U.S. Fish & Wildlife Service Summer 2023

Fish & Wildlife News

SPOTLIGHT

what's inside

features

On the cover: Bumble bee covered in pollen from a native prairie dock flower.

(PHOTO BY MIKE BUDD/USFWS)

MORE FEATURES

departments

Martha Williams, Director

Pollinators Need and Provide Help

As we near the end of summer, I, and I imagine, many of you, have been enjoying the fruits (and vegetables) of pollinators' labor. Peaches, tomatoes, cucumbers, and many more. It's more than food, though. I sometimes find myself charmed by the bumble bees in my garden as they flit from blossom to blossom. But they and other pollinators are in trouble, and in some ways, pollinators are among the more confusing of imperiled species.

It's not because of the reasons their populations are struggling—those are achingly too familiar for conservationists: loss of habitat, invasive species, disease, and of course climate charge, among others.

What confuses many of us is how pollinators got to this embattled state to begin with. As of April 2023, the U.S. Fish and Wildlife Service has protected more than 75 species of pollinators under the Endangered Species Act, and countless others are at risk of needing ESA's protections.

The value of pollinators to the economy and food production is staggering. A National Science Foundation-funded team found that the economic value of insect pollination in the United States was $34 billion in 2012. The U.S. Department of Agriculture says one out of every three bites of food we eat owes its production at least in part to pollinators.

Their ecological benefit is no less stunning, and in this category, we find a most interesting fact. Pollinators are very much threatened by the changing climate, but they also indirectly influence climate change for the better.

Climate change is so hard on pollinators, as Mara Koenig explains on page 22. They have evolved with the plants they rely on, so the right pollinator appears when its needed plant is blooming. Climate change can throw this timeless ritual off, causing the plant to bloom early or late and miss the pollinator. This can devastate the pollinator species, to say nothing of the plant.

Dawn Marsh explains that this syncing issue is one reason the Karner blue butterfly in such danger (p. 18).

The way pollinators can fight climate change is related to the plants and habitats they need. But people play a crucial role, too.

Katie Steiger-Meister and Bridget Macdonald explain in the story *Save Pollinators, Save the Planet* (p. 14). Essentially, the native plants pollinators need have strong root systems. Those roots are hard at work underground, helping prevent flooding, erosion, and other problems often associated with severe weather. Similarly, pollinator gardens or pollinator habitat provide for storage of carbon underground, keeping carbon dioxide out of the atmosphere.

This issue of *Fish & Wildlife News* features more stories on helping pollinators—what we are doing and how you can help. Our world, and the food we eat, depends on it. □

Diving for Starfish to Protect Palmyra's Coral Reef

To find the spiked, predatory starfish, divers in the middle of the Pacific Ocean looked for the bright white feeding scars on the coral.

Find the scars and they might find the culprit: the crown-of-thorns starfish.

In April 2023, a Service dive team went to Palmyra Atoll, about 1,000 miles south of Hawaii, to seek, count, and systematically disrupt the native-but-destructive marine invertebrates.

The crown-of-thorns starfish, known by ocean conservationists as COTS, is one of the largest sea stars in the world. If it were an actual crown, the head it sat upon would need to be 10–30 inches in diameter.

When they congregate in large numbers on a coral system, the results can be devastating, as documented across the Indian and Pacific oceans, including at Australia's Great Barrier Reef.

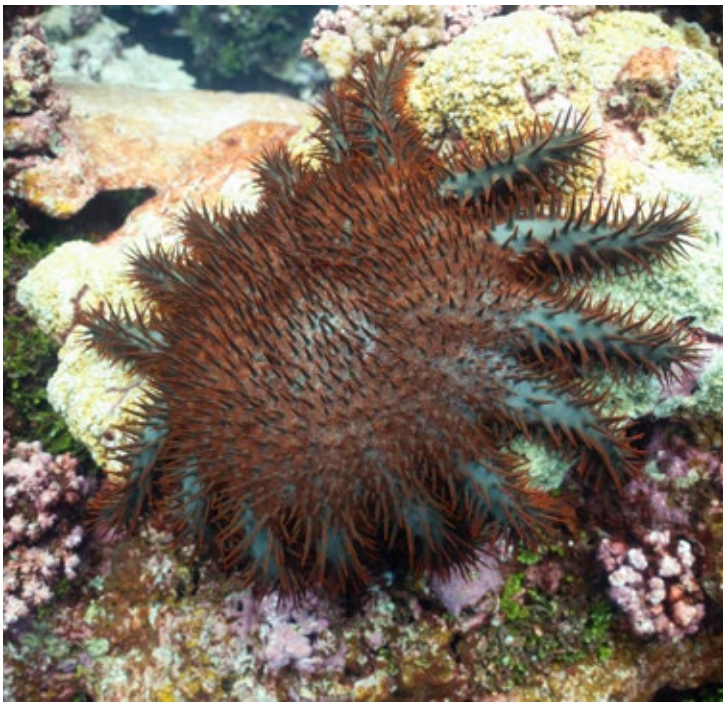
"That starfish is almost like a locust on reefs when it gets out of control," said Nancy Knowlton, chair of marine sciences at Smithsonian National Museum of Natural History, in a 2012 interview about COTS on the *PBS NewsHour.*

"A swimmer can see a hundred or even over a thousand in a 20-minute swim when you have an outbreak going on, and they can kill up to two-thirds of a reef just in a year when that happens," added Knowlton in the interview.

COTS outbreaks are one of the major causes of coral decline across the Great Barrier Reef over the past 40 years, according to the Australian Institute of Marine Science.

And the outbreaks are becoming more frequent in more places, even at the remote Palmyra Atoll National Wildlife Refuge, where an outbreak began in 2017.

Thankfully, COTS is one threat to coral that can be treated. »



(Top) A large crown-of-thorns starfish is attached to coral at Palmyra Atoll National Wildlife Refuge. (PHOTO BY RYAN HAGERTY/USFWS)

(Bottom) A member of a Service dive team treats a crown-of-thorns starfish on the coral reef of Palmyra Atoll National Wildlife Refuge. (PHOTO BY RYAN HAGERTY/USFWS)

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Our divers at Palmyra carried bags of household vinegar and special injector guns during their pilot study. The vinegar injections quickly cause organ failure for COTS but are harmless to other marine organisms, according to Amanda Pollock, who helped lead the dive team.

The goal was not eradication but rather reduction of COTS numbers back to their natural, pre-outbreak levels, Pollock says.

"COTS are native to Palmyra, and when in low numbers, they are an important part of the coral reef ecosystem, helping to increase the diversity of corals on the reef," explains Pollock.

During their countless dives, ranging in depth from three feet to 100 feet, the team treated about 200 acres of coral reef.

Based on the success of the first dive, there are plans for two follow-up missions in 2024, so Palmyra can continue to be known for its healthy, thriving coral reefs.

"The reefs of Palmyra have been shown to be resilient after past bleaching events, and our hope is that if we knock the COTS population back to normal levels, Palmyra will take care of the rest," Pollock says. □

TOSHIO SUZUKI, Office of Communications, Pacific Region

Deep Fork National Wildlife Refuge Works to Address Legacy Pollutants

Deep Fork National Wildlife Refuge in Oklahoma was established in 1993 on land with a long history of industry, the marks from which are still visible today. Railroad ties can be found in the shallow hollows where coal mine railroad beds once sat. Pecan tree orchards have blended into the forest, only discernable from the unnaturally straight lines of trees. But orphan wells, remnants of oil and gas extraction, are a scar left on the landscape that has not been allowed to heal. Now with funding from the Bipartisan Infrastructure Law, this persistent problem is finally being addressed.

"Orphan wells" are abandoned oil and gas infrastructure. These wells are no longer operational and don't have a viable operator on record. Without a viable operator, there is no party responsible for their upkeep and maintenance. In a state of disrepair, they can leak hydrocarbons, methane, and contaminated brine, posing a threat to human health and to the environment. According to a report by the Interstate Oil and Gas Compact Commission, Oklahoma has an estimated 123,772 orphaned wells.

The Problem at Deep Fork

Orphan wells spread across Deep Fork National Wildlife Refuge. There are ongoing efforts to locate, analyze, and categorize wells. So far, 217 suspected well sites have been surveyed, with plans to survey 350 more.

An orphaned oil well at Deep Fork National Wildlife Refuge in Oklahoma.
(PHOTO BY CATHERINE BELL/USFWS)

Orphan wells represent an ongoing hurdle to the conservation of the remnant bottomland hardwood forests and wetlands that the refuge was founded to protect. These habitats are havens for migratory birds and native wetland and aquatic species, so refuge manager Todd Gallion is eager to address the issue.

"Orphan wells have been a persistent problem for the refuge. Their presence is holding us back from cleaning up old contaminant sites and returning habitats to their natural state," Gallion says. "Capping these wells will benefit native species, and improve hunting, fishing, and wildlife viewing for visitors to the refuge. Basically, addressing this problem means that we can reclaim the land for everyone's benefit."

Beneficial Repairs

Orphan well capping is a process by which the wells are plugged, preventing future contamination, and then cut off and capped beneath the ground. This allows for the area to be cleaned up and reclaimed for conservation. In fiscal year 2022, Deep Fork received funding to cap 24 of wells through the Bipartisan Infrastructure Law. With the last stages of preparation being finalized in June, capping is expected to start in late summer or early fall. »

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Outside the direct benefits to wildlife, capping orphan wells will improve human safety and remove a source of environmental pollution from the landscape. Orphan wells are known to leak methane, a potent greenhouse gas that is 25 times greater at trapping heat than carbon dioxide. Rusted and dangerous surface equipment often surrounds these wells, risking injury to people and wildlife. Many also leak brine and hydrocarbons, which can degrade water quality, potentially impacting downstream communities.

"We want to make sure that we care for and protect the watershed by removing any known and potential contaminant sources and restoring bottomland hardwood habitats, including wetlands," Gallion says. "These restored habitats can provide ecosystem service, like being water filters to the landscape, improving water quality for communities downstream. Addressing orphan wells is a vital part of that mission."

Looking to the Future

While this year's capping efforts are still underway, Deep Fork is already looking ahead to next year. On June 8, U.S. Secretary of the Interior Deb Haaland announced fiscal year 2023 funding for legacy pollution clean-up. Deep Fork will receive funding to cap an additional 45 orphan wells. These wells were identified, categorized, and prioritized with the help of the Oklahoma Corporation Commission. "Without their cooperation we wouldn't be where we are today," Gallion says.

Of the newly funded capping projects, 32 are in upland habitat, while the other 13 will occur in the floodplain of the Deep Fork River. Gallion is optimistic that with lessons learned this year, they are well prepared to take on more in the future. □

EVAN MONNETT, Office of Communications, Southwest Region

Aerial view of Deep Fork National Wildlife Refuge. (PHOTO BY USFWS)

Endangered Frogs Return to Their Home in Plumas National Forest

In late June, biologists released 166 endangered Sierra Nevada yellow-legged frogs into streams in the Plumas National Forest in California to improve their declining population numbers in the northern Sierra Nevada.

Native frog populations in the Sierra Nevada have been heavily impacted by chytridiomycosis, a deadly fungal disease caused by the pathogen Batrachochytrium dendrobatidis, known as 'Bd' or 'chytrid' for short. This fungus has been hurting amphibians around the world and is present in many amphibian populations throughout the Sierra Nevada.

"After initial declines, many frog populations are persisting with the disease and rebounding, while others have been decimated when the disease first appears," says Isaac Chellman, an environmental scientist with the California Department of Fish and Wildlife.

Beyond chytrid, threats to Sierra Nevada yellow-legged frogs include habitat loss and destruction, impacts of climate change such as drought and wildfire, and the introduction of trout, bullfrogs, and other non-native species that carry diseases and eat the frog.

In 2022, biologists from the U.S. Fish and Wildlife Service, U.S. Forest Service, and California Department of Fish and Wildlife collected wild Sierra Nevada yellow-legged frog tadpoles living in the Plumas National Forest. The tadpoles were brought to San Francisco Zoo and Gardens and placed in an amphibian headstart program, which rears young, vulnerable tadpoles into adult frogs in captivity. This program greatly improves the survival rates of the frogs in their early life stages by helping them through metamorphosis when they are particularly susceptible to chytrid.

