

U.S. Fish & Wildlife Service

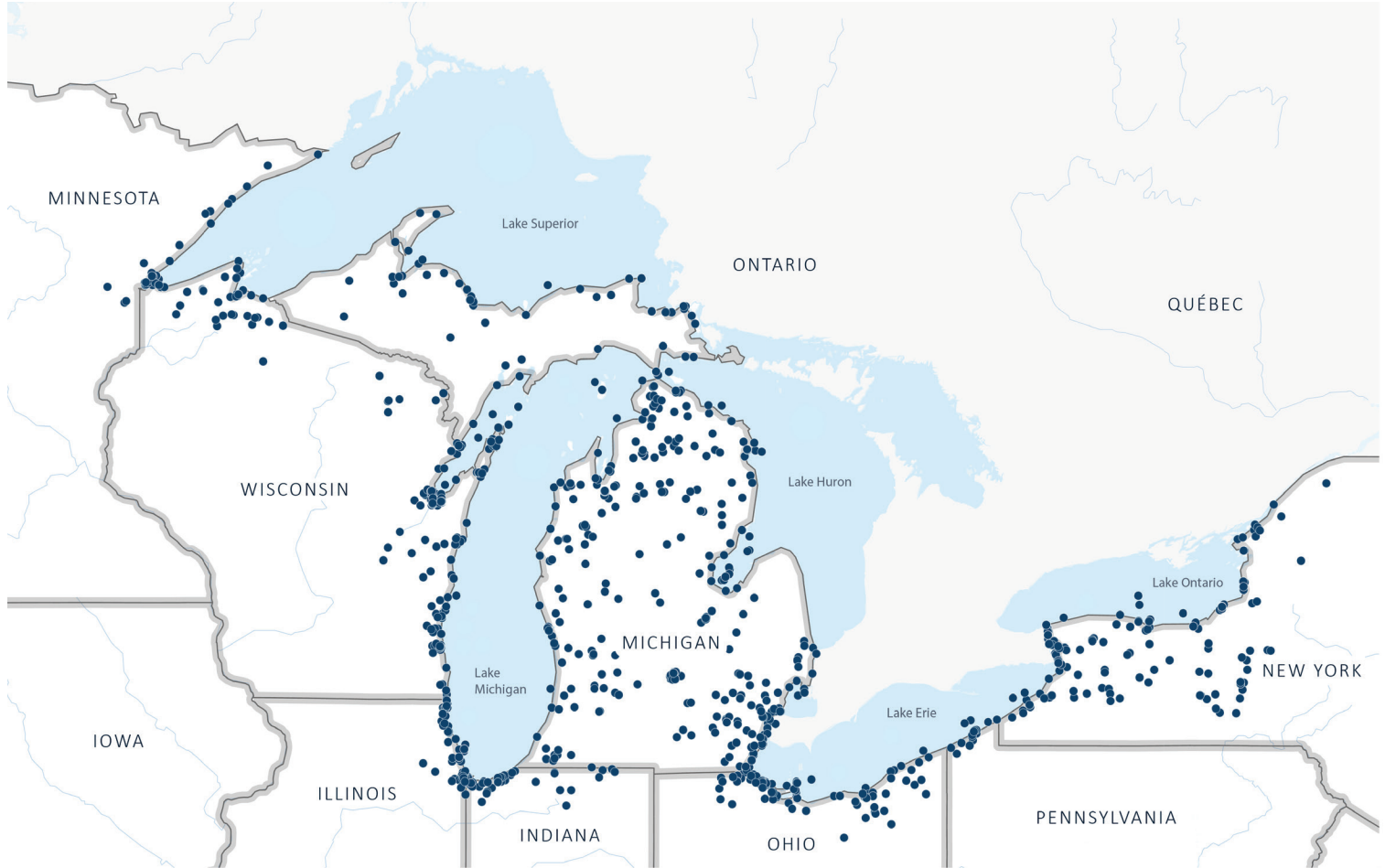
Restoring the Great Lakes

*15 years of the Great Lakes
Restoration Initiative*

Spring 2025



Great Lakes Restoration Initiative's impact



● Blue dots represent most of the Great Lakes Restoration Initiative projects that have been completed or are currently supported by our agency.

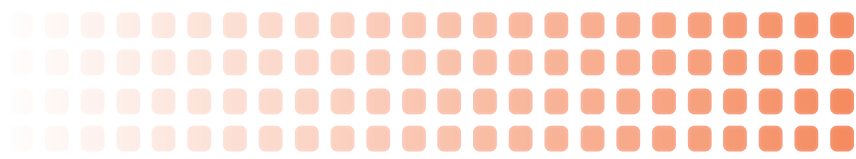
The Great Lakes Restoration Initiative is a driver for environmental action in the Great Lakes Basin, building upon strategic recommendations presented in the Great Lakes Regional Collaboration Strategy of 2005. The initiative is a collaborative effort of the U.S. Environmental Protection Agency and 15 other federal agencies, including the U.S. Fish and Wildlife Service, to address the most significant environmental concerns of the Great Lakes. The importance of the Great Lakes is evident when we look at the numbers:

- 35 million people in the Great Lakes Basin rely on this important resource for drinking water, transportation, power, and recreational opportunities.
- 10,000 miles of coastline (more than 4,500 miles in the U.S.) and 30,000 islands.
- 95% of surface water in the U.S. and the largest group of freshwater lakes on Earth.

Initiative funding has enabled the Service and our partners to:

- Restore, protect, and enhance more than 80,000 acres of coastal wetland and other habitats.
- Reopen more than 1,000 miles of Great Lakes tributaries.
- Implement projects on more than 11,500 acres of land and water to help control invasive species.

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Cover image: March ice on southeast Lake Michigan from 30,000 feet. Ice covers over 91% of the Great Lakes.
Charlie Wooley/USFWS

Remarkable progress



A blue ink signature of Will Meeks.

Will Meeks
Regional Director
Midwest Region



A blue ink signature of Wendi Weber.

Wendi Weber
Regional Director
Northeast Region

This year marks 15 years of the Great Lakes Restoration Initiative (GLRI), one of the world's largest freshwater restoration efforts. The initiative has significantly accelerated and amplified conservation actions throughout the region crossing county, state and international boundaries. The many collaborative restoration efforts spurred by GLRI have helped bring back fish and wildlife communities.

