

Great Lakes RESTORATION



Great Lakes Restoration Initiative Report to Congress

July 2025

Fiscal Year 2022



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About This Report

This report presents an overview of progress made under the Great Lakes Restoration Initiative (GLRI). It includes information through fiscal year 2022 on funding, project accomplishments, success stories, and actual results compared to planned targets under GLRI Action Plan III. Data on direct spending is taken from the U.S. Environmental Protection Agency (EPA) financial system. Any references to future actions are contingent on the availability of appropriations. Information on GLRI projects and activities also is available at <https://glri.us>.

The EPA Administrator is required by Clean Water Act Section 118 (c)(7)(H)(iii) to provide this report to the U.S. House Committee on Transportation and Infrastructure and the U.S. Senate Committee on Environment and Public Works.

Message from the Chair of the Great Lakes Interagency Task Force

The Great Lakes provide drinking water, recreational opportunities and economic value to tens of millions of Americans. With 10,000 miles of coastline, over 3,000 unique species, and a thriving \$5 trillion economy, it is vital to preserve these critical resources to Power the Great American Comeback.

The Great Lakes Restoration Initiative is proof that environmental protection and economic prosperity go hand in hand. An independent economic study found that every GLRI dollar spent produces \$3.35 of additional economic activity.

I am proud of the work done by the U.S. Environmental Protection Agency and our partners to restore and protect the Great Lakes ecosystem for every American. The GLRI has been made possible through resounding bipartisan support, the cooperation of 11 federal departments, and their partners from states, tribes, municipalities, businesses, citizens' organizations, academia and other stakeholders within the Great Lakes Basin. The GLRI has been a catalyst for this unprecedented cooperation that has delivered unprecedented results.

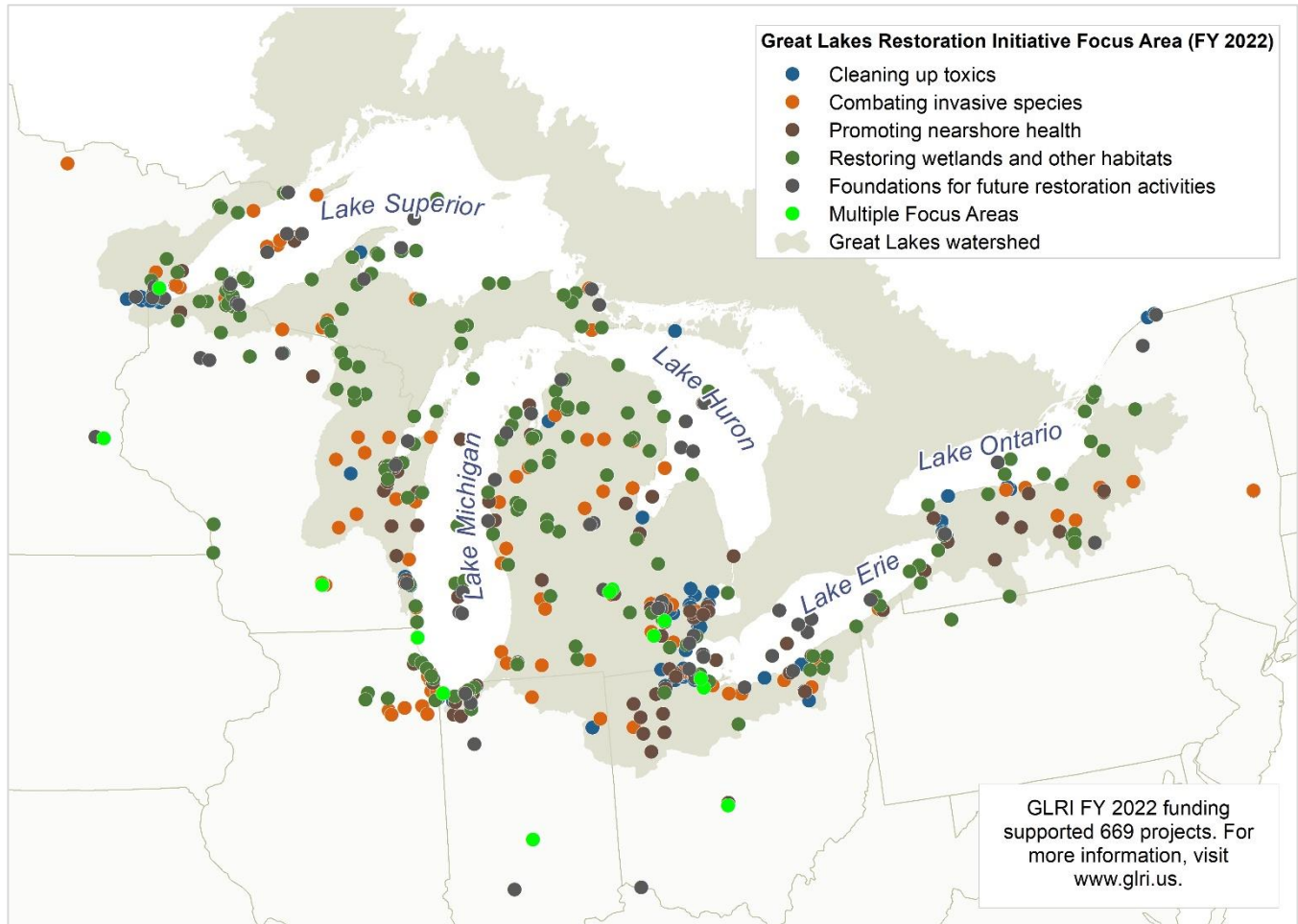
As this Report to Congress shows, the GLRI is accelerating the clean-up of contaminated hotspots known as "Areas of Concern"—areas that, once restored, will increase property values and property tax bases. Most notably, with the support of GLRI funds, all management actions required to ultimately delist were completed at the Buffalo River Area of Concern – bringing the total number of Areas of Concern either delisted or with completed management actions to more than one-half the original number.

