U.S. Fish & Wildlife Service Spring 2022

Fish & Wildlife News

SPOTLIGHT

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On the cover: Bullock's oriole at Malheur National Wildlife Refuge.

(PHOTO BY BARBARA WHEELER/USFWS VOLUNTEER)

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Martha Williams, Director

Climate Change Won't Prohibit Conservation Success

In 2021, wildfire season started earlier than normal in Montana, where I was living. For years we have been experiencing earlier and more severe wildfires due to higher temperatures. Today, the sad reality is that we no longer experience fire seasons; we experience fire years.

These longer and more intense wildfires are stark examples of the impact of climate change.

For Montanans, the fires meant that in July instead of August, streetlights began coming on during the day because of thick smoke obscuring the sun.

Outside of the poor air quality, I was lucky and not in physical danger from the wildfires. But the inability to see blue skies was hard. I felt daily like something was pressing on me.

That put me among the millions of people affected by our changing climate.

Wildlife and their habitats are reeling, too, and the news is grim.

As you will read in our story "Preventing Extinctions in a Changing Climate" (p. 12), all the old threats to wildlife—habitat loss, overuse, and the like—are now exacerbated by sea level rise, worsening drought, wildfire, and other impacts of climate change.

The story "Protecting Migrations" (p. 16) shares one of the truly distressing problems associated with climate change. Migratory wildlife depend on environmental cues to know when to arrive in areas to be able to eat, find shelter, or breeding habitat. Climate change is altering nature's clock and threatening the survival of these animals.

The Bramble Cay melomys, a small Australian rodent, may be the first mammal lost to climate change, specifically sea level rise. It won't be the last.

We know that some wildlife will face extinction as the effects of climate change increase. Some species won't go extinct but will disappear from places they have long called home. As they find new ranges to meet their needs, they may displace resident species.

So how do we respond?

For the public, the Service has put together resources on ways to get involved on climate change. If you're reading this magazine, you are already on your way to helping. Staying informed about climate change is the first step.

For Service employees, we have developed a Climate Change Action Program (p. 2). We are working with partners you would expect and others that might surprise you, as you will see in this issue. You'll also read about our new Resist-Accept-Direct (RAD) framework in action as our managers make decisions for wildlife in a changing climate (p. 28).

The RAD approach will be important to our future success. Historically, we looked at past conditions to anticipate the future of a landscape and used this information to inform our management decisions about habitats and wildlife.

No longer. Climate change means we can no longer manage for the past. We must manage for today and for a rapidly changing future. RAD is a way to do that.

But RAD does not mean we are abandoning the lessons history has taught us. We know that even the most horrific environmental crises can serve as the impetus for great conservation success. For example, the Dust Bowl in the 1930s spurred unparalleled waterfowl habitat restoration. We've seen unprecedented investment in Gulf restoration because of 2010's Deepwater Horizon disaster.

Climate change is not a simple subject with simple solutions. I know it can be easy to throw up your hands and feel overwhelmed. But we will rise to the challenge. With a nod to those who came before us and carried the torch for conservation, our time is now to leave a legacy that future generations can be proud of.

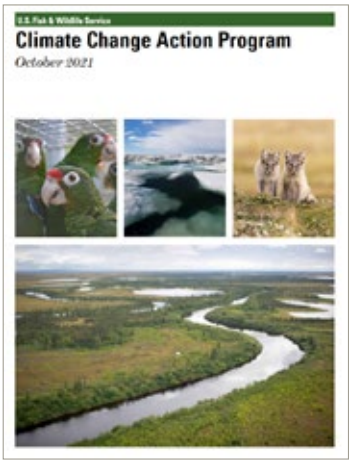
I know that we can come together and rise to meet this moment by tapping into our expertise, innovation, and dedication to our mission. □

Service Meets Climate Challenge With Action Program

The Biden-Harris administration is committed to combatting the climate crisis. In support, we created the Climate Change Action Program (CCAP) as a unified approach to climate adaptation and mitigation. It is a living framework that will evolve as we learn how to manage fish, wildlife, plants, and their habitats in a rapidly warming climate. The CCAP has seven core elements, including climate science, climate mitigation, and partnerships, that we use to ensure success.

Climate change is threatening the country's plants and animals. The United States has over 1,600 endangered species and 12,000 species in conservation need. One of the core elements in the CCAP is therefore the integration of climate adaptation into our natural resource planning and management actions.

One of the methods we're adopting is the Resist-Accept-Direct framework (p. 28), which provides fluid decision support to manage plants and animals in rapid habitat transformation. "Resist" occurs when management actions attempt to restore the system based on historical conditions. "Accept" is when management allows change in features of the lands and waters without intervention. "Direct" is when management actions attempt to influence the changing lands and waters to conditions that support wildlife and benefit people.



The Climate Change Action Program features the Resist-Accept-Direct framework.

In addition to responding to climate change through natural resource management actions and regional and national partnerships, we're working on climate mitigation with the goal to reduce our net emissions to zero by 2050. Efforts to reduce our emissions and increase carbon capture will benefit fish, wildlife, plants, and habitats. We'll implement energy conservation measures, ensuring that facilities meet sustainable building standards and promote renewable energy. In addition, we'll continue to identify well-suited locations and plan for a transition to electric vehicles and electric vehicle charging stations.

Although the CCAP provides internal strategic guidance, our overall success in responding to climate change depends on collaborating across the conservation community and working with partners to address climate change impacts with a focus on social and environmental justice. We're developing a national conservation adaptation strategy with external partners designed to incorporate climate adaptation into landscape-scale plans. The national strategy will allow the conservation community to identify common goals and actions to improve climate change resilience. We're committed to including Indigenous communities, First Nations, Tribes, territories and underserved communities as we develop shared conservation goals.

With an emphasis on working with others, the core elements of the Climate Change Action Program provide a foundation for Service-wide actions on climate adaptation and mitigation. Implementing the CCAP allows us to accelerate and expand efforts to manage the effects of climate change, and reaffirm our role in leading effective, collaborative conservation in a rapidly changing world. □

HOUSTON HUNT, Science Applications (Detail), Headquarters

Invasive Green Crabs Pose Threat to Washington's Shellfish Industry

A relatively new threat is spreading in the waters off Washington state—the European green crab.

European green crabs are one of the most widespread invasive marine species on the planet. Where they are abundant, green crabs outcompete native shellfish. Green crabs are voracious eaters and a major predator of clams, mussels, and oysters. One study suggests that a single green crab can eat around 22 clams per day. They also actively disturb bed sediments, leading to the loss of the eelgrass that serves as essential habitat for Dungeness crab and Pacific salmon.

In 2021, more than 102,000 European green crabs were caught in the Puget Sound and along Washington's coast. This is an astronomical 5,500% increase from the 1,800 crabs caught in 2019. In response to the explosion in the green crab population, a series of disaster declarations were made by the Lummi Nation and the Makah Tribe concerning the green crabs' impact on Tribal culture and economy. Washington Governor Jay Inslee followed suit and issued an emergency order to mobilize state resources.

To help protect against invasive European green crabs, we have been working with state, Tribal, and federal partners on a green crab monitoring network along the Pacific Coast and Puget Sound. Over the last few years, the coordinated program »

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has successfully detected and eradicated small colonies of the invasive crab. However, the recent discoveries of large colonies of over 86,000 green crabs in the Lummi Sea Ponds show how vulnerable the Puget Sound and Washington's coast are to a major infestation.

The recent increase in green crab populations combined with multiple Tribal disaster declarations has galvanized collaboration among the Service, the Bureau of Indian Affairs, and the U.S. Geological Survey. The intent is to leverage funding, resources, and technical expertise to improve detection, increase control efforts, and pursue eradication, where possible, of the European green crab.

Recognizing the serious threat to Tribal cultural and natural resources, the Bureau of Indian Affairs remains committed to working with Tribal, state, and federal partners to address invasive green crabs. The bureau has supported Tribes through recent years, prioritizing nearly $670,000 on its Invasive Species Program to target the European green crab in multiple Tribal waters for survey, control, and management efforts.

"Protecting cultural resources and the habitat that depends on having balanced ecosystems to thrive is a key part of meeting our trust responsibilities to the Tribes," says Bryan Mercier, the bureau's Northwest regional director. "By working with our partners, we are all better positioned to stop the spread of these invasive crabs."

For national wildlife refuges, we conduct early detection, monitoring, control, and removal of European green crab. These efforts are occurring at Billy Frank Jr. Nisqually National Wildlife Refuge Complex in south Puget Sound; Washington Maritime National Wildlife Refuge Complex in Puget Sound and the Strait of Juan de Fuca; and Willapa National Wildlife Refuge Complex in southwestern Washington.

"Detecting green crab populations is essential for limiting their spread," says Theresa Thom, our regional aquatic invasive species coordinator. "Thanks to ongoing monitoring, we have a better chance of finding the crabs early so we can remove them quickly."

European green crabs threaten Washington's native shellfish.
(PHOTO BY PAT DEHAAN/USFWS)

In 2018, we provided about $82,000 to the Makah Tribe to address the green crab population at the Makah Indian Reservation. This work included assessing the extent of the crabs, controlling their population growth, and providing training to Tribal staff to continue and expand control efforts. In 2021, we provided about $71,000 to the U.S. Geological Survey to assess the trapping effort needed for the early detection of green crabs.

The survey is also working to increase the effectiveness of Washington's green crab early detection and rapid response program. Research conducted at the agency's Western Fisheries Research Center aims to improve native shellfish habitat and limit the spread of green crabs in coastal waters. Scientists have added new molecular technologies to the current monitoring program to broaden its capabilities. New research also looks at the compounding effects of climate change on the green crab populations (e.g., warmer waters = more green crabs).

Ultimately, this work will help collaborators control the spread of green crabs and protect the region's vital ecosystem, culture, and fisheries economy. □

BRENT LAWRENCE, External Affairs, Pacific Region, U.S. Fish and Wildlife Service; ROBYN BROYLES, Bureau of Indian Affairs; STEVEN SOBIESZCZYK, U.S. Geological Survey

Monarch Waystations at Highway Rest Areas in Texas Support State Insect's Migration

Just like people rely on rest areas to refresh and sustain us during long journeys, monarch butterflies need areas rich with milkweed and nectar-producing plants to support them during their 2,500-mile migration between Mexico and Canada.

To help meet the needs of both kinds of weary travelers, the Native Plant Society of Texas, in partnership with the Texas Department of Transportation and the Service, created four monarch waystations at highway rest areas between Austin and Dallas along Interstate 35, the official "Monarch Highway." Monarch waystations are patches of habitat that provide resources for the butterflies to produce successive generations and sustain their migration. (Climate change threatens monarch migration, p. 16.)

"Texas is the intersection of the monarch's migration highways, connecting spring and summer breeding and migration habitat across the United States and Canada with winter habitat in central Mexico," says Katie Boyer, at-risk species coordinator for our Southwest Region. "Monarchs can travel about 50 miles a day when they're migrating, so having these pockets of habitat for them to stop over along that route is really important."

The monarch waystations feature hundreds of Texas native nectar plants, including critically important milkweed. Monarch butterflies lay their eggs on just one type of plant, milkweed, the only plant monarch caterpillars eat.

A monarch waystation with native *Malvaviscus arboreus* for monarch butterflies and other pollinators at the Bell County Southbound Safety Rest Area in Bell County, Texas. (PHOTO BY KIM CONROW/NATIVE PLANT SOCIETY OF TEXAS)

"Native Texas milkweeds provide a vital home for the first generation of monarchs produced each year in the spring, and our fall blooming nectar plants provide much-needed fuel for migrating monarchs en route to Mexico each fall," Boyer says.

In addition to providing a place for the insects to feed, rest, and reproduce, the monarch waystations provide a variety of benefits for people, too. For drivers and travelers, the waystations encourage good safety practices, like relaxing for a bit and enjoying the sight of the flowering plants and colorful pollinators instead of immediately getting back on the road.

The waystations also include educational signage describing the monarch life cycle, migration pattern, and the relationship between monarchs and native plants. One of the hopes is that travelers will be inspired by the beautiful gardens and return home to plant native plants for pollinators.

"These will help to educate millions of people about the Monarch Highway, the plight of the monarch butterflies, their amazing life cycle, and ways that anyone can help through the choice of plants they put in their home landscape," says Kim Conrow with the Native Plant Society of Texas.

While it may seem like there are still a lot of monarchs out there, monarch butterflies east of the Rocky Mountains used to number in the hundreds of millions. Over the last few decades, the population has declined 80% or more. »

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The decline of monarchs—as well as many other butterfly species, birds, bees, and bats that pollinate plants across North America—is an ominous sign for the health of the continent's natural systems.

Thousands of native wildlife species are at risk if pollinators continue to disappear, and hundreds of millions of people rely on the crops and habitats that pollinators sustain.

"Through gardening with native plant species and educating the public we are helping to save a species, and in the process, we might even save ourselves," Conrow says.

Boyer says the primary drivers affecting the health of the migratory population of monarchs are changes in breeding, migratory, and overwintering habitat.

"The best way we can address this stressor is to help protect, restore, and enhance monarch habitat," Boyer says. "Monarch populations benefit from widespread, ongoing conservation measures from the smallest gardens to large, landscape-scale efforts."

Though large patches of native, nectar-producing plants are ideal for monarch habitat, anyone can make a difference for the species. Conrow says whether you measure your space in acres or square feet, planting native plants for pollinators can help support the entire food web.

"It's critically important for people to plant native plants," Conrow says. "Make it three seasons of nectar producing plants and add in several milkweed—and you have a monarch waystation!"

Ultimately, saving the monarch butterfly will not happen without working together and creating collaborative opportunities for conservation. From building monarch waystations, planting home pollinator gardens, and spreading awareness of the monarch's journey to others, everyone can take action to make a difference for the species. □

AUBRY BUZEK, External Affairs, Southwest Region

? MORE INFORMATION

Save the Monarch

Things you can do to help monarch butterflies.

A New Step Forward in the Future Recovery of the Puerto Rican Parrot

While some animals rest during the winter months, Puerto Rican parrots are taking flight.