Since the initiative's inception in 2010, the U.S. Fish and Wildlife Service has been entrusted with hundreds of millions of dollars through interagency agreements with the U.S. Environmental Protection Agency. We've put those funds to work across all the Great Lakes states, leveraging investments by working with Tribes and federal, state and private partners. By working with communities and respecting public input, we've accomplished so much.

Our work has:

- Restored thousands of acres of fish and wildlife habitat
- Reduced threats from invasive species
- Reinvigorated fish and wildlife populations
- Generated critical information for future strategic actions

These actions ensure stewardship of natural resources while also investing in the region's economy. Fishing, hunting and wildlife-watching across the Great Lakes generate more than \$18 billion in annual revenue and support tens of thousands of jobs.

By improving the resiliency of freshwater habitats and delivering landscape-level conservation on public and private lands, we are ensuring a strong future for the Great Lakes. GLRI projects have garnered wide-spread public support, rekindled cultural connections and benefited local communities.

Collectively, we have made great strides, but our work is not done. We will continue forward with integrity as we restore this irreplaceable resource. As you will read in these pages, GLRI funding has been a catalyst for unprecedented coordination and innovation, with our agency playing an enormous role.

We hope you enjoy reading about these accomplishments and we invite you to visit our Great Lakes-based U.S. Fish and Wildlife Service offices, refuges and hatcheries to learn more.

The Great Lakes Restoration Initiative continues to be an incredible journey. Learn more at fws.gov/GLRI.

About the Great Lakes Restoration Initiative

The Great Lakes Restoration Initiative is a collaborative effort to address the most significant environmental concerns of the Great Lakes.

Through an agreement with the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service has allocated funding for projects in the following focus areas:

Toxic Substances and Areas of Concern

The areas of the Great Lakes Basin most severely impacted by toxic substances and pollutants are known as Areas of Concern. We work to restore and protect aquatic ecosystems from the threat of persistent pollutants.

Invasive Species

More than 180 non-native species are established in the Great Lakes and the most invasive spread rapidly ultimately degrading habitat, out-competing native species and disrupting food webs. Service activities are working to control and eradicate harmful, non-native species.

Habitat and Wildlife Protection and Restoration

A multitude of threats are affecting the health of the Great Lakes habitats and native wildlife. Service projects work to identify, restore and protect important habitat for the area's fish and wildlife.

Nonpoint Source Pollution Impacts on Nearshore Health

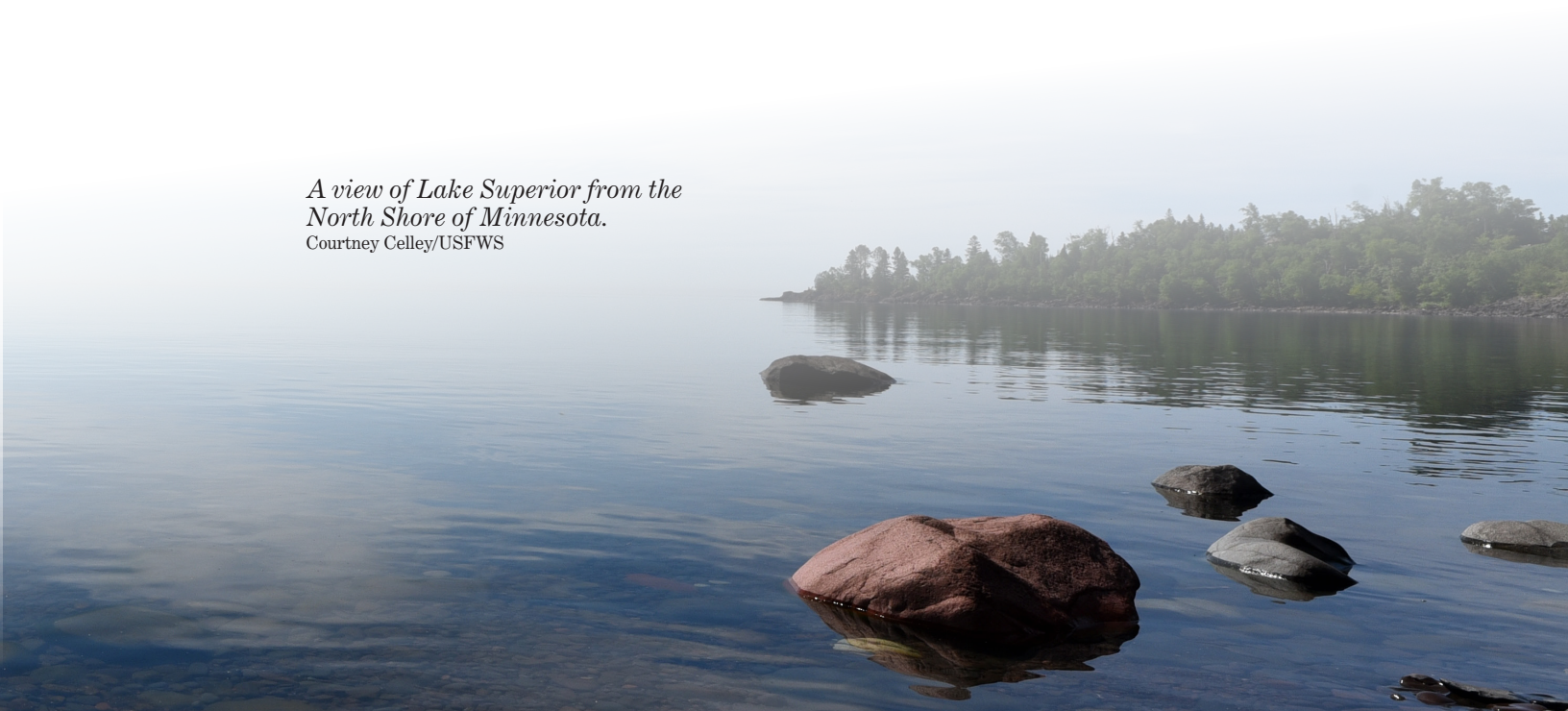
This work, delivered in partnership with the National Fish and Wildlife Foundation, supports projects aimed at reducing environmental impacts from contaminated stormwater runoff into bays and estuaries of the Great Lakes.

Foundations for Future Restoration Actions

Our agency takes a science-based adaptive management approach to new and ongoing projects. We also educate the next generation about the importance of the Great Lakes to fish, wildlife, plants and people.