Between the GLRI's inception in 2010 and the end of FY 2022, the U.S. Environmental Protection Agency and its partnering GLRI federal agencies invested over \$4 billion from the GLRI to implement more than 7,700 projects across the Great Lakes basin. GLRI-funded projects have kept silver carp, bighead carp, and black carp out of the Great Lakes, preventing irreparable harm to the region's economy and ecology. GLRI investments have also reduced nutrient runoff that contributes to harmful algal blooms in parts of the Great Lakes by working with farmers to put voluntary conservation practices into place in priority watersheds such as the Lower Fox River, Saginaw River, and Maumee River.

Having lived surrounded by water most of my life, and having fought to preserve Long Island Sound, I personally understand how important it is to protect national treasures like the Great Lakes. This is a mission worth fighting for and I look forward to achieving greater results in the coming years as we Power the Great American Comeback.

Lee Zeldin
Administrator, U.S. Environmental Protection Agency





Section 1 – Executive Summary

The Great Lakes Restoration Initiative, or the GLRI, has greatly accelerated efforts to protect and restore the Great Lakes—the largest system of fresh surface water in the world. Since its 2010 inception, the GLRI has continued to address the historically challenging environmental problems and imminent threats facing this irreplaceable ecosystem.

Under the leadership of the U.S. Environmental Protection Agency (EPA), the GLRI is a catalyst for unparalleled coordination among the GLRI federal agencies and departments that make up the GLRI Interagency Task Force and the GLRI Regional Working Group. Through fiscal year (FY) 2022, the GLRI funded over 7,700 projects that focus on the most important Great Lakes environmental issues, including cleaning up highly contaminated Areas of Concern (AOCs), protecting and restoring native habitat and species, and preventing and controlling invasive species.

Section 118 of the Clean Water Act (CWA) authorizes GLRI funding and directs efforts across five priority areas: (i) remediation of toxic substances and AOCs; (ii) prevention and control of invasive species and the impacts of invasive species; (iii) protection and restoration of nearshore health and the prevention and mitigation of nonpoint source pollution; (iv) habitat and wildlife protection and restoration, including wetlands restoration and preservation; and (v) accountability, monitoring, evaluation, communication, and partnership activities.

The GLRI [Action Plan III](#) focus areas described in this section correspond directly to the CWA five priority areas. This report provides an overview of progress during FY 2022 for each focus area within the Action Plan III.

GLRI Action Plan III Focus Areas

1) Toxic Substances and Areas of Concern

During FY 2022, GLRI federal agencies and their partners made significant progress remediating contaminated sediment and restoring habitat in AOCs.¹ A total of seven Beneficial Use Impairments (BUIs) were removed from AOCs, bringing the cumulative total of BUIs removed from the Great Lakes ecosystem to 113 since 2006, which surpasses the FY 2022 target set in GLRI Action Plan III (see [Appendix, Table A-1](#)). Through the end of FY 2022, GLRI federal agencies and their partners also completed all management actions necessary to delist the Buffalo River AOC, bringing the total of AOCs either delisted or with completed management actions to about one-half the original number of U.S. AOCs (i.e., 16 out of 31). The GLRI federal agencies and their partners also continued their work to protect human health from contaminants in Great Lakes fish and to assess the impacts of chemicals of emerging concern (e.g. per- and polyfluoroalkyl substances (PFAS)) on fish and wildlife populations in the Great Lakes basin.

2) Preventing and Controlling Invasive Species

During FY 2022, GLRI federal agencies and their partners continued efforts to prevent the introduction of new invasive species and to control existing invasive species throughout the Great Lakes ecosystem. Work continued on preventing the migration of silver carp, bighead carp, and black carp into the Great Lakes. Since the GLRI was launched in 2010, the GLRI federal agencies and their partners have taken actions to control invasive species on over 238,000 terrestrial and aquatic acres, including over 22,000 acres in FY 2022.

