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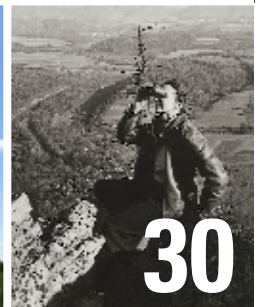
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Martha Williams,
Principal Deputy Director

150 Years Old

Fish and Wildlife Service Not Done by a Long Shot

What a time to start as the Principal Deputy Director of the U.S. Fish and Wildlife Service! And I mean that in a good way.

When I began working in January, the biggest issue was, and frankly still is, the COVID-19 pandemic and doing all we can to ensure the health and safety of our workers, volunteers, partners, and anyone who visits our public lands and facilities. That's why we announced guidance requiring that all individuals in federal buildings and on federal lands administered by the Service wear face masks.

The grace shown throughout this time by everyone in the Service—those who have set up offices at dining-room tables, those who have developed new facility and field procedures to satisfy social distancing requirements, and those in between—has been remarkable. You haven't missed a beat. Thanks to you, we've moved forward with important conservation work. And, I don't mean just our biologists. So many of you work behind the scenes to enable us to meet our mission.

You are all conservationists.

Throughout this magazine, you can read about some of our amazing work, from getting rid of yellow crazy ants at Johnston Atoll National Wildlife Refuge in the far Pacific (p. 2) to raising birds and snakes at Welaka National Fish Hatchery in Florida (p. 24). The U.S. Fish and Wildlife Service doesn't stop.

In fact, it hasn't stopped for 150 years. Congress created the U.S. Commission of Fish and Fisheries on February 9, 1871. The commission is the origin point of not just our Fish and Aquatic Conservation (FAC) Program but the entire Service.

Our historian, Mark Madison, writes of a "war for wildlife" that helped create both the American conservation movement and an agency committed to ensuring the future of "wildlife—furred, feathered, and finned." (See "the War for Wildlife" p. 30.)

We are still doing all we can for wildlife.

You see it in the incredible genetic achievement for black-footed ferrets (p. 2) and the scientific collaboration that allowed captive-raised Pacific lamprey to metamorphose from tiny larvae to juvenile lamprey (p. 20).

Our science even transcends the lab. We are helping people connect with nature through a podcast on fish (p. 11), a book club (p. 6), and Fish in the Classroom programs (p. 16).

We have more to do.

Building back better from the pandemic will not be easy. Anyone who has used a balance board knows you are constantly leaning this way and that, trying to find a sweet spot. Finding balance between wildlife and economic development is similar. It requires constant work. But it is possible, and we will sit down with all parties and figure it out.

The increasing crisis of climate change challenges all of us every day. We are meeting it with mitigation, adaptation, and resiliency. The administration strongly supports clean energy, which will take more balancing. We are up to it.

And we must find ways to make the outdoors and the world of conservation accessible and welcoming to everyone. (See "Conserving While Black," p. 35.)

Someone who didn't know the staff of the U.S. Fish and Wildlife Service might feel overwhelmed, might think, "How?"

I know exactly how, as we have been doing for 150 years: we will roll up our sleeves, tackle the first issue on our desks, or dining-room tables, then move on to the next one. I feel lucky to be a part of it. □

Innovative Genetic Research Boosts Black-footed Ferret Conservation Efforts

Black-footed ferret recovery efforts aimed at increased genetic diversity and disease resistance took a bold step forward December 10, 2020. Black-footed ferret kit Elizabeth Ann was born. She was created from the frozen cells of Willa, a black-footed ferret that lived more than 30 years ago.

The groundbreaking effort to explore solutions to help recover the endangered species results from an innovative partnership among the Service and species recovery partners and scientists at Revive & Restore, ViaGen Pets & Equine, San Diego Zoo Global, and the Association of Zoos and Aquariums.

“The Service sought the expertise of valued recovery partners to help us explore how we might overcome genetic limitations hampering recovery of the black-footed ferret, and we’re proud to make this announcement today,” said Noreen Walsh, Regional Director of the Service’s Missouri Basin and Upper Colorado Basin Regions, where the Service’s National Black-footed Ferret Conservation Center is. “Although this research is preliminary, it is the first cloning of a native endangered species in North America, and it provides a promising tool for continued efforts to conserve the black-footed ferret.”



USFWS NATIONAL BLACK-FOOTED FERRET CONSERVATION CENTER

“Maintaining and increasing wild populations and suitable habitat continues to be essential for black-footed ferret recovery and will remain a priority for the Service,” Walsh continued. “Successful genetic cloning does not diminish the importance of addressing habitat-based threats to the species or the Service’s focus on addressing habitat conservation and management to recover black-footed ferrets.”

Until Elizabeth Ann, all black-footed ferrets were descended from seven individuals, resulting in unique genetic challenges to recovering this species. Cloning may help address significant genetic diversity and disease resilience barriers to support habitat conservation and reestablishment of additional populations in the wild. Without an appropriate amount of genetic diversity, a species often becomes more susceptible to diseases and genetic abnormalities. Other potential problems include limited adaptability to conditions in the wild and a decreased fertility rate. Limited genetic diversity makes it extremely difficult to fully recover a species.

Elizabeth Ann, the first cloned black-footed ferret and first-ever cloned U.S. endangered species, at 26 days old.

This effort is consistent with the Service’s black-footed ferret recovery plan, which addresses the use of various assisted reproductive techniques. It also encourages the incorporation of any newly discovered black-footed ferrets into the current captive population and the use of the new genetic materials to maximize genetic diversity.

Once thought to be extinct and currently protected as an endangered species, black-footed ferrets were brought back from nearly vanishing forever by the Service and its partners after a Wyoming rancher discovered a small population on his land in 1981. Ferrets from this population were captured by the Wyoming Game & Fish Department and others to begin a captive breeding program to recover the species.

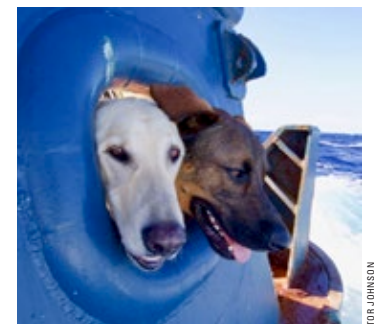
Willa, a black-footed ferret captured among the last wild individuals, has no living descendants and is therefore not one of the seven founders. □

Dogs Sniff Out Good News for Seabirds at Johnston Atoll National Wildlife Refuge

For the past three years Johnston Atoll National Wildlife Refuge has been a happy place for the tens of thousands of seabirds that live there. December 2017 was the last sighting of seabird enemy number one—the yellow crazy ant. First detected in 2010, the yellow crazy ants quickly took over about half of Johnston Atoll Refuge, nearly extirpating the red-tailed tropic bird colony in just a few years.

We have had great success in yellow crazy ant eradication efforts at Johnston Atoll, deploying 20 Crazy Ant Strike Teams to remove the ants. We recently brought to the refuge detection dogs to help sniff out whether the ants have been exterminated.

Johnston Atoll is one of the most isolated and oldest atoll formations in the world, providing a haven for feeding, nesting, and resting to tens of thousands of seabirds who for nearly a »



TOR JOHNSON

Solo and Guinness (conservation detection dogs) enjoy the three-day boat journey to Johnston Atoll Refuge.



IVAN VICENTE/USFWS

Continued from previous page

decade were threatened by the yellow crazy ant. More invasive ants have been accidentally transported to the Pacific Islands than any other biogeographic region on the planet. Of 12 total introduced ant species to the refuge, only yellow crazy ants have presented major threats to the seabird nesting colonies.

Since the invasion was first detected back in 2010, yellow crazy ants have had a negative impact on the survival of the 15 species of seabird nesting at the refuge, with red-tailed tropic birds affected the most. Other seabirds that rely on the refuge for nesting include three species of boobies, sooty terns, greyback terns, white-tailed tropic birds, great frigatebirds, fairy terns, and Hawaiian short-eared owls. Several species of shorebirds also nest there.

(Above) Great frigatebirds and red-footed boobies are among the most common seabirds that nest at Johnston Atoll National Wildlife Refuge.

Yellow crazy ants spray formic acid that can irritate the skin around the eyes, bill, and feet causing severe injuries ranging from swelling to deformities. These injuries can lead to death. Additionally, invasion by yellow crazy ants eliminates suitable nesting habitat in invaded areas. Because seabirds exhibit high nest site fidelity, meaning they return to the same nest site each year, it is likely that they will not pick others areas in which to nest. This eliminates their ability to reproduce for an unknown number of years.

Between 2010 and 2021, over 80 Service staff and volunteers from the 20 strike teams spent six-month stretches at the refuge working to eradicate the ants.

FWS's Aisha Rickli-Rahman leads Kyoko Johnson (detection dog trainer) and Solo (detection dog) on a yellow crazy ant survey at Johnston Atoll.



IVAN VICENTE/USFWS

Crews applied insecticide to a treatment area. Worker ants then collected and brought the bait back to the queens and the young to kill the nest. The efforts also entailed many on-the-ground experiments including improving the effectiveness of baiting procedures, building ant farms to study yellow crazy ant life cycles and ecology, and developing optimal control protocols.

To declare an invasive ant population as eradicated is no easy task—partly because their underground colonies are so hard to find. In December, we brought two conservation detection dogs to Johnston Atoll Refuge. The two dogs, Guinness and Solo, were trained to detect the scent of yellow crazy ants. Combining human visual surveys and canine olfactory surveys yields a higher detection rate than relying on one of them alone. Using dogs to detect yellow crazy ants for wildlife conservation had never before taken place in the United States.

After training for most of the year, Guinness and Solo showed what they had learned with successful yellow crazy ant searches in O'ahu in October and November. These practice sessions helped prepare them to join the strike team on Johnston Atoll Refuge.

"The combination of hand searching and use of conservation detection dogs for this project will help determine if the yellow crazy ants are truly eradicated from the refuge, or if more work needs to be done to exterminate any remaining ants," says Aisha Rickli-Rahman, trip leader and biological science technician with the Pacific Islands Refuges and Monument Office.

After having put their olfactory skills to work at the refuge for 14 days, Guinness and Solo found no yellow crazy ants within approximately 140 acres. They tracked a combined total of 110 miles! Guinness and Solo returned to O'ahu on December 22, leaving the rest of the search to the humans of the strike team for the next six months. »

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No detections by Guinness and Solo could mean that Johnston Atoll is yellow crazy ant-free, thanks to the collective eradication efforts that have taken place since 2010 by our 19 previous strike teams.

“Invasive species have detrimental impacts on our iconic Pacific Islands wildlife and places,” says Kate Toniolo, superintendent of the Pacific Remote Islands Marine National Monument. “Hopefully, when the Crazy Ant Strike Team returns to Honolulu, the U.S. Fish and Wildlife Service will be one step closer to declaring Johnston Atoll National Wildlife Refuge free of invasive yellow crazy ants.” □

IVAN VICENTE, External Affairs, Pacific Islands Region



Sooty terns hover over crew members of strike team CAST XX, who are at Johnston Atoll Refuge until June searching for yellow crazy ants, conducting bird surveys, and many other on-island duties.

African Americans Played a Huge But Little-known Role in Refuge Creation

Naomi Mitchell is the clerk and treasurer for St. Charles, Arkansas, (pop. 230) a small White River town renowned for duck hunting. In her spare time, she runs the local museum, a folksy repository of many things St. Charles.

Tucked into a back corner of the museum, which shares space with the Town Hall, is an exhibit featuring the Depression-era Civilian Conservation Corps (CCC). It chronicles the construction work done by the young, dollar-a-day men of Company 1741 and Company 3791 who helped create a national wildlife refuge from the bottomlands of the White River.

But another CCC unit did the unsung work of felling the oaks, dredging the streams, and laying the corduroy roads that ran through the refuge. Company 3776 was farther down river and separated—in many ways—from the St. Charles’ units. Co. 3776 was all-African American. Cos. 1741 and 3791 were all-White.

“There was a time when they were all segregated,” Mitchell says. “I don’t know much about the Black camp.”

Richard Kanaski does. Kanaski, one of our archaeologists, is compiling information about the little-known history of the African-American CCC enrollees throughout the South.

His immediate goal: Apply for National Register of Historic Places status for Dale Bumpers White River National Wildlife Refuge.



His ultimate goal: Shine a spotlight on the major, yet largely hidden role played by African Americans in rebuilding this country from the depths of the Great Depression.

“It’s part of our history and we’re working to acknowledge it,” Kanaski says. “We’re adding depth to the history of the CCC and, in particular, the African-American presence. They played a major role in the development of our refuges today.”

‘Two Wasted Resources’

In 1933, with the nation in the grip of the devastating depression, President Franklin Roosevelt created by executive order the CCC. Men between the ages of 17 and 28 were paid \$30 a month (with most of the paycheck sent directly to family back home) to build refuges, parks, hatcheries, levees, reservoirs, campgrounds, roads, and trails across rural America. By the time the program ended in 1942, more than 2.5 million young men had worked a CCC job.

Civilian Conservation Corps enrollees build a road at Dale Bumpers White River National Wildlife Refuge.

The demand for work coincided with another issue of American life circa 1930. Rural lands the country over were laid waste by poor farming practices and natural resource depletion. Eroded farmland immiserated already struggling families. Fish, ducks, deer, bears, beavers, and other animals had disappeared from many fields, waterways, and mountains. Droughts withered the crops, dried up the streams, and, with the help of howling winds, sent mountains of once-arable soil into the sky.

