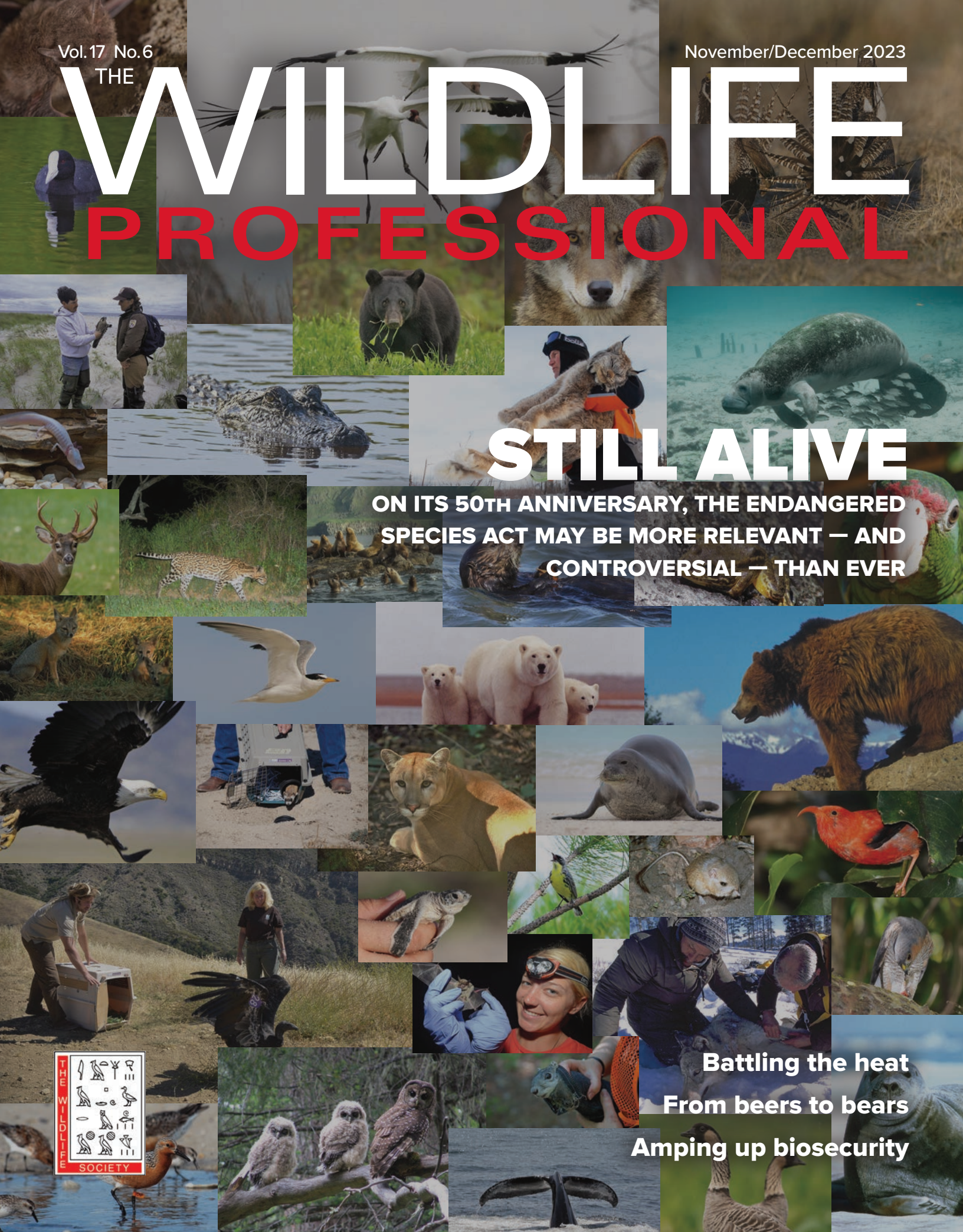
Vol. 17 No. 6

November/December 2023

THE

WILDLIFE PROFESSIONAL



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The Wildlife Professional is the flagship publication of The Wildlife Society and a benefit of membership. The magazine —published six times annually—presents timely research, news and analysis of trends in the wildlife profession.

ABOUT

The Wildlife Society, founded in 1937, is an international nonprofit scientific and educational association dedicated to excellence in wildlife stewardship through science and education. Our mission is to inspire, empower and enable wildlife professionals to sustain wildlife populations and their habitat through science-based management and conservation. We encourage professional growth through certification, peer-reviewed publications, conferences and working groups. For more information, visit us at www.wildlife.org.

BECOME A MEMBER

Membership is open to wildlife professionals, students and anyone who is interested in wildlife science, management and conservation. To learn about the benefits of TWS membership or to join, go to www.wildlife.org/join.

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The Endangered Species Act has been instrumental in preventing the extinction of thousands of at-risk species across the United States.

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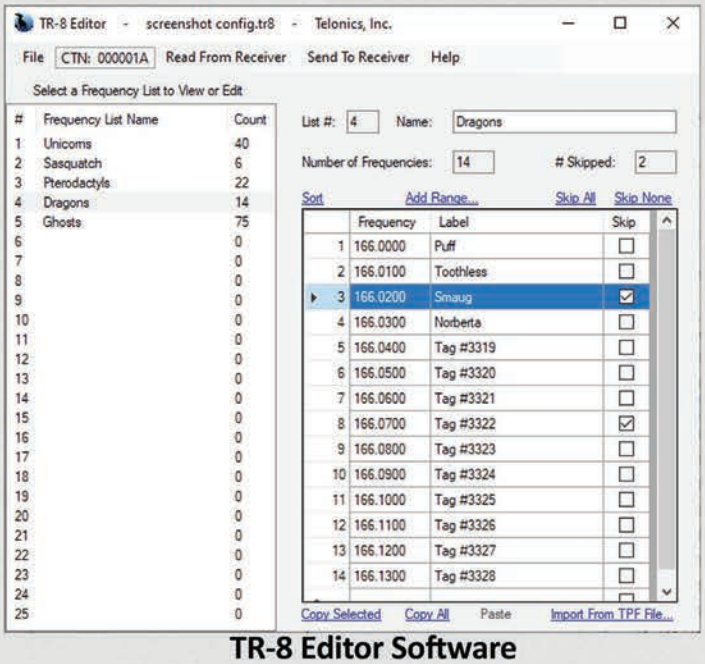

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4	Dragons	14
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2	166.0100	Toothless	☐
3	166.0200	Smaug	☑
4	166.0300	Norberta	☐
5	166.0400	Tag #3319	☐
6	166.0500	Tag #3320	☐
7	166.0600	Tag #3321	☐
8	166.0700	Tag #3322	☑
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THE WILDLIFE PROFESSIONAL

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Credit: David Majure/Arizona Game and Fish Department

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Credit: NASA

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This publication is available online to TWS members on wildlife.org. References printed in blue indicate links in the online version of the magazine.

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Credit: Aaron Haines

An important milestone for a critical law

In addition to serving as this publication's editor-in-chief, I lead The Wildlife Society's policy efforts. The U.S. Endangered Species Act is a topic that our TWS policy team regularly encounters in our efforts to advance science-based policies, and I'm pleased that we are able to use this magazine to recognize the 50th Anniversary of the act. Regardless of its controversies, the act has played a critically important role driving conservation forward in the United States for the past half-century. Thousands of wildlife professionals work with the ESA every day, and while it—like most everything else—could certainly be improved, it is largely successful at a primary goal of preventing extinction.

One of the threats pushing more and more species toward extinction: climate change. One of our staff-written articles in this issue focuses on this year's heat waves that raised the temperature across continents, causing risks to wildlife and people.

Contributed articles in this issue touch on a wide breadth of issues facing today's wildlife professionals. An article submitted by our partners at USDA Wildlife Services discusses the creativity and ingenuity required of wildlifers in the field to more effectively manage wildlife damage concerns. Another emphasizes the need for wildlifers to be good communicators, and how non-wildlife experiences (including bartending!) can help develop those skills. Fieldwork often means getting close to our subject species, and a third contributed article stresses the importance of good field-gear-cleaning practices to protect our wildlife. And a fourth contributed article highlights efforts to diversify our profession and support underrepresented students in their journey to join our wildlifer family. I hope you find inspiration, intrigue, and a sense of community in these stories.

Now we're preparing a new lineup for 2024 that I hope you will find inspiring and empowering. Similar to the contents of this individual issue, our articles in Volume 18 of the magazine will hit on a wide range of topics important to today's wildlifers. We'll have cover features and special focus sections that discuss specific species like beavers and broad topics like climate change impacts to montane ecosystems. We'll be talking about wildlife damage management, new techniques being used by nutritional ecologists, and undergraduate research efforts. Articles will discuss conservation efforts on tribal lands, the role of the IUCN in global conservation efforts and the USGS' Cooperative Fish and Wildlife Research program. Whatever the topic happens to be, I hope each issue contributes in some way to your professional journey and your important work of wildlife conservation and management.

I also encourage each of you to consider submitting your story to this magazine. Our magazine is strongest when members like you tell your own stories of overcoming conservation challenges, developing new collaborations and exploring ways of collecting data and implementing research. Each published article receives a free annual TWS membership and is put in the running for the *Best Contributed Article* award which comes with a $500 prize. You can learn about how to submit at wildlife.org/publications.

As always, your feedback and input on *The Wildlife Professional* are welcome and encouraged.

Keith Norris, AWB® (he/him/his)
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& Communications
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National Association of University Fisheries and Wildlife Programs

By Bob Lanka

Abraham Lincoln and the evolution of TWS

Four score and seven years ago, our founders brought forth on this continent a new society, conceived in science, and dedicated to the proposition that wildlife professionals should be rigorously trained individuals of the highest ethical standards.

Forgive me for adopting the first sentence of the 16th U.S. president's most well-known speech in my first Leadership Letter. I have been an on-and-off-again student of President Lincoln for some time now. Lincoln fascinates me. Not because of the myths that surrounded him after his death, or the fact that he was president during the American Civil War, but because of his evolution as a human being in the span of a few years.

At the beginning of his political career, he was a man of his time: Though philosophically opposed to slavery, during one of the Lincoln-Douglas debates in 1858, he stated plainly that he was not in favor of equality between the races, granting Black men any access to the political process or the right to vote, and that he believed the white race should assume the superior position in relations between the two. Clearly, his thinking evolved. At Gettysburg in 1863, in only a couple hundred words (400 less than this column!), he changed the nature of the Civil War from a war to preserve the Union the way it was—with slavery—to a struggle for freedom. He further evolved, expressing his biblical condemnation of slavery and all of America's role in it in his second inaugural address in 1865, which he chose to end with a call for compassion and mercy rather than revenge. That evolution of mind and heart occurred in the period of seven short years.

All of us, like Lincoln—though perhaps not as dramatically—are on a personal journey and, no matter our age, we are evolving as human beings. The Wildlife Society is evolving as well. For example, TWS' Diversity, Equity, & Inclusion Vision Statement, adopted in 2021, provides a framework for our Society and profession to evolve to ensure "All Are Welcome." Council's Publications Committee is working with the Native Peoples' Wildlife Management Working Group and others to identify ways our professional Society, founded on Western science, can embrace and incorporate Indigenous knowledge systems. Several of TWS' Position Statements have been recently revised to broaden their scope from a U.S.-centric perspective to one that applies across North America and, for some, globally. The world of peer-reviewed science is changing rapidly. Consequently, the business model of TWS' journals is evolving to ensure they continue to be successful and provide the Society critical financial support.

These issues, and more, demand that TWS continues to evolve. The Wildlife Society is revising its strategic plan. When completed (spring 2024 is our target date), our new plan, developed with extensive member input, will help TWS focus on critical program delivery in the next five years as well as position TWS to chart what it will be 10 and 20 years from now.

I am the 78th president of TWS. Of the 77 that came before me, only three were women. With all the exceptional women in TWS, we can do better. Some women, when asked to run, have declined because they did not think they could balance the weight of existing responsibilities with the demands that being TWS president brings. While that concern is not necessarily gender specific, it is real. The Wildlife Society needs to understand the barriers that prevent women from running—and remove them. President Yasuda began the process of understanding the issues at play here, and I intend to carry on that work—with Council's help and yours.

For those of you pulling out your hair over the chronology of my first sentence, I chose the date where the idea of a professional society of wildlifers was conceived. The Society of Wildlife Specialists was formed in 1936 at the first North American Wildlife Conference, 87 years ago this year. It was the beginning of what would, at the second Conference in 1937, become The Wildlife Society.

Thanks for all you do!

Bob Lanka, MS, CWB®, is retired from the Wyoming Game and Fish Department, a TWS Fellow, and current president of The Wildlife Society. He received TWS' Jim McDonough Award in 2011 and previously served in leadership roles with TWS' Wyoming Chapter and Central Mountain and Plains Section.

Recent papers from wildlife conservation and management journals

Small-town life suits Texas horned lizards

Texas horned lizards are struggling in much of their namesake state. But in south Texas towns like Kenedy—once dubbed the "horned frog capital of Texas"—and neighboring Karnes City, they're more abundant.

In a study published in *Ecology and Evolution*, Texas Christian University biology professor Dean Williams and his colleagues found these towns see densities of about 28 Texas horned lizards (*Phrynosoma cornutum*) per hectare—almost triple their densities elsewhere.

Researchers found the towns' alleys and yards have an ideal mix of native bushes, grasses, forbs and bare ground for the lizards. The unpaved alleys offer microhabitats where "they can regulate their temperature more easily," Williams said, by either basking in the sun or cooling off along the fences in the blazing summer months.

Even in these towns, though, actions like removing vegetation degrade the thermal landscape, driving down the lizards' numbers, researchers found.

▼ **South Texas towns offer ideal conditions for Texas horned lizards.**

Credit: Dean Williams

Credit: Luke Painter

▲ **Bison trample saplings in northern Yellowstone.**

Bison reduce aspen in Yellowstone

Bison are reducing the growth of aspen saplings in northern Yellowstone National Park, limiting tree recovery after decades of decline.

"[Bison] increased a lot, and their effects have increased," said Luke Painter, a senior instructor in wildlife ecology at Oregon State University.

Dense elk (*Cervus canadensis*) herds had been curtailing sapling growth until the reintroduction of wolves (*Canis lupus*) to Yellowstone in 1995. The carnivores contributed to reducing elk density in the area, which, in turn, decreased pressure on the young trees—for a time. But bison numbers have quadrupled since 2004.

Researchers surveying 87 random aspen stands every decade or so found that aspen growth has been limited as the bison population has increased. "These effects are spread throughout the area but are more significant where the bison are concentrated in the summer in their breeding herds," said Painter, lead author of the study published in *Ecology and Evolution*.

In the past, northern Yellowstone never had a lot of bison, since the large herbivores preferred the plains around the lower river valleys nearby. But, today they are changing vegetation in certain areas there. This could put the goals of sustaining bison and maintaining native vegetation in conflict, Painter said.

"I don't think the bison are going to completely undo all the willow and aspen recovery that has begun in northern Yellowstone," he said, "but they are undoing it in some places."

Nuthatch translocation successful in Missouri

Researchers say efforts to restore brown-headed nuthatches to the Mark Twain National Forest in Missouri were a success.

State and federal wildlife managers translocated 102 birds from Arkansas in 2020 and 2021 following native pine restoration efforts. After fitting nuthatches with VHF tags, researchers found 56% of those released the first year lived and remained in the release area for the first 25 days—about the lifespan of the devices. In the second year, the figure increased to 68%.

"We think this was a successful translocation," said TWS member Kristen Heath-Acre, an ornithologist with the Missouri Department of Conservation and lead author of the study published in the *Wildlife Society Bulletin*. "We're continuing to monitor the population closely."

The researchers couldn't track what happened to those that didn't stay, but they didn't find evidence any had died.

Brown-headed nuthatches (*Sitta pusilla*) were likely extirpated from Missouri in the early 1900s due to shortleaf pine logging.

▼ **Forest restoration efforts paved the way for the reintroduction of brown-headed nuthatches in Missouri.**

Credit: Noppadol Paothong/Missouri Department of Conservation

As Ohio bobcat numbers rise, a conservative harvest could be feasible

Growing bobcat numbers in Ohio have been met with a growing interest in a harvest season. But managers wanted to know if a harvest would destabilize their population.

The exact number of bobcats (*Lynx rufus*) in the state isn't known, but their population has been gradually rising since the mid-1900s after their extirpation a century earlier.

"People have seen an increase in sightings and an increase in roadkills, indicating that the population is growing," said researcher Marissa Dyck. "This prompted a resurgence in some folks interested in harvesting them for fur."

Credit: Marissa Dyck

▲ **Managers wondered how harvest would affect Ohio's bobcats.**

As a doctoral student at the University of Ohio, Dyck led a team in investigating how a harvest season might impact the bobcat's ability to persist in the state, particularly alongside vehicle collisions—currently bobcats' biggest source of mortality in Ohio.

In a study published in the *Journal of Wildlife Management*, they found the population could likely sustain low harvest numbers, but the outlook could change at higher rates.

"A conservative harvest didn't have a substantial risk for the population, but even small increases altered the outcome," Dyck said.

Dyck's team ran computer simulations for bobcat population trajectories over the next 40 years. With no harvest, they found bobcats had no risk of extirpation. The risk was low with conservative harvest numbers. But at higher intensities, the population became unsustainable.

Researchers recommend that if managers allow a harvest season, they should start small and keep monitoring to ensure the population remains stable.

"That's really the aim of this—to make sure we don't lose bobcats again," Dyck said.

Credit: Stella Capoccia

▲ **The Berkeley Pit was the site of previous waterfowl die-offs.**

Heavy metals found in waterfowl near the Berkeley Pit

When some 3,000 geese died at a Montana copper mine pit in 2016, several carcasses revealed elevated metal levels. But elevated compared to what?

To determine baseline levels, TWS member Stella Capoccia, a biology professor at Montana Technological University, led an effort to test the tissues of four species known to use the Berkeley Pit—snow geese (*Anser caerulescens*), Canada geese (*Branta canadensis*), mallards (*Anas platyrhynchos*) and American coots (*Fulica Americana*). In a study published in the *Wildlife Society Bulletin*, Capoccia's team looked for exposure to various metals in 65 birds harvested by hunters in the flyway.

They found a variety of effects among the species, including a range of metal levels and different organs that were affected.

"Each species metabolizes and stores different elements in different organs in different ways," Capoccia said. "It really showcases the need to understand biodiversity in management plans."

To conserve New England cottontails, exclude their competitors

If you build it, New England cottontails may not come. But their rivals might.

Managers in Connecticut hoped that by encouraging young forests to grow, they could increase New England cottontail (*Sylvilagus transitionalis*) populations. The idea—sometimes nicknamed the "Field of Dreams" hypothesis—suggests that by creating the right conditions, even imperiled species may flourish.

But instead of benefiting native New England cottontails, they were attracting a top competitor—introduced eastern cottontails (*Sylvilagus floridanus*).

"The New England cottontail has been a species of conservation concern in this area for a while, and a lot of effort has been put toward conserving them," said TWS member Kathryn Bischoff, a PhD student at the University of Connecticut. "But recently, studies have found that the presence of the introduced competitor—the eastern cottontail—has been complicating our management actions."

Credit: U.S. Department of the Interior

▲ **New England cottontails benefited from shrubland.**

Bischoff led a study published in the *Journal of Wildlife Management* looking at how creating early successional habitats affects both New England cottontails and eastern cottontails, which were historically introduced for hunting.