3) Nonpoint Source Pollution Impacts on Nearshore Health

During FY 2022, GLRI federal agencies and their partners implemented conservation activities to reduce nonpoint sources of pollution that threaten Great Lakes nearshore regions. These partners worked collaboratively to target nonpoint sources of excess phosphorus runoff that contribute to harmful algal blooms (HABs) around the Great Lakes in priority watersheds, such as the Lower Fox River, Saginaw River, and Maumee River. GLRI federal agencies estimate that GLRI-funded projects implemented since the program's inception have prevented over 2.3 million pounds of phosphorus from leaving farms and entering the Great Lakes (including over 268,000 pounds of phosphorus in FY 2022). In addition, GLRI federal agencies and their partners worked collaboratively in urban and suburban areas in FY 2022 to prevent more than 98 million gallons of polluted stormwater from entering the Great Lakes.

4) Habitat and Species

During FY 2022, GLRI federal agencies and their partners protected, restored, and enhanced habitats and native species populations throughout the Great Lakes basin. Since GLRI began, these efforts have included protecting and restoring over 506,000 acres of coastal wetland, nearshore, and other habitats (including over 26,000 acres in FY 2022). They also have benefited native fish, bird, and amphibian species, including significantly protecting and promoting recovery of the lake trout and Mitchell's satyr butterfly through completed management actions in FY 2022. Since the start of the GLRI, these actions have increased connectivity for aquatic organisms in more than 7,175 miles of streams and rivers (including over 445 miles in FY 2022).

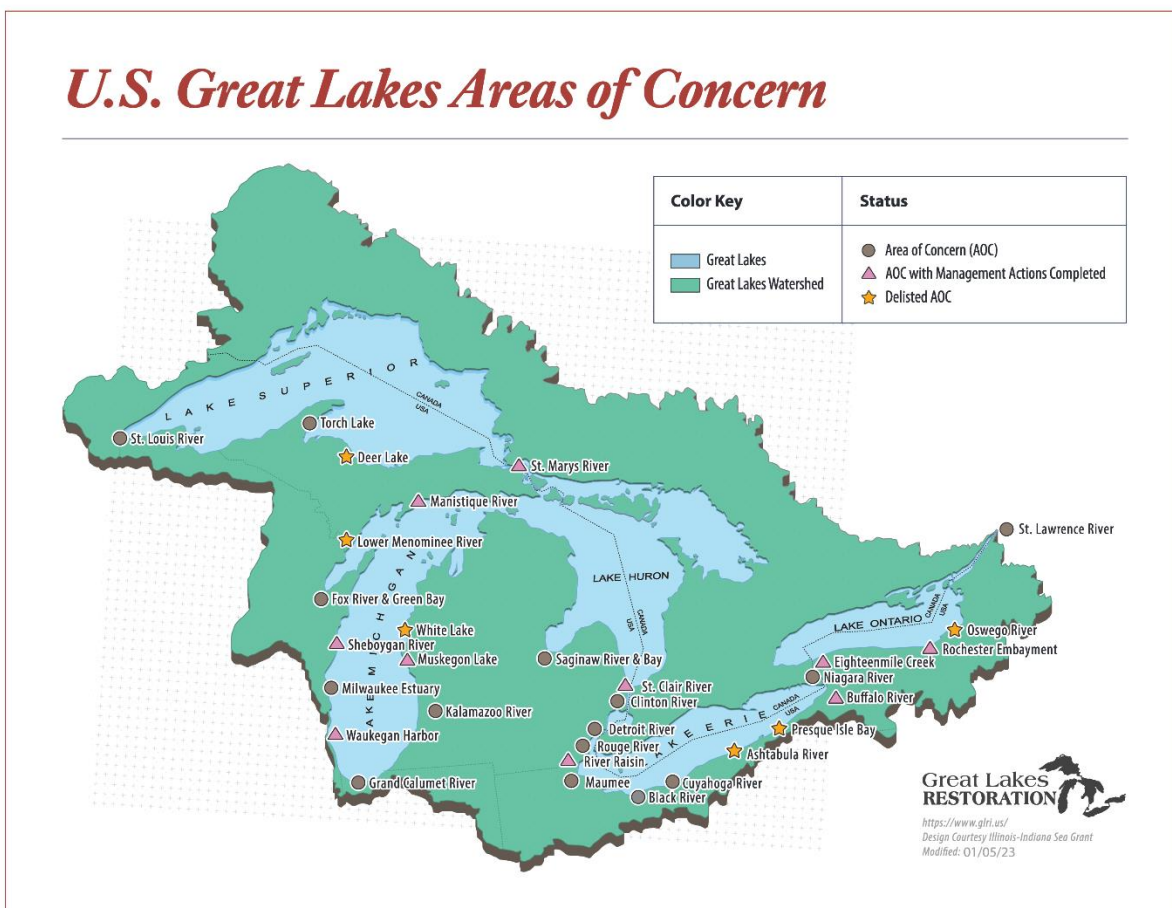
5) Foundations for Future Restoration Actions

During FY 2022, GLRI federal agencies and their partners engaged over 57,000 youth in hands-on education and stewardship projects. GLRI federal agencies and their partners also conducted comprehensive monitoring to assess and collect data on Great Lakes ecosystem status and trends. Those data guided plans for projects addressing coastal resiliency and both nuisance and harmful algae.