A Sierra Nevada yellow-legged frog is released into a creek in the Plumas National Forest after being raised in captivity at San Francisco Zoo and Gardens. (PHOTO BY ISAAC CHELLMAN/CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE)

Once the tadpoles matured into frogs, zoo conservationists treated half of the frogs for the deadly fungal disease. The remaining frogs were left untreated so biologists can test the effectiveness of treatments on the frogs' long-term survival.

"The hope is this treatment will help protect them from the fungus, so they can continue to reproduce and repopulate the streams and lakes in this part of »

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the Sierra," says Jessie Bushell, director of conservation at San Francisco Zoo and Gardens.

The frogs were then returned to streams near where they were found as tadpoles.

"The Plumas National Forest has several streams that have deep pools that can sustain the frog through the hot summer months and provide shelter during the winter," says Colin Dillingham, wildlife biologist at the Plumas National Forest.

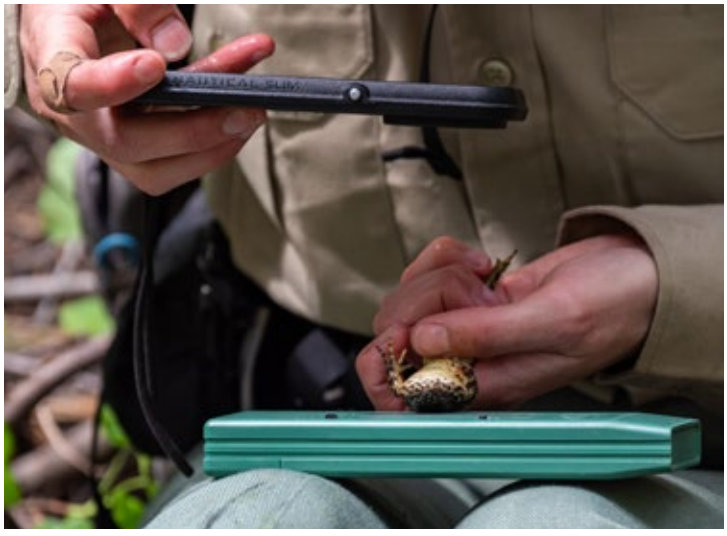
Before the release, biologists worked together streamside to scan a small identification chip under each frog's skin and take a photo of their uniquely identifying chin spot patterns. The chips and chin spot patterns will help identify individual frogs and differentiate captive-raised frogs from those that matured in the wild.

"This effort is a great example of organizations coming together to help an endangered species recover in the wild. The Endangered Species Act turns 50 years old this year, and the recovery of listed species is dependent on the cooperation of many partners," says Ian Vogel, senior wildlife biologist at our Sacramento Fish and Wildlife Office.

Biologists will continue to monitor the released frogs and watch for signs of the fungal disease.

There are ways you can help the amphibians, too. Vogel suggests that people clean their boots and gear regularly to prevent the spread of chytrid and other diseases. Additionally, people should avoid introducing other species, like live bait or pet bullfrogs, into creeks and streams as they can also carry disease or prey on frogs. □

MEGHAN SNOW, Office of Communications, Pacific Southwest Region



A biologist with the U.S. Forest Service takes a photo of the unique chin spot pattern on this Sierra Nevada yellow-legged frog. Chin spot patterns help biologists identify individual frogs.
(PHOTO BY ISAAC CHELLMAN/CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE)

Partners Give Golf Course Second Life to Benefit People and Wildlife

The abandoned golf course at Moosa Creek was an eyesore in the community of Bonsall, Calif. What was once a recreational hotspot had become a 67-acre junkyard of dilapidated bridges, defunct tennis courts, and overgrown vegetation. The site was creating a fire risk for residents.

But Katy Kughen, wildlife biologist with our Carlsbad Fish and Wildlife Office, saw the course through a different lens. She had visited about a half-dozen sites in search of land to restore when she discovered Moosa Creek, just a few miles from U.S. Marine Corps Air Station Camp Pendleton.

"It's really rare to find a site in Southern California where you can do riparian habitat restoration on this scale. Usually, you find one or two acres, but this was a site where we could do habitat creation — not just enhancement — but creation of habitat," Kughen says.

The Service was working with MCAS Camp Pendleton on a plan to remove native riparian habitat, including large trees that caused a potential flight hazard for the military installation's runway. Removing the habitat was also part of a future project to repair the levee that surrounds the installation. But the trees and surrounding grasslands were habitat for the endangered arroyo toad, least Bell's vireo, and southwestern willow flycatcher, so we and the camp devised a way to meet Department of Defense airfield safety standards and conduct the levee repairs while offsetting impacts to the protected toad and birds.

The Endangered Species Act directs all federal agencies to participate in conserving protected species. Agencies must consult with us when any project or action they authorize, fund, or carry out may affect a protected species or its designated critical habitat.

MCAS Camp Pendleton is no stranger to natural resource management. Its location within a flood plain terrace for the Santa Margarita River and its status as a landowner within the larger Marine Corps Base Camp Pendleton have made it a unique blend of undeveloped native habitat and advanced aviation technology. Within its footprint, it supports riparian scrublands and woodlands, native grasslands and forblands, a freshwater wetland, and mowed grasslands along the flightline, providing a home for three federally protected species and several California bird and amphibian species of Special Concern.

The Marines needed a commensurate amount of land to mitigate the habitat loss on the air station, and Kughen had the perfect recommendation: Moosa Creek golf course.

The air station partnered with Burns & McDonnell, a firm specializing in environmental mitigation solutions, to first obtain landowner permissions for the 67 acres, and then design and implement a riparian restoration project across the site. The Marines provided funding. »

Specialists recontoured Moosa Creek and established more than 50,000 native plants and trees.
(PHOTO BY BURNS & MCDONNELL)

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"MCAS Camp Pendleton continually demonstrates its value of local biodiversity and is one of our most important partners in protecting it," Kughen says. "We're proud to work with such a committed group of visionaries at the air station and Burns & McDonnell to harmonize wildlife conservation with infrastructure needs."

The restoration site was historically within the floodplain of the San Luis Rey River but was highly degraded and Moosa Creek was confined to a single channel.

Engineers worked to improve the hydrological function of the creek, reactivate the floodplain, and extend the habitat corridor essential to species living there.

Restoration specialists recontoured the area using 70,000 yards of on-site soil and established more than 50,000 native plants and trees, including Fremont cottonwood, California sycamore, coast live oak, blue elderberry, willows, and mule fat, sourced from on-site tree branch cuttings and a local nursery to restore the natural ecosystem. Now that implementation is complete, Burns & McDonnell will continue to work with the Service as the site meets performance objectives over the next several years.

"We are honored to join the Marine Corps and U.S. Fish and Wildlife Service in protecting natural resources through cost-effective and efficient solutions," says Paul Sherman, Burns & McDonnell project manager. "This project was designed to span the course of decades, mitigating impacts to endangered species and improving our environment."

MCAS Camp Pendleton replaced the trees at the end of its runway with low-growing native grasses and forbs that will continue to provide foraging and sheltering habitat for the toads. And the vireos and flycatchers will continue to use the remaining riparian habitat on the installation for foraging and nesting.

"The success of this restoration project is due to the triumvirate, and we are extremely proud to be part of the team with the Service and Burns & McDonnell to solve the aviation safety issue while supporting endangered species for our community," said Col. David B. Moore, commanding officer, MCAS Camp Pendleton.

The revegetation portion of the Moosa Creek Restoration Project is slated to be completed this summer. As the vegetation matures, it will provide a beautiful view with environmental benefits for both people and wildlife. □

JESSICA D'AMBROSIO, Office of Communications, Pacific Southwest Region

Ash Meadows National Wildlife Refuge Helps Play Defense for Pupfish

Imagine growing up in a system where you are the top predator. Nothing scares you — why would it? That's precisely the challenge the endangered Ash Meadows Amargosa pupfish has when faced with the invasive green sunfish.

"We call it prey naivety, and essentially it means that the pupfish isn't scared of the sunfish," says Michael Reeves, fish and wildlife biologist for Ash Meadows National Wildlife Refuge in Nevada.

Put simply, the sunfish will eat the pupfish at will. "When these two meet up in the water, there's no kind of defensive mechanism that the pupfish has evolved with to save it," Reeves adds. "It's just kind of swimming around free, loving and living its best life. And then this big sunfish comes in and has a fairly easy time with them."

In came the Service biologists from Ash Meadows with a plan for removal of the sunfish. First, they identified the problem, built a monitoring framework, collecting data and information, and adapted to what they learned for "optimal effectiveness," says refuge manager Mike Bower.

Service efforts have led to the removal of over 200 green sunfish, and the results have been noticeable, says Reeves. "You can anecdotally tell that the pupfish population is much, much higher than before the sunfish control efforts started.

Ash Meadows Amargosa pupfish swim underwater at a spring at Ash Meadows National Wildlife Refuge. (PHOTO BY JOHN HEIL/USFWS)

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The quicker we can detect an invasive problem, the easier it is going to be to eradicate that problem."

In addition to removing invasive species such as green sunfish, the refuge is putting a great deal of effort into restoring the habitat conditions that native species, like the pupfish, evolved with. In many cases, that means removing agricultural infrastructure that is no longer needed, such as irrigation reservoirs and ditches.

"The sunfish are an example of a species that's been here for many years, and they're extremely persistent," says Leah Simantel, ecological restoration specialist for the refuge. "A big reason that the sunfish are persisting is because of leftover infrastructure, like reservoirs, where they can thrive. It has created a stronghold for those populations, so our plan has been to decommission reservoirs like that and restore to marshy environments, which is going to favor the pupfish."

The refuge is also developing new tools to assist in its fight against invasive species. Scientists at the Desert Research Institute and Washington State University are helping develop environmental DNA (aka eDNA) tools for early detection of invasive species, allowing the refuge to intervene before populations can become established.

Reeves believes eDNA will not only save time but will confirm eradication. So how do these eDNA tools work? Per Reeves, scientists develop a primer or marker that is specific for the green sunfish. The green sunfish is constantly putting its DNA into the water via excretion, breeding, fighting, etc. Water can be sampled and filtered to concentrate eDNA. These samples can then be analyzed to determine if they match the green sunfish marker. In this way, the presence or absence of a species can be confirmed.

Reeves believes that they are very close to eradication at Crystal Spring, home to the Ash Meadows Amargosa pupfish. "We won't know for sure however until we have this new technology," he says.

Visitors to Ash Meadows have a critical role to play in helping preserve the unique biodiversity that calls this special place home. Please avoid releasing sport fish or aquarium pets. While species such as green sunfish enjoy a large range including much of North America east of the Rocky Mountains, many species found at Ash Meadows occur in single springs with nowhere else to live. □

JOHN HEIL, Office of Communications, Pacific Southwest Region

The Yakama Nation's Search for Bats in a Wide-ranging Landscape

The Yakama Nation is on a mission to find bats on their lands, and we're supporting the effort.

It isn't easy. Finding bats in the open shrub-steppe of south-central Washington requires some knowledge of where to start. Fortunately, Mark Nuetzmann has been the Nation's wildlife biologist for more than 20 years and knows his Pacific-Northwest bats.

All native animals and plants are important to the Yakama people, and central to their religion, culture, and heritage. (The word for bat in the Ichishkiin language is *lach'at lach'át*.) Nuetzmann divides his time between studying animals the Yakama traditionally harvest like salmon, evaluating northern spotted owl habitat in support of the Nation's timber harvest, and evaluating the area's bat populations.

He loves his job and appreciates the diversity of the habitats he works on. "Bat work has taken me out to other parts of the reservation," he says. "We have so much habitat that's beautiful."

Yakama Landscape and Bat Habitat

The reservation is a land of ponderosa pine, Oregon white oak, and rangeland for the Nation's grazing animals. Habitat shifts to more dense mixed-conifer and true-fir forests as elevation and moisture »

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increase, ultimately reaching the peak of Mount Adams at 12,281 feet. With so many landscapes, Nuetzmann notes that most of the known bat habitat types found in Washington are represented.

Finding the bats is important work. White-nose syndrome was first recorded in Washington in 2016, and while the fungus that causes white-nose syndrome was found in Yakama County in 2021, the disease hasn't reached Yakama Tribal lands yet.

Nuetzmann's work focuses on surveying the reservation's older buildings and open areas where bats fly.

