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The Wildlife Society, founded in 1937, is an international non-profit scientific and educational association dedicated to excellence in wildlife stewardship through science and education. Our mission is to enhance the ability of wildlife professionals to conserve diversity, sustain productivity, and ensure responsible use of wildlife resources for the benefit of society. We encourage professional growth through certification, peer-reviewed publications, conferences, and working groups. For more information, visit us at www.wildlife.org.

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Credit: Samuel King Jr./ U.S. Air Force

COVER: Col. Matthew Higer, 96th TestWing vice commander, releases a gopher tortoise into its new home at Florida's Eglin Air Force Base in October 2016.

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Credit: U.S. Army/Jeremy Dertien

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A Mission to Conserve Wildlife

THE UNIQUE CHALLENGES ON MILITARY LANDS

Credit: Samuel King Jr./U.S. Air Force

▲ **A member of the Air Force holds a gopher tortoise that has been relocated to Eglin Air Force Base. The tortoise is one of many imperiled species on American military bases, where biologists work with the Armed Forces to balance habitat protection and military operations.**

By Dana Kobilinsky

Chris Petersen hacked his way through the thick understory of the southeast Virginia forest with a machete, trying not to disturb the wildlife around him. He was searching for timber rattlesnakes (*Crotalus horridus*), a species that had been listed as endangered in the state since 1992.

The rattlesnake has a special significance here. It appeared on naval ships' flags during the American Revolution above the words "Don't Tread on Me," and as he worked his way across the grounds of this naval facility, Petersen was trying to take those words to heart. Teaming with Old Dominion University and the Virginia Department of Game and Inland Fisheries, the Navy wanted to track and learn about this rattlesnake species, including its habitat use, seasonal movement, and how the mission of the facility, the Northwest Annex of the Naval Support Activity Hampton Roads, might inadvertently impact the species' habitat.

"Every day was an adventure," said Petersen, a civilian senior natural resource specialist with the Naval Facilities Engineering Command Atlantic. "You never knew where the snakes were going to take you or what you were going to see."

Petersen had implanted radio transmitters in the snakes. Sometimes, he would come across one eating an eastern gray squirrel (*Sciurus carolinensis*) or an eastern cottontail (*Sylvilagus floridanus*). Sometimes, he would see a male sitting next to a female, mate-guarding her during the July and August mating season. Once, he even found one of the snakes up in a tree. On these 2,400 acres of Department of Defense land near the North Carolina state line, Petersen and his colleagues found that while some individuals used as much as 750 acres of land and traveled up to 19 kilometers during their annual movements, they frequently navigated back in the fall to the exact same rotting tree stumps where they spent their winter hibernation.

After 17 years of strapping on a backpack, machete and radio receiver to go out in search of rattlers, Petersen has found the reptiles to be far from their treacherous image on the famous flag. Laid-back creatures, they rarely rattled at him, he said, relying instead on their camouflage for protection. "The animals are in their natural environment and part of this healthy ecosystem," Petersen said.

Military installations like this one are the natural environments for a variety of species. Because of their remoteness and relative lack of development, they often provide excellent wildlife habitats, even if training exercises and unexploded ordnance can sometimes create unusual working conditions for the biologists who study them. In many cases, lands dedicated to military training exercises are home to endangered species and species at risk. At California's Vandenberg Air Force Base, 17 federally listed species of flora and fauna share 99,000 acres with military activities. That can create a tricky situation for all the military branches — the Army, Navy, Air Force, Marines and Coast Guard — which can find themselves balancing wildlife conservation with their bases' primary missions.

"It's a challenge, but, hell, it's fun," said Rhys Evans, a civilian biological scientist at Vandenberg and the former chair of The Wildlife Society's Military Lands Working Group, which deals with these issues.

Like other branches of the federal government, the military is required to follow the Endangered Species Act and other environmental protection laws that ensure the safety of wildlife on their lands. Sometimes those two objectives are at odds. Other times, what's good for wildlife proves to be good for the military, too.