¹ Includes U.S. Department of Agriculture (Animal and Plant Health Inspection Service, Natural Resources Conservation Service, and U.S. Forest Service); U.S. Department of Commerce (National Oceanic and Atmospheric Administration); U.S. Department of the Army (U.S. Army Corps of Engineers); U.S. Department of Health and Human Services (Agency for Toxic Substances and Disease Registry and Centers for Disease Control and Prevention); U.S. Department of State; U.S. Department of Homeland Security (U.S. Coast Guard); U.S. Department of the Interior (Bureau of Indian Affairs, U.S. Fish and Wildlife Service, National Park Service, and U.S. Geological Survey); U.S. Department of Transportation (Federal Highway Administration and Maritime Administration); and the EPA (Great Lakes National Program Office).

Section 2 – Program Accomplishments

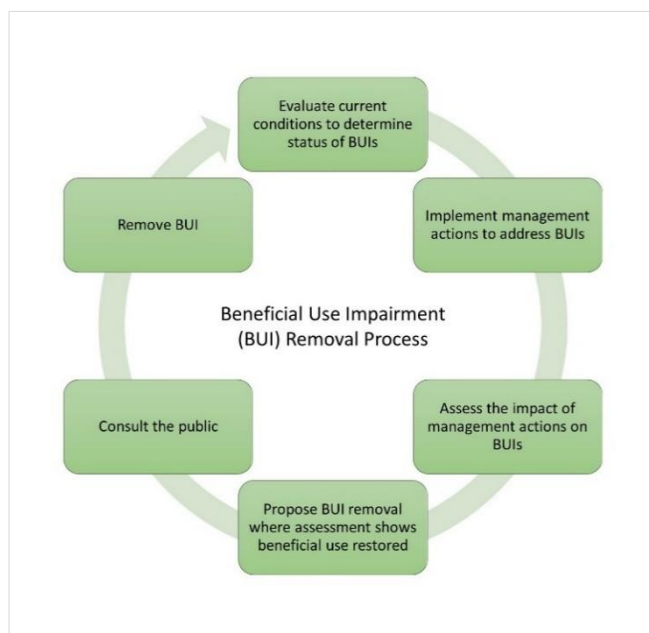
FOCUS AREA 1: Toxic Substances and Areas of Concern