*A view of Lake Superior from the
North Shore of Minnesota.*

Courtney Celley/USFWS



Great Lakes piping plovers: 15 years of progress

By Gigi Otten

A banded piping plover.
Jim Hudgins/USFWS



With funding from the Great Lakes Restoration Initiative, we at the U.S. Fish and Wildlife Service along with partnering federal agencies, communities and organizations are guiding the piping plover down the path of recovery.

Plovers need habitat to survive

Historically, Great Lakes piping plovers were abundant and there were thousands of these small gray and white shorebirds filling Midwest beaches. When plovers had healthy populations, they were able to weather the severe storms, flooded beaches and other disturbance events. But by 1985, the shorebirds had been pushed too far. Nationwide, populations had plummeted and by 1985, piping plovers in the Great Lakes watershed were listed as endangered.

Only 24 Great Lakes piping plovers were left in 1990. All in Michigan. With help and hard work from partners, we've grown the population to more than 160 breeding adult birds, thanks in part to funding from the Great Lakes Restoration Initiative.

"Funds from this initiative have allowed our program to go from triage to something proactive," said Jillian Farkas, a biologist with the U.S. Fish and Wildlife Service working on the Great Lakes piping plover recovery team. Michigan was a stronghold for the birds during their lowest numbers, but today plovers are breeding in all five Great Lakes, including four states and two countries. We have halted their rapid decline, reversed population trends, and now we are spreading a passion for conservation on their wings.

No chick left behind: Predator management and captive rearing

How did we do it? Teamwork, passion, and predator management. It's a wild world and every year piping plover parents raising their families are attacked by a variety of predators including merlins, coyotes and off-leash dogs. To protect the nests and chicks, we raise fences, install signage and deploy a passionate force of volunteers. Some piping plover nests receive a nearly 24/7 volunteer watch!

But if the threat isn't a predator, it's the water. Flooding reshapes beaches, and with increasingly unexpected weather patterns, more piping plovers are being forced to abandon their families. In 2023, the recovery team rescued and fledged 39 chicks— including some from Canada —



Keith Lott/USFWS

U.S. Fish and Wildlife Service biologists installed an enclosure around a piping plover nest in order to protect the eggs from predators. Plovers are able to freely move through the fencing.

and sent them into the world's only piping plover captive-rearing facility, run by the Detroit Zoo at the University of Michigan Biological Station and funded by the Great Lakes Restoration Initiative.

Prior to 2023, all captive-reared birds had been released on Michigan beaches. With so many captive-reared chicks, however, we had the opportunity to re-establish previous piping plover nesting sites. For the first time, beaches in Illinois, New York and Wisconsin were selected as release sites.

We know it's working. The Great Lakes population has nearly quadrupled with a record breaking 81 breeding pairs – plus the new fledglings.

We are encouraged by the progress that has been made, but our work is not done. The Great Lakes population of piping plovers is a prime example of a species that is stable and slowly recovering thanks to the protections provided by the ESA, but our efforts must continue in order to rehabilitate the population. Thank you to the volunteers, partners and funding from the Great Lakes Restoration Initiative who make it all possible.

The U.S. Fish and Wildlife Service's Coastal Program supports Tribal-led habitat restoration and stewardship with the help of Great Lakes Restoration Initiative funding. For example, the Little Traverse Bay Bands of Odawa Indians have been implementing habitat restoration and monitoring on High Island in Lake Michigan. The island supports critical habitat for the federally endangered Great Lakes piping plover and suitable habitat for federally threatened plants.

A few years ago, the Tribe and volunteers restored more than three acres of habitat, which is part of a broader effort to restore more than 13 acres of habitat. In 2023, the Tribe had found seven piping plover nests on High Island. The High Island nests contributed to a record 80 nesting pairs (at the time) – the most nests in the Great Lakes since the piping plover's federal listing in 1985.

The island hosts a wide range of unique habitats, including glacial drift, perched sand dunes and sandy beach ridges. Since 2002, the Coastal Program has supported habitat restoration and monitoring efforts by the Tribe by conducting project planning activities, such as habitat assessments and project compliance.

Lake sturgeon resilience and their steady resurgence

By Janet Lebson

Last year after conducting a thorough species status assessment, our agency determined that lake sturgeon do not require listing under the Endangered Species Act. However, there is still work to do and lake sturgeon still need our help.

Justin Chiotti/USFWS



Great Lakes Restoration Initiative funds have helped to halt the plummeting population trend for lake sturgeon and buoy populations across the region.

We at the U.S. Fish and Wildlife Service have worked to halt the decline of lake sturgeon populations and to support our partners in bringing back this flagship fishery throughout the Great Lakes and beyond. One of the most wide-ranging fish in the world, lake sturgeon once ranged throughout 24 states and five Canadian provinces. The Great Lakes Basin remains home to the largest remaining population and offers an optimal combination of big lakes and rivers lake sturgeon need for survival. It is a prime place for us to invest in lake sturgeon recovery.

Thanks to investments from the Great Lakes Restoration Initiative, our efforts have been targeted and supercharged over the last 15 years. Recognizing the positive trajectory from collaborative conservation, in 2024 our agency announced that the lake sturgeon would not be added to the federal list of endangered species. The fact that we are seeing more and more lake sturgeon populations spawning in their historical habitat is a clear sign that restoration efforts are progressing.

The struggle for survival

Lake sturgeon have struck awe in people for millennia and still inspire us today. These prehistoric-looking fish can be up to seven feet long, weigh up to 300 pounds and live for 50 to 100 years. They migrate to spawn and some have been recorded moving hundreds of miles throughout watersheds.

Unfortunately, we almost lost this iconic species despite their resilience and larger-than-life reputation. Lake sturgeon were overharvested in the 1800s and targeted for eradication, being perceived as a nuisance fish. Their population was decimated and these gentle giants faced increasing threats, such as industrial contamination and the damming of rivers, throughout the 1900s. Estimates indicate that the lake sturgeon population is now less than 150,000, just 1% of their estimated historic population of 15 million.

Efforts to improve water quality, increase fish populations and improve aquatic habitat started in the 1960s and were bolstered by laws such as the Clean Water Act and the Endangered Species Act in the 1970s. More environmental laws and partnerships established throughout the 1980s and 1990s expanded those early efforts. It took until the 2000s before we started seeing progress, in part because lake sturgeon can take decades to reach reproductive age. Thanks to landscape-scale collaboration through the Great Lakes Restoration Initiative, lake sturgeon restoration efforts finally have funding and resources to meet the challenge. Recovery has begun across their historic range.

