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SPOTLIGHT

Invasive Species 14

Birds & Battalions 32

Fuel for the Fire 34

Departments

From the Director / 1

News / 2

Curator's Corner / 36

Our People / 37

Features

SPOTLIGHT



The Scoop on Invasive Species | by JOHN KLAVITTER



Battling the Brown Treesnake / 18

*Guam National Wildlife
Refuge helps lead fight
against invader*

by EARL CAMPBELL



Going After the Most Complex / 20

*Large invasive species
eradication projects
show success*

by JOHN KLAVITTER



On the Right Track / 24

*The Chesapeake Bay
Nutria Eradication
Project*

by DAN MURPHY

ALSO IN THIS ISSUE

Birds + Battalions / 32

*Fort Hood in Texas
manages land for both
soldiers and endangered
species*

by CRAIG SPRINGER and LESLI GRAY

Fuel for the Fire / 34

*With prescribed fire at its wildland
fire education site, St. Marks
Refuge shows importance of
well-managed burns*

by TOM MACKENZIE

ON THE COVER: SAGE THRASHER EGGS
AND NEST ON SEEDSKADEE NATIONAL
WILDLIFE REFUGE IN WYOMING.
PHOTO: TOM KOERNER/USFWS




Fighting for Native Species

One of the largest single causes of native species decline and extinction is the spread of invasive species.

From cordgrass and zebra mussels to rats and feral pigs, invasive species continue to wreak havoc on species and ecosystems across the world. Despite the scope of the problem, the U.S. Fish and Wildlife Service has undertaken fierce battles in some of the most remote places and at times under inhospitable conditions to eradicate or at least halt the spread of invasives—and for good reasons.

Invasives degrade and destroy delicate ecosystems that have evolved over thousands of years—reducing the productivity of terrestrial and aquatic systems that sustain millions of people.

Dealing with invasives also costs our nation tens of billions of dollars each year forcing land managers and landowners—public and private—to use physical, mechanical, cultural, biological and chemical management strategies to protect the economy, humans and the environment from tenacious invaders.

In this issue of *Fish & Wildlife News*, you'll read about some of our work on invasive species, including the herculean effort to rid Maryland's Delmarva Peninsula of nutria.

As with many conservation efforts, the fight against nutria got its start on a local national wildlife refuge—Blackwater National Wildlife Refuge in Maryland—and brought together a group of allies to fight a scourge that had growing for decades.

I have seen firsthand the damage these small but voracious invaders do to wetlands with their destructive feeding habits. They eat the roots that hold marshes together, causing the wetlands to fade away. Nutria also accelerate forces such as saltwater inundation of freshwater wetlands.

Our work has been so successful on the Delmarva Peninsula that we are now moving into the project's final stages, searching for the last few remaining nutria.

This is what can happen when landowners, conservation groups, volunteers and the community all pitch in to stop an invasive species.

Invasives also compete with native species for food and habitat. Think of zebra mussels, spreading through our waterways, or feral pigs rooting up native foliage and destroying habitat across the country. Sometimes, invasive species even prey on native species. Unchecked non-native rats have devastated many an island paradise by devouring seabird eggs, chicks and adults; sea lamprey can kill up to 40 pounds of fish, like lake trout, each year over its 12- to 18-month feeding period.

Without prevention, early detection and rapid response to new infestations, and an educated public, the threat is only going to worsen.

Our world gets smaller every day, as trade expands our contact with people and places most Americans will never see. Giant vessels can move thousands of containers at a time even as they unintentionally bring non-native species stowed away in their hulls and cargo. Americans continue to crave exotic pets that soon outgrow their owners' abilities to keep them. Outdoor recreationists inadvertently spread invasive species on their waders, boats, boots and vehicles as they travel from one place to the next to experience the great outdoors.

We must rise to the challenge.

The best offense is a good defense; prevention is key. Our FY 2017 budget includes proposed increases to engage more Americans in this fight. We can arrest the advance of invasive species already in the United States and keep some nasty critters out.

As with the nutria, public-private collaboration is central to make meaningful progress. This is one of the reasons why the Service initiated an Island Restoration Memorandum of Understanding with partners to eradicate invasive species from islands and restore native biodiversity there.

Education is also critical—for example, teaching sports enthusiasts across the country to clean their equipment and gardeners to appreciate the beauty of native plants. Last summer the Service signed on as a partner to the "PlayCleanGo: Stop Invasive Species in their Tracks" national invasive species prevention campaign to help advance our outreach efforts.

Our communities want to help. We need to show them how. □

INVASIVE SPECIES

Out of Sight Is Not Out of Mind

Imagine trying to control the spread of a non-native fish in the Great Lakes and a series of interconnected ponds without harming the native fish populations. The ponds are fed by streams and creeks that can continually bring in more invasives. And the invasive fish breed rapidly, preying on the native species.

That's the scale of the challenge facing the Service's Sea Lamprey Control Team in the Great Lakes.

The invasive sea lamprey is a parasitic fish that uses its disc-like mouth to attach to host fish, such as the lake trout, feeding on its blood and body fluids. An adult sea lamprey can kill up to 40 pounds of fish each year over its 12- to 18-month feeding period.

The Sea Lamprey Control Team is responsible for treating the waters of the Great Lakes watershed with lampricide and using other control techniques to reduce the sea lamprey population and enable healthier native fish populations to thrive.

During the "off-season"—November to March—the sea lamprey is cloaked beneath the cold waters, but the Control Team is bustling, planning and prepping for the next field season. Priorities include planning an effective sea lamprey treatment schedule that will help reduce the fish's population in the Great Lakes to set targets. Each lake has its own population goal. For instance, in 2015, the adult sea



The Sea Lamprey Control Team studies the effects of a lampricide treatment.

JODANNA GILLESPIE/USFWS

lamprey abundance target was 24,113 for Lake Huron, a 30-year low that the team achieved.

Setting the treatment schedule for each field season requires a lot of coordination with federal, state and tribal partners to find the optimum window that ensures removal of sea lampreys while minimizing the effect on other species. Determining the best treatment for each individual tributary entering the Great Lakes watershed is a demanding task. Service fish biologists consider many factors—stream water volume, regulated flow patterns, pH cycles, sensitive species and detailed notes from previous treatments.

Another off-season priority for the team is calculating the abundance of adult sea lamprey in each Great Lake. For Lake Erie this year, it will gauge the effect of the lampricide treatment in Conneaut Creek in Pennsylvania. Conneaut Creek has long been a sea lamprey-producing stream, but in 2013, a portion of the stream was left untreated to protect the

hornyhead chub. The hornyhead chub is common among the Great Lakes, but has only small populations in two Pennsylvania streams, one of which is Conneaut Creek. To protect this fish in Pennsylvania, the Service partnered with the Pennsylvania Fish and Boat Commission in 2013 to attempt removal of larvae using backpack electrofishers, a way of electro-shocking fish by hand.

"While this effort pulled thousands of large sea lamprey ammocetes [larvae] from the system, it was very costly and not effective at reducing the larval population," Shawn Nowicki, larval unit supervisor for the Service's Marquette Biological Station in Michigan, says.

To solve the hornyhead chub issue, the Control Team conducted a biological assessment that demonstrated hornyhead chubs are not sensitive to lampricide in the concentration it is applied to the stream. It presented the findings to the state of Pennsylvania and requested to start treating the

creek. The Service collaborated with the commission to successfully treat the creek using lampricide last spring with no effect to the hornyhead chubs.

During this off-season and then continuing year-round, the team will also be coordinating and monitoring work on barriers on the Manistique and Grand rivers in Lake Michigan. Both projects are funded through the U.S. Army Corps of Engineers as part of the Great Lakes Fishery and Ecosystem Restoration Program, and both are crucial to sea lamprey control.

A new sea lamprey barrier on the Manistique River, in the upper peninsula of Michigan, will replace the Manistique Papers Inc. Dam that has deteriorated over time and resulted in increased numbers of sea lamprey getting into Lake Michigan.

On the Grand River, a feasibility study is investigating construction of a new barrier and rehabilitation of the river channel to improve flood protection, river habitat and recreational use while preventing sea lampreys from migrating upstream. This barrier would replace the Sixth Street Dam in Grand Rapids, Michigan.

Total elimination of sea lamprey populations from the Great Lakes is unlikely, but the Service has succeeded in reducing the abundance of sea lampreys by 90 percent, an astounding achievement, and one it will continue to build on with the help of the scientists on the Sea Lamprey Control Team. □

MARA KOENIG, External Affairs, Midwest Region

INVASIVE SPECIES

The Magna Carpa: Innovative Boat Helps Remove Silver Carp

In the hunt for a solution to curtail the spread of Asian carp in the Great Lakes Basin, the Service continues to research and enhance fish capture techniques. One innovative effort is a fishing vessel designed to detect and remove all sizes of silver carp from the water. Meet the Magna Carpa.

Decades after first being imported into the southern United States, the silver carp is now found throughout much of the Mississippi River and its tributaries. An invasive Asian carp with no natural predators in U.S. waterways, the fast-growing silver carp outcompetes native fish for food. Silver carp are also dangerous to humans. When agitated by the sound of a boat motor, silver carp jump out of the water with enough force to injure boaters.

This jumping behavior creates a unique challenge that standard river fishing vessels are not typically equipped to handle. With their hard hats in place, Service staff stepped up to take on the challenge.

The design and construction of the Magna Carpa was spearheaded by the Service's Columbia Fish and Wildlife Conservation Office in Missouri. Building off ocean system technology, staff modified a net known as a Paupier net, originally designed to catch jumping white shrimp. It moves on winches in and out of the water like wings and fishes the surface of the water down to a depth of 10 feet.



When not in use, the Paupier nets on the Magna Carpa lift out of the water like wings.

KATIE STEIGER-MESTER/USFWS

The net is used in conjunction with curtains of wire cables attached to chains placed in the water on either side of the boat. An electric current is passed through the cables and the electricity stuns any fish it touches. The fish then passively float into the nets.

Mostly. But silver carp aren't all passive. Some jump when they sense the electric charge, which is why the wing-like nets are needed.

Native fish are released back into the water, unharmed, while the invasive carp are kept.

For the youngest Asian carp, the Magna Carpa is equipped with a mamou net, a type of surface trawl with finer mesh that works on both bighead and silver carp juveniles.

The end result of countless hours of research, engineering and building is a silver carp capturing machine that can efficiently and effectively haul in thousands of silver carp in a single day.

The Magna Carpa is a primary example of how the Service, with the support of the Great Lakes Restoration Initiative, is pioneering new technologies

in the fight against Asian carp. The Service will continue to explore new and innovative net modifications as it works to stop the spread of Asian carp in U.S. waters. □



KEITH FRANKLIN/USFWS

Migration Station

These migratory birds began arriving at Tewaukon National Wildlife Refuge in southeast North Dakota on March 10, and their numbers gradually built to a high of more than 750,000. The flock consisted primarily of snow geese, with some blue geese sprinkled in. The birds stayed on Lake Tewaukon for several days, enjoying the only open water in the area.

INVASIVE SPECIES

Working on Fish Disease in the Northeast

As its name suggests, the Lamar Fish Health Center at the Northeast Fishery Center in Lamar, Pennsylvania, specializes in the hunt for and prevention of fish diseases, which can be brought to the United States, or subsequently spread, by invasive species.

Some non-native fish diseases entered the United States through well-intended fish importations before a particular disease and ways to test for it were known. Salmonid whirling disease from Germany, for example, wreaked havoc on wild trout populations in western United States in the mid-1990s. The spring viremia of carp virus, which weakens the immune response in many cyprinid fishes and northern pike and has caused significant fish kills, likely entered the United States through importation of goldfish and other carp.

Lamar's Fish Health scientists work with state, tribal and federal agencies throughout the Great Lakes, Chesapeake Bay, upper Mississippi and North Atlantic watersheds, screening for pathogens and diagnosing fish diseases both non-native and home-grown. Some diseases are nationally regulated; others are of regional concern. The center also conducts annual or even biannual fish health inspections at each national fish hatchery and several state fish hatcheries in the Service's Northeast Region. These comprehensive fish health



PATRICIA BARBASH/USFWS

investigations help identify, track, treat and prevent outbreaks that can devastate valuable recreational and commercial fisheries as well as other native species important to the overall health of our rivers and lakes.

One disease that's the focus of much research is epizootic epitheliotropic disease virus (EEDV), a lake trout herpesvirus that has plagued lake trout restoration efforts. It arrived on the scene in the 1980s causing high mortalities at several hatcheries. It cropped up again in 2010 at a hatchery that had been temporarily rearing fish at a heavy density while it was under construction.

"Detecting EEDV in the early stages or at low levels has been hampered by the inability to culture it in the lab and positively identify it," says John Coll, project leader at Lamar. "Once identified, it was often too late because EEDV causes rapid mortality."

Lamar scientists Jenny Johnson and Michael Penn test fish for bacterial, viral and parasitic pathogens.

Now, new tests, developed in part by Lamar scientists, allow for early detection of EEDV. The tests use polymerase chain reaction, or PCR, assays, which can detect the disease when fish show no symptoms.

PCR technology allows scientists to amplify small amounts of sampled DNA to enable analysis of that DNA. PCR is used routinely in early diagnosis of human diseases such as leukemia and lymphomas and for forensic analysis. PCR also allows for rapid and highly specific diagnosis of many infectious diseases.

Lamar also routinely screens for are viral hemorrhagic septicemia (VHS type IVb), which occurs in the Great Lakes area and causes hemorrhaging of internal organs,

skin and muscle in more than 28 species of freshwater fish, and infectious pancreatic necrosis (IPN), which affects salmonids such as trout or salmon, usually younger than six months.

VHS type IVb is an invasive disease—other strains are European—and scientists have tracked its progression upstream from Lake Ontario through Lake Erie, Lake Michigan and into Lake Superior.