One writer said Roosevelt “brought together two wasted resources, young men and the land, in an attempt to save both.” The CCC men had a job to do, and they did it.

They worked on more than 40 wildlife refuges, building roads, residences, levees, and fire towers. They planted millions of trees, garnering the nickname “Roosevelt’s Tree Army.” They also restored riverine and coastal habitats critical for migratory birds. »

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In Arkansas, the CCC erected 450 buildings, laid 6,400 miles of road, planted 20 million trees, and strung 8,600 miles of telephone wire. At White River, the young men basically created the refuge out of whole cloth. The White CCC'ers built the refuge buildings and residences. The Black CCC'ers, stationed downriver in Jack's Bay, mostly built fences, truck trails, fire breaks, levees, and cleared the river channels.

FDR established the refuge from bottomlands and farmsteads in 1935 with the mandate to protect and conserve migratory birds—mallards, Canadian geese, scaups, Gadwalls, prothonotary warblers—and other wildlife. The Service acquired 110,000 acres along a 60-mile stretch of the White River. The CCC helped raze “undesirable” farm buildings, re-plant hardwoods, and create impoundments that attracted the birds.

“The Service told the architects, ‘We’re not a high-falutin’ agency, and we don’t need glorious buildings. We need functional buildings where you can go in and clean the mud off your boots,’” Kanaski says. “Some of the buildings built by the CCC are still standing today.”

Separation of Duties

Mitchell ducks into her museum office and returns with an album of old photos. Inside are pictures of Black men cutting trees, milling the wood, pushing wheelbarrows, and making duck boxes from bark. Although the men helped build the refuge, Mitchell says, they weren't working in St. Charles so they're not part of the exhibit.

“The White crews did most of the buildings,” Kanaski says. “The Black crews got stuck with the erosion control, earth-moving, the planting of trees, and other tasks that promoted habitat restoration. The CCC, like a lot of other things at the time, was segregated.”

In all, there were 150 segregated camps across the country. Eventually, African Americans made up 10 percent of the CCC workforce, which was on par with national population figures. Yet Olen Cole Jr., who wrote *The African-American Experience in the Civilian Conservation Corps*, noted that Blacks suffered disproportionately higher levels of poverty and joblessness than Whites. And, while White enrollees were employed in the construction trades, Black enrollees were relegated to tree cutting, kitchen duty, and mosquito-control projects.

“The contributions of all-African-American camps were vital to the development and maturation of the nation’s major parks and conservation infrastructure,” Olen wrote.

Now, nearly a century later, their largely unsung yet critically important conservation work is finally getting its due. □

DAN CHAPMAN, External Affairs, South Atlantic-Gulf and Mississippi Basin Regions

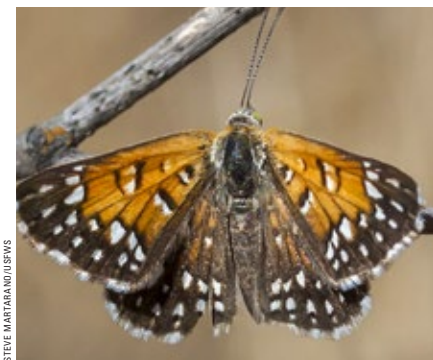
Sand from the Port of Stockton is Restoring Refuge in California

Over thousands of years, shifting sands built dunes that reached 120 feet high and stretched for 2 miles along the San Joaquin River, about 35 miles east of San Francisco. Isolated from similar habitats, the Antioch Dunes slowly developed species found nowhere else in the world.

The gradual shifting of sand, however, was replaced by a rapid effort to turn it into bricks in 1906 after a devastating earthquake and fires demolished buildings in San Francisco. As industry depleted the sand over the next 70 years, the dunes’ unique species struggled to survive on dunes that eventually topped out at 50 feet.

Now we are working with the Port of Stockton to turn back the clock, one load of sand at a time. Since 2013, the port has pumped nearly 92,000 cubic yards of sand—enough to fill more than 6,500 dump trucks—onto the dunes to support three endangered species: the Lange’s metalmark butterfly, Antioch Dunes evening primrose, and Contra Costa wallflower.

“The population of Lange’s has been trending downward for a couple of decades now,” says Mark Hayes, a biologist with our San Francisco Bay-Delta Office. “We counted about 10 butterflies in 2020, and the total population is very likely less than 50 currently.”



STEVE MARTIANO/USFWS

There may be fewer than 50 Lange’s metalmark butterflies remaining today, down from an estimated 25,000 between 50 and 100 years ago.

The orange, black, and white butterfly with a wingspan of 1 to 1.5 inches, whose population likely numbered 25,000 less than a century ago, was protected as endangered in 1976. The white-petaled primrose and yellow-petaled wallflower followed with listings in 1978.

We established Antioch Dunes National Wildlife Refuge for the three species in 1980, making it the first national refuge for insects and plants. At the time, the 55-acre urban refuge with two non-adjacent units was also the nation’s smallest.

“This is a very industrial neighborhood we’re tucked into,” says Louis Terrazas, a wildlife resource specialist for the refuge. “There’s a shipyard on one side, a gypsum-processing plant, an old water-treatment facility over there, and two strips of land owned by Pacific Gas and Electric.” »

Sand and water dredged from the San Joaquin River are pumped onto Antioch Dunes National Wildlife Refuge in October. The water will return to the river through outfall pipes, leaving the sand behind.



MARK HAYES/USFWS

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As sand disappeared in the 20th century, non-native grasses and plants took hold, crowding out the primrose, the wallflower, and the Antioch Dunes buckwheat, the only plant where the Lange’s butterfly will lay its eggs. In the early 2000s, a series of wildfires further cut the butterfly population, leaving only about 100 alive in 2010—all on the refuge’s 14-acre eastern unit.

With no butterflies on the western unit, we decided to overhaul that site and try to restore the conditions that had once enabled the dunes’ endangered species to thrive. Refuge staff began looking for sources of sand in 2012 and were soon contacted by the Port of Stockton.

The Army Corps of Engineers dredges sand from the San Joaquin River each year to clear passage for cargo ships, and the port is responsible for finding

sites to place the sand. It saw an opportunity at Antioch Dunes.

“It costs us a little extra in time and prepping the site and some other little work,” says Jeff Wingfield, the Port of Stockton’s director of environmental and public affairs, “but for us it’s important to beneficially reuse the material.”

Since the port’s first delivery in 2013, the evening primrose has experienced a huge jump in numbers, Terrazas says, and the wallflower and buckwheat are also reappearing. Eventually, the refuge hopes to re-establish the Lange’s butterfly on the western unit.

To fully restore the refuge’s dune system, we could continue taking sand deposits for a couple of decades, Terrazas says, which might not be possible without the port partnership.

“We bought some sand from another site in 2009, but it was really expensive, and the sand material had some non-native species in it,” he says.

Now, the port provides and delivers clean sand, and it doesn’t cost us a dollar.

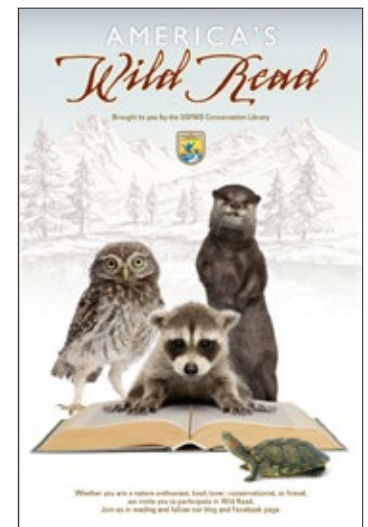
“Restoring the dunes is vitally important to the refuge’s ecosystem and could be the key to long-term preservation of its endangered species,” Hayes says. “We value our partnership with the port and hope this continues as we implement our restoration plan.” □

BRANDON HONIG, External Affairs, California-Great Basin Region

America’s Wild Read is Back

Do you enjoy reading books that will change your life, if you let them? Do you like the idea of being a part of a community of like-minded, open-hearted people? Will you take this journey seriously, and have some fun, too? Have we got a fun diversion for you.

This January, our Conservation Library relaunched America’s Wild Read, a virtual, quarterly book club centered on inspiring readers to engage with conservation literature and nature writing, both classic and contemporary. Read along with us, and look out for posts on the USFWS Conservation Library blog, where we’ll weave together the perspectives of Fish and Wildlife Service leaders through their commentary and conversation. Join the discussion by posting your thoughts and responses. »



America’s Wild Read is back, we invite you to read along with us.

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Currently, America's Wild Read features the PEN/E.O. Wilson Literary Science Writing Award Winner *Eager: The Surprising, Secret Life of Beavers and Why They Matter* by Ben Goldfarb. Goldfarb is an award-winning environmental journalist who covers wildlife management and conservation biology.

Eager is the story of how beavers, "ecological and hydrological Swiss Army knives," have shaped the North American landscape and can help us fight drought, flooding, wildfire, extinction, and climate change. *Eager* is not only expertly researched but a pleasure to read. It may make a beaver believer out of you!

Our first selection was J. Drew Lanham's *The Home Place: Memoirs of a Colored Man's Love Affair with Nature*. □

? MORE INFORMATION

Read with us.
USFWS Conservation Library
blog <bit.ly/3eqSxrz>

World's oldest known, banded wild bird hatches chick at Midway Atoll

Wisdom, a moli (Laysan albatross) and world's oldest known, banded wild bird, hatched a new chick February 1 at Midway Atoll. Biologists first observed the egg pipping January 29. Pipping is when a young bird begins to crack the shell of the egg when hatching.

Every year, millions of albatross return to Midway Atoll National Wildlife Refuge and Battle of Midway National Memorial. Beginning in October, birds go to their same nesting site and reunite with their mate in the world's largest colony of albatross. Wisdom and her mate, Akeakamai, have been hatching and raising chicks together since at least 2012, when biologists first banded Akeakamai.

"At least 70 years old, we believe Wisdom has had other mates," says Dr. Beth Flint, one of our biologists. "Though albatross mate for life, they may find new partners if necessary—for example, if they outlive their first mate."

Albatross don't typically lay eggs every year, and they lay only one egg. Biologists estimate that Wisdom has hatched at least 30-36 chicks in her lifetime. In 2018, biologists observed the chick that she fledged in 2011 just a few feet away from her current nest. Countless generations of albatross on Midway Atoll have a similar family reunion each year.



JOHN BRACK/FRIENDS OF MIDWAY ATOLL NATIONAL WILDLIFE REFUGE

The incubation period after an albatross lays an egg is typically 65 days—most chicks on Midway Atoll hatch in January or February. Wisdom laid her egg sometime during the last few days of November. Soon after, Wisdom returned to sea to forage and Akeakamai took over incubation duties. Albatross parents share in the incubation, and once the chick hatches, they share feeding duties. Parents feed their chicks a diet rich in fish eggs and squid by regurgitating food into the waiting mouths of their hungry chicks. The fatty acids and nutrients can sustain a chick for a number of days between feedings. Chicks fledge in the months of June and July.

Nearly 70% of the world's moli and almost 40% of ka'upu (black-footed albatross), as well as endangered makalena (short-tailed albatross) rely on Midway Atoll. In addition to albatross, more than 20 other bird species breed at Midway Atoll, most of them tropical seabirds. In total, over 3 million individual birds call the refuge and memorial home.

Wisdom's newest chick shortly after hatching, with its dad, Akeakamai.

Biologists first identified and banded Wisdom in 1956, but the very first albatross was banded on Midway Atoll in 1936. To date over 275,000 albatross have been banded at the refuge and memorial. By pairing modern data analysis with detailed current and historical records, biologists can make more informed management decisions that ensure seabirds have the habitat and resources they need.

"Each year that Wisdom returns, we learn more about how long seabirds can live and raise chicks," says Flint. "Her return not only inspires bird lovers everywhere but helps us better understand how we can protect these graceful seabirds and the habitat they need to survive into the future." □

Early Detection and Rapid Response Efforts Take the Fight to Invasives in South Florida

There are a lot fewer Gambian giant pouched rats crawling and Northern African pythons slithering around South Florida today than there were a decade ago thanks to ongoing and successful early detection and rapid response efforts.

“While invasive species prevention is the first line of defense, even the best prevention efforts won’t stop all exotic species from establishing and eventually spreading across Florida,” says Biologist Art Roybal, our invasive species coordinator for South Florida. “I can say, however, that early detection and rapid response practices have effectively curbed the spread of these particular rats and pythons in Florida over the past decade.”

Early detection and rapid response (EDRR) is a coordinated set of actions to find and eradicate potential invasive species in a specific location before they spread and cause harm. Rapid response in Florida, in some cases, has meant the continuous searching and removal of introductions of non-native species reported by the public until population numbers are minimized to the point of nearly achieving eradication.



The average size of a Northern African python in Florida is around 10 feet in length, but the snakes can grow up to 20 feet long in their native range. While very similar in appearance to the Burmese python, the pattern on the back of the Northern African python is less defined.

Gambian Giant Pouched Rats

The Gambian giant pouched rat, native to central and southern Africa, is the world’s largest rat, reaching up to nine pounds. It gets its name from the way it collects food by stuffing its cheek pouches. Gambian pouched rats were imported as pets into Florida until the state listed the species as “Prohibited,” which limits importation and possession to those with permits for research or public exhibition.

The rats were bred in captivity on Grassy Key, where eight rats escaped and established a breeding population. If this invasive species were to reach the U.S. mainland, there could be extensive damage to the Florida fruit industry. »



John Woolard, of USDA Wildlife Services, displays a Gambian giant pouched rat. This is the world’s largest rat, weighing up to nine pounds. The average size is three pounds, measuring 20–35 inches from the head to the tip of the tail.