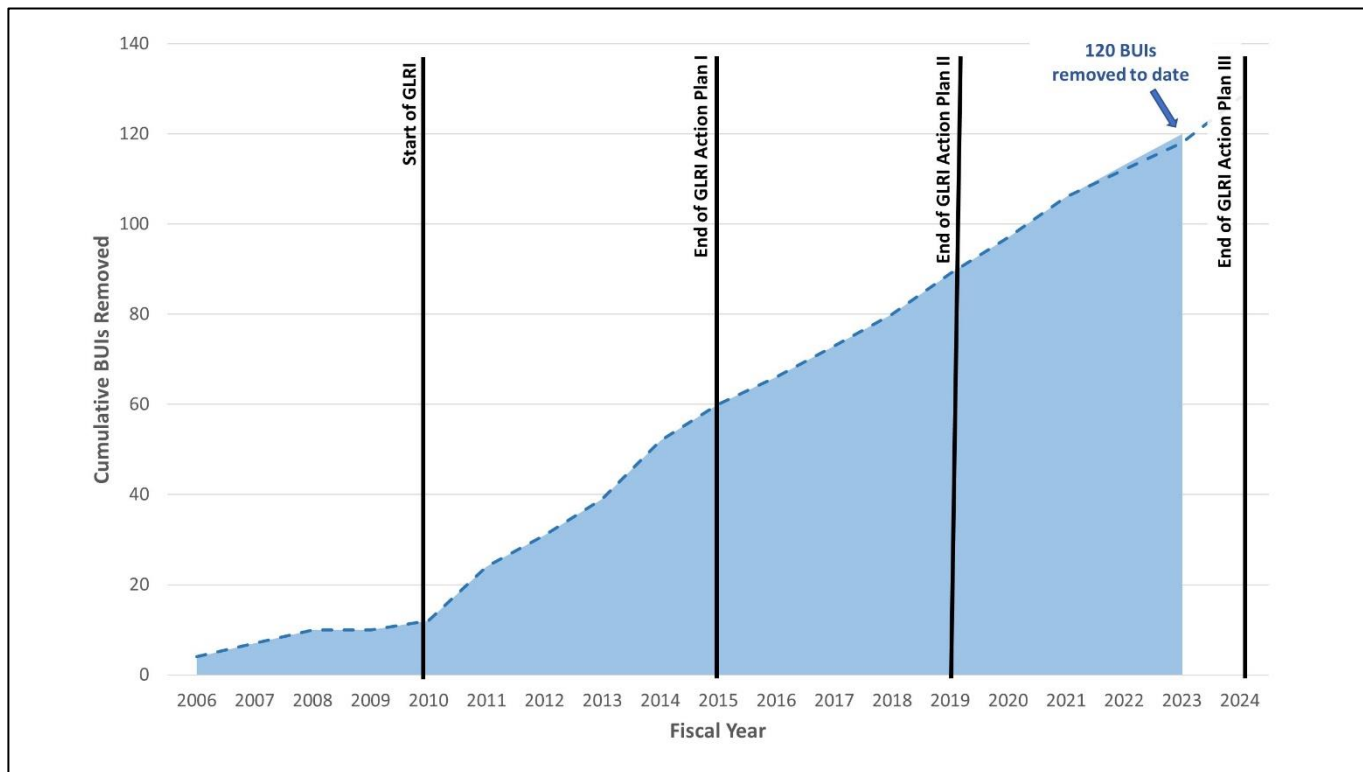


As defined in the Great Lakes Water Quality Agreement, AOCs are specific areas of the Great Lakes basin that are heavily contaminated with legacy pollutants and show signs of significant environmental degradation, such as habitat loss and contamination levels necessitating fish consumption advisories.

In FY 2022, the EPA and its GLRI federal and state partners completed all actions required to delist the Buffalo River AOC, for a cumulative total of 10 AOCs at which all management actions have been completed and six AOCs that have been delisted.

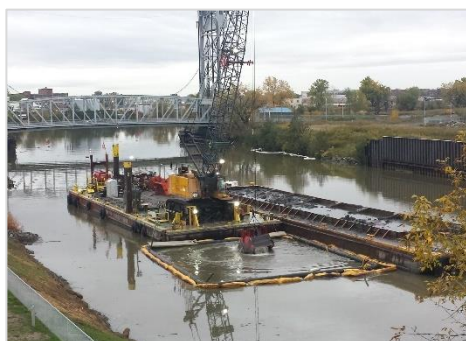
In FY 2022, GLRI federal agencies and their partners removed seven BUIs from AOCs, indicators of environmental harm, at six AOCs in four states, bringing the cumulative total of BUIs removed from the Great Lakes ecosystem to 113. Between FY 2010 and FY 2022, 103 BUIs were removed, which is more than 10 times the total number of BUIs removed before the inception of the GLRI. Once all BUIs in an AOC are removed, the process for delisting the AOC can move forward. The graphic to the right describes the BUI removal process.





During FY 2022, GLRI federal agencies supported projects to help 13 Tribal and state organizations collect and share information regarding Great Lakes fish consumption. The GLRI federal agencies and their partners conducted outreach activities, targeting populations that consume high amounts of Great Lakes fish, including urban, ethnic, Tribal, and subsistence anglers, and provided them with information on the benefits and risks of Great Lakes fish consumption. Additionally, GLRI federal agencies and their partners conducted monitoring activities to assess contaminant levels in fish collected from the Great Lakes and inland waters of the basin to be used to establish updated safe fish consumption guidelines by Tribal organizations and states. Partners continued implementing efforts to enhance communication of fish consumption advice to multiple Tribal and Asian (Bhutanese, Burmese, and Hmong) communities. Other projects enabled Tribes and states to collect and share fish tissue contaminant information to update fish consumption guidelines for mercury, perfluorooctanesulfonic acid (PFOS), and other contaminants.

GLRI federal agencies and their partners began implementing several projects assessing chemicals of mutual concern (CMCs) and other priority contaminants in the Great Lakes. Through these efforts, GLRI partners are working to fill critical data gaps on contaminants such as PFAS, mercury, and short-chain chlorinated paraffins (SCCPs). A topic of focus by GLRI partners included studies aimed at understanding how bioaccumulation of PFAS differs from that of other contaminants.



Mechanical dredging of contaminated sediment in the Buffalo River. (Credit: Brian Murphy)



Northeastern shoreline of the Katherine Street peninsula on the Buffalo River after habitat restoration. (Credit: USACE)

Focus Area 1 Success Stories

Cascade Valley Metro Park – Valley View Area Restoration Project in Akron, Ohio



The GLRI provided more than \$3.1 million to the National Oceanic and Atmospheric Administration (NOAA) – Great Lakes Commission (GLC) Regional Partnership to support the planning, design, and implementation of habitat restoration activities at the Cascade Valley Metro Park – Valley View Area Restoration site. The partnership restored approximately 55 acres of riparian

floodplain habitat along nearly 1 mile of the Cuyahoga River and installed almost 500 in-water habitat structures to address three BUIs. Early post-restoration monitoring results show a significant increase in the total number and variety of fish species using the restored stretch of river. The project was completed in 2022, and GLRI funding also supported production of a [documentary](#) about the restoration efforts. In addition to the GLRI-funded restoration, prior work at the site included restoring other stream and wetland habitats and reforesting upland areas. Together, these efforts have transformed this area into a natural landscape that supports fish, wildlife, and diverse opportunities for recreation.