Credit: Paul Block

▼ **Biologist Chris Petersen holds up a wood turtle (*Glyptemys insculpta*) after capturing it near the Navy's Survival, Evasion, Resistance and Escape School located in Franklin County, Maine. Petersen has worked on a variety of projects to help conserve and manage reptiles and amphibians on military lands.**

Credit: P. McCall

▲ **Researchers Bob Schmidt and Jeremy Dertien install a camera trap at Black Rapids Training Area in Fort Wainwright, Alaska, as part of a project funded by the Army. The team collected images of Dall's sheep to document their locations and movement in order to help the Army avoid their habitat on the installation during lambing season.**

A balancing act

On some bases, the military faces a challenge of timing operations to cause the least disturbance to wildlife. In a recent study funded by the U.S. Army and published in the *Journal of Wildlife Management*, researchers looked at Dall's sheep (*Ovis dalli dalli*) space use and lambing behavior at Fort Wainwright, an Army installation near Fairbanks, Alaska. They wanted to determine if military training should be restricted to take place during certain times of the year, or times of the day, to minimize impacts on the sheep.

"It was an interesting paradox with the need for conserved areas for wildlife and producing quality training scenarios for the overall mission," said lead author Jeremy Dertien, a PhD student at Clemson University and TWS member. "It's kind of at times an undiscovered gold mine to work on these lands." Apart from the military activities that take place on them, the landscapes were isolated and environmentally unchanged, Dertien said, resulting in a natural setting that many species, like the Dall's sheep, preferred.

Credit: U.S. Army/Jeremy Dertien

▲ **A camera trap captured this image of Dall's sheep lambs wandering in Fort Wainwright, Alaska, during the summer of 2013. Researchers suggested the military conduct training exercises between July and September to avoid interactions with the sheep when they give birth in June and rear their lambs in in the same area.**

As part of the study, Dertien and his colleagues deployed camera traps in the summer of 2013 and found the sheep used some of the military lands for lambing. He and his team suggested that by conducting training between July and September and avoiding areas with a slope greater than 60 percent, the Army could minimize interactions with the sheep when they give birth and rear their lambs in June.

The solution was easy at Fort Wainwright. Training activity wasn't common on sheep habitat during lambing season and the Army could easily avoid it. In other cases, managing the two missions is more complicated.

At the Hampton Roads Northwest Annex, conflicts arose between protecting timber rattlers and conducting the missions of the facility. Sometimes, Petersen said, the military needed to clear cut vegetation to maintain open zones for communication antennas, but clearing vegetation raised the potential of harming rattlesnakes. Wildlife biologists made recommendations based on their data as to where and when brush could be cut and when prescribed burns could take place, minimizing impacts on the snakes while allowing military activities to go forward.

It can be a delicate balancing act, but sometimes maintaining the land also benefits military objectives. "The military wants to use its properties over and over again for training and testing mission activities, perhaps even for decades," Petersen said. "It's our job as natural resource specialists to keep them as healthy and resilient as we can."

Mission friendly

Sometimes the biggest challenge of wildlife conservation on military lands is getting these wildlife projects started at all. In some cases, the military initiates the studies, but in others, it can be a reluctant participant.

"Part of the challenge is convincing the leadership that conservation action is a good idea to do in the first place and that it won't interfere with the military mission, whether that is storing chemicals or

training soldiers," said Jeff Mach, a civilian natural research conservation manager with the Oregon Military Department, which oversees the state's Army National Guard and Air National Guard.

Mach participated in a project by the Army, U.S. Fish and Wildlife Service and the nonprofit Global Owl Project to increase the burrowing owl (*Athene cunicularia*) population at the former Umatilla Chemical Depot in north-central Oregon near the Washington border.

Burrowing owls have been declining, and their range has been contracting for several decades, including at the depot, Mach said. This is due in part to agricultural and urban development cutting into their habitat and the reductions of burrowing mammals, such as coyotes (*Canis latrans*), that provide the burrows owls use.

After Congress decided in 2005 to close the depot, the Oregon Military Department began acquiring much of it for use as a National Guard training site. Another part of the depot is intended to be managed as wildlife habitat. Beginning in 2008, Army, National Guard and state wildlife agency staff members and volunteers installed 180 artificial burrows at 87 sites on the former depot.

It was an overnight success. "The owls took right to the artificial burrows, sometimes within 24 hours of putting them in," Mach said. "It was no problem at all."

When the installation closed in 2012 and its environmental staff departed, Mach still needed organizational support to continue the project. As the Oregon Military Department prepares to acquire much of the former depot and use the property for military training rather than storing chemical ordnance, Mach has had to prove that the artificial burrows wouldn't interfere with its activities. He also has had to show that continuing the conservation project was worth the effort. Installing an artificial burrow may take a four- or five-person crew an hour and require periodic maintenance, Mach said, but a healthy population of owls can have positive effects for the installation. Because rodents are a favored prey item and the deer mouse (*Peromyscus maniculatus*), which occurs on the installation, is a known hantavirus carrier, the owls provide natural rodent control.