In January and February, we released Puerto Rican parrots into the wild at the Maricao State Forest. Over a seven-week period, we released 32 parrots in three small groups. Parrots were also released on El Yunque National Forest.

The release locations differ but share a common purpose—to help the endangered bird recover after the devastation of Hurricane Maria.

It is hard to overstate the impact that a category 4 storm had on the Puerto Rican parrot, a species limited in range to Puerto Rico and the only parrot native to the United States. Hurricane Maria hit Puerto Rico on Sept. 20, 2017. It snapped trees, knocked out power, and prompted flooding across the island. High winds also shredded leafy parrot habitat at El Yunque and elsewhere.

Two weeks before, on Sept. 6, 2017, category 5 Hurricane Irma had hit. With back-to-back hurricanes, the parrots' home was decimated.

At the time, the national forest was home to 56 wild birds. Some of them died during the storm. Others that survived the storm itself died from starvation or increased hawk predation because of Maria's aftermath. The storm also suspended our plans to enhance parrot populations on the island. We had scheduled a 42-parrot release in Maricao but instead relocated the birds to the aviary at El Yunque. We restarted the parrot-release program in December 2020. Since then, we've released 81 birds. While we have the lead for the wild population at El Yunque and Maricao, the Puerto Rico Department of Natural »

In January and February, the Service released Puerto Rican parrots into the wild at the Maricao State Forest. (PHOTO BY JAN P. ZEGARRA/USFWS)

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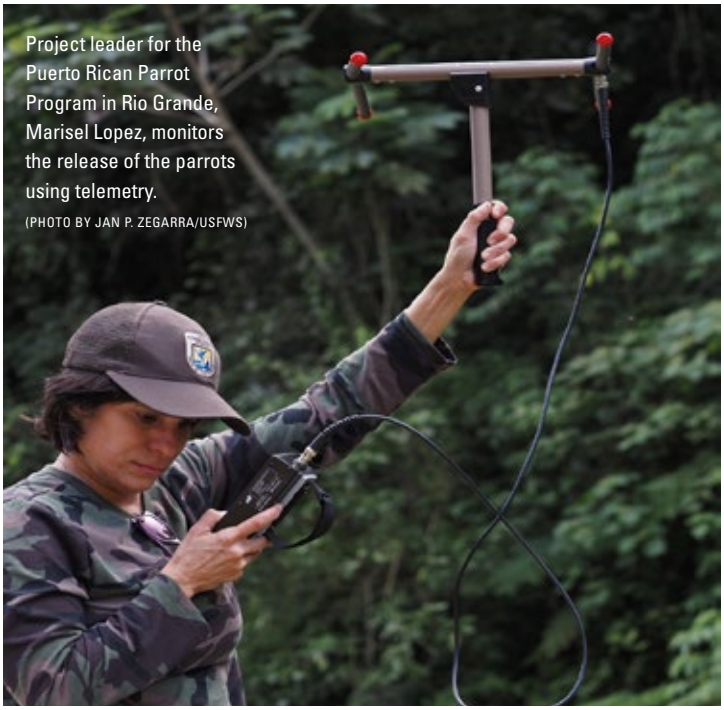
and Environmental Resources has the lead for the wild population at the Rio Abajo State Forest. They have also been very active releasing birds into the wild at that location since 2019.

"The Puerto Rican parrot is not only emblematic of the island's beauty but also a symbol of resiliency," says Leopoldo Miranda-Castro, Director of the Southeast Region, which includes Puerto Rico. "Despite the devastation from hurricanes Irma and Maria, working with our partners we have achieved this huge milestone and have this beautiful bird back on the road to recovery."

With the latest releases, we estimate that Puerto Rico is home to about 250 wild parrots at Maricao, El Yunque, and Río Abajo. These most recent releases highlight a 30-year partnership among the Service, the Puerto Rico Department of Natural and Environmental Resources, the U.S. Forest Service, the National Fish and Wildlife Federation, Para La Naturaleza/The Conservation Trust, Walmart, Herencia, and the World Parrot Trust. The Service and the Puerto Rico department operate two aviaries and three populations in the wild with the important close assistance from the U.S. Forest Service. The aviaries house more than 450 birds in captivity.

Biologists say wild parrots are breeding in El Yunque and Rio Abajo. From zero wild birds to a breeding population — proof that hard work pays off. Introducing captive birds into the wild to establish new populations is helping the recovery of the Puerto Rican parrot. □

JENNIFER KOCHES, External Affairs, Southeast Region



Project leader for the Puerto Rican Parrot Program in Rio Grande, Marisel Lopez, monitors the release of the parrots using telemetry.
(PHOTO BY JAN P. ZEGARRA/USFWS)

Climate Change, Species Conservation, and Public Safety in Central Texas

The Balcones Escarpment, the surface expression of a fissure in the Earth's crust formed 300 million years ago, extends from Waco and Dallas in the north to San Antonio and Del Rio in the south. Bound by Hill Country on the west and Coastal Plains on the east, the fault zone features distinctive traits from both halves of the continent. Above a 1,200-plus square-mile aquifer created from rainwater seeping through fractured rock over countless millennia, verdant pancake-flat prairies converge on juniper-studded canyonlands and stratified limestone bluffs.

In addition to millions of Texans, the region accommodates diverse and rare wildlife, including the endangered golden-cheeked warbler and the Houston toad, one of the first amphibians federally protected as endangered.

While relentless work over decades has helped thwart extinction for both species, the impacts of global warming are imposing daunting dimensions to the task.

Since 2011, when the state registered its driest year on record and the most destructive wildfire in its history, federal, state, and local agencies, and private landowners in the region, have been increasingly collaborating to protect the future for endangered species — and us.

This year has been grim: In its first three months, nearly 15,000 separate wildfires scorched more than half a million acres across the state. "Severe drought has been killing lots of trees the warbler requires," says Michael Warriner, one of our Austin-based biologists. "So, we're having to adjust accordingly."

We're currently revising a warbler recovery plan and updated species status assessment, working with spatial ecologists to estimate climate projections and identify vulnerable habitat.

The Houston toad was one of the first amphibians protected as endangered.
(PHOTO BY ROBERT POS/USFWS)

Forty miles northwest of Austin, the 27,500-acre Balcones Canyonlands National Wildlife Refuge has been central to conservation of the warbler, which requires large patches of oak-juniper woodlands with mixed, dense canopy. There, biologists have been developing protocols to protect people and warblers, reducing wildfire potential yet maintaining canopy cover. »

"All we knew was we wanted to create wildlife habitat," says Roxanne Hernandez, who moved to Texas in 2004 with husband Elvis. (PHOTO COURTESY OF ROXANNE HERNANDEZ)

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Their guidelines have been adopted by Travis County and the City of Austin to mitigate wildfire at "wildland-urban interfaces;" and some have been incorporated into FEMA's Hazardous Mitigation Grant Program, which provides assistance to communities for wildfire prevention and response efforts.

"FEMA has really embraced incorporating rare species' needs into their projects where they can," says Warriner.

Similar mitigation and conservation strategies are being deployed on the Coastal Plains, where only a few thousand Houston toads are estimated to exist in fragmented, narrowly distributed areas. Drought and wildfire have not only hindered efforts to repopulate these spots with eggs and tadpoles; they've all but decimated the oases.

The 2011 Bastrop County Complex fire, which consumed more than 34,000 acres and destroyed more than 1,600 homes, "was devastating to the people of Bastrop and the toad," says Warriner.

It burned all of the 6,600-acre Bastrop State Park, which "contained probably the largest Houston toad population and the largest block of contiguous pine forest habitat for the species."

Since then, the Texas Parks and Wildlife Department (TPWD) has pursued vegetation management and native grass and Loblolly pine forest restoration. FEMA stepped in as well, allocating funds for wildfire mitigation work on more than 1,200 acres in Bastrop County, mostly residential lands located within designated critical toad habitat.

Home for Wildlife

Elvis and Roxanne Hernandez are not your typical rural Bastrop County landowners. Elvis was raised outside New York City. Roxanne grew up near Chicago. They moved to Texas in 2004, buying a 53-acre former cattle ranch in McDade, population 700.

"All we knew was we wanted to create wildlife habitat," says Roxanne.

Since then, they've transformed their land by various means: from planting native grasses, vegetation, and thousands of Loblolly pine seedlings; to providing supplemental shelter for endemic wildlife; to, eventually, conducting prescribed burns to restore toad habitat.

In fact, the Hernandezes became the first in the state in 2018 to help the toad through our Safe Harbor program. The initiative, which assures additional land use restrictions won't be imposed on those who partake in conservation measures for threatened or endangered species, is an essential tool in Texas, where 95% of the land is privately owned.

And while they may seem anomalous next to their cattle-grazing neighbors, the couple has seen a growing number of likeminded efforts in the last decade.

As has Elizabeth Bates, a TPWD conservation initiative specialist who oversees Safe Harbor and other landowner conservation agreements. "We're seeing a lot more interest from landowners in managing land primarily for wildlife and ecosystem health," she says.

"Wildlife is an important measure of where we all stand," Roxanne says. "The collaborative work taking place here is the type of approach other regions might consider in mitigating climate change — and restoring a degree of ecological balance that will make them more resilient." □

BEN IKENSON, freelance writer, Southwest Region

New Plantings Give a Rare Species Hope for Survival

When the entire population of a species exists in a single location, it's a risky proposition. Catastrophic events like wildfire or drought can pose an outsized danger, perhaps jeopardizing the very existence of the species itself. One rare plant in central Washington that finds itself in such a situation, however, is being given an improved shot at survival.

We're leading a team trying to establish a second population of Umtanum desert buckwheat, a plant protected under the Endangered Species Act that currently exists naturally on only one windswept ridge within Hanford Reach National Monument. Our partners recently planted 264 precious seedlings of the threatened species on protected land at Cowiche Canyon Conservancy near Yakima, Washington, in hopes these young plants survive and reproduce at that new location.

"By having a second population, it provides some assurance that if disaster strikes in the form of wildfire or invasive species , the species as a whole may still persist," says Tara Callaway, our Washington state recovery coordinator.

The current population of Umtanum desert buckwheat consists of about 3,000 plants in a narrow band several hundred feet long. The yellow-flowering plant is long-lived, perhaps living for up to a century, but the single population is small and declining. The seedlings that were recently planted were not extracted from that critical group but rather »

Partners involved in the outplanting included the Service, the Cowiche Canyon Conservancy, University of Washington Botanic Gardens Rare Care Program, the Bureau of Land Management, and amazing volunteers. (PHOTO BY T. CALLAWAY/USFWS)

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grown in a nursery under the watchful eye of Wendy Gibble at the University of Washington Botanic Gardens Rare Care Program and at a local garden by volunteer Jane Abel.

The time spent in a nursery seems to give the young plants a boost. "Plants that are grown in a nursery for six months or more often have a better chance at survival than small seedlings when they are planted out at a site. While this is more labor intensive than directly sowing seeds at the site, it is an important tool to use when we have insufficient seeds available or seedling germination and establishment in the wild is poor," explains Gibble.

The location of the new outplanting is on land owned by the Cowiche Canyon Conservancy, whose mission is to protect shrub-steppe and connect people to this vanishing land. Megan Whiteside, conservation projects manager for the organization, says: "I think people are sometimes surprised to learn just how much diversity of life can be found in a healthy shrub-steppe community. If we let pieces of that complex puzzle quietly go extinct, we do a disservice to the land and to ourselves."

> *"It gives me hope to see people coming together to care for the land and prevent the loss of a native species..."*
>
> —MEGAN WHITESIDE, conservation projects manager for the Cowiche Canyon Conservancy

Only time will tell if the new seedlings will establish and survive on their own. Past outplanting efforts for the species have faced significant challenges, as the species has proven to be quite particular about its habitat. Hopes are high, however, that this time the endeavor will help preserve this small piece of Washington's natural heritage. □

ANDREW LAVALLE, External Affairs, Pacific Region

Pedestrian Trail at Rachel Carson National Wildlife Refuge Helps Connect Visitors to Nature

Residents of Wells, Maine, are enjoying a recently finished nature trail that passes through Rachel Carson National Wildlife Refuge.

The mile-long pedestrian trail, supported by funding from a Federal Lands Access Program grant, starts east of U.S. Route 1 in downtown Wells and proceeds through a residential neighborhood before continuing along Harbor Road on one side and the refuge-managed Webhannet River Salt Marsh on the other. The trail links downtown Wells to Wells Harbor and a popular beach area, as well as an existing trail network created by the town and the Wells National Estuarine Research Reserve.

Refuge staff worked with the town and engineers to design the project in such a way that pedestrian access, public safety, resource conservation, and wildlife observation opportunities were maximized at the Lower Wells Division of the refuge.

Before the trail's construction, pedestrian access to this area of the refuge was limited, apart from walking alongside a heavily trafficked road without a guardrail.

Now, residents will have a safe and eco-friendly alternative for traveling along Harbor Road and improved opportunities for plant and wildlife viewing within the refuge. Interpretative »

Service employees Carl Melberg (from left), Ella Weber, and Ryan Kleinert stand on the newly constructed Webhannet River Salt Marsh observation deck. (PHOTO BY USFWS)

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signs along the trail offer walkers a chance to learn more about the ecology within the refuge. Also included on the path is a newly constructed observation deck of the marsh.

"We at the refuge are excited about the new pedestrian trail at Harbor Road in Wells," says Karl Stromayer, manager at Rachel Carson National Wildlife Refuge. "It's going to be a huge asset in helping us connect people to nature and helps meet the town's objectives for active transit and reducing traffic volume on town roads during the busy spring and summer [vacation] seasons."

This trail complements other planned improvements in Wells, such as designing and constructing sidewalks, bike lanes, and streetscape improvements, as well as providing pedestrian amenities along Harbor Road and within Harbor Park. The goal is to minimize the need to widen impervious surfaces and the existing roadway.

The Federal Lands Access Program was established by the Federal Highway Administration to improve transportation facilities that provide access to, are adjacent to, or are located within federal lands. Grants benefit the Service by improving access to facilities through constructing or repaving roads, multi-purpose trails, bicycle paths, and boat ramps. Program money can also be used to purchase buses, trams, bicycles, and kayaks for people to access public lands.