Her team looked at occupancy data for both species on newly created young forests and shrublands. They found that razing existing forests to create young forests didn't increase New England cottontails, but they did benefit from shrublands. Creating new habitat patches amid existing shrublands—close to other known habitat patches—may be more important than the total acres of habitat created, Bischoff said.

"This will be important for understanding what specific action needs to be done to benefit New England cottontails, especially in a place where eastern cottontail are so prevalent," Bischoff said. ■

Contributed by David Frey, Joshua Rapp Learn and Dana Kobilinsky

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CENTRAL MOUNTAINS & PLAINS

Montana reduces deer quotas following harsh weather

Montana Fish, Wildlife and Parks has reduced the number of deer hunting licenses after harsh weather took a toll on populations. Mule deer (*Odocoileus hemionus*) and pronghorn (*Antilocapra americana*) had been hit hard in the region in recent years due to a combination of drought and harsh winters. "Montana didn't see quite the same severity that Colorado, Wyoming and Utah have had," said TWS member Brian Wakeling, game management bureau chief at the agency. But these conditions still affected deer populations, as the ungulates started off with low nutritional levels going into the harsh recent winter. The Montana wildlife agency sets quotas in response to spring deer surveys. In the southeast, the population has dropped 48% compared to the long-term average. As a result, the agency has been reducing opportunities to hunt antlerless mule deer in the past few years. "Even with the favorable weather conditions this spring and the resiliency deer can exhibit, their numbers will take some time to rebound," said Cory Loecker, a wildlife manager with the agency, in a press release.

Credit: Scott Akerman

▲ **Mule deer have faced drought and harsh winters in southeastern Montana.**

NORTH CENTRAL

Wisconsin drafts new wolf management plan

As wolf numbers have recovered to about 1,000 in Wisconsin, the state Department of Natural Resources has developed an updated management plan to help balance out maintaining a healthy population with limiting human-wildlife conflict. Wolves in the state had been eradicated by the 1950s, but conservation efforts allowed them to begin recovering naturally during the 1970s. By the beginning of this century, there were a couple hundred wolves. Fast forward two decades and the population has reached over 1,000 wolves and appears to be approaching biological carrying capacity. "It's something that should be celebrated," said TWS member Randy Johnson, large carnivore specialist with the Wisconsin DNR. "It's the result of many, many people's hard work, and much credit is due to the people of Wisconsin who are continuing to learn how to live and recreate with wolves on the landscape." But with the recovery came challenges. While some residents want wolves (*Canis lupus*) to continue to increase, others are concerned about impacts on livestock, pets and deer populations. "Ultimately, what this plan is trying to do is balance out all of these competing objectives and perspectives," Johnson said. Rather than setting a goal of 350 wolves on the landscape outside of Tribal areas, which was part of the previous wolf management plan, this plan doesn't set a numeric population goal. "Instead of trying to pick a particular number of wolves to represent this balance point, we're going to focus on adaptively trying to find that balance in the years ahead," he said. That may mean reducing wolves in one area and not others. If the plan is approved by the state's Natural Resources Board, the DNR will develop a wolf advisory committee to start putting management into action. It will also plan in advance for the possibility of a wolf-hunting season, which is required by state law any time wolves are not a federally listed species.

Credit: Michele Woodford

▲ **Wisconsin's draft management plan for wolves emphasizes adaptive management.**

NORTHEAST

Rare butterfly returns to Massachusetts Wildlife Management Area

An at-risk butterfly has returned to a Massachusetts Wildlife Management Area after massive habitat restoration efforts. Listed as a species of special concern under the Massachusetts Endangered Species Act, the frosted elfin (*Callophrys irus*) is a specialist, relying on just two host plants—yellow wild indigo and sundial lupine—to lay its eggs. In shrub-oak woodland, the butterflies look for the plants, which grow in little sand patches amid native warm-season grasses. "It's a relatively complex habitat type and one that has been mostly destroyed by development," said Brian Hawthorne, habitat program manager with MassWildlife. The state agency purchased an abandoned agricultural area in 1999 to create the Montague Plains Wildlife Management Area. To restore the historical landscape, MassWildlife engaged in a long-term project including thinning out trees, mowing the understory, using herbicides to control unwanted sprouts and administering prescribed fire. They also found patches of sundial lupine and expanded them. This past summer, district staff biologist Dave Fuller was collecting seeds in a lupine patch when he saw a small green caterpillar on the host plant. He sent a photo to Hawthorne, who checked with the state's invertebrate zoologist and confirmed it was a frosted elfin caterpillar—the first sighting of the species in the area. "It made my day," Hawthorne said. The discovery of this specialist shows the restoration work is paying off, Hawthorne said. "It signals the work we're doing there is benefiting not only that species but other less picky species," he said.

Credit: Mike Nelson

▲ **A frosted elfin caterpillar was found in Montague Plains Wildlife Management Area in Massachusetts.**

Credit: Jerry Glaser/U.S. Customs and Border Protection

▲ **A recent government report raises concerns about new sections of the U.S.-Mexico border wall.**

SOUTHWEST

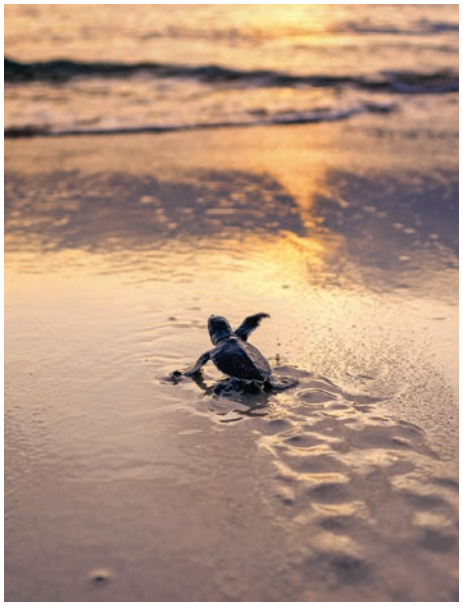
GAO report finds border wall blocks wildlife migration

A Government Accountability Office report found the recently built sections of the border wall between the United States and Mexico damaged natural resources and cultural sites. It also impeded wildlife migration, affecting some threatened and endangered species. Investigators looked at about 450 miles of barriers constructed through the southwestern U.S. from 2017 to 2021. They found that portions of the wall in Texas fragmented landscapes used by the endangered ocelot (*Leopardus pardalis*), elevating its risk of extinction in the U.S. While openings along the wall allow small animals to pass, the GAO found, "bigger animals—such as the Sonoran pronghorn and wolves—are too large to pass through these openings." Lighting along the barrier could also affect some species' foraging behaviors and bird migration, the GAO concluded. Construction work also removed native vegetation and allowed invasive species to take root. The September report says Customs and Border Protection and the Interior Department have agreed to develop a strategy to mitigate these impacts.

SOUTHEAST

Florida sees record sea turtle nesting

Nesting loggerheads and green sea turtles have reached record highs in Florida's Palm Beach County. By early September, the Loggerhead Marinelife Center, a nonprofit that conducts annual nesting season surveys, counted 15,662 loggerhead (*Caretta caretta*) nests along the 9.5-mile coastline it monitors. That broke the previous record of 15,234 set in



Credit: Jeff Beige

▲ **A green sea turtle hatchling makes its way to the sea.**

2016. Green sea turtle (*Chelonia mydas*) nests hit 9,051, breaking the previous record of 7,808 set in 2017. "Nesting was just out of control," said Justin Perrault, the center's vice president. Perrault and his colleagues also found robust numbers of leatherbacks (*Dermochelys coriacea*), which it monitors annually. Sea turtles declined throughout the 20th century, but conservation efforts and regulations on shrimp trawlers have contributed to higher survival. Palm Beach County wasn't alone in seeing high turtle numbers this year. "This is occurring Florida-wide," Perrault said.

NORTHWEST

Drones to survey pygmy rabbit habitat

State biologists in Washington are using drones to survey areas known to support pygmy rabbits. "We use drones to help survey pygmy rabbit distribution and map habitat conditions in areas occupied by this species," said Jon Gallie, a Washington Department of Fish and Wildlife biologist, in a press release. "Drones allow us to gather data we would not be able to collect through other methods." Washington Department of Fish and Wildlife staff plan to fly the drones over portions of Grant and Douglas counties in central Washington, where the pygmy rabbits (*Brachylagus idahoensis*) occur. The flights will take place over federal and state land, as well as private lands where landowners have given permission. By flying the drones over snow-covered ground, biologists hope they can gather data on the species' distribution. Pygmy rabbits are the smallest rabbit species in North America. Washington's small population is federally listed as endangered due primarily to the loss of the shrub steppe vegetation it relies on.

Credit: Jon Gallie/Washington Department of Fish and Wildlife

▲ **Washington's pygmy rabbit population is federally listed as endangered.**

WEST

Nevada bill to create funding for wildlife crossings

Nevada Gov. Joe Lombardo signed a bipartisan bill in June creating a funding mechanism for wildlife crossings in the state. Assembly Bill 112 was designed to help species like bighorn sheep (*Ovis canadensis*) cross highways without getting killed, damaging cars or injuring or killing humans. The act includes an initial state appropriation of $5 million "to implement projects to design, construct, identify, restore or protect wildlife crossings and other related highway features to improve permeability for wildlife." The account will also be used for matching federal dollars and any money garnered through private partnerships or donations. It includes provisions for researching optimal crossing points to improve overall wildlife connectivity in Nevada. The bill was passed unanimously in the Nevada State Assembly, while 19 of 21 state senators voted to pass the legislation.

Credit: Larry Lamsa

▲ **The Nevada state legislature has passed a new bill designed to provide more wildlife crossings for species like bighorn sheep.**

CANADA

NWT caribou remain listed as threatened

Boreal caribou and Peary caribou will remain listed as threatened in the Northwest Territories. The Conference of Management Authorities agreed in August to list the two species for another 10 years. Both were first listed in the Northwest Territories under the Species at Risk Act in 2014. A recovery strategy for boreal caribou (*Rangifer tarandus caribou*) was completed three years later. Last year, a progress report found significant work was underway to conserve the species in the region. A recovery strategy for Peary caribou (*Rangifer tarandus pearyi*) is due for release in 2024. "Successful conservation of these species will depend on the commitment and cooperation of many different groups with responsibility for wildlife management in the NWT," the conference said in a press release. The Conference of Management Authorities was established under Canada's Species at Risk Act to manage and recover at-risk species in the Northwest Territories.

Credit: Paul Asman and Jill Lenoble

▲ **Boreal caribou are considered threatened in the Northwest Territories.**

INTERNATIONAL

Record sea ice loss causes mass penguin die-off

Multiple emperor penguin colonies in Antarctica are suffering due to record-breaking lows in sea ice. Biologists worry that their falling populations put them on a path to near extinction by 2100. Emperor penguins (*Aptenodytes forsteri*) breed, molt and forage on the sea ice. To have a successful breeding season, they need stable ice from early April to late December, when chicks fledge. "If the ice goes out before they've fledged in December, they're too small to get back to the ice and can't swim properly," said Peter Fretwell with the British Antarctic Survey. "They'll likely freeze because their fluffy, gray feathers are not waterproof at all," Fretwell had been studying emperor penguins via satellite for over a decade. Checking the data last year, he noticed the ice edge was closer than normal. In a study published in *Nature Communications Earth & Environment*, Fretwell and his team found that four out of the five colonies along the Bellingshausen Sea had disappeared before December. He assumed that meant all the chicks had died. When he looked at the rest of the continent, he found 19 of the 62 colonies experienced some breeding failure. Thirteen of them appeared to have total breeding loss. Researchers attribute the sea ice retreat to warm ocean temperatures and strengthening winds. In the past when colonies failed, penguins would move to nearby colonies with stable ice, but that's not possible under current conditions. "Unfortunately, looking at the whole Bellingshausen Sea ice gone, we're not sure what the emperor penguins will do," he said. "It's purely driven by climate change." Global carbon emissions would need to decline in the next two decades to save the emperor penguin, he said. "If we don't do that, we're losing this really iconic species." ■

Credit: Dough Allan, British Antarctic Survey

◀ **Sea ice loss has caused emperor penguin chicks to drown or freeze to death.**

Contributed by David Frey, Joshua Rapp Learn and Dana Kobilinsky

Conservation Close to Home

LESA KARDASH HAS FOCUSED HER CAREER ON WISCONSIN WILDLIFE

By Dana Kobilinsky

Credit: Isabelle Kardash

▲ **Lesa Kardash participates in banding an ovenbird at Waupaca Biological Field Station in Waupaca, Wisconsin.**

Some wildlifers don't get field experience until after they graduate. Lesa Kardash was lucky enough to gain field experience much earlier—in high school—and she's been dedicated to protecting wildlife in her home state ever since.

Growing up in a small town in south-central Wisconsin, Kardash was raised hiking and fishing with her parents. "Just being outdoors has always been very important to me," she said. In third grade, she wrote a report about wanting to be a wildlife biologist. In her paper, she wrote about George Archibald, who worked to recover the whooping crane (*Grus americana*).

"It's funny because now, this is a professional I communicate with," said Kardash, who now works as a state biologist for the Wisconsin Department of Natural Resources. "I've had several opportunities to interact with him in my current position."

In high school, as gray wolf (*Canis lupus*) populations were recovering in the state, she became passionate about conserving the carnivore. Her classmates voted her "most likely to bring the wolf back." Volunteering with the Timber Wolf Alliance, a group that uses science to promote wolf populations and their coexistence with humans in Michigan and Wisconsin, she got to shadow state biologists in the field.

"She had such an intense interest in wolves and wildlife at an early age," said TWS member Adrian Wydeven, who ran the Timber Wolf Alliance program.

Following her passion

As an undergraduate at the University of Wisconsin Madison, Kardash continued to focus on wildlife. Her early connections with the DNR led her to an internship in northern Wisconsin, working as a night owl in search of wolves. For a summer, Kardash spent her evenings following collared wolves. It wasn't just radio collars the wolves were wearing. Researchers were testing shock collars to see if alpha females could be conditioned to avoid preying on cattle.

As Kardash continued to study wolves, she teamed up with Dick Thiel, a wildlife biologist with the state at the time, who supervised her as she tracked one particular wolf. It was part of a broader project to learn more about how the species was recolonizing the state. Thiel admired her approach.

"She's argumentative. She's brilliant. She questions everything," he said.

It was also at the University of Wisconsin Madison that Kardash learned about The Wildlife Society. In the late '90s, she and her colleagues converted their school's wildlife club into a student chapter of the Society. She has been involved in TWS ever since, including developing the newsletter for the Wisconsin Chapter of TWS and becoming a Certified Wildlife Biologist®.

"It stuck out to me that as an early career professional, she jumps in with both feet to be involved in the professional society," said TWS member Alan Crossley, a former public lands specialist for the Wisconsin DNR, who has become close with Kardash at TWS meetings, particularly in the Wisconsin Chapter.

Landing her dream job

After taking a seasonal position with the Wisconsin DNR, Kardash went back to the university for a master's degree. The experience broadened her horizons to include work on other species, including white-tailed deer (*Odocoileus virginianus*) and the impacts of chronic wasting disease on the state's population. Her team was able to make management recommendations, including increasing the harvest of young male deer, the primary group making permanent movements across the landscape.

A subsequent seasonal job at the DNR helped her decide what trajectory she wanted her career to take. She was working on state natural areas, learning about tools like prescribed burning to manage habitat for endangered and threatened wildlife. "I got even more passionate working with wildlife species that are endangered and threatened and just having those experiences with habitat restoration projects," she said. "It was from there, then, that I had ended up landing my dream job."

Kardash has worked as a wildlife biologist for the DNR in west-central Wisconsin since 2006. She is also the specialist for the state-threatened greater prairie-chicken (*Tympanuchus cupido*) and focuses much of her work on managing grassland habitat. The position has Kardash working with the agricultural community to help conserve greater prairie-chickens. "Getting to know each other's perspective is important," she said. "Landowners are tenacious and have strong land ethics. They have a vested interest and are inspiring to me."

Credit: Erin Grossman/Wisconsin DNR

The perfect balance

Through all of her hard work, Kardash still has time to raise four children and give back to students at the University of Wisconsin Stevens Point. She works with budding wildlifers in the field as part of the DNR's Adopt-a-Wildlife-Area program, providing them with opportunities to conduct wildlife surveys and implement habitat management actions such as invasive species control, native plantings and conservation grazing. She's also the state chapter's scholarship chair and gets the opportunity to recommend students for scholarships in the state. "It's really important to pay it forward because that's what was done for me," she said.

Mentors praise Kardash for modeling how a wildlifer can have a fulfilling professional life and a full personal life. "I'm proud of her commitment to balance her family and professional life," Crossley said. "I can't undervalue that. It's so incredibly important to the longevity of a wildlife professional, finding that balance."

Credit: Justine Hasz

▲ **Kardash and her family hike at Van Vliet Hemlocks State Natural Area in Vilas County, Wisconsin.**

◀ **Lesa Kardash obtains blood samples from a greater prairie-chicken on the Buena Vista Wildlife Area in Portage County, Wisconsin.**

Kardash has children from 4 to 13 years old, and she enjoys spending time with them camping. Occasionally, she takes them along with her to the field, helping her band waterfowl or conduct prairie-chicken surveys.

She reminds aspiring wildlifers to not spend so much time preparing for their futures that they forget about the present. "Should you make plans to achieve your career goals? Absolutely," she said. "However, try not to let planning for your future career shadow present opportunities to build relationships and learn."

Her mentors think Kardash's future isn't something she needs to worry much about. "I think she can probably go anywhere she wants to in the wildlife profession," Wydeven said. "It's up to Lesa to decide what works best for her and her family." ■

Dana Kobilinsky is the associate editor for The Wildlife Society.

STILL ALIVE

ON ITS 50TH ANNIVERSARY, THE ENDANGERED SPECIES ACT MAY BE MORE RELEVANT—AND CONTROVERSIAL—THAN EVER

By David Frey

"The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth ..."

—The Endangered Species Act of 1973

You will probably never see a San Clemente Bell's sparrow. Weighing no more than a few pennies, it exists only on its namesake island off the coast of Santa Cruz, California, where the dusky gray bird nearly vanishes into the desert scrub in search of insects or cactus seeds.

For a while, it seemed it might vanish altogether. Feral goats had spent more than a century chewing the island's vegetation down to nubs, leaving the sparrow just a narrow strip to nest along the stair-stepped marine terraces on the western coast. But decades of conservation actions driven by the Endangered Species Act brought this tiny bird back from the edge of extinction.

In 1977, just four years after the ESA was passed, the sparrow was listed as threatened, prompting heightened efforts to keep it from becoming extinct. The U.S. Navy, which administers the 21-mile-long island for training exercises, removed some 28,000 invasive goats. "That was not a simple undertaking," said Susan Meiman, Bell's sparrow project manager for the Institute of Wildlife Studies, a nonprofit group contracted to help conserve the bird. "It's extremely steep and rocky terrain. People died doing this."