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The Florida Fish and Wildlife Conservation Commission (FWC), working with the U.S. Department of Agriculture Wildlife Services and the City of Marathon, has trapped and monitored these rats via remote cameras since 2005. Their goal is to ensure that what is believed to be a small population does not grow and expand to the mainland and other parts of the state.

“FWC and our other partners have been very aggressive and it looks like what they’ve done in the way of an early detection and rapid response strategy has worked,” says Roybal.

Northern African Pythons

Northern African pythons, also known as African rock pythons, are considered an injurious species due to their likely predation of native wildlife similar to what is happening with the Burmese python. Unlike the Burmese python, they are not widely established in Florida.

However, a small localized population of this species was documented in western Miami-Dade County. At its February meeting, FWC approved staff recommendations to create new rules to address the importation, breeding, and possession of high-risk invasive reptiles—including these pythons.

“The Service listed Northern African pythons as an injurious species under the Lacey Act, which prohibits its importation into the U.S. and its territories. The FWC has been aggressive in monitoring for this species where it was first observed and

captured in the past to the point of no additional snakes having been captured in quite some time,” says Roybal. “Service personnel have participated in walking surveys looking for these snakes in the Miami area.”

Roybal believes these successful efforts to contain the spread of the Gambian giant pouched rat and the Northern African python are examples of what aggressive EDRR efforts can do to prevent introduction and population establishment and limit spread.

“Being aggressive and consistent with EDRR is the way to make it work. Our partners are showing how to get it done. It’s perhaps the most important tool we have in the fight against invasive species.”

He says that these efforts have been especially effective with the African pythons. “The Service’s injurious wildlife listing and the state’s aggressive on-the-ground response resulted in greatly reducing the presence of these snakes. The fact that there have been no captures of Northern African rock pythons in over two years with only one verified sighting in 2019 is a victory for native wildlife in Florida.”

“These control efforts with Gambian giant pouched rats and Northern African pythons focused on early detection and rapid response are powerful examples of success,” says Larry Williams, our Florida state supervisor for ecological services. “These examples show invasive species control can work. We can have more examples like this by becoming more deliberate and more focused with our work.” □

KEN WARREN, South Florida Ecological Services Office

FISHERIES

Mussels Continue the Race at Mammoth Spring National Fish Hatchery

In the first few days of 2021, a juvenile plain pocketbook mussel at Mammoth Spring National Fish Hatchery in Arkansas formed and fell off the gills of its host fish, a largemouth bass that had been inoculated with the mussel on December 16. It was the first round of mussel propagation to take place in the hatchery’s culture building in nearly four years.

In 2017, the Warm Fork River massively swelled and flooded the culture building at the hatchery. It wasn’t the first time the river had threatened hatchery operations, but with around 6 feet of water swirling inside the facilities, this flood proved catastrophic. The building that flooded housed most of the hatchery’s aquaculture activities, including the mussel conservation program. Once the water receded, hatchery personnel salvaged what they could and set up a temporary aquaculture system in one of the old hatchery housing garages. But the mussel conservation program was put on hold.

Through time, perseverance, and hard work, the hatchery repaired and restored the culture building and began using it to raise species again in the spring of 2019.

By late 2020, the equipment for the mussel program was either repaired or replaced, and the first round of mussels were propagated in the station’s self-contained, aquatic habitat system. During this first step of the new mussel program, the system worked wonderfully and successfully held the inoculated host fish. Largemouth bass and plain pocketbook mussels are common species from local waters and are being used as a surrogate to test equipment and help modify protocols.



Mammoth Spring National Fish Hatchery is testing its mussel propagation system.

After the microscopic juveniles drop off their host fish, they are collected in a series of screens, counted under a microscope, and transferred to another system, which is equipped with 24-hour feeders. Once the mussels reach a manageable size, hatchery staff will count, check for survivability, and monitor growth. As they grow, they will be separated out into new containers to prevent overcrowding. »



In 2017, Warm Fork River flooded Mammoth Spring National Fish Hatchery in Arkansas.

Continued from previous page

This “test/surrogate species” will help hatchery staff modify the current system before taking the next steps of developing a program to propagate the federally protected, rabbitsfoot mussel. In the future, Mammoth Spring will work with various state, local, and federal partners to re-stock the mussels into their native waters and to promote recovery of this threatened species. □

RICHARD PEEK, Fish and Aquatic Conservation, Mammoth Spring National Fish Hatchery

FISHERIES

Biologists Charting a Future for the Gulf Sturgeon

They’ve been with us since the age of the dinosaurs... So, how can we not help them survive the “age” of the Deepwater Horizon oil spill?

That sentiment has helped propel the work of a group of our biologists who have studied Gulf sturgeon for many years. Using funds provided by the *Deepwater Horizon* Natural Resource Damage Assessment Trustees, the biologists are set to advance their knowledge of sturgeon’s spawning behavior and habitat, and the behavior and habitat needs of juvenile sturgeon.

Sturgeon are unusual. They have a backbone of cartilage, whiskers like a catfish, rows of heavy armor-like plates, and no teeth in their sucker-like mouth. They also have a nasty habit of going airborne and causing near misses or collisions with

boaters. Still, they deserve a chance of surviving into the next century. “We have high hopes that the *Deepwater Horizon* oil spill settlement funding will significantly increase our ability to help the Gulf sturgeon by improving their reproductive success and sustainability,” says Adam Kaeser, fish biologist with our Panama City Fish and Wildlife Conservation Office.

The Gulf sturgeon was once common in river systems from Tampa Bay, Florida, to the Mississippi River. Populations of Gulf sturgeon, however, were greatly reduced by overfishing for meat and roe (or eggs). The species was protected as threatened in 1991 under the Endangered Species Act. Other factors such as habitat destruction and water quality deterioration have continued to stress sturgeon populations. »

Service Biologist Adam Kaeser shows the full length of an adult Gulf sturgeon.



GOING STRONG AT 150

Our fisheries program, and the Service itself, has been conserving aquatic resources since 1871.

The roots of our Fish and Aquatic Conservation (FAC) Program, and the U.S. Fish and Wildlife Service itself, run deep.

In 1871, people recognized that America's fisheries were in trouble and called on Congress to act. The U.S. Commission of Fish and Fisheries was created February 9, 1871. The commission would become the Service. (See p. 30 "The War for Wildlife.")

The commission's original charge was clear: to determine whether America's fisheries were declining and if so, to figure out how to protect them.

The first answer was clear: a resounding yes. FAC has been working on the latter ever since.

One method of aquatic conservation has been the National Fish Hatchery System.

In 1888, Neosho National Fish Hatchery was established in Neosho, Missouri. (See p. 14 "Typical is Atypical.") Today Neosho is the oldest operating federal fish hatchery in the United States and one of 18 national fish hatcheries more than 100 years old.

In 1936, the Civilian Conservation Corps (CCC) began construction on Chattahoochee Forest National Fish Hatchery in Georgia (then called Mill Creek Rearing Station) for the U.S. Forest Service. (See p. 4 for more on the CCC.) In 1939, responsibilities for the facility transferred to what eventually became the Service. >>



RYAN HAGERTY/USFWS

(Left) Yakama tribal members fish in the Klickitat River for Fall Chinook salmon.

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An important job at Chattahoochee Forest Hatchery, then and now, is to stock trout in local waters. Rail cars brought trout fingerlings needed for stocking during the mid-to-late 1930s from Walhalla, South Carolina. These rail cars transported fish all over the United States. Fish to be “planted,” or stocked, into local streams were hand carried in milk cans. These days, eggs produced at other federal hatcheries are delivered by Federal Express right to the hatchery door at Chattahoochee Forest and are placed in hatching jars inside the hatchery building. Trout, including rainbow, brown, and brook, are hand netted and weighed, then loaded onto two fully equipped distribution vehicles for stocking.

Currently, Chattahoochee Forest produces approximately 1 million trout each year. These fish are stocked into the waters of North Georgia in cooperation with the Georgia Department of Natural Resources, U.S. Army Corps of Engineers, Tennessee Valley Authority, and U.S. Forest Service.

That boosts the tourist attraction of Georgia. People from all over come to north Georgia for the trout fishing experience.

Across the country, we stock about 98 million fish into local waters a year. That results in jobs, increased revenue from taxes and retail sales, fun, and much more.

Annual fishing rodeos at hatcheries for children and adults with special needs, senior citizens, U.S. military veterans, and youth draw thousands, including some new anglers.

The pandemic has also brought out new anglers.

One told Chattahoochee Forest staff: “As a result of the COVID-19 pandemic and thanks to Chattahoochee Forest NFH, I’m happy to have become an avid trout angler!”



CRYSTAL THOMAS/USFWS



BRETT BILLINGS/USFWS



USFWS

Additionally, hatcheries work with local schools, communities, agencies and organizations, such as Trout Unlimited, to educate and promote conservation ethics. (See p. 16 “Small Fry, Big Job.”)

Many hatcheries, including Chattahoochee Forest, have also branched out beyond fish. (See p. 24 “All Species Great and Small.”) Chattahoochee Forest works on conservation projects for the bog turtle, eastern hellbender, and swamp pink plant.

Today, through FAC we work to conserve threatened and endangered species, restore declining populations of native fish and aquatic species so they don’t become endangered, mitigate the impacts of federal water projects to tribal and recreational fisheries for the benefit of all Americans, and prevent the introduction and spread of aquatic invasive and injurious species.

As important as hatcheries are, they are just one tool in the aquatic conservation toolbox. Along with hatcheries, FAC operates a network of field stations from the Arctic Circle to the Florida Keys that empower conservation efforts. (See p. 20, “Growing a ‘First Fish.’”) These field stations provide technical assistance to tribes, conduct scientific studies into fishery problems, and restore habitat through the National Fish Passage Program and the National Fish Habitat Action Plan.

Working with tribes, states, landowners, partners, and stakeholders, FAC and the Service will continue to ensure the health of our nation’s wildlife and to enable all Americans to realize the ecological, recreational, and economic benefits provided by these critically important resources. □

(Top) Jada, daughter of Chattahoochee Forest National Fish Hatchery Project Leader Kelly Taylor, shows the trout she caught at the hatchery’s annual Kids Fishing Rodeo. (Middle) Two youngsters fish at Gavins Point National Fish Hatchery in South Dakota. (Bottom) Historical rearing trout earth ponds at Chattahoochee Forest National Fish Hatchery.

TYPICAL IS ATYPICAL



At Neosho National Fish Hatchery, the oldest continuously operated federal hatchery, a normal day doesn't exist.

By HOLLY RICHARDS

A typical day at Neosho National Fish Hatchery means something unexpected.

“We came in today and couldn’t see the fish, so we had to deal with that first,” says Roderick May, the hatchery manager at Neosho, in the Ozark Mountain Region of southwest Missouri. Two inches of rain the day before had turned the water in the spring-fed tanks so cloudy that the staff couldn’t see the fish. But May wasn’t concerned. Problem solving is just a way of life for a hatchery manager. Whether it’s dealing with cloudy spring water or figuring out the best way to spawn endangered fish, the staff at Neosho has been solving aquatic conservation problems longer than anyone.

Neosho is the oldest continuously operated federal hatchery in the country, and one of 18 national fish hatcheries in the system that are over 100 years old, but you wouldn’t know it from looking around. From the pristine grounds, to the U.S. Green Building Council’s LEED-certified visitor center, and cutting edge conservation work, Neosho is helping lead the way into the next generation of aquatic conservation for the Service. >>

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Conservation Community

In addition to the pressure of propagating 180,000 rainbow trout a year and raising endangered Topeka shiners, pallid sturgeon, and freshwater mussels, staff at Neosho has to do their work under the watchful eyes of more than 60,000 visitors a year and a community that sees the hatchery as an extension of the town.

“Everything we do here is on display,” May says.

Some of the daily tasks at Neosho haven’t changed much since 1888. Every day brings feeding, spawning, and caring for the thousands of fish at the hatchery. Like it has for 133 years, the 2 million gallons of gravity-fed spring water that drive hatchery operations still flow through the tanks at 54-62°F. That spring water is the perfect temperature for rainbow trout, a key species the hatchery has raised since it opened.

But if you look a little closer, you’ll notice that some of the tanks at the hatchery are being cooled down.

The tanks that house endangered pallid sturgeon have chillers to ensure that those fish are kept at the same temperature as fish in the nearby Missouri River. “They’re getting winter right here like they’re getting winter in the river,” says May. Maintaining those seasonal temperature changes helps protect the natural reproductive cycle of sturgeons. It’s one of the many lessons

Neosho staff has had to learn along the way.

One of the most exciting undertakings for the Service’s Fish and Aquatic Conservation Program was the establishment of a captive-breeding program for pallid sturgeon. “There was no book on captive-rearing pallid sturgeon,” May says. The unique life cycle of pallid sturgeon and age of



KATIE STEIGER-MEISTER/USFWS

(Top) A 2-year-old pallid sturgeon at Neosho National Fish Hatchery. (Right) Hatchery staff works with pallid Sturgeon. (Bottom) Neosho National Fish Hatchery has paved walking trails for the public.

reproductive maturity made spawning efforts challenging.

Neosho is one of only a handful of hatcheries in the country that raise the fish. The hatchery raises as many as 15,000 pallid sturgeon for release each year into the Missouri River to bolster the population.