Kayakers passing through a restored stretch of the Cuyahoga River during the Valley View Ribbon Cutting Event. (Credit: NOAA)

Penn 7 Habitat Restoration Project in Toledo, Ohio



The Penn 7 Habitat Restoration project, funded by GLRI through the NOAA – GLC Regional Partnership, created 15 acres of coastal wetland habitat along a former confined disposal facility on the banks of the lower Maumee River. The project improved fish and wildlife habitat by adding a series of pools connected by channels to an existing emergent wetland area and breaching the existing

dike with a water control structure. Soils removed from the site were used to create a forested upland area. In addition, the northern embayment portion of the site was diked to provide sheltered nursery habitat and to allow water levels to be controlled while maintaining connectivity to the Maumee River. The City of Toledo began work on this project in 2020, with final planting and monitoring work completing the restoration in 2022. In total, the project improved approximately 59 acres of wetland and upland habitat. The City of Toledo implemented this project with assistance from their consultant. NOAA published a [short documentary](#) about the Penn 7 project in October 2022.



The nursery habitat embayment constructed in the northern portion of the Penn 7 habitat restoration site. (Credit: NOAA)

Emerald Shiner Fish Passage Demonstration Project in Buffalo, New York



GLRI funding supported the construction of the Emerald Shiner Demonstration Project near Broderick Park in Buffalo, NY, to restore passage to emerald shiner and other native fish species. The U.S. Army Corps of Engineers (USACE) repaired 78 feet of existing seawall and installed baffles designed to reduce water velocity to support emerald shiner migration upstream. The project design and construction are the result of prior

collaboration and support from the City of Buffalo, the Great Lakes Center of SUNY Buffalo State University, the Niagara Greenway Commission, and Buffalo Niagara Waterkeeper. Post-construction monitoring has shown high numbers of emerald shiner using the baffles. Based on this strong early success, design began in 2023 to install fish passage baffles along an additional 700 feet of seawall, allowing for direct shiner passage at Broderick Park, with potential to replicate this fish passage technology elsewhere in the Great Lakes Basin or nationwide.



Emerald shiner using fish passage baffles installed as part of habitat restoration work in the Niagara River. (Credit: USACE)

Tamarack Creek Stream and Wetland Restoration Project in Michigan



With \$2.3 million in GLRI funding, the Alliance of Rouge Communities completed a habitat restoration project on Tamarack Creek, a stream in the Rouge River AOC that primarily drains through an urban watershed. Over time, uncontrolled stormwater runoff into Tamarack Creek have resulted in bank erosion, sedimentation of in-stream habitat, and destabilization of substrate, leading to negative

impacts on local macroinvertebrate, fish, and wildlife populations. To address these impairments and ultimately increase fish and wildlife diversity, the Tamarack Creek project restored 1,950 linear feet of stream channel and 4.6 acres of wetland habitat and created in-stream habitat. Restoration actions included wetland expansion, stream alignment corrections, and native vegetation planting to slow runoff and improve bank stability. This restoration work provided high-quality habitat for valuable fish and wildlife, helped manage invasive species, and improved hydrology in the watershed.



Active restoration work to correct stream channel alignment on Tamarack Creek. (Credit: Alliance of Rouge Communities)

Kingsbury Bay and Grassy Point Habitat Restoration Project in Minnesota and Wisconsin



The Minnesota Department of Natural Resources completed a three-year, \$18 million habitat restoration project at Kingsbury Bay and Grassy Point in the St. Louis River AOC with funding from GLRI, the Minnesota Outdoor Heritage Fund, and a Natural

Resource Damage Assessment and Restoration settlement to restore the St. Louis River/Interlake/ Duluth Tar Superfund Site. In Kingsbury Bay, the project restored valuable coastal marsh habitat by removing approximately 170,000 cubic yards of excess sediment and restoring an 80-acre, shallow sheltered bay.

At Grassy Point, clean sediment from Kingsbury Bay was used as a cap at the island to facilitate healthy plant and wildlife communities, and approximately 130,000 cubic yards of legacy wood waste were excavated to restore a 230-acre coastal wetland and shallow, sheltered bay complex. Some of the wood waste was also used to construct an 18-acre island, which will protect the bay and provide additional bird habitat. Together, the two components of this large, complex project restored coastal wetland habitat, created open water, improved recreational opportunities, and continued efforts toward ultimately delisting the bistate St. Louis River AOC.