"On a positive note," says Coll, "we have not seen any big outbreaks of VHS type IVb or outbreaks of IPN recently, suggesting our biosecurity protocols at hatcheries are helping us to control and prevent outbreaks."

Even with stronger screening, invasive species still cause problems. They come in undetected and when new viruses or diseases appear, scientists don't know how to treat them.

"We will want to maintain collaborations with fisheries scientists around the globe and keep a close eye on invasive species that are coming in and potentially carrying new viruses and new diseases, which our native species may not be able to fight," Coll says, "as well as assist in developing new methods and treatments."

Whether it's an emerging disease or existing, you can be sure the scientists at Lamar Fish Health Center will do everything in their power to protect the aquatic resources of the Northeast. □

CATHERINE GATENBY, Fish and Aquatic Conservation, Northeast Region

INVASIVE SPECIES

How to Prevent Rats and Cats from Spoiling an Island Paradise

What images spring to mind when you hear the word “island”? Do you picture yourself in a tropical paradise, with sandy toes and a sunscreened nose, coconut beverage in hand, where the only concern in life is that volcano in the distance that hasn’t sparked a flare of lava in decades? Have you just finished a hike through exotic passages and hidden waterfalls and are sitting up on a mountain cliff with a breathtaking botanical view stretching out before you?

Whatever your great island escape scenario looks like, it probably doesn’t involve large rodents, feral cats or wild pigs, but these are some of the very real and present invasive species that take up residence on islands. They threaten the native species

and habitats we cherish and look to for adventure, rest and everyday life.

Believe it or not, islands contain 40 percent of the world’s critically endangered animals but cover just 5 percent of the earth’s surface area. However, because that land mass is surrounded by water, it creates an isolated ecosystem that’s easily upset by foreign factors such as invasive species. Of the 245 recorded animal extinctions since 1500, 80 percent were on islands, and invasive species were responsible for the majority of them. These numbers seem gloomy, but on the sunnier side, they provide insight for an unmatched opportunity to save unique and imperiled plants and animals by targeting invasive species on islands.

The Service and partners such as Island Conservation, whose whole mission is to prevent extinctions by removing invasive species from islands, have done just that.

Off the Gold Coast of California, rats invaded Anacapa Island causing colossal damage to native seabird populations by eating their eggs and vulnerable hatchlings, including the rare and threatened Scripps’s murrelet. In 2001 and 2002, the Service, California Department of Fish and Wildlife, National Park Service, National Oceanic and Atmospheric Administration and Island Conservation stepped in and eradicated the rats, which benefited the murrelet and other native species. By 2014, nesting by Scripps’s murrelets had increased by six-fold to 60 nests, and hatching success post-eradication rose nearly three times from pre-eradication levels.

The island night lizard is found only on three of the Channel Islands of California. Predation by feral cats and habitat loss from grazing by feral goats and pigs led to its protection as threatened under the Endangered Species Act in 1977. In 2010, the Service, Island Conservation, U.S. Department of the Navy, Institute

for Wildlife Studies and The Humane Society of the United States removed cats from the San Nicolas Island. In 2014, the Service took the island night lizard off the protected list thanks to successful restoration projects on San Nicolas, San Clemente and Santa Barbara islands.

These are just two examples from a stockpile of success stories whose numbers continue to climb. Since 1998, the Service and Island Conservation have worked together to remove invasive vertebrates from more than 23 island ecosystems in the United States and internationally (Canada, Mexico, the Caribbean and South America), helping 48 imperiled species. On April 16, 2015, the Service redoubled its commitment to this 17-year-old conservation partnership with Island Conservation through the formal adoption of a Memorandum of Understanding (MOU) to save imperiled island species.

The MOU promotes a coordinated approach to invasive species removal through project implementation, information exchange, education and training, coordination, and taking inventories and monitoring. Other conservation agencies and organizations are encouraged to become members of the MOU.

By working together, the Service and partners can restore island ecosystems and prevent the extinctions of native island species, protecting islands and the imaginative “paradise” escapes they inspire. □

BETSY PAINTER, International Affairs, Headquarters



Island Conservation scientist Emma Stansbury records bird sounds on Anacapa Island.

ABE BORKER

INVASIVE SPECIES

“Bashers” Are Part of Community Fabric

For almost 40 years, volunteers have flocked to the Lanphere Dunes, part of Humboldt Bay National Wildlife Refuge in California, for the annual Lupine Bash, when people of all ages devote their Saturdays to manual labor in the cause of biodiversity. The ritual has become part of the fabric of the local community.

When the Lupine Bash started in 1978, removing shrubs of yellow bush lupine from the dunes was controversial because some local botanists believed the shrub to be native. However, a professor from nearby Humboldt State University recognized the damage it was doing to the diverse, herbaceous “dune mat” community. The large, fast-growing and short-lived shrub was quickly replacing native wildflowers. Today, botanists know that this lupine species was introduced from a different, central California climate.

The non-native shrub quickly raises the fertility of the soil. Poor soils are a condition to which native dune plants have adapted and evolved. Through continuing research, botanists also know that yellow bush lupine, although bearing many showy flowers, is visited mostly by bumblebees and non-native honeybees, whereas the diverse wildflowers it displaces are pollinated by a variety of rare species of native ground-nesting bees.



Young volunteers remove non-native yellow bush lupine from the Lanphere Dunes, part of Humboldt Bay National Wildlife Refuge in California.

Wildlife Foundation’s Pulling Together Initiative <www.nfwf.org/pti/Pages/home.aspx>, among other sources.

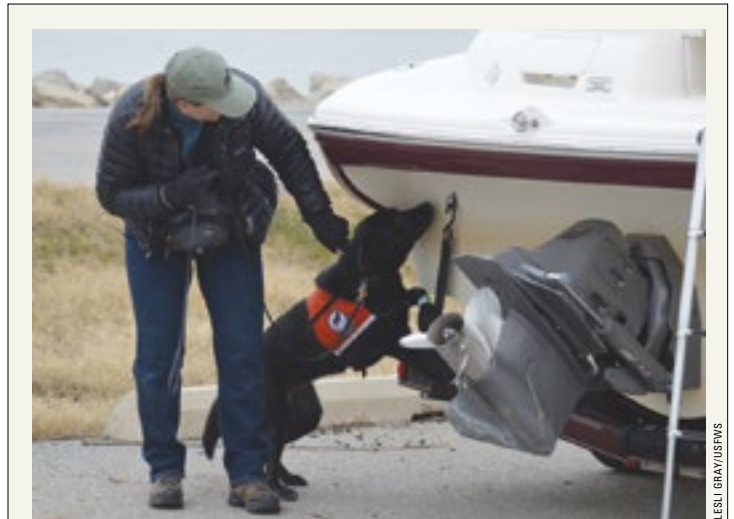
At a time when it can be difficult to get young people outdoors, the events bring together whole communities to spend a day in a beautiful setting, work up a satisfying sweat and laugh over bagels or cookies. Participants are eager to return. Many second-generation Bashers work alongside their parents, wielding “weed wrenches,” loppers and shovels to keep this special place remains for generations to come.

□

ANDREA PICKART, Humboldt Bay National Wildlife Refuge, Pacific Southwest Region

The Lupine Bash is one of several annual volunteer events organized or supported by the nonprofit Friends of the Dunes and Friends of Humboldt Bay National Wildlife Refuge. The annual Ammophila Sweep targets invasive European beachgrass. During the Ivy Grab volunteers remove English ivy from the dune forest. People for Pickleweed brings together volunteers to fight the invasive cordgrass that threatens native salt marsh plants. Such events provide the needed, long-term followup to more intensive restoration/eradication efforts that took place earlier.

Even volunteer events require staff time and funding for tools and publicity. Funding is available through the National Fish and



The Nose Knows

Wicket looks for invasive zebra mussels. Dogs own an incredible sense of smell, and that attribute can be put to good use for conservation. Thanks to a \$52,000 grant from the Service, Working Dogs for Conservation (WD4C) continues to teach shelter dogs how to detect invasive species, helping to protect important ecosystems in the United States and Canada. In Texas, dogs will help the Texas Parks and Wildlife Department sniff out harmful invasive species such as zebra mussels, which hitchhike to new habitats by attaching to boats.

Monarch Numbers Increase, But Work to Restore Butterflies Is Not Over



COURTESY OF PABLO LEAUTAUD/CREATIVE COMMONS

The 2015–16 monarch butterfly population estimates reflect a 255 percent increase in the area occupied by monarchs in the overwintering habitat since last year. Overwintering monarch butterflies occupied approximately 10 acres of cumulative treetop habitat in Mexico this year compared to last year’s estimate of 2.8 acres. This is great news, but more work is needed to restore the eastern population of monarchs.

After a phenomenal two-month migration from the United States and southern Canada, the North American monarch butterfly reaches Mexico, where it spends the winter months. There, monarchs cluster together in small areas of habitat, and each winter the population is estimated by the total tree canopy area they occupy in the overwintering grounds.

Overwintering monarch colony in Mexico.

Long story short, monarchs are still struggling, but conservation work is already making a difference to restore their habitat. In recent years, monarchs have decreased by 90 percent since peak populations in the mid-’90s. Loss of milkweed and prairie habitat in the United States, along with loss of habitat in the overwintering grounds have contributed to the decline of this incredible insect. □

JOANNA GILKESON, External Affairs, Midwest Region

For Black-footed Ferret Surveyors, Green Eyes Mean Success



STEVE SEGUN/JUSEWS

A pair of green, glowing eyes stared back at Assistant Refuge Manager Nick Kaczor as he slowly scanned the snow-covered ground with a spotlight from the seat of the UTV, searching for the presence of one of the newly released black-footed ferrets at Rocky Mountain Arsenal National Wildlife Refuge outside of Denver.

“There is one right there,” said Kaczor. The green eyes were barely visible in the distance as the ferret peered at the search vehicle rolling slowly across the frozen ground.

This nighttime survey for black-footed ferrets was one of many being conducted on the refuge since December to monitor the effectiveness of reintroduction efforts.

Two-person teams conduct nighttime searches for black-footed ferrets.

“We released 32 ferrets on October 5th and are doing our 30-60 day post reintroduction survey,” says Kaczor. Three two-person teams patrolled the 1,600 acres of prairie dog colonies, which have become home to the newly released ferrets. Each team measured success by how many of the nocturnal predators were spotted and identified during the three-day survey.

“Just spotting one ferret is success for me,” says David Lucas, project leader for the refuge. “Seeing one of North America’s most endangered mammals in the wild is a cool thing and not something many people get to do.” »



RYAN MOEHRING / USFWS

The search teams use a tennis racket style chip reader, similar to what many veterinarians use to read identification chips in pets. Before it is released, each ferret is chipped with a unique identification number at the Black Footed-ferret Recovery Center in Wellington, Colorado. The reader has an approximately 10-inch diameter and it is placed over the prairie dog hole in the hope that the ferret will pass through or close to the reader.

“Once you find an animal, it’s pretty easy to set the reader over the hole and hopefully the ferret will poke his head out and we can read the code,” says Kaczor.

At 12:40 a.m., Kaczor and Wildlife Technician Scott Quigley found their first ferret of the night.

“You can see the glowing eyes right there,” said Kaczor as he

beamed the spot onto the distant ferret. “Now we are going to keep the light on him so he freezes as we get closer.”

The strategy is to keep the spotlight on the ferret while the other team member prepares the reader and gets close to the hole. Usually the ferret ducks quickly inside when the reader is placed over the opening. And that’s exactly what happened in this instance.

“He will come back up in a minute,” says Kaczor.

Within a few minutes the soft chirping of the reader indicated that the ferret is up and the chip has been read.

The three-day survey identified 15 of the 32 black footed-ferrets, which is above average for most surveys.

On October 5, the Service released 32 black-footed ferrets at Rocky Mountain Arsenal National Wildlife Refuge near Denver.

“We were told if you get 40 percent that’s a great number and we identified almost 50 percent so we’re above average,” says Lucas.

Crews will continue to survey for the ferrets twice a year, once in the spring and once in the fall. The refuge is hopeful that the ferrets will adapt quickly to their new home and there will be some new ferret kits to tag in the fall. □

STEVE SEGIN, External Affairs, Mountain-Prairie Region

A Quest for the Little Red Fish

What do you call a program that combines conservation education, smartphones, salmon viewing and *The Amazing Race* into one family friendly outdoor adventure? The Kokanee Quest!

The Lake Sammamish Urban Wildlife Refuge Partnership launched this exciting program in the Seattle metro area in November. It uses a technological treasure hunt known as geocaching to connect urban residents with nature while raising awareness of and support for kokanee salmon within the watershed.

Kokanee salmon, or the “little red fish,” are essentially sockeye salmon that do not migrate to salt water. They’re full-time Lake Sammamish residents and one of only two native kokanee populations in western Washington. While they once numbered in the tens of thousands, they’ve suffered dramatic declines due to impacts from urbanization such as habitat loss and pollution.

Since 2007, the number of documented adults has dipped below 150 four times. This does not bode well for the health of the watershed ecosystem because kokanee are an important source of food for the animal communities. Kokanee also die after they spawn, so their carcasses provide essential nutrients for the plant communities that filter water and reduce flooding and erosion.



USFWS

(Above) Children try their hand at geocaching. (Right) Kokanee salmon are essentially sockeye salmon that do not migrate to salt water.



USFWS

Despite their importance, surveys of area residents indicate that many do not even know kokanee exist within their watershed, let alone their population status. The Lake Sammamish Urban Wildlife Refuge Partnership (composed of nonprofits as well as federal, state, local and tribal governments) has made progress toward restoring this population, but raising awareness is critical. That's where the Kokanee Quest comes in.

The Kokanee Quest fosters awareness of and appreciation for kokanee through geocaching. Geocaching is an outdoor activity where people navigate to specific latitude and longitude coordinates in search of hidden containers (caches). Millions of caches exist throughout the world, and nine are unique to the

Kokanee Quest. To complete the quest, participants must navigate to and find all nine caches using a smartphone or handheld GPS. Once found, the participants check in by marking their "passport" using the unique stamp within each cache. Completed passports are then redeemed for a custom collector's coin known as a Pathtag.