The Harbor Road pedestrian trail was completed with 20% funds from the Wells community and 80% from the access program. With the recently passed Bipartisan Infrastructure Law, the program will now be able to provide up to 100% of funding for projects. □

MASON WHEATLEY, External Affairs, Northeast Region

The pedestrian trail along Harbor Road in Wells, Maine, provides safe access to Rachel Carson National Wildlife Refuge. (PHOTO BY USFWS)

CLIMATE CHANGE

It is affecting our world and our work in profound ways. Explore how climate change is rewriting the conservation playbook.

Climate change presents a growing threat to America's fish, wildlife, plants and their habitats. We are focused on helping species adjust to the impacts of climate change, as well as moderating those impacts on trust resources using cutting-edge science.

We, and our partners, deal with climate change in all our ongoing work, including land and species management, and habitat restoration.

The following stories provide a glimpse of how climate change impacts what we do and how we're responding. »

(Left and previous page) Coastal marshes provide protection against sea level rise. (PHOTO BY STEVE HILLEBRAND/USFWS)

PREVENTING EXTINCTIONS IN A CHANGING CLIMATE

Threats like sea level rise challenge wildlife and habitats.

By GINA CORAL
and BRIAN HIRES

The endangered akiapolaau searches tree trunks and branches for grubs and arthropods within the bark.
(PHOTO BY JIM DENNY)

In late 2021 we announced 23 proposed delistings from the endangered species list due to extinction. We had never proposed delisting so many species due to extinction at one time, and based on the massive response, our announcement touched a nerve.

About 90% of the ʻiʻiwi population lives in a narrow band of forest on the windward slopes where it is too cold for the mosquitoes that spread avian malaria. (PHOTO BY JIM DENNY)

Most of these extinctions happened decades ago, before the act existed and the protections afforded under the Endangered Species Act (ESA) could help. But these 23 stories are so compelling because the reasons these species are extinct are the same reasons countless species are imperiled or declining today— habitat loss, disease, overuse, and inadequate protections.

Wildlife and habitats in the 21st century also face the added threats from climate change including sea level rise, increased frequency and intensity of drought, wildfire and storms, altered growing seasons, reduced snowpack, loss of sea ice, and much more. Climate change is multiplying existing threats to numerous species and natural areas.

The emperor penguin and Mount Rainier white-tailed ptarmigan are two of the first species proposed for protection under the act primarily due to the impacts of climate change and the resulting ecological transformations. More are likely to follow. In Hawaii, increasing temperatures are fueling the spread of invasive species and diseases among species already at the brink of extinction.

Emperor Penguin

Reliant upon sea ice and healthy, functioning oceanic ecosystems that support robust populations of krill, emperor penguins face a challenging future against the backdrop of climate change. Using the best available science, we determined that if no greenhouse gas mitigation measures are taken and global temperatures increase up to 4.8 degrees C, emperor penguin populations are expected to decline 47%. Projections for sea ice habitat in some areas are rather dramatic, with three segments declining severely, resulting in 90% declines of penguin populations by 2050 in those areas. Such outcomes would leave just two other populations in the wild. Even if warming can be maintained at 2.0 degrees C with greenhouse gas mitigation measures, emperor penguin populations are still expected to decline 27%.

The Climate Change 2021 Physical Science Basis report published by the Intergovernmental Panel on Climate Change (IPCC) highlighted increasingly warmer temperatures over the past four decades. According to the IPCC Ocean and Cryosphere in a Changing Climate report, ice sheets in parts of Antarctica have been melting. Emperor penguins rely on stable sea ice during the breeding season to shelter from harsh conditions, as breaks in the ice could lead to death, stranding, or losing a chick before it develops waterproof plumage, according to Yale Climate Connections. Sea ice is also essential for food resources, molting, and protection from predators.

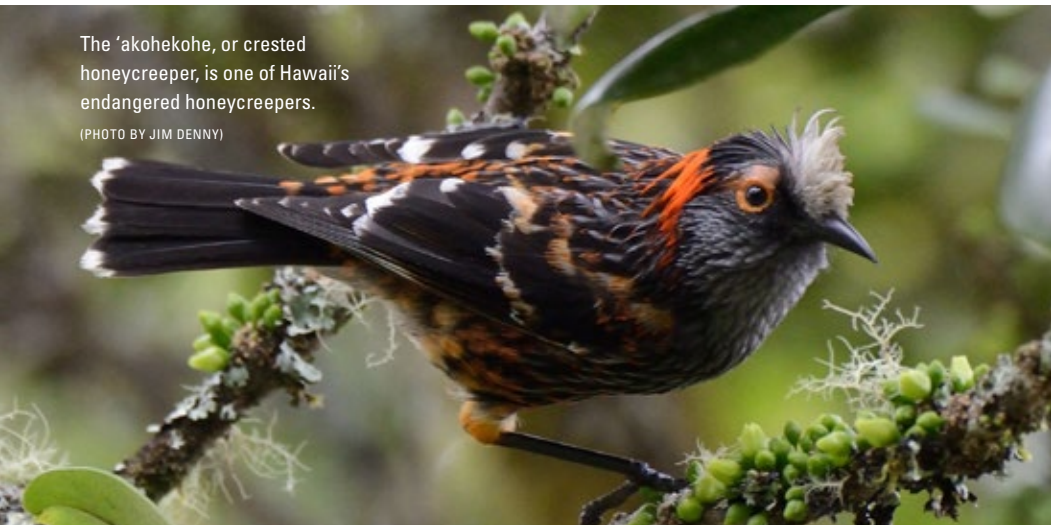
Because of these findings in August 2021, we proposed listing emperor penguins as threatened under the ESA with a rule that provides exceptions for activities that are traditionally allowed under the Antarctic Conservation Act. The listing would provide immediate protections for the emperor penguin, such as prohibiting import, export, possession, sale, or take of the species including harassing, harming, capturing, collecting, or killing them. It also provides support for conservation partnerships. Scientists say that conserving emperor penguins and countless other species that call the Antarctic home will require more than ESA protections. A global reduction of greenhouse gas emissions would make strides toward ensuring emperor penguin populations across the Antarctic remain stable.

Mount Rainier White-Tailed Ptarmigan

Mount Rainier white-tailed ptarmigans are uniquely adapted for living on alpine mountaintops of the Cascade Range in Washington and southern British Columbia. They change appearance throughout the year to match their environment, turning all-white in the winter when they live in snow. White-tailed ptarmigans depend on alpine meadows for

We have proposed to protect the Mount Rainier white-tailed ptarmigan as threatened. (PHOTO BY JAMIE HANSON/USFWS)

Emperor penguins need Antarctic Sea Ice.
(PHOTO BY MICHAEL STUDINGER/NASA)



The ‘akohekohe, or crested honeycreeper, is one of Hawaii’s endangered honeycreepers.
(PHOTO BY JIM DENNY)

We proposed listing emperor penguins as threatened under the Endangered Species Act.
(PHOTO BY WILLIAM LINK/USGS)

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finding food, raising young, and avoiding heat stress in the summer. In the winter, they need quality snow for roosting and predictable snow patterns to ensure ›› their plumage matches their surroundings to avoid predation.

As climate change alters alpine ecosystems faster than species can adapt through natural evolutionary processes, the special characteristics of ptarmigans and other alpine species are actually working against their survival.

Due to climate change, the Cascade Range is experiencing and will continue to experience a loss of glaciers, reduced snow amount and extent, and changes to the timing of snowfall, in addition to rising treelines. These threats to the Mount Rainier white-tailed ptarmigan are exacerbated by other risks such as predation and recreation.

Climate-related changes in the Cascade Mountain range could lead to a loss of up to 95% of Mount Rainier white-tailed ptarmigan habitat, based on one model. This loss of alpine vegetation is significant not just for the ptarmigan, but for other alpine species as well. Migration north to Canada is unlikely to help, given similar climate changes and habitat loss there. Under both moderate and high carbon emission scenarios, including those incorporating management interventions to aid the species, only one to two of the six known populations of ptarmigan would remain within 50 years.

As such, in 2021,we proposed to list the species as threatened under the ESA with a 4(d) rule. Conservation measures would include increasing knowledge of the species to better understand the threats and risks, determining where habitat is most likely to persist as the climate warms, implementing strategies to reduce other threats such as recreation and land degradation, or identifying ways to manage the habitat that resists the effects of climate change. These efforts would complement existing work ››

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already underway including white-tailed ptarmigan research conducted by the Washington Department of Fish and Wildlife, the Washington-British Columbia Transboundary Connectivity Project that developed actions for benefiting ptarmigan, and ptarmigan surveys conducted in Mount Rainier National Park and North Cascades National Park. Through collaborations with other federal agencies, states, Tribes, and researchers, steps can be taken toward survival.

Hawaii

A Hawaiian honeycreeper, the Kauai ‘O’o was one of the 23 species recently proposed for delisting due to extinction, the result of critical forest habitat loss from the introduction of non-native species and avian malaria. In total, eight of the proposed 23 delistings due to extinction are Hawaiian forest birds.

Given its geographic range, unique topography, and extreme isolation, Hawaii is home to species found nowhere else in the world. It is also home to more ESA-listed species than any other state, with our Pacific Islands Fish and Wildlife Office overseeing more threatened and endangered species than all other field offices combined. While most of these species are imperiled by the same threats that caused the O’o’s extinction, the impacts from climate change are now greatly multiplying these threats and their interactions.

In total, only 17 of Hawaii’s 50-plus native honeycreeper species remain in the wild, with nearly all of those facing shrinking ranges and declining populations. These extinctions and declines began centuries ago, when mosquitoes were first accidentally introduced to the Hawaiian Islands. These mosquitoes along with diseases (avian malaria), first found in the pet bird trade in the 1900s, have devastated island bird populations that had no previous exposure to or defense against these diseases. As such, wherever honeycreeper ranges have overlapped

The ‘anianiau is the smallest of Hawaii’s honeycreepers. (PHOTO BY JIM DENNY)

with mosquitoes, those populations have disappeared.

On the island of Kauai, every species of native forest bird is in decline. On the island of Hawaii, which is higher in elevation than Kauai, seven species of honeycreeper are impacted by avian malaria. Exposure to the disease is fatal or severe for five of these species, all of which are now found only in disease-free habitat at upper elevations. For instance, 90% of the population of Hawaii’s most famous honeycreeper, the ‘i’iwi, is confined to a narrow band of forest on the windward slopes, between 4,000 and 6,000 feet in elevation. These birds survive only at higher elevations where it is still too cold for mosquitoes. Climate change, however, is rapidly shrinking these former strongholds.

Increased temperatures are allowing the upslope migration of avian-malaria-carrying mosquitoes in Hawaii. This dynamic is threatening species already on the brink of extinction, such as the kiwikiu and ‘akikiki honeycreepers, each of which has less than 200 individuals remaining in the wild.

“We are at this point where some of these populations are so low or so dependent on a single area, that a single catastrophic event could spell the end of a species,” says Josh Fisher, one of our invasive species biologists. “There’s an urgency now that didn’t exist before because warming temperatures are already starting to push mosquitoes into the upper elevations of places like Kauai. There really isn’t anywhere else for these birds to go. They can’t go down and they can’t really go up much higher.”

To combat these challenges, the Service and conservation partners are innovating, turning to the “Incompatible Insect Technique,” which has never been used before to address avian malaria in the wild. With our conservation partners, we are testing the release of male mosquitoes treated with a naturally occurring bacteria to prevent reproduction. This method acts like birth control for mosquitoes and has been used to protect humans against mosquito-borne illnesses. The current plan is to begin releasing treated male mosquitoes at a landscape scale sometime in late 2023.

What the Future Holds

Climate change is already touching every continent and ecosystem on the planet and future extinctions due to climate change are all but certain. At least one such extinction, the Bramble Cay melomys, has already occurred. This small Australian rodent lost its sand and coral island habitat in 2016 due to sea level rise.

The most recent IPCC report further underscored both the urgency and scale of the challenge and called for immediate, global action in addressing the cause of climate change and in developing strategies to help people, ecosystems, and wildlife adapt to its impacts. We’re doing both, through conservation partnerships, through strategies like nature-based solutions, and through new conservation frameworks like Resist-Accept-Direct (p. 28).

The Biden-Harris administration’s America the Beautiful initiative that is aimed at connecting and restoring 30% of lands and waters by 2030 will also help. One of the initiative’s goals is to enhance wildlife habitat and improve biodiversity—to keep species from reaching the point where they are in danger of extinction or are too far gone to save. □

GINA CORAL, Ecological Services, Headquarters, and BRIAN HIRES, External Affairs, Headquarters

PROTECTING MIGRATIONS

Birds, butterflies, and fish make their way across a changing planet.

By AUBREY KURTZ, KATE NOVAK, *and* LEAH SCHRODT

The bright colors of the migratory Baltimore oriole delight communities across the eastern United States. (PHOTO BY DOUG GREENBERG/CREATIVE COMMONS)

It starts with a journey—Baltimore orioles soar through sleeping cityscapes, monarch butterflies flit over dry dusty deserts and country borders, and salmon surge up wildly flowing rivers.

These celebrated animals carry a wealth of information about seasonal patterns and movement across the landscape. Like any traveler, migratory species stay on the lookout for safe rest stops to refuel or recuperate. What happens when these waystations change their hours of operation, become uninhabitable, or disappear altogether? As climate change creates an ever-shifting landscape, we and many partners are finding out.

Climate Change and Nature's Rhythms

According to the National Oceanic and Atmospheric Administration, Earth's average surface temperature has risen 1.8 degrees Fahrenheit since 1880. While this might not seem like a big change, it has dramatically impacted migratory fish and wildlife.

If you watch birds or track seasonal changes, you have likely noticed recent shifts in nature's rhythms. Scientists are witnessing these changes, too, through phenology, the study of biological cycles. The deep Native American generational knowledge of seasonal patterns and the movement of wildlife is also informing these changes.