Credit: Jeff Mach

▲ **A banded male western burrowing owl stands in the Umatilla Army Depot in Oregon, where the Army and National Guard installed artificial burrows to benefit the owls. Many of the owls began using them within 24 hours.**

Since 2008, the number of nesting pairs of owls in the depot has increased from approximately four pairs to as many as 66 pairs. "The depot now has one of the most concentrated and accessible burrowing owl populations in the United States," Mach said. Biologists have captured and banded the nesting adults and chicks, taken their measurements and collected data on individual owls as part of a long-term demographic study.

As the owl population on the depot has increased, the installation has hosted outside researchers trying to learn more about the species. Some birds have been fitted with geolocators to determine where they winter — including, it turns out, Air Force land in California. Wing molting patterns of known-age birds are being studied to try to figure out the ages of the unknown-age birds. Biologists have held graduate-level studies involving the owls on the depot.

"Through this work I hope we will be able to show there are ways the military can encourage species,

Credit: Jeff Mach

Credit: Jeff Mach

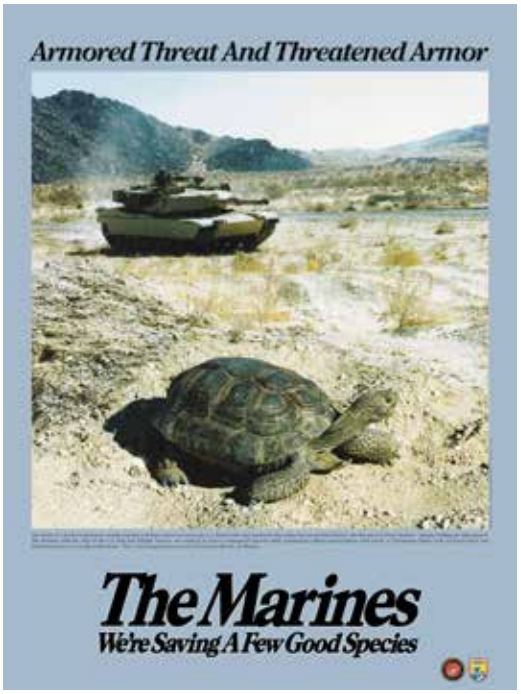
▶ **The Umatilla Army Depot celebrated National Public Lands Day in 2016 by putting in place artificial burrows for burrowing owls. A burrowing owl (right) makes use of an artificial burrow installed by the National Guard and the Army at the Umatilla Army Depot. Researchers had to demonstrate to military leadership that the underground burrows could help the owls without interfering with training exercises.**

such as the burrowing owl, to use habitat on their installations, including nesting, with no effect on the military mission," Mach said. "Projects such as this can be used as a tool to enhance a species' population and help keep the species from being listed, should it ever come to that."

Bringing back species at risk

In the Florida panhandle, Eglin Air Force Base is becoming a refuge for the gopher tortoise (*Gopherus polyphemus*).

With its falling population due largely to central Florida urban development, the tortoise is being considered for federal listing under the ESA, with a decision expected in 2023. In 2007, the state began working with landowners to plan the removal of tortoises permited for take from private property, translocating them to properties where they could be safe from habitat fragmentation. The U.S. Fish and Wildlife Service and Florida Fish and Wildlife Conservation Commission approached Eglin about being a release site.



Credit: U.S. Marine Corps

▲ **The Marine Corps and U.S. Fish and Wildlife Service produced seven "We're Saving a Few Good Species" posters to highlight their work protecting sensitive wildlife and plants.**

"We wanted to be able to participate in the conservation of this species," said Jeremy Preston, a civilian endangered species biologist at Eglin.

A pre-listing conservation agreement in the works would allow for tortoises to be released on parts of the base with limited military presence. In exchange, Eglin could continue testing and training on existing ranges without additional permits or lengthy consultation. The agreement, Preston said, would provide the base with "maximum mission flexibility for many, many years to come."

The bulk of work moving the tortoises to Eglin began in October 2016. Preston hopes these efforts will help preclude the need to federally list the species, but if it is listed, he believes the Eglin population will have a head start in recovery efforts. He pointed to Eglin's red-cockaded woodpecker (*Leuconotopicus borealis*) population, where the Air Force had reduced capabilities on the property due to population declines within the longleaf pine (*Pinus palustris*) forests on the base. Eglin took steps to protect the bird in the early 1990s in an effort to regain flexibility for testing and training opportunities.