“Freshwater mussels, that’s our next great adventure,” May says. Yes, they raise mussels now, but Neosho is working toward raising them at a production level so they can stock and restore them. The hatchery is on its way. Neosho’s assistant manager, hired in 2018, is a mussel biologist by profession and manages the mussel program.

When May says “our next great adventure,” he doesn’t just mean new conservation challenges, such as finding the most effective protocols. For May and the staff at Neosho, it’s a journey they will take with the public. Like everything at Neosho, conservation starts in the community. May wants Neosho to help the public get to know the mussels, so they can help protect them.

“This place belongs to the community; we just manage it for them.” □

HOLLY RICHARDS, Fish and Aquatic Conservation, Headquarters



USFWS



KATIE STEIGER-MEISTER/USFWS



SMALL FRY, BIG JOB

Around the country, the Service supports fish education in the classroom to help give native fish a brighter future.

By DENISE WAGNER and HOLLY RICHARDS

Students from Boise-Eliot/Humboldt Elementary School in Portland, Oregon, tour a hatchery operation.

For the last 10 years, Angela Palacios and the New Mexico Fish and Wildlife Conservation Office have been shining a light on some of the forgotten fishes of the Southwest. Palacios is a fish biologist and information and education coordinator for the office in Albuquerque, New Mexico. Every year they help students around the state make connections between the classroom and the natural world through their Native Fish in the Classroom Program. »

PAT EDWARDS/SUSPENS

When her boss initially pitched the idea of an outreach program based on the popular Trout in the Classroom program in 2011, Palacios and a coworker decided to take a slightly different approach. “We built it around the native fish of the Rio Grande,” Palacios says. The longnose dace, red shiner, western mosquito fish, and flat-head chub all live in the warm waters of the Rio Grande. These relatively small native fish would work well in an aquarium setting. Just as important for Palacios, they were fish that nobody really knew or saw.

The Rio Grande is fairly turbid, so even folks who spend time on the banks of the river will probably never see the rich and complex fish community living below the surface. “It’s kind of like that whole out-of-sight, out-of-mind kind of thing,” Palacios says. “We really wanted to focus on native fish and bring them out into the public and give people a chance to get to know them.”

All Across the Country

Most fish in the classroom programs begin when classrooms sign up to get fish, fingerlings, or fish eggs from a nearby national fish hatchery or conservation office. Teachers then incorporate aquatic conservation lessons throughout the year to supplement their curriculum needs. Along the way, students learn to raise fish and get to know their behavior and varying life stages.

Through our Fish and Aquatic Conservation Program, we support at least 19 fish in the classroom programs across the country. Most of the programs partner with state agencies and are based on the popular Trout in the Classroom program created by the nonprofit organization, Trout Unlimited, more than 30 years ago. Fish in the classroom programs are like having a living laboratory that can provide unique opportunities to enhance a classroom-learning environment. Students discover



firsthand the value of aquatic environments, the balance needed to maintain and conserve fish and other aquatic species within these environments, and how their actions can affect or improve these resources.

In Arizona, Diego Araujo with the Arizona Fish and Wildlife Conservation Office works with three local schools to highlight fish that meet the needs of their community. “Our office is located on the Fort Apache Indian Reservation, so in our area we like to provide Apache trout,” Araujo says. “Those are not only one of two native trout to Arizona but a culturally significant fish to our local community,” he says.

Araujo and the Arizona office gear their classroom lessons toward what the students are currently learning and cover topics such as invasive species, habitat conservation, and fish 101 lessons. >>



(Top) Students prepare to release their native fish. (Below) Kids release their fish.



Students feed the fish during a hatchery visit.

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Fish in classroom programs vary greatly from school to school. Some simply provide fish or eggs to a state partner who administers the program; others make classroom visits and write curriculum that incorporates local species into state and national education standards.

Garrison Dam National Fish Hatchery in North Dakota began participating in the Trout in the Classroom program in 2017 when the North Dakota Game and Fish Department started its outreach partnership with Trout Unlimited. Across the state, 12 schools are participating for the 2020-2021 school year. The state agency visits classrooms periodically to talk about fish management and aquatic invasive species—an important part of the curriculum because students will release aquarium-raised fish into the wild.

Conservation Ethic

No matter the involvement level, fish in the classroom programs strengthen connections between students and the hidden life all around them.

In Maine, Craig Brook National Fish Hatchery partners with Fish Friends, a program of the Maine Council of the Atlantic Salmon Federation. Fish Friends provides students across Maine the opportunity to observe, learn, and care for endangered Atlantic salmon. As a part of the program, hatchery staff take students on a tour of the hatchery, supply eggs to participating schools, and provide mentors to the local schools through the Friends of Craig Brook National Fish Hatchery. “In the past we’ve had as many as 75 schools participating,” says Oliver Cox, hatchery manager at Craig Brook. >>

“Helping students develop a conservation ethic is a core value of all the programs, and the impacts can last much longer than the school year.”

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Across the country at Columbia River Gorge National Fish Hatchery Complex, with six hatcheries in Washington and Oregon, Salmon in the Classroom programs have been thriving for 25 years. Thousands of students at 25 schools are introduced each year to the salmon story. Students kick off their experience with a hatchery tour to learn about the important role of hatcheries in conservation. Throughout the school year, Service staff makes six visits to each classroom to teach lessons about salmon life cycles, the importance of healthy watersheds, salmon anatomy, and the cultural importance of salmon. At the end of the unit, students release their fish to begin their long trek to the ocean.

At the end of the school year, many fish in the classroom programs host a classroom or community release day. Releasing fish into an approved and appropriate habitat requires coordination and guidance from a federal or state agency.

Making the connection between native species and habitat protection is an important part of any fish in the classroom curriculum, as are the risks from aquatic invasive species. Fish in classroom lessons include discussions with students that explain the differences between native and non-native fish, and teach the dangers of releasing aquarium pets into the wild.

Helping students develop a conservation ethic is a core value of all the programs, and the impacts can last much longer than the school year. Students in Michigan who took part in the 2019 Sturgeon in the Classroom program will be able to track “their” fish for decades to come on the web. The program, supported by the U.S. Forest Service, the Michigan Department of Natural Resources, our Ashland Fish and Wildlife Conservation Office, and the Great Lakes Restoration Initiative, teaches students about lake sturgeon biology and restoration, the importance of conservation, and stewardship of the environment.

Currently, five western Upper Peninsula school districts participate in Sturgeon in the Classroom in the Ontonagon River watershed. The sturgeon raised by the students receive a passive integrated transponder (PIT) tag with a unique identification number, before being released into the Ontonagon River. Students can use the number to track the fish they raised and released through the Great Lakes Lake Sturgeon Tag Identification Database.

Fish in the classroom programs help students gain an appreciation for aquatic ecosystems that will hopefully impact them for the rest of their lives. Back in New Mexico, Palacios says she sees entire families affected by their program. “At one point, for three years in a row, we had siblings from the same family. So all the kids in this one family got to go through

the program, and the parents brought them back every year to our release field days,” Palacios says.

For Palacios and others who do this work, the ultimate goal is bigger than just learning about an individual fish. The students who came through her program 10 years ago are 18 years old now. “Hopefully this is memorable enough to them that they’ll have a positive influence on what happens to the Rio Grande from just this experience.” □

DENISE WAGNER and HOLLY RICHARDS,
Fish and Aquatic Conservation, Headquarters

Salmon in the Classroom’s Cheri Anderson brings a salmon to Boise-Eliot Humboldt Elementary in Portland, Oregon.



A photograph showing a large number of Pacific lampreys in a white tray. The lampreys are dark brown and elongated. A ruler is visible in the lower right portion of the image, providing a sense of scale. The ruler has markings in inches and centimeters. The lampreys are scattered across the tray, some overlapping. The background is a plain white surface.

GROWING A 'FIRST FISH'

How nutritionists and their research collaborators pioneered Pacific lamprey aquaculture.

By SEAN CONNOLLY

(Photo) Before 2019, no captive-raised Pacific lamprey had ever metamorphosed from tiny larvae to juvenile lamprey.

James Barron never realized he would become a larval lamprey whisperer.

Over the past decade, Barron, a fish biologist with our Abernathy Fish Technology Center in Washington, has been working with colleagues and a team of tribal and federal scientists to generate groundbreaking studies to help establish the nation's first Pacific lamprey aquaculture programs.

"It's been an odyssey," Barron says.

The work touches on four things: hatchery programs, the collaborative nature of Pacific lamprey research, why the fish is vital to West Coast tribes, and the unique life cycle that makes raising them in captivity complex.

Hurdles

"The long duration of the larval life stage, typically 3–9 years, makes the continuous production of larval lamprey a long-term project that requires a lot of rearing tank space," says Ralph Lampman, a Yakama Indian Nation Pacific lamprey project biologist.

Creating lamprey hatchery programs in a region where hatchery operations are dominated by salmonid culture, has been another difficulty. Pacific salmon and steelhead hatcheries have existed since the late 1800s.

Not so for Pacific lamprey, which are anadromous like salmon and steelhead but live twice as long and spend most of their lives in their larval and early juvenile stages.

No hatchery program for Pacific lamprey exists throughout their entire range, which extends from Alaska to the Mexico border.

"Overcoming salmon-centric thinking both within the research community and our funders has been a challenge," says Dr. Mary Moser, a research fish biologist with NOAA Fisheries. "Lamprey culture is a long-term commitment. This information also gives insights into lamprey biology needed for management of wild lamprey populations."

Tribes have been sounding alarm bells for decades about declining lamprey populations.

Their concern is personal. Pacific lamprey is a cultural ambassador that provides an opportunity to pass knowledge of and appreciation for a "First Food" from one generation to another.

"Working to develop artificial propagation for lamprey provides the opportunity to investigate different strategies to save this imperiled species," says Aaron Jackson, project leader for the Confederated Tribes of the Umatilla Indian Reservation's Pacific Lamprey Project.

That's how Barron, his boss Dr. Ann Gannam, and partners Jackson, Lampman, Moser, and Dr. Alexa Maine, the Umatilla Tribes' aquatic propagation lab manager, ultimately joined forces.

What to Feed Larval Lamprey

Using Abernathy's resources, in 2012 Barron led a team that investigated larval lamprey growth and survival rates through diets.

Findings indicated that a larval lamprey feeding regimen with a slurry of dry yeast and a commercial fish feed was most effective. Algae, which is part of wild larval lampreys' diet, surprisingly was not. >>



James Barron feeds the 2014 lamprey.



A larval lamprey feeds.

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“We were very fortunate to have the partners that we did: they had already figured out how to spawn adults and incubate the eggs, which is a huge task,” Barron. “We were able to begin our work focused on rearing the young lamprey starting before they begin to feed and still have a yolk sac.”

Conducting the diet research was difficult. The delicate larval lamprey don't grow more than a few centimeters the first year of their lives. They also spend their entire larval and early juvenile periods buried in aquatic substrate, filter-feeding. Most of the time they're virtually invisible.

“The lamprey don't often do what you expect them to, so we tried a lot of things by running multiple trials,” Barron says.

Teamwork

Besides key diet clues, that first study generated something equally valuable: awareness that tribal and federal scientists could together tackle tough questions, share results, and safeguard everyone's research by independently maintaining young lamprey refugia populations.

“The unique assets that each of our partners brought together made it possible to collaborate in a way that would not have been possible if we tackled this problem alone, and was the seed of success,” Lampman says. “Another benefit is that we don't put all the eggs in the same basket, figuratively and literally speaking.”

In 2013 and 2014, using fish provided by the Yakama Nation, Abernathy investigated the effects of various ration sizes and rearing densities on young lamprey growth.

The research not only helped tribal partners refine their own nascent Pacific lamprey aquaculture programs but got the attention of others. In 2015, Chelan County Public Utility District (PUD), which operates three Columbia River dams in Washington State, provided multiyear funding to continue research, including a challenge to grow larval lamprey into juveniles to help support future PUD studies.

The district's investment allowed the researchers to tackle bigger questions: when should the critical first feeding period begin, and at what fish size could scientists safely and humanely implant tracking tags to monitor the movements of

larvae or transformed juveniles that would stay in place to facilitate accurate data collection?

The 2015 research achieved breakthroughs on both fronts.

Studies indicated that larval lamprey first fed between 16 and 24 days post-hatch seemed to survive and grow the fastest. The timing of the first feed was not only vital for early development but increased the likelihood that the young fish would grow rapidly enough to survive fluctuating environmental conditions.

Meanwhile, the tagging research demonstrated two commonly used tags could be implanted even in tiny lamprey. A third tag, which required more invasive surgical techniques, could be safely implanted in fish as small as 3 inches long.

Trust between the scientists deepened with every successive research phase. Decades of mistrust over salmon management without their input and broken treaties over two centuries have left tribes understandably wary when working with the federal government. Twenty-first century Pacific lamprey conservation, fundamentally collaborative in nature, is a pronounced contrast to that history.

“This process has provided the opportunity to build meaningful relationships between the federal government and tribal governments,” says Jackson, an enrolled Umatilla tribal member.

The team analyzed and refined their handling techniques with each study and provided each other with valuable peer review. The stepping-stone research revealed other surprises: alfalfa pellets improved the growth of larger larvae. However, handling the larvae and keeping the study tanks clean was proving extremely complicated without stressing the fish and potentially amplifying mortality. The partners tackled the problem together, learning from each other's successes and setbacks. >>

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“One of the main challenges presented when culturing lamprey is substrate. They need it,” Barron says. “But it completely hides the lamprey from view so you cannot really see what is going on from day to day. Carefully separating out the delicate animals from heavy sand is very labor intensive. Over time, the substrate develops its own ecosystem and requires specialized cleaning and maintenance to keep the lamprey going.”