But there's a twist. These are "mystery" and "multi" caches, which require the treasure hunters to correctly answer kokanee-specific questions to obtain the necessary latitude

and longitude coordinates. Some questions (and cache locations) focus on kokanee life history, habitat, status and cultural significance. Others ask about recovery accomplishments and future goals, such as restoring native plant communities and removing fish passage barriers. Participants are provided with web links and directed to educational kiosks that contain the information needed to answer these questions.

Despite the cold and near record rainfall, the Kokanee Quest has already seen plenty of action. The nine caches were found more than 580 times (cumulatively) between the launch November 13 and February 8. Participant feedback has been overwhelmingly positive:

"Love this series and learning about our little red fish. We've spotted a few spawners as we have explored."

"Wow...walked up and saw about 6 or 7 bright red fish in the creek. BEAUTIFUL. Loving the lessons."

Raising kokanee awareness and fostering personal connections with these fish will generate support for their recovery. This approach also serves as a great way to connect diverse urban residents to nature—the Seattle metropolitan area is host to the 15th largest population in the country, where 94 languages are spoken. And this smartphone-driven outdoor adventure is fun to boot! □

DANIEL SPENCER, Fish and Aquatic Conservation, Pacific Region

Service Updates Native American Policy

In January, the Service strengthened its 20-year-old policy guiding how it interacts with Native American tribes.

The Service manages lands and resources of great importance to tribes, and federally recognized tribes, Alaska Native villages and Hawaiian and Pacific Island natives protect and conserve more than 56 million acres of wildlife habitat. This relationship makes it vital that the Service and Native Americans work well together.

“To be good stewards of our planet and its remarkable natural history for future generations, we

must work effectively across shared landscapes. We can only do that as a nation by working collaboratively with Native American tribes,” says Service Director Dan Ashe.

The revised Native American Policy exemplifies that collaborative principle. It guides broader, more open dialogue and working relations between the Service and federally recognized tribes and Native Alaskans. As part of the renewed partnership, the updated policy promotes the use of tribal knowledge in the Service’s decision-making.

Sixteen tribes worked with Service representatives for more than two years to create the revised policy. John Banks, director of the Penobscot Nation’s Natural Resources

Department, was among them.

“As tribal people, our relationship with the natural world goes back thousands of years. We’ve evolved with these resources and have an ingrained cultural, spiritual and ecological connection with them,” says Banks. “It was important for tribal people who work in the fish and wildlife arena to be involved in the development of this policy. This policy offers a great opportunity for tribes to improve on the partnership with the Service.” □



MORE INFORMATION

To view the final revised policy, visit the Service’s website at www.fws.gov/policy/510fw1.html

Service Director Dan Ashe signs the agency’s revised Native American Policy at a ceremony attended by tribal representatives from across the continent.



KAY T. JONSSON/FWS

Small Seeds Mean Big Fine for California Trafficker

John Shea had a plan to start a Brazilian rosewood plantation in Fiji, where he would eventually harvest and sell the highly prized and highly profitable wood to manufacturers of guitars and other products. His plan, however, relied on illegally smuggling seeds out of Brazil and through the United States.

In May 2013, Service law enforcement agents received a tip about Shea's intentions, and along with Customs and Border Protection agents, intercepted him as he was preparing to board a flight from Los Angeles to Fiji.

"We asked him if he was traveling with any rare seeds," says Special Agent Ed Newcomer with the Service's Office of Law Enforcement in Torrance, California. "He initially denied carrying any seeds on his person or in his luggage, but, after additional questioning, said 'yes,' admitting to traveling with Brazilian rosewood seeds, which he spontaneously described as 'highly endangered.'"

The Brazilian rosewood tree is unique to the Amazon basin in Brazil and is valued for its beautiful color and grain, its durability, and its ability to be worked for a variety of uses. The slow-growing trees take decades to mature, so boards can sell for thousands of dollars on the black market. The pursuit of profits from this valuable wood has resulted in widespread poaching of trees and destruction of forests. The species is now so rare, it is



Seeds of the rare Brazilian rosewood tree were intercepted by federal agents at Los Angeles International Airport before they could be smuggled to Fiji.

provided the highest level of protection (Appendix I) under the Convention on the International Trade in Endangered Species of Fauna and Flora, or CITES, and is also protected by the federal U.S. Endangered Species Act (ESA).

CITES is an international treaty among 181 parties, including the United States, and Fiji, that helps ensure wildlife trade does not threaten species' survival in the wild. Trade in species covered by CITES is controlled and requires permits. Appendix I species require permits issued by both the exporting and importing countries. Shea had neither.

"He told me that he hoped his plantation would serve some role in the conservation of the Brazilian rosewood tree. He also told me he had put together a business plan for the venture," Newcomer says. "He claimed to not know what the seeds were worth but told me he bought seeds from eBay for about

\$1 a piece." The agents later learned the truth.

Shea's plan began in 2012 with the assistance of a friend who helped him smuggle seeds out of Brazil and into the United States.

A search of Shea's luggage and other packages checked with the airline turned up more than 7,000 seeds. He even had a dozen seeds in his wallet.

"The seeds were concealed inside parts for a motorcycle and an ultra-light aircraft, as well as inside a drink bottle," says Erin Dean, Resident Agent in Charge of the Service's Office of Law Enforcement in Torrance. Shea admitted to storing an additional 7,000 seeds at his home near San Diego, which were later

recovered by Service agents. More than 14,600 Brazilian rosewood seeds were eventually seized. Shea was arrested and charged with smuggling and violating the ESA.

Last September, Shea pleaded guilty in federal court to violating the ESA and was sentenced to two days' imprisonment and one year of supervised release. Significantly, though he was ordered to pay a \$100,000 fine, the maximum fine allowed under the ESA.

"We felt that the maximum fine was appropriate because it reflects the seriousness of the crime and the judge agreed," says Dean. "The Brazilian rosewood tree is perhaps the most well-known endangered species of plant and the demand for the tree is contributing to deforestation and violent crime in Brazil."

The plea agreement between Shea and the U.S. Attorney's Office allowed Shea to avoid the more serious penalties associated with smuggling, which is a felony.

As for the seeds, Newcomer says the bulk were transferred to the Smithsonian Institution in Washington, DC, where some may be planted at the National Botanical Gardens, while others are maintained for research. Approximately 1,000 seeds were transferred to the U.S. Department of Agriculture for study and to use for comparison on possible smuggling cases in the future. □

SCOTT FLAHERTY, External Affairs, Pacific Southwest Region

Big Data: New Tool Helps Planners Prioritize Fish Habitat Conservation Projects

The story of science in the 21st century is told by data: The volume and pace of data collection seem to increase daily, and yet, the pressures of limited budgets and resources have forced many agencies—the Service among them—to make hard decisions about what lines of work to pursue. Too often this translates to winners and losers in the race to conserve and restore habitats and species, but the pressures on resources has put an itch in the back of the mind of many planners: Is this the best way forward?

Julie Devers, a fisheries biologist with the Service’s Maryland Fisheries Resource Office, underlines the problem: “Dam removals, stream restoration, culvert improvement projects—we can do all of this and more, but we have to set our sights on more than restoring a single segment of stream,” she says. “We need to try and plan for the long term and for maximum impact.”

To meet future conservation goals, resource managers such as Devers need a way to harness the power of the data at their disposal to find the most strategic places to work today.

That’s where the new Fish Habitat Decision Support Tool comes into play. Developed by environmental consulting firm Downstream Strategies with support from the North Atlantic Landscape Conservation Cooperative, the Service and other partners, the tool allows users to establish



Brook trout are the focus of a restoration effort across the eastern United States.

USFWS

and rank conservation priorities, predict how species will fare under various management scenarios and evaluate long-term conservation benefits in the face of climate change.

“Over and over again we heard from conservation planners about how hard it is to pin down project sites where you really get the most bang for your buck,” says Fritz Boettner, a principal scientist for Downstream Strategies. “The plan we outlined with the U.S. Fish and Wildlife Service was to build something—not just tools but also methods—that can assist planners in getting over that last hump from great information and local knowledge into effective on-the-ground work.”

The plan is working.

Through prioritization, Devers and others are using the Fish Habitat Decision Support Tool to expedite site review, evaluate projects and dig deeper into the potential effects of proposed restoration and conservation activities. “There are a lot of available tools to prioritize, but this is probably

the most comprehensive and versatile tool that is available to me,” says Ben Hutzell, a biologist with the Service’s Stream Habitat Restoration Division. “We can go back and look at connectivity with previous work, or examine how a project, if installed, might change things—for better or worse. That’s powerful.”

The partnership among the Service, Downstream Strategies and West Virginia University boasts a string of successes. The group first collaborated in 2010 to complete extensive fish habitat analyses in the Midwest. That work planted the seeds for the Fish Habitat Decision Support Tool, and the work expanded into the Great Plains region in 2014, followed by an updated assessment for the Great Lakes area. The team developed an online tool to help model the North Atlantic region—including wide-ranging analysis of brook trout in the Chesapeake Bay drainage—in 2015. The website now offers data, maps and analytical tools for nearly half of the continental United States.

“I’m really excited that it’s a

web-based tool, I think that’s going to make it a lot more accessible to agency folks as well as consultants and contractors,” says Devers.

The next challenge for the team is the restoration of an enigmatic fish unique to the Lake Superior basin: coaster brook trout.

“Historically, coasters were widely abundant in Lake Superior, but their large size helped encourage unregulated fishing, leading to serious population loss. Recovery is a high priority [and] is really quite complicated, requiring numerous measures,” says Dr. Todd Petty, professor of stream ecology at West Virginia University. “We’re working with the Ashland, [Wisconsin,] U.S. Fish and Wildlife folks and our methods and tools to distill all of the available science into achievable restoration strategies.” □

? MORE INFORMATION

The Fish Habitat Decision Support Tool can be accessed at <www.fishhabitattool.org>.

Rescuing a Huge Leatherback Sea Turtle

Eight hundred pounds of anything is a heavy lift—even for a lot of people with a big crane and adrenaline pumping because they were saving a massive leatherback sea turtle trapped in waters near a South Florida power plant.

On February 19, a leatherback sea turtle was entrained, or trapped, at the St. Lucie Florida Power and Light plant. Due to its size, InWater Research Group (IRG) a nonprofit group responsible for capturing and tagging sea turtles coming into the power plant, was summoned. Steve Traxler, an IRG board member, was called to help capture, tag, transport and release the turtle ASAP.

Traxler works for the Service as the Peninsular Florida Landscape Conservation Cooperative's science coordinator. He recruited and organized a number of folks he works with at the South Florida Ecological Services Office as well as folks from co-located offices. They all either participated in the rescue/relocation or just took the opportunity to see one of these magnificent reptiles up close.

The water was chilly, but the rescue team's spirits were warm and high as the capture went smoothly. The turtle had not been previously tagged, and both flipper tags and passive integrated transponder tags were inserted. The turtle was safely removed from the water, transported to the beach and released back into the ocean where it swam away.



JEFF HOWE/USEFWS

"Participating in wildlife rescues is a rewarding experience. This was a great opportunity for all of us to get away from our desks and do something directly for one of the many species we work to protect as Service employees in South Florida," Traxler says.

The total capture and release time was about an hour.

The leatherback is listed as endangered under the Endangered Species Act. It's the largest, deepest diving, and most migratory and wide ranging of all sea turtles. An adult leatherback can reach eight feet in length and 2000 pounds in weight. Its shell is composed of a mosaic of small bones covered by firm, rubbery skin with seven longitudinal ridges or keels—hence the name "leatherback." □

KEN WARREN, External Affairs,
Southeast Region



JEFF HOWE/USEFWS

(Top) Waves from the Atlantic Ocean greeted the massive turtle as it made its way back into the sea. (Bottom) Rescuers work to safely remove a leatherback sea turtle trapped in waters near a South Florida power plant.



INVASIVE SPECIES

INSIDE SPOTLIGHT

Battling the Brown Treesnake / 18

Large Invasive Species
Eradication Projects Show
Success / 20

The Chesapeake Bay Nutria
Eradication Project / 24

The Unsung Success of
Injurious Wildlife Listing / 26

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THE SCOOP ON INVASIVE SPECIES

Some alien species are harmless or even beneficial, but others cause major environmental damage that costs almost \$120 billion per year

by JOHN KLAUITTER

Within the conservation realm, the term “invasive species” pops up often, and with good reason, because they are pegged as the second greatest threat to native biodiversity after habitat loss. But what qualifies a species as an invasive?

According to Executive Order 13112 signed by President Clinton in 1999, an invasive species means “an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.” With approximately 50,000 alien species in the United States (and the number increases annually), this definition is very important in guiding the Service’s work when planting, transporting, controlling or attempting to eradicate alien species.

Some alien species, such as many food crops, benefit the country and tend not to spread into natural areas and compete with native species. But as many as 4,300 alien species are considered invasive, causing major environmental damage that costs almost \$120 billion per year. About 42 percent of federally protected species are at risk primarily due to invasive species.

A variety of laws, policies, guidance and plans help the Service prevent the introduction or spread of invasives. The Lacey Act of 1900 enables the Service to list as “injurious” animal species that are

harmful to humans; the interests of agriculture, horticulture or forestry; or to the wildlife or wildlife resources of the United States. (See p. 26) On receiving this designation, these species can no longer be legally imported into the country or transported across state lines without a permit. This helps prevent their establishment or spread. Currently, 240 species are listed as injurious for their risk of invasiveness, including the Burmese python, Indian mongoose, silver carp, Java sparrow and zebra mussel. The U.S. Department of Agriculture Animal and Plant Health Inspection Service has similar authority for plants (and plant pests, parasites and pathogens) under the Plant Protection Act and can list extremely invasive plants as “noxious” weeds, which is the same as an invasive listing.

