.e., the basic building blocks that natural resource managers can use to enable the mission, protect our precious natural heritage, and improve the quality of life for troops and their families. Refer to Naturally Speaking (p.2) for more information. The DoD Instruction also has been covered in the news. Peter Boice discusses it on [The Pentagon Channel](#), [Around the Services](#) (April 22) as well as in blogs on [DoD Live](#) and [Armed with Science](#).

2011 Sustaining Military Readiness Conference

July 25-29, Nashville, Tennessee

Call for Posters Ends June 1!

Sponsored by the Office of the Secretary of Defense, this year's SMR conference will offer educational opportunities for DoD personnel and stakeholders interested in military training and testing, natural and cultural resources management, and sustainable and compatible land, air, sea, and frequency use. The agenda for the week features three dynamic plenary sessions, cross-cutting as well as track sessions, and more than 20 workshops.

For more information, visit www.smrconference.com.

IN THE NEWS Feral Swine, Overrunning America

By Keith P. Wehner, Assistant State Director, Wildlife Services (TN/KY)



Feral swine (*Sus scrofa*) have earned a reputation as a destructive invasive species throughout the United States, with damage costs far exceeding their recreational benefits. The number of states with wild pigs has doubled in the last 20 years to more than 31 states reporting self-sustaining wild populations. The natural range expansion of existing herds continues to be augmented by the intentional (and often unlawful) relocation of animals for hunting purposes.

Estimating wild populations can be difficult, but the 1991 national estimate of 1 to 2 million pigs transformed to an estimated 1.5 million animals by 2003, in Texas alone. Wildlife Services (WS), a program within the USDA's Animal and Plant Health Inspection Service (APHIS), has seen similar population

trends when responding to assistance with damage issues. About 6,000 feral swine were lethally removed from 10 states in 1999. By 2009, WS took more than 33,000 pigs from 28 states as part of its mission to safeguard agricultural, natural, and property resources as well as human safety.

Two characteristics of feral pigs contribute to their expansion: they breed prolifically and can thrive in nearly all North American habitats. Juveniles reach puberty at about 6 months, and adult females can have two litters annually of 3-8 piglets each. Groups of adult females and piglets, called sounders, roam territories leaving significant destruction in their wake. Sounders can decimate agricultural crops, manicured lawns, and sensitive ecosystems, seemingly overnight.

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NATURALLY SPEAKING

From the Desk of L. Peter Boice, DoD Deputy Director, Natural Resources and Director, Legacy Program



POLICY PRIORITIES FOR DOD'S NATURAL RESOURCES PROGRAM

During my Natural Resources Policy Update presented at the annual National Military Fish and Wildlife Association's training workshop in Kansas City last March, I introduced six priorities, currently in draft form, that represent the framework upon which our new DoD Natural Resources Strategic Plan is being built. Those priorities are Policy, Program Oversight, Tools and Training, Partnerships, Program Awareness, and Advocacy.

Here I'd like to briefly describe the key current and ongoing elements associated with our top program priority, Policy. In future issues, I'll provide details about other program priorities.

Natural Resources Conservation Instruction, DoDI 4715.03

A major new policy issuance, the Natural Resources Conservation Instruction, DoDI 4715.03 was signed by USD(AT&L) Ashton Carter on February 14, 2011, and is now official DoD policy. The Instruction incorporates legislative and policy changes, gives increased consideration to species at risk (SARs), adds new requirements to consider climate change and provide for sustainable ecosystem services, and formalizes new Natural Resources Metrics. It also identifies key responsibilities of the DoD Components for natural resources conservation, including:

- Integrate the DoD Natural Resources Program with mission activities
- Comply with all applicable federal statutory requirements, including Executive Orders and DoD policies

- Plan, program, and budget necessary resources
- Ensure scientifically sound, innovative, and effective stewardship
- Ensure that installations prepare, maintain, and implement Integrated Natural Resources Management Plans (INRMPs)
- Conduct internal self-assessments and external INRMP reviews

INRMP Implementation Manual

Now that the new DoD Instruction is complete, we'll be resuming work on the companion INRMP Implementation Manual. One final round of informal comments likely will be solicited before we request formal coordination. In addition to general INRMP-related provisions, the Manual provides complementary procedures for:

- Ecosystem-based management principles and guidelines
- DoD Forestry Reserve Account criteria to determine project eligibility and authority
- Valuing and managing DoD ecosystem services
- Planning for climate change impacts to natural resources

Coordination with USFWS Draft Sikes Guidance

To ensure consistency between our new Instruction and Manual and the USFWS Draft Sikes Guidance, we are working with USFWS to resolve apparent discrepancies related to consistency of definitions; the nature and timing of reviews for operation and effect; the inclusion of environmental contaminants in USFWS guidance; and establishing a mutually agreed upon process to ensure USFWS and state input to annual DoD metrics reviews.

Proposed Sikes Amendments

The House Subcommittee on Fisheries, Wildlife, Oceans and Insular Affairs has again introduced proposed amendments to the Sikes Act that have been attached to the FY12 National Defense Authorization Bill. The main provision, a request from the Army National Guard, would add 47 ARNG installations by modifying the statutory definition of "military installation." This change, if enacted, would align management of these state-owned lands with Army policy, streamlining funding. A separate provision, first offered last year by Delegate Bordallo, which would have expanded invasive species management provisions on military installations, was not included in the Readiness pre-mark.

Pending Policy Memos

Policy memos are a final policy element. There will always be topics that need more immediate guidance than can be provided by a formal DoD issuance such as an Instruction or Manual. We currently are developing policy memos, to be signed by our OSD Installations and Environment office, on several topics including white-nose syndrome, birds and powerlines, access for disabled sportsmen, feral animals, and no net loss of wetlands.

Expect updates on these and other Policy issues, as well as additional information on the pending DoD Natural Resources Strategic Plan and its other key elements, in future columns.

The Silent Invaders of Vandenberg Air Force Base

By J. Tim Belton and Rhys Evans, Vandenberg AFB

Feral pigs (*Sus scrofa*) have invaded Vandenberg Air Force Base (the Base) and are causing damage to the native ecosystems, harming individuals and populations of threatened and endangered species, damaging Native American artifacts, and digging up the golf course, landscaping, and neighborhood lawns.

Natural resources managers have undertaken an effort to closely monitor feral pigs' use of their habitat by day and by season to better manage these pests and reduce the amount of damage they cause. A telemetry study is just getting under way that will employ radio telemetry and GPS techniques to improve harvest (hunting) opportunities.