Through this rich phenological record, many are witnessing how climate change, with its warming temperatures, drought, and extreme weather, are altering the availability of food and shelter for migratory species like the Baltimore oriole, monarch butterfly, and Pacific salmon. The result is a climate-induced mismatch between the schedules of fish and wildlife, and the timing of the biological cycles and seasons upon which they rely.

A Baltimore Oriole's Journey—From U.S. Cities to Tropical Forests

The Baltimore oriole, a raucous, flaming-orange bird arrives in neighborhoods throughout the eastern United States and Canada just as their namesake baseball team gears up for another season. These harbingers of spring rely upon protein-rich insect meals throughout their breeding season, then switch to nectar and fruits while they overwinter in Central and South America. Like all migratory birds, their semi-annual journey must be specifically timed to coincide with the availability of both food and safe rest areas. The travelers also face a multitude of threats such as habitat loss, outdoor cats, window collisions, pollution, pesticides, and disease. Climate change adds further challenge to this bird's ability to survive.

A review of 48 years of data from ongoing projects, such as the Christmas Bird Count, shows these obstacles are taking their toll. The Baltimore oriole population has dropped 44%, a staggering loss of two out of every five of these birds.

For sure, these threats affect more than the oriole. Since 1970, nearly 3 billion birds overall have disappeared in the United States and Canada.

Grouping bird migration routes into four flyways has allowed us to work internationally through initiatives like the Joint Ventures Program to create corridors of high-quality habitat. Each flyway covers a vast geography. For instance, the Atlantic Flyway stretches from the Hudson Bay to Tierra del Fuego.

Within these flyways, we're restoring natural areas through innovative biological carbon sequestration partnerships. First, partners purchase degraded land to restore. Once restored, these lands remove, or sequester, the greenhouse gas carbon dioxide from the atmosphere. Because reduction of this gas helps ››

As a keystone species, salmon are vital to the entire ecosystem, culturally significant, and a valuable resource for recreational and industrial fishing.
(PHOTO BY ROGER TABOR/USFWS)

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combat climate change, the landowner qualifies for carbon credits—a kind of tradable permit that offsets the emission of a certain amount of carbon dioxide. While retaining the credits, partners then transfer the restored land into our care. This work actively addresses climate change while filling in habitat gaps along migratory flyways. To date, partners have restored more than 70,000 acres in the Lower Mississippi River Valley alone.

A Monarch's Journey—A Legendary Transcontinental Migration

For many, the monarch butterfly evokes memories of grade school days spent huddled with peers around monarch chrysalises, discovering the wonder of metamorphosis. An ambassador for the world of pollinators, monarchs have inspired countless children and adults alike to witness pudgy striped caterpillars transform into striking orange and black winged butterflies.

Once monarchs take flight, their journey is phenomenal—a voyage of thousands of miles from Mexico to Canada and back, undertaken by an insect with a wingspan of only four inches. These stunning butterflies are also vital pollinators for countless varieties of colorful native wildflowers. Yet this invaluable butterfly, once a common part of our landscape and a symbol of summer, is now at risk.

It takes four generations for monarchs to complete their annual migration, and at each stage they are confronted with unique threats. Their migration timing, reproduction requirements, and overwintering habitat all rely heavily on temperature clues, making monarchs vulnerable to a changing climate. Caterpillars depend on native milkweed as their sole food source and adult butterflies need nectar flowers for refueling. As intensified weather events such as drought, excessive rain, and temperature variability impact these critical food sources, many monarchs are unable to complete their voyage.

Climate change, habitat loss, and pesticide and herbicide use are all contributing factors that are altering natural areas and forcing monarch migration patterns to change at a pace they cannot keep up with. Since the 1990s, we have witnessed a more than 80% decline of monarch butterfly populations in North America. In 2020, we announced monarchs warranted protection under the Endangered Species Act and they are now a candidate species until a listing decision is finalized.

Collaborative conservation efforts in the United States, Mexico, and Canada are crucial to ensuring this important species survives. We're working with partners, communities, and individual citizens to improve, restore, and create habitats to support monarchs within natural areas and along roadsides and backyards across North America. For example, we're creating and maintaining butterfly trails and gardens at national wildlife refuges, national fish hatcheries, and community areas across the nation. ››

Monarch butterflies roost along their multigenerational migration journey in an oak tree at Port Louisa National Wildlife Refuge. (PHOTO BY JESSICA BOLSER/USFWS)

Communities across the nation are coming together to volunteer in restoring habitats and creating safe refuges for migratory species along their perilous journeys. (PHOTO BY USFWS)

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A Pacific Salmon's Journey — From Snowcaps to Sea Caps

Imagine wading through salmon-filled pristine, coldwater streams, or spending summer days floating down wild whitewater rivers fishing and later savoring delicious salmon dishes. These experiences are made possible by a remarkable species that evolved over thousands of years, migrating from freshwater rivers and streams to salt water in the Pacific Ocean, and finally returning to their original natal stream. Their ancestral journey ends when they reproduce, die, and leave behind their vital nutrient-rich bodies to sustain many plants and animals. Because salmon are ecologically important throughout their lifecycle, they are considered a keystone species, a fish upon which the entire ecosystem depends. They are essential culturally and spiritually to many Native peoples and represent the symbol and lifeblood for numerous Tribes who call the Pacific Northwest home. They also have played a critical part in the economy in the Pacific Northwest for generations through recreational and commercial fishing.

Throughout their life, these resilient fish face countless obstacles including predators, habitat loss, pollution, dams, and passage blockages. Only a handful will successfully migrate. The rest will die before they are able to spawn.

These coldwater fish are a federally protected species that faces further challenges from climate change, which is causing an increase in stream and ocean temperatures. This warming alters the timing and magnitude of stream flows, raises sea levels, shorelines, and ocean current patterns — all critical components to a salmon's successful migration.

In the face of climate change, the Service and many partners, including Tribes, are working collaboratively to sustain salmon populations. Through engaged, multi-stakeholder partnerships, we're supporting habitat restoration projects, infrastructure and fish passage improvements, supplementation of wild populations through national fish hatcheries, and community education and engagement.

Ensuring the Splendor of Migration

It is natural to feel concern and even despair about the challenges climate change puts upon wildlife, including migratory species. Fortunately, we can turn this ship around.

Consider the 1970s, when the bald eagle was listed as an endangered species. We at the Service sprang into action, working with multiple partners to tackle the problem. Thanks to these efforts, the beloved bald eagle was removed from the endangered species list in 2007. Not only does this example provide hope, it also reminds us that our most important asset in tackling climate change is each other.

We at the Service are working within communities to protect and restore habitats and green spaces to foster safe havens for migrating species. Join us in these efforts! Create a backyard wildlife garden, add pollinator or native plant gardens to your local parks and schoolyards, or join a local stream restoration project. Observe and report seasonal patterns in your neighborhoods through formal community science groups and initiatives like the National Phenology Network or the Great Backyard Bird Count. As always, keep learning and teaching others about migratory species, climate change and the many ways we can collectively help. For the Baltimore oriole that traverses two hemispheres, the monarch that hatches in a hidden patch of milkweed, and the salmon that navigates strong currents, we can work together to preserve these wonders of nature for present and future generations. □

AUBREY KURTZ, National Wildlife Refuge System, Chincoteague National Wildlife Refuge; KATE NOVAK, Ecological Services, Mountain-Prairie Region; and LEAH SCHRODT, Ecological Services, Pacific Region

STEWARDS OF THE LAND

Ranchers are on the front lines of conservation.

By CHRISTINA STONE

Every morning, ranchers across the country are up and moving before most of us have even had our morning coffee. To them, ranching is more than a job. It's a promise to protect and care for the land, a promise often passed down from generation to generation. Being stewards of our lands is challenging but vitally important, and their efforts play a critical role in supporting our communities, economy, and the environment. ››

(Above) Ungrazed prairie left for 20 years (left) vs. grazed (right). (PHOTO BY CLINT WIRICK/USFWS) (Left) Kansas Partners for Fish and Wildlife State coordinator Mike Disney shows the height grass can grow when grazing is deferred. (PHOTO BY ARON FLANDERS/USFWS)

"When you view land as a community and you're part of that community, that's when you can start to really love and cherish the land. And I want to be part of the community. I want to be part of this web of life that's going on out there," Kansas rancher Bill Sproul says. "I don't want to conquer the land. I want to be part of the land."

When considering the day-to-day life of living on the land, most of us probably picture idyllic images from movies, a simple life, but the reality is there is a lot more to ranching. It requires big-picture vision and attention to what most would consider even the smallest detail: grass.

Vital

Grasslands are one of the world's most critical ecosystems, providing habitat for resident and migrant birds and mammals, protecting against drought, flooding, and wildfire, as well as reducing the amount of carbon dioxide in the atmosphere. While forests and oceans command the world's attention for their capacity to reduce carbon, grasslands are the unsung champions of carbon reduction. The root system of native grasses is surprisingly deep, some reaching 6 feet in depth. This allows for the storage of carbon deep underground, reducing the amount of carbon dioxide in the atmosphere.

Underneath these lands, critical natural processes take place without fanfare or recognition, all under the careful watch of ranchers.

"If you want to have an open, healthy prairie, one of the best stewards of the prairie is the rancher, because the rancher wants open space grassland," Sproul says. "I hope that people start to understand what the prairie is and how important this plant community is to air quality, to water quality, to wildlife, to humans, everything. There's not very much prairie left. It's important we keep some of it around and then we try to do the best we can with it. That's what gets me up every morning and keeps me going right now, is working with the land."

Grazing Helps Grass Grow

Negative perceptions about grazing practices often focus on the risks of over-grazing, which can strip the land of nutrients needed to support grass growth. However, as with most things, nature needs balance, and good grazing practices increase ecosystem resilience and soil health.

For thousands of years, herds of bison, elk, deer, and pronghorn roamed the lands that now stretch from Alberta, Canada, to Texas, as far east as Illinois, and as far west as California and Oregon. These herds enjoyed miles upon miles of pristine grasslands with "hardly a bush to disrupt the vast prairie," according to 19th-century pioneer and sheepman George Kendall. We are learning just how important those animals were for keeping the prairies healthy.

Those herds have disappeared and, today, we need a more hands-on approach to land management. When grasslands are not managed, they can start to decay and the grass loses its nutritional value. This reduces its value for both cattle and grassland-dependent wildlife.

As the grass gets tall and falls over in autumn, it creates a layer of dead grass the next spring called thatch. This becomes an impenetrable wall that new native grass can't get past—but heartier plants, such as invasive grasses and woody species like weeds, trees, and shrubs, can. As the thatch becomes more and more dense, less water gets into to the soil, leading to increased runoff and degradation of soil health, making it even harder for grass to grow.

Over time, woody species, many of which are invasive, take over the grassland, and the native grasses are pushed out. This invasion transforms the area and eliminates critical habitat for native plants, animals, and invertebrates. Conserving grasslands is crucial for the conservation of many imperiled species.

As we've come to understand the importance of grasslands, conservation agencies and partners have committed to removing trees and invasive plants to restore our native prairies. ››

Cattle on Kroll Waterfowl Production Area in North Dakota. (PHOTO BY KRISTA LUNDGREN/USFWS)

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The Importance of 'Hoof Action'

While machines can help keep grasslands healthy, one of the most economical ways to manage grass is by returning to nature: with animals. As grazing animals move over the land, their hooves leave divots in the ground where seeds and water can fall. The herd then packs down those seeds and water, and the animals' waste fertilizes them, eventually giving rise to the next generation of grass. This is known as "hoof action."

Hoof action plays other roles in managing grasslands, too. The divots left by hooves turn into tiny pools supporting invertebrates, tadpoles, and all sorts of organisms. Many of them play a larger role in other ecological chains.

For example, we discovered that grazing practices helped sustain an endangered species. When the Wyoming toad was discovered in Laramie, Wyoming, biologists found that the tadpoles had been living in the small pools left behind by cattle. When the cattle were removed from the land, biologists observed several effects, including the loss of this key habitat for tadpoles.

Additionally, biologists discovered the herd had been keeping invasive plants from overtaking the area, which helped to slow the spread of one of the greatest threats to the Wyoming toad, the Chytrid fungus. This is a deadly skin disease that can kill an animal in less than three weeks and is responsible for a decline in amphibians across six continents.

Chytrid fungus thrives when plants become so overgrown that sunlight cannot break through, creating a dark, moist environment perfect for this disease to spread. In the absence of land management practices that control this overgrowth, the fungus spreads unchecked, and infected animals struggle to find the most effective cure: sunlight. As biologists learned more about the

(Left) Bill Sproul. (PHOTO BY TONY IFLAND/USFWS)(Above) Wyoming toads enjoy a micropool. (PHOTO BY DOMINIC BARRETT/USFWS)

relationship between grazing and the recovery of this endangered species, it became more apparent that, without the herds on the plains of Laramie, the toads might have gone extinct before anyone realized they were there. Now, biologists use sustainable grazing practices to help conserve and restore this species.

When grazing animals roam over land, their hooves stamp down and weaken less-desirable plants, usually weeds, giving more desirable, native plants the chance to grow. This causes a chain effect of benefits: As plant biodiversity improves, so too does the diversity of pollinators, which then attracts a broader range of wildlife. In a healthy ecosystem, a diversity of plants, animals, and insects ensures the natural cycles that maintain the system.

Without hoof action, grasslands decline and plants, animals, and insects that migratory birds rely on it suffer. Migratory birds, and a variety of other grassland-dependent wildlife, have declined dramatically since 1970. In that time, grassland birds have lost 53% of their populations in North America, a loss of over 700 million birds.

Sustainable Ranching for the Future

Most grasslands in the United States are privately owned. A large portion of that land is used for agriculture, which means the care and conservation of these key ecosystems are up to individual landowners, the stewards of the land.

"The prairie pothole region is known to produce the majority of the migratory waterfowl in the nation. The first thing we need to acknowledge is that over 90% of South Dakota is privately owned, so we are not going to reach our conservation goals, particularly for migratory waterfowl in the state, unless we find these win-win solutions with landowners," says Kurt Forman, coordinator of our South Dakota Partners for Fish and Wildlife.