Over time, the native landscape recovered—and so did the sparrows. By 2017, researchers tallied over 7,600 adults. As the native vegetation returned, the

▼ **Once endangered, the San Clemente Bell's sparrow rebounded after decades of work restoring vegetation on the island it occupies.**
Credit: Susan Meiman

sparrows expanded into parts of the island where they had never been seen before. Last February, the U.S. Fish and Wildlife Service declared the recovery a success. The San Clemente Bell's sparrow (*Amphispiza belli clementeae*) was removed from the endangered species list, along with four plant species endemic to the island—the first plants to be listed under the act.

"It's nice to be able to say, yes, my species is actually increasing," Meiman said. "It's not fast. For biologists, 50 years is practically immediate. For the rest of the people, that's a time frame that they're not prepared for."

The island's suite of recoveries came in time for this year's 50th anniversary of the Endangered Species Act. Since passing Congress nearly unanimously and signed into law by President Nixon in December 1973, the ESA has been credited with preventing the extinction of over 99% of species listed. Fifty-four have been delisted due to recovery, including the bald eagle (*Haliaeetus leucocephalus*), Louisiana black bear (*Ursus americanus luteolus*) and American alligator (*Alligator mississippiensis*). Another 56 species have been downlisted to threatened. Yet over 1,300 U.S. animals and plants with active recovery plans remain listed, and the tally continues to grow, heaping new responsibilities on the two agencies charged with overseeing the list—the USFWS and the National Marine Fisheries Service.

▼ **Biologist Susan Meiman, project lead for the Institute for Wildlife Studies' San Clemente Island Bell's Sparrow Project, collects data on a captured sparrow.**

Credit: Institute for Wildlife Studies

The controversies that surround the act also seem to grow. In just this past year, lawmakers have been at odds over what species should be protected, and White House policies have shifted how the act is implemented. Meanwhile, conservationists point to ever-growing needs for action as habitat loss, invasive species and climate change contribute to a global biodiversity crisis. Over the decades since it passed, the USFWS has faced pressure from environmental groups to list more species more quickly, and pressure from industry and agriculture to use voluntary measures to reach conservation goals. Amid this tumultuous 50th anniversary, conservationists wonder what lies in the act's future.

"I have always been candid in saying that I believe in the Endangered Species Act," said USFWS Director Martha Williams, a TWS member. "And I think it has been impactful. It has continued to evolve, but it also remains one of the most important tools that we have as a society to stem the loss of biodiversity. I think it has been successful, but I also see it as a work in progress."

Growing awareness

The ESA grew out of rising public concerns about iconic species disappearing from the American landscape. In 1966, Congress passed the Endangered Species Protection Act, with a list of about seven dozen species at risk of extinction, from the bald eagle (*Haliaeetus leucocephalus*), suffering the effects of the pesticide DDT, to the gray wolf (*Canis lupus*), the subject of eradication efforts, to the American alligator (*Alligator mississippiensis*), whose numbers had dwindled due to unregulated market hunting and habitat loss. But while the act laid out concerns about these species, it did little

to protect them. In the midst of a growing environmental movement spurred by the first Earth Day in 1970, politicians were feeling pressure to do more.

"It was clearly a growing public awareness of environmental issues," said Douglas Wheeler, one of the ESA's architects. Much of Wheeler's career has centered around the ESA. He would serve as executive director of the Sierra Club, vice president of the World Wildlife Fund, California secretary for resources and a private attorney for landowners. But he was a young deputy assistant secretary for fish, wildlife and parks at the Interior Department when Nixon, sensing the public sentiment, challenged Congress to pass comprehensive endangered species legislation.

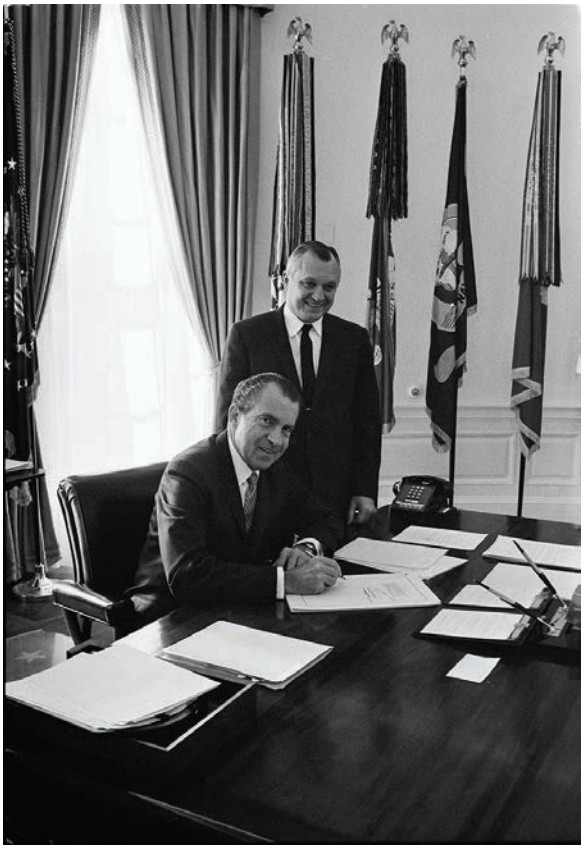
"Nothing is more priceless and more worthy of preservation than the rich array of animal life with which our country has been blessed," Nixon said as he signed the act into law on Dec. 28, 1973. The new law pledged not only to conserve wildlife but, in an acknowledgment of the growing awareness of the science of ecology, to protect "the ecosystems upon which endangered species and threatened species depend."

"It was without doubt a milestone piece of legislation," Wheeler said. "It has come to be even more significant in its application and administration than we anticipated back then in 1973."

The full weight of the act wouldn't become clear for years, though—not until a tiny fish swam in the way of a massive dam. The snail darter (*Percina tanasi*), a three-inch fish in the waters of East Tennessee, was listed as endangered in 1975, just as the Tennessee Valley Authority was preparing to build the Tellico Dam. The hydroelectric dam would convert the Little Tennessee River into a reservoir, blocking the snail darter's migration. A lawsuit seeking to stop the dam worked its way to the Supreme Court, where conservative Chief Justice Warren Burger penned a 6-3 decision supporting the plaintiffs.

"It is clear from the Act's legislative history that Congress intended to halt and reverse the trend toward species extinction—whatever the cost," Burger wrote.

Congress responded by exempting the dam from the ESA. But conservation work continued.



Credit: Richard Nixon Presidential Library and Museum

President Richard Nixon grins as he signs the Endangered Species Act into law. In a statement, Nixon praised the act for providing the federal government with the "needed authority to protect an irreplaceable part of our national heritage—threatened wildlife."

Credit: simmonsj1 via iNaturalist

The tiny snail darter stirred a major controversy when it stood in the way of the construction of the Tellico Dam.

Managers transplanted the small fish out of the region, biologists discovered other populations elsewhere, and the TVA embarked on habitat improvement efforts that benefited the snail darter throughout its range. In October 2022, it was delisted, but its legacy may be the decades of controversies that have surrounded the ESA.

"It's been the most contentious and litigated environmental act of all of those that were passed in the '60s and '70s," said Lowell Baier, an environmental attorney and historian, who recently published a two-volume history of the act. "It's become the most loved and protected, and it's the most divisive. That continued divisiveness is what keeps it alive."

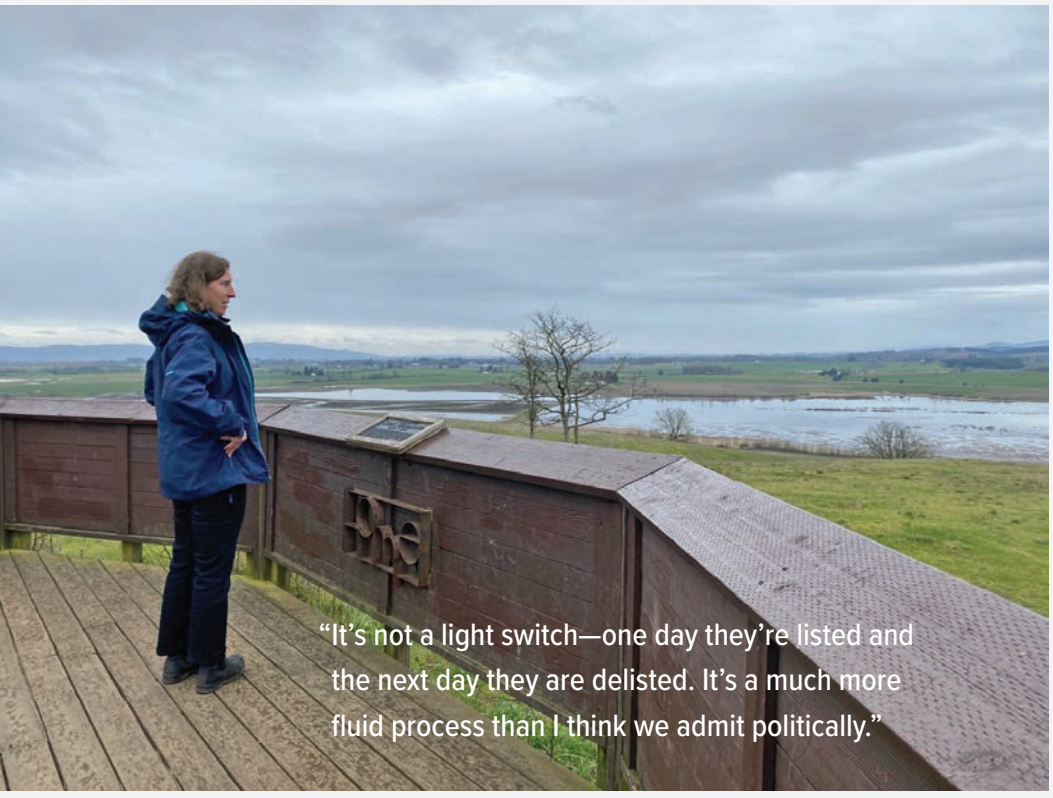
'I Believe in the Endangered Species Act'

For USFWS Director Martha Williams, the ESA is successful, and evolving

As director of the U.S. Fish and Wildlife Service, Martha Williams oversees the implementation of the ESA. But even before that, she was intimately involved in recovering threatened and endangered species. Prior to leading the USFWS, Williams—a TWS member—served as director of Montana Department of Fish, Wildlife and Parks and chaired the Interagency Grizzly Bear Committee. She sat down with TWS to consider the contributions of this landmark act and what may lie in its future. Her comments are edited for brevity and clarity.

How do you see the Endangered Species Act on its 50th anniversary?

I have always been candid in saying that I believe in the Endangered Species Act. And I think it has been impactful. It has continued to evolve, but it also remains one of the most important tools that we have as a society to stem the loss of biodiversity. I think it has been successful, but I also see it as a work in progress.



Credit: Megan Nagel

What do you see as its biggest successes?

I want to go from the heart to the head—how it impacts wildlife professionals and people on the land. The American public embraces the Endangered Species Act and what it stands for. Wildlife and nature remain more important than ever to the American public. Wildlife still captures people's imaginations. They have this sense of awe. I think the Endangered Species Act represents something to the American public. And I think we all share that.

But if we talk more specifically, it's a success story in that it is has been credited with saving 99% of the species that have been listed. It saved them from extinction. It has done its job in helping stem the loss of species and preventing them from blinking out.

◀ USFWS Director Martha Williams looks out from a platform onto Baskett Slough National Wildlife Refuge in western Oregon.

The controversy continues

Among the public, the ESA is not as divisive as it might seem. A 2018 paper in *Conservation Letters* revealed about four in five Americans support the ESA, and only one in 10 oppose it. About 74% of conservatives, 77% of moderates and 90% of liberals said they supported the act (Bruskotter et al. 2018).

Yet in Washington, D.C., the act seems as controversial as ever. In what was considered some of the most substantive changes to the ESA's implementation, the Trump administration made a number of moves that critics said would weaken protections. One of the most significant was the removal of a rule that grants species listed as threatened many of the same protections as those listed as endangered.

Where do you see it falling short?

What's hard—and this is something that I think wildlife professionals know especially well—is that, unfortunately, it's akin to the emergency room for many species. Often, once species are listed, it's hard to recover them. It's a bit too late. I wish we could be more proactive, collectively, to not need to list them in the first place.

How do we do that?

Working together. None of us can do this individually. States, landowners, interested parties, Tribes—broadening the tent and getting more inclusive in how we look at wildlife in our country and recognizing it's a collective effort. That's the only way we are going to prevent species from needing to be listed.

You've dealt a lot with grizzly bear recovery. What lessons do you take away from your experience chairing the Interagency Grizzly Bear Committee and leading Montana Department of Fish, Wildlife and Parks?

One is an appreciation for the complexity and the enormity of the work that wildlife professionals, landowners, and so many other people have done to bring back grizzly bears and work with people on the landscape to address conflicts and build the ability to support them on the landscape. I want to recognize that and celebrate it, because it's good and hard work.

What I also have learned is there's a singular focus on listing and delisting, but there's this whole continuum of the species recovering and becoming management reliant. It's not a light switch—one day they're listed, and the next day they are delisted. It's a much more fluid process than I think we admit politically.

Put another way, when I worked for Fish, Wildlife and Parks, even delisting meant the state would have to work very hard to support long-term recovery.

The ESA was passed nearly unanimously, but it has become incredibly controversial. What happened?

I think it is a really good thing to use the Endangered Species Act at 50 years old to reflect on why it was passed to begin with, to recognize it was passed in the Nixon administration and that it had nearly unanimous support in Congress. To recognize what it represented at the time—elevating species and saying, 'this is very important to us as a collective in the United States. What's good for people is also good for species.'

I think that thinking is still true. Even those who have issues with the Endangered Species Act still speak in a way that they realize the act is important. I think that's an important first step—to realize it's so well supported that we don't want to lose it. Where the discussions can be is more on the margins—how we implement it and if it's incentivizing that which we hope to incentivize.

Do you see ways to transcend the politics?

What we could do better—and I don't think we had to do this in the past, but we must do it now—is connect the dots and show the American public that clean air, clean water and healthy ecosystems that support these species are also really good for us as communities, as people. They're good for the economy.

Are there changes to the ESA that would make it more effective?

We have some regulatory revisions proposed right now, together with NOAA and the National Marine Fisheries Service, that demonstrate a desire to find a path forward that takes away these giant swings in the pendulum. We're really trying to find durable, helpful revisions going forward. We're trying to take the politics out and find more meaningful ways for us to do all the work together and be more efficient in how we implement the Endangered Species Act.

What would it take to get more species recovered and off the list?

Not thinking next year, in four years, or 10 years, but thinking long term. Traveling with the secretary of the Interior, Deb Haaland, it came to light when we were in Alaska that by working together more with Indigenous peoples, taking into account Indigenous knowledge, it shifts us to the long-term, multi-generational approach. I think that will help us get to recovery—long-term recovery—instead of these swings of the pendulum.

Known as the "blanket 4(d) rule," the policy has been in place since 1978 to try to keep threatened species from sliding closer to extinction.

The administration also stripped the phrase "without reference to possible economic or other impacts of such determination" from the rules governing how listings are made, allowing officials to consider the economic impact of listing decisions. And it sought to limit the designation of unoccupied lands as critical habitat. The Wildlife Society expressed concerns over those actions, and it welcomed the Biden administration's announcement in June that it planned to undo them.

"Elections do make a difference," said TWS member Gary Frazer, USFWS' assistant director for ecological services and a 39-year veteran of the agency. "Different administrations have different policy priorities and approaches. We're public servants, and we certainly are responsive to the direction of our political leadership."

Controversies continued over the USFWS' decision last year to list two species as endangered. Suffering from habitat loss in the short-grass prairie of Texas, Oklahoma, New Mexico, Kansas and eastern Colorado, the lesser prairie-chicken (*Tympanuchus pallidicinctus*) has disappeared from about 90% of its former range. The USFWS worked with states and landowners to craft voluntary efforts to conserve the bird under a rangewide conservation plan, but its numbers continued to decline. Northern long-eared bat (*Myotis septentrionalis*) numbers have also plummeted due to the deadly white-nose syndrome, which in some areas has wiped out entire bat populations. Concerned over economic impacts, however, Congress took the unprecedented step of reversing the listings. In September, President Biden vetoed the Congressional actions, saying each "would overturn a science-based rulemaking that follows the requirements of the law, and thereby undermines the ESA."

Meanwhile, other bills sought to prohibit listings that would cause "significant" economic harm and call for permanently removing gray wolves and grizzly bears (*Ursus arctos horribilis*)—two species at the center of decades of political wrangling and litigation—from the list.

"It's a function of our times," Frazer said. "I hope that over time, we will get back into a more respectful and civilized approach of resolving our differences without necessarily having to characterize parties with a different view as being our enemies."

A target of criticism

Property rights advocates and industry organizations say endangered species protections too often serve as hindrances. They want federal agencies to incentivize private landowners to protect at-risk species on their properties.

In a recent report, the Property and Environment Research Center, an organization dedicated to market-based conservation and landowner incentives, found that only about 3% of listed species have recovered, and only about 4% are even improving.

"We're not even seeing incremental progress," said Jonathan Wood, PERC's vice president of law and policy. "We're not just failing to recover species. We're failing to improve them."

Too often, he said, landowners feel penalized for hosting at-risk species rather than rewarded for supporting them through methods like financial incentives or flexible regulations in response to growing populations.

"They're failing to encourage the proactive habitat restoration and recovery efforts that we need if we're going to recover species," Wood said.

But the ESA has been just as targeted by environmentalists who criticize wildlife officials for not being aggressive enough in protecting imperiled species. "The Endangered Species Act is not broken. It's starving," said Jamie Rappaport Clark, president and CEO of the endangered species conservation organization Defenders of Wildlife.

Before leading Defenders, Clark served as director of the USFWS in the Clinton administration, where she oversaw the delisting of the peregrine falcon (*Falco peregrinus*)—a species she first worked to reintroduce as an undergraduate at Towson University in Maryland.

"What I can tell you about the ESA, in my experience, is most times, by the time a species is finally afforded the protections of the law, we're almost too late," Clark said.

Researchers have reached similar conclusions. In a study published in February in the *Wildlife*

SPECIES STATUS CHECK

Credit: U.S. Fish and Wildlife Service

California condor (*Gymnogyps californianus*)

Endangered

Illegal shooting and poisoning brought California condors, which once ranged across the West Coast of the U.S., to the brink of extinction. When conservationists captured the last wild condor in 1987, only 27 of these massive birds remained—all kept in breeding facilities to try to sustain the species. Since then, conservation efforts have facilitated a wild population of over 300 California condors in California; Arizona; Utah; Baja California, Mexico; and a new Pacific Northwest population that federal officials and the Yurok Tribe established. While their numbers continue to climb, lead contamination from bullet fragments left in carcasses continues to hinder the birds' recovery.

Credit: U.S. Fish and Wildlife Service

Polar bear (*Ursus maritimus*)

Threatened

The polar bear was the first species to be listed specifically due to the effects of climate change. The bears, listed as threatened in 2008, depend on sea ice for hunting seals. But warming trends have led to a decline in sea ice, raising concerns about their future without conservation action.

Credit: U.S. Fish and Wildlife Service

Kirtland's warbler (*Setophaga kirtlandii*)

Recovered

Kirtland's warblers historically nested only in young jack pine stands in the north of Michigan's Lower Peninsula. As fire suppression and industrial logging altered the landscape and brood-parasitic brown-headed cowbirds (*Molothrus ater*) invaded, the warblers' numbers tumbled. After decades of habitat restoration, the birds rebounded. But biologists believe they will remain dependent on conservation efforts.