There are 112 federally listed noxious weeds, including hydrilla, giant hogweed, melaleuca, mile-a-minute and catclaw mimosa. Individual states can also list plants as noxious weeds—Hawaii lists 97, including miconia, gorse and tropical kudzu.

A federal list of invasive species does not exist. But plans help guide invasive species prevention and management: the National Invasive Species Management Plan, Department of the Interior Invasive Species Action Plan and National Wildlife Refuge System National Strategy for the Management of Invasive Species. A common theme of all the plans and guidance is to focus on prevention activities as well as detecting and rapidly treating new invasions, commonly called “early detection and rapid response” (EDRR).

Annually, each of the 563 national wildlife refuges records its top five problematic invasive species and other invasive species data. In 2015, there were 337 unique invasive species identified, of which the top were: Canada thistle, feral hogs, Phragmites, leafy spurge and reed canary grass.

This list gives a snapshot on the invasives affecting the majority of the national wildlife refuges, but it falls short of identifying the species most severely impacting protected wildlife, such as mosquitoes, swine, cats, >>

Feral horses and burros are not native to the United States. They were introduced by Spanish explorers several hundred years ago. They browse native plants, cause erosion and pollute native streams. Over a several-year period, the fenced Sheldon National Wildlife Refuge in Nevada successfully gathered and adopted out almost all feral horses and burros.

rats, mongoose, avian malaria, avian pox and cheatgrass. The Refuge System has 2.3 million acres infested with invasive plants; 9 percent of them are being treated. About 7 percent of the 1,758 invasive animal populations on refuge lands are considered under control (eradicated or reduced to a maintenance level). Limited funding is one reason why treatment/control percentages are less than 10 percent.

Occasionally, native species act like invasives and cause harm. These species, white-tailed deer is one, are called native “pest” species.

The Refuge System is beginning to refocus its resources on places where the Service can have the greatest impact: preventing new invasive species from reaching the country through regulation, education, enforcement and strict biosecurity measures. One example of biosecurity is for visiting Hawaiian Islands National Wildlife Refuge. Vessels must receive a “rat free” and “clean hull” certification, and crews may only pack/wear brand new clothes that have undergone a recent machine washing plus freezing for at least 48 hours just before the trip to islands within the refuge. In July 2015, the Service also signed on to the National Invasive Species Prevention campaign called “PlayCleanGo: Stop Invasive Species in their Tracks,” which provides prevention materials such as signs and boot cleaning stations. In addition, the Refuge System has five Invasive Species Strike Teams that focus on EDRR work. They map and monitor refuges for invasives. When new invasive species are located, they respond quickly to either eradicate or achieve maximum control, after which, low-level “maintenance control” of the invasive can be turned over to refuge staff.

While the problem is not new, the Service’s means of combat are, even as the problem of invasive species onslaughts continue. □

JOHN KLAVITTER, National Invasive Species Coordinator, National Wildlife Refuge System, Headquarters



FERAL PIGS

Invasive zebra mussels are freshwater bivalve mollusks usually one inch or less in size and are native to Eastern Europe and western Asia. Zebra mussels were inadvertently introduced in the 1980s into waters near the Great Lakes region, probably in ballast water tanks of commercial ships or on anchor chains or other equipment. Zebra mussels have spread, unchecked by natural predators, throughout much of the eastern United States and have been detected in California and other Western states. They reproduce quickly and in large numbers, typically creating large populations. They biofoul pipes in municipal and industrial raw-water systems, requiring millions of dollars annually to treat. They produce microscopic larvae that float freely in the water column, and thus can pass by screens. As filter feeders, they remove suspended material from the habitat in which they live. This includes the planktonic algae that is the primary base of the food web. Thus, zebra mussels may completely alter the ecology of water bodies they invade. A wide variety of chemical and mechanical control methods have been employed to combat zebra mussels, but a key control method is public education and outreach through the “Stop Aquatic Hitchhikers” campaign, which informs boat owners and water recreationists how to prevent the mussels’ introduction or spread.

ZEBRA MUSSELS



Feral pigs occur in at least 40 states around the country, including the Hawaiian Islands. They severely degrade native ecosystems by eating native vegetation, cause erosion and create breeding pools of standing water for both native and non-native mosquitoes. Non-native mosquitoes in Hawaii spread avian malaria and pox as well as dengue, which threatens humans and wildlife. The U.S. Department of Agriculture recently completed a National Feral Swine Management Plan, which will help federal agencies work together more strategically to reduce feral swine numbers within the country. Community outreach is critical to prevent hunters from moving pigs to new areas for sport purposes or from cutting fences that protect natural areas from pigs.

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LISA TEWKSBURY

How a Non-Native Moth Could Help a Native Butterfly in the Fight Against an Invasive Weed

The non-native swallow-wort vine is spreading, swallowing up stands of native plants in its path, including milkweed, the only food for monarch butterfly caterpillars. This adds insult to injury for the treasured insect species already in severe trouble as a result of development, farming practices and pesticide use.

Pale swallow-wort and black swallow-wort, both commonly called dog-strangling vines, have been advancing insidiously for nearly two decades in the northeastern United States and southeastern Canada after invading from Europe. They thrive in previously disturbed and somewhat open lands, just like milkweed. In open fields where both milkweed and black swallow-wort exist, female monarchs may inadvertently lay their eggs on the invasive vine, which provides no food value to the hatching caterpillars. The monarchs don't survive to become the striking orange and black butterflies we all know and love. But it's not just milkweed that is impacted; black swallow-wort has been overgrowing populations of the federally listed Jessop's milkvetch in Vermont.

What is the Service doing to fight the problem on behalf of the butterfly and milkvetch?

Swallow-wort entwined on milkweed.

Along with more traditional techniques, such as herbicide application and cutting and disposal of the plants, biological control can also be used to target such aggressive invaders. While not without its risks, biological control can be employed to target only the alien invasive, making it highly effective while minimizing the potential for collateral damage to native species—a prime goal of integrated pest management.

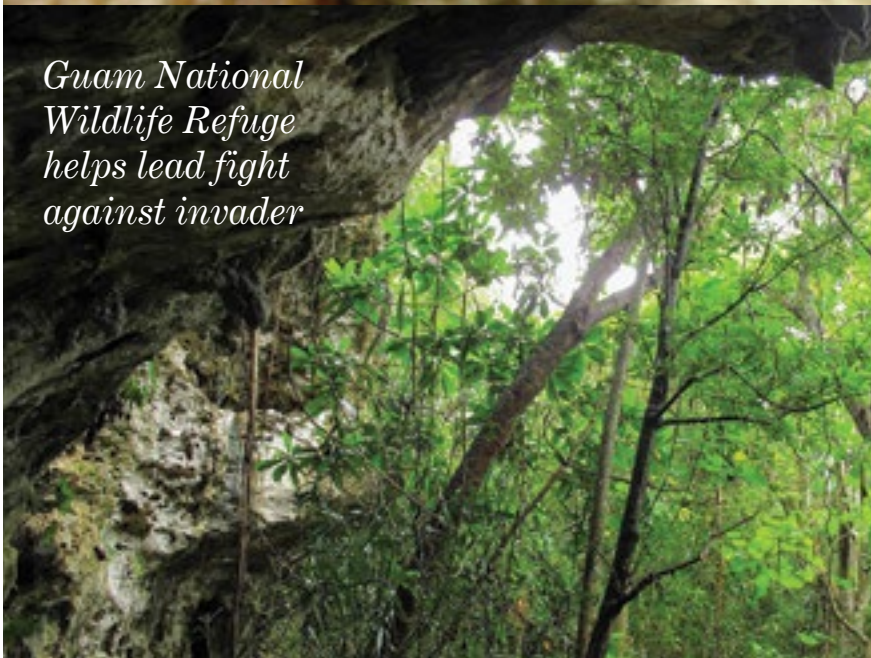
In this case, researchers have honed in on a non-native leaf-eating moth, *Hypena opulenta*, which feeds exclusively on swallow-wort and has the potential to keep the aggressive invader in check. The U.S. Department of Agriculture, which has the responsibility to review and permit the release of non-native biological control agents of weeds, is now carefully considering this moth for use in the United States. The Service is standing by for access to this new tool that has the potential to give the monarch butterfly a much-needed boost. □

CINDY HALL, National Coordinator, Integrated Pest Management, National Wildlife Refuge System, Headquarters

A close-up photograph of a brown tree snake's head, showing its yellow eyes and textured scales. The snake is looking slightly to the right.

BATTLING THE BROWN TREESNAKE

*Guam National
Wildlife Refuge
helps lead fight
against invader*



by EARL CAMPBELL | The brown treesnake, native to Australia, Indonesia and Papua New Guinea, was accidentally introduced to Guam in the late 1940s or early 1950s in military cargo. The snake subsequently spread across the island causing widespread impacts at multiple levels.

Ecologically, the snake caused the extinction or extirpation of many native and endemic species of birds and lizards. The loss of these animals has caused, and continues to cause, cascading ecological effects on the island's native plants and animals. For example, the loss of pollinating bird and fruit bat species is negatively affecting forest regeneration and future forest structure on the island.

The snake has also had socioeconomic and human health effects. Power outages caused by the snakes are common, some lasting up to 12 hours, and can number almost 200 per year. The annual cost of these snake-related outages has been estimated at \$4.5 million. Bites from the venomous brown treesnake typically cause pain and distress, especially to children, sending many to the hospital.

(Top) The brown treesnake is considered the primary cause for the decline of native Guam bird species. (Left) Even plants and animals untouched by the snake are hurt by its presence. (Right) Refuge horticulturist Ryan Deregnier with a brown treesnake.

Since its establishment in 1993, Guam National Wildlife Refuge has been a critical partner in multi-agency efforts to develop and implement techniques to control the brown treesnake. These collaborative efforts have helped to stop the spread of the snake to other sites in the Pacific and provide hope for the restoration of Guam's endemic avifauna.

The U.S. territory of Guam is the largest and southernmost island in the Mariana Archipelago, a chain of volcanic islands in Micronesia. Guam is in the Western Pacific Ocean approximately 3,800 miles west of Honolulu, Hawaii, and 1,500 miles south of Tokyo, Japan.

Restoration of Guam's avifauna is a goal of the refuge, and a critical step in this effort is control of the brown treesnake.

When this pest was first identified as the culprit for the loss of majority of Guam's forest birds in the mid-1980s, worldwide experts in the fields of ornithology, island biology and invasive species were surprised to learn that an introduced snake could so devastate a location. Efforts to develop and implement control techniques to address this new challenge have been precedent-setting.

The Guam Division of Aquatic and Wildlife Resources, the Service and U.S. Geological Survey (USGS) researchers developed and refined snake traps and barriers. Similarly, the refuge hosted early field tests of brown treesnake toxicants developed by USDA Wildlife Services researchers. Each of these tools (traps, barriers and toxicants) is used as a component of successful brown treesnake control efforts on Guam and elsewhere.

USGS researchers, working out of the refuge headquarters, are currently focused on: 1) understanding how control tools impact different sizes of snakes; 2) planning for landscape-level snake control and 3) rapid response to snake sightings in sites off Guam.

Brown treesnake interdiction and control activities at ports, airports and cargo handling facilities on Guam, in the Commonwealth of the Northern Mariana Islands and Hawaii are key to help prevent the spread of this pest throughout the Pacific region.

Also key: the USGS-led regional BTS Rapid Response Team, a coordinated, multi-agency group of trained agency personnel and others throughout the Pacific who stand ready to respond to sightings of brown treesnakes or other snakes on snake-free islands. A core component of rapid response training is to learn how to find nocturnal semi-arboreal snakes at night. This is no easy task as there is a 26-times difference between a good and poor snake searcher.

The control of the brown treesnake is good news for the endangered Guam rail, or ko'ko. The ko'ko is a flightless species endemic to Guam. With no closely related species in Micronesia, this brown and black bird has both cultural and environmental significance. In the late 1960s and early 1970s, the population of ko'ko was estimated between 60,000 and 80,000 birds. But the species was decimated by the spread of the brown treesnake.

Researchers are working to see if native birds can be reintroduced at low thresholds of snake presence. Earlier work by Guam Division of Aquatic and Wildlife Resources staff suggests this may be feasible for certain species such as the Guam rail. □

EARL CAMPBELL, Pacific Islands Fish and Wildlife Office, Pacific Region



Invasive rats have impacted most of the island ecosystem and surrounding reefs and waters of Desecheo.

Large invasive species eradication projects show success

by JOHN KLAVITTER

Since its launch in 2009, the National Wildlife Refuge System Large Invasive Species Allocation has tackled some of the toughest invasive species problems with an annual infusion of \$1 million. Eradication of the invasive is always the goal.

The funds are allocated competitively. A 11-person national review team—with three members from Headquarters and one from each of the eight regions—reviews project proposals. Projects are ranked based on feasibility, methodology, post-eradication monitoring, anticipated outcomes, likelihood for success, biosecurity and reinvasion potential, long-term sustainability and partnerships, and more.

Over the years, the program has contributed, or is contributing, to eradication of invasive species from: Palmyra Atoll National Wildlife Refuge in Hawaii to protect and restore native *Pisonia grandis* forest; Sheldon National Wildlife Refuge in Nevada to recover great sage-grouse; Humboldt Bay National Wildlife Refuge in California to provide habitat for Ridgway's rails; Midway Atoll National Wildlife Refuge in the Pacific to enhance habitat for albatrosses; Johnston Atoll National Wildlife Refuge in the remote Pacific for red-tailed tropicbirds; Hakalau Forest National Wildlife Refuge in Hawaii for endangered honeycreepers; and Desecheo National Wildlife Refuge in Puerto Rico to conserve seabirds and more.

This year, the \$1 million funding will continue the eradication of invasive rats on Desecheo Refuge, where the need is urgent and the window of opportunity narrow. A successful eradication would result in significant benefit to native species and have wide applicability for island managers throughout the Refuge System battling rats and other invasive species.