Between 2016 and 2018, the team’s efforts focused on new variables influencing larval lamprey behavior and survival: water turnover, substrate particle sizes, tank cleaning techniques, amount of daylight, feeding frequency variations, and optimal rearing densities.

Success

Then, in 2019, another breakthrough occurred.

The lamprey in both Abernathy’s and the Yakama Nation’s studies did what no other captive-raised Pacific lamprey had ever done.

They metamorphosed from tiny larvae to juvenile lamprey. Their eyes developed. Their skin color began changing from the dun brown suited for camouflage in substrate to the pale silver better suited to conceal them in a water column. Their mouths began to curve into an oral disc with rows of small, circular posterior teeth, and the three large anterior teeth that give *Entosphenus tridentatus* its ‘three-toothed’ binomial name.

The collaborators were elated.

“We are one of only two groups of people in history that have ever succeeded in production of eyed juvenile lamprey from artificial propagation,” Lampman notes.

In 2019 and 2020, the team was able to conduct studies to help answer important questions about rearing juvenile fish in different hatchery rearing environments and see how those promoted—or inhibited—metamorphosis.

They did so without removing a single fish from the wild.

Today, Abernathy raises thousands of lamprey across four different year classes. In 2021, the researchers are exploring cues that trigger larval transformation to juveniles, helping lamprey culturalists prepare for this pivotal life cycle moment. The Yakama and Umatilla Pacific Lamprey Projects are using the canon of studies to eventually ramp up full-cycle Pacific lamprey hatchery programs.

It’s something lamprey advocates have been hoping to see for years. Now it’s closer than ever; thanks to a nearly a decade of effort by a group of persistent scientists.

The next step is persuading others to invest in Pacific lamprey artificial propagation programs. After all, research proves they can operate.

For Barron, the knowledge that Abernathy’s fish are continuing to help close knowledge gaps is highly satisfying.

“Even when you don’t get the result you expect you are still learning something, kind of like finding pieces to a puzzle,” he says. “That is one of the most rewarding aspects of this work—and practicing science. When you reveal something new, and get that answer for the first time, you reveal a universal truth that no one before has ever known.” □

SEAN CONNOLLY, Fish and Aquatic Conservation Program, Columbia-Pacific Northwest Region



Tribes have been sounding alarm bells for decades about declining populations of Pacific lamprey. This is a wild lamprey, not part of the study.

FRESHWATERS ILLUSTRATED AND USFWS



ALL SPECIES GREAT & SMALL

Fish remain important, but hatcheries embrace snakes, mussels, and more.

By DAN CHAPMAN

(Top) Welaka Project Leader Ken Blick and Deputy Project Leader Tony Brady in the hatchery's mobile release aviary. (Left) The endangered Florida grasshopper sparrow is non-migratory and is limited to the prairie region of south-central Florida.

Welaka, Florida—Tony Brady, behind the wheel of his government-issued Ford truck, rattles off the usual warm water offerings his hatchery stocks in southern streams, lakes, and ponds. Striped bass. Catfish. Bluegill.

Then there are the unusual offerings.

“These are our birds,” Brady says, pulling up alongside a newly constructed aviary.

Birds?

“The snakes are in here,” he says a few minutes later outside an all-purpose metal building.

Snakes?

What in the blue-goose world is going on at Welaka National Fish Hatchery, which, since 1938, has been growing and hauling fish for the angling masses from Louisiana to South Carolina?

Welaka, and other Service hatcheries across the country, have increasingly taken on non-fish propagation work to help threatened and endangered species survive habitats under siege. Fourteen hatcheries raise everything from mussels to toads to frogs to turtles. In all, 35 non-fish species get specialized attention at the nation’s hatcheries, a dramatic increase in recent years in the breadth and diversity of the propagation work.

Meanwhile, all of the 70 hatcheries the Service manages continue to churn out more than 70 types of fish.

“I’ve spent most of my career on a hatchery where you feed fish and you haul fish, so what we’re doing now is truly remarkable,” says Allan Brown, Assistant Regional Director of Fish and Aquatic Conservation (FAC) in the Southeast who spent two decades at Welaka. “We’re really expanding the kinds of projects that

FAC can be involved in. We challenge our field folks to think outside the aquatic environment.”

Given the high number of threatened and endangered species in the Southeast — 437—it’s no surprise the Southeast is tops in non-traditional hatchery work. And perhaps no hatchery is as innovative, or gung-ho, as Welaka. The birds, for example, are Florida grasshopper sparrows, one of the most endangered birds in the world.

“We’re always looking to do something different,” says Ken Blick, the project leader at Welaka. “We like being challenged.”

Fish — and Much More

Tri-colored herons, white egrets, and ospreys encircle the 33 ponds that make up Welaka’s Beecher Unit, all looking for an easy meal of striper or bream. But they aren’t picky. They’ll eat lake chubsuckers too, another animal oddity that Welaka raises as forage for largemouth bass.

But it’s the non-fish specialties that sets Welaka, along the St. Johns River, 60 miles below Jacksonville, apart.

Brady, the deputy project leader at Welaka, parks the F-350 in a well-hidden field above the fish ponds. Two carport-like structures enclosed in wire mesh sit 20 yards apart. The aviaries are home, temporarily, to 31 grasshopper sparrows. Inside, the tiny, brown, white, and black birds remain hidden behind clumps of bushy bluestem grass. Finally, movement. A sparrow hops onto the screen.

“Grasshopper sparrows are ground-hugging birds. They’d rather run than fly,” Brady says. “This one looks like he’s ready to go.”

The birds were an obvious candidate for Welaka’s help in the summer of 2019. Their grassland habitat, where frequent, restorative fires once flourished, have been taken over by cattle pastures, sod farms, and housing developments. Predators include other birds, snakes, rats, raccoons, skunks, coyotes, and fire ants. Flood waters drown their nests. The sparrows made the endangered species list in 1986. In 2018, only 80 sparrows remained in the wild, including 20 breeding pairs.

Before accepting any birds, Brown requires that the hatchery to complete a checklist, or “new species synopsis,” detailing costs, partners, expected outcomes, infrastructure needs, and what happens if a critter dies. Welaka accepts sparrows fledged at White Oak Conservation in northeast Florida. They’ll stay a few weeks or months before release into the wild. The Welaka staff built a mobile aviary that releases the sparrows as close as possible to their new homes.

“The lessons we’ve learned are to do your homework, understand the expectations and figure out what happened if things go wrong,” Brown says. “Now we’re getting to the point where we have more work than we can handle. I guess you can teach an old dog new tricks.”

Virtually every Service hatchery, warm water or cold, in the Southeast has caught the non-traditional propagation bug. Natchitoches (Louisiana), Orangeburg (South Carolina), Dale Hollow (Tennessee), and Greers Ferry (Arkansas) National Fish Hatcheries all raise threatened or endangered mussels. Orangeburg also raises gopher frogs. Natchitoches rears alligator snapping turtles, too. And Ozark hellbender salamanders call Greers Ferry home, at least for a few months. >>

Continued from previous page

Georgia stations have also embraced the fishery future. Warm Springs National Fish Hatchery, 70 miles south of Atlanta, propagates gopher frogs and gopher tortoises. The cold-water Chattahoochee Forest National Fish Hatchery created an artificial bog six years ago to head-start bog turtles. The mountain hatchery also raises swamp pink lilies and purple pitcher plants.

Brown estimates that up to 15 percent of the hatchery work across the region is devoted to non-fish species. Typically, the region's Ecological Services Program will come up with an at-risk species in desperate need of help and the cash to propagate them too. Outside partners, too, play a major role. The Georgia Department of Natural Resources, for example, gives Warm Springs thousands of gopher frog tadpoles each year.

A Visit with the 'Emperor'

The propagation dance is a bit more delicate—and fraught—with eastern indigo snakes. The Orianna Center for Indigo Conservation, a nonprofit focused on reptiles and amphibians, breeds and hatches the sleek, lustrous snakes at its "herpetarium" in Sanford managed by the Central Florida Zoo.

Welaka received its first batch of indigos in early 2018, but not before a lot of education and preparation. The hatchery staff switched out fish tanks (used for American shad) for plastic tubs. The tubs are cleaned each morning. The non-venomous snakes are periodically tested for parasites. They're fed a hearty diet of dead mice, quail chicks, and rainbow trout kept in an adjoining freezer in the hatchery's snake room.



Brady slips on a pair of rubber gloves and pulls out tub No. 473. He lovingly picks up a 3-foot indigo. It curls and slithers mid-air without hissing or lunging.

"They're big, black, shiny, elegant. They're just amazing," Brady says. "Their scientific name means 'emperor of the forest.' They prefer eating venomous snakes. I don't know why anybody fears these guys. They're so docile."

This batch of 11 snakes, once they reach about 4-and-a-half-feet long, is destined for Apalachicola Bluffs and Ravines Preserve in the Florida Panhandle. Welaka has raised 73 snakes. It hasn't lost a single one.

"The head-starting role that Welaka plays is a critical step in the recipe for success," says Chris Jenkins, chief executive of the Orianna Society. "They're a central figure in this whole, very complex effort to return indigo snakes to the wild."

Tony Brady holds Eastern indigo snake No. 473 at Welaka.

In all, 69 indigos have been released at Apalachicola Bluffs, and 191 at Conecuh National Forest in Alabama. The goal is 300 indigos in Florida and another 300 in Alabama. Yet reintroducing snakes is only half the battle. Given their elusive, far-ranging ways, they're hard to track down (even with electronic tags) to determine if they're successfully breeding. Last year, though, a young, 27-inch indigo was captured in Conecuh—the presumed offspring of a reintroduced snake. It was the first evidence in nearly 70 years that indigos are breeding in the Alabama wild.

"And there are other signs of success, too," Jenkins says. >>



A hungry Florida grasshopper sparrow feeds in a Welaka aviary.

Continued from previous page

Flying, Thriving

Sparrows are much easier to track. Ten Welaka birds were released in mid-February on a well-tended prairie at the Three Lakes Wildlife Management Area south of Kissimmee. They spent the previous 24 hours in Welaka's mobile aviary filled with grasses, forbs, seeds, and mealworms. Another batch of 10 birds was sent into the wild the following week.

Roughly 250 captive-bred sparrows have been set free in Florida. Maybe one in three survive, about average for reintroduced species. Biologists estimate the wild population of grasshopper sparrows at about 100 with 30 breeding pairs.

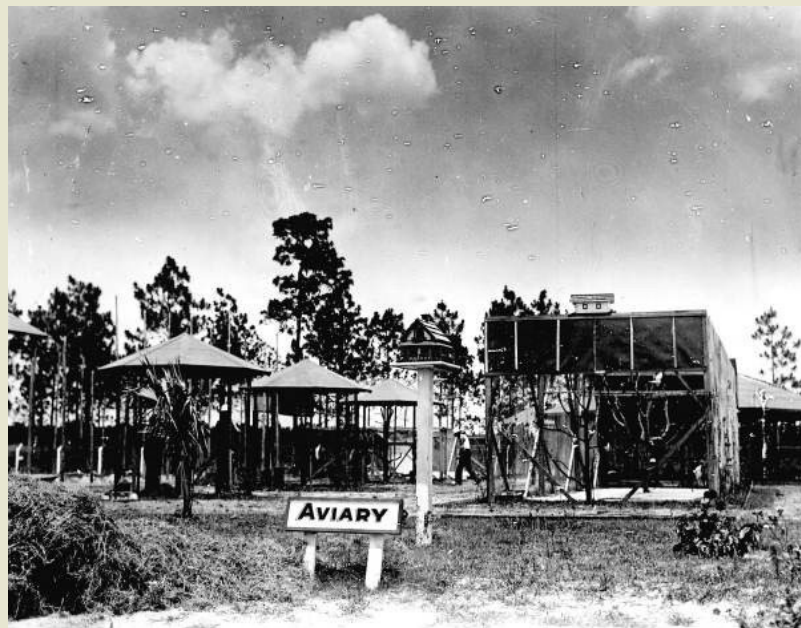
So, what's next?

Brown, in Atlanta, says crayfish are a possibility. Definitely more plants. Maybe Pearl darters and Madtoms. More salamanders too.

"I challenge my folks by asking, 'What else can we do?'" Brown says. "We're just expanding into everything. It truly amazes me." □

DAN CHAPMAN, External Affairs, South Atlantic-Gulf and Mississippi Basin Regions

Welaka is For the Birds—Again!



Welaka National Fish Hatchery, in Welaka, Florida, has roots going back to 1926 when the Florida State Fish Hatchery and Game Farm was built. Conceived with the idea of making Florida a fishing and hunting paradise, largemouth bass, American shad, white-tailed deer, and bobwhite quail were all propagated there.

In 1938, a portion of the original property was transferred to the Service, and Welaka National Fish Hatchery came into being. The lands that were once part of the deer and quail operations are now owned by the Welaka State Forest.

Over the 95 years the Welaka facility has been in existence, priorities have come full circle. From deer and quail to snakes and birds again—and always fish—Welaka eagerly embraces the challenges of the future.

(Above) Some of the aviaries at the original Florida Fish Hatchery and Game Farm.

FISH CAMP & FAMILY

Cora Demit shares her Alaska Native heritage with visitors to Tetlin Refuge. | BY GLEN MARTIN

Cora Demit gets a lift off a float plane.



USFWS

Early life for Cora Demit was defined by family and fish, and they combined to create the foundation for a joyous childhood.