Feral pigs are an unwanted invader, but also a game animal harvested only with a permit from the California Department of Fish and Game. Natural resources staff on the Base coordinates with Conservation Law Enforcement to develop hunting strategies to harvest as many of the feral pigs as possible, but the pigs can be very difficult to hunt. Under hunting pressure, pigs may adopt nocturnal habits, rarely being seen in the open during daylight hours. During different seasons, the pigs may be so widespread that they are difficult to locate or so restricted to areas overgrown with poison oak and in tight canyons that are almost impossible to access.



photo by Benton Harris

The feral pigs at Vandenberg display a range of physical appearance, from the reddish brown Duroc with its aggressive temperament, to the pink Yorkshire type, to the shorter bodied, longer legged, black, hairy Russian boar type. Estimated population is from 500 to 1,000 or more animals throughout four major drainages and 11 different vegetation communities. Vegetation types most used are riparian woodland, coast live oak savanna, grasslands, and freshwater marsh edges. Seasonal use of these habitats varies. In the rainy seasons, pigs spread their home ranges and move out into the oak savanna and the grasslands. As summer dries up water sources, home ranges appear to shrink to areas closer to available water. Ranges probably further constrict to a socially unacceptable level as fall continues to dry up water sources, and intraspecific

competition may result in the youngest pigs dying or being driven to more marginal habitats.

The study now getting under way involves trapping and immobilization of pigs, affixing telemetry collars to adult sows, releasing them, acquiring movement and habitat use data via a remote handheld base station, and analyzing the data with GIS. The resulting information will be used to help pig hunters identify the types of habitats and habits that might help them be more successful. The new habitat use data may also be useful in identifying seasonally limiting habitat components that may be managed to reduce the carrying capacity of feral pigs on the Base. Taken together, these efforts will help reduce the impact that these non-native invaders have on the natural and cultural resources that Vandenberg Air Force Base has under its stewardship.

IN THE NEWS CONTINUED

Military installations and unmanaged buffers can provide sanctuary for feral swine that cause damage both on and off base, including:

- consumption and trampling of agricultural crops, turf, and tree seedlings
- rooting, digging, and wallowing in infrastructure such as dikes, levees, roads, irrigation ditches, and fences
- rooting up sensitive ecological areas containing rare, endangered, or threatened species
- inducing the spread of invasive plant species by rooting up native plants and allowing invasive plants to get established

- spreading parasites and diseases that can affect humans such as brucellosis, leptospirosis, salmonellosis, toxoplasmosis, E.coli, and trichinosis.

Fencing and harassment can reduce damage in small, defined areas and for limited times. However, the cost to install and maintain pig-proof fences can be prohibitive, and although harassment can work for a limited amount of time, neither are solutions to this problem. As a result, most strategies to reduce pig damage include lethal control. This is accomplished with one or all of the following techniques: aerial shooting with

trained pilots and crew, trapping with cage traps or snares, and night shooting.

An aggressive control program utilizing all possible techniques is the best option for significant population reductions and resolution of damages. As a leader in wildlife damage management, USDA/APHIS Wildlife Services can assist military installations in defining realistic management goals, building internal capacity to reduce feral swine damage, or conducting direct operations. For more information, contact the local office at [1-866-4USDA-WS](tel:1-866-4USDA-WS) (1-866-487-3297).

Enabling the Mission, Defending the Resources

Natural Selections

U.S. NAVY INVASIVE SPECIES MANAGEMENT

Invasive species management on Navy installations is an important component of our Integrated Natural Resources Management Plans and our ecosystem management approach. Invasive species control focuses on supporting the military mission through land sustainability and creating realistic and effective training areas. Highlighted here are three successful invasive species removal projects.

INVASIVE SPECIES REMOVAL San Clemente Island, Naval Base Coronado

By Bryan Munson and Kim O'Connor

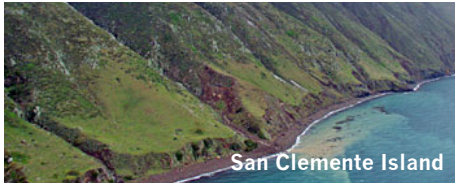


photo courtesy of U.S. Navy

For much of the 19th and 20th century, San Clemente Island was used for grazing tens of thousands of non-native herbivores. These herbivores devoured most of the island's native plant life, in the process removing most of the shrubs and leaving non-native grassland in their place. With Legacy support, San Diego State University's Soil Ecology and Restoration Group (SERG) removed weeds from a highly disturbed site near West Beach. SERG did extensive herbicide application, weed-whacking, and hand-pulling to decrease the populations of veldt grass, iceplant, and other invasive species. After the invasive species were removed, dense lines of dune plants were planted. The dune plants have sufficiently shaded the soil and developed healthy root structure so that areas underneath most of the larger shrubs are weed-free. Many of the native plants are recruiting heavily, thus creating new habitat. Hummingbirds are attracted by the presence of flowers on the Southern Channel Island tree mallow (*Lavatera assurgentifolia*), while other birds such as the endemic and federally threatened San Clemente Island sage sparrow (*Amphispiza belli clementeae*) are attracted to the abundance of native seeds and a more open environment.

Note: Kim O'Connor, formerly a botanist at Naval Base Point Loma and San Clemente Island, now works with the U.S. Forest Service.

ORCUTT'S SPINEFLOWER RESTORATION SUCCESS Naval Base Point Loma

By Bryan Munson and Kim O'Connor



photo by Michelle Cloud-Hughes

The highly endangered Orcutt's spineflower (*Chorizanthe orcuttiana*) is a very small and inconspicuous member of the buckwheat family (*Polygonaceae*) that was considered extinct at the end of the 20th century. Three populations of this plant were discovered on Naval Base Point Loma, and the plant has been intensively managed since its rediscovery. Invasive species management has been an important part of managing this species. In 2002, the Navy funded San Diego State University's Soil Ecology and Restoration Group (SERG) to remove approximately 11 tons of iceplant by hand. In 2005, after heavy winter rains, an undocumented population of more than 250 Orcutt's spineflower individuals germinated in this treated area, which had been covered with iceplant for more than 40 years. The Navy continues to remove invasive species from this area, including acacia that the San Diego Zoo hauls away and feeds to animals there. The spineflower continues to expand into the areas where invasives have been removed, and the number of plants increases every year with sufficient rainfall.

ERADICATION OF LONG THORN KIAWE Pacific Missile Range Facility

By John Burger and Keren Gundersen



photo courtesy of U.S. Navy

Removal of the invasive species, long thorn kiawe (LTK) (*Prosopis juliflora*), continues from the Pacific Missile Range Facility (PMRF) on the island of Kauai, Hawaii. Partners include PMRF's Environmental Coordinator, the Naval Facilities Engineering Command - Pacific (NAVFAC PAC) Sr. Field Biologist, and the Kauai Invasive Species Committee (KISC). NAVFAC PAC has contracted mechanical clearing of large infestations along the southern edge of PMRF, spending in excess of \$100,000 since 2005. Following each phase of clearing, KISC crews cut remaining stumps and treat with herbicide. KISC has routinely monitored and treated LTK seedlings and re-sprouts at PMRF since 2001. To date, more than 4,000 acres have been surveyed, with 1,167 acres being treated (repeat acres included). KISC has contributed almost 7,000 person-hours battling this invasive plant. Throughout the cleared areas, natural recruitment of native plants sprouting from remnant seed banks have re-established, rejuvenating and restoring this unique coastal habitat.