On Desecheo, an island off the west coast of Puerto Rico, invasive rats have impacted most of the island ecosystem and surrounding reefs and waters by preying on seabird eggs and chicks; consuming seeds and seedlings of native plants, thereby preventing regeneration and causing erosion; and preying on a variety of smaller reptiles (including several found only on Desecheo) and invertebrates. The project seeks to restore this island ecosystem through the removal of invasive black rats using application of rodenticide by licensed professionals by hand and helicopter during the optimal, dry season. This project is the second attempt at eradication of the black rat from Desecheo using aerially broadcasted rodenticide.

“A successful eradication would result in significant benefit to native species...”

The first attempt in 2012 appeared at first to be successful; however, approximately eight months later rats were observed. Genetic testing indicated that this was not a reinvasion but rather all rats had not successfully been exposed to the bait. The project partners commissioned an independent review of the 2012 operation that concluded that the project likely “came very close to succeeding.” The review identified factors that may have contributed to the lack of success including: higher than average rainfall before the operation; a subsequent increase in the availability of natural food resources for rats and probable rat breeding; insufficient bait availability to

rats because of competition by invertebrates; and areas that received less than the prescribed amount of bait. The review also provided proposed solutions, which are being incorporated into the planning for this second attempt. Partners, including Island Conservation (see p. 5), are working with the Service on the eradication.

The removal of invasive predatory rats will benefit an island ecosystem that includes adjacent marine resources, subtropical dry forest, the threatened higo chumbo cactus, the endangered hawksbill sea turtle and nesting seabirds including what once was one of the world's largest brown booby colonies.

The success sought with the second round of funding at Desecheo Refuge has already been seen in other projects:

- Funding in 2009 led to the successful eradication of black rats from **Palmyra Refuge** in 2011. After the rats were eradicated the ecosystem responded dramatically: the native *Pisonia* forest recovered, two species of crabs new to the atoll were observed, and nesting success of sooty tern soared.

- In 2010 **Humboldt Bay Refuge** was funded to eradicate dense-flower cordgrass, which is native to Argentina and was brought to the United States from Chile in the ballast of lumber ships. This perennial grass out-competes and replaces native tidal marsh species such as pickleweed and the rare and endemic owls' clover and Point Reyes bird's beak. Cordgrass has nearly been eliminated; now the refuge is working to get rid of the remaining seed bank. The endangered Ridgway's rail has benefited from the return of native marsh plants, which provide suitable vegetative cover for nesting, resting and foraging. >>

■ **Midway Atoll Refuge** was funded in 2011 and 2012 to eradicate the invasive golden crownbeard plant and received matching funding from the National Fish and Wildlife Foundation (NFWF). Golden crownbeard has been eradicated from 99 percent of the refuge. The refuge is home to one of the world's largest albatross colonies. Both Laysan and black-footed albatrosses set nesting records in 2015, likely due in part to the eradication work.

■ After two years of gathering up horses and finding adoptions for them, **Sheldon Refuge** is 99 percent horse- and burro-free. Degraded habitat has begun to recover, which will benefit many native species including the greater sage-grouse.

■ **Johnston Atoll Refuge** is the only nesting habitat for 15 seabird species in more than 750,000 square miles of open Pacific Ocean, and it has been invaded by the yellow crazy ant, likely native to West Africa. They secrete formic acid that blinds nesting seabirds such as red-tailed tropicbirds. The birds eventually die and are consumed by the ants. Some of the 2014 funding was matched by the NFWF with the aim of eradicating the ants by 2017.

■ **Hakalau Forest Refuge**, which received funding in 2015, is working to eradicate a portion of its feral pigs using snares, thus allowing the forest to naturally recover. Feral pigs consume native plants, causing erosion and enabling water to pool, ultimately creating breeding habitat for non-native mosquitos that spread avian malaria.

The focused nature of the Large Invasive Species Allocation is its strength. The Service knows only too well the outcome of partial or incomplete eradication. The total removal of certain “keystone” invasive species allows native wildlife to flourish. □

JOHN KLAVITTER, National Invasive Species Coordinator, National Wildlife Refuge System, Headquarters



A chick after being swarmed by yellow crazy ants.

SHELDON PLENTOVICH/USFWS



Male endemic Desecheo anole displaying.

ERIK OBERG/ISLAND CONSERVATION



USFWS

Forest Health

Annually, insects and diseases kill more trees and reduce more forest growth than all other destructive agents combined. Although non-native species can often have significant impact in newly invaded environments, pests and pathogens native to the continental United States that play valuable roles in the healthy function of their native forests can move to other regions and invade in the new ecosystems

To maintain the health and productivity of the nation's forests, the Service works at detecting, preventing, monitoring and suppressing forest insect and disease outbreaks that interfere with healthy ecosystems.

The U.S. Forest Service (USFS) helps by providing money to federal agencies to target diseases and destructive forest insect pests. Each year since 1978, the Service has successfully competed for nearly \$1.5 million in Forest Health Protection funding for work on national wildlife refuges.

In 2015, for instance, Wertheim National Wildlife Refuge in New York used \$200,000 in Forest Health funds to conduct early response (felling and chipping) against the southern pine beetle—native in the south but now moving north. This destructive beetle was reported at Wertheim Refuge last fall—among

Inspecting beetle damage in downed pines at Wertheim National Wildlife Refuge.

the first sites in the state that confirmed existence of the pest.

Hakalau Forest National Wildlife Refuge in Hawaii has been working to control Florida blackberries and other invasive plants using herbicides and mechanical methods for several years, receiving nearly \$100,000 annually.

Chesapeake Marshlands National Wildlife Refuge Complex in Maryland recently received \$43,000 to treat gypsy moths with a virus specific to them, Gypchek.

All integrated pest management tools: biological, chemical, physical/mechanical and cultural controls to target forest pest and disease issues are considered for funding.

Requests for proposals are sent out by the Service's National Integrated Pest Management Coordinator (Cindy_Hall@fws.gov) to regions by September 1 each year with a proposal deadline is October 15.

To learn more about the USFS Forest Health Protection, see <www.fs.fed.us/foresthealth>.



The Chesapeake Bay Nutria Eradication Project: getting rid of an unwelcome rodent on the Delmarva Peninsula

by DAN MURPHY

(Above) Nutria were introduced to Maryland in the 1940s for fur trading. (Opposite) Nutria Detector Dog Rex puts on a nutria detection display at Blackwater National Wildlife Refuge.

The fight against nutria—invasive rodents about the size of a small beaver that were introduced to the Maryland part of the Delmarva Peninsula in the 1940s for fur trading—is nearing its final phases. It's been a pitched battle since 2002.

Since their introduction, nutria have devastated thousands of acres of marshland on the peninsula through their destructive feeding habits. Nowhere has this been more evident than at Blackwater National Wildlife Refuge in Dorchester County, Maryland, which had lost 5,000 acres of wetlands through a combination of nutria, sea-level rise and land subsidence. Nutria accelerated and exacerbated the impacts of the other forces by their appetite for wetland plants, especially the roots that hold the marsh together.

The Chesapeake Bay Nutria Eradication Project (CBNEP) started in 2002 with 15 Service field staff working on the refuge's 28,000 acres. The project area was ultimately expanded to 250,000 acres as surveys confirmed that nutria lived beyond the refuge's boundaries and would repopulate the refuge very quickly if not eradicated. The CBNEP goal is to eradicate nutria from the marshes of the Delmarva Peninsula in order to protect,

enhance and restore aquatic and riparian ecosystems. The area's wetlands provide habitat for migratory birds including wintering habitat for waterfowl, habitat for other marsh obligate species such as saltmarsh and seaside sparrows, threatened and endangered species, and other Service trust resources.

Partners include the Service's Chesapeake Bay Field Office Coastal Program and Chesapeake Marshlands National Wildlife Refuge Complex, U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS)-Wildlife Services, the privately owned Tudor Farms, and the natural resource agencies of Maryland, Delaware and Virginia.

One of the project's advisers is Dr. Morris Gosling, who led a successful decade-long nutria eradication effort in the United Kingdom in the 1980s. Dr. Gosling was well-acquainted with nutria's persistence: After his U.K. project ended because the



nutria catch had dwindled, the population rebounded explosively. After a number of years, the reinitiated project resulted in successful eradication.

With the voluntary cooperation of public and private landowners, the CBNEP has employed multiple techniques to detect and remove nutria. Detection methods include tracking dogs and monitoring platforms with various lures. Fully half of the nutria captured during the project have been on private lands.

Nutria are harvested by trapping and hunting.

As the eradication program moves into its final stages—searching for the last few remaining nutria—specially trained detection dogs have proved particularly important in confirming the absence of nutria in previously trapped areas. APHIS trains the dogs at a center in Georgia, where they learn to track only nutria. Monitoring platforms with hair snares placed in rivers and creeks adjacent to wetlands have also been an invaluable tool, eliminating the need for the project's small field staff to continuously search thousands of acres to detect the presence of nutria.

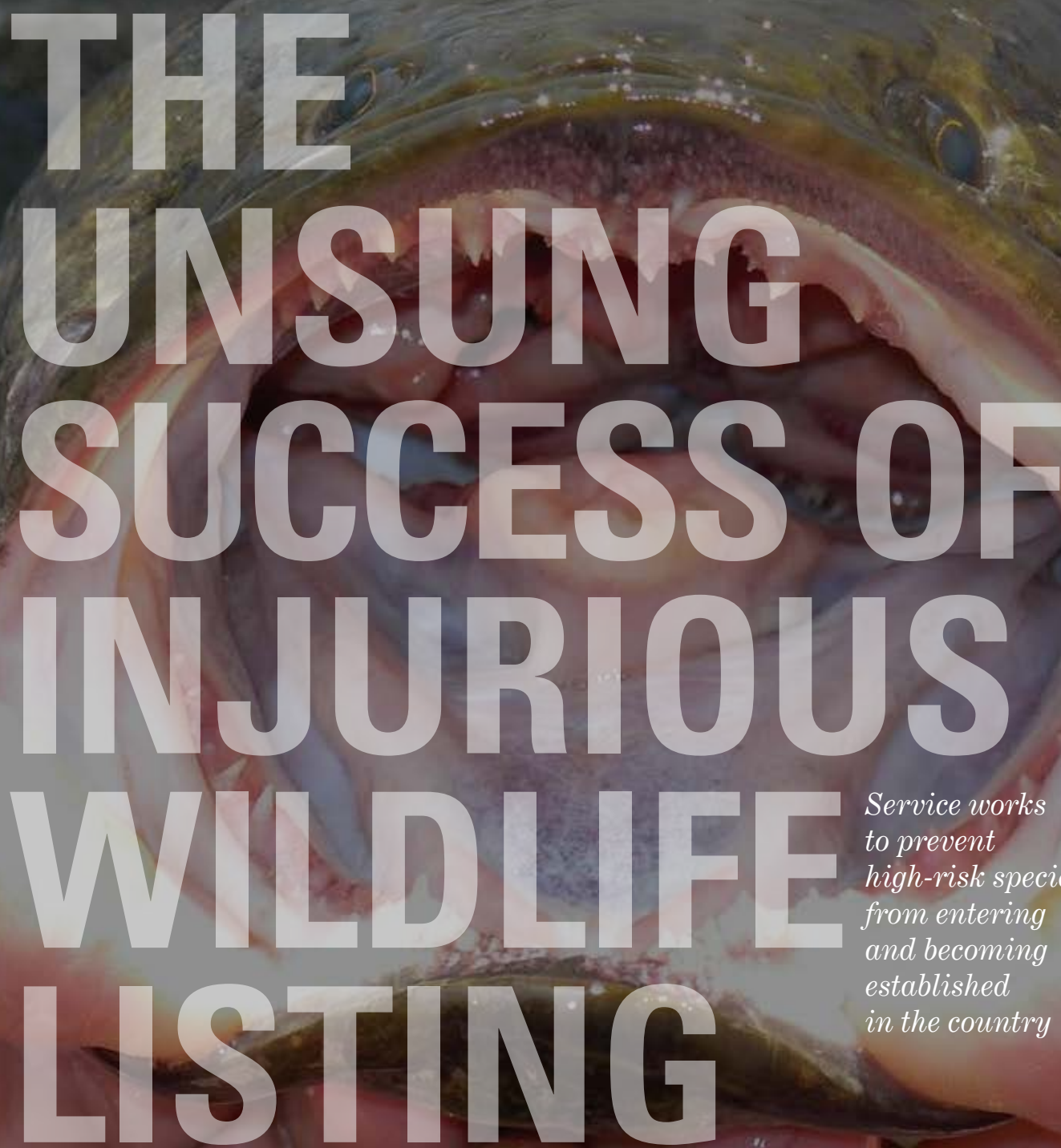
The CBNEP has completed what is known as the “knockdown” and “mop-up” phases of eradication; the large known concentrations of nutria have been eliminated and the nutria-infested watersheds have been revisited to remove any animals that were missed. The project is new in the “verification phase,” which involves surveying six saturation monitoring zones across the Delmarva Peninsula for remaining signs of nutria. As nutria are detected, mop-up efforts are re-employed with a subsequent return to verification monitoring. Each monitoring zone is surveyed a minimum of three times after each detection/removal effort to confirm complete eradication in that zone.

In 2009, the CBNEP contracted with Invasive Species International experts from New Zealand and Louisiana to perform a project review, assess accomplishments, and recommend how the project should proceed to ensure eradication once nutria are reduced to low numbers. The experts concluded that “Given the creditable progress which has been made, we recommend that a continued focus on eradication is appropriate, provided three critical issues are addressed.”

Those critical issues: access to private lands, developing methods to put all nutria at risk throughout the Delmarva Peninsula, and growing and maintaining support for continued funding. The results: the project has 99 percent private landowner cooperation; thanks to the development of innovative detection and removal techniques, all nutria have been put at risk; and funding continues.