SPECIES STATUS CHECK

Credit: U.S. Fish and Wildlife Service

Lesser prairie-chicken (*Tympanuchus pallidicinctus*)

Endangered

One of the latest controversies surrounding the ESA involves this iconic grassland bird. Worried that habitat destruction and other threats have put this grouse on the path to extinction, the USFWS worked with states and landowners to craft voluntary efforts to conserve it under a rangewide conservation plan. As the bird continued to decline, the Service listed the lesser prairie-chicken as endangered in 2022. Concerned about impacts to agriculture and energy production, Congress took the unprecedented step of reversing the listing, a move President Biden vetoed.

Credit: U.S. Fish and Wildlife Service

Green sea turtle (*Chelonia mydas*)

Threatened/Endangered

Killed for their meat and eggs, green sea turtles faced global declines. Worldwide conservation efforts have helped sustain their populations, but they continue to face a range of threats. Populations along the continental U.S. are listed as threatened, but some Pacific populations are considered endangered. In July, the U.S. Fish and Wildlife Service and NOAA's National Marine Fisheries Service proposed new areas of critical habitat throughout their U.S. range to protect places where they bask, nest and begin their migrations.

Credit: U.S. Fish and Wildlife Service

Red wolf (*Canis rufus*)

Endangered

The red wolf was among the first species listed as endangered in 1967—before the ESA existed—but its recovery has been a challenge. Only about 25 exist in an experimental population in North Carolina, with another 269 in a captive breeding program—all descended from 14 breeding wolves rounded up in the wild. In addition to concerns over inbreeding, poaching and accidental shooting have hindered their recovery. In August, the USFWS settled a lawsuit with conservation organizations, pledging to resume releases of captive-bred wolves after their numbers dwindled.

Society Bulletin, researchers found species listed as threatened face a similar number of threats as those listed as endangered. "They are equally conservation reliant," the authors found (Costante et al. 2023). Last October, a study published in *PLOS ONE* found that by the time a species is listed, its small population size makes recovery a challenge. Delayed protections and lack of funding don't make it any easier (Eberhard et al. 2022).

"We have this incredibly powerful, ambitious law to protect our imperiled wildlife, and for decades, the U.S. Fish and Wildlife Service—the agency primarily responsible for operationalizing the law—has been starved for resources," said Columbia doctoral student Erich Eberhard, the study's lead author.

Looking over the past three decades, Eberhard and his team found that after conservationists petitioned the USFWS to add a species to the list, it took on average between three and nine years for officials to reach a listing decision—more than the two years the act mandates.

The findings point to a dilemma the agency faces. While environmentalists complain it is too slow to act on petitions, critics say the steady stream of petitions—and the lawsuits that have often followed—have kept the agency from protecting species most in need. To try to speed up the process, the USFWS has implemented a priority system for where to use available time and funding.

"We use every dollar that we have to get the listing work that we have on our plate across the finish line," Frazer said. "But the listing work that's on our plate is far more than we have the resources to do in any one year."

That prioritization, and a settlement agreement in which two conservation organizations—the Center for Biological Diversity and Wild Earth Guardians—agreed to slow down their listing petitions, has helped the Service tackle the workload, Frazer said, whittling the candidate list from 251 species in 2010 to just 21—including only four nonforeign species—today.

"The Endangered Species Act has done a remarkable job saving species from extinction. It's most significant limitation is it needs adequate funding to fulfill its goals," Clark said. "And it needs the support and respect it was originally intended to compel."

On-the-ground work

At times, the controversies surrounding the act can be divisive. When the northern spotted owl (*Strix occidentalis caurina*) was listed as threatened in 1990, it sparked years of acrimony between conservationists and timber industry supporters over the future of Pacific Northwest forests.

Gray wolves have also been at the center of impassioned disputes—and often litigation. After a volley of legislative and legal actions, the Northern Rockies population remains delisted. Wolves in Minnesota are listed as threatened. Wolves elsewhere are considered endangered. The USFWS plans to submit a new proposed listing decision by February.

"Who are we serving when we keep these listing battles continuing on? And does that really help our wildlife in the end?" said TWS member Julia Smith. As wolf policy lead for the Washington Department of Fish and Wildlife, Smith has two sets of wolves on her hands. In the western two-thirds of the state, they remain protected under the ESA. In the east, where the wolves are considered part of the Northern Rockies population, they're deemed recovered. But all wolves in Washington are considered state endangered.

"To constantly have the rules change is confusing to people," Smith said. "Folks who live close to wolves want to know what the message is."

Credit: David Majure/Arizona Game and Fish Department

▼ As field supervisor for Arizona's Mexican wolf restoration efforts, Julia Smith helped prepare pups born in captivity to be cross-fostered in wild dens.

Credit: U.S. Fish and Wildlife Service

▲ **As the U.S. Fish and Wildlife Service director in 1998, Jamie Rappaport Clark, second from left, joined former Mexican wolf recovery leader Dave Parsons, left, and former Interior Secretary Bruce Babbitt, in releasing the first Mexican wolves into the wild.**

The wolves' return to the Lower 48 could only have happened thanks to the ESA, Smith said. The same is true with the restoration of the Mexican wolf (*C. l. baileyi*) in the American Southwest, where Smith previously worked as the field supervisor for Arizona's wolf project.

While states are usually responsible for managing wildlife, an ESA listing imposes federal guidelines. For the Mexican wolf, that has involved an interagency team including the USFWS, states and Tribes, with federal funds for conservation efforts that states would have trouble raising on their own. Those funds allowed for an ambitious program to birth wolf pups in captivity and have them "cross fostered" in packs in the wild to boost the genetics of the tiny population. Efforts like that "may not happen without them being listed as a federally endangered species," Smith said. "It's a partnership a lot of the time."

Other times, the relationship between the USFWS and states can be strained. Under its previous governor, New Mexico refused to take part in Mexican wolf recovery. Under the current governor, it is an active participant.

"You can probably make some pretty clear and consistent statements as far as red states and blue states when it comes to Endangered Species Act politics," said Tony Wasley, president of the Wildlife Management Institute. Before leading WMI, Wasley spent nearly 10 years as director of the Nevada Department of Wildlife and served as president of the Association of Fish and Wildlife Agencies from 2021 to 2022.

But it's not just politics. States often fear that restrictions involved in protecting listed species will stand in the way of economic development, affecting both private lands and industries like forestry and energy development on public lands. And having a species listed is often seen as a critique of a state's management.

"That is never a positive from a state perspective in terms of the state effectively fulfilling its public-trust responsibility," Wasley said. "Whether it's a real or perceived failure, it's never positive when you get to the point of an actual listing."

Having a species *considered* for listing, however, is another story. The perceived threat of a listing can motivate stakeholders to work together to avoid it. "It is a really strong motivator to get people to talk. To provide a seat at the table for conservation. To get the attention of developers and industry," Wasley said.

Working together

As the act heads into its sixth decade, observers on all sides say they would like to see more work earlier on to keep species from being listed in the first place.

"Unfortunately, it's akin to the emergency room for many species," Director Williams said. "Often, once species are listed, it's hard to recover them. It's a bit too late. I wish we could be more proactive, collectively, to not need to list them in the first place."

Increasingly, the USFWS has been working with private landowners to develop conservation plans for at-risk species to prevent them from being listed. The effort has paid off for the New England cottontail (*Sylvilagus transitionalis*), a rabbit native to the Northeast whose populations plunged due to habitat loss, making it a candidate for endangered species protections. But in 2009, state and federal agencies and nonprofits throughout its range started creating a conservation strategy, including habitat creation and protection on both public and private lands. In 2015, the USFWS concluded listing wasn't necessary.

A similar strategy in the Southeast prevented gopher tortoises (*Gopherus polyphemus*) from being

SPECIES STATUS CHECK

Credit: U.S. Fish and Wildlife Service

Bald eagle (*Haliaeetus leucocephalus*)

Recovered

The bald eagle is not just a national emblem; it's become an icon of endangered species' ability to recover. Once on the verge of extinction, due largely to the effects of the pesticide DDT, the bald eagle has recovered throughout the Lower 48 states, with numbers topping 300,000.

Credit: U.S. Fish and Wildlife Service

Rusty-patched bumblebee (*Bombus affinis*)

Endangered

In 2017, the rusty-patched bumblebee became the first wild bee to be listed as endangered. Once ranging throughout the eastern U.S. and upper Midwest, its numbers fell steeply before their listing, likely due to a combination of disease, pesticides and habitat loss. Biologists believe these threats continue to plague the species, alongside climate change and other stressors.

Credit: U.S. Fish and Wildlife Service

Black-footed ferret (*Mustela nigripes*)

Endangered

Considered extinct before a Wyoming ranch dog showed up at its home with a carcass in its mouth, the black-footed ferret is the subject of an ongoing captive-breeding program. Once numbering in the millions, some 300 black-footed ferrets exist in the wild in over two dozen reintroduction sites, where they face threats from plague wiping out the prairie dogs they prey on.

Credit: U.S. Fish and Wildlife Service

American alligator (*Alligator mississippiensis*)

Recovered

Once on the brink of extinction, the American alligator rebounded quickly since its listing under the ESA. Officially, it remains listed as threatened due to protections for the American crocodile (*Crocodylus acutus*), which it resembles. Hunting is now allowed in some states, but habitat destruction remains a concern.

Credit: U.S. Fish and Wildlife Service

Northern long-eared bat (*Myotis septentrionalis*)

Endangered

Threats from the deadly white-nose syndrome have caused northern long-eared bat numbers to plummet and are expected to affect the bat's entire range by the end of the decade. The bats range across 37 states and all Canadian provinces, but the fungal disease has wiped out entire populations. The USFWS listed the bat as endangered in 2022, prompting Congress to vote to delist it due to concerns over how the listing may affect industry. President Biden vetoed the action.

Credit: U.S. Fish and Wildlife Service

Delmarva Peninsula fox squirrel (*Sciurus niger cinereus*)

Recovered

Made up of coastal areas in Delaware, Maryland and Virginia, the Delmarva Peninsula is home to this hefty squirrel. Considered endangered since 1967, its range was just 10% of its original size at the time of listing. Reintroduction efforts reestablished populations in pockets throughout the peninsula. Since much of its habitat occurs on private property, its success is due to cooperation with landowners, timber companies and developers to maintain the mature forests the squirrel occupies.

Credit: Leo Miranda

Credit: Leo Miranda

▲ **A Georgia Forestry Commission forester oversees a prescribed burn on Leo Miranda's property. The fires are intended to improve conditions for native longleaf pines, which benefit gopher turtles (Inset) and other species.**

listed on most of their range. Conservationists turned to voluntary forest management practices like prescribed burning, forest stand improvement, and brush management to improve habitat conditions on private lands.

"We have learned after 50 years that you need to talk to people and depend on others to conserve species," said Leo Miranda, executive director of the organization Conservation Without Conflict, which works to advance conservation through voluntary approaches.

For many species, the USFWS carves out individual rules that free landowners from being responsible for killing or injuring endangered species on their land in the course of conservation work. In one case, that allowed farmers and timber companies to continue to operate if they provided habitat for Louisiana black bears (*Ursus americanus luteolus*).

"Millions and millions of acres were restored through those programs, and the landowners were not threatened by the regulatory process," said Miranda, a retired USFWS Southeast regional director who has been restoring native longleaf pine on his own west-central Georgia timberland. "When we first got this place, it was not well-managed. They never burned. It was like a desert. Now I have quail. A lot of turkeys. Gopher tortoises are showing up. That's the beauty. It's pretty cool to see that transformation."

The path forward

Flexible rules like those may be critical as the ESA faces a growing challenge of imperiled species in the face of habitat loss, climate change and other threats.

"I really think collaboration is the path forward for making the ESA work," said David Willms, associate vice president for private lands at the National Wildlife Federation. In 2015, Willms worked with then-Wyoming Gov. Matt Mead, who chaired the Western Governors' Association, on a bipartisan effort to consider ways to improve the ESA. What began as a one-year initiative turned into a three-year dialogue that brought together Republicans, Democrats, environmentalists, ranchers, industry representatives and others. Together, they found common ground, and their work became the basis for legislation to reform the act, but it never got far.

Credit: Danny Martin via iNaturalist

When the cactus ferruginous pygmy-owl was first listed as endangered in Arizona, it became the target of controversy. After litigation led to its delisting, the owl has been listed as threatened throughout its range.

"There's just nervousness," Willms said. "I think that's one of the reasons why you don't see a lot of real, authentic efforts to tackle some of the challenges with ESA implementation at the congressional level. This was a many-years-long process that just ground to a halt when politics got involved. That can be frustrating, and as a result, species can suffer."

Some conservationists look to the Recovering America's Wildlife Act for the next chapter in protecting at-risk species. The act, which fell just shy of passing last year over funding concerns, would provide nearly $13 billion over 10 years to help states, territories and Tribes conserve at-risk wildlife and protect habitats identified in state wildlife action plans.

"RAWA would go a long way toward funding the kinds of things we want state agencies to do," said Robert Fischman, an environmental law professor at Indiana University. If the ESA acts as an emergency room, Fischman said, states need more resources to protect wildlife designated as species of greatest conservation need—some 12,000 of them.

"That's sobering," Fischman said. "It's simply beyond the capacity of USFWS and NOAA to handle this tsunami of coming listings if states can't respond to their species of greatest conservation need. What we really need is not so much a thorough revision of the content of the ESA but better funding for states to carry out the plans they have on their shelves in state wildlife action plans."

Big changes for a little bird

The cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) is among the newest species protected under the ESA. Listed as threatened in July, the six-inch-tall, diurnal owl nests in tree cavities and cacti in the deserts of southern Arizona, Texas and northern Mexico.

The latest finding is actually a return to the list for the owl, but this time around, conservationists hope the outcomes will be better, both for the bird and for the public.

"It's like the spotted owl of the Southwest," said Aaron Flesch, a University of Arizona research scientist who has dedicated over two decades to studying the owl.

After environmentalists first petitioned the USFWS to list the owl in 1992, the Arizona population was determined to be endangered. That triggered years of litigation by the National Association of Home Builders, which feared it would halt development on private lands around Tucson. The Ninth Circuit Appeals Court sided with developers, and the USFWS delisted the owl in 2006. Then, environmentalists sued. This time, the court ruled in their favor. Last July, the Service listed the owls as threatened throughout their range.

This listing has been less contentious. The owl's population near Tucson, which previously stoked controversy, is no more. (After the initial listing, state wildlife officials gathered up the owls to raise them in captivity and reintroduce them elsewhere.) Now, regional conservation plans are in place to protect the owls and other desert species—plans that wouldn't exist without the pressure brought by the ESA.

"It's a really important legal tool," Flesch said. "It really reflects the general public's sentiment about wildlife. People, in general, are really supportive of the ESA, and they don't want all the teeth removed from it. They want it to function because they care about wildlife. They care about their natural heritage." ■

David Frey is the managing editor for The Wildlife Society.

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Battling the Heat

THIS SUMMER'S HEAT WAVE POSED WIDESPREAD RISKS TO WILDLIFE. WAS IT A SIGN OF THINGS TO COME?

By Dana Kobilinsky

Each summer, the Liberty Wildlife rehabilitation center in Phoenix gears up for an uptick in operations, as residents show up with wildlife suffering from dehydration in the desert heat. But they never saw anything like this summer. Temperatures were hitting 118 degrees Fahrenheit, day after day, and it wasn't cooling off much at night.

▼ **Veterinarians from Midwestern University provide care to a heat-stressed long-eared owl (*Asio otus*) at Liberty Wildlife in Phoenix, Arizona.**

Credit: Lauren Hackett

"We were hitting record highs multiple days in a row without any relief," said Laura Hackett, a wildlife biologist at the center. "We had 30 days of unrelenting heat."

On some days, over 100 animals—mostly birds—came in during the heat wave's peak. Once animals were in their facility, they couldn't be released back into the scorching temperatures. Even in the center's outdoor aviaries, swamp coolers ran around the clock, and birds often had to be brought in to be rehydrated. Chicks had to be raised to adulthood before they could be released. Some 300 volunteers took on extra shifts to hose down birds in their enclosures. "It was extra taxing on the animals—and the team," Hackett said. As high temperatures continued unabated, Liberty Wildlife asked people on social media to put out water for birds and other wildlife.

Arizona wasn't alone. Throughout North America and around the world, soaring temperatures, droughts, wildfires and other symptoms of global warming were affecting the environment and impacting wildlife. Wildfires driven by hurricane winds devastated Maui. Canada endured its most severe wildfire season ever, doubling record wildfires in British Columbia. In the Mediterranean, devastating fires ignited in countries like Greece, Italy, Algeria and Tunisia. Oceans as warm as bathwater bleached corals, prompting unprecedented rescue efforts to save them. Even in the Southern Hemisphere's winter, temperatures were soaring. Drought and high water temperatures were blamed for the death of over 100 river dolphins (*Inia geoffrensis*) and thousands of fish in the Amazon. Antarctica endured record-high winter temperatures, with sea ice retreating more than ever, further stressing endangered emperor penguins (*Aptenodytes forsteri*).

The blistering summer left wildlife managers and conservationists grappling with how to mitigate its effects in the short term. But they're also looking

to a future where heat waves and erratic weather become more common.

Predicting extreme events

When scientists talk about climate change, they often focus on average warming temperatures and the impacts they may bring. But those general trends can gloss over extreme weather events, like the heat waves experienced in the summer of 2023. Dramatic temperature swings like these "are getting more and more extreme over time," said Gopal Murali, a postdoctoral student at Israel's Ben-Gurion University of the Negev.

Some species are adapting to these changes, but others aren't. "Species are moving to suitable climate toward the poles or go to higher elevations," he said. "Some species are going locally extinct."

Murali expects extreme weather events will last longer and longer, for months at a time in some cases. "In that sense, there's pressure on how species mitigate these impacts."

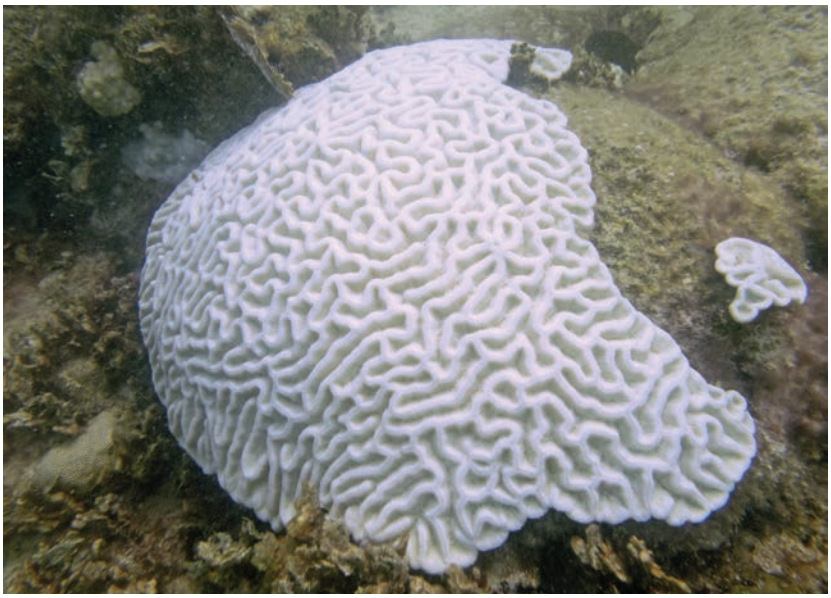
Murali led a study predicting the effects of extreme heat waves on wildlife around the world published in March in *Nature* (Murali et al. 2023). Building on data starting in 1950, and projecting into the future to 2100, he and his colleagues examined how extreme temperature events have changed over time and will continue to change under different warming scenarios.