U.S. ARMY INVASIVE SPECIES MANAGEMENT

The Army is concerned with invasive species on hundreds of thousands of acres on installations and ranges. Invasive species pose significant challenges, risks, and costs associated with direct effects to training. Actions taken by the Army and others to reduce invasive species will have beneficial effects on endangered species and species at-risk, as well as keystone species and pollinators already facing challenges. Perhaps the greatest invasive species challenge is in managing for indirect installation effects by maintaining a natural ecological balance in biodiversity. Access to and management of training lands are closely linked to maintaining biodiversity and restoring and rehabilitating those lands. Highlighted here is an Army-led community-level study funded by the Legacy Resource Management Program to research the effects of a wind-pollinated, nonnative, invasive grass—Lehmann lovegrass.



photo courtesy of John M. Randall, The Nature Conservancy, Bugwood.org

Understanding Lehmann Lovegrass Impacts

By Denise L. Lindsay, U.S. Army ERDC-EL

Lehmann lovegrass (*Eragrostis lehmanniana*) is considered to be a dominant plant species on about 140,000 ha in the United States, the majority of which occurs in southeastern Arizona, including the Fort Huachuca Army installation. Understanding potential impacts of Lehmann lovegrass on Palmer's agave (*Agave palmeri*) is critical for anticipating the future of the desert community where they coexist and for addressing management concerns about associated threatened and endangered species. Prescribed fires to remove Lehmann lovegrass populations have been unsuccessful in maintaining control, often resulting in regrowth during subsequent seasons.

Led by the U.S. Army Engineer Research and Development Center Environmental Laboratory (ERDC-EL), the community-level study determined current distributions of Lehmann lovegrass and Palmer's agave on Fort Huachuca and analyzed trends in size class, distribution, and density of Palmer's agave relative to the lovegrass. Pollinator surveys were conducted during peak agave blooming season to assess agave pollinator guilds relative to the abundance of the lovegrass. Historical fire records were used to investigate the degree to which both fire and the abundance of the lovegrass were associated with changes in agave

density, as well as the abundances and guild constituencies of agave pollinators. Spatial analyses were performed to determine overlap of fire, soil type, Lehmann lovegrass abundance, and Palmer's agave density.

The results provide strong indications that Lehmann lovegrass negatively impacts Palmer's agave. Areas of high lovegrass abundance (>35% cover) were associated with significantly lower agave densities and greater relative frequencies of small agave plants, suggesting that the lovegrass may exclude agave. There were no significant differences in species richness, abundance, or community composition when comparing flower associates in the pollinator community associated with Palmer's agave in areas of high and low lovegrass abundance; however, the findings suggest significantly lower connectedness within the pollination network associated with Palmer's agave in areas with high lovegrass abundance.

Although the lovegrass forms thick stands that presumably increase fire frequency, there was no significant association between the presence of the lovegrass and fire frequency. Interestingly, medium to high densities of Palmer's agave were associated with areas of greater fire frequency. While a positive relationship was observed between

agave density and fire, there exists the possibility of negative impacts on overall nectar production if the timing of fire prevents agave plants from blooming or destroys agave seedlings.

This information will enhance the ability of DoD to access, evaluate, and use existing inventory data in combination with field surveys to promote best management practices, potentially leading to increased protection of important habitat, restoration of natural habitat and ecosystem services, and management of invasive grasses and imperiled species on training ranges, which will reduce conflicts with range sustainability and the military mission.

For more information, visit <http://el.erdcl.usace.army.mil/elpubs/pdf/eltn10-01.pdf>.



Sampling insect pollinators of Palmer's agave at Fort Huachuca using a handheld vacuum modified with a 60 cm nozzle extension and collection tube.

U.S. AIR FORCE INVASIVE SPECIES MANAGEMENT

The U.S. Air Force manages invasive species under two broad authorities, Executive Order (EO) 13112, Invasive Species and AF Instruction (AFI) 32-7064, Integrated Natural Resources Management. EO 13112 requires all federal agencies to prevent the introduction of invasive species, provide for their control, and minimize their economic, ecological, and human health impacts. AFI 32-7064 instructs installations to address invasive species management in the Integrated Natural Resources Management Plan (INRMP). The INRMP serves to formulate and implement goals and objectives to detect, respond rapidly to, and control populations of invasive species in a cost-effective and environmentally sound manner. The INRMP also serves to promote native habitats and the restoration of native species in ecosystems that have been invaded. Invasive species management topics discussed in more detail in AFI 32-7064 include invasive species detection and monitoring, invasive species control on agricultural outgrants, control of feral animals, and interagency cooperation. Noteworthy examples in these areas follow. See also the article on page 3 highlighting a feral swine telemetry study.

RIFA CONTROL Camp Bullis Training Site

By Matt Kramm



photo courtesy of Alex Wild

At Camp Bullis, part of Joint Base San Antonio, red imported fire ant (RIFA), *Solenopsis invicta*, management began in September 1999 to minimize infestations where karst invertebrates may encounter or compete with RIFA. RIFA pose a threat to three federally listed karst invertebrate species (*Rhadine infernalis*, *Rhadine exilis*, and *Cicurina madla*) and one state threatened salamander. At this time the Camp Bullis RIFA program includes 88 sites. Six of these sites are research plots, three are control areas, and the remaining 79 are designated caves and karst features. Camp Bullis conducts monthly inspections at all 88 sites to count mounds within a 50m radius of the designated feature. If a critical density of 80 mounds within this 50m circle is reached, treatment regimes (hot water) are implemented. Any mounds within a 10m radius are treated within 15 days. Biannual hot water treatments are conducted with one treatment in spring and one treatment in the fall. Hot water treatments are conducted with a “Hotsy” high pressure washer and water heater. Since this treatment regime was implemented, infestation levels have been dramatically reduced at nearly all designated locations. Only those locations subject to flooding have less dramatic reductions in infestation levels.

MESQUITE CONTROL Melrose Air Force Range

By Rick Crow



Extensive honey mesquite (*Prosopis glandulosa*) control is being conducted at Melrose Air Force Range (MAFR) to restore the native grasslands to a healthier and more productive state. Because of its deeper root system, honey mesquite is capable of supplying itself with water that is out of reach of other plants, out-competing native plants, and reducing forage yields. Heavy mesquite can also make it difficult to move and work livestock. Removal of mesquite has been accomplished by mechanical means (grubbing) using specialized equipment—either rubber tire dozers from the mining industry or wide-track track hoes from the construction industry—that protects the grass turf. Both machines have to be modified to dig deep enough to get below the “knot” where the limbs join together. After the plant is pulled from the ground, the hole is filled before proceeding to the next plant. Any areas that are significantly disturbed are reseeded with blue grama (*Bouteloua gracilis*) and tracked in with the equipment to prevent erosion. Approximately 8,000 acres have been grubbed at MAFR over the past 17 years. Depending on the density of the plants, productivity can be improved by as much as 300 percent. Additional acres are being controlled as funds become available.