If funding is available, the verification phase should be complete by early 2019. At that point, the project will enter a “biosecurity” phase with a smaller team for three to five years. The biosecurity team will respond to reports of nutria sightings and continue a scaled-down search for nutria. Following a biosecurity phase with no detections, the CBNEP will be fairly certain that nutria have been eradicated from the Delmarva Peninsula. □

DAN MURPHY, Chesapeake Bay Field Office,
Northeast Region



THE UNSUNG SUCCESS OF INJURIOUS WILDLIFE LISTING

Service works to prevent high-risk species from entering and becoming established in the country

by SUSAN JEWELL | “We list wildlife species as in-jur-i-ous.” I have learned to enunciate the last word when I explain what we do. I am so accustomed to rolling it off my tongue casually that I don’t realize how unfamiliar the word is to many people until they reply, “You list species as what?”

“When a species is put on the federal injurious wildlife list, it is illegal to import it or transport it across state lines.

I came from a background of endangered species listing, and most people I talk with outside of the Service have heard of that, but not injurious listing. To complicate matters, although many people have heard of the Lacey Act, they are familiar only with the part that combats interstate and global wildlife and plant trafficking, not the part that authorizes injurious listing. So, injurious listing remains enigmatic, even within the Service. I’d like to change that.

Injurious wildlife listing has been around since the Lacey Act was passed in 1900 and can save the United States billions of dollars in damages caused by invasive species. Under the Lacey Act, injurious wildlife are species of wild mammals, wild birds, fish, mollusks, crustaceans, amphibians and reptiles that are determined by Congress or the Secretary of the Interior to be injurious to human beings, to the interests of agriculture, horticulture or forestry, or to the wildlife or wildlife resources of the United States. Species designated as harmful are, or have the potential to be, invasive. However, the designation of “injurious” may capture other aspects as well, such as species that are hosts of pathogens that may be harmful to the interests protected by the act. When a species is put on the federal injurious wildlife list, it is illegal to import it or transport it across state lines. Given the global trade in species, preventing movement is a critical tool in stopping invasions.

Chances are you have heard of injurious-listed species such as silver carp, northern snakehead or Burmese python. You’ve heard of them because they were listed after they became invasive. These are the examples that catch the public’s attention.

Chances are, however, that you have never heard of the largescale silver carp, black snakehead or southern African python. That is because we listed those not-yet-here species at the same time we listed their already-here relatives, and the not-yet-here ones are still not here. For example, of the 100 species of walking catfishes we listed in 1969, 98 species are not known to be here. In 2002, we listed 28 species of snakeheads, four of which were already here and 24 that were not and are still not here. We also proactively listed the raccoon dog in 1982 and the brushtail possum in 2002, and both remain absent in the wilds of the United States. We have other examples that we count among our quiet successes.

Of the approximately 240 species listed as injurious based at least partly on their risk of establishing and causing harm, I can point to fewer than 20, which were here before listing, that are currently established and causing harm. The point is, if we start the listing process before a species becomes a problem, and if our listing process takes months (not years), then we have a good chance of being successful.

The process for designating a species as injurious typically goes like this: First, we publish a proposed rule in the *Federal Register* to explain why we believe we should list a species. At that time, we open a public comment period and we obtain expert peer review. We also review the economic effects of the rule and make that information available to the public, along with other supporting documents, on <www.regulations.gov>. After reviewing public and peer review comments and relevant new information, we finalize our determination by publishing a final rule in the *Federal Register*.

This process, while seemingly straightforward, is inherently complex and time-consuming, sometimes taking five or more years. By this time, it may be too late because the species has already been brought into the country or (even worse) become established in U.S. ecosystems. >>

Snakeheads are air-breathing freshwater fish that are not native to North America.



Service Director Dan Ashe holds a Burmese python, listed as injurious in 2012, at the announcement of the listing of four additional species of large constrictor snakes as injurious at Arthur R. Marshall Loxahatchee National Wildlife Refuge in Florida in March 2015. Art Roybal and Susan Jewell coauthored both rules on injurious constrictor snakes.

Unlike the Endangered Species Act, the Lacey Act does not contain a statute-specific provision for emergency listing.

Because time is of the essence with increasing global trade and because a Lacey Act listing is an extremely effective way at helping to prevent the introduction, establishment and spread of these species, we are striving to improve the listing process and prevent high-risk species from entering and becoming established in the country. Here are three ways that we are doing that:

- We are streamlining the process by using a relatively new method of compiling basic information quickly. The Ecological Risk Screen Summary (ERSS) process developed by Mike Hoff, of the Service's Midwest Region, allows us to rapidly screen species for their risk of invasiveness and more quickly proceed with our listing evaluation.
- A second way is by focusing our efforts on listing species that are not yet here but

that we determine to be of high risk for invasion and establishment. Preventing the introduction of a high-risk species is the most effective way of preventing invasions. With that goal in mind, last year we proposed to list 11 freshwater species that are not yet threats in the United States. In addition to improving the odds that these listings will be successful, the economic effect on the United States should be negligible, and the listing is less likely to be controversial.

- Finally, until last year, our program prepared environmental assessments for listing rules. In 2015, after a multi-year application process, we received approval for a categorical exclusion under the National Environmental Policy Act (NEPA) from the Council on Environmental Quality. This means that one part of the listing process under NEPA should require less time. We recently used the categorical exclusion for a high-priority listing of 201 salamander species from around the world that could carry a contagious fungus on their skin. A swift listing was crucial to prevent the introduction of the pathogen into the United States.

“We clearly understand the factors that contribute to effective injurious wildlife listings,” says Dave Miko, Division Chief for the Service's Fish and Aquatic Conservation Program. “We're focusing on ways to better utilize the existing framework to address the growing problem of invasive species, adding to the already substantial successes of the injurious wildlife listings.” □

SUSAN JEWELL, Branch of Aquatic Invasive Species, Fish and Aquatic Conservation Program, Headquarters

Disclaimer: Due to ongoing litigation on the injurious wildlife provisions of the Lacey Act, the views expressed in this article are solely those of the author and do not purport to reflect the views of the Fish and Wildlife Service, the Department of the Interior or the United States.



Rough-skinned newt

TEAL WATERSTRAT/USFWS

Rule Protects Salamanders

Salamanders, quite important as indicators of environmental health and part of nature's food web, are disappearing.

In addition to problems that affect all wildlife, such as changing climate and habitat loss, an insidious threat to salamanders has reared its ugly head—the fungus Bsal. It's common in various species of Asian newts (newts are a type of salamander), but it does not seem to harm them. And it poses no threat to people. But in the Netherlands and Belgium, where it has been introduced, Bsal has killed massive numbers of wild salamanders.

Bsal has not been found in the United States yet—incredibly lucky given that more than 2.5 million salamanders were imported into the United States between 2004 and 2014. The Service aims to keep it that way.

In January, the Service published an interim rule to designate 201 salamander species as injurious wildlife. Unlike many species listed because of the direct harm they themselves cause, these salamanders are injurious because they have been identified as capable of carrying Bsal.

This rule went into effect almost immediately because of the danger of Bsal to native salamanders. But the Service will still consider all public comments before issuing a final rule.

Principles of Integrated Pest Management

When people hear IPM, it's often followed immediately with "what is IPM?" But first, what are "pests?"

Pests are living organisms, including invasive plants and introduced or native organisms, that may interfere with achieving management goals and objectives or that jeopardize human health or safety.

IPM, or Integrated Pest Management, is a sustainable approach to managing pests that uses biological, cultural, physical and chemical tools in a way that poses the least risk to human health, non-target resources natural and cultural resources, and the environment.

Here are the long-standing principles of Integrated Pest Management.

Describe your pest problem. What is the pest's effect on your site or resource?

Describe your site and its ecology. What are the habitat and ecosystems at your site? What are your management objectives?

Know your pests and their natural enemies. Understand the biological and physical conditions (water, food, shelter, temperature and light) that support natural enemies, and how to make conditions more attractive to beneficial insects.

Monitor the pest. How many are there? What is the destruction, and when? How are they getting to your resource?

Establish "action thresholds." An action threshold is the level of damage or number of pests at which a management strategy will be implemented to reduce the pest population.

Decide what methods or tools you will use to control the pest. Cultural, for example, rotating crops; biological, release of non-native insect that solely targets an invasive plant (see p. 17); chemical, pesticide; and physical, for example, pulling weeds by hand.



At Assabet National Wildlife Refuge in Sudbury Mass., volunteers remove invasive plants.

Build consensus. Get buy-from with neighbors, such as beekeepers, who may be affected by your pest management actions.

Keep risk low. Implement the lowest risk, most effective methods and tools in accordance with applicable laws, regulations and policies.

Know what you did. Keep records of your actions, the pest numbers, level of damage actions implemented, etc.

Monitor. Evaluate your results, quantitatively monitor to determine if your objectives have been achieved and, if not, modify the strategy.

It's a foolproof, er, pest-proof, strategy!

POEM

Shot Hole Borer

Hello California
Here I am
What a place
Climate's sure good
Real estate's better
Willows, cottonwoods
Avocados and more
Set up shop
One after another
Perfect for me
My fungal friends
too
Snug as a bug
Well in a
Tree

Biologist Patrick Gower knows the threat the Polyphagous and Kuroshio shot hole borers are to thousands of trees in southern California. They bore tiny holes and inject a fungus to feed their young. The fungus damages a tree's ability to uptake water and nutrients, and exposes the tree to other deadly pathogens.





BIRDS+

War transformed the nature of farmlands in central Texas. What had been a checkerboard landscape of fields interspersed with mosaics of oak-juniper woodlands turned into a busy army base during World War II.

The soldiers from what was then Camp Hood ended up in Europe to help bring the war against Germany to a close. This temporary military camp later became the permanent Fort Hood, the largest U.S. Army facility in the nation encompassing more than 218,000 acres and supporting more than 371,000 people including some 50,000 well-trained soldiers.

Today, the sounds of live weapons fire from helicopters, the roar of mechanized combat vehicles, the rumble of metal-tracked tanks are all common at Fort Hood.

And so, once again, are two songbirds: the golden-cheeked warbler and black-capped vireo. In seemingly incongruent fashion, the wispy songs of these two federally endangered birds enliven the springtime air of Fort Hood.



(Top) Soldiers train near a trap on Fort Hood that is used to reduce nest parasitism on vireos by brown-headed cowbirds. (Bottom) The showy golden-cheeked warbler has been considered endangered since 1990. Scientific research and conservation work on Fort Hood has improved its lot.

Black-capped vireo



GIL ENRICH

The golden-cheeked warbler wears a splash of yellow on its head like the panache of an officer of old. A true native Texan, with its breeding range entirely within the Lone Star State, including Fort Hood, the bird has been protected as endangered since 1990. Habitat loss to rampant urbanization caused the bird's numbers to decline. But having a fair amount of habitat on a military installation has been a blessing for the bird.

When the warblers return from their wintertime haunts in Mexico and Central America, nesting habitat at Fort Hood welcomes them home. The number of birds on the fort is on the rise, and it's not been by accident.

The warbler was discovered on Fort Hood lands in the 1950s. In the 1970s, recognizing the growing conservation need, biologists recommended to the fort's commanding general that blocks of land be set aside for the bird. The Army agreed, and as a result, just this past year, biologists predicted there were 7,382 male warblers on the fort.

In the 1980s, another bird species came into view. Surveys by scientists revealed that the black-capped vireo was declining in the northern part of its summertime breeding range, which included Fort Hood.

Though not as showy as the warbler, the black-capped vireo is distinctive and elegant, adorned with its namesake black "cap" and what looks like white spectacles bridging its face. The vireo has declined for many of the same reasons, but with the added threat of nest parasitism.

Brown-headed cowbirds have evolved to forgo nest-building and raising their own offspring, to instead lay their eggs in the nests of other birds, such as the vireo. The unwitting hosts are fooled into raising the cowbird young for them. When a female cowbird lays its egg in a nest, it may remove one of the host bird's eggs. The young cowbird also usually hatches before

the others in the nest and is bigger. Consequently it is able to claim more food than the other baby birds, which can starve to death.

The vireo was protected as endangered in 1987. Two years later, surveys of the bird revealed 143 males living on Fort Hood. Thanks to the conservation efforts there, which include active cowbird control, vireo numbers grew, and in the 1990s, the population on Fort Hood was too large to accurately assess. A new method of measuring bird numbers came into use around 2005; it revealed an upward trend, with an estimated 7,500 male black-capped vireos living on Fort Hood by 2014.

Fort Hood is now home to the largest known population of both birds, particularly noteworthy because most of the vireo's summer range and all of the warbler's summer range exists in Texas, where 97 percent of land ownership is in private hands.

"The Service greatly values our partnership with Fort Hood. They have gone above and beyond to work with us and to address the conservation needs of the golden-cheeked warbler and black-capped vireo," says Service biologist Omar Bocanegra.

The fort additionally opened itself to scientists from academia and government agencies to conduct research. Thanks to Fort Hood's cooperative approach, the science available to advance conservation efforts for the warbler and vireo, as well as

many other species found at Fort Hood, has flourished. For instance, the use of miniature video cameras to monitor vireo nests revealed for the first time that Texas rat snakes are significant predators of vireos on the nest.

Research and conservation on behalf of the birds benefits the Army, too. Natural habitats used by these species are the same lands used for training soldiers. Tanks and artillery fire are hard on the land. Managing for healthy native habitat on the fort maintains that terrain so that it can continue to accommodate a high volume of military exercises. "Thanks to the cooperative relationship between the Service and Fort Hood, we have greatly enhanced the information on both species," says Bocanegra. "They've clearly demonstrated that it is possible to successfully manage endangered species and military preparedness."