Aerial views of Grassy Point before (left) and after (right) restoration work. Legacy wood waste removed from the site, along with clean sediment removed during restoration of Kingsbury Bay, was used for construction of the island and sheltered bay. (Credit: Google Earth)

Scanlon Reservoir Sediment Remediation Project in Minnesota



The Minnesota Pollution Control Agency (MPCA), the EPA, and USACE have completed a \$10.5 million sediment remediation project in Scanlon Reservoir, a 40-acre hydroelectric reservoir located within the St. Louis River AOC. Through a voluntary partnership under the Great Lakes Legacy Act, this project remediated 55,000 cubic yards of dioxin- and furan-contaminated sediments, covering

13.5 acres of the reservoir. For this project, pelletized activated carbon, a new remediation technology, was used to absorb and immobilize contaminants and prevent uptake of toxins into the food chain. Project partners also will restore native vegetation on land near the reservoir. Partially funded through the GLRI under the Bipartisan Infrastructure Law, this work represents the fifth remediation project in a successful partnership between the EPA and MPCA under the Great Lakes Legacy Act.



Placement of a sediment cap containing pelletized activated carbon mixed with sand to absorb and immobilize contaminants in Scanlon Reservoir. (Credit: USACE)

FOCUS AREA 2: Preventing and Controlling Invasive Species

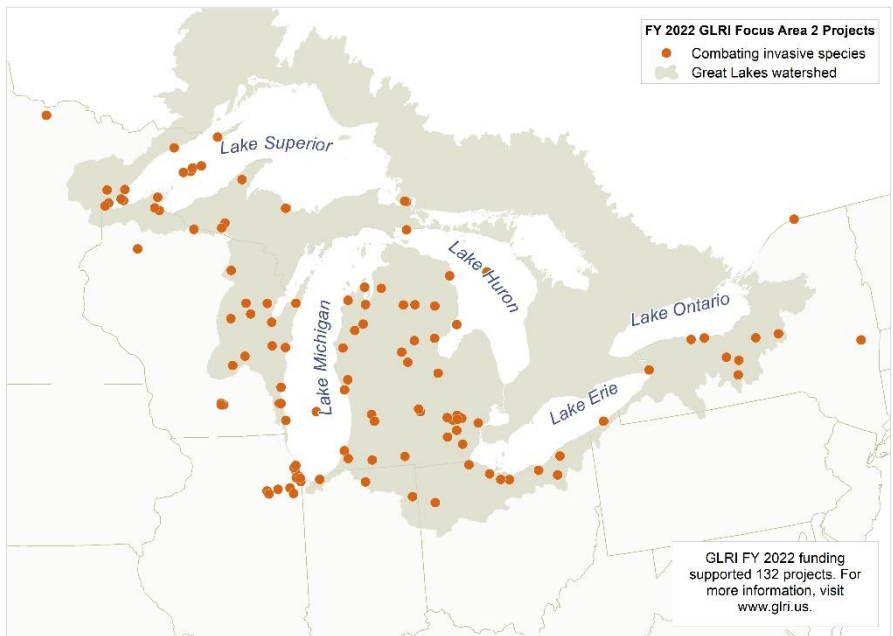
During FY 2022, GLRI federal agencies and their partners continued efforts to prevent the introduction of new invasive species and control existing invasive species populations in the Great Lakes ecosystem. GLRI investment in Focus Area 2 in FY 2022 continued to prioritize the prevention of new introductions of nonnative and invasive species into the Great Lakes. This proactive approach allows for greater efficiency and cost-savings.

Key investments during FY 2022 included continuing critical prevention activities, such as maintaining a comprehensive invasive species tracking and reporting system—the Great Lakes Aquatic Nonindigenous Species Information System

(GLANSIS); targeted monitoring of high-risk sites for introduction of new invasive species; completing risk assessments for invasive species not currently present, but which could become established if introduced; and developing and applying genomic tools to aid early detection of aquatic invasive species.

During FY 2022, GLRI funded 45 early detection monitoring activities that enhance the ability of GLRI federal agencies and their partners to detect and respond to new invasive species introduction. GLRI federal agencies and their partners also completed training in rapid response to new species detections and conducted 47 tabletop exercises, field responses, and/or drills—exceeding the GLRI Action Plan III target of eight rapid responses and exercises in FY 2022.

GLRI federal agencies and their partners have further reduced the risk of invasive species entering the Great Lakes watershed by funding 317 projects in FY 2022 that help block pathways of introduction. These pathways include canals and waterways, recreational boating, commercial shipping, illegal trade of banned species, the release of aquarium species, and release of live bait.



An aggressive infestation of invasive phragmites in the Chippewa Run Natural Area in northern Michigan. (Credit: Leelanau Conservancy)

GLRI federal agencies and their partners also conducted restoration activities at many sites degraded by aquatic, wetland, and terrestrial invasive species. GLRI federal agencies supported community efforts to control and reduce the spread of invasive species. These projects were implemented with local partners who are expected to continue maintenance and stewardship beyond



The resulting successful control of the same phragmites patch by the Leelanau Conservancy following implementation of a suggested management plan by the Phragmites Adaptive Management Framework (PAMF; www.greatlakesphragmites.net/pamf). Enrollment of this management area in a PAMF treatment plan also resulted in sharing lessons learned with other Great Lakes region. (Credit: Leelanau Conservancy)

the duration of the federally funded project's life span. In FY 2022, GLRI funded projects that controlled aquatic and terrestrial invasive species on over 22,000 acres in national forests, parks, and wildlife refuges, for a cumulative total of more than 238,000 acres since the inception of GLRI.