Efforts to boost populations

We work alongside American Indian Tribes and First Nations, states, provinces and countless conservation groups and community partners to restore lake sturgeon. The most widespread, ongoing conservation actions are rearing lake sturgeon in fish hatcheries and streamside rearing trailers and tagging them for ongoing monitoring before reintroducing them into the wild. We also work to remove or adapt dams, construct fishways and restore habitat. These efforts have bolstered existing populations and returned lake sturgeon to areas where they had disappeared. In many parts of their range, we have eventually seen spawning activity once reintroduced sturgeon reach reproductive age, which can take 15 to 30 years.

Here are some notable signs of our progress:

- Working with the State of Ohio, we are exploring the possibility of reintroducing lake sturgeon to the Cuyahoga River, a triumphant milestone that would have been impossible 50 years ago, but environmental cleanup has made the river viable habitat once again.
- We have renewed hope along the 100-mile corridor connecting Lakes Huron and Erie, where the St. Clair

and Detroit Rivers flow and the largest lake sturgeon population remains. Dredging destroyed much of the prime spawning habitat but partners restored 20 acres of reef in these rivers. We are now consistently finding sturgeon eggs year after year.

- We celebrate the lake sturgeon's resurgence on the Manistee River in Michigan, where the Little River Band of Ottawa Indians pioneered streamside rearing of lake sturgeon 20 years ago, helping to restore the community's relationship with the clan animal they call nmé.
- Lake sturgeon assessments in the upper and lower Niagara River have provided New York state with 10 years of demographic data leading New York to downlist lake sturgeon from Threatened to Special Concern.

All of these successes are leveraged with other partnerships and resources outside the scope of the Great Lakes Restoration Initiative and significantly benefit the species as a whole. Good examples in recent years are the return of lake sturgeon spawning on the Red River on the Minnesota/North Dakota border and the Osage River in Missouri.

In addition, ongoing environmental cleanup will always be a component of lake sturgeon restoration. Monitoring the impacts of environmental contamination in Areas of Concern supports mitigation efforts to prevent harm to fish and wildlife from pollutants.

If we continue to follow the current trajectory, our actions will ultimately create healthy, self-sustaining populations in more areas. When we work to reverse the damage, lake sturgeon respond.

To learn more about lake sturgeon and recent efforts in the Great Lakes, visit fws.gov and read "Restoring reverence along with the lake sturgeon" by Janet Lebson.

Cuyahoga River: Troubled waters see significant recovery

By Ashley Peters



Kayakers paddle the Cuyahoga River. Restoration work enhances recreational opportunities and benefits regional communities who rely on the Great Lakes ecosystem.

DJ Reiser/NPS

The Cuyahoga River and dozens of other toxic hotspots were designated as Areas of Concern decades ago. The Great Lakes Restoration Initiative has been an important source of funding for areas like the Cuyahoga River and has bolstered significant progress towards restoration goals.

More than 55 years ago, the Cuyahoga River's burning surface made national news and entered the public consciousness. The Environmental Protection Agency has partnered with the U.S. Fish and Wildlife Service and many other state and local agencies to bring back the health of public waters, like the Cuyahoga, thanks in part to funding from the Great Lakes Restoration Initiative. Our agency is proud to support the process of restoring Areas of Concern and helping fish and wildlife across the region.

Tackling the problem

An image of the burning Cuyahoga River in Ohio appeared in a popular national magazine in 1969 and the river had burned at least a dozen times before then. The river was lifeless and described as having almost no fish present in the 50 miles between Akron and Cleveland, where the putrid river emptied into Lake Erie.

In 1987, the Cuyahoga was named an Area of Concern due to the extent of the pollution and industrial contamination, making it a toxic hotspot. According to the Environmental Protection Agency who oversees Areas of Concern and the Great Lakes Restoration Initiative, the concern for the Cuyahoga was due to erosion, water quality impacts from city and agricultural discharges, and historic contamination.

Also in 1987, the U.S. and Canada updated the Great Lakes Water Quality Agreement, which laid out a plan for improving water quality. Individual checklists were created for each of the 31 toxic hotspots in the U.S., which outlined the steps to restore or "delist" an area. The Cuyahoga wasn't beyond hope, but it would take a herculean effort to turn plans into real-world progress.

Improvement of habitat and water quality

Between the 1980s and the early 2000s, the restoration of the Cuyahoga was slow but steady through implementation of cooperative agreements and local work. While positive changes were being made across the Great Lakes, limited resources

meant that there was only one Area of Concern taken off the toxic hotspots list before 2010.

However, more funding and more resources became available with the passage of the Great Lakes Restoration Initiative in 2010, especially because one-third of that funding is put towards Areas of Concern restoration. By 2017, partners had seen enough progress on the Cuyahoga that they finally checked off their first big restoration goal. The decades of preparation and work are paying off. Today, the Cuyahoga River Area of Concern is no longer the eyesore it once was, it has no restrictions on fish and wildlife consumption, the fish are healthier and algal blooms have been reduced.

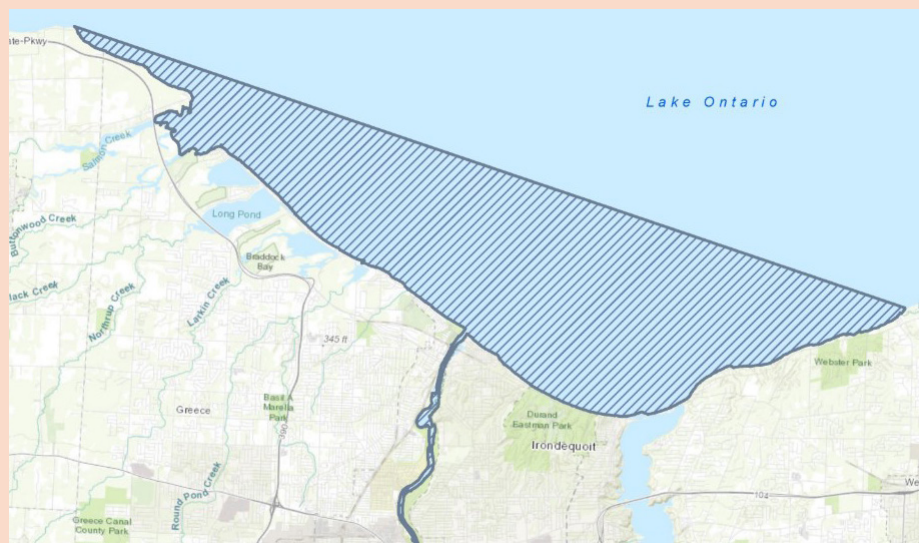
Reintroduction of a prehistoric species

While there is still work to be done and the Cuyahoga might be years away from being fully restored, there is cause for celebration. Last year, our agency worked with Ohio to take significant steps to consider reintroducing lake sturgeon to those waters. The Cuyahoga River historically supported spawning

lake sturgeon but that has not been the case for more than a century. Conditions have now improved and the restoration of lake sturgeon in the river is an exciting possibility. The creation of fish habitat and the improvement in water quality is an incredible testament to our work and the work of partners.