In high greenhouse gas emissions scenarios, they found—which would produce a world 4.4 degrees Celsius hotter by 2099—at least 41% of vertebrate species would see more than half their range exposed to extreme heat events beyond historical levels. Under a more moderate emissions scenario, resulting in a world 2.7 degrees warmer, the percentage decreases to 15.1%. Mid-latitude deserts, shrublands and grasslands would experience the most severe events, they found, forcing many species "into constant severe thermal stress."

"Deep greenhouse gas emissions cuts are urgently needed to limit species' exposure to thermal extremes," they concluded.

Coral problems

Some of the summer's most extreme effects last summer occurred in the sea, where coral reefs experienced unprecedented bleaching events in waters that reached 100 degrees Fahrenheit off the Florida Keys.



Credit: Lauren Toth

▲ **Florida's coral reefs faced increased and prolonged bleaching, prompting scientists to remove corals as a last-ditch effort to save them.**

"Temperatures are already much higher this year than we have seen any time in the satellite record since the '80s," said Lauren Toth, a research physical scientist with the U.S. Geological Survey in St. Petersburg, Florida. "But also, the peak in temperatures happened a lot earlier this year."

Coral's wild shapes of waving fans, twisting branches and coiled mounds can make it easy to forget that these are actually animals. They play a critical role in the marine food web, creating underwater structures for a host of species, including many that become prey for larger fish and marine mammals. Warming waters put them at risk, though. Photosynthesis in ocean algae "operates in overdrive," Toth said, poisoning the coral they live inside. The coral saves itself in the short term by expelling the algae, but in the long term, they starve. In typical conditions, reefs can recover in about six to eight weeks as temperatures cool, she said, but when warm waters persist, the reefs die.

These events have been going on for the last 40 or so years, driven by El Niño episodes—patterns of above-average sea surface temperatures that occur periodically across the Pacific Ocean and affect the weather around the globe.

But this past summer has been the worst so far, Toth said. Usually in Florida, bleaching would occur in August or September, but cooler waters in October or November would allow corals to recover. This year, with extreme temperatures

building up by mid-July, the reefs never had a chance to cool. "It seems like almost every reef in South Florida is experiencing pretty severe bleaching right now," she said.

In a last resort to save the corals, groups of conservationists are pulling them out of the water and putting them in nurseries, where the temperature can be controlled, or in some cases, in deeper water that's cooler. "The hope is that if we can get these corals to survive this event, then we have that brood stock that we'll be able to put back out on the reef once the temperatures cool down a bit," Toth said.

Credit: Richard Burt

Since the 1930s, Florida's reefs have eroded by about a foot. That's not just a problem for sea life, Toth said. Coral loss also inhibits the reefs from breaking waves, compounding the problem of stronger, more frequent hurricanes and other storms affecting coastal communities. "This is something that's really unprecedented," she said.

◀ **An adult emperor penguin stands with its chicks in Halley Bay, Antarctica, where declining sea ice is contributing to the death of emperor penguin chicks.**

▼ **Emperor penguins on the sea ice near Halley Research Station in Antarctica.**

Credit: Christopher Walton

Ice in retreat

Also unprecedented, sea ice cover in Antarctica reached a record low in February 2023. In March, Antarctica suffered a six-day heat wave. Temperatures in East Antarctica climbed 18 degrees Celsius higher than the month's historic average (Clem et al. 2023). Those temperatures correlated with collapse of the Conger Ice Shelf, a floating ice platform that plays a role in slowing the flow of inland ice into the ocean, which can result in sea level rise. The shelf had been shrinking since the mid-2000s but sped up recently when it finally sloughed off.

Throughout the Antarctic winter, sea ice remained at record lows. "Now, we're in the order of about 1.5 million or more square kilometers below normal," said Walter Meier, a senior research scientist at the Cooperative Institute for Research in Environmental Sciences at the University of Colorado Boulder. "This year sticks out like a sore thumb. This is wreaking havoc on the wildlife there."

In a study published in August in *Nature Communications Earth and Environment*, researchers studying satellite images found colonies of emperor penguins were devastated by receding sea ice that left chicks drowning or freezing to death (Fretwell et al. 2023). "We have never seen emperor penguins fail to breed, at this scale, in a single season," lead author Peter Fretwell, a geographic information scientist at the British Antarctic Survey, said in a press release. "The loss of sea ice in this region during the Antarctic summer made it very unlikely that displaced chicks would survive. We know that emperor penguins are highly vulnerable in a warming climate—and current scientific evidence suggests that extreme sea ice loss events like this will become more frequent and widespread."

Meier said wind and ocean temperatures are likely to blame for the sea ice loss. In fact, there's a possible connection between Antarctica's melting ice and the same El Niño temperatures that were

responsible for coral bleaching. “Ice is white and reflects the sunlight coming into a dark ocean that would absorb the sunlight,” he said. “It acts like an air conditioner and prevents energy from the sun coming in when there’s 24 hours of sunlight in the polar regions.” But when that ice goes away, things can heat up around the globe, increasing the impacts of phenomena like El Niño events. “This aspect is important in terms of the big picture, connecting a warming climate directly to the heat waves,” he said.

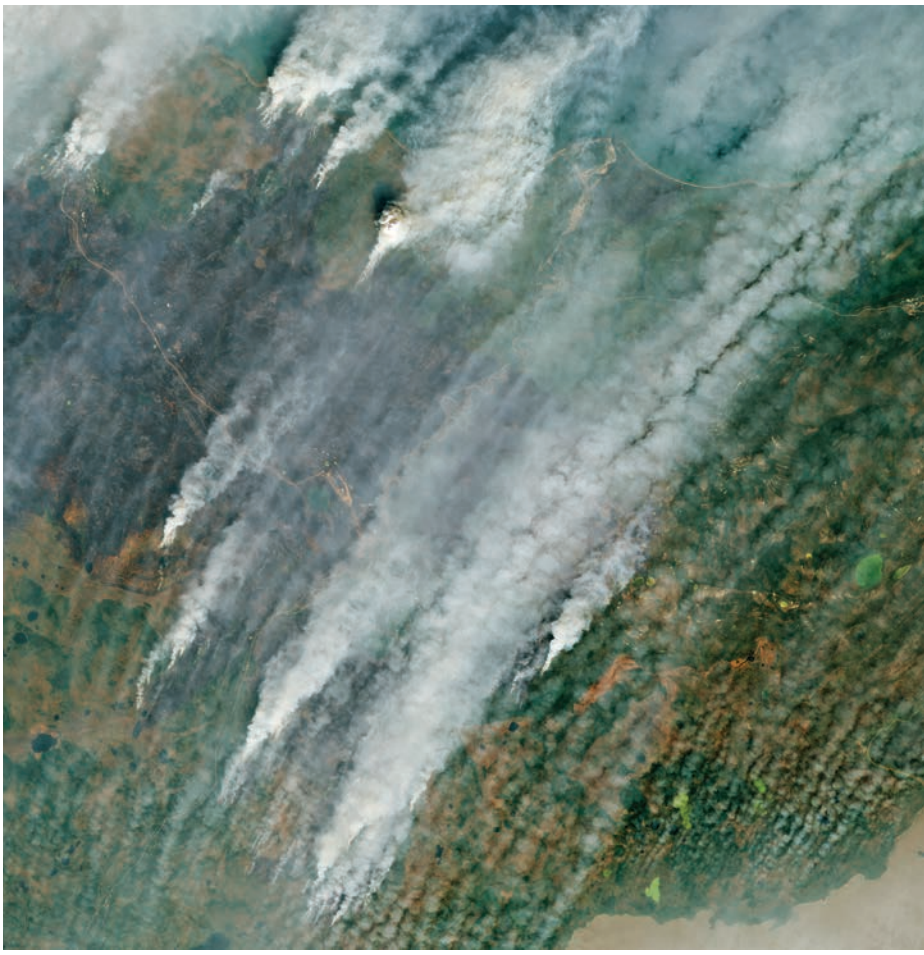
Devastating fires

If melting sea ice in Antarctica is hard to visualize, massive wildfires throughout much of Canada were hard for many North Americans to ignore. Shrouds of smoke clouded communities across Canada, darkened skies in the United States from Washington state to Washington, D.C., and spread into Spain and Portugal.

Historically, wildfires are a common, even healthy part of Canadian ecosystems. “They’ve been a natural part of the cycle. But what we’re seeing now is that they are happening much, much more frequently, and their intensity in many cases is much higher,” said Gráinne McCabe, chief conservation officer at the Wilder Institute/Calgary Zoo. “It’s having a bigger impact on ecosystems.”

Wildfires last summer burned across much of Canada, including British Columbia, the Northwest Territories, Yukon, Alberta and Ontario. One driving factor is drought, McCabe said. The fires raise concerns for a number of species unable to escape the flames or those who have to survive in a charred landscape. McCabe is keeping an eye on the endangered half-moon hairstreak butterfly (*Satyrium semiluna*), which had a wildfire strike through its range in Waterton Lakes National Park, near the Montana border. Her team at the zoo is working on methods to breed the butterflies in captivity and reintroduce them into the wild to safeguard them from fires and other threats. One of the other threatened species they breed and release, the northern leopard frog (*Lithobates pipiens*), was also recently impacted by fires at a site straddling the provinces of British Columbia and Alberta.

“Thankfully, the teams were able to get out there once it was safe to do so, and there didn’t seem to be any impact on the pond where the animals are, which is great. But it certainly is a warning that these wildfires are getting closer and closer to quite critically endangered species,” she said.



Credit: NASA

Credit: Hawaii Division of Forestry and Wildlife

▲ **This satellite image shows a large wildfire charring forests in the Northwest Territories on Aug. 24. At the time, the blaze had overrun the community of Enterprise and was pushing toward the town of Hay River.**

◀ **Wildfires in Lahaina, Maui, burned close to the Maui Bird Conservation Center.**

Even common species can be a concern, McCabe said, as frequent wildfires make it hard for ecosystems to recover, and smoke inhalation raises new concerns. Little is known about the impacts of smoke on wildlife, but one study found that it can result in adverse health effects in birds (Sanderfoot and Holloway 2017).

Water in the Desert

Some managers are working on short-term solutions to save species from the heat. This summer in Arizona, that has meant using water trucks and helicopters to fill a network of over 3,000 water catchments across the state to help desert wildlife endure the record heat.

Water tanks have long been used throughout the West to help desert species like mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), and desert bighorn (*Ovis canadensis nelsoni*) endure droughts. Songbirds, waterfowl and quail benefit, too.

In the deserts of West Texas, researchers found stock tanks can also help migrating and resident raptors. Camera trap images from the drought of 2011 showed barn owls (*Tyto alba*), northern harriers (*Circus cyaneus*) and Swainson's hawks (*Buteo swainsoni*), appearing at tanks throughout the year.

"The bird usually comes in and perches on the rim, and then just kind of dips over and reaches in," said TWS member Clint Boal, a wildlife biology professor at Texas Tech University, who authored a study on the troughs. Boal and his colleagues found that these birds tended to use these areas during heat waves.

Carnivores like bobcats (*Lynx rufus*) and coyotes (*Canis latrans*) are also taking advantage of the tanks, Boal said. "The ones out there are already serving a good conservation purpose," he said.

Credit: Arizona Game and Fish Department

▲ **A truck prepares to deliver water for wildlife in Arizona, with a message designed to raise public awareness about the program on its side.**

In Hawaii, wildfires have not been common, but August's devastating fires on Maui revealed how conditions are changing. The land surrounding the town of Lahaina, which was devastated by one of the fires, was once a wetland. Changing land use and diverted waterways transformed the region into a grassy area susceptible to fire that erupted into flames when hurricane-force winds took down power lines.

"With climate change, we're going to see more of these unusual weather impacts worldwide. Here in the islands it's amplified," said Rachel Kingsley, the Hawaiian forest bird outreach educator for the Maui Forest Bird Recovery Project.

Kingsley felt lucky a fire burning in upcountry Maui missed the project's office buildings. But nearby, the Maui Bird Conservation Center—part of the Hawaii Endangered Bird Conservation Program, which houses a population of endangered Hawaiian birds—had an even closer call. Flames reached within 150 feet of the property. Firefighters, concerned citizens, and a center employee worked to fight the fire and save the captive birds.

But scientists don't know yet how those fires may have impacted birds that aren't in sanctuaries. "For sure, it's going to have impacts," she said. "Many of our native species are only found in small areas of their historic ranges. There has been an increase in wildfires and other storms over the years. It's foreshadowing that we need to save these species and protect their spaces before something happens."

Dangers like this one point to the need for centers like these, which protect critically endangered Hawaiian forest birds, like the kiwikiu (*Pseudonestor xanthophrys*), from the effects of climate change, Kingsley said. "No one really wants to talk about the need for conservation breeding as a last-ditch effort and to see the birds taken out of the forests," she said, "but it's definitely an important step to help save the species right now." ■

Dana Kobilinsky is the associate editor for The Wildlife Society.

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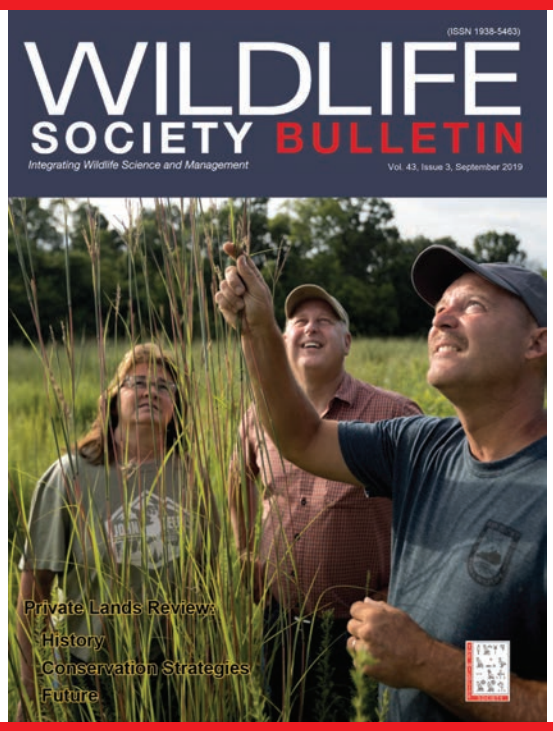
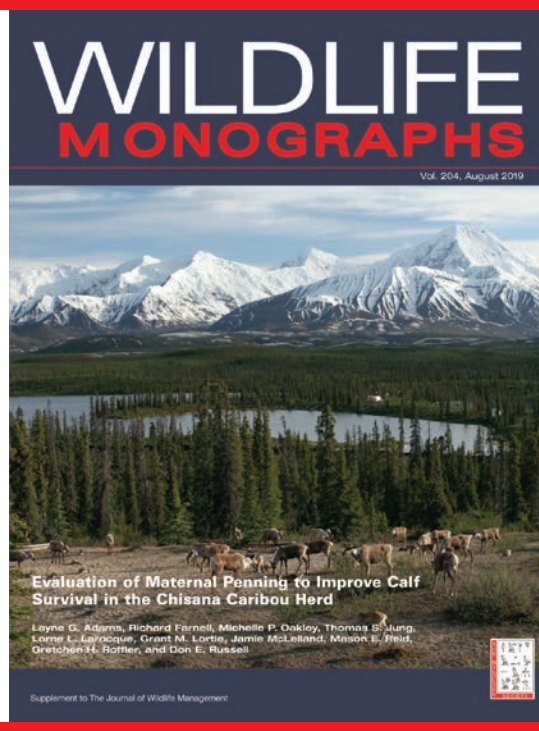




Building a Better Bird Trap

A LITTLE INGENUITY HELPED CAPTURE NUISANCE STARLINGS

By Cliff Caldwell and Robert Hromack

In 1890, amateur ornithologist Eugen Schiefflin released European starlings in New York City's Central Park in an effort to "grace" America with all the birds noted in Shakespeare's works (Cabe 1998). It may have been well intentioned, but the release resulted in a starling population boom that transformed North America's ecological landscape, prompting many Americans to view the European starling (*Sturnus vulgaris*) as an invasive species—and a damaging one at that.

Within a decade, the birds multiplied to several hundred million, becoming problematic in both urban and rural areas throughout the country (Homan et al. 2017). Reports of starlings damaging private property and agricultural operations soon became commonplace. Wildlife managers and agricultural producers worked to try to reduce the threats they posed to agriculture and to human health and safety.

Even today, farmers in Michigan, New York, Washington, Oregon and California identify starlings as one of the bird species most responsible for more than $189 million in damage to fruit crops each year (Homan et al. 2017). Congregating by the thousands at dairy operations, starlings eat cattle feed during the winter and spread disease, leading to decreases in overall herd health and millions of dollars in losses for producers.

▼ **Modified traps succeeded in capturing numerous starlings.**

Credit: Cliff Caldwell/USDA Wildlife Services

Starlings also impact human health and safety, especially at airports. According to Federal Aviation Administration statistics from 1990 to 2022, starlings were one of the top six species most frequently struck by planes, accounting for over $9.4 million in aircraft damages (FAA 2022). They are also responsible for the highest bird-related human fatality in aviation history. In 1960, Eastern Airlines Flight 375 struck a flock of starlings during takeoff at what was then known as Logan National Airport in Boston, killing 62 passengers. The incident prompted the FAA to initiate bird ingestion certification standards for turbine engines and led to the establishment of forensic ornithology.

A heap of problems

Starlings are also a significant problem at landfills, where their accumulating fecal waste can damage property and threaten human health and safety. Nesting and congregating in large numbers, they can create deafening noises. Starlings also move garbage off site, creating potential human health hazards. As a result, landfill managers often request USDA Wildlife Services for assistance in managing them.

As a full-time wildlife technician at a landfill in Ohio, Cliff devotes much of his time to managing starlings year-round. Due to the sheer number of birds using the landfill, their fecal accumulations cause substantial and costly damage. Every day, landfill employees need to use pressure washers to clean starling feces off buildings and equipment. Accumulating feces also damage employees' vehicles and, in the winter, create a slipping hazard in the employee parking lot.

Since treated human waste is discarded at this landfill by sewage treatment facilities, the thermal heat it produces presents a unique hazard when starlings are present. Attracted by the warm temperatures, starlings gather by the thousands, then disperse into smaller groups to roost in adjacent residential areas for the night, presenting a potential for disease transmission. Starlings also remove garbage, attracting birds and other nuisance wildlife from adjacent areas.

Despite harassing more than a million starlings annually from this site, Cliff found he made little progress reducing the damage they caused, even when using every tool at his disposal, from propane exploders to explosive pest control devices to lasers. While trapping is always an option, he found the "V-top" trap design commonly used to capture starlings generally ineffective.

Improving on the design

Initially, he was disappointed by the trap's catch rate. He would watch thousands of starlings approach the V-top traps, but while they might loaf on or around the traps, they were reluctant to enter.

After spending weeks observing their activity, he noticed that when the birds already inside the trap stopped trying to escape and started to feed, the starlings outside immediately went from loafing and observing to feeding and attempting to enter the trap.