“I was born in Northway, south of Tok, but my four siblings and I grew up in a fish camp,” recalls Demit, an Upper Tanana Athabascan tribal member. “It was on an allotment my mother owned, about 20 miles from the village. My father died when I was 3 years old, so my mother and grandmother raised us. And that camp was our world.”

Only one other family—friends of Demit’s mother—lived on the allotment. Everyone toiled endlessly from late spring through early fall, harvesting whitefish, pike, and suckers from adjacent waterways and drying the fish on racks, as well as trapping and hunting.

“It was true subsistence living,” Demit says. “Over the course of a season, we could literally put up tons of fish, and we also had meat from caribou and moose, and blueberries and cranberries. For storage, we’d build caches or dig pits in the ground down to permafrost, and my mother would arrange the food between layers of willows.”

The family was poor in the sense that there was little available cash, Demit says, “but the land provided for us, just as it had provided for our

ancestors over thousands of years. We didn’t have toys—for Christmas, our presents were moccasins and mukluks my mother sewed from moose skins she had tanned. But we had everything we needed, and I was so happy there.”

Though the fish camp formed the physical parameters of Demit’s life, her mother knew the family—indeed, all Upper Tanana Athabascan people—straddled two worlds. And the outside world was encroaching on the traditional world Demit knew. From mid-autumn through early spring—when she wasn’t at fish camp—Demit attended a Bureau of Indian Affairs school in Northway. And when she was around 10, her mother sent her to a boarding school in Wrangell.

“My mother couldn’t read or write, and she felt that we needed to get formal educations to negotiate the modern world,” Demit says. “But I didn’t want to leave her. They put me on a little plane at Northway kicking and screaming, and I kicked and screamed when they transferred me to other planes at Fairbanks and Juneau. I was incredibly homesick—traumatized, really. Even today, more than 50 years later, I sometimes get a little twinge when I’m on a plane because that memory comes back.”

The following years were tough for

Demit. In the 1960s, Alaska Native children were punished for speaking their primary languages in school, and tribal cultures were denigrated.

“I wasn’t allowed to speak Upper Tanana Athabascan, and they cut my long hair,” Demit recalls. “My mother was terribly upset when she found out. In general, Native kids were just treated poorly. I wanted to come home, but mom wouldn’t let me, insisting that I needed to be educated. She’d send me dried fish and meat to make me feel better.”

Ultimately, Demit says, “I just went within myself for protection, and I stayed there.”

Things started to turn around after Demit graduated high school. A school counselor, Dorothy Johnson, took the young girl under her wing and helped her find work. The genuine concern and care expressed by the counselor was transformational, Demit says, describing herself as a butterfly emerging from its chrysalis.

“Dorothy made me feel worthy again,” Demit says, “and when I returned to Northway, I got a job at the airport lodge, doing everything from waitressing to cleaning rooms. And I did the best job that I could possibly do. My mother taught me that. There’s a saying in our

language, which essentially translates as ‘Do the best you know how,’ no matter what it is. That ethic kept us alive in our family fish camp, and that’s still how I live my life today.”

Demit married her husband, Glenn Demit, in 1966, and they eventually had four children. She became an alcoholism counselor and maintains her certification “because sometimes people just want to talk. Sometimes they need to call and check in, and I always want to be available to help.”

Later, she became a special education aide for the Northway school district.

“I had that position for 10 years, and I loved every minute of it,” Demit says. “Working with those kids was one of the most rewarding things I’ve ever done.”

Demit’s life changed again in 1991, when the Service posted an opening for a park ranger at the Tetlin National Wildlife Refuge. She applied for the job and got it. She later became a refuge information technician, charged with overseeing Tetlin’s visitor center in Tok.

“It keeps me really busy from spring through fall,” Demit says. “I work on everything from our budget to refuge statistics, but public contact and outreach is a big part of the job. Tok and Tetlin are the first places most people visit after crossing the Canadian border on the Alaska Highway, and I’m often the first face they see. I take that very seriously. I want to make sure they have a good impression of Alaska and Alaskans.”

Debbie Steen, the Chief of Visitors Services and Communications for the Service in Alaska, says Demit invests her position with particular meaning due to both her native heritage and her personal qualities.

“When she welcomes people, she welcomes them not only to Alaska, not only to the Tetlin National Wildlife Refuge, but to her homeland, to the place where her ancestors lived for thousands of years,” Steen says. “She loves Tetlin—the land, the habitats, the wildlife, the people—and she’s able to communicate that. She also spends a great deal of time just helping people out, including traveling to Fairbanks and Anchorage to visit elders and other community members who are in the hospital.”

Upper Tanana Athabascan culture remains the central anchor to Demit’s life. She still speaks, and thinks, in her native language and is teaching it to younger tribal members to ensure it remains a vital and living tongue. She still makes moccasins and mukluks from traditionally tanned hides, which she decorates with extensive and meticulous beadwork. And she still savors the traditional foods of her childhood.

“I couldn’t get along without my fish and moose meat,” Demit says. “When I eat them, I’m taken back to our fish camp, to the place where I was happiest as a child. Food and language are the bedrocks of our culture. Without both, I’d be lost.” □

GLEN MARTIN, freelance writer, Alaska Region



Caribou at Tetlin National Wildlife Refuge.



Inside the Tetlin National Wildlife Refuge Visitor Center.

The War for Wildlife



Fish and Wildlife Service ensures fish and wildlife resources for the future.

By MARK MADISON

Hawaiian Monk seal at Papahānaumokuākea Marine National Monument in the northwestern Hawaiian Islands. JAMES WATT/USFWS (Top) Theodore Roosevelt on Breton Island Bird Reservation in 1915. USFWS (Right) Rachel Carson at Hawk Mountain, Pennsylvania. SHIRLEY BRIGGS

Shortly after the end of the Civil War, a new battle drew Americans' attention, the war for wildlife. From 1800 to 1871, the precipitous decline in American fisheries drove the creation of the American conservation movement and the U.S. Commission of Fish and Fisheries. Out of the wanton destruction of all American wildlife—furred, feathered, and finned—arose a popular movement and an agency to help ensure this age of exploitation would never be repeated.

Overfishing and habitat degradation in the eastern half of the United States had noticeably reduced many fisheries in the aftermath of the Civil War. To remedy this environmental crisis, on February 9, 1871, Congress created an independent U.S. Commission of Fish and Fisheries to investigate the decline in fish stocks and suggest possible remedies. This modest mandate was embraced and expanded by renowned naturalist and Assistant Secretary to the Smithsonian, Spencer Fullerton Baird. As the first Fish Commissioner, Baird set out to build a continental conservation movement based on science and fish stocking. Soon the Fish Commission established hatcheries across the nation tasked with stocking lakes, rivers, and streams from Alaska to DC. Between 1872 and 1940, the Fish Commission distributed more than 200 billion fish and other aquatic species, largely by specially designed Fisheries Rail Cars traveling 2,029,416 miles. After leaving the tracks, the fish traveled an additional 8,104,799 miles by fish culturists called “messengers.” This was truly the first continental-wide wildlife restoration effort.

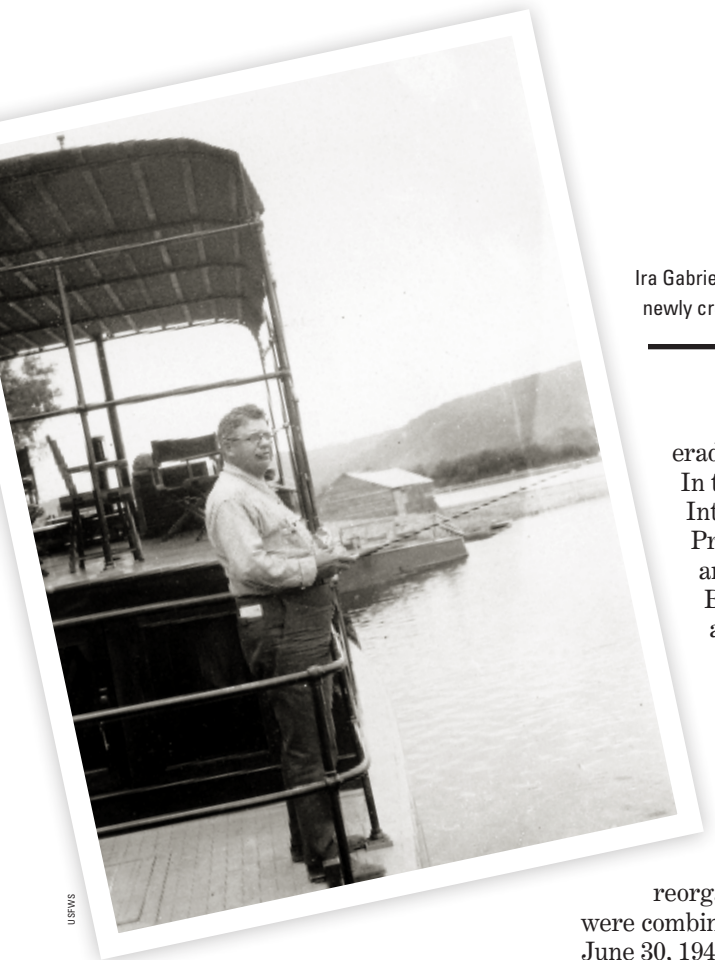
Baird, a renowned naturalist, supported a strong scientific underpinning for the Fish Commission. The U.S. Fish Commission established the marine biological laboratory in Woods Hole, Massachusetts, in 1882, and it commissioned a small fleet of research vessels from 1880 to 1926, including the U.S.F.C Fish Hawk, Albatross, and Grampus. Baird, during his tenure from 1871 to 1887, had a scout's eye for the best scientific talent. This tradition persisted when in 1927, the agency (renamed the U.S. Bureau of

Fisheries in 1903) hired its first permanent female scientist, Louella Cable. She witnessed a revolution in fisheries science during her 43-year career as an aquatic biologist and scientific illustrator. For 69 years, from 1871 to 1940, the Fish Commission and its successors built upon their pillars of science, restoration, and national conservation initiatives to help restore fish populations and fulfill the early promise of the conservation movement.

Congress established a parallel agency in 1885 to protect terrestrial wildlife. Its origins were similarly humble, when the U.S. Department of Agriculture (USDA) established a Section of Economic Ornithology. The section's modest mandate was to study both the “useful” birds (those that ate insects) and “injurious” birds (those that ate crops) in the rather narrow ecological outlook of farmers of the day. Like the early Fish Commission, this little office had a gifted leader to expand its mission, naturalist C. Hart Merriam, one of the premier ornithologists and mammalogists of the era. In 1886, Merriam expanded his one office and one clerk into the Division of Economic Ornithology and Mammalogy with a broader mandate to “educate” farmers about all wildlife and conduct studies on the geographic distribution of plants and animals (which a later generation would dub “ecology”). As befit this expanded mission, Merriam and his talented naturalists began to distribute continental studies of wildlife from Canada to Central America in what he called “Life-Zone Maps,” which we would recognize today as large-scale ecosystems.

As its mission grew, Merriam advocated for the more encompassing name of Division of Biological Survey in 1896. As its budget, staff, and ecological mapping continued to expand, the Division evolved into the Bureau of Biological Survey in 1905—the last name change until its absorption in 1940 with the U.S. Bureau of Fisheries into the new U.S. Fish and Wildlife Service. With Merriam at its helm from 1885 to 1910, the Bureau of Biological Survey flourished as it carried out important conservation studies of wildlife. Merriam was friends with fellow ornithologist Theodore Roosevelt, and together they helped create the first bird reservation at Pelican Island, Florida in 1903, the origin point of the National Wildlife Refuge System. While fish culturists had mastered raising fish in hatcheries, birds and mammals required new forms of management. Theodore Roosevelt established 51 bird reservations and 4 game ranges between 1903 and 1909, a bold new experiment to conserve birds and mammals by protecting their habitat. The Biological Survey combined this early habitat protection with the first federal wildlife protection. The 1900 Lacey Act and the 1918 Migratory Bird Treaty Act both attempted to prevent the wanton destruction of birds and other wildlife working in conjunction with the nascent refuge system in a two-pronged approach to wildlife conservation.

The Biological Survey's early conservation measures were modestly successful, until a combined economic and ecological disaster in the 1930s drove innovations and a new agency. The drastic decline in waterfowl numbers during the 1930s Dust Bowl led to a reorganization of the entire Biological Survey. President Franklin Roosevelt brought in Jay N. “Ding” Darling, an editorial cartoonist and avid sportsman, as Chief to revive the Bureau in 1934. A waterfowl hunter, Darling quickly enlisted his fellow hunters to support conservation through the institution of a Duck Stamp; he drew the first stamp that year. As these hunters spent their buck (the original cost of the stamp) for ducks, it created a growing conservation constituency for the >>



Ira Gabrielson was the first Director of the newly created U.S. Fish and Wildlife Service.

eradication than for conservation. In that year, Secretary of the Interior Harold Ickes persuaded President Franklin Roosevelt and Congress to move both the Bureau of Biological Survey and the U.S. Bureau of Fisheries into the Department of the Interior in an effort to create, what he hoped would be, a new “Department of Conservation.” That department never arose, but something nearly as important came out of this

reorganization as the two bureaus were combined to form a new agency on June 30, 1940—the U.S. Fish and Wildlife Service.

The first Director of the newly minted Service, Ira Gabrielson, noted in his 1943 Annual Report and in the midst of World War II, that when the soldiers returned home, millions of Americans would be eager for the relaxation afforded by hunting and fishing opportunities. In preparation for this influx of new and returning sportsmen (many much better shots after military service), wildlife refuges expanded their access to hunters and anglers in the decades following the end of the war.