The good news doesn't stop there – we are on track to see continued progress. The Environmental Protection Agency along with our agency and other partners intend to remove seven more Areas of Concern by 2030. To date, seven Areas of Concern have been delisted, including the most recent 2024 delisting of New York's Rochester Embayment Area of Concern.

As you will read elsewhere in this booklet, Great Lakes Restoration Initiative funding supports the recovery of Areas of Concern, prevention of invasive species spreading through watersheds, restoration of species like the lake sturgeon, and establishing foundations for future actions. To learn more about our work with lake sturgeon, read more in "Lake sturgeon resilience and their steady resurgence" on page 8.



Rochester Embayment Area of Concern

Out of 31 total Areas of Concern in the United States Great Lakes region, the Rochester Embayment Area of Concern was the seventh area to be officially removed from the Environmental Protection Agency's list of Areas of Concern in October 2024. The 35-square mile bay on Lake Ontario's south shore in New York is no longer considered one of the Great Lakes' most environmentally degraded areas.

Standing together against the threat of invasive carp

By Janet Lebson

A fish biologist holding a bighead carp. In 2011, bighead carp was listed as an injurious species under federal Lacey Act.

Ryan Hagerty/USFWS



A call to action for Great Lakes partners: Over the last 15 years, steady investments have made our collective efforts possible, enabling us to defend the health of the Great Lakes.

The first investments in invasive carp management under the Great Lakes Restoration Initiative came right on time. By the 2000s it seemed possible invasive carp could someday dominate the waterscape of the whole 31-state Mississippi River Basin—and eventually the Great Lakes.

We at the U.S. Fish and Wildlife Service, along with states and other natural resource managers, were increasingly concerned as invasive carp spread in every direction. Managing this proliferation had already become one of the most wide-ranging and complex conservation challenges of modern times.

From their starting point in the lower Mississippi River in the 1970s, invasive carp surged west into the Arkansas, Red and White rivers, south into the delta region, northeast into the Ohio River, east and south into the Tennessee and Cumberland rivers and northwest into the Missouri River. Because of their voracious feeding habits, prolific reproduction and lack of predators, invasive carp soon infested scores of tributaries, lakes and reservoirs.

It was the abundance of invasive carp in the Illinois River, with its connection to Lake Michigan through the Chicago Area Waterway System, that prompted urgent action for the Great Lakes. Just as the Great Lakes Restoration Initiative was becoming a reality, a detection of invasive carp environmental DNA and then a discovery of a live bighead carp in the Chicago waterway underscored the need for more investment in coordinated management.

A multi-agency rapid response team assembled and the group was formalized in 2010, bringing partners together to

safeguard Lake Michigan and the rest of the Great Lakes. The Invasive Carp Regional Coordinating Committee now includes 26 state, provincial, Tribal, federal, and municipal agencies and bi-national commissions.

Protecting American values

Invasive carp, notably bighead, silver, grass and black, have devastating effects on the environment, our way of life and livelihoods. Communities up and down the Mississippi River and its tributaries already know about the destruction invasive carp can bring. In the most infested areas, families are deprived of their favorite on-the-water pastimes and tourism-related businesses lose their means to make a living. Native species, sportfisheries and commercial industries are heavily impacted as invasive carp dominate new waterways and outcompete other species.

We at the U.S. Fish and Wildlife Service and the U.S. Environmental Protection Agency, along with two dozen partners, are committed to making sure our treasured Great Lakes don't meet the same fate. Currently, 45 projects led by members of the Invasive Carp Regional Coordinating Committee are significantly supported by the Great Lakes Restoration Initiative. In fiscal year 2024, the initiative bolstered members' funding with \$21 million out of the \$47 million total project cost.

Over the last 15 years, these steady investments have made it possible to fortify, improve and accelerate our collective efforts to defend the health of the Great Lakes against the threat of invasive carp.

We will hold fast to our shared commitment to protect the Great Lakes. When it comes to invasive carp, we know all too well that the old adage is true: An ounce of prevention is worth a pound of cure.



Illinois Department of Natural Resources and partners harvest invasive carp using the Unified Method.

Illinois Department of Natural Resources

Powerful partnerships

Natural resource management agencies have organized into regional partnerships to most effectively battle invasive carp.

Investments from the Great Lakes Restoration Initiative support the Invasive Carp Regional Coordinating Committee with its focus on the Illinois River and the Great Lakes Basin. The U.S. Fish and Wildlife Service and U.S. Environmental Protection Agency have leading roles in this partnership.

Six other partnerships are based within sub-basins of the Mississippi River, organized under the broader scope of the 28-state Mississippi Interstate Cooperative Resource Association. The U.S. Fish and Wildlife Service has a leading role in these partnerships, too, providing agency funding to states and other partners to support priority projects.

We are currently carrying out more than 80 projects to manage invasive carp through all these regional partnerships.

Independently and altogether, these are among the largest coordinated conservation efforts in North America.

More on our invasive carp partnerships

The Great Lakes attract millions of anglers, support valuable commercial and charter fishing, and are a binational treasure worth more than \$5 billion annually. This incredible resource is at risk if we don't address the threat of invasive carp today. We are investing in the future of our fisheries, especially for the 35 million people who live in the Great Lakes Basin.

Joanna Gilkeson/USFWS



Leveraging for advantage

Because invasive carp management is so broad and complicated, our ability to pool our expertise, resources and information is the main leverage we have. Here are the ways we confront the challenges:

Partners gather and analyze data to inform management approaches

Monitoring the Illinois River population helps gather crucial information on invasive carps' life cycle, abundance, congregating habits and movement. Throughout the Great Lakes Basin, we conduct sampling to screen for the presence of invasive carp as well as environmental DNA, an early detection tool. We implant individual invasive carp with coded tags and use a network of telemetry arrays to track their movement. All the data we gather and analyze helps us improve the effectiveness of removal efforts, develop deterrents and assess the effects of different management actions.