Based upon his earlier observations, Nuetzmann suspects they're using the buildings as day roosts. Additionally, it's possible the buildings serve as hibernation areas and maternity colonies during the winter. "They can get into tight nooks and crannies in these old buildings where it's difficult to shine a light," he says.

Part of his work includes emergence surveys to tally how many bats — and which species — leave these structures at night to feed.

New Efforts to Find Bats

In 2021, to meet the growing need for white-nose syndrome monitoring, the Nation applied for funding through the Service's White-nose Syndrome Grants to States and Tribes program to assess bat populations and determine future research needs

One of several older buildings, once used as a ranger station, on the reservation that potentially serve as bat habitat. (PHOTO BY MARK NEUTZMANN/ YAKAMA NATION)

across the reservation. Bats in Washington known to have the disease include the little brown, Yuma, western long-eared, and fringed myotis. Additionally, silver-haired bats have been found with the fungus on them but no signs of disease.

Thanks to the Service funding, Nuetzmann integrated a new technology — autonomous recording units — into his bat surveys. The devices sit on poles across the reservation, in meadows, shrub-steppe landscapes, and in front of old buildings, recording the bats' calls as they fly by. He then downloads that data and uses software to identify bat species.

Using data from previous years as reference, Nuetzmann says it's possible he will find up to 14 bat species. The current work started in summer 2022, and he is surveying eight areas across habitats using the North American Bat Monitoring Program protocol.

Little brown bat with white-nose syndrome. (PHOTO BY JONATHAN MAYS/MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE)

White-nose Syndrome

The goal is to help the Yakama Nation stay ahead of the white-nose syndrome fungus by monitoring bats and preventing its spread across the Nation's lands. The Yakama Nation is partnering with the Washington Department of Fish and Wildlife to analyze bat guano for the presence of the fungus. Nuetzmann will collect the feces at buildings used by bats on the reservation.

Bat awareness is important in these efforts. Nuetzmann works with people living in the reservation's valley to carefully exclude bats from their homes. He is most worried about rabies, but, "It's important to minimize contact where bats are congregating, whether it's a cave, or other places where we can transfer the fungus to other colonies and bats." He adds, "We don't have a lot of caves," thus, the need to find bats in new and old buildings.

To keep the fight against white-nose syndrome alive in coming years, Nuetzmann wants to get the word out. He assists with a camp that aims to teach high school students about bats, rabies, and white-nose syndrome, and ultimately, spark their interest in wildlife, conservation work, biology, and science. The biologists capture the bats, and the students see the bats in action. "Most people don't get a chance to see bats up close; they love that."

Perhaps one day, when Nuetzmann has moved on, one of those students will continue his stewardship of the Yakama Nation's wildlife in this diverse and beautiful landscape. □

GABRIELA WOLF-GONZALEZ, Ecological Services Program, Missouri Ecological Services Field Office, Midwest Region, and GRETCHEN NEWBERRY, Ecological Services Program, Oregon Fish and Wildlife Office, Pacific Region

HELPING POLLINATORS

Flower Flies: Pollinators in Disguise

There are more to flies than walls or Jeff Goldblum.

Meet the most underappreciated member of the pollinator club. There are nearly 900 species of flower flies in North America (they're also known as syrphid or "hover" flies). Adult flower flies feed on pollen and nectar. Pollen grains hitch a ride on these unwitting pollinators as they move from plant to plant.

Flower flies are an easy target for predators as they feed on flowers. But they've evolved a clever strategy: They mimic the appearance of bees and wasps to trick potential predators into thinking they can sting (they can't).

Flower Flies Vs. Bees

Like bees, flower flies feed on nectar and pollen. Many are hairy and can carry pollen and nectar on their bodies. Bees can carry even bigger loads of pollen on their legs or bellies where they have long hair. Interestingly, some bees aren't hairy at all (like little masked bees) and will swallow pollen and store it in their crop.

Movement

Flower flies are also known as hover flies because of the characteristic way they float in the air above flowers. Bumble bees are much more direct in their mission to collect pollen and nectar from flowers.

Tongue Size

Shorter tongued species (most flower flies) favor open flowers like members of the daisy family and other open flowers like roses. Long-tongued bumble bees are often observed on deeper flowers such as Mertensia or Hedysarum.

Parental Care

A big difference between flies and bees is parental care.

Unlike bee larvae that develop in nests built and provisioned with food by their mother, flower fly larvae are independent and free-living. Flower fly larvae eat a wide variety of food, including live and decaying plants, tree sap, fungi, and small juicy bugs like aphids.

Some are even more specialized. One group of flower fly has aquatic larvae called rat-tailed maggots. It's not the best name for making friends, but who wouldn't want their own snorkel to breathe air? This allows these larvae to survive in oxygen-poor pools filled with tasty decaying organic matter.

Because flies do not take care of their larvae, they do not need to put time into collecting pollen to feed their young, like bees do.

The Bottom Line

Abundant and diverse native pollinator communities are essential for maintaining healthy, functioning wild ecosystems. Pollinators are at risk from habitat loss and alternation, invasive pollinators and plant species, parasites and pathogens, pesticides, and climate change. If you want to help pollinators here are some easy ways: »

(Top) An actual bumble bee from the Aleutians. (Bottom) Criorhina bubulcus is a bumble bee mimic (a fly in disguise). This one was spotted in Wrangell, Alaska.
(PHOTO BY SUSAN WISE-EAGLE AND D. SIKES)

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- Plant native flowers. Choose varieties of colors, shapes, and sizes.

- Use flower combinations that result in blooms throughout the growing season, so pollinators have a diverse/steady food source.

- Learn more about invasive plant species in your area and volunteer for a local weed pull event.

- If you have pests eating the vegetables in your garden, consider natural pesticides. Did you know that nasturtiums (a colorful, edible flower) will repel many unwanted insects? Avoid chemical pesticides, which can have unintended effects on pollinator species.

- Put that fly swatter down. □

KATRINA LIEBICH, Office of Communications, Alaska Region

Service biologist Jeff Everett holds the Western bumble bee nest after hours of work excavating it. (PHOTO BY USFWS)

HELPING POLLINATORS

Can't Bee-t the Heat: Climate Change Is Bad News for Bumble Bees

Bumble bees are some of nature's most efficient pollinators. They are essential for pollinating a long list of wildflowers and are especially important in the pollination of crops like tomatoes, peppers, and cranberries. Unfortunately, like most pollinators, their populations are in decline nationwide. In the Pacific Northwest, recent research has linked the range-wide decline of the once common Western bumble bee to a more recent factor — climate change.

The study analyzed a range of climate change variables and showed that temperature had the largest effect on bumble bee occupancy. With their large body size and fuzzy hair, bumble bees are more adapted to colder climates and do not tolerate extended periods of high temperatures very well. This means bad news for bumble bees during heat waves, which have become more frequent and severe due to climate change. But direct heat-related mortality is not the only way heat waves are impacting bumble bees. Heat waves also tend to decimate native floral communities, limiting forage availability at a critical time in the bumble bee colony's development. Unfortunately, heat waves are only predicted to increase in the years to come.

To conserve bumble bees in the face of a changing climate, scientists need to better understand their ecology. Overshadowed by other pollinator species for decades, most native bees are relatively new to conservation, with significant gaps in our understanding of these animals. In particular, significant parts of bumble bee ecology are understudied — such as colony site selection and queen bee overwintering dynamics. Both of these life history stages typically occur underground and can represent up to half of a bumble bee's lifetime. These knowledge gaps make conserving, protecting, and recovering these species particularly challenging. The Service and partners are working to fill these knowledge gaps and conserve bumble bees into the future.

For example, last year the Service and partners excavated a Western bumble bee nest in Oregon to learn more about the species and how and why it might select certain colony sites. Parts of the colony are still undergoing testing, but the excavation and data gathered will be featured as a case study in a forthcoming white paper on bumble bee best management practices. The team will continue to look for more nests in Oregon at several locations this summer.

We are also collaborating with the U.S. Geological Survey on research to better understand bumble bee diapause, also known as overwintering behavior, in Colorado. After pouring through data and scientific literature, the team hopes to make connections between species and their habitats such as how they are associated with different microclimate characteristics, soil types, and invertebrate assemblages. Scientists »

The Western bumble bee is currently being considered for protection under the Endangered Species Act. (PHOTO BY JEREMY GATTEN)

We will continue working with partners to learn about and conserve pollinators, including bumble bees, across the nation in the face of a changing climate. Join us in the effort to conserve our beloved pollinators through planting a pollinator garden and taking climate action. □

JEFF EVERETT, Ecological Services Program, Pacific Region

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hope the information gathered will help them find the best places to dig for nests, as they plan several test excavations of overwintering bumble bees next year. This research will help scientists be able to apply more meaningful conservation for bumble bees in the right places and at the right times.

Nine bees are currently listed under the Endangered Species Act. Seven of those are Hawaiian yellow-faced bees, and the other two are bumble bees: rusty-patched bumble bee and Franklin's bumble bee. However, several other bumble bees have been petitioned for listing, including the American bumble bee and Suckley's cuckoo bumble bee. The Western bumble bee is currently being considered as well.

Fish Quilt

For the National Fish Hatchery System 150th anniversary in 2022, the National Fish and Aquatic Conservation Archives coordinated a long-distance quilting bee. National fish hatcheries, fish health centers, fish technology centers, the Archives itself, our Aquatic Animal Drug Approval Partnership Program, volunteers, and the Service each submitted a square.

(PHOTO BY APRIL GREGORY/USFWS)

HELPING POLLINATORS

POLLINATORS provide vital benefits to people and wildlife, but for the past 25 years, many species of bees and other pollinators have experienced large drops in numbers. ••••• Habitat that pollinators need in order to survive is shrinking. Invasive wildlife crowds out native plants and increases disease threats. Improper use of pesticides can harm pollinators and other wildlife. ••••• One of the biggest problems is climate change. Flowers are blooming earlier as temperatures warm, costing some pollinators the opportunity to feed. More flooding and increasing fire seasons threaten native habitats. ••••• Read about some of the issues and how we are fighting them. •••••

SAVE POLLINATORS, SAVE THE PLANET

Efforts to conserve these critical species will help fight climate change.

By KATIE STEIGER-MEISTER

Hawaiian yellow-faced bees are the only native group of bees to Hawai'i. (PHOTO BY SHELDON PLENTOVICH/USFWS)

It's high noon and the bright summer sun blazes in a flat blue sky, not a cloud in sight. A breeze ripples across a small outcropping of blooming flowers, momentarily jostling native bees and butterflies feasting on nectar.

You could be witnessing this in a city garden or possibly the beach on a tropical island in the Pacific. Or on the side of the highway in any part of the continental United States. While the dance between pollinators and plants is as ubiquitous as it is timeless, there is more to this idyllic scene than meets the eye.

Though pollinators are essential to our food production and food security, the plants on which they depend have the power to help people in a different way. On public and private lands across the country, a quest for pollinator conservation is also leading to climate solutions. Work happening across the Service demonstrates that caring for the even the smallest insect has the potential to lead to big changes for the planet.

The Highway to Hope

According to the Federal Highway Administration, the United States is criss-crossed with more than 3.9 million miles of roadways. On the edges of these roads, in shoulders and ditches, are unpaved places where pollinators can find food and shelter. Known as transportation rights-of-ways, they represent a conservation opportunity of enormous magnitude in stretches of land most people drive past without ever noticing. The opportunity grows larger when combined with energy rights-of-way, the land that follows overhead powerlines or underground pipelines and is kept clear of woody vegetation for safety and maintenance purposes.

"Native flowers and grasses are able to flourish in these areas," says Sean Sweeney, a fish and wildlife biologist with the Service.

Sweeney coordinates the programmatic candidate conservation agreement with assurances for the monarch butterfly on energy and transportation lands. Participants who enroll in the monarch agreement voluntarily agree to provide habitat for the monarch butterfly on energy and transportation rights-of-way found across the country.

"To-date, there are more than 850,000 acres nationwide that are currently committed to monarch and pollinator habitat," Sweeney says. "We expect much more in the near future as well."