The Dingell-Johnson Federal Aid in Sport Fish Restoration Act (1950) placed a small excise tax on boating and sport fishing equipment, so the Service could provide financial assistance for state fish restoration, recreation, and management endeavors. Since their enactment, the Pittman-Robertson and Dingell-Johnson acts have provided nearly \$21 billion dollars in financial assistance for wildlife restoration, hunter safety and education, and sport fish restoration in states and territories under the auspices of the Service’s Wildlife and Sport Fish Restoration Program.

In 1945 the Service created a small Office of River Basin Studies, which would become the origin point for ecological services within the agency. River Basin Studies biologists began to take a more comprehensive look at major public works projects impacting fish and wildlife resources, working hard to find ecological solutions with the Army Corps of Engineers, Bureau of Reclamation, and Soil Conservation Service. The office’s unofficial motto in those early years was “save the dirt!” Innovative ideas emerging from this ecological think tank included the first National Wetlands Inventory (1952 to 1954) and the National Survey of Hunting and Fishing Activity (1955) to take stock of wildlife habitat and those who enjoyed it.

From 1940 to 1970, all fish and wildlife resources were under the stewardship of one agency, the Service. However, on October 3, 1970, President Nixon removed marine fisheries from the U.S. Fish and Wildlife Service to the newly created National Marine Fisheries Service in the Department of Commerce. The timing was inopportune as this was shortly before the passage of the Marine Mammal Protection Act (1972) and the Endangered Species Act (1973), effectively dividing the authorities for protecting wildlife resources between two agencies, as it had been before 1940.

Other changes were occurring in this era. The Bureau of Fisheries hired Rachel Carson in 1935 and she rose to become chief editor for the Service. In that prominent role, Carson first began to describe the dangers of DDT and other toxins to fish and wildlife resources. The research culminated in her best-selling book *Silent Spring* (1962), in which she laid the framework for the modern environmental movement.

Part of Carson’s legacy was an increasing emphasis on threatened and endangered species, clean water, and habitat restoration in the late 1960s and early 1970s. In 1972, the Service renamed River Basin Studies to the Division of Ecological Services to better reflect a recently >>

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expanding refuge system. The 1937 Pittman-Robertson Federal Aid in Wildlife Restoration Act further strengthened this sportsman-conservationist partnership. The P-R Act placed a small federal excise tax on firearms and ammunition to greatly expand state wildlife work for both game species and endangered and threatened species.

At the federal level, Darling helped create a series of migratory bird refuges along corridors called “flyways” and, in so doing, created the first systematic expansion of the refuge system since Theodore Roosevelt. The nation’s most successful youth-in-nature experiment, the Civilian Conservation Corps, worked on 44 wildlife refuges during the 1930s and in that decade the number of refuges expanded from 51 to 170.

By 1939, the Biological Survey was the premiere wildlife agency in the world and no longer a particularly good fit for the USDA, which wanted more funds for



JOHN AND KAREN HOLLINGSWORTH

Wildlife Inspector with seized property.

Continued from previous page

enlarged portfolio of protection, including increasingly sophisticated analysis of water pollution, coastal habitat destruction, and environmental impacts of habitat loss. The addition of the Endangered Species Program to Ecological Services in 1983 greatly expanded its role to protect and restore threatened and endangered wildlife.

In 1969, the Service created the first national wildlife refuge for an endangered species, the bald eagle, at Mason Neck, Virginia. Shortly thereafter, a number of endangered species refuges were established across the country for condors, eagles, and even endangered fish such as the narrowly endemic desert fishes protected at Ash Meadows National Wildlife Refuge in Nevada and San Bernardino National Wildlife Refuge in Arizona.

Just as the Fish Commission had worked with global partners since the 1880s, so, too, the Service expanded its role in international wildlife conservation when it signed onto the 1975 Convention on International Trade in Endangered Species of Wild Fauna and Flora. This expanded conservation work beyond our own borders by joining 183 other signatories to help with international conservation of threatened species such as tigers, great apes, rhinos, and elephants. Changes in the environmental sciences, and a growing environmental political movement, transformed the

Service into an agency that managed wildlife without borders in the most ecologically sensitive manner possible. Ironically, some of these efforts involved removing non-native fish species, unwittingly stocked a century earlier by the U.S. Fish Commission and its successors, to revive native fishes.

As the agency entered its second century of wildlife work, its capacity grew to meet new challenges. The Service's law enforcement role extended back to the 1900 Lacey Act providing critical protection to America's wildlife both on and off refuge lands. A new Division of Law Enforcement was created in 1972 with the addition of special agents in 1973 and wildlife inspectors in 1975 at the forefront of combatting domestic and international wildlife trafficking.

Migratory bird conservation took on an early federal role with the Migratory Bird Treaty of 1916, signed between the United States and Canada. Building on the earlier flyways concept, the Service gradually worked toward a more comprehensive hemispheric conservation of migratory birds that included a North American Waterfowl Management Plan (est. 1985) and Partners in Flight (est. 1990), a public-private partnership to conserve all land birds in the Western Hemisphere. A growing realization that birds do not recognize political borders and the Service couldn't conserve all avians alone, led to the creation of the first joint venture. Beginning in 1987, over 5,700 joint venture projects brought together regional partnerships of government agencies, nonprofit organizations, corporations,

tribes, and individuals to conserve habitat for the fish, birds, other wildlife, and people.

The origins of the Service and the American conservation movement began 150 years ago with one Fish Commissioner and a report outlining the causes of fisheries decline and a blueprint for recovery. Today 8,000 professional conservationists in the agency manage the world's largest fish and wildlife conservation program. From one hatchery in 1872, the Service now manages 70 national fish hatcheries, 7 fish technology centers, and 9 fish health centers across the nation to improve, conserve, restore and enhance fish and other aquatic resources. From 1 4-acre Pelican rookery in Florida, the agency now manages 567 refuges and 38 wetland management districts on more than 150 million acres across the country. From the inaugural Alaska's Afognak Islands Forest and Fish Culture Reserve to protect sockeye salmon in 1892, this modern descendent of the U.S. Commission of Fish and Fisheries manages aquatic resources on more than 685 million acres within 5 Pacific and Atlantic marine national monuments. Although the Service's employees, habitat, and mission have grown and evolved over the last century and a half, its ultimate goal has remained to ensure our rich American fish and wildlife resources are enjoyed by future generations. □

MARK MADISON, U.S. Fish and Wildlife Service Historian, National Conservation Training Center

MUSEUM
OBJECTS
COME TO
LIFE

This is a series of notes about curiosities of the Service's history from both the U.S. Fish & Wildlife Service Museum and Archives as well as the Service's National Fish and Aquatic Conservation Archives. We feature submissions from Steve Flory, curator of the U.S. Fish & Wildlife Service Museum and Archives, and April Gregory, curator of the National Fish and Aquatic Conservation Archives.

Buttons Ride the Rails



Two buttons reside in the Fish and Aquatic Conservation Archives at D.C. Booth Historic National Fish Hatchery in Spearfish, South Dakota. "USFC" stands for U.S. Fisheries Commission, or the U.S. Commission of Fish and Fisheries, the predecessor of today's Service. They

are from uniforms worn by the fish car employees who transported live shipments of fish across the country via specially designed rail cars from the 1880s to 1947. We had 10 fish cars over the years. Every fish car had a staff of five: a caption, a cook and three "messengers" to care for the fish. A 1923 report indicated that over the previous 20 years 72 billion fish were distributed by fish cars that had traveled over 2 million miles. The buttons are from between the 1880s and 1903. The USFC was renamed the U.S. Bureau of Fisheries in 1903. (APRIL GREGORY)



Planning Doc, Art, or Both?

The Service develops and implements a variety of planning documents to help guide us in the effective management of the wildlife, lands, facilities, and resources that we administer for the public. Servicewide planning initiatives date back to our predecessor agencies, and a number of historic planning documents are among the holdings of the U.S. Fish & Wildlife Service Museum and Archives at the National Conservation Training Center. Of course, planning documents from 87 years ago look a bit different from those from today. For example, the 1934 plan for North Dakota's Upper Souris Migratory Waterfowl Project, which became Upper Souris National Wildlife Refuge, isn't merely a plan—it's a work of art. Of course when the Director of the Service is an accomplished artist willing to help—J.N. "Ding" Darling—what would you expect? (STEVE FLORAY)



Fish Hatchery Worth a Postcard

A quick glance at this postcard and most would not think it is an image of a fish hatchery. But small print across the top reads, "United States Fish Hatchery, Cape Vincent, N.Y." A fish hatchery building of such size and stature, four stories of brick and mortar, is not what hatchery buildings look like today. Many of the early federal fish hatchery buildings were architectural works of art. The

original blueprints for the Cape Vincent hatchery building are also housed at the National Fish and Aquatic Conservation Archives. The Cape Vincent federal fish hatchery was established in 1894 and the postcard is circa 1915. The hatchery raised trout, salmon, sturgeon, walleye, and whitefish. The hatchery was transferred to the state of New York in 1965 and is still in use for fisheries work. (APRIL GREGORY)

The First Refuge Manager's Badge

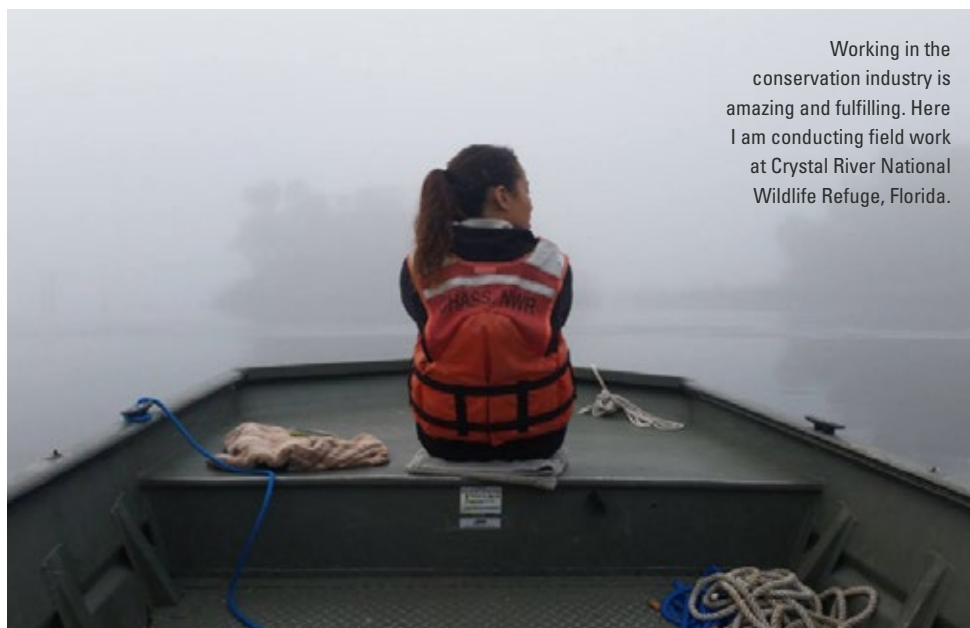
President Theodore Roosevelt signed an Executive Order on March 14, 1903 to establish Florida's Pelican Island as the nation's first federal "...preserve and breeding ground for native birds." Paul Kroegel, who lived on the mainland in view of Pelican Island, had served as the "unofficial protector" of the island's birds for many years. Carrying his double-barreled shotgun, Kroegel worked hard to persuade market hunters to steer clear of the island. After Pelican Island became our first wildlife refuge, Kroegel was hired as our first refuge manager, then referred to as warden. In 2009, Kroegel's granddaughter donated his badge, shotgun, revolver, pipe, and the refuge sign he placed on the island to the U.S. Fish & Wildlife Service Museum and Archives. The next time that you're at NCTC, check out Kroegel's Pelican Island sign in our new museum exhibits. (STEVE FLORAY)





Conserving While Black

Breaking Down Barriers in the Conservation Community | BY DANA BIVENS



Working in the conservation industry is amazing and fulfilling. Here I am conducting field work at Crystal River National Wildlife Refuge, Florida.



TRISHA PHT
KAREN JANOWSKI

Enjoying Yellowstone National Park.

In my industry, I am more than a minority... I am a rarity.

Professionals as well as participants in the conservation and recreation community overwhelmingly identify as white. As an African American with mixed ancestry, I stand out in a crowd. This has always been a part of my life, and it is a fact that I passively accepted. Over the past year however, as the national discourse on racial equality reached a fever pitch, I began to reflect on my own sphere and the homogeneity in my industry in order to help change the status quo and open conservation and recreation to all groups.

According to the 2019 US Census Estimate, African Americans comprise 13.4% of the national population. Despite this, African Americans only represented

1% of visitors to national parks, national forests, or national wildlife refuges while nearly 95% of visitors were white. From my own personal observations, the vast majority of my agency coworkers are white and I am very aware that I look different from my peers. In reviewing this data, I can't help but wonder why this is the case.

Why are Black people underrepresented as conservation professionals and participants compared to the national distribution? This is undoubtedly an extremely complex issue, but one reason lies in the optics of what it means to be a conservation professional or an outdoor enthusiast. Culturally, we as a society associate environmentalism with whiteness and privilege, and those who participate who do not fit this mold become a novelty that stands out. I can tell you from experience that there is no faster

way to make someone feel unwelcome in a new setting than feeling as though you don't look the part.