Partners work with commercial fishers and use special methods for mass removal

On the Illinois River, about 8 million pounds of invasive carp are now removed annually, reducing the number moving upstream and the likelihood of their introduction in new areas. To further incentivize the partnership

with commercial fishers and increase removal, the State of Illinois launched a special initiative in 2022 to encourage restaurants and consumers to cook with invasive carp, or "copi." The goal is to develop a new domestic commercial market for these fish that are widely consumed around the world.

Partners develop deterrents and barriers to invasive carp movement and evaluate their effectiveness

The main deterrent system currently protecting the Great Lakes is the Electric Dispersal Barrier System operated by the U.S. Army Corps of Engineers since 2002 and located on the Illinois River in Romeoville, Illinois, about 30 miles from Lake Michigan. In addition to this continuous electrical current system, the agency is testing underwater sound, carbon dioxide and automated barge clearing as additional deterrent components. Partners are developing and evaluating a range of other deterrents to be used in conjunction with removal of fish to improve control.



Our most notable sign of progress in protecting the Great Lakes from invasive carp is what we have carefully managed to avoid: The Illinois River population front has not advanced in more than 10 years. Our ability to hold the line is attributable to scores of projects supported by the Great Lakes Restoration Initiative.

Ryan Hagerty/USFWS

Updates on Invasive carp deterrents

The U.S. Army Corps of Engineers and the States of Illinois and Michigan are developing the Brandon Road Interbasin Project at the Brandon Road Lock and Dam on the Illinois River near Joliet, Illinois, about 40 miles from Lake Michigan. This project integrates different deterrent technologies, including underwater sound, bubble curtains and flushing lock, to create a more robust line of defense for the Chicago waterway's access point to the Great Lakes. In 2024, the agency began the construction phase of this project.

In an interbasin study, the U.S. Army Corps of Engineers identified three areas that could be potential pathways for invasive carp movement into the Great Lakes during intermittent high water events. Partners constructed barriers to reduce this risk at Eagle Marsh in Fort Wayne, Indiana, in 2016 and at the Ohio & Erie Canal in Akron, Ohio, in 2020. In 2024, the first phase of barrier construction was completed at the third location, Little Killbuck Creek near Wooster, Ohio.

Partners are nearing completion on a 3-year experimental project testing an underwater acoustics deterrent system on the Mississippi River at Lock and Dam No. 19 in Keokuk, Iowa. Long serving as a pinch point for dense populations moving north along the Mississippi River, this dam site was chosen as the best location for this particular experiment due to the physical characteristics of the site and the presence of established invasive carp for tracking. Data will inform options for future Great Lakes Basin projects, including the Brandon Road Interbasin Project.

Partners are nearing completion on a 3-year experimental project testing the effectiveness of a bio-acoustic fish fence, a deterrent system at Barkley Lock and Dam on the Cumberland River in Kentucky. This features a combination of sound, light and air bubbles. The site was chosen as the best location for this particular experiment due to the physical characteristics of the site and the presence of established invasive carp for tracking. Data will inform options for future Great Lakes Basin projects.

Taking stock of our progress for lake trout

By Janet Lebson

Emblematic of the Great Lakes, lake trout are prized as both a recreational and commercial fishery.

Katie Steiger-Meister/USFWS



A comeback for lake trout was half a century in the making when the extra boost from the Great Lakes Restoration Initiative accelerated the recovery of this once-devastated fishery.

Thanks to steady investments from the Great Lakes Restoration Initiative, we at the U.S. Fish and Wildlife Service—along with a network of partners across the Great Lakes waterscape—can begin to celebrate the return of a native fish. Restoration began as long ago as the 1960s, when lake trout were nearly gone from the Great Lakes after suffering from a combination of overharvest and sea lamprey predation. All that remained were remnant populations in Lake Superior and a small population in Lake Huron.

Today, lake trout are fully recovered in Lake Superior and notably closer to that goal in the other two upper Great Lakes. We have been able to reduce stocking lake trout in Lake Huron by 60% over the last 5 years due to natural reproduction success. Over the last 10-15 years, we are also seeing more evidence of reproduction in Lake Michigan, especially in areas where large numbers of lake trout historically gathered during spawning. Evidence of reproduction has been coming more slowly for Lakes Erie and Ontario where recovery is more challenging.

Some crucial components of the restoration program simply would not exist without the Great Lakes Restoration Initiative, particularly the mass marking program. This is a primary way of gathering information on how stocked fish are faring so partners can make well-informed management decisions going forward. The initiative also has made it possible to greatly improve our hatchery facilities so we can raise healthier fish to meet our goal of restoring self-sustaining populations.

Double trouble

Lake trout were already struggling from overharvest when sea lamprey invaded the lakes and preyed on lake trout en masse. Since 1958, a sea lamprey control program spearheaded by the Great Lakes Fishery Commission, working with the U.S. Fish and Wildlife Service and the Department of Fisheries and Oceans Canada, has relied on a

It takes a network

The U.S. Fish and Wildlife Service contributes extensive expertise and resources for lake trout restoration. We have a leading role in what is notably the largest freshwater fisheries restoration effort in the world in terms of geographic scope, number of partners involved, number of fish stocked and sustained commitment.

The Great Lakes Fishery Commission, established in 1954, is the main hub for partners' coordination on lake trout and other fisheries conservation. Lake by lake, the commission brings partners together to set fishery restoration benchmarks and monitor progress. Tribes, First Nations, states and provinces make fisheries management decisions for their waters, including where and how many lake trout to stock to meet restoration targets. The U.S. Fish and Wildlife Service's role supports our partners' strategic decision-making.

lampricide called TFM to specifically target sea lamprey in their larval stage. Partners have now reduced sea lamprey by 90% in most areas. Dealing with the sea lamprey threat was a priority to ensure fish stocking could succeed.

Hatcheries to the rescue

Since the 1960s, the lake trout restoration program has relied on stocking hatchery-raised fish to supplement wild populations. The U.S. Fish and Wildlife Service is now releasing 3.7 million hatchery-reared fish every year in the four Great Lakes where lake trout are still charting a comeback.

It all starts with “egg takes.” Every year, our vessels are out on the Great Lakes for various fisheries surveys. Every 7 to 10 years during these surveys, we capture a small number of wild lake trout to collect eggs from females and milt from males to create future “broodstock.”