Members of the Rights of Way as Habitat Working Group, led by the University of Illinois-Chicago, hope to reach 2.3 million acres of monarch habitat nationwide. What does all this pollinator habitat mean for climate? In addition to providing food and shelter for pollinators, these lands are drinking in and storing gases that otherwise would enter the atmosphere and trap the sun's heat, contributing to global warming. The monarch rights-of-way work could potentially lead to the sequestration of between 106 million and 138 million tons of carbon dioxide. Looking to the future, the monarch is only the beginning. The Service and partners are exploring a companion agreement for at-risk and protected bumble bee species. ››

The areas found under power lines, known as energy rights-of-way, can be places where pollinators find food and shelter. (PHOTO COURTESY OF DAN SALAS)

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Picky Eaters and the Need for Seeds

While the rights-of-way work demonstrates a creative and collaborative solution to finding and connecting pollinator habitat across the country, acreage alone is not enough. Conservation success for pollinators starts with a foundation of native plants. When it comes to climate solutions, native plants do the heavy lifting on soil health, sequestering carbon and providing shade cover. In heavily degraded areas, how do we know what native plants to put where during restoration work? The answer: Pollinators have food preferences.

In Hawai'i, the endangered Anthricinan yellow-faced bee is no exception. A medium-size bee that can easily be mistaken for a small wasp, it is found in thin bands of habitat along Hawai'i's coastline. As the only native group of bees to Hawai'i, Hawaiian yellow-faced bees have co-evolved with many of the state's native plants that depend on the insects for pollination. The special connection between pollinator and plant can be seen with the Anthricinan yellow-faced bee and the 'akoko and 'ākulikuli plants that grow close to the ocean, along rocky and sandy coastlines.

Ākulikuli plants grow on the sandy and rocky beaches of Hawaii. Pollen from 'akoko and 'ākulikuli plants are found in greater abundance in yellow-faced bee nests, indicating to biologists that the bees have food preferences. (PHOTO COURTESY OF FOREST & KIM STARR/ CREATIVE COMMONS)

"In general, habitat restoration takes years and sometime decades," says Dr. Sheldon Plentovich, the Service's Pacific Islands Coastal Program coordinator. "However, I recently had an experience when I got that rare feeling of instant gratification at work. I was out-planting 'akoko at our Ka Iwi site on Oahu. 'Akoko vanished from this site years ago, so the bees had no prior experience with the plant. Yet while I was there, two yellow-faced bees appeared and started visiting the flowers before I could get a plant from a pot into the ground."

Biologists found that pollen from 'akoko and 'ākulikuli plants are found in greater abundance in yellow-faced bee nests. When reviewing the presence and abundance of plants in the areas where the bees forage for food, it became apparent that the bees were seeking out certain native plants more so than others in the area. Identifying yellow-faced bees' favorite foods told biologists what they should plant during restoration efforts.

Knowing what to plant is only part of the challenge. Like the pollinators they support, native plants are also in need. The recent National Assessment of Native Seed Needs conducted by the National Academies of Science, Engineering, and Medicine found that the United States doesn't have the quantity of native seeds and plant materials needed to achieve restoration goals. It is estimated that millions of pounds of native seeds and plant materials will be needed to ensure the success of habitat restoration projects across the country. In the case of the yellow-faced bee, seeds for out-planting efforts were collected onsite or from the next closest population.

When asked about how looking at the restored yellow-faced bee habitat made her feel, Plentovich replies, "It's extremely satisfying, especially when the work is ›› powered by the community who continue

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to protect and enhance the site through partnerships with scientists and land managers."

Climate Oasis for People and Pollinators

In Wilmington, Del., local community sits at the heart of the National Wildlife Federation's Sacred Grounds Program, which works with congregations, houses of worship, and faith communities to create on-site wildlife habitat and engage members in stewardship activities. Due to rapid development and urbanization, Wilmington is home to an abundance of impervious surfaces, like roofs and pavements, that mean more flooding during intense rainstorms, and more trapped heat during summer heatwaves. This can present challenges to both people and pollinators.

Climate change is already taking a disproportionate toll on Wilmington's most vulnerable residents. People of color and those with the lowest incomes are more likely to live in neighborhoods affected by flooding, air pollution, and the urban heat-island effect. The city's youngest and oldest residents are more susceptible to associated health impacts.

With support from the Service's Delaware Watershed Conservation Fund, the National Wildlife Federation is assisting 20 faith communities in becoming designated Sacred Grounds sites, prioritizing communities most vulnerable to climate change and environmental injustices. Through hands-on technical assistance, mini-grants, and educational workshops, these congregations will install native pollinator gardens on their grounds and engage their communities in environmental stewardship.

The key to the project's success has been tapping into a network of community partners and leaders. The National Wildlife Federation partnered with Delaware Interfaith Power and Light, Delaware Nature Society, Delaware Center for Horticulture, and Interfaith Community Housing of Delaware to understand the needs of congregations and congregants.

"It started with asking what they want," says Grant LaRouche, director of conservation partnerships for the National Wildlife Federation in the Mid-Atlantic. "It grew into a passion among our partners for creating these pollinator habitats and a pollinator corridor in Wilmington."

The gardens will support more than just pollinators. They will serve as places of peace and celebration while creating a more resilient Wilmington. Native plants have strong root systems that absorb and filter water and stabilize soil. Collectively, the 20 300-square-foot pollinator gardens that will result from the project will mitigate flooding, erosion, and polluted runoff in these neighborhoods. They will also work to reduce the urban heat island effect by lowering surface temperatures instead of absorbing and re-emitting the sun's heat like pavement does. According to the U.S. Environmental Protection Agency, trees and plants help cool the environment, making solutions like pollinator gardens a simple and effective way to reduce the temperature in urban heat-islands.

From highways to the Pacific islands to church gardens and beyond, pollinator conservation and climate solutions can be found walking hand-in-hand. With pollinators living on every continent save Antarctica, there are opportunities to help pollinators, and in turn combat climate change, wherever you live. On the road to saving some of the world's smallest inhabitants, we just might find ourselves saving the planet, too. □

KATIE STEIGER-MEISTER, Science Applications, Headquarters
Contributing: Bridget Macdonald, Office of Communications, Northeast Region

Community members prepare to plant native plants in a new pollinator garden at the Bethel African Methodist Episcopal Church in Wilmington, Delaware. The church received a grant to build the garden through the National Wildlife Federation's Sacred Grounds initiative, which received funding from the Delaware Watershed Conservation Fund to create a pollinator corridor in the city. (PHOTO COURTESY OF NATALIE COHEN/NATIONAL WILDLIFE FEDERATION)

RECOVERING THE KARNER BLUE BUTTERFLY

Managing for the future of the endangered species in the face of climate change.

By DAWN MARSH

Adult Karner blue butterflies feed on the nectar of flowering plants.
(PHOTO BY JILL UTRUP/USFWS)

Growing up in Michigan, I took the acres of wild blue lupine at my childhood home for granted. Today, I think about lupine all the time, as I recently became the range-wide recovery lead for the Karner blue butterfly.

This small, postage stamp-size butterfly is dependent on wild lupine, the only source of food for Karner blue butterfly larvae. One of my mother's favorite photos of me shows me sitting in a sea of blooming lupine, surrounded by brilliant purple flowers with green umbrella leaves. While it's tempting to imagine I also grew up with the Karner blue butterfly, it's unlikely. It has been protected as an endangered species for my entire life.

The small, blue butterfly lives in oak savannas and pine barren ecosystems from western Wisconsin eastward to the Atlantic and is currently found in Michigan, New Hampshire, New York, Ohio, and Wisconsin. Populations are at risk of winking out of existence without regular habitat management or protection to provide the habitat the species requires. In addition to requiring wild blue lupine, the butterfly and lupine occur in habitats that are fire-dependent—that is, they require regular disturbance to limit the intrusion of woody vegetation into open areas and expansion of dense forest cover. Management that replicates these natural processes keeps lupine and other nectar resources on the landscape.

When the Karner blue butterfly was protected in 1992, Indiana Dunes National Park was home to one of the largest populations with 5,000 to 10,000 butterflies. Today the Karner blue is no longer found in Indiana. Despite years of management and habitat restoration efforts, the species has not been observed in Indiana since 2014. After years of declining population numbers, extreme heat and drought in 2012 led to Karner blue butterflies vanishing from Indiana. Impacts of severe weather are a major concern for this vulnerable species.

Becoming an endangered species lead can be an overwhelming experience, especially if the species has been listed for decades. There are boxes and boxes full of history to be absorbed from previous leads and researchers who spent their careers becoming experts on the species. Thank goodness I have their work and our partners to help me step into this role. Over the years, a diverse network of partners from all sectors, including private citizens, industry, academics, Tribes, local units of government, and state and federal agencies, have all directly contributed to the overarching Karner blue butterfly recovery effort. A recovery team was established in 1994 to draft the Karner Blue Butterfly Recovery Plan. Simultaneously, the Wisconsin Department of Natural Resources drafted the Service's first statewide Habitat Conservation Plan (HCP) for a species. The Wisconsin Statewide Karner Blue Butterfly HCP now has more than 50 partners, and over 792,000 acres are enrolled. Wisconsin is now considered the stronghold for the species—thanks to the Wisconsin Department of Natural Resources, the HCP enrollees, private landowners enrolled in the Service's Partners for Fish and Wildlife programs, and Fort McCoy, which is home to one of the largest populations of Karner blue butterflies in the state.

Upon stepping into the new role, I learned about an extraordinary effort to complete a comprehensive review of climate change impacts on the Karner blue butterfly. While a report may not be thrilling news to everyone, I was ecstatic! "Blue Snowflakes in a Warming World: Karner Blue Butterfly Climate Change Vulnerability Synthesis and Best Practices for Adaptation" not only synthesizes the existing research on Karner blue butterflies and climate change but also outlines ››

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a menu of recovery actions to ensure the species persists into the future. The report is one of the most in-depth looks at an imperiled species, and the recovery approaches we take for the Karner blue butterfly may blaze the path forward for other at-risk plants and animals.

I encourage anyone interested in species recovery, pollinators, or climate change to look at the report when it's available later in 2023. The climate change report inspires hope for species recovery in a changing climate, and not just for the Karner blue butterfly. The actions highlighted in the report are relevant to a wide variety of species, especially those with similar larval-host plant relationships.

One of the challenges outlined in the report is how sensitive the Karner blue butterfly is to temperature and precipitation changes. The species is limited in its ability to move northward because of the larval-host plant relationship with wild blue lupine. The butterflies cannot move without lupine moving first. Without connecting corridors of lupine and nectar plants, the species is unable to move to new places without assistance. And even more concerning is the disruption that shorter winters and hotter summers are having on the relationship between the flower and the butterfly. The time when the lupine blooms and the butterfly caterpillars hatch is falling out of sync, resulting in some very hungry caterpillars.