Army staff has taken ownership in managing the fort not only for national defense but for wildlife and natural resources as well. As a result of more than two decades of research and conservation work at Fort Hood on the vireo and warbler, the base operates around the endangered species with few restrictions. Fort Hood's efforts have helped the Service meet—and by some measures, exceed—its population recovery goals for both bird species. Most importantly, Fort Hood has demonstrated that natural resources entrusted to the Department of Defense's care are not only sustained, but can be improved, all while ensuring that military training and testing are uncompromised. Fort Hood serves as a model for other military installations across the country, clearly demonstrating that national defense and conservation are not mutually exclusive. □

CRAIG SPRINGER and LESLI GRAY, External Affairs, Southwest Region



Fuel for the Fire

With prescribed fire at its wildland fire education site, St. Marks Refuge shows importance of well-managed burns

story and photos by TOM MACKENZIE

Wildland fire is a critical part of the natural lifecycle of a forest. History has shown us that trying to prevent it can not only disrupt regeneration of the habitat, but lead to a dangerous build-up of flammable vegetation that can eventually fuel catastrophic fires across the landscape. Fire also helps control non-native plant species that are poorly adapted to the natural fire cycle and could otherwise choke out native species. Controlled burning, or prescribed fire, has therefore become a crucial technique in the management of many national wildlife refuges.

While the fire crew at St. Marks National Wildlife Refuge in Florida regularly applies prescribed fire treatments on hundreds of acres at a time, it also maintains a smaller demonstration area of the forest near the visitor center to show the public why prescribed fire is needed.

Scott's Plots Educational Fire Management site is at the end of a spur off the St. Marks Refuge Visitor Center trail. Scott's Plots is an eight-acre site divided into four two-acre plots. Prescribed fire is applied to three of the two-acre plots, each on a specific

schedule. The Winter Plot is burned in December of odd years. The Spring Plot is burned in April of even years. The Summer Plot is burned in July of even years. The fourth plot is never burned and serves as a control.

The difference is amazing. The plot that isn't burned is an impenetrable morass of thick palmetto, scraggly underbrush and choked pines mixed with hardwoods. Dead brush festoons the area.

The other plots are clearly more open,

free of deadfall, and exhibit a lush green understory. This young vegetation in the burned areas supports wildlife as a healthy part of their diet.

St. Marks has a strong record of conducting regular prescribed fires to reduce undergrowth and manage habitat for wildlife, including the endangered red-cockaded woodpecker and frosted flatwoods salamander. Both these species require fire on the landscape to survive. Last year 23,062 acres were burned on the 72,000-acre refuge.

An added benefit of regular planned and controlled fires to people enjoying the refuge is the more open canopy and increased visibility across the landscape to take photographs, and watch the local animals and migrating birds. It also provides mobility impaired, youth and other hunters an opportunity to pursue elusive deer.

"We apply the same rigorous safety principles on a small burn as we do on a larger one," says Fire Management Officer Greg Titus. "Of course, the larger ones can be more time consuming and complex, but these small ones help us fine tune our teamwork."

On December 7, the eight-person team assessed the temperature, wind, weather and habitat factors to plan for the small



burn on the Winter Plot. They also used the same safety planning, communications notifications and emergency action planning as with larger treatments.

They initially used drip torches filled with a 70/30 mixture of diesel fuel and gasoline to light a test fire on the downwind side of the plot to see if their objectives would be fulfilled and to see if the fire would burn as expected. It did.

Given the “go” by Firing Boss Meagan Bieber, the team spread out to monitor the blaze and the smoke. Brian Pippin and Dale Shiver walked along the downwind side directly adjacent to a firebreak that had been refreshed that morning by Fire Equipment Operator Willy Lindsey.

A firebreak is a natural or constructed barrier devoid of burnable vegetation, which stops fire from spreading on the ground. Firebreaks can slow a moving fire and help firefighters safely control it.

The flames reached the edge of the firebreak and pushed back into the plot’s unburned grass and palmetto. Pippin laid a new fire line parallel to and about 20 feet from Shriver’s first ignition line, and the flames started to join together, actually changing the direction of the very light breeze on that cool Florida afternoon. The smoke wafted upward, fanned by the gathering heat from the two lines of flames.

The torch-bearers then walked through the burn unit contained within firebreaks, adding ignition lines until they reached the end of the plot. The blaze burned as planned, and the smoke acted as expected, moving away from the nearby visitor center and office.

An additional team of two firefighters equipped with a fully loaded wildland fire-fighting engine was prepared to respond to any fire that jumped the lines. None did, but they extinguished some of the smoldering pines just as an added precaution to prevent any possibility of a getaway fire.

Equipment Operator Lindsey was ready to snuff out any outliers but had accomplished his mission before the fire was even set, encircling the two-acre plot with a nice firebreak, which will double as a trail for visitors.

By the time the fire team reached the end of the burn area, their first line of flames was already flickering out, having burned underbrush and grass, consumed dead palmetto leaves to leave smoldering ash to fertilize the ground and allow fire-dependent grasses and shrubs to regenerate. Those new grasses will start popping up after the first few rains, followed by buds of regenerating shrubs such as gallberry and high bush blueberry. The deer and other wildlife will swing

(Opposite) Old Palmetto leaves burn during prescribed fire at St. Marks. Some of the green palm fronds on the palmettos did not catch on fire. (Middle) Firing Boss Meagan Bieber recons the prescribed fire at St. Marks. (Right) A five-foot-long alligator gives firefighters the evil eye during the prescribed fire. This 15-foot wide pond was not within the burn area.

back into the area to chow down on those tasty, nutritious morsels within the first month or two. In six months, rainfall and subsequent plant growth will obscure most of the fire scorch on the trees and woody plants. Thus, the prescribed fire is leaving a healthier pine stand, which will show people why fire is important in the forests and ecosystems. Actually it will show why fire is necessary for Florida and all the other fire-dependent habitats in the nation.

Wildlife would suffer without controlled burns to regenerate the vegetation, and so would the people who come to enjoy this stunning landscape, to hunt, photograph wildlife, or just enjoy the serenity of southern lands as they were meant to be—unspoiled by urban development and regularly burned. □

TOM MACKENZIE, External Affairs, Southeast Region

MUSEUM
OBJECTS
COME TO
LIFE

This is a series of curiosities of the Service's history from the National Conservation Training Center Museum. As the first and only curator of the museum, Jeanne M. Harold says the history surrounding the objects in the museum give them life.



Alligator in Oklahoma

In our last edition, we wrote about the Alligator, an aluminum airboat. I received this comment from Jerry French, one of our priceless retirees who is active in promoting and saving our Service heritage and is a former member of our Heritage Committee: "Those first airboats were developed and constructed at Bear River [National Wildlife Refuge] in northern Utah. Salt Plains NWR in northern Oklahoma needed just such a boat to navigate its many shallow waterways so Refuge Manager Julian Howard traveled to Utah to transport the boat back to Oklahoma. As he towed the boat back over the Continental Divide, he found the truck he was using did not have enough power to pull the extra weight. Being a good and innovative refuge employee he parked the truck, fired up the airboat and used the extra power to push his truck to the top of the pass." And he included this photo of that very airboat in use at Salt Plains from the 1948 annual report. Another note explained that biologists G. Hortin Jensen and Cecil S. Williams actually invented and built the first Alligator. (The boat at NCTC is Alligator II.) Please folks, keep those cards and letters coming.



Beat It!

Don't you hate it when you can't think of a word? Years ago, a 14-year-old volunteer was writing up descriptions of objects for our inventory records. She was working on a law enforcement tool and she called it a "beating stick." Well, that certainly describes it! The word truncheon, baton, night stick, cudgel or billy club would have been better, but she certainly nailed it for realistic description of purpose. We will forever call it a beating stick now, at least in jest and remembrance! Volunteers are the best.



Save Our Stuff

We have a thick, colorful Save Our Stuff mouse pad with lots of photos of FWS Museum objects and photographs. All you have to do to get one is send an email with your address to <jeanne_harold@fws.gov>, and I will mail it to you.

Model Behavior

Volunteers and interns are so important to our museum. They provide much-needed help in our day-to-day activities, and they say the darndest things. Years ago, one of my favorite interns, Cameron, was in the storage area taking photographs of objects to document their condition. I went by the door, and could hear him saying, "Work it, work it baby..." He was alone, and he was pretending that a large punt gun was a supermodel! He was correct; all of our museum objects are superstars!



transitions

Alaska



After investing more than 41 years of exemplary dedication and professional excellence to better ensure the conservation of migratory birds in Alaska, **Christian "Chris" Dau** retired from the Migratory Bird Management Program in December. Chris obtained a B.S. degree in biology from Fresno State and went onto the University of Alaska Fairbanks for an M.S. degree in wildlife and fisheries addressing nesting biology of spectacled eiders. Chris then began his career as a wildlife biologist in 1971 on the Clarence Rhode National Wildlife Range which in 1980 became the Yukon Delta National Wildlife Refuge. He was drawn to the Yukon-Kuskokwim Delta because of the more than 1 million ducks, half a million geese, and the nearly 40,000 loons, 40,000 grebes, 100,000 swans and 30,000 cranes that return to the refuge each spring to nest. After 10 years on the Delta, Chris moved to Izembek National Wildlife Refuge in 1981 where he served as the refuge's wildlife biologist until 1997 when he moved to Anchorage to begin work with the Migratory Bird Management Program. Chris is

recognized by his peers as the consummate wildlife biologist with the rare capacity to blend natural history, ecology and social science to address just about any question on migratory birds. Chris plans to stay in Alaska with his family (Carla, Jens, Niels and Karin) to enjoy art, reading, hunting and fellowship. □



Kenai National Wildlife Refuge Park Ranger **Gary Titus** retired at the end of December after 15 years of service to Kenai Refuge. Since 2000, Gary spearheaded work to restore, preserve and interpret the refuge's historic cabins. He developed the Refuge Cabin Management Program, which maintains 24 cabins—16 are available for overnight stays by the public, and the remaining are preserved for historical interpretation purposes and can be visited for viewing.

Gary's commitment resulted in a growing stewardship ethic among locals and visitors for the cabins, which were in bad shape before his arrival. He consistently engaged the community in historical preservation projects, even reaching out to groups beyond the refuge, and in 2013 he won the Alaska Region's

Sense of Wonder Award, which honors excellence in the field of environmental education and interpretation. The award recognized Gary's ability to foster a sense of wonder and stewardship for the historic heritage of Kenai Refuge.

Gary registered more than 100 historic cabin sites and cabins with the State of Alaska's Office of History and Archeology, and two cabins are listed in the National Registry of Historic Places. He also cataloged almost 500 historic artifacts and more than 10,000 historic photos of Kenai Refuge and Peninsula.

Gary shared his expertise willingly, leading historic structure restoration for the Alaska Department of Natural Resources, U. S. Forest Service, Bureau of Land Management and national wildlife refuges in the Lower 48. He also helped create a training course, "Stabilization and Preservation Techniques for Historic Log Structures," to help others in restoration work. In the course, Gary taught the use of historically appropriate hand tools and techniques so that the restored structures will look like their builders made them—right down to axe marks on the logs.

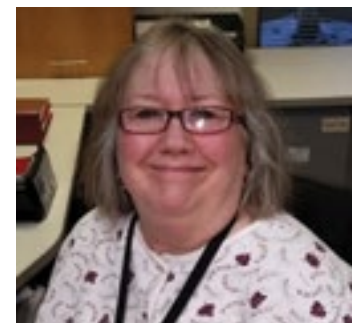
On top of all that, Gary served as a commissioned federal law enforcement officer for the first 12 years of his tenure with the Service.

Before joining the Service, Gary worked for Alaska as a fish and wildlife protection officer (game warden) on the Kenai Peninsula. He was also a seasonal ranger at the Chugach National Forest on the Kenai Peninsula.

Retirement will give Gary more time at his remote Alaskan cabin for his historical writing projects, and for exploring the outdoors engaging in his favorite pursuits of wildlife observation, fishing and hunting.

CANDACE WARD, Kenai National Wildlife Refuge, Alaska Region

Photo: Ranger Gary Titus (left) with Brian Taylor and Ivan Sjodin after restoring the 1920s era sauna at the Moose Creek Cabin on the shores of Tustumena Lake.



After nearly 45 years in federal service (15 with the Air Force and almost 30 with the Service in the Alaska Region), **Dee Bothell**, secretary for Office of Law Enforcement, retired at the end of 2015.

Dee worked for nearly every program in the regional office, and Alaska Regional Director Geoffrey Haskett said, "I am certain they are all better for it."

In a plaque recognizing her career Haskett added: "To dedicate yourself so completely to the work of this Country for more than 44 years, is a true achievement." □

Headquarters

Robert “Bob” Curry began work with the Wildlife and Sport Fish Restoration Program as Deputy Assistant Director in January. He was previously with the North Carolina Wildlife Resources Commission, where he served as chief of the Inland Fisheries Division.

Bob has a wealth of experience in wildlife conservation and restoration. He worked for more than 31 years at the commission serving in additional roles—fisheries program manager, coastal development coordinator, and fisheries technician. Earlier in his career he worked as assistant county ranger for the North Carolina Forest Service and wildlife officer for the Tennessee Wildlife Resources Agency. He also once worked as a biological aide right here at the U.S. Fish and Wildlife Service.

Bob refers to his new position as a “once-in-a-lifetime opportunity.” □



Dave Scott has been named the Service’s Science Integrity Officer. Dave’s role is to ensure that the Service’s scientific and scholarly information is of the highest quality and the result of the most rigorous scientific and

scholarly processes as can be achieved. He is responsible for implementing the Department of the Interior’s Scientific Integrity policy, and serves as an ombudsman for staff with questions and concerns, and conducts formal investigations on allegations of scientific misconduct as warranted.

Previously, Dave was the Assistant Regional Director for Migratory Birds and State Programs in the Midwest Region and co-chaired the Upper Midwest and Great Lakes Landscape Conservation Cooperative. Before joining the Service, Dave served as the Wildlife Section Chief at the Ohio Department of Natural Resources. He holds degrees in wildlife management from The Ohio State University (BS) and Penn State University (MS).