We saw the power of prejudice when the #BirdingWhileBlack movement grew after Christian Cooper, a Black man who also happened to be a birder, was accosted by a White woman who used his race as a weapon to intimidate him into submission. While her efforts failed, the encounter highlighted how the image of Black people in the outdoors can often make people uncomfortable, and this fear and discomfort can lead to acts of violence or intimidation.

While speaking to a family member recently, I asked him why he never goes hiking or camping and why his family never took him when he was a kid. His response was swift and decisive: "we didn't feel welcome or safe outside of >>



Continued from previous page

our neighborhood.” My family members did not feel wanted in rural settings or in outdoor spaces because they were seen as outsiders, and this lack of safety and inclusion was a major barrier to participation. My family members sensed the same animosity when they left their urban community, and so over time our family traditions evolved to exclude those

running, and spending time in the country is among my favorite pastimes. I can remember many instances when I have been out jogging on rural roads or visiting farms and people will walk outside and stare at me suspiciously as I pass. Other times I have had drivers yell racial slurs at me while speeding by. I started carrying pepper spray for personal protection because my skin color made me a target.

vocalize their experiences and this bravery has helped me to realize that it is my responsibility to challenge stereotypes no matter the venue and no matter the situation. I encourage all members of the minority community as well as supporters from the majority to do the same. There can be no change in silence. Inaction is silence.

To all who have felt unwelcome or who have questioned whether or not this world was for them, it is for all of us. Recreate, and reinvent what it means to “look the part” in conservation by participating and breaking down the cultural barriers ahead of you. Let’s work together to change these images for kids and future generations who may never have thought this world was open to them. If you dream of being a wildlife biologist or if you want to explore public lands in your area, there are resources out there to connect you and your community with the outdoors.

Here are a few:

- [USFWS Jobs and Internships](#) 🔗
- [USFWS Urban Wildlife Conservation Program](#) 🔗
- [Find a national wildlife refuge near you](#) 🔗
- [National Recreation Resources](#) 🔗

If you need help identifying opportunities or if you want to share your conservation and recreation stories, email me at <dana_bivens@fws.gov>. I would love to help connect individuals and communities to local opportunities to experience the outdoors or to help support conservation efforts. I hope you come out and enjoy the natural world with me. We belong. □

 DANA BIVENS, External Affairs, Columbia-Pacific Northwest Region

Hiking near Kohala National Forest Reserve, Hawaii.



DAVID JANKOWSKI

To all who have felt unwelcome or who have questioned whether or not this world was for them, it is for all of us.

unsafe spaces. Growing up we didn’t hunt, we didn’t camp or hike, we didn’t go birding, we didn’t fish, and we didn’t get to enjoy the natural world because threats of violence took away any joy from those activities.

My family member’s response and Christian Cooper’s encounter resonated deeply with me. I love riding horses and

I want to change this. I love the wildlife and plants that create the unspeakable beauty of this planet and I want others to enjoy nature as well. To my peers in the Black, Indigenous, and People of Color, or BIPOC, community: we are welcome on public lands, and the conservation and recreation world is open to all who wish to participate. As discussion on racial equality have become more mainstream in recent months, it has encouraged many to

transitions

Columbia-Pacific Northwest Region



Long-serving natural resource professional **Chris Swanson** has been named state supervisor for the

Service's Idaho Fish and Wildlife Office (IFWO).

Chris is the office's deputy state supervisor and has been acting state supervisor since August 2019. He brings strong leadership to the office through his emphasis on people and collaborative partnerships in the delivery of the Service's conservation mission. Chris has an established track record of successful conservation and science leadership. He acquired this experience working in diverse habitat regions from the southeastern United States to the Prairie Potholes and the Pacific Northwest, including five field stations and two Regional Offices. Chris has demonstrated exceptional leadership qualities in building teams and managing staff to achieve desired conservation outcomes and has helped develop the strong partnerships essential to achieving the Service's mission.

"Home to numerous iconic species and habitat types, Idaho has many important conservation opportunities for the Columbia-Pacific Northwest Region," says Robyn Thorson, Columbia-Pacific

Northwest Regional Director. "The Service, our trust resources, and partners will benefit from Chris's proven leadership skills and cooperative approach to conservation."

Chris will lead a staff of approximately 48 employees in Boise, Coeur d'Alene, and Chubbuck, Idaho. These offices manage complex natural resource issues throughout Idaho, requiring broad collaboration on landscape scales with a variety of partners. The office's core responsibilities include species conservation and recovery, private lands and conservation partnerships, listing and classification of endangered species, federal agency assistance and consultation, and the assessment of contaminants on natural resources.

"Chris's experience in partnering and collaboration are traits that really stand out for him and will be a valuable skill in leadership of the IFWO," says Thorson.

He received a B.S., M.S., and Ph.D. from South Dakota State University. His Ph.D. dissertation focused on sage-grouse ecology in the eastern edge of their range. Chris and his family live in Boise, Idaho. He enjoys spending time outdoors and at a diversity of youth sports activities with his wife and their three children. □

North Atlantic-Appalachian Region



Kyla Hastie has been selected as the Deputy Regional Director for the Service's North Atlantic-

Appalachian Region. Kyla, a 22-year veteran of the Service, served as acting Deputy Regional Director since October 2019.

"Kyla has shown her talents and leadership in many areas, but I especially appreciate her leadership and dedication toward helping us work to create a diverse and engaged workplace," says Regional Director Wendi Weber. "She is passionate about our employees and the conservation we achieve, and I know she will work for all of us to support our priorities and improve our workplace culture."

Kyla served as Assistant Regional Director for External Affairs from 2008 to 2019. She was responsible for media relations, congressional and tribal relations, stakeholder outreach, and communications. Before moving to the Northeast, she worked for a decade in various public affairs, communications, and outreach positions in the Southeast. She is a graduate of the Service's Stepping Up To Leadership Program and of the Advanced Leadership Development Program.

"I feel fortunate to work for an agency with such a noble mission, and one that has given me so much," Kyla says. "I have learned from many great leaders

and mentors who have helped me grow and supported me to be my best at work and at home. It's important to me to pay it forward, and to do all I can to support our workforce."

Inspired by her mother, a history and government public school teacher, Kyla says she always knew she wanted to be a public servant. She developed a love of the outdoors growing up fishing and camping with her family, and studied ecology at Southwestern University in Georgetown, Texas. She completed her education at Indiana University's School of Public and Environmental Affairs, earning master's degrees in environmental science and public administration and combining her interest in science with public service.

Kyla says she is proud to work with such smart and passionate fish and wildlife professionals, as well as support staff who oversee contracts, human resources, IT, administration, communications, and all of the other functions that makes conservation possible.

"Their work is so important, and I am inspired by the resilience, resourcefulness and perseverance of our teams," she says. "It's exciting to be part of building a conservation legacy together."

She and her husband, Keith, have two daughters and live in western Massachusetts. □

Headquarters



After a six-month detail as the Service's acting Public Affairs Chief in Headquarters External

Affairs, **Karen Armstrong** has been named the permanent Chief.

Karen came from the U.S. Geological Survey (USGS), where she worked for 33 years. She started her career at USGS in public affairs in 1987, but she served in many roles over the years, all in communications. Most recently she held the position of external communications and web/social media officer. She also led the USGS web team, helping to migrate their website to a Drupal content management system platform, a project the Service is currently working on.

She replaces **Gavin Shire**, who moved to USGS as the Associate Director of Communications and Publishing. Gavin was with the Service for eight years. □

honors

Headquarters



Edward Stoker, a partners and intergovernmental affairs specialist in External Affairs, was recognized

with a Special Thanks for Achieving Results, or STAR, Award for his exceptional energy, enthusiasm, and work in outreach to new audiences. Eddie has been an ambassador for the Service in proactively seeking and developing relationships to help ensure that the Service remains relevant as our nation becomes increasingly more urban and diverse. Eddie has also tirelessly advocated for diversity and inclusion in the Service's outreach, recruitment, and hiring of qualified staff as well as in the delivery of products and services across the Service's programs and regions. □

Missouri Basin and Upper Colorado Basin Regions



Recently, the North Dakota Chapter of the Wildlife Society awarded **Chad Maier** the prestigious North

Dakota Habitat Award at their annual meeting.

The award recognized Chad for his tremendous contributions to grassland and wetland conservation on private lands across North Dakota throughout his career.

Chad has spent his entire life in North Dakota and began his career working as a seasonal Service biotechnician at several refuges and wetland management districts across North Dakota before being hired as a private lands biologist with the Service's North Dakota Partners for Fish and Wildlife Program in 1998. Since then, Chad has been responsible for the restoration, enhancement, and creation of nearly 1,500 wetlands covering over 7,000 acres of wetland habitat. He has also restored more than 7,200 acres of grassland habitat and implemented livestock grazing systems on over 75,000 acres.

Chad is widely recognized by his peers, private landowners, and conservation partners in North Dakota as one of the leading experts in designing and implementing habitat restoration, enhancement, and creation projects on private lands. Chad is dedicated to improving and increasing wildlife habitat on private lands in North Dakota and works closely with private landowners as well as internal and external conservation partners to turn conservation plans into realities.

Chad exemplifies the cornerstones of the region's Partners for Fish and Wildlife program (Trust, Respect, Honesty, Flexibility, Friendship, and Two-way Communication), and his dedication to conservation is helping improve wildlife populations in North Dakota and helping the Service achieve our mission.

□

*in memoriam***California-Great Basin Region**

With a career spanning more than 30 years at the Service, **Cay Goude** will be remembered by the conservation

legacy she leaves behind in northern California.

Starting as a wildlife biologist in the Service's Sacramento Fish and Wildlife Office in 1984 and rising to the office's assistant field supervisor, Cay championed the development of regional habitat conservation plans and the recovery of species. She was the driving force behind nearly every regional HCP in the Sacramento office jurisdiction, including the East Contra Costa County and Santa Clara Valley Habitat Conservation Plans, which protect thousands of acres of important habitat in highly urbanized areas. She also worked alongside partner groups to conserve land for Don Edwards San Francisco Bay National Wildlife Refuge.

"She was able to bring together disparate entities and work toward finding common ground without losing sight of conservation," say Kim Squires, division manager of the Bay-Delta Fish and Wildlife Office.

In 2015, Cay received the Service's Recovery Champions Award for her leadership in promoting recovery planning as the foundation for successful conservation. Her involvement in the development of the 1998 Recovery Plan for Upland Species of the San Joaquin Valley, California, was considered to be ahead of its time as a multi-species, ecosystem-based recovery strategy focused on the protection of keystone species.

"Cay was a passionate biologist and leader who accomplished untold victories for the protection of listed species and precious landscapes. She connected many people at the right time for important causes," say Valary Bloom, biologist in the Bay-Delta office.

Cay was deeply committed to using her leadership role to lift other women in the agency and make space for their voices to be heard. She gave each of her staff a marquee project to work on under her direct guidance. By providing these opportunities, her staff gained experience and confidence and honed essential negotiation and technical skills.

"Cay held up her staff at every opportunity, always making time to call out their accomplishments and express appreciation," says Bloom.

Cay retired from the Service in 2015. She passed away in early January after a courageous battle with cancer. □

Headquarters

James (Jim) F. Voelzer, 80, of Brush Prairie, Washington, died January 3, 2021, of complications related to

dermatocytosis. He was a native of the Cayuga Lake area of upstate New York. Jim earned a degree in wildlife management at Utah State University followed by three years in the Army, including service in Vietnam as a first lieutenant, flying low-level reconnaissance missions over enemy positions.

Joining the Division of Management and Enforcement (now the Division of Migratory Bird Management) in 1969, Jim was a pilot-biologist (flyway biologist) assigned to conduct migratory bird surveys in portions of the United States, Canada, and Mexico as well as duck banding in portions of western Canada. He was stationed in Washington, DC, New Mexico, Missouri, and Oregon during his 37 years with the Service, retiring in 2006. Jim served 24 years as Chief of what is now the Branch of Migratory Bird Surveys and several years prior as acting Chief. He supervised the Flyway Biologist group and advised Migratory Bird Management headquarters staff on status and needs for migratory bird survey and banding activities.

Jim's experience in national and international program coordination made him the "go to" person for advice and assistance by colleagues in other resource agencies and organizations throughout the continent. He was well-respected and thought of among his colleagues and peers, and possessed a unique capability to navigate difficult planning and logistical challenges associated with his position. During his career, he was responsible for the successful conduct of some of the largest wildlife surveys in the world, including the annual North American Waterfowl Breeding Population and Habitat Survey, and the Western Canada Cooperative Waterfowl Banding Program. He oversaw many improvements to these operations and others that helped ensure their status as some of the most reliable and longstanding wildlife monitoring programs ever developed. Jim's extraordinary ability to manage a diverse group of pilot-biologists and his overall responsibility for the maintenance and safe operation of more than a dozen complex airplanes will remain a hallmark of his professional career with the Service. These accomplishments and others are an extraordinary testament to his long career in the Service and a reflection of his many contributions on behalf of our shared, international migratory bird resource. □

Fish & Wildlife News

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ROGER TABOR/FWS

Face Time

Who wouldn't love a face like this? But the first trick is to spot them! Sculpins are international masters of disguise. Found throughout the world in a variety of habitats (rivers, lakes, estuaries, and oceans), these bottom-dwelling fish have the perfect camouflage to both avoid predators and ambush prey. This prickly sculpin is one of about 300 species of sculpin and was photographed by fish biologist Roger Tabor of the Service's Western Washington Fish & Wildlife Conservation Office.

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