As economies and populations continue to grow, so too does our global consumption of animal-based foods. Science continues to point to emissions produced from agriculture, specifically livestock production, as a major factor to consider when responding to climate change.

No single solution addresses the many challenges we face in conservation. While livestock production is a contributor to global emissions, it is important ››

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to remember that there are different approaches to raising livestock. Sustainable grazing practices are essential to conserving our grasslands and the fish and wildlife species that depend on them. In fact, the industry has shifted to the term "regenerative grazing" to incorporate the practices of building, rebuilding, or restoring degraded grasslands, alongside sustainable practices such as rotating herds and crops, planting diverse crops, using no-till agriculture, and keeping the lands covered during off-seasons. Together, these techniques promote soil health by restoring and maintaining carbon.

Win-win

Ranchers understand the importance of healthy grasslands. Good stewardship practices are key to maintaining a profitable operation important for financial security as well as benefitting wildlife. Healthy grasslands provide many more benefits, too, including increased resistance to wildfire, drought, flooding, invasive species, and disease. They also perform a major role in the natural carbon cycle.

Key partnerships within the conservation community—like Working Lands for Wildlife (WLFW)—work directly with ranchers and landowners to maximize both these environmental outcomes and the benefits to the hard-working families that steward these lands and the wildlife that depend on them.

"WLFW bridges wildlife conservation with the people who are supported by these landscapes, focusing on voluntary, locally led conservation that produces win-win solutions that keep working lands in working hands while benefitting wildlife," says Tim Griffiths, Western Working Lands for Wildlife coordinator with the Department of Agriculture's Natural Resources Conservation Service.

"Conserving grasslands at scale requires an all-hands-on-deck approach. Combining landowner 'know how' with new spatial technology helps ensure the right practices hit the ground in the right places to keep rangelands productive, intact, resilient and healthy."

Storing carbon in the rich soils of grasslands and shrublands plays a significant role in sequestering carbon emissions from fossil fuels. Despite occupying only 37% of the Central Grasslands, grasslands, shrublands, and wetlands contain as much as 50% of the region's carbon stock. However, in addition to being considered one of the world's most critical ecosystems, grasslands are also one of the most altered and imperiled. All over the world, native grasslands have been replaced with vast stretches of crops, urban development, and invasive species.

According to the JV8 Central Grasslands Conservation Initiative, an average of 2 million acres of grassland are lost each year. This has led to a decline in the amount of carbon stored inside the soil.

"Grandpa was out here farming the land and they drained the wetlands because that's what they did back then to get more acreage and more production," says North Dakota landowner Chad Kunz. "Forty years later, we're restoring the wetlands, for the wildlife, and that's what we enjoy and what we feel strongly about. Have the grass for the wildlife and cattle."

Increasing regenerative ranching on grasslands contributes to the restoration of important ecological processes that has the potential to allow for even more carbon capture and storage. If you think that's impressive, think about regenerative ranching combined with the immediate benefits of increased productivity and protection against drought, flooding, wildfire, and disease. While forests store carbon above-ground and are highly susceptible to wildfires, grasslands are better-protected from wildfires by storing carbon deep in the soil.

The National Cattlemen's Beef Association has also made commitments to a sustainable future, aiming for carbon neutrality by 2040. "Cattle producers in the United States play a vital role in mitigating climate-related risks. And in the face of growing concerns related to climate change, the cattle industry commits to showing that we are part of the solution. The cattle industry is committed to leading the charge to ensure that farmers and ranchers have the most up-to-date research and technologies related to carbon sequestration and emissions reduction."

In many cases, efforts to restore or conserve these ecosystems have cascading benefits such as cleaner water; improved resilience to wildfire, flooding, and storms; and protected ecosystems for wildlife and people. Ranchers take great pride in their land and want to leave it in better shape than they received it, ensuring the ranch is sustainable for future generations. □

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WORKING TOGETHER

Collaborative conservation and Indigenous Traditional Ecological Knowledge fuel wildland fire management.

By GRACE RODGERS *and* LEAH SCHRODT

A prescribed burn on Florida Panther National Wildlife Refuge. (PHOTO BY JOSH O'CONNER/USFWS)

Since time immemorial, Indigenous peoples have used fire as a land management tool, shaping the land as we know it. But when European settlers arrived, they adopted a fire-exclusion approach and prevented the use of traditional fire practices. Today, we are grappling with the consequences of those actions.

Wildfires naturally occur, but changes to fire management practices — including the prevention of traditional practices, coupled with hotter, drier, and longer fire seasons due to climate change — cause increased fuel buildup and create environmental conditions for more frequent and intense fires.

These changes add challenges to wildfire management and endanger human lives, communities, infrastructure, and the natural resources we depend on. Tribal communities, with their close connection to the land, are disproportionately impacted.

Restoring balance in this complex ecosystem is difficult and requires all our resources and dedication. For this reason, wildfire managers are learning from Indigenous Traditional Ecological Knowledge — the knowledge acquired by Indigenous peoples through many generations of direct contact with the environment in a particular place — in the ongoing efforts to develop a solution. Addressing these impacts compels the Service and our many partners, including Tribes, to work toward a collaborative conservation model of landscape and wildland fire management.

The Important Role of Wildfires

Fire is a vital conservation tool. Roughly 80% of Service-managed lands, from marsh to forest to prairie, evolved with fire and depend on periodic burns to remain productive wildlife habitats.

On fire-adapted landscapes with frequent natural wildfires, less severe fires naturally "clean" the forest. These less-severe fires decrease diseases and invasive species, provide more food for wildlife from the fresh growth, and remove flammable and thick vegetation to allow more sunlight and support a diversity of life. They also enrich the soil from the ashes of plants, fallen leaves, pine needles, and small woody debris.

While wildfires can be a tool for regeneration, extreme fires fueled by climate change can be devastating for species, habitats, and surrounding communities. By working with multiple stakeholders, including Tribes, we are more equipped to address the impacts of severe wildfires.

Learning from Indigenous Traditional Ecological Knowledge

For generations, Indigenous peoples have been living in harmony with fire-adapted-and-dependent lands through applying Indigenous Traditional Ecological Knowledge landscape management practices. These traditional practices vary across Indigenous communities. ››

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More than just decreasing the threat of catastrophic wildfire and supporting resilient lands, controlled, less-severe fires often promote the growth of culturally significant resources. Fresh shoots from willow and bear grass for basketry material and new plant growth to support deer and elk populations are two examples.

Indigenous Traditional Ecological Knowledge is particularly important for identifying environmental changes attributable to climate change at the local and regional level. Understanding traditional practices and the potential impacts of climate change on land, wildlife, and subsistence users is critical during federal decision-making processes. Applying an Indigenous Traditional Ecological Knowledge lens informs conservation of species and habitats, provides a comprehensive approach for climate change projects, and shapes the ways the Service collaboratively manages fire on while reducing the risk of damage to surrounding communities.

Finding Solutions through Collaborative Management

Three locations across the country provide a model for the ways in which the Service, Tribes, and our many partners are working together to address the impact of climate change and wildfire:

Alaska

While wildfire varies from year to year, Alaska's fire season is becoming hotter and longer, creating environmental conditions for more frequent and intense fires. Over the past 30 years, Yukon Flats — the traditional homeland of the Gwich'in and Koyukon Athabascan people in eastern interior Alaska — has experienced a clear shift toward more frequent, larger fire seasons. Since 1988, the frequency of years that burned over 250,000 acres on Yukon Flats has quadrupled.

After the Swan Lake Fire on Kenai National Wildlife Refuge in Alaska, new growth provides important food for many browse species (PHOTO BY LISA HUPP/USFWS)

That's of particular concern for Alaska Native peoples who follow traditional subsistence ways of life, given that access to certain species can be a matter of life and death. The smoke risk is also a health concern for remote villages, where access to health care is limited, and hospitals and clinics are difficult to access.

"With ecological transitions happening so rapidly, it's not practical to plan for a steady-state refuge," says Jimmy Fox, Yukon Flats National Wildlife Refuge manager. "We have to plan for the future refuge — one that may have a different suite of species assemblages and wildfire regimes."

Back in 2020, the Service and the Alaska Conservation Foundation (ACF) signed a five-year cooperative agreement to enhance collaborative conservation by leveraging resources among the Service and its many partners through the Northern Latitudes Partnerships (NLP). Since then, Alaska Native Tribes, Alaska Native organizations, the Alaska Department of Fish and Game, and the Service have worked together to design six high-priority projects.

(Above) A controlled burn at William L. Finley National Wildlife Refuge in Oregon to reduce the risk of wildfire and improve key wildlife habitat. (PHOTO BY BRENT LAWRENCE/USFWS)

One of these high-priority projects invited scientists, Tribal members, and Alaska Native organizations to discuss climate change impacts from current and projected wildfire dynamics, carbon emissions, and permafrost melting. With the help of the Alaska Fire Science Consortium, the project continues to help ongoing conversations with Tribes and inform wildfire management in and around Yukon Flats National Wildlife Refuge.

Oregon

For years, the Service and partners have worked to mitigate climate change and the risk of extreme fire in southwest Oregon. Lomakatsi Restoration Project is a primary partner in this region. For nearly three decades, the nonprofit has focused on creating social equity and economic opportunities, while working collaboratively to enhance wildlife habitat and reduce wildfire risk.

"By working closely with community-based nonprofit organizations like Lomakatsi, we're able to leverage Service resources and expertise into projects that meet the diverse needs of local communities and jurisdictions, while promoting ecocultural values," says CalLee Davenport, acting regional coordinator for the Service's Partners ››

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for Fish and Wildlife program. "With an all-lands restoration approach, we maximize the benefits to wildlife habitat and reduce the risk of wildfire on a landscape scale."

Lomakatsi champions Tribal members as the first, best stewards of the land.

"'We are still here' is the regional Tribal motto," says Belinda Brown, Lomakatsi Tribal partnerships director. "Involving Aboriginal people in collaborative, landscape-scale restoration projects brings a wealth of place-based knowledge and promotes ecocultural values that are essential to Tribal communities"

Through their Tribally led Tribal Partnerships Program, Lomakatsi assists Native partners in building their capacity through workforce development, training programs, and fostering Tribal businesses, layered into landscape-scale restoration projects.

Two projects exemplify these Indigenous Traditional Ecological Knowledge informed collaborative efforts on wildfire:

Initiated in 2015, the Table Rocks Oak Climate Adaptation Project aims to reduce community wildfire risk and restore critical oak habitat at a regionally iconic and important cultural site in the Rogue Valley, while returning beneficial fire to the land.

Since 2010, the Ashland Forest Resiliency Project has become recognized as a national model for ecological community wildfire protection, treating 13,000 acres with ecological thinning and prescribed fire. "By working closely with partners such as the Service across federal, city, and private lands, the Ashland Forest Resiliency Project is reducing the risk of severe wildfire in a changing climate and helping to protect wildlife, communities, and drinking water," says Marko Bey, executive director of Lomakatsi.

Arizona

The Service's Southwest Region focuses on strong and holistic ecological restoration initiatives with support from Tribal partnerships and Indigenous Traditional Ecological Knowledge — all of which is increasingly necessary as fire seasons lengthen and fire intensity heightens. Two such restoration projects, one nearing completion and another in its introductory stages, are:

On Buenos Aires Wildlife Refuge in Arizona, the Cumero Burned Area Rehabilitation Project successfully planted close to 13,000 plant, bush, and tree species following the 4,000-acre Cumero Fire in July 2018. The restoration approach is inspired by the traditional Three Sisters Planting practice, a method used by Native people for thousands of years for their agricultural needs. The ongoing project successfully planted species in triads — corn, beans, and squash — to enhance soil fertility and plant growth.

Along the Gila River drainage south of Phoenix, a second Burned Area Rehabilitation Project is helping restore vital habitat. Threatened and endangered species, including the yellow billed cuckoo, Yuma ridgeway's rail, and willow flycatcher, use this vastly ecologically important habitat damaged by the Avondale Fire in June 2020. The site has also been utilized by Native peoples for generations. As part of a larger restoration cooperative through the Rio Reimagined group, this rehabilitation project combines a coalition of organizations consisting of federal agencies, state, and local governments and consults with Tribes on cultural resource impacts.

Deer and elk benefit from the fresh growth of plants after wildfire. (PHOTO BY TOM KOERNER/USFWS)

Building Wildfire Resilience in Our Communities

Collaborative conservation management invites all of us to take part. Roughly 80% of wildfires in the United States are ignited by humans. These preventable wildfires threaten lives, property and precious natural resources.

Find out if you live in a wildfire-risk zone and follow safety recommendations on Firewise. In your community, address wildlife habitat loss by planting vegetation that provides food and shelter for birds and insects. Also, participating in your community's urban planning can help encourage responsible building practices in environments near fire-prone ecosystems.

All together, we can improve collaborative landscape management by applying Indigenous Traditional Ecological Knowledge aimed at achieving conservation objectives and honoring socio-cultural values. Through listening and learning more about Indigenous Traditional Ecological Knowledge and landscape management, we can continue to collectively improve wildfire resilience and forest health while protecting our ecosystems and communities in the face of climate change. □

GRACE RODGERS, External Affairs and Science Applications, Alaska Region, and LEAH SCHRODT, Ecological Services, Pacific Region

CHANGING AS CONDITIONS CHANGE

Climate change is rapidly transforming wildlife habitat across the country. The Resist-Accept-Direct framework can help land managers keep pace.

By OLIVIA GEIGER, KAITLYN LANDFIELD, ANSLEY NASH, *and* MASON WHEATLEY

Since the Blackwater National Wildlife Refuge's establishment in 1933, 5,000 acres of marshland have been lost due to sea level rise—and this trend is continuing.
(PHOTO BY STEVE DROTER/USFWS)

Alongside a paved road at Blackwater National Wildlife Refuge in Maryland, a large-yet-unassuming body of water sits just beyond a stretch of grassy marsh. From the adjacent observation deck, visitors can see birds roosting or watch the sun set and find nothing out of the ordinary. But for those with a trained eye, like refuge biologist Matt Whitbeck, the sight is alarming.