Dave works out of the Southeast Regional Office and can be reached at david_scott@fws.gov to answer questions or concerns and assist informally if appropriate. □

honors

Service-wide

The Service is proud to recognize the recipients of the **2015 Rachel Carson Award** and inaugural **Sam D. Hamilton Award for scientific excellence**. The awards honor Service employees for their scientific contributions to improve the Service’s knowledge and management of fish and wildlife resources. The honorees receive \$50,000 to be used at their field stations to support additional scientific work.

2015 Rachel Carson Award for Exemplary Scientific Accomplishment: **Gail Collins**

As the supervisory wildlife biologist at Sheldon-Hart National Wildlife Refuge Complex, Gail Collins led multiple scientific studies to document the severe ecological impacts to wildlife habitat from feral horses and burros.

Gail’s investigations provided strong scientific support to justify the controversial and complex decision to remove the feral horse and burro population from Sheldon. With the removal now complete, priority species such as pronghorn and greater sage-grouse will benefit from improved habitat in the largest intact tracts of sagebrush-dominated habitat in the West.

2015 Sam D. Hamilton Award for Transformational Conservation Science: **Gulf Coast Vulnerability Assessment Team**

The Gulf Coast Vulnerability Assessment (GCVA) team evaluated the potential impacts of climate, sea-level rise and urbanization on four Gulf Coast ecosystems and 11 associated species to assess their susceptibility to future change and aid in developing adaptation strategies.

The GCVA was initiated by the four Landscape Conservation Cooperatives (LCCs) along the Gulf of Mexico—Gulf Coast Prairie, Gulf Coastal Plains & Ozarks, South Atlantic, and Peninsular Florida LCCs—in collaborative coordination with more than 50 partners. The GCVA will guide conservation and restoration efforts by

helping conservation partners across the large Gulf landscape identify vulnerable areas to focus critical resources.

For more information about the Science Awards, the winners’ projects and the Service’s commitment to scientific excellence, visit: <www.fws.gov/science/awards.html>. □



Contributions to wildlife conservation in Missouri and beyond under the leadership of Director **Dan Ashe** (seen with an American burying beetle) were recognized by the St. Louis Zoo as Director Ashe received the 2015 St. Louis Zoo Conservation Award late last year.

“Under Dan Ashe’s leadership, the USFWS has enabled the Saint Louis Zoo to undertake conservation efforts from the Pacific Islands to our own state of Missouri,” Jeffrey P. Bonner, Dana Brown president and CEO of the Saint Louis Zoo, said at the awards ceremony. “We could not enjoy the successes we have had without the support and encouragement of the agency that Dan leads so well.”

The Service has a long-standing partnership with the St. Louis Zoo, collaborating on a number of conservation projects,

including the recovery of endangered American burying beetles and Ozark hellbenders through captive propagation programs. The St. Louis Zoo also supports the City of St. Louis Milkweed for Monarchs program, for which the Service provided funding in 2015 through its role with the Eastern Tallgrass Prairie and Big Rivers Landscape Conservation Cooperative.

Director Ashe's award is one of four presented by the St. Louis Zoo to outstanding community leaders in 2015. □

Two Service teams were honored as winners of 2015 **Federal Energy and Water Management Awards** for deploying cutting-edge practices that significantly reduce carbon pollution, protect the environment, reduce energy costs, and implement innovative practices and technologies.

One winning team rehabilitated the **Northeast Regional Office Building**, in Hadley, Massachusetts, in conjunction with the GSA and the building owner.

The LEED gold-rated building features a 108 kW solar PV system—the largest renewable energy system on a building fully occupied by the Service—as well as aggressive recycling, two pollinator gardens, innovative HVAC systems, energy-efficient lighting, low-flow fixtures, superinsulation and low-emitting materials to provide a healthy work environment. Thanks to these

multiple sustainable strategies, the building effectively takes the greenhouse-gas emissions of 75 cars off the road. A new plumbing system will save an estimated 136,425 gallons of potable water annually.

On the other side of the country, the other winning team designed and constructed the **Corn Creek Administrative Office and Visitor Center at Desert National Wildlife Refuge** in Las Vegas, Nevada.

The new high-performance LEED Platinum-certified visitor center at the Corn Creek Field Station is net-zero energy use with a 91.5 kW solar power system and showcases state-of-the-art sustainable design techniques and technologies including water-source heat pumps as well as heat-reflecting paint, a cool roof, integrated daylighting and energy-efficient lighting, energy recovery ventilation, and water conservation technologies. Many building elements are composed of recycled materials.

Both winning projects showcase efficiency features that can be replicated and offer visitors the opportunity to learn from site displays. □

The 2016 National Wildlife Refuge System Awards—presented by the National Wildlife Refuge Association—honor three outstanding individuals and a Friends group exemplifying outstanding conservation management skills and volunteer leadership.

PAUL KROEGEL REFUGE MANAGER OF THE YEAR



Keith Weaver, project leader at Central Arkansas National Wildlife Refuge Complex, is a 31-year veteran of the Refuge System. His career has spanned 11 national wildlife refuges across five states (Arkansas, Louisiana, Maryland, Mississippi and Vermont). An accomplished wildlife biologist, Keith has successfully integrated a science-driven approach to refuge management.

Cache River Refuge in the Central Arkansas Complex has been identified as the most important wintering area for mallards in the North American Waterfowl Management Plan. Keith has created innovative partnerships to acquire funding and support for the restoration of bottomland hardwood forest habitats for these wintering waterfowl. He is currently working to establish a Friends organization at Cache River Refuge.

Keith says his accomplishments are possible because of his staff's "outstanding motivation and dedicated service. The award is really the 'Refuge Staff of the Year.'" □

REFUGE EMPLOYEE OF THE YEAR



Douglas Head II is an assistant zone biologist for multiple refuges in the Southwest (Texas Chenier Plain Refuges Complex, Texas Mid-Coast Refuge Complex, Aransas National Wildlife Refuge and Southwest Louisiana National Wildlife Refuge Complex).

Doug is a problem-solver who demonstrates innovation and ingenuity. He designed a permanent platform system to monitor the effect of sea-level rise on marsh ecosystems. He also streamlined the process of recording field data for the only wild population of whooping cranes, at Aransas.

He also provided several educational outreach opportunities to urban youth, including a group from Los Angeles. He participates in local public outreach events and most school field trips to coastal refuge complexes. He is also working with Texas Tech graduate students on a marsh project at Anahuac National Wildlife Refuge. □

VOLUNTEER OF THE YEAR



Ann Humphrey's enthusiasm and commitment to Midway Atoll National Wildlife Refuge in the Pacific Ocean earned her the 2016 Volunteer of the Year award. She completed four volunteer tours to Midway Atoll National Wildlife Refuge but also dramatically improved the volunteer program itself.

At her suggestion, program volunteers now serve six-month tours, instead of the original two-week to one-month tours. This revision has led to the development of long-term, committed volunteers who become technically savvy and help further achieve the refuge's mission. Under her direction, the resulting 20-person volunteer corps has provided more than 26,500 hours of service to Midway Atoll since March 2014. This has saved the government hundreds of thousands of dollars in professional services and ensured the refuge's conservation mission remains fulfilled.

David Houghton, president of the National Wildlife Refuge Association, says, "Her willingness to pitch in whenever necessary from reorganizing the volunteer program to data collection makes her an invaluable steward and asset for the refuge."

Ann's success in biological resource management recently earned her a fulltime position as a biological science technician at Midway Atoll Refuge. □

MOLLY KRIVAL FRIENDS GROUP OF THE YEAR AWARD



Friends of Tamarac National Wildlife Refuge's most impressive accomplishment was its successful campaign to build the Tamarac Discovery Center. The \$800,000 environmental education center was donated to the refuge.

This Friends group has been instrumental in expanding the refuge's ability to provide family oriented outdoor experiences. Outreach to the White Earth Reservation community, adjacent to the refuge, includes Tamarac Whispers, a radio show airing on the local tribal station, now in its third year of production by the Friends and refuge staff.

The Friends of Tamarac has developed from a group focused on the local refuge to an organization with a broader awareness and appreciation of the Refuge System's mission. The group regularly incorporates Refuge System national priorities, such as migratory birds and monarch butterflies, into local events and outreach strategies. □

Southwest



Dave Smith (seen collecting aquatic insects from Larry Canyon), a fish and wildlife biologist at the Arizona Ecological Services Field Office—Flagstaff sub-office, was honored with the Award for Outstanding Achievement in National Rangeland Management for his participation on the Wallow Fire Range Restocking Team. Dave worked in close collaboration with U.S. Forest Service staff to evaluate grazing on approximately 18 allotments after damage from the May 2011 Wallow Fire, the largest wildfire in Arizona's history. Forest Service staff nominated him.

The fire burned across approximately 538,000 acres on the Apache-Sitgreaves and Gila National Forests. Multiple watersheds were compromised and a diverse array of resource management issues followed. However, the Range Restocking Team's intensive efforts resulted in approximately 115 miles of reconstructed fence, 50 cleaned earthen tanks and six rebuilt corrals. More importantly, as the award notes, "The Wallow Fire Range Restocking Team has been responsive to meeting and providing for the multitude of resource needs across the burned area, including those associated with proposed,

threatened and endangered species, and overall watershed health and restoration."

For Dave, this award "shows biologists, particularly Ecological Services biologists, the importance of getting out into the field with our federal counterparts during Section 7 consultations, listing processes and recovery actions to make site-specific recommendations and decisions regarding potential effects of the action on listed species. The knowledge of site-specific field data is crucial when implementing the ESA." □

Mountain-Prairie



Laura L. Clellan, Chief of Leadership and Employee Development in the Mountain-Prairie Region, has been promoted to the position of Brigadier General in the Army National Guard. Laura joined the Regional Office in 2015. She brings a level of passion and professionalism to her role that not only is evident by this promotion but is observed almost instantly when she walks into the room. In her time with the Service, she has proved herself to be a tremendous resource to the leadership and employees in the Mountain-Prairie Region.

“Laura epitomizes the traits of a great leader whether it is in her personal life, civilian career or her military career. She is a patriot and a person of great integrity who truly cares for her people, their families and the organization to which they belong,” says Kathy Dennis, Assistant Regional Director of Budget Administration. □

Midwest



Senior Firefighter **Jason Westholter** (seen accepting award from Regional Director Tom Melius) was recognized with the 2015 Torch Award that honors the “best of the best” of the Midwest Region National Wildlife Refuge System Fire Management Program.

Jason is known for stepping up to any challenge with can-do spirit. He displays a high standard of conduct and professionalism for other personnel to strive for in both work and personal life.

“Jason continues to provide critical leadership and support to our fire organization during a period of declining staff and budget,” says Detroit Lakes Wetland Management District Fire Management Officer Steve Schumacher.

“A huge part of meeting these challenges is providing notable assistance in meeting Service habitat management, facilities, and fleet maintenance needs,” Schumacher says.

Jason is also credited with advancing the fire management skills of others through effective mentoring of college interns, seasonal firefighters and collateral duty staff. In addition, he builds strong relationships with local rural fire departments and partners such as The Nature Conservancy, the Minnesota Department of Natural Resources and the Bureau of Indian Affairs to assist the Service in meeting fire management goals. Through his dedicated service, Jason has helped build and lead a fire program that is regarded with the highest esteem by Service staff our partners. □

Pacific



Robyn Thorson, the Service’s Pacific Regional Director, has received a Presidential award for exceptional performance. Thorson, honored as a Meritorious Executive, manages 1.3 million acres on 64 national wildlife refuges, 24 fish hatch-

eries, eight fisheries stations and 11 ecological services field offices. The Pacific Region consists of Oregon, Idaho, Washington, Hawaii and the Pacific Islands. Her Service career began in Portland, Oregon, in 1985. She has worked in regional offices in Alaska, the Midwest and the Southwest and in headquarters in Washington, DC.

In 2011, she received the Ira Gabrielson Award, which recognizes significant contributions to conservation by a person who reflects the powerful commitment and leadership qualities of Ira Gabrielson, the first director of the Service. Her leadership focus is on relationships and she emphasizes the importance of telling the Service story. □

Headquarters



Jim Kurth, Deputy Director for Operations, has received a Presidential award for exceptional performance, the Distinguished Executive Award, which is offered to only 1 percent of Senior Executive Service members. He is responsible for the day-to-day operations of the Service,

overseeing a budget of \$2.5 billion and a staff of 9,000 employees.

Kurth, a Service veteran and career federal employee, served as Chief of the National Wildlife Refuge System from 2011 to 2015, when he led the development and implementation of *Conserving the Future*, a blueprint for the growth and management of the Refuge System.

After graduating with a degree in wildlife management from the College of Natural Resources at the University of Wisconsin-Stevens Point, Kurth began his Refuge System career in 1979 with posts at Mississippi Sandhill Crane National Wildlife Refuge, Arthur R. Marshall Loxahatchee National Wildlife Refuge in Florida, Bogue Chitto National Wildlife Refuge in Louisiana, Seney National Wildlife Refuge in Michigan’s Upper Peninsula and Ninigret National Wildlife Refuge in Rhode Island.

Starting in 1994, Kurth managed the Arctic National Wildlife Refuge in northern Alaska—the largest refuge in the United States, spanning 20 million acres. Arctic also contains an 8 million-acre Wilderness Area—the largest within the Refuge System. □

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20 Years of Blue Goose Tattoos

At the annual Wildlife Festival at St. Marks National Wildlife Refuge in Florida, Visitor Services Manager Robin Will's twins, Lauren and Julia Will, now 26, show off their refuge spirit, just like they did in the January 1997 *Fish & Wildlife News*.



TOM DARRAGH

Fish & Wildlife News

Editor: Matthew Trott

Assistant Editor: Jennifer Deschanel

Art director: Jane Pellicciotto, Allegro Design

Submit articles and photographs to:

U.S. Fish and Wildlife Service
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MS: EA
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Submission deadline:

Summer 2016: by May 14