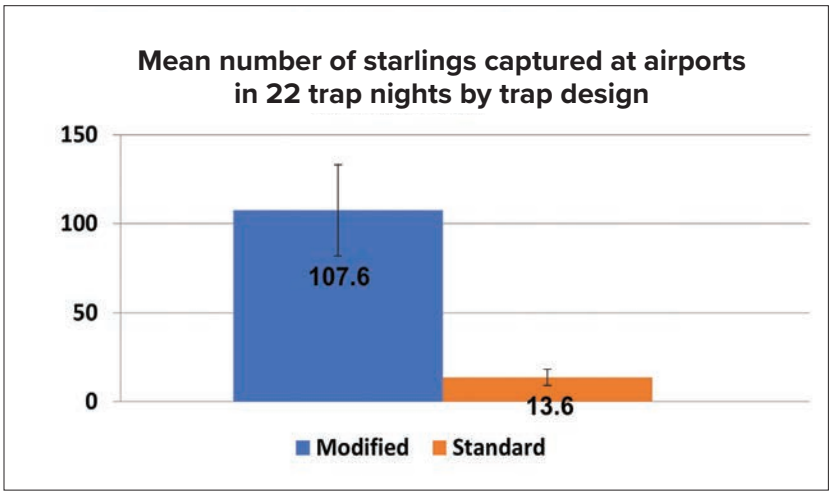
Once two or more birds dropped into the trap, though, the situation changed. The birds already inside renewed their escape efforts. The birds outside ceased all attempts to enter the trap and instead stopped to observe those inside. Cliff suspected the sight of the distressed birds deterred other birds from entering. He realized he needed a way to keep the birds in the trap calm so they would not discourage other birds from entering.

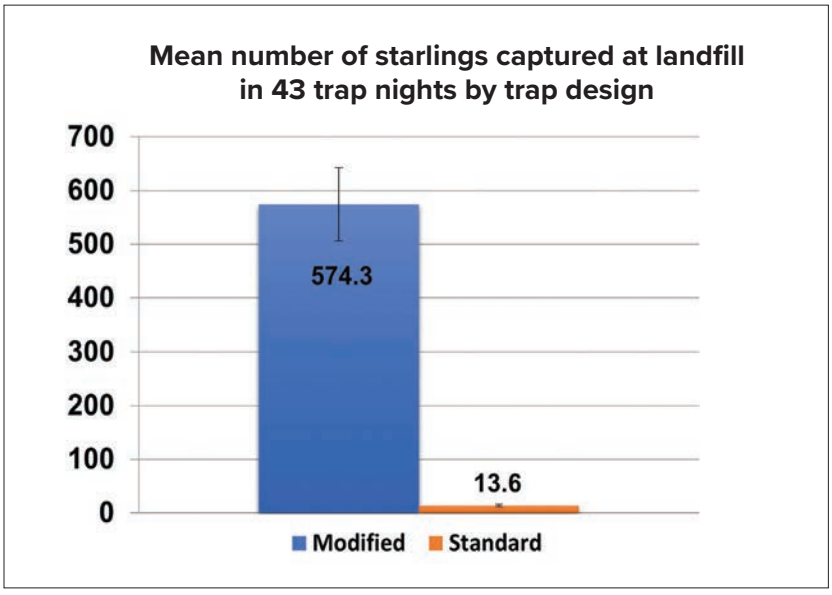
To block the direct view into the bottom of the holding cage, he replaced the V-top with a single sheet of plywood. On the plywood base, he designed a new entry system comprised of a metal cage with multiple funnel openings, like other commercially available bird traps. Leaving a 12-inch perimeter between the base of the cage and the edges gave the birds a place to land. This top cage system served as an entryway to the trap and a temporary holding area for birds that had not yet dropped down into the bottom cage. The hope was that this system would allow these birds to act as living—and non-distressed—feeding decoys.

After testing multiple materials in various sizes, Cliff settled on constructing the top cage out of ½-inch-square 19-gauge hardware cloth. After experimenting with funnel dimensions, he found a size that was effective at capturing the most birds

To view step-by-step plans for building a starling trap like this one, visit the link below, click on "information and resources," and select the PDF "Modifying a European Starling Trap."

www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/operational-activities/sa-damage-management/ct-species-by-name?sp=Starlings%20and%20Blackbirds





Credit: Cliff Caldwell/USDA Wildlife Services

with the fewest escapes. The most effective funnels measured six inches long, with the outside opening measuring four inches square and the inside measuring 2 ¾ inches square.

While testing the top cage and funnel designs, Cliff noticed that once birds entered the top cage, they would calmly walk several laps around the inside perimeter and then panic when they could not escape. To remedy this, he installed a small secondary cage adjacent to the main one and connected the two with a funnel. Once birds found their way inside the secondary cage, they would drop through a pipe into the lower holding cage and be out of sight from the remaining birds on top). A 3 ½ inch long, 4-inch diameter schedule 40 pipe seemed to be the right size to prevent birds from flying back to the top.

Only starlings actively feeding—not panicking—were present on and in the top part of the trap. As a result, the starlings outside the top cage, which were feeding on the bait placed on the edges of the plywood, continued to enter the trap.

Once he was satisfied with the dimensions and determined the trap was effective, Cliff realized he needed a trap that could be moved around without having to take it apart and put it back together again—so he made some from scratch. He built three easy-to-move traps with a cheap trailer, scrap metal, wood and wire. Making the trap mobile and quick to move was surprisingly effective. Being able to temporarily leave birds in the trap and quickly move it to a better location—sometimes just 50 yards away—significantly improved trapping success.

Bait selection and application are also vital parts of this system. Cliff tested multiple types of bait, including corn, birdseed and poultry pellets. While other baits may be more effective in other areas and situations, the starlings here seemed to prefer small-pellet dry cat food. Placing 10 to 16 ounces of the cat food in the center of the top cage and lightly distributing it on the plywood overhang in front of the entry funnels was the most effective strategy. Changing bait after excessive rain or snow helped, since birds visited the traps less frequently once the bait became soggy.

Testing it out

To gauge the success of the modified trap, Cliff conducted two small field studies—one during the spring and summer and another during the winter, when bird activity peaked. He placed one standard V-top trap and one modified trap 30 yards apart at three study sites in Ohio—two airports and one landfill. Each trap received an equal distribution of live decoy birds and the same type and amount of bait.

Wildlife Services personnel checked the traps at the airport study sites for 22 days during the spring and summer and at the landfill site for 43 days during the winter and counted the number of captured birds from each trap at the end of each field day.

The modified traps captured a combined total of 27,061 starlings during the 65 days of trapping, but the standard traps only captured 886. At the airport sites during the spring and summer, the modified traps

captured an average of 107.6 starlings each day. The standard traps averaged only 13.6 captures per day.

A similar lopsided ratio emerged at the landfill site during the winter. The modified traps captured an average of 574.3 starlings per day, while the standard traps averaged 13.6 captures per day. When placed side by side, the modified trap significantly outperformed the standard V-top trap by a wide margin.

When trapping starlings with modified traps, details could make all the difference. Even a small change could go a long way toward improving the traps. Adjusting a single element by just an inch, or changing the gauge of wire, or moving the trap 50 yards, could dramatically impact success. Factors like setting the trap next to a water source in the summer or using a broom to sweep away the snow and expose bare ground next to the traps in the winter could also increase the number of starlings captured.

We hope that by sharing this experience, others can take what we have learned and use it to better meet their needs. If you try this yourself, don't be afraid to experiment.

Many USDA Wildlife Services field staff have designed and built starling traps that also work well. Cliff took his observations, combined them with bits, pieces and parts of known traps, added a few ideas of his own, and came up with something we hope is useful to others. That doesn't mean it is perfect, though. We welcome others to share thoughts and ideas for improving the trap designs. ■

Cliff Caldwell is a wildlife technician with the USDA Wildlife Services Ohio program.

Robert Hromack is a staff wildlife biologist with the USDA Wildlife Services operational support staff.

Being a Bartender Made Me a Better Biologist

LEARNING TO COMMUNICATE WITH PEOPLE IS CRITICAL TO WORKING WITH WILDLIFE

By Emily Carrollo

Credit: Ruth Hartnup

▲ **Science may teach a lot about wildlife, but for Emily Carrollo, slinging beers helped her learn to work with people.**

Some of my best days as a wildlife biologist were early in my career, working in the field as a technician. Of course, the low pay can make being a technician difficult. For me—like many others who have come before me and after—holding a second job was often necessary to pay the bills. Fortunately, many places where I worked had no shortage of additional jobs I could pick up that didn't interfere with my 9-to-5 wildlife positions. Working in the restaurant business, in particular, meant I could work with wildlife by day and sling beers by night.

The side work didn't just give me extra money. It made me a better biologist.

Wildlife work doesn't have to be the only experience that provides opportunities to grow your skills as a wildlife biologist! Before accepting my current position as the Pennsylvania Game Commission's black bear program manager, I spent many years as a bartender, where I had the opportunity to work on some of the skills I found necessary to being a good biologist. Frankly, it gave me the chance to work with people in sometimes less-than-ideal and unpredictable situations, which we all know can arise when working with wildlife.

After I gave a talk titled "How Being a Bartender Made Me a Better Biologist" at two wildlife conferences, people approached me and said they had similar feelings about the odd jobs they had worked over the years. Those jobs had given them experiences in the world of human communication and interaction. It made me feel a little less silly for presenting on a topic that wasn't an important scientific study providing insight into the management of a wildlife species. These were biologists with significant experience and knowledge. I felt privileged to just have a conversation with them, let alone share a similar experience of beneficial odd jobs.

We've all heard the adage, "Being a wildlife biologist is 90% managing people and 10% managing wildlife." The specific percentages may change depending on the biologist, but the takeaway is the same. We are constantly working with people to achieve wildlife management goals. We are tasked with speaking for wildlife and for the public we manage wildlife for. It's an important and sometimes daunting role. Learning how to speak—and more importantly, to listen—is vital. That is where being a bartender comes into play and how it made me a better biologist.

Divided opinions

As biologists, we must accept that some people will never be happy with our recommendations or management decisions. They may seem like a majority, at times, but often these people make up a small percentage of the public. For example, in the 2019 nationwide survey "Americans' Attitudes Toward Hunting, Fishing, Sport Shooting and Trapping" conducted by Responsive Management, 80% of Americans said they approved of legal hunting, including 55% who said they strongly approved. (It is important to note that this was the overall approval number. Regionally, this approval percentage changed. The Midwest had the highest approval rate, at 86%. The Northeast had the lowest, at 72%.) When asked a follow-up question—"No matter your opinion on hunting, do you agree or disagree that it is OK for other people to hunt if they do so legally and in accordance with hunting laws and regulations?"—92% agreed.

I would like to focus on two groups: the people who did not approve of hunting but agreed others should be allowed to hunt, and those who did *not* agree others should be allowed to hunt. As for the latter group, wildlife biologists may never be able to fully incorporate their opinions into management practice unless hunting were removed entirely—an option that would raise concerns with hunters and may hinder management goals. That is not to say everyone's opinion is not valid, but it highlights how managers working within a dichotomy of sharply divided opinions will likely leave a few people unhappy. Just like some bar patrons will be unhappy and leave an abysmal tip no matter how wonderful your service was, we can't make everyone happy.

The former group, however, brings me to my next point. Just because someone doesn't agree with a decision doesn't mean they don't understand why it is being made or appreciate others' values. These people—people who did not approve of hunting but did agree that others should be allowed to hunt—are a great example for the practice of active listening.

Take time to listen

Active listening is a valuable skill for any biologist to have because it helps us understand our constituents more thoroughly. If we only listened to how people responded to the first question, we may think this first group would never support hunting. But the truth turns out to be more nuanced. Although they may never hunt themselves, they think others should be able to. While this survey isn't quite the same as speaking with someone directly, it shows why it's important to take the time to listen—so we can understand people and be able to respond with the right information.

Active listening can be practiced anywhere, at any time, with anyone. It's a skill I significantly improved while working in bars. Making a mistake there can literally mean life or death if you don't understand that someone asking if the fries are cooked in peanut oil may have a life-threatening allergy.

Courtesy Emily Carrollo

As the black bear program manager for the Pennsylvania Game Commission, Emily Carrollo discovered that gathering data from wildlife is only part of the job.

Credit: Emily Carrollo

▲ **For wildlife managers, learning how to speak and how to listen are important parts of the job.**

When practicing active listening, try removing any external or internal influences. That helps us stay focused on the conversation. External influences are the everyday noises and events going on around us. Finding a place away from barking dogs, noisy officemates or humming lawnmowers can be difficult, but choosing a quiet place to talk can remove some of these distractions. When that's not possible, our daily conversations can provide opportunities to practice blocking out the surrounding environment to better listen to the conversation we're having. That's another skill I honed in restaurant work. There's nothing like trying to take a food order in a noisy room full of patrons who have a few drinks in them!

▼ **When practicing active listening, removing external and internal influences helps keep the focus on the conversation.**

Credit: Joe Milmoe/U.S. Fish and Wildlife Service

Set your biases aside

Removing internal influences can be even more difficult. We all come into a conversation with personal ideas, beliefs, and opinions. These internal influences can affect how we take in information (Antai-Otong 1999). They can prompt us to respond as soon as we hear something we disagree with, or to respond too quickly before the other person finishes their thought. While it can be tempting to let these internal biases speak up before hearing the whole story, coming in with an open mind to fully understand what another person is saying can help avoid negative outcomes. It also helps us get a complete picture of what we're being told so we can give the best response.

While you're listening, pay attention to both verbal and nonverbal communication—your own and those of the person you're speaking to. In a bar, the tone of someone's voice when saying "Hey buddy" can make the difference between a friendly hug or a brawl. Whether we realize it or not, a lot of our ability to communicate is not related to what we are saying or writing. Nonverbal forms of communication—our facial expression, our stance, the tone of our voice—make up much of our everyday interactions with other people. Understanding how these nonverbal cues can give mixed messages is very important, especially when we're trying to educate the public on an important topic. And paying attention to nonverbal cues from members of the public may lead us to a better conclusion on the support they're looking for than what they are actually saying. Practicing our ability to pay attention to the nonverbal cues of others and of ourselves will make us much better communicators to the public.

It's also important to enter a conversation with empathy. Empathy is not the same as sympathy. The American Psychological Association defines sympathy as "feelings of concern or compassion resulting from an awareness of the suffering or sorrow of another." Empathy, on the other hand, is "understanding a person from his or her frame of reference rather than one's own."

Empathy is especially hard when you strongly disagree with someone, but it doesn't have to come in the form of agreement. Empathy can come from having an unrealized common goal. Both hunters and nonhunters, for instance, may want a species on the landscape despite differences in how they think it should be managed. It can also come from the understanding that someone's passion for a topic reminds you that they care as equally about wildlife as you do as a biologist, even if there's disagreement on a management topic.

Empathy can be hard to provide in conversations at times, but it is a key component when building trust. Sincere empathy in a conversation allows for quality communication between both parties and builds trust in that relationship (Head 2012). Hence, as wildlife managers, it's imperative we allow ourselves to be truly empathetic to build trusting relationships among our constituents. These relationships will mean greater understanding and belief in our management decisions moving forward. That's another strategy from the bar. Bartenders use empathy and genuine conversation to keep their regulars coming back.

Three magic words

Finally, it's important to be able to say, "I don't know." That can be a terrifying statement when you're supposed to be the expert addressing a group of people. It can be frightening if you're a server with impatient customers at a busy restaurant, too. However, the importance of responding with known information is crucial to effective communication. As with empathy, it is also important to building trust in relationships.

This is especially true for wildlife biologists and managers. Providing incorrect data can cause listeners to second-guess other information you're looking to disseminate. Fortunately, we often have access to many different types of information and research to back our understanding of wildlife, and we should use these resources as much as possible to respond to questions about wildlife biology and management. We also need to be able to admit when we don't know an answer and make sure that we try our best to respond with the correct answer to our constituents when possible.

The admission that we don't always know everything simply means we're human. Following up means we care about their questions and their desire to learn more. This builds strong, trustworthy relationships between biologists and the public.

People work

My experiences happened to be in a bar, but there are many opportunities to practice these skills in everyday life. It's easy for wildlifers to underestimate how powerful they are because we're not thinking much about communicating with the bear we're handling.

Most wildlife work is people work, however, and communication skills are vital to achieving our management goals. Taking every opportunity to practice effective communication skills can mean being better biologists—even if it's while serving a pint or two. ■

Emily Carrollo, MS, is the black bear program manager for the Pennsylvania Game Commission.

Amping up Biosecurity for Herps

SIMPLE, STRICTER PRACTICES CAN HELP PROTECT REPTILES AND AMPHIBIANS FROM DISEASE

By Molly C. Bletz, Jenna Palmisano, James T. Julian, Lisa Shender and Deanna H. Olson

As amphibians and turtles top lists of species with conservation concerns, the lens of wildlife management is increasingly focused on measures to reduce threats to them at local, regional and national levels.

Reptiles and amphibians face a mosaic of risks—climate change, habitat degradation, the pet trade and overexploitation among them. Yet diseases pose some of the greatest threats to their populations. Pathogens and parasites continue to arise, jeopardizing these diverse animals, which are so central to food webs and ecosystem integrity.

Credit: Kim Titterington/Swamp Girl Adventures Reptile Rehabilitation

▼ **Jenna Palmisano wears gloves when handling pygmy rattlesnakes (*Sistrurus miliarius*) in Florida to reduce human-mediated transmission of both the snake fungal disease ophidiomycosis, caused by the skin fungus *Ophidiomyces ophidiicola*, and pentastomiasis, caused by the lung pentastome *Raillietiella orientalis*.**

In North America, biosecurity practices are being more widely adopted to reduce humans' role in transmitting amphibian disease—both between animals and between sites. We need to amp up these practices. Using higher disinfectant concentrations and longer disinfectant contact times can help combat amphibian diseases. Increasing disposable glove usage and disinfection procedures can reduce the spread of reptile diseases.

Protecting amphibians

In the 1990s, the amphibian skin disease *Bd* chytridiomycosis—caused by the aquatic fungus *Batrachochytrium dendrobatidis*—was first described. While it remains a concern for some amphibian populations, increased attention is being given to its newfound relative, *B. salamandrivorans*, or *Bsal*.

Like *Bd*, *Bsal* is thought to be native to Asia. It emerged in Europe just over a decade ago, where it continues to cause salamander die-offs. It has yet to be documented in North America, but most experts feel it is only a matter of time before *Bsal* finds a back door to our continent.

Because North America is a world salamander biodiversity hotspot, if *Bsal* reaches here, we can likely expect widespread effects (Gray et al. 2023). Lines of defense are already conceived, but additional updates are needed. To reduce human-mediated transmission of invasive disease-causing pathogens of native wildlife, many field crews engage in standard biosecurity practices that include disinfecting field gear and equipment both within a site and between sites (Gray et al. 2017; Julian et al. 2020; Olson et al. 2021).

These standard practices do not go far enough, though. Higher disinfectant concentrations are needed to prevent *Bsal* transmission (Van Rooij et al. 2017).