Five thousand acres of tidal marsh once sat here, Whitbeck explains. Decades of sea level rise have drowned out the habitat, leaving behind only this quiet pool, christened Lake Blackwater. Knowing that, it's harder for Whitbeck to appreciate the view.

"'One of the penalties of an ecological education is that one lives alone in a world of wounds,'" he says, quoting early conservationist Aldo Leopold. Blackwater is a grim case study on the effects of climate change. Since the refuge was established in the 1930s, rising waters have swallowed nearly half its historic wetland habitat, with more disappearing each year, and the encroaching salt water has left swaths of dead trees, called ghost forests, in its wake.

Salt marsh-dependent birds like the saltmarsh sparrow and black rail have all but vanished from the refuge as this valuable habitat disappears, and the threat of total population collapse looms large over these species.

It's not just wildlife that are at risk. With the advent of more frequent and intense storms, losing these wetlands means losing the buffer that absorbs storm surge and prevents extreme flooding in coastal communities. Virtually all these wetlands could be under water by 2100.

Dramatic transformation is happening here and elsewhere. When it comes to tackling these challenges, the old ways of natural resource management are no longer sufficient. The speed and severity of climate change has altered the rules of the game. A new approach to managing through this change is needed, and we're at the forefront.

Focusing on the Future

Wildlife managers traditionally focus on restoring habitats and wildlife populations to what they looked like in years prior, also known as "baseline conditions." With climate change causing unprecedented and irreversible changes to the lands and waters, wildlife managers are focusing less on what things looked like in the past and more on what things will look like in the future.

What exactly are these changes? Scientists are calling them ecological transformations. Ecological transformations occur when habitats and the communities of plants and animals that depend on them shift from one state to another — from estuary to freshwater wetland, salt marsh to mangrove forest, or spruce forest to grassland.

"Traditional wildlife management relies on the principle that baseline conditions don't change, but ecological transformation turns that principle on its head," says Scott Covington, one of our senior ecologists. "Wildlife managers may reluctantly accept that baselines are changing, forcing them to shift management paradigms and seek alternative frameworks to address the issue."

In response, we and other federal resource management agencies proposed the Resist-Accept-Direct, or RAD, framework, building upon decades of research for addressing wildlife management in the face of rapid change. Partners include the National Park Service, U.S. Geological Survey, Bureau of Land Management, U.S. Forest Service, and National Oceanic and Atmospheric Administration.

The framework provides three pathways for managers to consider when approaching conservation:

- Resist represents traditional wildlife management. Actions are taken to counteract changes and restore habitats and populations to baseline conditions.

- Accept is a conscious decision to take a hands-off approach to the transformation, allowing habitats to transition without intervention. This method accepts the loss of some species and habitats and the establishment of others.

- Direct allows managers to incorporate future projections of the land and take actions that work alongside occurring transformations. The goal is to steer change in ways that continue to support biodiversity and provide ecosystem services.

Here is a sampling of how the RAD framework is being applied at Service-managed lands across the country:

Resist: Billy Frank Jr. Nisqually National Wildlife Refuge, Washington

Billy Frank Jr. Nisqually National Wildlife Refuge is no stranger to ecological transformation. Before we obtained the land for the refuge in 1974, a five-mile-long dike had cut off the estuary from tidal inundation for a century. The dike was built to block salt water and tides so the area could be converted into rich farmland. Eventually, agricultural activity ceased, and rainwater collected in the former fields, transforming them into freshwater wetlands.

Over time, the wetlands were degraded by invasive reed canary grass and provided little habitat for wildlife. Refuge managers opted to resist these changes and restore the wetlands back to baseline condition, a high-functioning estuary. In 2009, they collaborated with Nisqually Indian Tribe and Ducks Unlimited to remove the dike.

Since natural tidal flow was restored, the estuary's native vegetation has been slowly recovering and food resources have rebounded. The estuary now supports an abundance of wildlife, including the culturally significant and federally threatened Chinook salmon and a diversity of waterbirds.

For now, choosing to resist has created quality habitat for many species. Managers know the estuary will look very different in the coming decades with climate change, however.

The highest sea level rise projections show much of the tidal marsh habitat will transform to unvegetated mudflat or ››

(Top) Nisqually National Wildlife Refuge after the removal of a dike. (Bottom) A 19th century dike cut the estuary at Nisqually National Wildlife Refuge off from tidal flow, and it eventually turned the landscape into a freshwater wetland. (PHOTOS BY GLYNNIS NAKAI)

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submerged habitat by 2100, while other parts of the estuary will creep farther inland. Recognizing the inevitable, managers have expanded the refuge's approved boundary up-river and are keeping an eye on future land acquisition and habitat restoration that will help the refuge adapt to ongoing landscape changes.

Accept: Chassahowitzka National Wildlife Refuge, Florida

Crystal River National Wildlife Refuge Complex, which consists of Crystal River, Chassahowitzka, Egmont, Passage Key, and Pinellas National Wildlife Refuges, has felt the effects of sea level rise acutely, as encroaching saltwater shifts freshwater ecosystems to brackish and brackish ones to salt water.

In the face of such strong forces, managers are left with few options besides accepting the change. Changes in salinity and, consequently, vegetation will force many wildlife species to leave the area, seeking better-suited habitats, while new, salt-tolerant plants attract other animals.

"On Chassahowitzka Refuge, there is not a lot that can be done to combat or compensate for sea level rise and the changes to the habitat," says Joyce Kleen, a wildlife biologist at Crystal River Complex.

Mangrove trees at the refuge exemplify this changing ecology. In the past, occasional freezes hindered their spread, and a lower sea level limited the area where the saltwater dwellers could place roots. Rising seas and an increasing average temperature are facilitating mangrove expansion eastward.

Warden Key and the Crystal River National Wildlife Refuge Complex, which the island is a part of, has experienced such drastic effects of sea level rise that managers have sought new ways to protect wildlife. (PHOTO BY JOYCE KLEEN)

Kleen says the refuge has implemented several stopgap measures to keep these changes at bay and make the area habitable for native species. Yet, one refuge can do only so much to hold off the inevitable changes of a rising tide.

Direct: Kenai National Wildlife Refuge, Alaska

At Kenai National Wildlife Refuge, a warmer and drier climate has hindered the native Lutz spruce trees' ability to produce sap, which defends against pests. The trees have grown more vulnerable to the spruce bark beetle, whose population has skyrocketed with warmer weather. With reduced defense and more bugs, trees across the peninsula's southwest corner have died, making space for grass to quickly take over and turn the landscape, once a spruce forest, into a grassland.

Resisting and accepting this change were largely off the table at Kenai. Replanting a native spruce forest would only cause the destructive cycle to continue and allowing the newly established grass to remain would leave the landscape a depleted monoculture with one grass species covering nearly 90% of the land.

Managers are contemplating a third option: Directing this change to foster a healthier, biodiverse area in drier, warmer conditions. ››

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One option is to usher in the growth of another forest ecosystem by bringing in non-native plants, such as lodgepole pine. Many neighboring landowners have already done this, including the Ninilchik Native Association.

Another option, says John Morton, who served as supervisory biologist at Kenai for two decades, is to direct the flora already there.

"What you have now is a big grassland, without a grazer," Morton says. Bison, he believes, are the foundational species the land needs. Through grazing and wallowing, they would introduce "patchiness" to the monocultured grassland, creating space for other plant species to grow and a more stable, richer environment. The approach would allow the landscape to operate as a resilient, self-reliant, steady-state system.

For now, at Kenai, refuge managers are researching options before committing to a direction—a choice that will have lasting impacts on the landscape and the species that call it home.

A New 'Gold Standard' for Conservation

At Blackwater, Matt Whitbeck remembers a time in his career when the "gold standard" of resource conservation was to restore land and water back to baseline conditions. The impacts of sea level rise on the refuge, however, have made that vision unattainable.

"Blackwater is changing, whether we like it or not," Whitbeck says. "So, we've just got to acknowledge it, and work with it the best we can."

Rather than try to preserve all the current tidal marsh, the refuge has identified areas that may be more resilient or are most valuable to the refuge's focal species to resist the effects of sea level rise. Staff has also placed conservation protections where future tidal marsh is expected to occur and is working to direct upland habitats into productive salt marsh.

Our efforts at Blackwater and across the United States are works in progress, and RAD won't address climate change overnight. But that's the nature of this emerging approach: It's a framework for building climate resilience that, as the late Rachel Carson described in her 1948 Service publication "Guarding Our Wildlife Resources," "is dynamic, changing as conditions change, seeking always to become more effective."

The RAD framework simplifies the decision process, Covington says, but it doesn't absolve managers from making hard decisions. Climate change is a pervasive, global force demanding a new gold standard for resource management and stewardship, now and in the future. The challenge facing the Service, Morton suggests, is to help shape that future or be shaped by it.

"What's different about climate change, as a driver and stressor on the system, is it knows no boundaries. You can't draw your refuge boundary and hold it back," Morton says. "It's coming across the landscape, and that's the way it's going to happen. So, we may as well take control of it. We may as well be responsible for the outcomes." □

OLIVIA GEIGER, External Affairs, Northeast Region; KAITLYN LANDFIELD, Science Applications, Pacific Region; ANSLEY NASH, External Affairs, Northeast Region; and MASON WHEATLEY, External Affairs, Northeast Region

(Above) Supervisory wildlife biologist Matt Whitbeck has helped lead efforts to stem the loss of marsh at Blackwater National Wildlife Refuge. (PHOTO BY STEVE DROTER/USFWS)

(Left) Protecting habitat for the salt marsh sparrow, one of the most cherished and most threatened birds on the Atlantic Coast, is one of the largest priorities for managers on many East Coast refuges under threat from sea level rise. (PHOTO BY PETER PATON)

RETURN TO THE RIVER

Restoring Tribal land shows power of collaborative conservation.

By SYDNEY GIULIANO

Fones Cliffs is distinguishable by its stunning white cliffside.
(PHOTO BY JEFFREY ALLENBY/CHESAPEAKE CONSERVANCY)

Rising more than 100 feet above the glittering waters of the Rappahannock River, Fones Cliffs is unmistakable. Its pristine white cliffside teems with wildlife. Rushing water and the call of eagles create a welcoming harmony. This is a sacred space.

This land is the ancestral home of the Rappahannock Tribe, and after centuries of separation, land and Tribe are united once again.

On April 1, in collaboration with Rappahannock River Valley National Wildlife Refuge and the Chesapeake Conservancy, Rappahannock Tribal leaders hosted Department of the Interior Secretary Deb Haaland, Service Director Martha Williams, and other partners to celebrate the Tribe's reacquisition of 465 acres of Fones Cliffs adjacent to the refuge.

"It is difficult to put into words how much it means to our people to walk in the footsteps of our ancestors who were driven from these very lands nearly 400 years ago," Chief Anne Richardson says. "Their spirits remain here, and we will remember and respect them, as we do the eagles, plants, and wildlife that thrive here. We were river people then and will continue to be river people in the future."

Recognizing the Past

Before the ceremony, Secretary Haaland, Director Williams, and representatives from the Chesapeake Conservancy, National Park Service, National Fish and Wildlife Foundation, and U.S. Fish and Wildlife Service took a boat tour of Fones Cliffs. From the water, they witnessed a view not unlike the one Captain John Smith might have seen during the first English encounter with the Rappahannock Tribe in 1607.

At that time, the cliffs were occupied by three villages: Pissacoack, Matchopick, and Wecuppom. English settlement began encroaching on these Tribal lands in 1640. During the following seven decades, the Rappahannock people contended with colonial violence and expansion that eventually forced them from these ancestral homelands.

During April's homecoming celebration, the Tribe restored the original name of Pissacoack to the reacquired land.

Although there are no plans for archaeological exploration at this specific property, St. Mary's College of Maryland anthropology professor Julia King and her team of archaeological instructors and students have conducted digs at adjacent properties on Rappahannock River Valley National Wildlife Refuge. During these studies, the team unearthed evidence of Indigenous inhabitance dating back to the 1600s.

By studying these artifacts, as well as the land in which they were discovered, we learn more about our shared history and the lives of those who came before us.

So much of how a people defines itself is rooted in their sense of home. The places where we grow, learn, and experience life are the cornerstones of our character. By holding spaces significant to our heritage as a nation, we transform these lands into cultural classrooms. When we visit these locations, we discover the world through ancestral eyes and better understand the foundations of American society.

"When we work together to conserve significant locations like Fones Cliffs, we continue the complicated work of honoring a shared history and recognizing our national identity, an identity that is rooted in stories of faith, conflict, courage, and resilience," Secretary Haaland said at the ceremony.

Passionate Commitment

This was not a simple transaction. The opportunity was the result of careful coordination, strategic financing, and above all, committed and passionate individuals.

Through the generosity of the family of William Dodge Angle, M.D., and with support from the National Fish and Wildlife Foundation and a grant from Walmart's Acres for America Program, the Chesapeake Conservancy purchased the land and donated a conservation easement to the Service. Land ownership was donated to the Rappahannock Tribe, which intends to place the property in trust with the Bureau of Indian Affairs.

Through the easement, the Service will have an opportunity to work in close collaboration with the Tribe on conservation of the natural and cultural resources found there. This agreement preserves the Tribe's private ownership rights and permanently protects the land from development.

More to Do

This celebration marks just one victory in the larger effort to reclaim and protect more than 2,000 acres at Fones Cliffs. The adjoining acreage is owned by a corporation seeking to develop the land for residential and commercial use. In 2014, developers illegally cleared more than 13 acres along Fones Cliffs, weakening natural defenses against erosion and destroying essential wildlife habitat.

Without healthy root systems to secure sediment at the cliffside, cleared locations are susceptible to landslides. Although the cause is uncertain, in 2020, a local ››

"It is difficult to put into words how much it means to our people to walk in the footsteps of our ancestors who were driven from these very lands nearly 400 years ago," Chief Anne Richardson says. (Photo by Tami Heilemann/DOI)

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fisherman discovered a landslide 800 feet long, where 28,000 tons of soil had slid off the cliff face adjacent to this clearing. This sediment contaminated the Rappahannock River with nitrogen, threatening the delicate balance of nearby ecosystems.