SIX RIVERS CISMA PARTNERSHIP, Hurlburt Field

By Kristal Walsh



Hurlburt Field participates in a Northwest Florida invasive species partnership, the Six Rivers Cooperative Invasive Species Management Area (CISMA). CISMAs are made up of federal, state, and local government agencies, tribes, individuals, and other interested groups. They are geographic alliances that address invasive species prevention, education and awareness, early detection and rapid response, monitoring, and integrated pest management. The Six Rivers CISMA was founded by The Nature Conservancy with support from the Legacy Resource Management Program, building on the Gulf Coastal Plan Ecosystem Partnership (GCPEP) effort. As one of more than twenty Six Rivers partners, Hurlburt Field is taking a new look at its land management practices to ensure that CISMA goals are incorporated. Some of these initiatives include improving decontamination guidelines for landscaping; identifying, mapping, and monitoring non-native invasive species; and evaluating the effectiveness of treated areas to reduce continued infestations. Invasive species actively targeted on Hurlburt Field include cogongrass, torpedograss, Japanese climbing fern, Chinese tallowtree, Japanese privet, mimosa, chinaberry, lantana, Japanese honeysuckle, and air potato.

SERDP and ESTCP Brown Tree Snake Initiative

By John A. Hall, SERDP and ESTCP - Resource Conservation and Climate Change Program Manager



Brown Tree Snake

The inadvertent introduction of the brown tree snake (*Boiga irregularis*) to Guam has had far-reaching consequences. Ecologically, it has resulted in the extirpation of most of the island's native terrestrial vertebrates. The mildly venomous snake also presents a health hazard to small children. Its economic impact ranges from electrical blackouts to delays in shipping. Because of the significant damage caused by the brown tree snake on Guam, as well as its direct and indirect impact on military missions, the potential for the snake to be spread to other Pacific Islands is of grave concern. SERDP and ESTCP research and demonstration efforts are aimed at

controlling populations and preventing further spread.

Brown tree snake management encompasses a number of objectives that include interdiction, control, and eradication of incipient populations. Various control approaches and tools have been developed or are under development. For example, ESTCP is funding a demonstration project that is evaluating the aerial application of acetaminophen-treated baits for the control of brown tree snakes. Success here would not only reduce control costs but also make interdiction more effective.

SERDP is investigating new approaches to enable control of extant brown tree snake populations in proximity to military facilities and transport operations with relative cost-efficiency and effectiveness but minimal impacts to non-target organisms. With SERDP support, researchers are developing an artificial bait to replace dead

mice for field application via the aerial control technique, developing a bait based on gecko skin extracts for use with juvenile brown tree snakes, and investigating the use of parasites as a control measure for brown tree snakes.

Ultimately, brown tree snake control can't be thought of in isolation. Control itself may result in unintended consequences that lead to new invasive species problems. In addition, the past impacts of the brown tree snake have resulted in ecological legacies whose long-term impacts are poorly understood. The loss of native bird species on Guam also resulted in the loss of potential pollinators for the native trees. Future research will be needed to understand the new dynamics of species interactions on Guam and what this means to the long-term ability of Guam's ecosystems to maintain their ecological function and provide desired ecosystem services.

Additional information on these ongoing SERDP and ESTCP projects can be found at www.serdp-estcp.org under Featured Initiatives > Conservation > Brown Tree Snake.

The Wildlife Society on Feral Cats

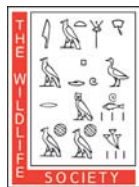
By Emily Boehm, TWS Human Wildlife Conflict Policy Intern, February 2010-January 2011



Feral Cat

Many species of North American birds and other wildlife face a daunting array of threats in today's human-dominated environment, with significant impacts from climate change and habitat loss. Now, feral and free-ranging domestic housecats—a non-native species—are adding another serious stress to native wildlife populations, preying on and spreading disease to birds, rodents, and other species.

Trap-neuter-release (TNR) management is widely promoted as a solution to the feral cat problem, with advocates maintaining outdoor cat colonies across the country. However, peer-reviewed studies have shown that TNR does not eliminate feral cat populations and fails to address the wildlife losses inflicted by outdoor cats.



The Wildlife Society (TWS) has a strong position against TNR and feral cat colonies, instead supporting science-based management of this invasive species. To effectively promote this policy, TWS has joined an unofficial coalition with a wide range of private and public partners.

The coalition has created four committees to help address the feral cat issue. These

committees are focused on policy and litigation, human dimensions and public relations, ecological impacts, and disease. Each group shares the common goal of creating a unified message—intended for the public, local and state policymakers, and wildlife professionals—that cats are not part of the natural landscape and must be removed for the health of ecosystems and the welfare of the cats themselves.

TWS also has developed a series of fact sheets (available at wildlife.org) for those seeking a solution to the conflicts between feral cats and wildlife conservation and human health in their communities. TWS is hopeful that science-based policies and sound management decisions at the state and local level can help to mitigate the devastating effects that domestic cats have on biological diversity.

Enabling the Mission, Defending the Resources

Natural Selections

Legacy Invasive Species Tools, Training & Partnerships

By Jane Mallory, DoD's Legacy Resource Management Program



The Military Services require healthy natural landscapes on which to train; therefore, conservation is not only good land stewardship, but also an operational necessity. Invasive species can radically change landscapes and can even make training and operations difficult or in some cases impossible. Because of the importance of this issue, Invasive Species Control is one of the DoD Legacy Resource Management Program's primary Areas of Emphasis. From its inception in 1991 to fiscal year 2010, Legacy has funded 123 invasive species-related projects at a cost of more than \$16.7 million. The range and focus of these projects vary widely, but all have a common purpose to increase our knowledge of invasives and find solutions to management problems. The following highlight just a few examples of these efforts.



Tools and Training



Noxious and Nuisance Plant Management Information System (PMIS) - <http://el.erd.c.usace.army.mil/pmisi/>. This user-friendly database developed by the U.S. Army Engineer Research and Development Center (ERDC) enables users to

identify 150 species from terrestrial, aquatic, and wetland habitats. The system includes species-specific management strategies. PMIS also contains the noxious plant and pesticide laws by state as well as noxious weed lists for all 50 states. Because invasives information is constantly increasing, PMIS has been refined, updated, and expanded over the last several years, with the latest version coming out this summer. This generation of PMIS will include videos and be accessible on the Denix web site and on mobile devices.



Invasive Species Toolkit - www.DoDinvasives.org. This toolkit provides templates for brochures, posters, reference cards, PPT presentations, and radio public service announcements to help resource managers educate others on the problem of invasives and how they can

help support management efforts. The toolkit also includes a comprehensive list of online resources.