While the Karner blue butterfly may be a "snowflake in a warming world," we are taking steps to protect it. Another element covered in the report is Resist-Accept-Direct, or RAD, and how this framework can be used to evaluate recovery actions. Do we resist the ongoing changes and attempt to reverse impacts, accept change by allowing Karner blue butterflies to respond to climate change without any assistance, or intervene and direct change to areas that may become more suitable for the species in the future? These are just a few of the questions weighing on my mind as I learn more about the species and work with our partners. ››

The Karner blue butterfly is currently found in Michigan, New Hampshire, New York, Ohio, and Wisconsin. (PHOTO BY JILL UTRUP/USFWS)

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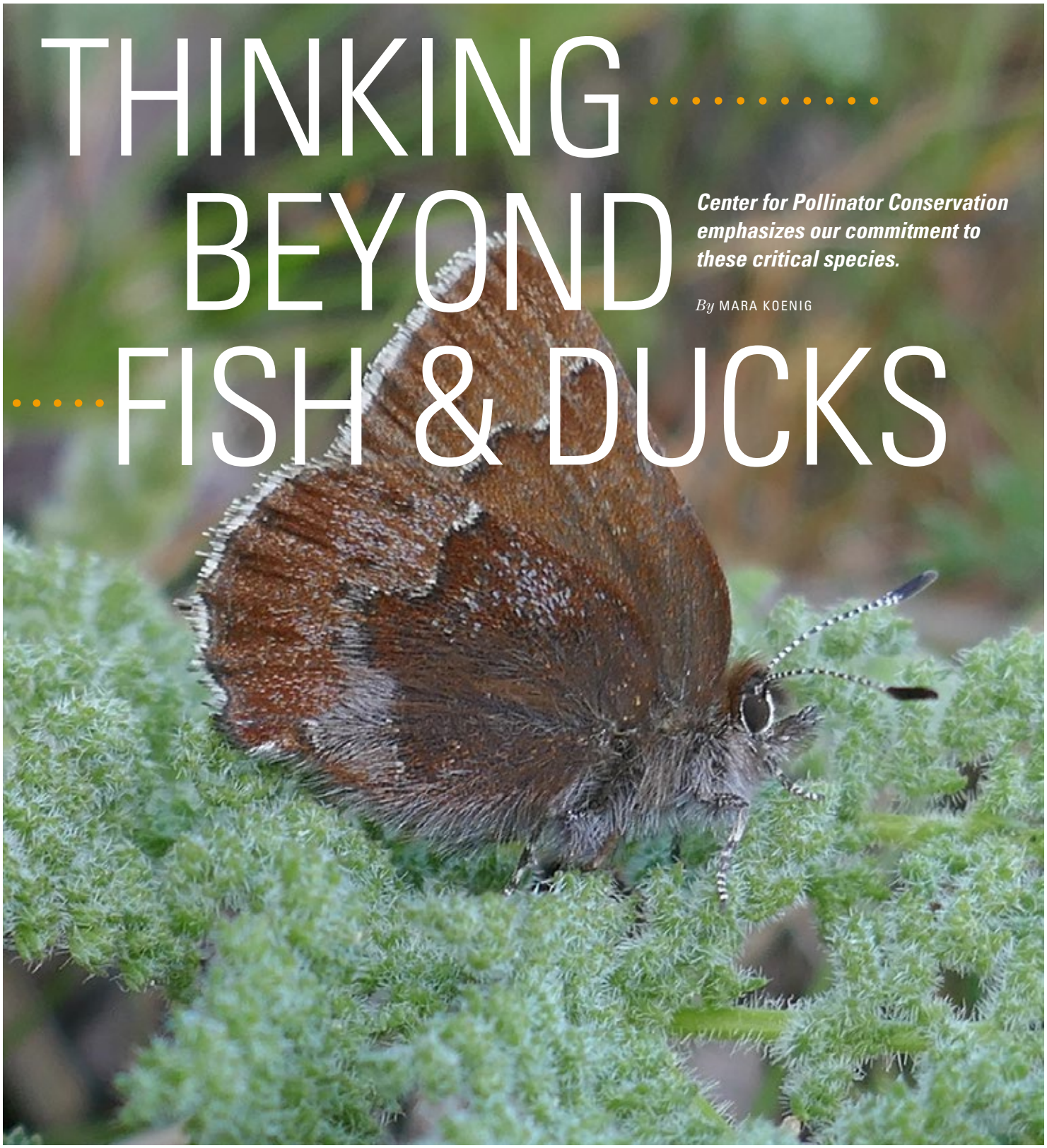
This summer I am out in the field, visiting with partners and observing Karners in flight. When I look out across fields of wild blue lupine, I can't help but be reminded of my childhood. I hope that future generations will be able to see the beautiful, blue butterfly when scanning these lupine fields. □

DAWN MARSH, Minnesota-Wisconsin Ecological Services Field Office, Ecological Services, Midwest Region

(Top) The Karner blue butterfly is dependent on wild lupine, the only source of food for its larvae. (PHOTO BY DAWN MARSH/USFWS) (Right) The Karner blue butterfly is sensitive to temperature and precipitation changes. (PHOTO BY DAWN MARSH/USFWS)

THINKING BEYOND FISH & DUCKS



Center for Pollinator Conservation emphasizes our commitment to these critical species.

By MARA KOENIG

Insects are incredible! Did you know that they make up roughly 70% of all known animals? While we are more commonly known for conserving fish and other charismatic wildlife, we want to draw your attention to insects. They are the real heroes in habitat conservation, restoration, and recovery.

Insects are considered the best pollinators for plants, with bees holding the gold medal. Pollinators help about 80% of the world's flowering plants to reproduce. A flower's generous offerings of color, smell, and nectar are all on show for one reason — to persuade a pollinator to visit. Plants and pollinators have coevolved: Plants provide sweet nectar and pollen for pollinators to consume, and in return, pollinators move pollen from flower to flower so plants can produce seeds. This pollination service is essential for plants, including the ones we like to eat.

Getting It Right

The relationship between plants and pollinators is ancient. Researchers have found a tumbling flower beetle trapped in amber from the Cretaceous Period almost 99 million years ago. Over time, plants have evolved their flower shapes, colors, and scents to maximize their pollination chances. But their relationship is hindered by many challenges, including climate change. Take for example the San Bruno elfin butterfly and broadleaf stonecrop. This stonecrop is the only food source for the endangered San Bruno elfin caterpillars. Seasonal rains too early or too late may shift the growth period of the host plant so that it is out of sync with the butterfly. If there is no broadleaf stonecrop, there are no San Bruno elfin butterflies — it's that simple.

For this endangered butterfly, and many other pollinators facing significant declines, we created the Center for Pollinator Conservation in December 2022. The center enables science-based solutions and collaboration needed to stabilize and improve populations. A focus on pollinators benefits many of the fish and wildlife resources we manage.

Center for Pollinator Conservation Selects Director

We work with others to make our world better for wildlife and people. That requires having the right people, and Nicole Alt leads our efforts for pollinators as the first director of the Center for Pollinator Conservation.

Alt grew up in eastern Iowa, exploring and enjoying being outside. A small family farm provided many adventures, and her grandfather always made discoveries — a fox den, milkweed patches, or a bird nest with eggs. These small adventures and her grandfather's words, "if you take care of the land, it will provide for you," helped build a curiosity and foundation for the love of nature, especially in the prairie.

With more than 20 years in the Service, Alt began her career at headquarters in Washington, DC, with congressional and legislative affairs, then the Director's Office and Ecological Services. Representing the agency within the Department of the Interior and with Congress offered a broad view of operations, policies, litigation, and every program in the agency. After serving at the national level, Alt moved west to the Mountain-Prairie Region as Deputy Assistant Regional Director for Ecological Services. Then she then became a field supervisor at the Colorado Ecological Service Field Office.

In her new role, Alt continues to call the Mountain-Prairie Region home. Being co-located in Fort Collins, Colo., with the Natural Resources Conservation Program, offers Alt an opportunity to leverage the center's function as a national network to support and inform conservation decisions across the agency's programs and regions.

"Conservation is always about people, building relationships, and supporting others," Alt says. "I strive to build trust and relationships by listening, understanding perspectives, and finding common ground to improve conservation success."

Alt's successful coaching leadership style stems from her time on the farm, a competitive swimming career, and learning from those who walked before her. She is grateful for the support and opportunities that have helped her grow and take on large-scale challenges like creating an inclusive workplace culture, transforming the Endangered Species Act listing program, and building a coalition to support conservation measures for greater sage-grouse habitat. She takes the lessons from these experiences to help define the agency's voice and role for the Center for Pollinator Conservation. Alt looks forward to listening and working with others to promote pollinator conservation.

Sprouting Moves

Like soil, pollinators are a key component for a healthy ecosystem. While they may be small and easy to miss, they make up a large, diverse group of organisms that play an integral part in the whole system. The Center for Pollinator Conservation staff is keenly aware of this connection and uses it to identify projects that will benefit pollinators the most. Here are a few projects from the center.

■ To leverage conservation efforts, the center is expanding pollinator inventory and monitoring efforts on national wildlife refuges. Tennessee National Wildlife Refuge Complex, and Savannah, ››

(Previous page) Broadleaf stonecrop is the only food source for the endangered San Bruno elfin caterpillars.

(PHOTO BY TOMMY PETERSON/CREATIVE COMMONS)

Monarch butterflies and bumble bees enjoying blooming biden flowers. (PHOTO BY MIKE BUDD/USFWS)

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Carolina Sandhills, and Santee National Wildlife Refuges are conducting bumble bee surveys with Bumble Bee Atlas, a community science project aimed at gathering bumble bee data. The data collected will be submitted to Bumble Bee Watch, an online database effort to track and conserve North America's bumble bees. In addition, employees are conducting rapid vegetation surveys to supplement the bee data with associated plants. This additional information offers a deeper understanding of the plant-pollinator relationship.

■ Partnering with Monarch Joint Venture, we'll be using uncrewed aircraft systems and artificial intelligence to rapidly survey the distribution of milkweed on several refuges throughout the Midwest and Mountain-Prairie regions. This partnership is pioneering a new approach for counting common milkweed, an essential host plant of monarchs. The hope is to expand this type of technology to other future survey needs across public lands we manage.

■ The center is expanding knowledge through assessing the state of pollinators, with a focus on butterflies and bees. For the status of butterflies in the United States, we are working alongside the U.S. Geological Survey, Xerces Society for Invertebrate Conservation, and leading scientists from Washington State University, University of California-Davis, Georgetown University, Michigan State University, and University of Nevada-Reno. The center is bringing disparate data to capture a big-picture view of overall butterfly trends, including overlooked at-risk species to better understand their challenges. The resulting analyses will culminate in a state of the butterflies report of about 200 species for guiding future conservation actions, inventory and monitoring, and data management.

■ Building on a legacy of strong work for monarch butterflies with the Commission for Environmental Cooperation, an international organization established by Canada, Mexico, and the United States, the center is co-leading a two-year project for native bees throughout North America. This project is focused on sharing best practices, protocols, and case studies for native bee inventory and monitoring and developing new approaches to visualize and share geospatial data across the three countries. These efforts can reshape what is known about native bees and how biologists conduct conservation efforts.

■ The center continues to advance the conservation of at-risk native pollinators by contributing funds to the National Fish and Wildlife Foundation's ››

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Monarch Butterfly and Pollinators Conservation Fund. The Pollinator Fund is awarding $2.7 million in grants for the 2023 grant cycle. Since 2015, the fund has awarded $19.7 million to 123 projects that are helping conserve and recover the monarch butterfly while also benefiting other native pollinator species.

The center's effort and investment for pollinators will continue to grow as the center evolves. It is a place for land managers, decision- and policymakers, scientists, program leaders, and others to explore, coordinate, and share best practices and approaches to proactively addressing the decline in native pollinator populations. □

MARA KOENIG, Office of Communications, Midwest Region

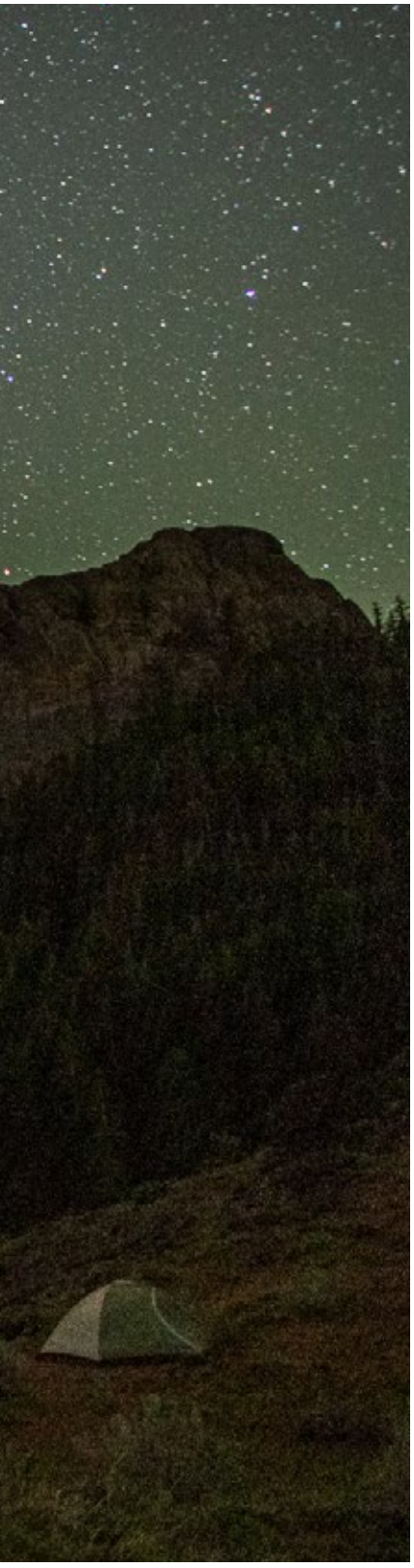
Bees visit pickerel weed.
(PHOTO BY MIKE BUDD/USFWS)

Nicole Alt. (PHOTO COURTESY OF NICOLE ALT)

DIM THOSE LIGHTS!