Future broodstock are first isolated at our Genoa National Fish Hatchery in Wisconsin to clear health inspections over an 18-month cycle. This allows us to sample for genetic diversity and perform fish diagnostics to help ensure we raise healthy fisheries for future stocking. Five other national fish hatcheries in Michigan, Pennsylvania and Wisconsin will eventually raise lake trout for stocking from these healthy lines.

Our Midwest Fishery Center in La Crosse, Wisconsin, and our Northeast Fishery Center in Lamar, Pennsylvania, provide fish health services for all the hatcheries that rear lake trout for reintroduction.

Marking our progress

Before lake trout are stocked in the Great Lakes, we mark them with a small fin clip and coded tag so we can continue to learn about their movement, life cycle needs, survival and reproduction. Our fish tagging and lake surveys provide all kinds of information that eventually guides our partners' fisheries management decisions, such as the best locations and how many fish to stock, as well as harvest regulations.

Our Green Bay Fish and Wildlife Conservation Office in Wisconsin travels to all lake trout-rearing hatcheries serving the Great Lakes to mark and tag fish prior to their release. A mass marking/tagging trailer is employed to tag as many as 8,500 lake trout per hour. Our experts in several Fish and Wildlife Conservation Offices throughout the Great Lakes Basin analyze vital information from recovered mass-marked fish.

Lake trout will be considered restored when stocking is no longer necessary because we see enough populations reproducing sufficiently on their own to remain robust and replenishing. When we reach that goal for this magnificent fishery, the Great Lakes Restoration Initiative will have been a pivotal part of our progress.

Bee a force for good: Pollinator restoration in the Great Lakes

By Gigi Otten

The rusty patched bumble bee, pictured, is listed as endangered under the Endangered Species Act and is one of many pollinators that has a struggling population and needs our help to recover.

Jill Utrup/USFWS



Through the funding and multi-agency collaboration under the Great Lakes Restoration Initiative, the Pollinator Task Force was established. The task force is now executing cutting-edge research, practicing adaptive management and strategic habitat conservation at scale, and providing tools to be used and applied by anyone within the Great Lakes Basin.

Recently, we at the U.S. Fish and Wildlife Service announced that monarch butterflies are proposed as threatened under the Endangered Species Act. In addition to the status of monarchs, pollinators of all kinds are struggling and need our help. Our agency and our partners are actively engaged in conserving pollinators through surveys and monitoring, conservation planning, research, habitat management and enhancement, as well as outreach efforts. We have leveraged Great Lakes Restoration Initiative funding to improve native pollinator habitat across the Midwestern and Northeastern U.S.

Habitat loss is the number one challenge for most pollinators and, six years ago, our agency initiated the Great Lakes Pollinator Task Force, a team that has since initiated projects to improve habitat for other pollinators, plants and wildlife. The task force conducted surveys to determine which geographies needed the most help. Already, the task force participants and their partners have restored 4,000 acres inside the priority areas. In addition to helping bees, butterflies and busy pollinators of all kinds, these acres restored also help clean the water and provide habitat for other native wildlife.

Research informs habitat restoration

The task force is investigating creative new ways to protect native insects; for example, they are determining how to conserve pollinators even when pesticides are present. Additionally, they are coordinating and communicating with groups outside of our agency to spread the message, garner support and connect efforts.

“Pollinators are silent nurturers of our planet, essential for the survival of over 80% of the world’s flowering plants,” said Meredith Holm, a biologist with our agency who coordinates the Great Lakes Restoration Initiative Pollinator Task

Force. “Without them, our landscapes would be unrecognizable and our food sources vastly diminished.”

Understanding native pollinators is key to understanding ecosystem health. In the United States, there are more than 1,000 species of butterflies and moths and more than 3,600 native bee species. Most Great Lakes states have more than 400 species of bees. However, to begin improving pollinator health around the Great Lakes, the task force needed more research to know where species still exist and what areas are supporting healthy populations.

Many of our National Wildlife Refuges had no data on native bee populations or presence on their lands, and neither did many other federal agencies. Field staff conducted public land surveys and they were able to clarify the presence and ranges of native bee species. During the surveys, they recorded a bee species that was previously thought to be extinct in Wisconsin. They were also the first to identify the spread of an invasive bee species into Michigan, the invasive Mediterranean golden-tailed woodborer bee, which is responsible for causing damage to wood structures. Having an early warning has helped the staff at the Detroit River International Wildlife Refuge to mitigate damage and pivot to habitat restoration plans that exclude the invasive bee.

Not surprisingly, the task force work suggests that many native bee and pollinator populations are in decline or at risk. The good news is that these pollinators can benefit from conservation action and wildlife tend to do well when we give them a chance.

Building buzz and transforming backyards

The task force has combined their newer, more accurate species distribution map with additional datasets like insecticide



A GLRI Pollinator Task Force sign among beautiful restored pollinator habitat in Detroit, Michigan.

use and habitat resiliency. This Focus Area Map is publicly available and helped them to choose distinct focus areas that could benefit the most from their help and begin planning projects to start work immediately.

The task force is working on several research projects, but also wants to communicate their findings and their passion for conservation. Communication efforts by the task force include hosting stewardship days, pollinator education events, bi-annual workshops, running social media campaigns, publishing a pollinator landscape guide, writing and distributing quarterly newsletters and more.

You can join the Great Lakes Pollinator Task Force as they collaborate, communicate, learn and share. Local events may be held in your area and you can learn to transform your backyard into a pollinator haven. We encourage you to learn more and share with friends and family how to help monarchs, bees and pollinators of all kinds.

Restoration drives refuge habitat recovery

By Ashley Peters

A great egret stands on a post at Shiawassee National Wildlife Refuge, which provides habitat for more than 250 species of birds and serves as an important migratory stopover for tens of thousands of waterbirds. Great egrets are one of the many colonial nesting waterbirds that use the refuge during their breeding season.

Mike Budd/USFWS



Work at Shiawassee National Wildlife Refuge is emblematic of work funded by the Great Lakes Restoration Initiative, including innovative approaches to building partnerships and restoring wetlands.

Over the past 15 years, we at the U.S. Fish and Wildlife Service, along with our partners, have restored more than 80,000 acres of wetlands, grasslands and shorelines thanks to the Great Lakes Restoration Initiative.

More than a decade ago, Shiawassee National Wildlife Refuge was one of the first places to see habitat improvement through initiative funding. More than 1,000 acres of wetland habitats have been restored at the 10,000-acre refuge.

Restoration efforts have been ongoing across the Shiawassee Flats, which include the Shiawassee National Wildlife Refuge, a state game refuge and adjacent wetland complexes. Furthermore, the refuge continues to be a popular recreational haven for birdwatchers, anglers and hunters.