Neighboring wetlands, as well as large marshes across the river, are of crucial import to rare and threatened plant life and several protected species of fish and waterfowl. Fones Cliffs is a global Important Bird Area for resident and migratory birds. This essential habitat is the sheltering site for the mid-Atlantic's largest population of bald eagles, which hold spiritual significance to the Rappahannock Tribe as prayer messengers.

A "true partnership" led to Fones Cliff conservation, Service Director Martha Williams said at the ceremony. (PHOTO BY TAMI HEILEMANN/DOI)

A Voice for Nature

Part of honoring the past is recognizing its place in the present and future. The Rappahannock Tribe intends to expand their Return to the River program to Pissacoack. This initiative teaches leadership skills and passes down traditional cultural knowledge of the river to Tribal youth. This property will help the Tribe retain their cultural identity and maintain the traditions of their ancestors.

The Tribe plans to create trails and a replica of a 16th-century village, where they can educate the public about their history and Indigenous approaches to conservation. This interpretive opportunity is essential. For decades, Indigenous voices have been silenced and sidelined. The public will learn about the Rappahannock Tribe's history, traditions, resilience, and commitment to conservation. ››

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"As we stand together in this sacred place," Director Williams said at the ceremony, "we're reminded of what true partnership can look like and achieve: passionate people working collectively with a shared mission of conserving our natural and cultural resources for the benefit of future generations."

This project sets a precedent for collaborative conservation. By valuing the assets each partner has to offer, this joint effort proves that ownership does not need to be exclusionary. Instead, organizations and nations with similar goals can pool resources and knowledge to find ways to cooperate in the interest of conservation.

"Successes of this magnitude don't happen without collaboration among committed partners," says Chesapeake Conservancy CEO Joel Dunn. "Chesapeake Conservancy is proud of our engagement over the years to protect Fones Cliffs, and we continue to stand united with the Rappahannock Tribe, the U.S. Fish and Wildlife Service, and so many conservation organizations and individuals whose diligence and commitment contributed to the success of this project."

We're committed to pursuing innovative conservation strategies to serve both wildlife and people. Evidence of this commitment will flourish far above the Rappahannock River, where bald eagles soar and new generations of conservation stewards put down roots. □

SYDNEY GIULIANO, External Affairs, Northeast Region

Marshlands directly adjacent to Fones Cliffs.
(PHOTO BY JEFFREY ALLENBY/CHESAPEAKE CONSERVANCY)

Model *for the* Future

White Slough Tidal Wetlands Restoration Project is the first of its kind in Humboldt Bay.

By JOHN HEIL

Deputy Project Leader Jason Storlie looks on as work wraps up on the White Slough Tidal Wetlands Restoration Project. (PHOTO COURTESY OF JILL DEMERS/ HUMBOLDT COUNTY RESOURCE CONSERVATION DISTRICT.)

A multitude of benefits and a model for the future. That's the result of the White Slough Tidal Wetlands Restoration Project, which was completed in fall 2021.

It is the first project in California's Humboldt Bay to tackle a failing levee, sea level rise, and the loss of important habitat by improving infrastructure. This "proof of concept" pilot project has been a team effort spanning seven years from planning to completion with many partners and professionals.

We managed the project, which restored 41 acres of salt marsh habitat on Humboldt Bay National Wildlife Refuge. The project makes the banks of White Slough a resilient living shoreline that provides flood protection for ranchlands and roads.

Help Needed

It began in 2014 shortly after a tide breached the dike in the area, threatening to convert critical marshland to mudflats.

"We knew we needed to take action right away," says former refuge manager Eric Nelson, who, along with Service civil engineer Conor Shea, developed the initial design for the project in 2012 before the breach.

The first steps were raising land surface elevations to levels that would support marsh vegetation and then breaching the dike around the unit.

Up to 180,000 cubic yards of clean sediment increased the level of the project site. Workers then lowered portions of the levee to tidal marsh elevations. Other parts were left in place to create bird roosting areas.

"This was outside the box," says Ken Griggs, who managed the project when it started early in his career. He now serves as the deputy project leader with Klamath Basin National Wildlife Refuge Complex. "Instead of trying to kind of push back against nature, the focus of this project was to restore salt marsh habitat. All credit goes to Eric on that—for being the instigator of this project. It was good for a young refuge manager to be a part of. Being five years removed from it and looking back, I learned a lot about how to get conservation done on the ground with lasting change."

Saving Dirt

One of the bigger challenges was finding enough and the right kind of fill or soil.

"That was the hardest part—finding the right sediment and bringing it to the Bay," says Shea.

And quite a challenge it was.

"Cost of trucking dirt over long distances is expensive, so we had to try and secure sources of material relatively close by," says Steven Lewis, engineering equipment operator for the duration of the project and a 40-year Service employee. "Just by a stroke of luck there was a large-scale restoration project at the mouth of the Eel River—the Salt River Restoration Project—that brought in quite a bit of material. At the same time, we weren't 100% happy with that because it contained invasive plants that we had to get rid of, but beggars can't be choosers. We got sediment from the Martin Slough Restoration Project that was from a golf course, so the material came in loaded with golf balls. Good material, but it had golf balls in it." ››

Aerial view of the White Slough Tidal Wetlands Restoration Project. (PHOTO BY USGS)

Water from Humboldt Bay enters a portion of White Slough, filling a series of tidal ponds near the outlet of the newly reconnected Chism Creek. (PHOTO COURTESY OF JILL DEMERS/HUMBOLDT COUNTY RESOURCE CONSERVATION DISTRICT)

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Adds Nelson, with Martin Slough in particular, "It truly was a win-win, as they had material they needed to get rid of and instead of having to go to landfill, we were able to use it."

Kurt Roblek, who managed the project's later stages, agrees that it was challenging. "Every year we were working different angles to find enough fill material," he says. "All donor materials needed to be tested for contaminants to ensure the right fit for the ecosystem. We could find it, but there were lots of checks and balances. Ultimately, we persevered, and there wasn't one year we didn't have enough material."

Key to the success of White Slough, according to the many Service professionals who worked on this project, were the partners and a Service Maintenance Action Team. Additionally, according to Shea, the Service's Coastal Program provided engineering analysis, prepared design plans, and helped refuge staff implement the project.

'A Lot of Seat Time'

A Maintenance Action Team is a group of employees from across the Service brought together to complete a project. These projects are training-based so that we provide our maintenance professionals opportunities to learn skilled trades and leadership lessons on the job. Team projects also save the Service over 30% in costs over traditional contracting costs.

"The Maintenance Action Team was a key part of the project," says Nelson. "It made a huge difference physically and financially getting the project done. A real team aspect and a great model for refuges to use. As budgets get tighter, it makes sense to spread the resources around."

"Some inexperienced operators gained a lot of seat time in a short period of time," says Lewis of the Maintenance Action Team effort. "We had a couple examples of guys who showed up with literally one hour of seat time on a bulldozer, and they were immediately working 60 hours a week pushing dirt. So it was trial by fire, but a great opportunity to gain some real-life experience."

Nelson adds, "It was a great opportunity for them and us. This was one of the more gratifying projects of my career."

Working With Others

And with the funding tight, the work from partners such as the California Coastal Conservancy and Humboldt County Resource Conservation District was critical to keeping grants moving through completion of the project and with continued maintenance for invasive species post-project completion.

"This was a massive team effort," says Brendan Leigh, who managed the White Slough project at its end. "The budget was one whole challenge. We had amazing people like Joel Gerwein and Julia Elkin finding and procuring grants to fund this project. Having buy-in from other refuges to participate in maintenance team projects was a huge cost savings and just an all-around benefit to the project and team," Leigh says.

"Knowing this is a part of making our community more resilient to sea level rise and all the different forces that climate change might throw at us in terms of storm events, wave over-wash, and the whole gamut in the coastal system, it was pretty exciting to be a part of," says Jill Demers, executive director for the Humboldt County Resource Conservation District. "It also provides security for our highway [US-101], the main artery to our connection to the rest of California in Humboldt Bay."

Funding was made possible due to the state's Executive Order B-55-18 using a "cap and trade" approach with a goal of carbon neutrality by 2045. The U.S. Geological Survey was brought in to monitor carbon neutrality for the project into 2023.

"It provides a huge opportunity for ecosystem restoration across the board," says Karen Thorne, a research ecologist with USGS of the "cap and trade" ››

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process to secure funding. "Standing something like that up fairly quickly is exciting because it is leading the country and the world on how to do this."

According to Jenny Curtis, a research geologist from USGS, this project required monitoring when often many projects do not. "We've been trying to call attention to that for decades," she says. "We need to monitor this so we learn from it."

Gerwein, with the California Coastal Conservancy, feels the partnerships aligned well with their mission.

"One of the key parts of our mission is to restore coastal natural resources, work on sea level rise adaptation and climate change adaptation," says Gerwein. "The refuge staff was willing to be innovative with piloting this project. We got a lot of funny responses from some of the agricultural community who would drive by and be like 'Hey, how do I get a permission to fill in my wetlands?' It was exciting for the community with everyone coming back and forth on the 101 seeing the site gradually change."

Critical Salt Marsh

With more than 90% of salt marsh habitat gone from Humboldt Bay, this project was also critical to provide the habitat diversity necessary for a variety of species to survive, such as migratory birds like sandpipers, egrets, ducks, geese, gulls, and other shorebirds.

"It is revolutionary — one the first projects of this type on the entire West Coast and to this scale almost anywhere," says Leigh. "While it only accomplished 41 acres of much needed salt marsh habitat, on a broader scale it provided an example of what it takes to accomplish something like this. That is why documentation is so important, so that other entities hoping to undergo similar projects will have all the information going into it that we learned along the way."

Cashell Villa, project leader at the Humboldt Bay National Wildlife Refuge Complex, is pleased to wrap up the project on her watch and knows well the importance of salt marsh habitat. "They provide important functions for ecosystems and species, and they also provide a buffer from the ocean as well," said Villa. "It's important to think about what salt marshes do for us. What would happen if a bunch of little salt marshes started popping up around here because we're restoring them? Could they provide some protection to our communities that are inland? We're definitely looking at that and how we can build in more resiliency for Humboldt Bay. The bay is going to be severely impacted, especially these very low-lying areas from sea level rise in the future, and so looking at some of these successful models may be one important step in the right direction on how we as a community can move forward." □

JOHN HEIL, External Affairs, Pacific Southwest Region

Fill from College of the Redwoods getting loaded to be moved to White Slough. (PHOTO BY USFWS)

MUSEUM OBJECTS COME TO LIFE

In this series we highlight the "Treasures of the Service" from the museum collections of both the U.S. Fish & Wildlife Service Museum and Archives and the Service's National Fish and Aquatic Conservation Archives. We feature submissions from Steve Floray, curator of the U.S. Fish & Wildlife Service Museum and Archives, and April Gregory, curator of the National Fish and Aquatic Conservation Archives.

Bob Hines 'National Wildlife Artist '

From 1948–1981, Bob Hines was the Service's "National Wildlife Artist." During his tenure, Hines produced thousands of paintings, drawings, and other illustrations of North American wildlife. These works graced a variety of Service and Department of the Interior publications, including scientific studies, reports, brochures, pamphlets, prints, posters, and guidebooks. In addition to his day job, Hines spent many evenings and weekends working by commission on paintings for private collectors and illustrating numerous books and magazine articles. Two of his most significant commissions were to illustrate two volumes by his life-long friend Rachel Carson: *The Edge of the Sea* (1955) and the 50th anniversary edition of *Under the Sea Wind* (1991).

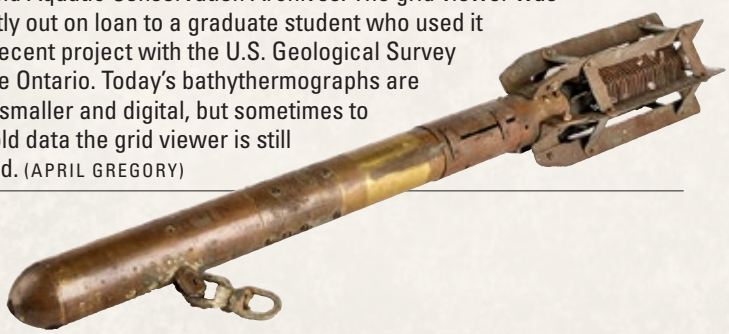
Several of the illustrations from both books, along with hundreds of other works by Hines, are now in the collection of the U.S. Fish and Wildlife Service Museum and Archives at the National Conservation Training Center (NCTC). The works highlighted here are but a sampling of Hines's rich artistic legacy. (STEVE FLORAY)

Among Hines' Work at NCTC:

- Cutthroat trout sketch for President Dwight D. Eisenhower
- Western Tanager watercolor

What's the Temperature?

A bathythermograph is used to detect changes in water temperature versus depth. This bathythermograph came with a grid viewer, extra grids, and a wooden holding crate, all of which reside at the National Fish and Aquatic Conservation Archives. The grid viewer was recently out on loan to a graduate student who used it for a recent project with the U.S. Geological Survey at Lake Ontario. Today's bathythermographs are much smaller and digital, but sometimes to read old data the grid viewer is still needed. (APRIL GREGORY)



What We Do

This original painting on pressboard is from Little White Salmon National Fish Hatchery in Washington state. It and a companion each measure 18 inches across and 9 inches tall. The artist and year they were created are unknown, but the circular USFWS patch on the gentleman's sleeve dates them between 1957 and 1974. They were likely displayed in a visitor area for educational purposes. (APRIL GREGORY)

transitions

Headquarters

(PHOTO BY TAMI HEILEMANN/DOI)

Martha Williams was sworn in as Director of the U.S. Fish and Wildlife Service by Secretary Deb Haaland on March 8. Martha has been serving as Principal Deputy Director of the Service since January 20, 2021, exercising the delegable authority of the Director.

"Martha's decades of experience in conservation, wildlife management, and natural resources stewardship have been a crucial asset as the Department of the Interior tackles the dual climate and biodiversity crises," Secretary Haaland says. "Her strategic vision and collaborative approach will be key in her role as Director of the Fish and Wildlife Service and as the Department works to conserve, connect, and restore America's lands, waters and wildlife for current and future generations."