Protecting habitat for the woodpeckers resulted in a great landscape for training and a suite of at-risk species, Preston said. By the summer of 2017, the base's woodpecker population had increased from 150 breeding groups in the early 1990s to more than 460 potential breeding groups, far exceeding the goal of 350 set in the recovery plan.

"We should contribute whatever we can to the recovery of species," Preston said. "If we recover a protected species population to the point that it can ultimately be removed from the endangered species list and become just another bird in the woods, fish in the stream or herp on the ground, then we've done our job for the military in securing maximum regulatory flexibility."

Mission-sensitive species

Recovery of a wide range of species is important on Department of Defense lands, said Alison Dalsimer, a program manager with the Department of Defense Natural Resource Program. The DoD manages more than 25 million acres of land in the United States, and its biologists work on bases in distant U.S. territories and partner with biologists on bases in foreign lands.

"DoD's mission is to defend our nation," Dalsimer said. "The Natural Resources Program enables our soldiers, sailors and air personnel to test, train and operate with maximum flexibility by managing our lands and waters in ways that protect our nation's priceless natural heritage. Species recovery is an important component of that scheme because of the high numbers of at-risk species that live on them."

The organization NatureServe, a nonprofit that provides scientific data on endangered species to DoD and USFWS decision makers, found military lands have more listed and at-risk species per acre than any other lands in the country. In data collected in 2004 and updated in 2011, NatureServe found that out of 729 military bases examined, 224 contained species at risk.

In all, DoD is responsible for protecting more than 430 threatened and endangered species and over 550 species at risk, 47 of which were candidates for federal listing, from the Pacific walrus (*Odobenus rosmarus divergens*) to the Taylor's checkerspot

butterfly (*Euphydryas editha taylori*) to the yellow-billed cuckoo (*Coccyzus americanus*).

Military lands are typically less developed than other areas of the United States, Dalsimer said. "Having said that, we don't want them to become refugia and lose the ability for the military to use them for training."

Charles Buchanan, director of the Range Management Office at Luke Air Force Base, understands the balance firsthand. He's been on both sides, having served as a pilot at the base before overseeing operations that include its management program to protect the endangered Sonoran pronghorn (*Antilocapra americana sonoriensis)*. "Understanding the

Operation Sonoran Pronghorn Survival

With binoculars, spotting scopes and telemetry equipment, five contracted wildlife biologists working for Luke Air Force Base climbed up hills on the Barry M. Goldwater Range. They may have looked like part of a military operation, but they were scanning the Arizona desert in search of the endangered Sonoran pronghorn (*Antilocapra americana sonoriensis*). If pronghorn appeared, the range's coordination center would close down nearby targets.

"It's a really slick operation and the monitoring program is quite effective," said Aaron Alvidrez, an Air Force civilian wildlife biologist with the 56th Range Management Office at Luke AFB. "Pilots certainly understand the importance of endangered species on the range and have contingency plans for dealing with Sonoran pronghorn sightings."

The Sikes Act of 1960 provides for cooperation between the Defense Department, Interior Department and state agencies to plan, develop and maintain fish and wildlife resources on military lands. The act requires the Defense Department to develop and implement integrated natural resource management plans on every military installation with significant natural resources.

The Air Force and Marine Corps jointly implement the plan for the Barry M. Goldwater Range, incorporating ecosystem management principles with military training requirements to protect natural resources, including the Sonoran pronghorn and its habitat. At most bases, military operations and environmental issues are handled separately. Here, both are handled under the same roof.

Credit: George Andrejko, Arizona Game and Fish

▲ **Aaron Alvidrez, a wildlife biologist for the 56th Range Management Office, holds the head of a Sonoran pronghorn while other team members process it for relocation.**

"It's an interesting balance that we run," said Charles Buchanan, a retired Air Force lieutenant colonel who directs the 56th Range Management Office. "On one hand, we're bombing the desert, and on the other hand, we're protecting the desert."

In drought-stricken years, military personnel observed pronghorn drinking water from bomb craters within the tactical ranges. The Air Force and Marine Corps, which each manage different portions of the range, met with other federal agencies to come up with conditions to benefit the species, which are protected under the Endangered Species Act.

Partners including the U.S. Fish and Wildlife Service, National Park Service, Bureau of Land Management, Tohono O'odham Nation, Arizona Game and Fish Department and the military continue to work together to recover the pronghorn with the goal of delisting the species.