Bsal disinfection

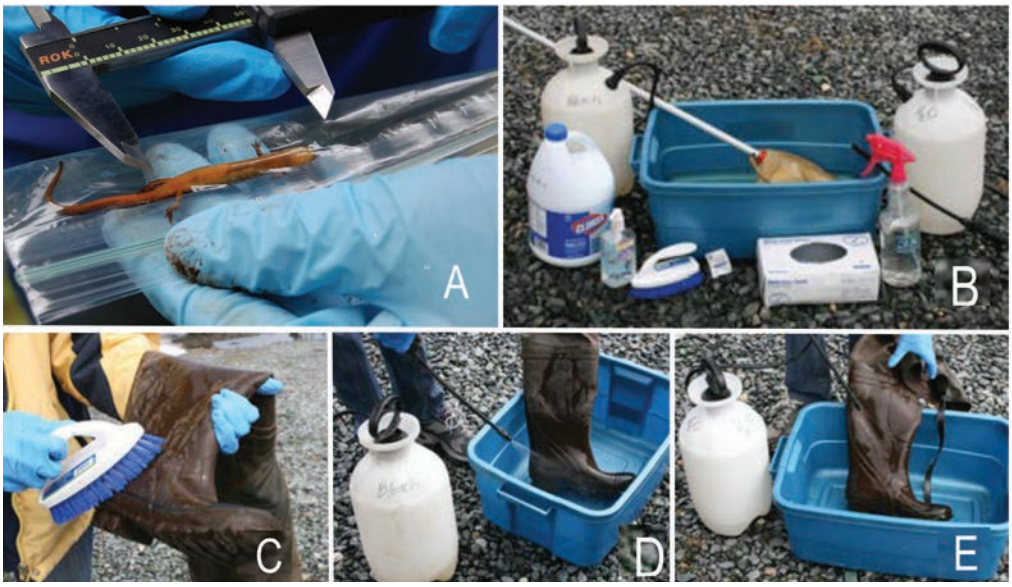
Disinfectants can be a powerful tool in minimizing pathogen spread. However, they must be used at proper concentrations, applied with suitable contact times and appropriately stored so that efficacy is not reduced via biodegradation.

We echo recently revised field-disinfection procedures to emphasize higher disinfectant concentrations for *Bsal* (NE PARC 2022; Bletz et al. 2023). Virkon, bleach and ethanol can all be used. Each has advantages in particular contexts. Ethanol, for example, is useful for disinfecting delicate equipment. Virkon Aquatic is a particularly suitable disinfectant for field gear and larger equipment due to its reduced corrosiveness and toxicity. It can be prepared by adding 1.3 ounces of powder to 1 gallon of water, but care is needed, as the powder should not be inhaled. This requires working in a well-ventilated area and/or using face masks.

If store-bought liquid bleach is used to disinfect field gear, note that concentrations of the active ingredient, hypochlorite, differ in these products and can be between 5.25% and 8%.

For store-bought bleach with an 8% hypochlorite concentration, add one part bleach to four parts water (for a gallon of water, add four cups of bleach). Allow the concentration to contact the items being disinfected for five minutes, then rinse thoroughly with water. Online bleach calculators are useful tools for preparing appropriate bleach solutions. One we use is www.omnicalculator.com/chemistry/bleach-dilution.

It is inadvisable to use containers of store-bought bleach that have been opened for a month or more because hypochlorite is not stable and may not be effective. Light will also degrade bleach solutions that are stored in transparent containers. The revised bleach disinfectant concentration for *Bsal*—1.6%, or 16,000 parts per million hypochlorite—is effective for other wildlife disease pathogens, including *Bd*, ranavirus pathogens and *Ophidiomyces ophidiicola*. Follow product label instructions for use and disposal of these disinfection chemicals.



Credit: Northeast PARC

▲ **Field gear disinfection process for amphibians and reptiles: A) Secure each animal (here, a salamander is secured in a new disposable bag) and use new gloves for handling. B) Acquire equipment used for disinfection. C) Scrub debris off gear, then rinse with water prior to applying disinfectant. D) Apply disinfectant and follow product instructions for proper contact time. E) Rinse off disinfectant with clean water (From NE PARC 2022).**

Reptile worries

Concerns for North American reptile disease biosecurity are rising as reptile disease reports increase. Some of these diseases have human-mediated transmission and ties to invasive pathogens from other regions of the world. Three fungal foes warrant mention.

First, recent evidence supports the hypothesis that the snake fungal pathogen *Ophidiomyces ophidiicola* (*Oo*) has been introduced to the United States (Ladner et al. 2022). This pathogen causes

Forestall *Bsal* (*Batrachochytrium salamandrivorans*) with higher disinfectant concentrations, which also are effective against *Bd (B. dendrobatidis)*, *Ranavirus* spp., and *Ophidiomyces ophidiicola*. Prepared solutions indicate the final concentration of the active ingredient. (From NE PARC 2022; Bletz et al. 2023)

Virkon Aquatic®	Bleach*	Ethanol
1% solution	1.6% hypochlorite solution	70% solution
For personal gear and large equipment	For personal gear and large equipment	For delicate equipment

*Note that bleach can be sold at various concentrations. Be sure to check this and make the correct dilution.

the skin disease ophidiomycosis. Although our understanding of the disease is still developing, *Oo* is not ubiquitous across the continental U.S. It is known to occur in 26 states, mostly in the eastern U.S., as well as in Puerto Rico and Ontario, Canada. The disease has infected more than 49 native snake species and three nonnative species (Haynes and Allender 2021).

For more information, check out these resources:

- Partners in Amphibian and Reptile Conservation Disease Task Team: parcplace.org/species/parc-disease-task-team
- PARC resources: parcplace.org/resources/herpetofaunal-disease-resources
- North American Bsal Task Force: salmanderfungus.org

The higher disinfectant concentrations cited above are effective against *Oo* (see Haynes and Allender 2021). Hence field-gear disinfection between sampled individuals or sites merits consideration to forestall human-mediated *Oo* spread.

Second, additional pathogens causing skin lesions in snake and lizard species of North America are the fungi of the genera *Paranannizziopsis* (Lorch et al. 2023) and *Nannizziopsis* (Gentry et al. 2023). Little is known about these pathogen taxa in the wild, but there are several reports in captive lizards, tuataras and snakes. In Florida, nonnative wild chameleons have been found with *Paranannizziopsis* infections, a warning of the potential for pathogen spillover to native squamate populations (Claunch et al. 2023).

Third, a turtle shell fungus, *Endomyces testavorans*, has been described causing shell lesions in some North American aquatic turtles (Woodburn et al. 2019).

These three reptile fungal pathogens are a new frontier for both science advancement and management response for biosecurity and conservation actions. Hygiene measures such as disposable glove use and field-gear disinfection procedures are especially important for people handling reptiles across regions or between wild and captive populations.

Lungworm risks

In addition to the fungal diseases described above, lungworms present a concern for snakes. Snake pentastomiasis is the disease caused by a taxonomic group of parasitic crustaceans known as snake lung pentastomes. Although several are native to North America, the pentastome *Raillietiella orientalis* is native to Asia and is thought to have been introduced to the U.S. from the established population of Burmese pythons (*Python bivittatus*) in South Florida. At least 18 native Florida snake species across 20 Florida counties have been found infected with *R. orientalis*, with the observations of infections in snakes spreading northward (Miller et al. 2020; Palmisano et al. 2023).

Credits: A. Dane Conley/Virginia Tech; B. Jenna Palmisano/Univ. Central Florida; C. Jenna Palmisano/Univ. Central Florida; D. Terence Farrell/Stetson University

Biosecurity measures can reduce human-mediated transmission of emerging reptile diseases. A: A rainbow snake (*Farancia erytrogramma*) with lesions from the snake fungal disease ophidiomycosis, caused by *Ophidiomyces ophidiicola* shown at the arrows. B-D: Snake pentastomiasis caused by *Raillietiella orientalis*. In image B, the pentastome is circled on the road adjacent to road-killed southern black racer (*Coluber constrictor priapus*). In image C, an arrow points to the pentastome in a black racer's mouth (note that gloves are recommended). Image D shows pentastomes removed from the lungs of a scarlet king snake (*Lampropeltis elapsoides*) during a necropsy.

These pentastomes have a complex life history, cycling through invertebrate and vertebrate intermediate hosts before fully developing in their definitive snake hosts (Palmisano et al. 2022). With an abundance of potential intermediate hosts and the use of broad taxa of native U.S. snakes as definitive hosts, biosecurity concerns for the invasive pentastome are paramount in both wild and captive contexts.

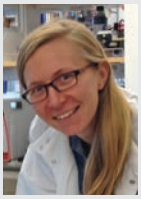
At present, *R. orientalis* infections have been found in four captive snakes, three of which died. Although it is unknown whether *R. orientalis* can infect humans, other pentastome species can. Given that potential, it is prudent to adopt the elevated biosecurity measures of glove use and gear disinfection.

Limiting our role

With a daunting potential multiple-front assault of novel disease-causing agents in North America, now is the time to amp up broader best practices for wildlife health to reduce human-mediated pathogen transmission to North American reptiles and amphibians.

Preventing pathogen spread to novel hosts is an important component of retaining North American ecosystem integrity. It's time to refresh your field biosecurity kit.

Don't be a vector. Be a wildlife protector!



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Jenna Palmisano is a PhD student at the University of Central Florida.

James T. Julian, PhD, is an ecological program specialist/biometrician with the Pennsylvania Department of Conservation and Natural Resources.

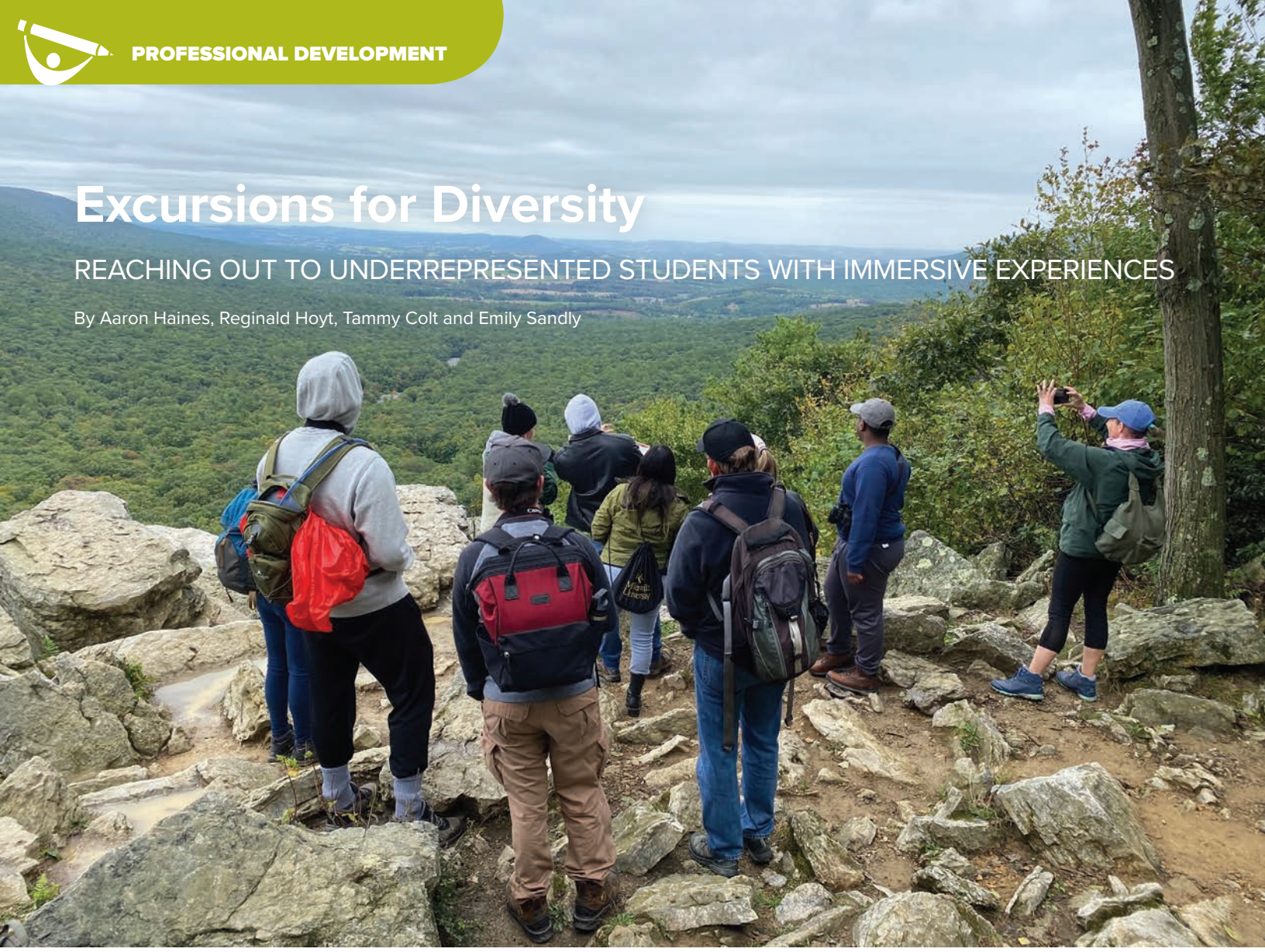
Lisa Shender, MS, DVM, PhD, is a wildlife veterinarian with the National Park Service Biological Resources Division.

Deanna H. Olson, PhD, is a research ecologist with the U.S. Forest Service Pacific Northwest Research Station.

Excursions for Diversity

REACHING OUT TO UNDERREPRESENTED STUDENTS WITH IMMERSIVE EXPERIENCES

By Aaron Haines, Reginald Hoyt, Tammy Colt and Emily Sandly



Credit: Aaron Haines

▲ **Students on the Lookout Trail at Hawk Mountain Sanctuary keep an eye out for migrating hawks.**

During the 2022-2023 academic year, the Pennsylvania Chapter of The Wildlife Society received a grant from TWS—as part of TWS' diversity, equity and inclusion initiatives—to provide interactive field opportunities and transformative experiences for systemically underrepresented minority students to become involved in ecology, natural resource and conservation careers.

We felt this would be an important program for students and for the profession as a whole. Effective policies that promote diversity are important for the future of the wildlife field. Organizations that better integrate diverse teams of scientists are generally more productive, creative and better able to solve problems (Smith-Doerr et al. 2017). It is also important to have a diverse representation of professionals in a science-based workforce to better communicate with the public (Morales et al. 2020).

Recognizing the benefits of diversity, The Wildlife Society committed itself to strengthening and supporting diversity, equity and inclusion efforts throughout the wildlife profession, as emphasized in its guiding documents, strategic plan and the establishment of the Diversity, Equity and Inclusion Network. Among its activities, TWS provided grant-funding opportunities to enhance and support DEI initiatives in the field. This funding contributed to efforts that focus on eliminating barriers and cultivating mechanisms for support at all educational and career stages of the wildlife field.

To implement the grant we received, our chapter partnered with Millersville University and Delaware Valley University to recruit underrepresented students and arrange activities. Our goal was to provide these students better integration into

the wildlife field by providing wildlife excursion opportunities—including professional workshops, field experiences and conferences.

The grant helped cover travel expenses, food, entrance fees and registration fees. It also provided seed money for additional grant opportunities to further support opportunities for underrepresented minority students seeking to be involved in wildlife-related activities.

Choose your own adventure

As part of the philosophy of the DEI grant, the students helped choose the wildlife excursions that most interested them. A small-group format helped personalize the experiences (McGill et al. 2021). Students completed a short survey before and after each excursion, which helped us quantify how much these experiences changed their perceptions regarding careers in wildlife biology and related fields. The students represented different races, ethnicities and gender identities. Their excursions were led by chapter members to provide an opportunity to meet and talk with active wildlife professionals.

Our first excursion occurred in the fall at Hawk Mountain Sanctuary, a nonprofit refuge in central Pennsylvania dedicated to raptor conservation. Our in-person workshop at the facility began with an introduction to raptors and information on their seasonal migrations. After the morning presentation, the group headed up the Lookout Trail to keep an eye out for migrating hawks. The workshop concluded with a lecture on broad-winged hawk research by raptor research scientist Laurie Goodrich. This excursion provided a great introduction to the type of work associated with the nonprofit sectors of the wildlife profession.

In the winter, students attended a field day event at Middle Creek Wildlife Management Area, a 6,000-acre reserve in southeastern Pennsylvania managed primarily for waterfowl, grassland nesting birds and wetland species. This excursion was led by Pennsylvania Game Commission wildlife biologist Lauren Ferreri, who took students into the field to learn about waterfowl banding and placing GPS telemetry units and geologgers on waterfowl.

Ferreri shared with the students the commission's waterfowl-related research project objectives, such as assessing waterfowl migratory movements, monitoring waterfowl harvest and understanding population dynamics. The group also discussed the agency's broader goals and the career paths taken by PGC employees. The excursion ended with a tour of the wildlife management area so students could see some of the management strategies involved in promoting the landscape for wildlife—including controlled burns and silviculture—while balancing the interests of the public.

In the spring, the students attended the 78th Annual Northeast Association of Fish and Wildlife Agencies Annual Conference in Hershey, Pennsylvania, with the registration costs covered by the DEI grant and two Millersville University grants.

▼ Wildlife biologist Lauren Ferreri shows Millersville student Jennifer Juarez how to band a male mallard (*Anas platyrhynchos*) at Middle Creek Wildlife Management Area.

Credit: Aaron Haines

Credit: Aaron Haines

▲ **Students attend the 78th Annual Northeast Association of Fish and Wildlife Agencies Annual Conference in Hershey, Pennsylvania.**

On the first day of the conference, the students participated in a series of workshops and panels devoted to professional development. At the first workshop, "Getting That Job: Applying and Interviewing with Federal, State and Private Entities, A Professional Journey Panel for Students," students heard from a panel of wildlife professionals who provided advice on crafting a resume, writing a cover letter, interview skills and where to apply for jobs. At the Professional Journey Panel for Students, panelists shared their stories on how they became wildlife professionals and eventually leaders in their respective fields. The panel ended with an inspirational talk from Ashley Smith, CEO of the Minority Outdoor Alliance, who explained how coming together as one people in nature benefits all of us. Following the session, students had a chance to network with wildlife professionals at a meet-and-greet session and the conference welcome reception.

Investing in the future

Student feedback regarding their experiences was overwhelmingly positive. The results of our survey suggest that these activities are potentially excellent tools to assist in retaining underrepresented minority students in the natural resources field.

"It was great to get some hands-on experience in the field and talk to professionals," wrote Orion Groff, a participant from Millersville University. "I feel more prepared to manage my disabilities in this line of work now that I've gotten some experience, and the general inclusive attitude at the conference was reassuring."

However, many students enrolled in college have already decided on their degree. For the students in our program, the activities had limited influence on changing their majors to a natural resource management degree. This suggests that more effort may be needed to recruit underrepresented students while they are still in middle or high school. Those students have not yet committed to a major and may not even be aware of what career options are available in natural resource management.

We believe that integrating groups like these into wildlife-related activities can greatly help cultivate diversity in the profession. Students in our program said they felt welcomed and empowered with new knowledge and experiences. We recommend more investment in the future to provide young people from different backgrounds opportunities to be actively invited and engaged in wildlife-related activities.

Such efforts will call upon different chapters and working groups of The Wildlife Society to dedicate time and resources to provide underrepresented and minority students with opportunities to attend wildlife excursions and become better integrated into the wildlife profession. This type of investment to increase diversity will help develop more productive and creative teams in the wildlife field to address the complex problems of the future. ■

Aaron Haines, PhD, CWB®, is a biology professor at Millersville University and past-president-elect of the Pennsylvania Chapter of The Wildlife Society.