Says Martha: "It's an incredible honor to serve the American people as Director of the Fish and Wildlife Service at a time when the challenges and opportunities to maintain healthy ecosystems and wildlife have never been greater. I look forward to continuing my life's work of collaborating with local communities and stakeholders to tackle conservation efforts and the tough wildlife and resource management issues facing the country."

As Director of the Fish and Wildlife Service, Martha will play a critical role in implementing the Bipartisan Infrastructure Law's $1.4 billion investment in ecosystem restoration and resilience, which will help restore America's lands and fund stewardship contracts, ecosystem restoration projects, invasive species detection and prevention, and native vegetation restoration efforts.

Before joining the Biden-Harris administration, Martha served as the director of the Montana Department of Fish, Wildlife and Parks from 2017 to 2020. Previously, Martha was an assistant professor of Law at the Blewett School of Law at the University of Montana in Missoula, Montana, where she co-directed the university's Land Use and Natural Resources Clinic.

Martha served as deputy solicitor for parks and wildlife in the Department of the Interior between 2011 and 2013, providing counsel to the National Park Service and the Fish and Wildlife Service.

Growing up on a farm in Maryland, Martha gained an appreciation for open lands, waters, wildlife, and people. She earned a bachelor's degree from the University of Virginia and a juris doctor degree from the University of Montana School of Law. □

Mountain-Prairie Region

Matt Hogan has been named Regional Director for the Mountain-Prairie Region.

Matt has over 30 years of experience working on difficult policy issues to achieve conservation successes in the American West, including 15 years with the Service in various leadership roles. Over the last nine years, Matt served as the Deputy Regional Director for the Mountain-Prairie Region, taking on conservation challenges such as grizzly bears and wolves as well as the region's priority landscapes in the sage-steppe and grassland ecosystems.

Matt joined the Mountain-Prairie Region in 2010 as the Assistant Regional Director for Migratory Birds and State Programs, and in 2012 served as the Regional Refuge Chief. He has also held senior leadership positions in the Service and the Department of the Interior. Matt has also served as Executive Director of the Association of Fish and Wildlife Agencies (AFWA) where he worked with state fish and wildlife conservation agencies to promote a unified vision for sound management and conservation of fish and wildlife across North America. Matt started his career working as a staff member in the U.S. House of Representatives.

Matt has a passion for the wide open spaces of the West, which is what inspired him to move to the Mountain-Prairie Region from the East. In addition to prioritizing strategic conservation for the landscapes of the West and the species that call them home, Matt is committed to increasing the Service's diversity. While not at work, Matt enjoys seeing nature through the eyes of his 9-year-old daughter who constantly reminds him why he works for the Service. □

Alaska Region

Sara Boario has been chosen as the Service's Regional Director for the Alaska Region.

Sara has nearly 20 years of public service experience in Alaska, including 16 years as a leader in conservation and public lands stewardship. During that time, she has earned a reputation for strategic vision-setting and creative partnerships. Sara also became known for prioritizing the ways we listen, share, and build relationships — from our talented employees to our outstanding partners and the public.

Since 2014, Sara has served as Assistant Regional Director for External Affairs and recently as acting Deputy Regional Director. In these positions she has been a senior adviser on the region's highest profile policy challenges and provided critical leadership to cross-cutting efforts such as the Alaska Region's Strategic Intent, Alaska Native Relations, Arctic Council Strategy (including creating the Arctic Youth

Ambassadors Program), the Arctic Refuge Virtual Bird Fest, and urban engagement. Before the Service, Sara established a reputation as a collaborative leader, beginning with her Presidential Management Fellowship with the U.S. Forest Service, Chugach National Forest, where she eventually served in multiple roles. At the Forest Service, Sara led creation of the Chugach Children's Forest, the Classrooms for Climate partnership with the University of Alaska Anchorage, and a multi-disciplinary planning process in Prince William Sound. Her earlier public service included work as chief of staff for Alaska State Senator Georgianna Lincoln.

Sara was raised in welcoming communities across Alaska — Yakutat, Wrangell, Sand Point, and Fairbanks — where she grew up fishing, hunting, and exploring the natural world. The places where she grew up, and the people she learned from, shaped her personal and professional values and set the stage for her commitment to long-lasting, successful partnerships with Tribes, local governments, state agencies, and private partners. She is helping lead the Service on critical diversity and inclusion challenges, both within and outside the agency, including her role as a prominent voice on LGBTQ+ issues.

Sara comes from a large, spirited, music-loving, and adventurous family that stretches from Juneau to Fairbanks. Nowadays, she loves exploring the outdoors and playing sports with her two sons, Leo and Raineri. □

honors

Headquarters

The Service's **Dorothy "Dede" Manera** has received the National Fish and Wildlife Foundation's (NFWF) 2022 Guy Bradley Award. Named after the first wildlife law enforcement officer to be killed in the line of duty, the award honors one state and one federal recipient for "an outstanding lifetime contribution to wildlife law enforcement, wildlife forensics or investigative techniques." Dede is the first woman to receive the Guy Bradley federal award since this national award program was established in 1988.

"Dede Manera exhibits the highest level of professionalism and has served as an outstanding leader in conservation law enforcement throughout her career," says Jeff Trandahl, executive director and CEO of NFWF. "Determined, masterful criminal investigators such as Manera are true champions of conservation, going above and beyond to protect wildlife species being unlawfully exploited both here in the United States and abroad," Trandahl says.

"Resident Agent in Charge Dede Manera is a distinguished leader who is committed to protecting imperiled species for future generations," says Edward Grace, Assistant Director of our Office of Law Enforcement (OLE). "Her exemplary professionalism, dedication to wildlife conservation, and tenacity to overcome any challenge makes her the ideal recipient of this prestigious award. We are incredibly proud of her and her work."

Dede began her law enforcement career as a Service special agent in 1992 and, ever since, has been a role model of what an exceptional agent could be. Relentless in bringing the world's most notorious wildlife traffickers to justice, she keeps working a case until that person faces their day in court. For example, during one of our most successful investigations, Operation Crash, she led an international lure-and-arrest operation against a Chinese national living in China. Due to her expertise and investigative skills, the trafficker was arrested, tried in New Jersey, and sentenced to 70 months in a U.S. federal prison — one of the most significant wildlife crime sentences at the time. In addition to actually investigating wildlife crimes, Dede serves as the resident agent in charge of our elite Special Investigations Unit, where she supervises covert agents who conduct complex, large-scale criminal investigations into the dark and dangerous world of wildlife trafficking. In particular, they investigate and infiltrate transnational organized criminals and entities who traffic endangered wildlife.

Dede has received numerous awards throughout her career including twice winning the Northeast Conservation Law Enforcement Association's Officer of the Year Award, the Conserve Wildlife Foundation of New Jersey's Women & Wildlife Service Award, and the Samuel J. Heyman Service to America, People's Choice Award, which is considered the "Oscar" of government service.

"I am honored to be the recipient of this significant and coveted award," Manera says. "I thank the National Fish and Wildlife Foundation, OLE leadership, everyone who mentored me throughout my career, and especially my family. I would also like to thank those who told me that something could not be done. Even negativism may be turned into something positive because it drove me to overcome obstacles that resulted in success over time. I believe in the power of paying it forward and I tell those I mentor to be persistent, don't give up, and never take no for an answer. If you want to initiate changes that support and preserve wildlife, you have to be dedicated, work hard, and inspire others who will carry on when you are no longer around."

There is also a $2,500 monetary award that Dede has donated to New Jersey's Downe Township Green Team, a group of volunteers who perform a variety of environmental work in this local community by the Delaware Bay. □

Service-wide

The annual U.S. Fish and Wildlife Service Science Awards shine a spotlight on the scientists and technical staff who demonstrate outstanding leadership, integrity, and dedication to upholding the agency's highest standards of scientific excellence in their work.

The Alaska Region's **Neesha Stellrech**t, branch manager of the Endangered Species program in

the Fairbanks Fish and Wildlife Conservation Office, was selected for the Science Leadership Award. The Pacific Southwest Region's **Pacific Salmon Thiamine Deficiency Investigatory Group** received the Rachel Carson Award for exemplary scientific accomplishment. The Southwest Region's **Masked Bobwhite Conservation Cadre** received the Sam D. Hamilton Award for transformational conservation science.

Neesha received the Science Leadership Award for her commitment to the professional development of her staff and her dedication to producing measurable positive effects on the recovery of threatened and endangered species. Since becoming the branch manager of the Endangered Species program in the Fairbanks Office in 2015, Neesha has had a profound impact on the program. One of her top accomplishments is critically evaluating the work of the branch to improve subsequent research and management actions. Neesha pursued new approaches to strengthen the rigor of species status assessments, including structured decision-making and integrated population modeling. A prime example of the culmination of these conservation efforts is her incredible work to protect rare arctic sea ducks, including the spectacled and Steller's eider, from lead poisoning. Neesha collaborated with partners and remote communities to successfully ban the sale of lead ammunition in the Yukon-Kuskokwim Delta in the heart of spectacled eider habitat and in stores in Utqiagvik near the highest density nesting area of Steller's eiders in Alaska.

The **Pacific Salmon Thiamine Deficiency Investigatory Group** was selected for the Rachel Carson Award for solving the mystery of high mortality rates in Pacific salmon production programs. Working at breakneck speed, the group identified the culprit, a never-before-seen vitamin deficiency, and developed a course of treatment for hatchery reared fish. The group's work has set the stage for a comprehensive, ecosystem-based approach to investigate the cause of what we now know is a thiamine deficiency in Pacific salmon. The team's achievements are especially important to the critically endangered winter-run Chinook salmon. Were it not for the swift diagnosis and development of thiamine treatments, the winter-run Chinook salmon population would have suffered a potentially catastrophic loss.

The Pacific Salmon Thiamine Deficiency Investigatory Group consists of Service employees **William Ardren, Brandt Becnel, Dan Castleberry, Kaitlin Dunham, Scott Foott, Jeff Freund, Scott Freund, William Hopkins, Taylor Lipscomb, Rubert Null, Marc Provencher, Ronald Stone, Emily Van Seeters, Travis Webster**; NOAA Fisheries' **Rachel Johnson**; U.S. Geological Survey's **Dale Honeyfield** and **Donald Tillit**; **Jacques Rinchard** of the State University of New York-Brockport; **Esteban Soto** of the University of California-Davis; **William Hopkins**, **Taylor Lipscomb**, and **Kevin Kwak** of the California Department of Fish and Wildlife.

The **Masked Bobwhite Conservation Cadre** was selected for the Sam D. Hamilton Award in recognition of their work

supporting and improving masked bobwhite recovery. The group furthered the conservation of the masked bobwhite, an endangered quail, by employing science-based strategies, adaptive management feedback, and working with state and non-profit partners. They standardized an efficient and repeatable approach to genetic management, habitat restoration, and quail release site identification. These critical efforts have resulted in significant achievements for the species over the last five years. Most notably, what may be the last wild population of this rare bird now lives and reproduces on Buenos Aires National Wildlife Refuge in Arizona.

The Masked Bobwhite Conservation Cadre includes **Dr. Matthew Butler, Rebecca Chester, Dr. Lacrecia Johnson, Paula O'Briant, Bill Radke, Dr. Steven Sesnie**, and **Jude Smith**. □

in memoriam

Mountain-Prairie Region

Kevin Kritz, a wildlife biologist in the Migratory Bird Program of the Mountain-Prairie Region, died unexpectedly in January.

Kevin was a valued member of the Migratory Bird team, both nationally and regionally. He was a fixture in the program, most recently working tirelessly on eagle, raptor, and migratory bird conservation in the face of some of our most pressing challenges.

Given his 30-year federal career and 20-year career with the Service, his list of accomplishments is extensive. Kevin joined the Service in 2001 with the Nevada Fish and Wildlife Office in Reno, where he led on sage grouse, sagebrush, bald eagles, and migratory bird issues.

He joined the Mountain-Prairie Regional Migratory Bird team in 2007 as the regional program lead for the delisting of bald eagles, raptor conservation, and as our representative to the Partners in Flight Western Working Group. In 2010, he expanded his role to become our go-to expert on energy, eagles, raptors, regulations, and incidental take of migratory birds. He worked collaboratively across programs, with state and Tribal partners, and with various industries for the benefit of birds and the American public. His impact and reach here cannot be overstated.

The following list includes a few things we know Kevin was proud of:

- Kevin was a long-term and very engaged member of the Raptor Research Foundation (RRF) and The Wildlife Society. He participated in many conferences, quiz bowls, and seminars over his career, including an RRF meeting in Argentina.

- Kevin was a point person on very high-profile projects (e.g., Keystone XL, Chokecherry/Sierra Madre Wind, Ruby Pipeline) and very interesting projects (e.g., Christo's "Over the River") throughout his career.

- Kevin was a walking encyclopedia, regular trainer, and long-term chair or co-chair of various teams working on migratory bird and eagle regulations and policies.

- Kevin was raised in Wisconsin, and his love of the state, the University of Wisconsin Badgers, and the Green Bay Packers never subsided. In fact, Kevin recently became a member of the Green Bay Packers ownership team when he purchased a share of the team in December 2021. Talking about Wisconsin-based sports teams with Kevin was something many of us often did!

- Kevin not only had a passion for the outdoors, migratory birds, and the mission of the Service but was also a very compassionate person. He regularly donated leave, he supported students through mentorship and graduate projects, and he was always willing to help a colleague in need of technical assistance.

- Kevin loved his family dearly, rarely, if ever, missing a family reunion or major family gathering, always traveling to Wisconsin for the holiday season, and hosting family members in Colorado for skiing and hiking adventures.

We extend our deepest sympathy and support to Kevin's family and colleagues. □

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parting shot

6 Signs of Hope

The strong partnership among the Service, North Carolina Wildlife Resources Commission, landowners, and stakeholders paid off in April at Alligator River National Wildlife Refuge with the first wild-born litter of red wolves since 2018. (PHOTO BY USFWS)

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