Nighttime pollinators can be disrupted by artificial lighting. | *By* JOANNA GILKESON

Skyglow above an urban area obstructs the lower night sky, as pictured from Soda Mountains Wilderness in Oregon. (PHOTO BY KYLE SULLIVAN/BLM)



Wildlife, plants, and insects evolved to co-exist with the night sky, illuminated by the stars and moon.

In a matter of decades, humans transformed the dark and naturally lit night sky to one that is glowing and brightened by artificial lights. In 2016, 80% of the world was estimated to live under skyglow, a term used to describe the brightening of the night sky in areas where people live. The same year, the National Oceanic and Atmospheric Administration reported that an estimated one-third of humanity could no longer view the Milky Way galaxy. In areas where this occurs, the soft glow of more than 100 billion stars is obscured by human-produced light. This excess of light at night is a form of pollution that can harm wildlife and plants.

Artificial light pollution is caused by any kind of outdoor lighting including streetlamps, porch lighting, and even homes and office buildings that leave the lights on throughout the night without the use of shades or blinds.

Light pollution disrupts the natural sleep-wake cycle that repeats every 24 hours, known as the circadian rhythm. It also distorts natural rhythms in seasonal lighting that provide important cues to all life on Earth—such as when to begin hibernating or migrating. It changes the time that plants and animals spend awake or asleep and the activities they typically carry out during waking hours. The impacts of light on other species such ››

A lesser long-nosed bat sips nectar from a cactus flower. (PHOTO BY BRUCE TAUBERT/ BAT CONSERVATION INC.)

White-lined sphinx moth pollinating at night.
(PHOTO BY TOM KOERNER/USFWS)

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as birds and sea turtles are fairly well-known, however, few studies have evaluated the interaction between insects, pollinators, plants, and artificial light.

"Although not well-studied, we are beginning to more clearly understand the impact light pollution has on insects and pollinators. This topic is emerging in more and more conversations," says Melissa Burns, our western monarch coordinator.

The studies that have been conducted show artificial lighting can drastically affect the behavior of insects and pollinators, and therefore the ability of plants to produce fruit and reproduce.

In 2014, a group of scientists in the United Kingdom studied the effects of streetlamps on moths. The scientists found that 70% of the moths flew toward the streetlamps and away from flowering plants. This resulted in a reduction of plant pollination.

A separate study conducted in 2017 also found that nighttime pollinators were less likely to visit plants underneath artificial light, reducing pollination and fruit produced by the plants. The researchers found that approximately 62% fewer insects visited the plants in a meadow illuminated at night with LED streetlamps than a meadow naturally lit by the moon.

Both studies show that the presence of artificial light at night deters pollinators from their nightly routine. Some nocturnal pollinators are attracted to and disoriented by artificial light, expending precious energy and distracting them from their nighttime routines and pollination duties. Others are deterred by well-lit areas. In both cases, the result is a disruption in nighttime pollination and fewer plants producing fruit and reproducing. Researchers are not exactly sure why this happens, but there are several theories.

"Artificial lighting at night also increases a nocturnal pollinator's risk of predation because they are easier to see. Their ability to see and avoid predators is also reduced by the lighting—so they may avoid it. This risk is thought to be one of the factors contributing to declines in nocturnal pollinators globally," Burns says. ››

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More research is needed to better understand how exactly artificial lights impact plants and pollinators and the long-term implications. Luckily, each of us can adjust how we use outdoor lighting through the tips below and help our backyard pollinators. These actions have the added bonus of helping other species of wildlife, reducing energy use and costs, and contributing toward a healthier future in the face of a changing climate.

Tips for Reducing Skyglow at Home

- *Keep light indoors*: Close blinds and curtains at night to keep the light inside.

- *Color matters*: Use warmer colored light bulbs and minimize blue-violet light (light bulbs with a temperature of no more than 3000 kelvins).

- *Use outdoor light where and when you need it*: Control your lighting through motion detectors, timers, or dimmers. Use motion-triggered lights to address safety concerns.

- *Keep light where you want it*: Properly shield all outdoor lights to eliminate light pollution drifting into the sky.

- *Visit International Dark Sky Certified places (and refuges!)* to learn more about light pollution and experience the night sky! We manage two internationally certified places: Valle de Oro National Wildlife Refuge in New Mexico is certified as an Urban Dark Sky Place and Lost Trail National Wildlife Refuge in Montana is certified as an International Dark Sky Sanctuary.

- *Plant a moon garden for nighttime pollinators.* □

JOANNA GILKESON, Office of Communications
Pacific Southwest Region

Armyworm moths are important nighttime pollinators. (PHOTO COURTESY OF ARK. EXPERIMENT STATION/CC-BY-NC 2.0)

JOIN THE BUZZ

Find out all about pollinators.

By DR. LYNN CARTMELL

National wildlife refuges are not only havens for wildlife, they also serve as critical sanctuaries for pollinators. These incredible insects, mammals, and birds play a vital role in conservation by ensuring the pollination of plants, as well as the production of fruits, nuts, and seeds that support other wildlife. Yet, native pollinators face growing threats from increasing development, disease, and climate change. Recognizing their importance, we actively work from coast to coast and border to border, even beyond, to conserve pollinators and their habitats.

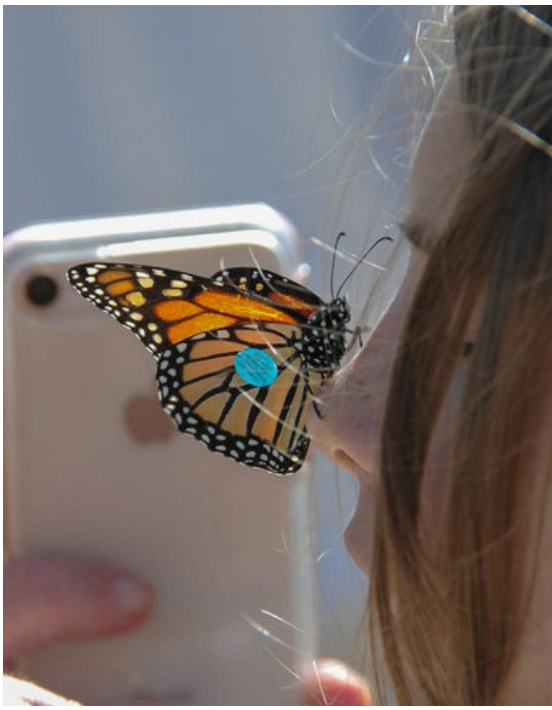
Through the National Wildlife Refuge System, one of our land management programs, staff, volunteers, and Friends groups provide a number of opportunities throughout the year to learn about and engage with pollinators and the plant species that support them. National wildlife refuges across the nation organize pollinator events and exhibits.

From festivals and guided tours to interactive demonstrations and environmental education programs, wildlife lovers and outdoor enthusiasts of all ages learn about and celebrate the incredible world of pollinators. These opportunities not only educate and entertain the public but also instill a deeper appreciation for, or newfound understanding of, the crucial role pollinators play in nature and in our day-to-day lives. So come join the buzz and celebrate the remarkable pollinators that make our world bloom. Check out the list below for an opportunity near you.

■ *Buzz about the Pollinator Patch at Ankeny Hill Nature Center in Jefferson, Oregon, daily from mid-March to September.*

The word garden doesn't quite define the Pollinator Patch at Ankeny Hill Nature Center. That would be too structured and tended to describe the 4,000-square-foot tapestry of native plants that is meant to help visitors discover the world of native pollinators. Funded by partners and constructed by volunteers, the Pollinator Patch is divided into 10 themed areas. Among them is Bees with Bling, which showcases the 650 native bee species in Oregon, some of which are brightly colored and even shimmering. Here, you can peer into a mason bee house and learn about the life cycle of a mason bee or investigate the demonstration area to learn how to create a similar space in your yard. Explore the dual language English and Spanish interpretive panels that explain the pollination process, reveal how native plants sustain native pollinators, and teach about threats to pollinators.

Two small children pose with their mother behind a monarch butterfly cutout. (PHOTO BY NANCY WILLIAMSON/FRIENDS OF HACKMATACK NATIONAL WILDLIFE REFUGE)



A tagged monarch butterfly rests on a child's nose. (PHOTO BY FRIENDS OF ST. MARKS NATIONAL WILDLIFE REFUGE)

■ *Roam like a herd of bison at Wichita Mountains Wildlife Refuge near Lawton, Oklahoma, daily from May to August.*

There is nothing more iconic than an American bison grazing on the open prairie. While bison aren't technically pollinators, they do such great work supporting pollinator habitat, I just had to include them here. America's grasslands provide vital habitat for native pollinators, and bison's selective grazing on those grasslands increases native flowering plants and pollinators. ››

(Previous page) A bison stands in a meadow covered with wildflowers. (PHOTO BY QUINTON SMITH/USFWS)

Continued from previous page.

Recent studies show that bison seem to prefer wind-pollinated grasses that allow insect-pollinated flowering species to flourish. There's no better place to see this dynamic relationship on display than Wichita Mountains National Wildlife Refuge, where bison and a bit of rain can cause a riot of wildflowers.

■ *Flutter by the Butterfly Festival in October at St. Marks National Wildlife Refuge, St. Marks, Florida.*

October brings cooler weather and transport winds for migrating birds and butterflies. Join refuge staff and Friends at the historic St. Mark's Lighthouse for the annual Monarch Butterfly Festival to learn about Monarch butterfly migration. Monarch butterflies are the most advanced among all known butterfly species, travel up to 2,500 miles from their breeding grounds in Canada and the United States to reach forests in central Mexico. Festival-goers are typically able to witness the tagging and release of these large, brilliant orange, white, and black marathon migrators alongside exhibits and demonstrations, family-friendly crafts, music, food, and more.

Don't see a nearby refuge here? There is at least one national wildlife refuge in each state, and many have an interest in pollinators. Find a refuge near you.

DR. LYNN CARTMELL, Chief of Visitor Services, National Wildlife Refuge System, Midwest Region

? MORE INFORMATION

National fish hatcheries also provide space for pollinators. Find a hatchery near you.

Adults and children dressed up as monarchs parade around during a pollinator festival. (PHOTO BY USFWS)

A paved trail bordered by flowering plants and interpretive signs invite the public to explore the world of pollinators at Ankeny Hill Nature Center. (PHOTO BY USFWS)

(Above) At the Leavenworth National Fish Hatchery's pollinator garden, volunteers from the Chelan Douglas Master Gardeners tackle spring projects. (PHOTO BY JULIA PINNIX/USFWS)

RIVER REFUGE IN THE ARCTIC

Remote Porcupine River is an ancient home to migratory birds. | *By* LISA HUPP

Flying over the boreal forest and wetlands of Alaska, southwest of the Porcupine River area at Kanuti National Wildlife Refuge. (PHOTO BY STEVE HILLEBRAND/ USFWS)

Swathed in bug netting and waterproof waders, Paul Leonard steps out onto the edge of a sunlit, rocky bluff overlooking the Porcupine River. At 9 a.m., he is already six hours into a grueling workday in a remote corner of Arctic National Wildlife Refuge in Alaska.

"Did you hear that?!" he exclaims. "Downriver, on that steep slope. There!"

"Che-lek," the harsh and clipped song calls back. "Che-lek." And then a second call, across the river. Two yellow-bellied flycatchers, songbirds that winter far to the south in Central America, are home in the Arctic for their summer nesting season in the far northern boreal forest.

Ravens wheel overhead while ducks dive in the river below. Tiny kinglets, weighing no more than a AAA battery, chorus from the dwarf black spruce trees. A peregrine falcon scolds out from a cliff-side nest somewhere nearby.

And everywhere, the mosquitos and black flies thickly buzz, an insect feast for carnivorous dragonflies and abundant bird life.

Arctic National Wildlife Refuge is a summer paradise for birds. With five ecological biomes, vast expanses of ideal nesting habitat, and a *very* healthy insect population, birds travel there annually from six flyways, from as far away as New Zealand and Africa. For Leonard, the supervisory wildlife biologist at Arctic Refuge, it is also a dream for avian monitoring.

Except for one tiny, logistical hiccup: There are no roads. And the complication: This nursery for birds covers more than 19 million acres.