Strategic Management of Invasive Species Workshops. These regional workshops targeting the Southwest and Southeast provided military installation personnel

and other natural resource professionals with knowledge and resources that they can use to prioritize and solve invasive species problems on installations and adjacent lands. The Center for Invasive Plant Management offered a five-day workshop in October 2009, in Phoenix, Arizona. Presentations are available at www.weedcenter.org/dodworkshop/2009. Invasive Plant Control Inc. then offered a five-day workshop in December 2009, in Chapel Hill, North Carolina.

Collaborative Efforts



Management Areas. To date there are 16 Cooperative Invasive Species Management Areas or CISMAs in Florida. Through

the coordinating efforts of The Nature Conservancy with support from Legacy, six new CISMAs now contain DoD installations as partners. Refer to p. 6 for a summary of Hurlburt Field's involvement in the Six Rivers CISMA. CISMA members meet to strategize and plan invasive work throughout the year. As an example, within the CISMAs with military installations, 16 invasive species actions took place during this year's National Invasive Species Awareness Week. Work ranged from invasive species surveys, removal, workshops, and outreach events. Similarly, Legacy provided start-up support for the highly successful North Carolina Sandhills Weed Management Area (NCSWMA), which works to help manage and control invasive plant species in the Sandhills region of North Carolina.



National Public Lands Day (NPLD) - www.publiclandsday.org. With support from

Legacy, NPLD events on DoD lands have brought volunteers from within and outside of the fence to help installations clear invasive species and restore habitat. In 2010, 48 installations held NPLD events, many of which involved invasive species work. For example, at Cape Canaveral Air Force Station volunteers removed invasive Brazilian pepper plants and planted more than 500 native mangroves. At Biak Training Center, 140 members of the Oregon Youth Challenge Program enhanced five miles of trails by removing 2,000 pounds of trash and clearing 100 pounds of invasive species.

A comprehensive list of Legacy invasive species projects and products from these efforts is available on Denix (www.denix.osd.mil/nr) and the Legacy web site (https://www.dodlegacy.org/Legacy/intro/ProductsList_NU.aspx). For more information, contact Legacy@osd.mil

USGS Invasive Species Solutions

By Annie Simpson, USGS Biological Informatics Program



Land managers must meet the invasive species challenge every day, starting with identification of problem species, then the collection of best practices for their control, and finally the implementation of a plan to remove the problem. At each step of the process, the availability of reliable information is essential to success. The U.S. Geological Survey (USGS) has developed a suite of resources for early detection and rapid response, along with data management and sharing.

Can't determine what a species is or how best to control it? The USGS library of resources for early detection and rapid response (<http://edrr.nbii.gov>) provides quick access to reliable information in the areas of identification, reporting, expert verification, occurrence databases, rapid assessment, planning, and rapid response. It contains online identification guides as well as expertise databases with contact information for assistance. Once a species has been identified, it is important to determine its weaknesses in order to be able to control it. Can that weed be hand-pulled, or does it require repeat application of herbicide? Is there a targeted solution for the new invasion on your installation, or is its impact low compared to the cost to eliminate it? Who has experience with the species causing trouble on your lands? How successful was their effort to control their problem, and how much did it cost? Answers to all of these questions and more can be found in the resources accessible through <http://edrr.nbii.gov>.



photo by Annie Simpson, USGS

Need to factor in biodiversity? The Biological Informatics Program at USGS provides focused access to biodiversity information through the Raptor Search Engine (<http://search.nbii.gov>), from U.S. government and other reliable science sources, including some that are not accessible through general Web search engines. Raptor's geospatial search capability is a special feature that includes only those Raptor sources with enough geographically referenced information to permit mapping of search results and any associated data points.

At a loss for images to communicate the invasive species challenge? The USGS Biological Informatics Program also provides a comprehensive online source of nature images, including many related to invasive species issues, which are made available through the Library of Images from the Environment (LIFE), at <http://life.nbii.gov>. LIFE is a collaborative effort to make diverse, high-quality images (photographs, illustrations, and graphics) of the environment freely available for research and other nonprofit uses.

Meeting the invasive species challenge on military installations is an ongoing issue that requires significant planning and budget. Sharing information resources can make meeting this challenge an easier task by jump-starting your efforts and saving you work. If you would like more information on how to share your invasive species information with others who are addressing similar issues, please contact Annie Simpson at asimpson@usgs.gov.



Are you having difficulty keeping track of the invasive species information that you collect? USGS offers free access, through the Inter-American

Biodiversity Information Network's Invasives Information Network (I3N), to an open source invasive species database and Web template with password-protected administrative access. Incorporated within the database is the ability to perform and track risk assessments, so that the different species you are confronting can be prioritized according to parameters you determine and compare. For more information about the I3N database and Web template, contact asimpson@usgs.gov.



Interested in contributing your invasive species information to a larger effort?

If you already have a database or spreadsheet where you are collecting invasive species information and would like to share your data as well as have access to invasive species data from other reliable sources, check out the "share your data" link on the Global Invasive Species Information Network (<http://www.gisin.org>), which provides a platform for sharing invasive species information at a global level, via the Internet and other digital means.

National Invasive Species Awareness Week in Review

By Pete Egan, Armed Forces Pest Management Board

The 2nd National Invasive Species Awareness Week (NISAW) was held in Washington D.C., 28 February through 4 March 2011. This event was organized by the National Invasive Species Council (NISC) under the leadership of Executive Director Ms. Lori Williams and all the partners she brought together to sponsor and host the various activities of the week. Participants included the diverse groups of federal and state agency representatives as well as folks from non-governmental organizations and private individuals engaged in combating invasive species.

The message was the same; we were all there to protect our nation's natural resources from non-native invasive species. Personally, it was good to see so many people focus on the harm caused by these unwanted invaders. Aquatic and terrestrial plants and animals along with state and international programs were topics of discussion. Presentations can be



found at www.nisaw.org. Receptions at the National Aquarium and the National Botanic Garden provided an excellent opportunity for networking and meeting potential partners.

Plans are being made for next year's NISAW. Perhaps we can make it more national by having events throughout the country, something along the lines of National Public Lands Day. Are you interested in trying to do something like this? If so, let me know at peter.egan@osd.mil.

DID YOU KNOW?

Adapted from the National Invasive Species Council, *What Can I Do About Invasive Species?*

Invasive species threaten native plants, animals, and ecological systems worldwide, as well as impacting the economy. They can also directly harm humans.

What Are Invasive Species?

An invasive species is a non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive species can be plants, animals, or pathogens.

How Do They Harm The Environment?

Some invasive species feed directly on fish and wildlife or make them ill, and invasive plant pathogens can kill forest trees. Indirectly, invasive species compete with other species for food and space and interfere with growth, reproduction, and development. Invasive species place other species at increased risk of extinction.