Through the resources provided to our agency, our partners, Tribal Nations, state and federal agencies and private landowners, we have seen profound

improvements made in Great Lakes fish and wildlife habitats. Funds have enabled us to save vital habitats, restore wetlands, enhance grasslands and improve our understanding of fish and wildlife needs.

Establishing a baseline

Before and during restoration efforts, our staff examine how fish and wildlife interact with available habitats. At Shiawassee National Wildlife Refuge, our agency partnered with the University of Michigan, the Michigan Department of Natural Resources and others to collect samples of fish, aquatic macroinvertebrates, water chemistry, vegetation and flow data. These datasets provide vital context for restoration planning and enable experts to track changing conditions for fish and wildlife.

Innovating with sonar and machine-learning

To further understand the refuge, scientists also analyzed water flow and studied how fish communities move

between wetlands, rivers and the Saginaw Bay. We worked with partners to use hydroacoustic sonar to collect continuous data and then, a machine-learning model processed and analyzed the dataset.

Restoring natural water cycles

As our team and partners gathered vital information, we simultaneously advanced restoration work. In 2011, GLRI funding facilitated a partnership between the refuge and Ducks Unlimited to develop a multi-phased restoration plan to reconnect the wetlands to the Shiawassee and other rivers. This project, supported by numerous partners including the Saginaw Bay Watershed Initiative Network and the U.S. Geological Survey, has revived the floodplain within the refuge. The restored wetlands provide crucial water filtration and occasional flood protection for a watershed that supports 1.4 million residents.

- 1 2010:** Restored the hydrology of Moist Soil Unit 7. It was the very first habitat restoration project ever funded by GLRI across the entire Great Lakes Basin.
- 2 2011-2020:** Restored wetlands hydrology for 940 acres of Maankiki Marsh in the heart of the refuge.
- 3 2018:** Removed a dike and constructed a small barrier island to stop wave fetch and erosion from damaging the wildlife drive and to protect habitat.
- 4 2019:** Enhanced 850 acres of floodplain forest and restored prairie habitat.
- 5 2020:** Enhanced 100 acres of Moist Soil Unit 9.
- 6 2020:** Installed carp exclusion gates and actuators to limit invasive species entering the refuge.
- 7 2024:** Restored Germania Long Pond, removed cart paths from the former golf course, and restored 50 acres for pollinator habitat.
- 8 2024:** 80 acres of wetland restored at the Little Prairie units.



Environmental DNA reveals invasive species

By Laura Vachula

Collecting water samples in Presque Isle Bay for eDNA work
Alexa Davis/USFWS



The Great Lakes Restoration Initiative has supported the use of environmental DNA (eDNA) for early detection of invasive fish in the region. By alerting experts to the arrival of new invasive fish, eDNA can help to prevent costly eradication efforts years later.

“It’s like trying to find a needle in 100,000 haystacks.”

That’s the metaphor Dr. Zy Biesinger uses to describe the challenge of catching a newly introduced invasive fish in the Great Lakes. You might have a better chance buying a winning lottery ticket.

“And if you don’t find them before they start spreading, then it’s too late,” said Biesinger, fish biologist at the U.S. Fish and Wildlife Service’s Lower Great Lakes Fish and Wildlife Conservation Office in Basom, New York. At that point, eliminating the species becomes challenging and costly.

In the Great Lakes, where controlling invasive species, like carp and sea lamprey, already costs millions of dollars each year, preventing the establishment and spread of new ones is critical. Fortunately, scientists have a trick up their sleeves — one that allows them to detect a fish without even seeing it. Testing the water, scientists can identify fish species present in an area by looking at the DNA they leave behind — a vital clue to combat invasive species early.

The magic of metabarcoding

Environmental DNA, or eDNA, can come from a fish’s shed scales, feces or other secretions. Like an amateur criminal, they leave DNA everywhere they go, and it can persist in the water for a couple days.

Scientists at our Northeast Fishery Center and Whitney Genetics Lab process eDNA samples in their labs and, through a technology known as metabarcoding, identify each species that was present when the water sample was taken. Similar to a barcode on your cereal box, each species has a unique DNA sequence.

In the biology field, metabarcoding is a well known and widely used technology, often used to identify species. But using it on this large scale — processing thousands of samples annually — is novel and exciting.

“It allows us to be much broader in our search for aquatic invasive species,” said Dr. Aaron Maloy, geneticist at the Northeast Fishery Center.

A strong foundation

Successful metabarcoding relies on a complete reference database. The process matches DNA found in a water sample with the DNA of known species. Without reference data, it isn’t possible to identify individual species and determine if there’s something new in the water. It’s kind of like playing “Go Fish” with a single suit of cards.

“Building out that reference data set and completing it for all of the fish species of the Great Lakes Basin has been really critical to getting the project up and running,” Maloy said.

Collecting reference data has been a collaborative project between our Fish and Wildlife Conservation Offices and partners, including state agencies, Tribes and universities.

“Partners are on the water handling fish for other purposes and for years have been opportunistically taking fin clips to support the reference database development,” he said. In the lab, the geneticists obtain DNA sequences from the known species and add them to the database.

Maloy believes the reference database for native species of the Great Lakes is now nearly 98% complete. With this, combined with DNA sequences from fish around the world — possible future

invasive species in the Great Lakes — geneticists can produce lists of species from lake samples they receive, revealing any fish that doesn’t belong.

Game changer

As with any tool, there are limitations. eDNA can travel to a body of water by bird feces, boats and other avenues. Finding DNA from a species doesn’t necessarily mean a live, invasive fish was present. But the rewards outweigh the risks. Metabarcoding is more efficient than other detection methods — like setting nets to catch invasive fish — and can expand the reach of the early-detection program.

“Metabarcoding takes fewer staff hours,” Biesinger said. “You can go to many more places and get much more information with relatively little effort.”

Biesinger’s team monitors and collects eDNA from a handful of sites in Lake Erie and Lake Ontario, while counterparts at the Ashland, Alpena and Green Bay fish and wildlife conservation offices, as well as conservation partners, cover other sections of the Great Lakes. For now, they’re sampling areas that have a high risk of invasive species being introduced — locations near large human populations.

Though early detection of invasive species is challenging, with metabarcoding, it’s easier. We can know if there’s a needle in the haystacks and generally which haystacks to look through. Having this information to act early can make all the difference.

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