Alaska: A Challenge for Bird Surveys

The annual North American Breeding Bird Survey in early summer is one of the most widespread and consistent ways to monitor bird species in the world. The survey relies on a series of roadside stops where observers look and listen for birds during the early-morning hours. This survey network across the continent helps us better understand how different bird species are doing—and when they are in trouble.

The survey only works in a small area of Alaska, however. Most of the state is only accessible by boat, plane, or on foot, which holds true for the interior Alaskan boreal forest. Unfortunately, birds that nest and raise chicks in the boreal forest face the second steepest population decline among all the biomes in North America.

The Alaska Landbird Monitoring Survey (ALMS) is one solution to the problem of the enormous information gap in Alaska's roadless areas. It is also an arduous and sometimes daunting task: Surveyors must navigate to a random series of points far from roads or trails to listen and observe for birds. The terrain for each survey location can be densely vegetated, steep, full of bears and bugs, and formidably difficult to access and navigate.

The challenges of observing at the Porcupine River ALMS are worthwhile to Leonard, however, in the face of drastically declining bird populations and a lack of information.

"I think the eastern Arctic region is egregiously undersampled," he explains, "but this region is important to understand how climate change is driving range expansion and contraction for birds."

The Porcupine River ALMS site may be among the most challenging in Alaska. Just getting there requires ingenuity and flexibility. Changing conditions like water levels, wildfire smoke, and the logistical hurdle of landing small planes on infrequently visited gravel bars can alter plans in a moment. Few planes fly in this area of Alaska, and there are limited backup options to refuel or find alternative landings.

This year, Leonard and his teammate arrived by boat from Fort Yukon, a couple of hundred miles downstream. They nearly missed the scheduled pickup by plane a few days later when strong headwinds pushed against their small rafts.

Ancient River of Beringia

As Leonard recorded the birds he could hear and see in the thick forest, the Porcupine River curled below, cutting against the edge of an ancient landscape.

Fifty thousand years ago, the land was one of the few areas of North America to remain unglaciated during the peak of the last ice age: part of a strip of open country known as Beringia. The river grew out of streams and headwaters in Canada as a two-mile thick ice sheet melted and overflowed lakes. It ultimately reached the mighty Yukon River, linking the northeastern Arctic to the far western coast of Alaska. It flows through what is now the southeastern corner of Arctic National Wildlife Refuge. ››

(Previous page) Blackpoll warblers breed in northern coniferous forests. They have lost over 90% of their population since the 1970s. Learning more about these birds at all of their life stages is critical to our understanding of what's driving this population loss. (PHOTO BY ZAK POHLEN/USFWS)

(Counterclockwise from top) A historical wooden house on the banks of the Porcupine River in Canada, near the Alaska border. (PHOTO BY CALLIE GESMUNDO/USFWS)

The Porcupine River winds through the southeast corner of Arctic National Wildlife Refuge, as seen from a bluff above the river. (PHOTO BY CALLIE GESMUNDO/USFWS)

Bluffs with a long history of climate changes reflect along the Porcupine River. (PHOTO BY FRAN MAUER/USFWS)

The sun rising through the black spruce boreal forest along the Porcupine River, a vital habitat for insects and nesting songbirds. (PHOTO BY CALLIE GESMUNDO/USFWS)

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The river has long been a travel corridor and important place for both people and wildlife. Gwich'in Athabascan communities continue to access hunting and fishing areas that lie between the villages of Alaska Natives near Arctic Refuge and villages of First Peoples in Canada. Trappers and prospectors also used the river during the 1800s for travel and trade. Old village sites, cabins, and a Hudson Bay trading post remain along the banks.

Salmon travel this way, too: King and chum salmon migrate up to spawning grounds in Canada from the Pacific Ocean in an incredible long-distance feat over hundreds of miles. Along with the Tanana River to the south, the Porcupine is one of the most important streams for fall chum salmon in the Yukon River watershed.

It is also the namesake for the Porcupine Caribou Herd that winters near the headwaters and crosses the river annually on their migration to the Arctic coastal plain to calve.

As the river crosses into Alaska, large bluffs rise along the shore, carved out by water over time. The layers of rock and silt hold a history of climate changes spanning millions of years, including mammoth bones and old redwood trees.

This is some of the best nesting habitat for peregrine falcons in Alaska. It is also the beginning of the Porcupine ALMS observation points, a survey made possible because the river provides access.

"The Arctic Refuge sampling locations (the Porcupine River and the nearby Colleen River) were chosen to represent an interior boreal forest ecosystem with a minimal human footprint," Leonard says. "These sites also balance some of the logistical complications of surveying this part of the country. Both sites are accessible by major rivers during the survey period and provide [mostly] reliable fixed-wing landing locations."

Remote But Connected

"In the short term, I have a very simple goal of making sure this survey effort can have a future at Arctic Refuge," Leonard reflects. "I think there is more to learn, more to uncover."

The promise of learning more about these birds extends far beyond the remote landscape of a far northern refuge.

"By gaining an understanding of these species during the summer, it connects us to the many networks of places, people, and problems that these birds encounter at other periods in their life histories," Leonard explains. "One of the great things about studying migratory birds is that they provide a wonderful example of how important it is to work together."

The Porcupine River provides connection as well: between villages and countries, across climate epochs, and along cultural histories. And, through the winged creatures that call it home, the river connects the Arctic Refuge with the rest of the world. □

LISA HUPP, National Wildlife Refuge System, Alaska Region

from sink to swim

Sport Fish Restoration dollars help fund world-class boating facility.

By LANIER CLEGG

People fish for bass. (PHOTO COURTESY OF TAKE ME FISHING/ RECREATIONAL BOATING AND FISHING FOUNDATION)

The Bass Anglers Sportsman Society's Bassmaster Classic is to professional bass fishing as the Super Bowl is to professional football. Large cheering crowds, lights, and blaring music. It's a spectacle to behold.

You can imagine the excitement of folks in Anderson County, South Carolina, when poor fishing conditions and low water levels at a lake set to host the 2008 competition in another part of the country unexpectedly forced the Classic to relocate to their local fishing hole — Lake Hartwell.

Matt Schell, who manages the Anderson County Parks Department, remembers the 2008 Classic vividly. An avid angler himself, on the big day, he was ecstatic. Before sunrise he headed to the Lake Hartwell dock before sunrise, ensuring he had a prime spot for viewing the trophy bass caught by Bassmaster Classic competitors.

When he arrived, something wasn't right. His feet were getting soaked. The dock was sinking. Schell realized the crowd was too big for the dock to handle.

Sinking docks. Inadequate viewing space. Insufficient availability of boat docking. Things were clearly not going quite as planned.

"There has to be a better way to attract this type of tournament and host this event," Schell remembers thinking.

Thus, Green Pond Landing was born.

Building an Icon

Using Geographic Information Systems, 13 sites on Lake Hartwell were evaluated to find the best location for a high-capacity boat ramp.

Green Pond Landing was a standout. For starters, Green Pond allowed the design and construction of a facility that would still reach the water should a drought occur. It's also centrally located on Lake Hartwell, allowing easy access to different lake sections and satisfying anglers' preferences for fishing locales.

After settling on a location, the design of the facility started to take shape. It would include three concrete launch ramps each 276 feet long. There would also be a floating courtesy dock. The cost: $2.8 million.

Some funds were available through various sources, but they were not enough to make the vision reality. A coalition of potential partners started pooling resources and introducing Schell to other funding possibilities. Ross Self, chief of freshwater fisheries for South Carolina's Department of Natural Resources (DNR), suggested Schell explore the Sport Fish Restoration Program.

Funded through excise taxes on fishing tackle and motorboat fuel, Sport Fish Restoration funds are administered by the Service. They help pay for fisheries projects, boat ramps, docks, and other public waterway needs.

The program pays 75% of the costs of a project with states providing the rest. The Green Pond project was awarded $750,000. Using state water recreation funds, DNR chipped in $250,000. With other funding already earmarked for Green Pond from other sources, the project could move forward.

Ground broke on the project in May 2012, and Green Pond had its grand opening in December 2014. Fittingly, two months later, the first event to launch out of the new facility was the 2015 Bassmaster Classic.

Green Pond turned out to be the perfect facility for the 2015 event, and things went much more smoothly than in 2008. ››

Green Pond Landing has hosted the Bassmaster Classic three times since opening in 2014.

Green Pond Landing before and during the 2022 Bassmaster Classic. (PHOTOS BY USFWS)

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But there is always room for improvement.

Construction on Green Pond Landing began again, investing more Sport Fish Restoration funds when Anderson County expanded the docks.

The Classic returned to Green Pond in 2018 and, yet again, inspired further improvement.

Green Pond kept drawing the Classic back to South Carolina. By the time the event returned for the third time to Green Pond in 2022, and the fourth time to Lake Hartwell, Sport Fish grants and matching funds had expanded the docks, including a large weigh-in dock.

"Every year when the Classic has returned, it has come with a huge tie to Sport Fish investment," Schell says. "The Sport Fish Program is completely woven into the fabric of Green Pond Landing."

Looking to the Future

Since opening, Green Pond Landing has generated an estimated $100 million in economic impact for Anderson County and put the area on the map as a prime fishing destination.

As recreational fishing has expanded, bait and tackle shops have opened. New boating dealerships have popped up, and existing ones have expanded.

Today, Green Pond Landing is known regionally as the model for bass fishing tournament facilities.

"We've received inquiries and requests for assistance, leadership, or guidance from folks building similar facilities," Schell says. ››

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Green Pond Landing, to Schell, is one of the top three fishing facilities in the country.

To date, approximately $8.6 million has been invested into Green Pond. Schell notes, they still have ideas on how to continue improving the facilities for anglers.

"It's been a ride, and it continues to pick up steam."

Fishing tournaments with anglers of all ages and abilities routinely launch out of Green Pond. It is set to host 44 fishing tournaments this year and is ready to take more should the opportunity arise.

Schell says there are plans to apply for more Sport Fish grants for more dock expansions and other improvements.

"There is no better project in my eyes to show what the Sport Fish Program has done for us in the state of South Carolina," says Schell. "Sport Fish funds have played a critical role in the development and construction of Green Pond." □

LANIER CLEGG, Office of Communications, Southeast Region

Since opening, Green Pond Landing has generated an estimated $100 million in economic impact for Anderson County.

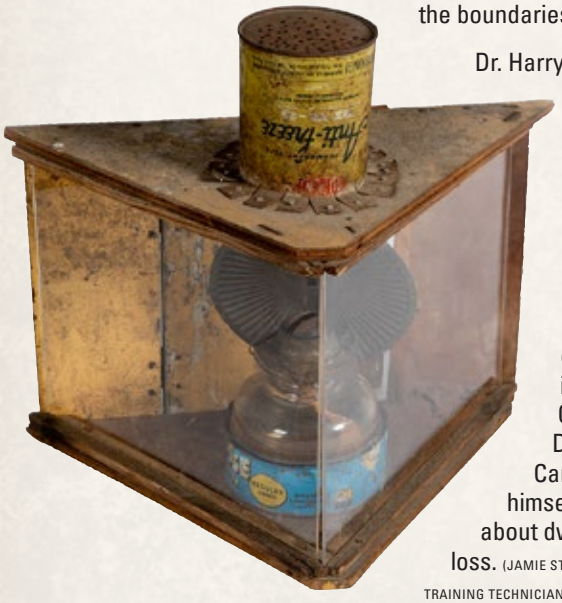
MUSEUM OBJECTS COME TO LIFE

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.

Do-It-Yourself Egg Hatching

This egg tray cabinet is like a lot of items in the National Fish and Aquatic Conservation Archives collection—it's homemade. National fish hatcheries have been around for over 150 years. For a great many of those years, items needed for the successful rearing of fish couldn't simply be ordered from a catalog to arrive at your doorstep in a few days. Hatchery personnel made many of the tools they used in-house. This egg cabinet has numbered metal trays that can be pulled out to check on the fish eggs inside. Holes were punched in the bottom of the trays to allow water to flow through to the trays below. A door with air holes was also crafted for extra safe keeping of the fragile eggs inside. While we don't know the years this cabinet was used, we do know that it was made and used at Gavins Point National Fish Hatchery in Yankton, S.D., and transferred to the collection in 2011. (APRIL GREGORY)

Pieced Together



Gunning lights were mounted to the front of boats to illuminate waterfowl and conceal hunters in the darkness. This gunning light is patched together using wood, glass, a coffee can, and an antifreeze can. It is one of many objects in an expansive collection that highlights the effective lethal techniques used by hunters who worked within and outside the boundaries of the law during the Market Hunting era.