The efforts seem to be paying off. Since the early 2000s, when the pronghorn population crashed to about 20 animals with the onset of the drought, biologists have seen the endangered pronghorn population grow to over 200. Now, the recovery team is translocating new animals from a semi-captive breeding facility at the Cabeza Prieta National Wildlife Refuge in Arizona to Air Force and Marine lands and wildlife refuges.

"The success of the recovery team's intervention is a testament to the importance of partnerships," Alvidrez said. "No single agency would have been capable of accomplishing all that was necessary."

When observers spot pronghorn on the base, either visually or by telemetry, they estimate the animals' positions and call in their coordinates. The Range Operations Coordination Center enters their locations into a geographic information system, which generates a target closure list for the day. In the winter, when the pronghorn congregate on the base's impact ranges during their migration, as many as 70 percent of the targets can be closed. "That's just the give and take of the operation," Buchanan said.

Back when he was a pilot here, Buchanan said, he learned to work around the target closures brought on by the presence of pronghorn, but he didn't really understand the significance. Now, he said, he embraces the conservation side of the operation.

"It's incumbent that we do the land management business correctly," Buchanan said. "If we don't, we're at risk of losing that land we so dearly need to execute the mission."

Credit: Marty Korenek

▲ **Jeff Hall, a Partners in Amphibian and Reptile Conservation biologist with North Carolina Wildlife Resources Commission at the Marine Corps' Camp Lejeune Environmental Conservation Branch, holds an eastern diamondback rattlesnake (*Crotalus adamanteus*). The venomous snake is found on Marine Corps installations throughout the southeastern United States.**

environmental side of it, we can't take it lightly," he said. "We have to do the environmental side right in order for the military to use the land and air space for the military mission. [The military members] get it now — it's fascinating. It's something that we need to pay attention to and certainly a worthy cause."

Programs such as the Department of Defense Partners in Flight have identified bird species such as piping plovers (*Charadrius melodus)* or prothonotary warblers (*Protonotaria citrea*) which, if listed as threatened or endangered, could have a significant adverse effect on military installations. They call them "mission-sensitive species." One of those is the burrowing owl, which Mach is working to enhance in Oregon.

"Their range is throughout the West, extends through the Gulf Coast, and throughout Florida," he said. "Overall, quite a few installations have burrowing owls on them."

Important partnerships

Like almost all wildlife management conservation projects today, partnerships are important on military lands. "The fact is that we have to work in partnerships," Dalsimer said. "No one has the resources to do it by themselves."

The Pollinator Partnership, which focuses on the protection and promotion of pollinators and their ecosystems, has included the Defense Department for almost 10 years.

The Legacy Resource Management Program, which awards funding on a competitive basis to natural and cultural resource projects that involve more than one armed services branch, are regional and can't otherwise be funded by installations, has awarded more than $2 million for nearly 300 pollinator-related projects, many of them through the National Public Lands Day partnership.

Pollinators are important to protect, Dalsimer said, not only because they're in decline, but because their role in maintaining diverse native plant communities is critical for the lands the military relies on for realistic training and testing. "We actually need healthy ecosystems to conduct appropriate training missions," she said.

A project on western monarch butterflies (*Danaus plexippus*) includes collaboration between the Air Force, Navy and Army on Vandenberg Air Force Base in California, the Naval Weapons Systems Training Facility Boardman in Oregon, the Yakima Training Center in Washington and other sites. The project involves surveys and demographic models for timing of monarch breeding in order to allow the DoD to balance habitat conservation with military training.

Launched in 2009, the DoD Partners in Amphibian and Reptile Conservation is made up of military and civilian personnel with a mission to conserve and manage amphibians and reptiles on military lands in ways that coexist with testing, training and operational activities.

Other organizations also focus attention on the importance of wildlife on military lands. Created in 1983, the National Military Fish and Wildlife Association advocates for wildlife primarily though policy. The Wildlife Society's Military Lands Working Group focuses on the science conducted on these lands.

"People think the military works in a vacuum focused on just the mission," Evans said, but the military often funds wildlife research projects and actively supports wildlife in their missions.

At the Hampton Roads Northwest Annex, far from brushing aside the rattlesnake research, the Navy has embraced it, Petersen said, and it has allowed him to study an array of other reptiles and amphibians at the annex and across the DoD landscape. The Navy installation has even made the timber rattler its mascot, he said, and it works to keep its military exercises from treading on the snake's habitat.

"The bottom line," Dalsimer said, "is that the DoD is committed to environmental excellence." ■

Dana Kobilinsky is a science writer at The Wildlife Society.