Reginald Hoyt, MA, is an associate professor at Delaware Valley University and chair of the conservation affairs committee of the Pennsylvania Chapter of The Wildlife Society.

Tammy L. Colt, MS, is a regional wildlife recovery biologist at the Pennsylvania Game Commission and treasurer of the Pennsylvania Chapter of The Wildlife Society.

Emily Sandly, AWB®, BS, is a seasonal hawk counter for Hawk Mountain Sanctuary and newsletter editor for the Pennsylvania Chapter of The Wildlife Society.

THE WILDLIFE SOCIETY

is delighted to announce our highly anticipated 31st Annual Conference, set to take place in Baltimore, Maryland from October 19–23, 2024. This exciting event will unfold at the Hilton Baltimore Inner Harbor and marks the first time our Annual Conference has visited the state of Maryland. We're excited to return to the east coast for the first time since 2016!

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for our call for proposals and abstracts, on ***twsconference.org*** in early 2024.

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Congratulations

RECOGNIZING THE WILDLIFE SOCIETY'S 2023 AWARD RECIPIENTS

The Wildlife Society's Awards Program annually honors professional excellence, recognizes outstanding achievement and highlights contributions to wildlife science, conservation and management.

We congratulate each of these winners and thank them for their excellence and dedication to science-based wildlife conservation and management.

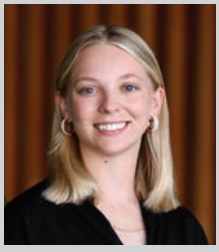
Aldo Leopold Memorial Award

Carol Chambers

Jim McDonough Award

Don Barnes

Ronald F. Labisky Graduate Fellowship in Wildlife Policy



Hannah Henry

Caesar Kleberg Award for Excellence in Applied Wildlife Research

Lisette Waits

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Award Winners!

Diversity Award

Vanguarding an Inclusive Ecological Workforce

Jennifer Merems

Group Achievement Award

Doris Duke Conservation Scholarship Program Collaborative

TWS Fellows

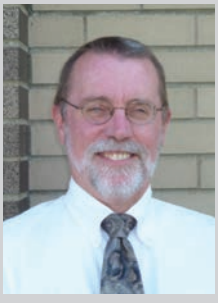
Quentin Hays

Serra Hoagland

Jessica Homyack

Glynnis Hood

Ray Iglay



Paul Johansen

Kevin Monteith

Dee Patriquin

Mindy Rice

Sarah Rinkevich

Read more about each of our award winners at wildlife.org.

Congratulations to The Wildlife Society's 2023

Distinguished Service Award

Rick Warhurst

W.L. McAtee and G.V. Burger Award for Outstanding Service as an Associate Editor

Journal of Wildlife Management
Quresh Latif

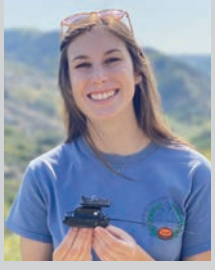
Wildlife Society Bulletin
Antoinette (Toni) Piaggio

Jay N. "Ding" Darling Memorial Award for Wildlife Stewardship through Art

Erika Coover

Melissa Groo

Donald H. Rusch Memorial Game Bird Research Scholarship



Cailey Isaacson

Excellence in Wildlife Education Award

Steve Johnson

Student Chapter of the Year

University of Wisconsin—Stevens Point

Student Chapter Advisor of the Year

Robert Brewer

The Wildlife Professional: Best Contributed Article

Mary M. Rowland, Michael J. Wisdom, Darren A. Clark, Bruce K. Johnson

2022. A Legacy of Science and Partnerships: For over 25 years, the Starkey Project has conducted policy-shaping research on deer and elk.

Award Winners!

Special Recognition Service Award

Jeannine Fleegle

Seth Magle

Wildlife Restoration Award: Wildlife Management

Kentucky Department of Fish and Wildlife Resources

Chapter of the Year

Texas State Chapter

Wildlife Publication Award: Article/Journal Paper

Clayton T. Lamb, Roland Willson, Carmen Richter, Naomi Owens-Beek, Julian Napoleon, Bruce Muir, R. Scott McNay, Estelle Lavis, Mark Hebblewhite, Line Giguere, Tamara Dokkie, Stan Boutin, and Adam T. Ford

2022. Indigenous-led conservation: Pathways to recovery for the nearly extirpated Klinse-Za mountain caribou. Ecological Applications.

Ana Miller-ter Kuile

Wildlife Publication Award: Student Paper

Ana Miller-ter Kuile, Devyn Orr, An Bui, Rodolfo Dirzo, Maggie Klope, Douglas McCauley, Carina Motta, and Hillary Young.

2020. Impacts of rodent eradication on seed predation and plant community biomass on a tropical atoll. Biotropica.

Christine L. Madliger

Wildlife Publication Award: Edited Book

Christine L. Madliger, Craig E. Franklin, Oliver P. Love, and Steven J. Cooke

Conservation Physiology: Applications for Wildlife Conservation and Management

Wildlife Publication Award: Monograph

Gregory H. Golet, Kristen E. Dybala, Matthew E. Reiter, Kristin A. Sesser, Mark Reynolds, and Rodd Kelsey.

2022. Shorebird food energy shortfalls and the effectiveness of habitat incentive programs in record wet, dry, and warm years. Ecological Monographs.

Gregory H. Golet

Kristen E. Dybala

Wildlife Publication Award: Authored Book

Michael R. Conover and Denise O. Conover

Human-Wildlife Interactions: From Conflict to Coexistence. 2nd Edition.

Guiding Engagement on Key Wildlife Policies

TWS DRAFTS NEW STATEMENTS ON THE CONSERVATION OF IMPERILED WILDLIFE AND BIOLOGICAL DIVERSITY

By Kelly O'Connor

Coinciding with the 50th anniversary of the U.S. Endangered Species Act, TWS staff and Council are updating our policy resources pertaining to wildlife facing population decline and extinction. This effort has included updating guidance on how to enhance the ESA, new information on at-risk wildlife policy in Canada and reestablishing our organization's perspectives on conserving biological diversity globally.

The Wildlife Society's position and issue statements also support our work on the ESA. These statements define key challenges facing wildlife and wildlife professionals, establish our organization's policies and recommend actions specific to those issues. These statements, developed by TWS Council's Position Statements Committee with expertise from our members and TWS staff, guide the advocacy actions of TWS' policy staff and provide a resource for TWS members for their own engagement with wildlife conservation policy.

Conserving U.S. species

TWS and our members play a critical role in ensuring the ESA is being implemented according to the best available wildlife science and can adapt to emerging and increasing threats to wildlife and habitats. Although the implementation of the ESA has largely succeeded in preventing the extinction of federally listed species since its passage in 1973, support for this legislation is being called into question in today's political climate. The Wildlife Society's policy regarding the ESA incorporates long-held stances of our organization pertaining to the legislation and its role in the overall conservation of biological diversity, while highlighting current issues with ESA implementation.

In recent months, we saw two attempts to delist species under the ESA via joint resolutions by Congress: the lesser prairie-chicken and the northern long-eared bat. These legislative efforts undermine the science-based and public decision-making processes implemented by agencies that administer the act, and TWS discourages such efforts to list or delist species via legislative actions. The Wildlife Society is also committed to supporting wildlife professionals across federal, state, Tribal and local governments via advocacy for adequate staffing and resources for wildlife professionals implementing the ESA.

The Wildlife Society's policy team continues to engage with ESA rulemaking—work supported by tools like our position and issue statements. We provided comments to the U.S. Fish and Wildlife Service in August to inform the implementation of protections for threatened species and designation of critical habitat under the ESA. Tools like TWS' issue statements guide units and members looking to leverage their expertise to shape processes like species status assessments, determination of critical habitat and species listing determination.

Engagement in Canada

TWS staff and Council are continuing to explore ways to facilitate engagement with policies pertaining to wildlife and wildlife professionals in Canada, including through a new TWS statement on Canadian at-risk species conservation policy. This new policy resource will provide background information, highlight current challenges and establish guidance for engagement with Canada's Species at Risk Act and other policies implementing protections for at-risk species across Canadian provinces and territories.

The Position Statements Committee and TWS staff have received guidance and feedback on the new policy from the Canadian Section of The Wildlife Society, members of the Section's Conservation

Affairs Committee and other wildlife professionals working to conserve at-risk wildlife in Canada.

We emphasize the importance of coordination across Canada's federal, provincial and territorial governments, as well as the role of the First Nations, Métis and Inuit in managing wildlife populations. Canadian wildlife professionals continue to call for landscape-level and multi-species approaches to achieving species recovery goals, a vision included in the policies of this Issue Statement. This statement will be a welcome addition to TWS' policy resources.

Biodiversity around the world

Biological diversity is a fundamental component of thriving ecosystems, and it is increasingly under threat globally. TWS' policy staff worked with our Position Statements committee and TWS working groups to revise our existing Position Statement on the Conservation of Biological Diversity.

This statement unifies the issue statements described above and further defines our organization's role and perspectives on the global conservation of biological diversity. We strive to also recognize the role of Indigenous peoples globally in conserving biological diversity and further explore current threats to biological diversity, including climate change, habitat destruction and modification and overexploitation of ecosystems.

Combined, these issue and position statements will provide TWS and our members with a suite of resources to affirm our role in the conservation of imperiled wildlife. TWS staff looks forward to providing additional opportunities for wildlife professionals to use these policy resources in their engagement with wildlife conservation policies. ■

Kelly O'Connor, MS, is the conservation policy coordinator for The Wildlife Society.

Kitten collars for cougars

By Joshua Rapp Learn

Even kittens that grow up to be cougars start out as little creatures. That makes it hard for researchers to study the young cats, since the GPS collars used on adults are way too heavy for them.

"We don't know much about survival of newborn mountain lion kittens," said TWS member Kristin Engebretsen, a PhD candidate at Utah State University. "When they are born, they are just super tiny."

But a combination of low-technology fabric and a piggybacking VHF signal is helping Engebretsen and her colleagues learn more about cougar kittens in Utah.

VHF devices are a lot lighter than GPS collars—only 70 grams—but they require extra work from researchers, who must be nearby with a tracking device to pick up the signal. That's impractical for studying cougars (*Puma concolor*), since even kittens can roam long distances.

But cougar kittens are heavily dependent on their mothers in their first few months, so Engebretsen and her team used that to their advantage. They used an expandable VHF collar that has a special stitch that pops out to accommodate the kitten's growing neck. And instead of tracking the kittens themselves, researchers drafted the kittens' mothers to do the work. The kittens' VHF signals are picked up by GPS collars on the mothers' necks, then relayed to biologists.

The researchers tested this technology on 30 kittens from 15 litters for three consecutive summers starting in 2019. They found that by the time the kittens had reached six months in age, only four of them lost their collars. This was likely due to kittens being kittens—play fighting or getting picked up by the scruff of their necks by their mothers.

The system allowed the researchers to learn more about the early lives of cougar kittens in Utah and monitor their survival. They found that after five to seven weeks, the mothers move them from their original natal den to subsequent dens as they grow. Every so often, they may move them again to be closer to kill sites. By three to four months, the mother often brings the kittens to kill sites. In one case, a mother moved two kittens roughly six miles away to a kill site—something that would have been hard to document without this technology.

The researchers could also determine when kittens had died, based on the transmission of a mortality alert via the mother's collar. In one case, they determined that a mother went back to visit a kitten after it had died. She had cached the body, which remained intact.

"We could tell through the radio-link connection that she kept going back to check on this kitten," Engebretsen said. ■

Credit: Julie Young

▲ **The signal from this cougar kitten's VHF collar is picked up by the mother's GPS collar.**

Credit: Kristin Engebretsen

▲ **The VHF collar is designed to expand as the kitten grows.**

Credits clockwise from top left: Richard Guenzel; Cameron Kovach; Lara Brenner; Marc Mains; Richard Harness; Rebecca Lazarus; Steve Hillebrand/USFWS; Gannon Castle/USFWS; Lisa Hupp/USFWS

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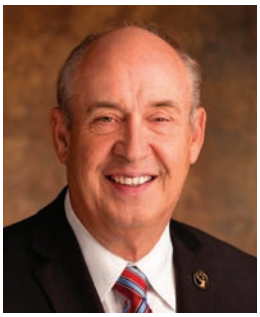

Courtesy Photo

Miles Moretti

Former Mule Deer Foundation President and CEO Miles Moretti died Sept. 17, 2023, after a short battle with cancer. He was 70.

A longtime TWS member, Moretti spent 15 years leading the Mule Deer Foundation before retiring in 2021. He previously spent 30 years with the Utah Division of Wildlife Resources, where he retired as deputy director.

"Miles was a true icon of western conservation," said Joel Pedersen, Moretti's successor as MDF president and CEO. "His impact on the conservation of mule deer and western landscapes will be felt long into the future."

Moretti earned his B.S. in wildlife management from Utah State University in 1976 and an M.S. in range and wildlife services from Brigham Young University in 1979. He joined the Utah Division of Wildlife Resources in 1978 and served as a field biologist and regional supervisor before becoming deputy director in 2000.

Moretti was a life member of the Mule Deer Foundation, a professional member of the Boone and Crockett Club and a board member of the National Deer Alliance and the CWD Alliance. He was also a longtime board member of the Intermountain West Joint Venture, where he served a term as chairman.

He was appointed to serve on two federal advisory councils, the Wildlife Hunting Heritage Council and the Hunting & Shooting Sports Conservation Council, and he was instrumental in developing and implementing former Interior Secretary Ryan Zinke's order on big-game migration corridors.

"Not only was he a hero in conservation, but he was a friend and mentor to so many," said Mule Deer Foundation board Chairman Chad Schearer. "The impact Miles Moretti had on mule deer and other wildlife will benefit generations to come."

Survivors include his wife, Julie, and two children.

Chester Martin

Longtime TWS member Chester Martin died Aug. 27, 2023, at the age of 80.

A Certified Wildlife Biologist®, Martin was also an accomplished artist who painted several TWS Quiz Bowl grand prizes.

He earned a B.S. and M.S. in wildlife and fisheries sciences at Texas A&M and completed post-graduate work at Texas A&M, Mississippi State University and New Mexico State University.

He retired in 2008 after 37 years with the Department of Defense, including 25 years with the U.S. Army Engineer Research and Development Center, where he served as team leader of the Wildlife Resources and Environmental Stewardship teams and acting branch chief for the Wetland and Terrestrial Habitat and Ecological Resources branches.

Martin was a member of numerous professional organizations, including the Wildlife Management Institute, National Wildlife Federation, National Military Fish and Wildlife Association, American Society of Mammalogists, Society of Wetland Scientists, Society for Conservation Biology, Southwestern Association of Naturalists and Southeastern Bat Diversity Network.

Credit: The Wildlife Society

Chester Martin poses with winners of the 2018 Quiz Bowl alongside his painting, which served as the grand prize.

His artwork has been included in several books, technical papers and magazine articles on fish and wildlife.

The Mississippi Wildlife Federation named him a Champion of Conservation in 2012. In 2018, TWS awarded him the Jay N. "Ding" Darling Memorial Award for Wildlife Stewardship through Art.

Survivors include his wife, Shirley, and two children.

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I certify that all information furnished above is true and complete.
Keith Norris, Editor.

Photo by Makeda Hanson

Gotcha!

TWS member Makeda Hanson took this photo of two red fox (*Vulpes vulpes*) kits playing on June 10, 2023, at Scofield State Park in Utah.

Want to share your photo here? Send it to editor@wildlife.org.

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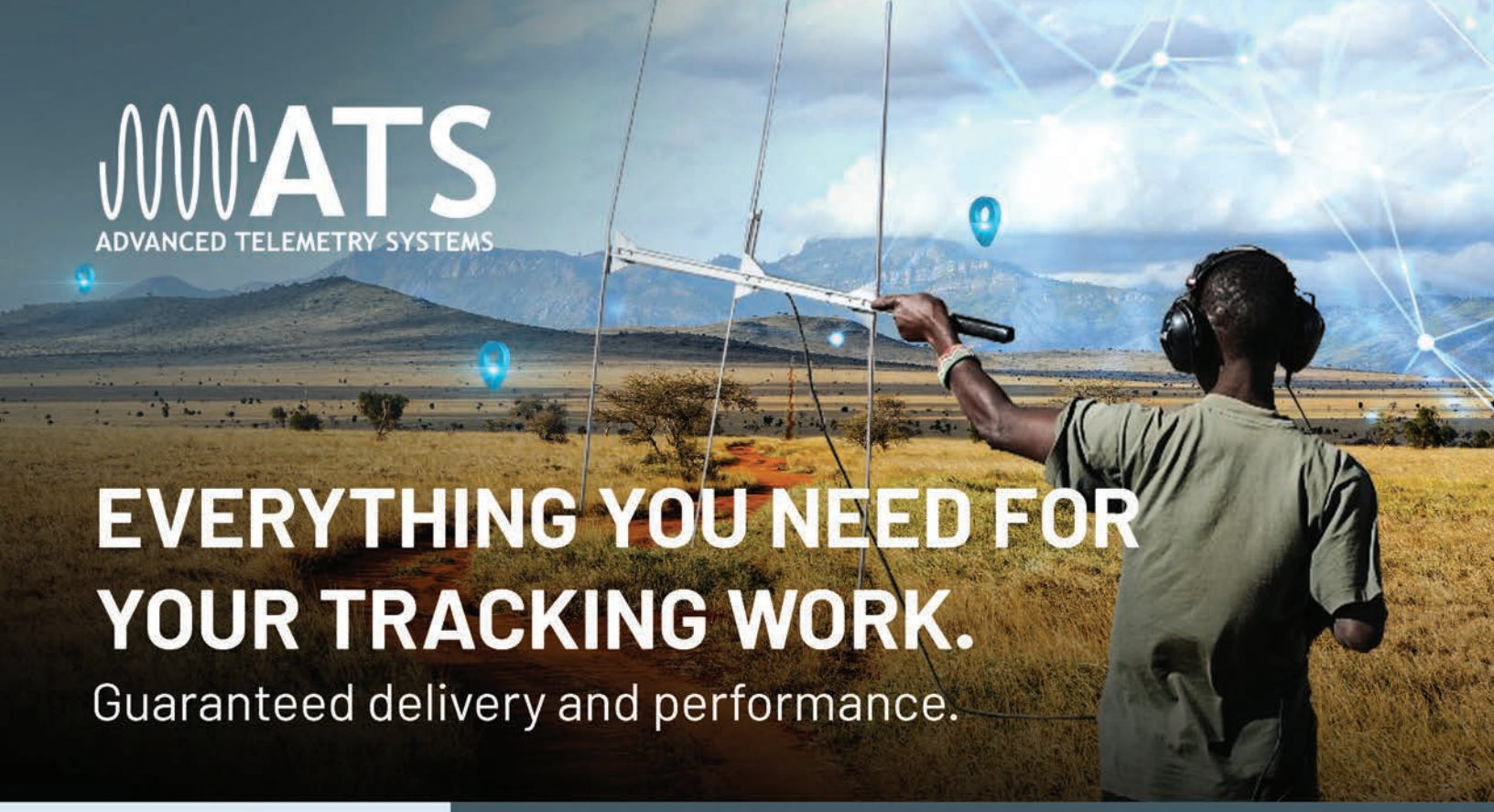

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