Dr. Harry M. Walsh wrote what is considered to be one of the most comprehensive studies on waterfowling in his book, *The Outlaw Gunner.* Objects from the Walsh collection will be exhibited at the National Conservation Training Center to highlight the devastation caused during this time in our history, and the continuing need for waterfowl conservation efforts. Raised on Maryland's Eastern Shore, Walsh's collection focuses on the methods used in the Chesapeake Bay, North Carolina's Outer Banks, and the tidewater regions of Delaware, Maryland, Virginia, and North Carolina. An avid hunter and outdoorsman himself, Walsh became increasingly concerned about dwindling waterfowl populations and habitat loss. (JAMIE STONER, U.S. FISH & WILDLIFE SERVICE MUSEUM AND ARCHIVES TRAINING TECHNICIAN)

Early National Fish Hatchery Souvenirs

The K&O (Kronheim & Oldenbusch) Metal Novelties Company was in business from 1895 to 1939 in Brooklyn, New York. K&O specialized in metal bookends, gewgaws, and place-specific souvenirs. National fish hatcheries fit the bill of tourist attractions worthy of keepsakes. Many of early hatcheries were—and still are—popular tourist attractions, and K&O decided to capitalize on tourism to federal hatcheries, state and national parks, dams, and other public lands. Their signature place-specific souvenirs usually had a metal shield with an engraving of the name and location. The shield was then attached to salt and pepper shakers, small metal trays, paperweights, and the like. The Spearfish National Fish Hatchery has multiple K&O site-specific keepsakes such as these copper salt and pepper shakers. Today, tourists still buy similar souvenirs from national fish hatcheries across the nation. (APRIL GREGORY)

transitions

Headquarters

Longtime public servant **Barbara Wainman**, the Assistant Director for the Office of Communications, retired at the end of June.

She began her career at the Service in 2017 after 18 years in the same position at the U.S. Geological Survey. In both agencies, she emphasized the importance of internal communications to keep employees abreast of what was happening at the agency beyond their individual assignments. At the Survey, the work on internal communications was one of the first such programs in government.

At the Service, the robust Intranet platform and Wild Weekly email to staffers, both developed under her watch, have proved invaluable to communicating with staff throughout the agency.

She also undertook an effort to manage how communications funding and personnel resources were managed across the Office of Communications. This has resulted in a truly national program that works together across the country to better tell the Service's stories.

The Service's first-ever content management system, a project that spanned nearly eight years, came to fruition under her leadership, improving engagement and access to information.

Beyond all that, her September 2022 Department of the Interior Distinguished Service Award said, "She has played a critical role in the Department's communications and outreach efforts on a myriad of natural resource issues of national significance."

She also headed up the Bureau of Land Management's Legislative and Congressional Affairs Office, and before that spent 19 years on Capitol Hill.

In retirement, Barbara will have more time to be a grandmother and passionate fan of Washington sports teams.

Deputy Assistant Director **Matt Huggler** steps into the role of acting Assistant Director. □

Pacific Region

The Service has selected **Bridget Fahey** as the new Deputy Regional Director for the Pacific Region. Fahey's tenure began July 30.

As deputy, Fahey oversees the day-to-day operations of the region, which spans six times zones and includes almost 1,000 employees. During Fahey's 25-year career with the Service, she has worked at all levels of the agency—from field biologist to acting Assistant Director of International Affairs—in four regions and across multiple programs. Coming to the Pacific Region from the Headquarters Endangered Species office as chief of the Division of Conservation and Classification, Fahey has extensive experience working on national and regional policies and issues.

"Bridget has a track record of achieving results and improving conservation and regulatory processes in a way that improves outcomes for species, partners, and employees," says Hugh Morrison, Regional Director for the Service's Pacific Region. "Her background in biology and expertise in conservation management and policy will make her a tremendous addition to our team in the Pacific Region."

In addition to Hawaii, Idaho, Oregon, and Washington, the region includes the territories of American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands, and the islands and waters located within Marianas Trench, Papahanaumokuakea, Pacific Remote Islands, and Rose Atoll Marine National Monuments. The region also coordinates with partners on conservation projects in many insular areas across the Pacific including the Republic of Palau, Federated States of Micronesia, and Republic of Marshall Islands. And the region works closely with 46 federally recognized Native American Tribes to fulfill Tribal trust responsibilities.

"The Pacific Region has a history of working with others to find innovative solutions for conservation challenges," says Fahey. "We have unparalleled natural resources in the Pacific Region, some of which are found nowhere else on Earth. I look forward to supporting our people and partners in their ongoing work for fish, wildlife, and plants—and their habitats."

Fahey has a bachelor's degree from Bucknell University, where she majored in biology and anthropology, and a master's degree in conservation biology from University of Michigan. She is originally from Scranton, Penn. □

Scott Covington has been named Assistant Regional Director of Science Applications in the Pacific Region.

Science Applications is a nonregulatory program within the Service that tackles conservation issues no single Service program or conservation partner can address alone. The program brings partners together to identify shared conservation priorities and deliver scientific information and tools needed to achieve conservation goals across the landscape. With a foundation of climate adaptation, the work of Science Applications sits at the nexus of landscape conservation, »

inclusive collaboration, and science support. Covington will lead the Science Applications Program in the Pacific Region, which comprises Hawaii, Idaho, Oregon, Washington, and the Pacific Islands, including America Samoa, Guam, and the Commonwealth of the Northern Mariana Islands.

"We're excited to add Scott to our team. He is poised to embrace the challenges of addressing highly visible and complex issues in the Pacific Region," says Hugh Morrison, Regional Director for the Service's Pacific Region. "This is an important role that works closely with states, Tribes, federal agencies, and partners to look for solutions to landscape-level conservation challenges."

Covington began his Service career 16 years ago as an energy biologist with the Ecological Services Program. He has held various leadership positions at the state, regional, and program levels. Most recently, Covington worked as a senior ecologist in the Service's National Wildlife Refuge System in Falls Church, Va. He also spent numerous years working with Vermont Fish and Wildlife Department and Wyoming Fish and Game.

In his career, Covington has represented the Service as a senior leader, administrating programs for energy and leading climate science activities across the National Wildlife Refuge System. He has assisted managers and conservation partners with efforts to reduce atmospheric greenhouse gasses, developed strategies to adapt to climate change, and engaged staff and external partners on climate change issues and methods to reduce its effects on fish and wildlife.

Covington co-developed the Service's Climate Change Action Program, which provides overarching guidance for incorporating climate change into all Service actions. He has also coauthored climate policy updates and led efforts within the Service and the conservation community to normalize the concepts of the Resist-Accept-Direct (RAD) Framework, which supports more resilient and informed decision-making in conservation planning and management. Covington has co-led a Civilian Climate Corps fellows' group, working through the Hispanic Access Foundation to hire candidates responsible for developing guidance to assess climate impacts on refuge lands, develop scenarios of future climate impacts on host refuges, and provide recommendations to address ecological transformation.

"I'm excited to begin this new phase of my career, and I'm further energized by the support and dedication I've observed in the Pacific Region staff," Covington said. "I'm determined to see Science Applications continue to provide important resources that helps the Service, Tribes, and partners make forward-thinking decisions in the face of a changing climate."

Covington is committed to bringing an inclusive, diverse, and equitable standard to the workplace, enabling a work environment and organizational culture that values and promotes diversity of both persons and points of view in meeting the Service's mission.

Covington, originally from Benton, Ark., earned his Bachelor of Science in aquatic biology/limnology from the University of Arkansas and a Master of Science in zoology and physiology from the University of Wyoming. □

Alaska Region

Soch Lor has been named Deputy Regional Director for the Alaska Region.

Soch has a wide-ranging life path and career with the Service. A Cambodian refugee who came to America when she was 12 years old, Soch says, "As an immigrant, my mom wanted me to be a doctor or lawyer." Instead, she "got hooked" by wildlife biology, where "she found her solace and her service." Soch went on to earn a B.A. in biology, and M.S. and Ph.D. in wildlife science — all ultimately leading her to a career in conservation. She started her journey with us as a cooperative education student in 1989, and since then has a diversity of experiences within the Service across programs and the nation.

Over the course of her 30-year journey, Soch has worked in four regions and multiple programs including the National Wildlife Refuge System, Fisheries, and Ecological Services, along with details in International Affairs and Migratory Birds. Across this arc — from biological science technician to Deputy Assistant Regional Director of the National Wildlife Refuge System in Alaska (and acting Deputy Regional Director) — she has addressed challenging conservation and organization issues, including partnering with various agencies, universities, and NGOs on fish, wildlife, and habitat studies; advocating for scientifically sound inventory and monitoring programs; supporting responsible data management; leading efforts to strengthen relationships with Alaska Native peoples and Tribes; and championing a welcoming, diverse, and inclusive work environment.

In addition to this, during her time in Alaska she has worked on and provided leadership to major policy or regulatory challenges in the region, including the Arctic EIS, Izembek land exchange, Kaktovik right-of-way, Donlin gold mine, Susitna-Watana Hydro dam, Alexander Archipelago wolf status assessment (2015), along with the Great American Outdoors Act and Bipartisan Infrastructure Law implementation efforts and more. □

honors

Service-wide

The Environmental Leadership awards honor those who demonstrate exceptional thinking and actions that improve the Service's ability to protect the environment and preserve our natural resources. We have been recognizing these actions within the Service since 2001. The 2022 winners:

Mark Roger — Mobile Diesel Transfer Fuel Tank Project, Rice Lake National Wildlife Refuge

Seney Strike Force Crew — Prevention of Asbestos Contamination Project, Seney National Wildlife Refuge

Goose Point Marsh Restoration Project Team — Big Branch National Wildlife Refuge

Rachel Portwood — Browns Park National Wildlife Refuge Restoration Project

Orlanda John — Lacreek National Wildlife Refuge Restoration Project

Eldon Brown — Pacific Southwest Region Native American Liaison, Cultural Resource Protection

Mike Cox — Nevada Statewide Bighorn/Mountain Goat Staff Biologist, Nevada Department of Wildlife, California Bighorn Sheep Genetic Strategy

Maintenance professionals install bird-friendly materials to the windows of the Northeast Regional Office in Hadley, Mass. (PHOTO BY LEAH RILEY/USFWS)

Project of the Year — **Northeast Region Bird Collision Prevention Project Team**

Refuge of the Year — **Crab Orchard Lake Cleanup Team**, Crab Orchard National Wildlife Refuge

Honorable Mention awards go to:

Celeste Lebo — Crook Point Prairie Restoration Project, Oregon Islands National Wildlife Refuge

Former Hog Lagoons Habitat Restoration Project Team — Back Bay National Wildlife Refuge

The following receive "Best of the Best" trophies:

Individual of the Year — **Mindee Thagard**, Mountain-Prairie Region Budget Analyst, Radioactive Cattle Guard Disposal, Lacreek National Wildlife Refuge

Individual of the Year — **Markham Kearns**, Mountain-Prairie Region Regional Environmental Compliance Coordinator, Radioactive Cattle Guard Disposal, Lacreek National Wildlife Refuge

Día de los Niños

Visitors look for bald eagles and other birds at Día de los Niños at Ridgefield National Wildlife Refuge. Día de los Niños is a day to celebrate children in many Latino cultures. The national wildlife refuge in Washington welcomed hundreds for a community party that showed newcomers what you can see at a refuge. (PHOTO BY JULIETTE FERNANDEZ/USFWS)

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parting shot

Bringing Rainbows

Wolf Creek National Fish Hatchery once again transported rainbow trout to Fair Oaks Health and Rehabilitation in Jamestown, Kent., so residents were able to get outdoors for some trout fishing. Project leader James Gray, deputy project leader Travis Collier, and volunteer Dana Crowley unloaded the fish in a large tank set up just outside the facility. Each resident was given a fishing pole complete with hooks, sinkers, bobbers, and bait. With the help of hatchery staff and volunteers, many of the residents were able to reel in a nice catch while others simply enjoyed being outdoors and watching the other anglers. (PHOTO BY TRAVIS COLLIER/USFWS)

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