How Do They Harm Humans?

Some invasive plants and their pollen can cause skin irritations and allergic reactions. Pathogens and parasites infect humans as well as wildlife and livestock. Additionally, pathogens are spread by ticks, insects, and other animal vectors. West Nile Virus has caused more than 1,000 deaths in the United States. Indirectly, invasive species impact the agricultural sector, shipping industry, tourism, and military mission.



photo courtesy of the Centers for Disease Control and Prevention

What Can You Do About Invasive Species?

You can help by learning what invasive species are in your area and what is being done about them. Check out your County's Extension Office at www.csrees.usda.gov/Extension/index.html for local invasive species information. Report any new invasive species and range expansions. Clean hiking boots, waders, boats and trailers, off-road vehicles, and other pathways of spread to stop hitchhiking invasive species. Use certified "weed-free" forage, firewood, hay, mulch, and soil. Remove invasive plants from your land and plant non-invasive plants in your garden. Volunteer for organized efforts to remove invasive species from natural areas and ask your political representatives to support invasive species efforts. Write a letter about invasive species to your newspaper and support non-profit organizations that work with invasive species. Share your knowledge of invasive species widely.

UPCOMING EVENTS

Conferences, Workshops, and Training

Army National Guard 2011 Conservation Workshop

June 21-23, Charleston, South Carolina

This workshop will bring together Army National Guard natural and cultural resource professionals from all 54 states and territories to meet, exchange information and lessons learned, and learn more about the newest guidance from ARNG-ILE program managers. For more information, visit www.armgconservationtraining.org/.

Coastal Zone 2011 - Winds of Change: Great Lakes, Great Oceans, Great Communities!

July 17-21, Chicago, Illinois

Many factors are changing coastal communities and estuarine, marine, and Great Lakes environments, including the impacts of coastal development, invasive species, and global climate change. This conference will explore new approaches to ocean and coastal resource management. Visit www.doi.gov/initiatives/CZ11/index.htm for details.

Pacific Northwest Economic Region (PNWER) 2011 Invasive Species Conference

July 20, Portland, Oregon

Join federal, state, tribal, and local government agencies; academic institutions; non-profit organizations; industry leaders; legislators; and others in developing regional strategies to address the threat of invasive species to our natural resources, economy, and quality of life. Visit <http://pnwer.org/invasivespeciesconference.aspx> for more information.

Sustaining Military Readiness Conference - Connecting Missions, Resources, and Communities

July 25-29, Nashville, Tennessee

DoD personnel and stakeholders interested in military training and testing, natural and cultural resources management, and sustainable and compatible land, air, sea, and frequency use are invited to:

- Explore the interdisciplinary nature of sustaining military readiness
- Share lessons learned and best practices among colleagues and stakeholders
- Participate in a broad spectrum of informative training workshops

The draft agenda and lodging details are available at www.smrconference.com. Organizations interested in exhibiting a poster or booth should e-mail conference@dandp.com by June 1.

4th National Conference on Ecosystem Restoration (NCER)

August 1-5, Baltimore, Maryland

This interdisciplinary conference on large-scale ecosystem restoration will present state-of-the-art science and engineering, planning, and policy in a partnership environment. NCER brings together nearly 1,000 scientists, engineers, policy makers, planners, and partners from across the country to share their experiences concerning large-scale ecosystem restoration on both national and international levels. Visit www.conference.ifas.ufl.edu/NCER2011/index.html for more information.

96th Ecological Society of America (ESA) Annual Meeting - Earth Stewardship: Preserving and Enhancing the Earth's Life-Support Systems

August 7-12, Austin, Texas

Human society currently faces global-scale issues, including climate change, loss of biodiversity, population pressures, food production, energy acquisition, and resource use that threaten the earth's life-support systems. This conference will explore integration of knowledge from the local to the global scale; from the sciences, humanities, and engineering; and from sources ranging from traditional knowledge of indigenous peoples to the most modern technological advances to resolve these issues. Visit www.esa.org/austin for more information.

Sustainable Military Lands Management Certificate

This three-course online certificate from Colorado State University provides training in the breadth and complexity of military land management and knowledge of the rapidly evolving practices, technologies, and analytical tools necessary to support this national defense mission. Visit www.learn.colostate.edu or contact Jenny Hannifin at 970-491-2665 or jhannifin@learn.colostate.edu for details.

NEW! NATURAL RESOURCES DOCUMENTS

Reports, Fact Sheets, Spreadsheets, Presentations

Highlighted here are recently uploaded reports and fact sheets on the Legacy Tracker or on the DENIX web site. For Legacy-related products, please visit https://www.dodlegacy.org/Legacy/intro/ProductsList_NU.aspx. All Legacy products and many more are available at www.denix.osd.mil/nr. In addition, bird-related products are also posted on the DoD Partners in Flight web site at www.DoDPIF.org.

Policy and Guidance

[DoDI 4715.03 - February 14, 2011 – DoD Instruction](#)

This instruction reissues authority to establish new policy and updates to policy for integrated management of natural resources on property and lands managed or controlled by DoD; implements new Natural Resources Conservation metrics; and provides procedures for DoD Components and installations to develop, implement, and evaluate natural resource management programs.

[Sikes Act Outreach and Education \(Legacy 09-417\) – Fact Sheet](#)

This project developed a one-day Sikes Act 101 course to (1) improve INRMPs by providing information and training to DoD natural resources managers and (2) develop and improve cooperative partnerships between DoD, USFWS, and the military Services.

[Scanning the Conservation Horizon: A Guide to Climate Change Vulnerability Assessment \(Legacy 09-460\) - Guidance Document](#)

Developed collaboratively by conservation professionals and scientists, this guide is designed to assist fish and wildlife managers and other conservation and resource professionals to better plan, execute, and interpret climate change vulnerability assessments. Climate change vulnerability assessments provide two essential contributions to adaptation planning: (1) identifying which species or systems are likely to be most strongly affected and (2) understanding why these resources are likely to be vulnerable, including the interaction between climate shifts and existing stressors. The guide describes various approaches available for assessing vulnerability and highlights examples of climate change vulnerability assessment in practice.

Invasive Species Management

[A Landowner's Guide to Wild Pig Management: Practical Methods for Wild Pig Control – Guidance Document](#)

Wild pigs are numerous and widespread throughout much of the United States and will continue to be a management challenge. In addition to damaging crops and livestock, wild pigs damage forests and are a threat to native wildlife and the environment. This document outlines various management practices and strategies for wild pigs. Detailed design drawings are included.

[Do Frogs Still Get Their Kicks on Route 66? A Transcontinental Transect for Amphibian Chytrid Fungus \(*Batrachochytrium dendrobatidis*\) Infection on U.S Department of Defense Installations \(Legacy 09-426\) – Final Report and Article](#)

A major factor in the decline of the world's amphibians has been the spread of infection by the chytrid fungus Bd. To better understand the spatial and temporal scales of infection, this project conducted a transcontinental transect for the presence of Bd in DoD installations along highways from Camp Pendleton in California to Naval Air Station Oceana in Virginia. This study represents the most geographically extensive survey for Bd infection conducted to date.

[Creating Cooperative Invasive Species Management Areas \(CISMAs\) to Effectively Reduce Re-Infestation on Four Military Bases and Surrounding Lands in Florida \(Legacy 09-437\)](#)

[Phase I – Fact Sheet and Technical Report](#)

The overall objective of this effort was to create four CISMAs to address the critical threat from invasive species on four Florida military bases and surrounding lands. Key elements were to have plans to prioritize their efforts, include many agencies and organization, use on-the-ground control projects to demonstrate effectiveness in approach, and be networked into other CISMAs.

[Statewide Coordination – Strategic Plan Template](#)

This Strategic Plan template for use by CISMAs throughout Florida should be considered a starting point and should be revised by each CISMA to reflect local priorities, landowners, and membership capacity. This plan emphasizes terrestrial invasive plants; however, actions are defined that address animals and pest/pathogens as well as aquatic resources. A presentation describing CISMAs and a poster highlighting the project also are included.

[Strategic Plans](#)

These strategic plans were developed to guide the interactions of all agencies and landowners within the CISMA boundaries.

- [First Coast IWG/Camp Blanding Army National Guard](#)
- [Keys ISTF/ Naval Air Station Key West](#)
- [Heartland CISMA/Avon Park AFR](#)
- [Six Rivers CISMA/Eglin AFB](#)

[Utilizing CISMAs to Effectively Reduce Re-Infestation of Invaders on Six Military Bases and Adjacent Lands in Florida \(Legacy 10-437\)](#)

[Monitoring Reports](#)

These reports detail efforts to remove priority invasive plants.

- [NAS Key West: Phase I](#)
- [Eglin AFB: Phase I](#)

Southwest Ecosystem Management

[Integrating Science and Policy for Water Management \(Legacy 06-250\) – Book Chapter](#)

This chapter, from the book Ecology and Conservation of the San Pedro River, describes the collaborative efforts of scientists, agency representatives, non-governmental organizations, elected officials, and other stakeholders to address water policy and management issues in the Sierra Vista subwatershed of the upper San Pedro River basin. Fort Huachuca is a partner in this effort.

[Quantifying Impacts of Groundwater Withdrawal on Avian Communities in Desert Riparian Woodlands of the Southwestern United States \(Legacy 08-290\) – Fact Sheet and Final Report](#)

The objective of this project was to assess the value of riparian woodlands to the health and persistence of avian communities in the desert southwest. The extent to which both surface water and the health of riparian vegetation influence the abundance and diversity of riparian birds was quantified. Models were developed that will enable resource managers on military lands to better predict the effects of future groundwater withdrawal and surface water depletion on riparian bird communities along the San Pedro River and elsewhere in the southwestern United States.

continued on next page

NEW! NATURAL RESOURCES DOCUMENTS *Continued*

Reports, Fact Sheets, Spreadsheets, Presentations

[Habitat Use at Multiple Scales by Pinyon-Juniper Birds on Department of Defense Lands: Landscape Scale \(Legacy 09-425\) – Fact Sheet and Final Report \(Year 1\)](#)

Throughout their range, pinyon-juniper habitats are threatened by drought, insects, disease, and fire, all of which can be exacerbated by climate change. This project is investigating habitat use at multiple scales (landscape, territory/colony, and nest) by the gray vireo and pinyon jay at three DoD installations in New Mexico. These species differ in seasonal movements, social structure, and foraging habits. Analysis at multiple scales and across several installations will enable a broad perspective on management of pinyon-juniper woodlands.

[Effects of Invasives on the Distribution of Keystone Desert Plants on Military Lands \(Legacy 08-411\) – Fact Sheet and Technical Report](#)

The overall objective of this project was to better understand the impacts of invasive species on key components of ecosystems and pollinator communities in order to address management concerns for desert plant communities and their associated threatened and endangered species. Non-native Lehmann lovegrass (*Eragrostis lehmanniana*) and its impact on native plants was the focus. Products from this study will assist with installation decisions to implement the best management practices for invasive grasses and imperiled species on training ranges throughout the Southwest.

[Landscape-Level Habitat Associations - Desert Tortoises \(Legacy 08-385\) – Fact Sheet](#)

The objective of this study was to develop a landscape-level predictive habitat model for desert tortoises inhabiting the Yuma Proving Ground and Barry M. Goldwater Range. This model, validated with tortoise movement data, was used to identify areas where desert tortoise occupancy is most likely and focus tortoise conservation planning on these ranges.

Threatened, Endangered, and At-Risk Species

[Chiricahua Leopard Frog \(*Lithobates \[Rana\] chiricahuensis*\): Considerations for Making Effects Determinations \(CMED\) and Recommendations for Reducing and Avoiding Adverse Effects \(Legacy 05-258\) – Technical Report](#)

This report aims to focus the effects analysis of proposed Federal activities on critical elements, reduce uncertainty in determining effects, and improve and facilitate Section 7 consultations that may be required under the Endangered Species Act. The CMED should be used as a guide in assessing potential effects of a proposed action to the species, but consideration must be given to site-specific information in making the final determination of effects. The CMED provides considerations in determining if the species may be in the action area of the proposed activity and, if so, possible ways in which Federal activities may affect various aspects of the species and its habitat.

[Migratory Linkages of Burrowing Owls on DoD Installations and Adjacent Lands \(Legacy 05 through 08-243\) – Fact Sheet and Final Report](#)

Burrowing owl (BUOW) (*Athene cunicularia*) populations have declined throughout the western United States and Canada, and they have been extirpated from the periphery of their breeding range. Despite these declines, BUOWs appear to be increasing in other areas. One possible explanation for this paradox is that BUOWs are becoming less migratory. This study analyzes the connectivity of BUOW populations on DoD installations in the western United States and determines how far BUOWs nesting on DoD installations and adjacent lands disperse from one year to the next using a combination of stable isotope ratios, DNA samples, and radio telemetry.

[Pollinators of TERS Plants on DoD Installations in the Southeast \(Legacy 09-391\) – Fact Sheet](#)

The objective of this project was to locate pollinator information on 87 threatened, endangered, and at-risk species (TERS) found on DoD installations in seven southeastern states (North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, and Louisiana) and create a spreadsheet database associating pollinators with their respective host plants. Data have been made available to resource managers, their contractors, and other interested environmental agencies and individuals.

[Near Surface Sound Propagation, A Key to Alerting North Atlantic Right Whales of Approaching DoD Ships \(Legacy 06-145\) – Fact Sheet](#)

Whales are vulnerable to collisions with ships when near the ocean surface because they cannot hear the sounds of ships. A cost-effective technology that addresses the underlying acoustic cause of ship strikes was developed to alert whales, mitigating the risk of collisions and impact on DoD operations. This project tested the efficacy of prototype projectors at selectively “filling in” the acoustic shadows ahead of ships with modulated ship noise.

[Determining Marine Movement and Behavior of the Gulf Sturgeon in the Gulf Sturgeon Critical Habitat of the Gulf Testing and Training Range and Santa Rosa Island Complex \(Legacy 09-428\) – PowerPoint Presentation](#)

This presentation describes the results of a project that is using acoustic tracking technology to determine sturgeon presence and movement within critical habitat areas of Eglin Air Force Base’s Gulf ranges. Areas where and when sturgeon typically occur were identified, and movement and distribution patterns of sturgeon from different river systems were documented.

[Species at Risk \(SAR\) on Department of Defense Installations \(Legacy 03-154\)](#)

[Master List of SAR On or Near National Guard Installations – Excel Spreadsheet](#)

This spreadsheet features various data on species at risk found on or near U.S. National Guard installations, including locations and ecoregions, species descriptions, habitat types, scientific names, conservation and federal/state listing status, and species threat information.

[SAR on Department of Defense Installations, Appendices 2-7 - Excel Spreadsheets](#)

These appendices supplement the January 2004 report, Species at Risk on Department of Defense Installations (an update to the July 2002 report). The appendices list data regarding the key identifiers, locations, and status information for all species at risk on DoD installations.

[List of DoD Installations with Species at Risk, including Comprehensive Information about the Species at Risk that Occur on Them \(Legacy 09-391\)](#)

[By Plant Species – Excel Spreadsheet](#)
[By State – Excel Spreadsheet](#)

These spreadsheets feature various data on species at risk found on Southeast DoD installations, including locations and ecoregions, species descriptions, habitat types, scientific names, conservation and federal/state listing status, and pollinator information.

LINKS OF INTEREST

Of particular interest to this issue.

[National Invasive Species Council - www.invasivespecies.gov](http://www.invasivespecies.gov). NISC provides high-level interdepartmental coordination of federal invasive species actions and works with other federal and non-federal groups to address invasive species issues at the national level.

[Armed Forces Pest Management Board - www.afpmb.org](http://www.afpmb.org). The AFPMB recommends policy, provides guidance, and coordinates the exchange of information on pest management throughout DoD. The AFPMB's mission is to ensure that environmentally sound and effective programs are present to prevent pests and disease vectors from adversely affecting DoD operations.

[Aquatic Nuisance Species Task Force - www.anstaskforce.gov/default.php](http://www.anstaskforce.gov/default.php). The ANS Task Force is an intergovernmental organization dedicated to preventing and controlling aquatic nuisance species. It coordinates governmental efforts dealing with ANS via regional panels and issue-specific committees and work groups.

[National Biological Information Infrastructure Invasive Species Information Node \(ISIN\) - www.nbii.gov/portal/server.pt/community/invasive_species/221](http://www.nbii.gov/portal/server.pt/community/invasive_species/221). ISIN serves as an information portal for invasive plants, animals, and pathogens in the U.S. It coordinates invasive species information from other NBII nodes, several USGS Science Centers, and other government and non-government partners.

[DoD Natural Resources Conservation Program - www.DoDNaturalResources.net](http://www.DoDNaturalResources.net). DoD's NR Program provides policy, guidance, and oversight for management of natural resources on all land, air, and water resources owned or operated by DoD.

[DoD Legacy Resource Management Program - https://www.dodlegacy.org](https://www.dodlegacy.org). This DoD program provides funding to natural and cultural resources projects that have regional, national, and/or multi-Service benefits. The Legacy Tracker lets you download fact sheets and reports for completed Legacy-funded projects.

[DoD TER-S Document Repository - http://dodtes.nbii.gov](http://dodtes.nbii.gov). A compilation of DoD Threatened and Endangered Species documents and data made available online through the National Biological Information Infrastructure. Information contained in these documents is considered "gray" literature (i.e., not peer reviewed).

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

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

[DoD Pollinator Workshop - www.DoDpollinators.org](http://www.DoDpollinators.org). This web site provides an overview of pollinators and the reasons they are important to DoD. It highlights the 2009 NMFVA workshop on pollinators, and has many useful resources, including factsheets and technical reports, pocket guides to identifying pollinators, and links to other web sites on pollinators.

[USDA Forest Service Invasive Species Program - www.fs.fed.us/invasivespecies/index.shtml](http://www.fs.fed.us/invasivespecies/index.shtml). This web site serves as a portal to Forest Service invasive species information and related management and research activities across the agency and with their many partners.

[U.S. Fish & Wildlife Service Invasive Species - www.fws.gov/invasives/](http://www.fws.gov/invasives/). This web site provides various resources and information on programs, activities, partnerships, regulations, and news related to invasive species concerning the U.S. Fish and Wildlife Service.

[Center for Invasive Plant Management - www.weedcenter.org](http://www.weedcenter.org). CIPM serves as a regional hub for invasive plant expertise to promote ecologically sound management of invasive plants in western North America by sponsoring research, conducting public education, and facilitating collaboration and communication.

[DoD Invasive Species Outreach Toolkit - www.DoDinvasives.org](http://www.DoDinvasives.org). The Toolkit is an education and outreach tool to help DoD land managers communicate about invasive species. It contains modifiable outreach materials such as posters, brochures, reference cards, and a PowerPoint presentation. A list of resources to help identify information and funding sources is also included.

[DENIX - www.denix.osd.mil/nr/](http://www.denix.osd.mil/nr/). DENIX is an electronic environmental bulletin board that provides access to environmental information, such as Executive Orders, policies, guidance, INRMPs, fact sheets, and reports.

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

[Strategic Environmental Research and Development Program and Environmental Security Technology Certification Program - www.serdp-estcp.org](http://www.serdp-estcp.org). SERDP and ESTCP are DoD's environmental research programs, harnessing the latest science and technology to improve environmental performance, reduce costs, and enhance and sustain mission capabilities. They are independent programs managed from a joint office to coordinate the full spectrum of efforts, from basic and applied research to field demonstration and validation.

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

[Bat Conservation International - www.batcon.org](http://www.batcon.org). BCI is devoted to conservation, education, and research to protect bats and their ecosystems around the world.

[Partners in Amphibian and Reptile Conservation - www.parcplace.org](http://www.parcplace.org). PARC is a partnership of individuals and entities dedicated to the conservation of amphibians and reptiles and their habitats as integral parts of our ecosystem and culture through proactive and coordinated public/private partnerships.



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Deputy Director, DoD Natural Resources
Director, Legacy Resource Management Program
Peter Boice: peter.boice@osd.mil

Natural Resources Specialist, Legacy
Jane Mallory: jane.mallory.ctr@osd.mil

DoD Conservation Program Support
DoDNRConservation@bah.com

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