In FY 2022, GLRI federal agencies and their partners maintained or increased support to seven species-specific "collaboratives," which help communicate the latest control technologies and management techniques to their members. Collaboratives that received continued funding focus on invasive carp, *Phragmites*, invasive mussels, invasive crayfish, monoecious hydrilla, European frog-bit, and forest health. Those collaboratives are actively involved in invasive species prevention and control efforts under the GLRI.

During FY 2022, GLRI federal agencies and their partners developed and refined invasive species control technologies and management techniques while minimizing harm to noninvasive fish, wildlife, and plant species. To evaluate their effectiveness in controlling invasive species, GLRI federal agencies and their partners field tested five different technologies and methods. For example, projects in FY 2022 including testing approaches for removing invasive dreissenid mussels from soft substrates and developing adaptive management strategies for Emerald Ash Borer.

Continuing in FY 2022, the GLRI supported the implementation of a Great Lakes Ballast Water Research and Development Plan to address the unique challenges faced by commercial ships operating solely within the Great Lakes. This comprehensive plan includes extensive collaboration with states, port authorities, non-governmental organizations, industry, academics and other stakeholders. It is accelerating shipboard and land-based testing of ballast water management systems to identify technologies and practices capable of reducing ship-mediated transfers of organisms within the Great Lakes. The research and technology development effort is being led by the Great Waters Research Collaborative operating out of the University of Wisconsin-Superior's Lake Superior Research Institute through an agreement with the U.S. Department of Transportation – Maritime Administration.

Protecting the Great Lakes from invasive carp

The GLRI provides support to the Invasive Carp Regional Coordinating Committee (IRCC).

More IRCC information is available at <https://www.invasivecarp.us>.



Focus Area 2 Success Stories

Great Lakes Basin Forest Health Collaborative Helps Communities Fight Invasive Tree Pests in Northeast Ohio



Tree breeding is an important tool in the fight against invasive tree pests, such as the emerald ash borer (EAB). In 2022, the Great Lakes Basin Forest Health Collaborative, organized and supported by the U.S. Forest Service (USFS) using GLRI funding, held 10 workshops to advance tree grafting, document trees that have persisted after pest infestations, and ultimately provide Great

Lakes partners the tools and capacity to succeed in future restoration projects. Through their network, local news stories, and outreach, the Collaborative also helped members of the public learn to spot and collect seed from lingering ash trees. Collected seed and grafts will be used to advance efforts to breed ash species for increased EAB resistance while maintaining high levels of genetic diversity. Such efforts are critical to maintaining healthy watersheds and Great Lakes water quality through reforestation efforts.



Volunteers at Holden Forests & Gardens clean debris from lingering ash seeds collected by Cleveland Metroparks. (Credit: USFS)

East Branch Au Gres River Sea Lamprey Trap in Iosco County, Michigan



In FY 2022, USACE implemented a project to control and reduce sea lamprey populations by installing a permanent sea lamprey attractant water trap in the East Branch Au Gres River in Michigan. Sea lamprey are an invasive, predatory fish species not native to the Great Lakes. Sea lamprey spawn in tributaries to the Great Lakes and as adults they feed on, wound, and kill native Great Lakes fish, including lake trout. It is estimated that the furthest

downstream portion of the East Branch Au Gres River is home to approximately 33,000 larval sea lamprey, making this river one of the larger known sea lamprey spawning and nursery rivers in the Great Lakes. The East Branch Au Gres River flows in a northwest-to-southeast direction through the northern Lower Peninsula of Michigan and empties into Lake Huron. This newly installed water trap captures and removes approximately 1,733 sea lamprey each year, significantly protecting the important Lake Huron native fishery.



Completed sea lamprey trap at East Branch Au Gres River. (Credit: USACE)

Saint Regis Mohawk Tribe Restores Native Vegetation after Invasive Species Removal in New York



As part of a multiyear project on the St. Lawrence, Raquette, and St. Regis Rivers, the Saint Regis Mohawk Tribe is restoring native vegetation to sites that have been treated for invasive species. By the end of 2022, the Tribe had treated over 4,431 square meters of invasive *phragmites*, Japanese knotweed, and common/glossy buckthorn. Native plants

from the Saint Regis Mohawk Tribe's Native Plant Nursery were installed on sites that showed no regrowth of invasives 1 year after treatment. Restoration plans included planting one willow (*Salix spp.*), two red osier dogwoods (*Cornus sericea*), and three plugs of sweet grass (*Hierochloa odorata*) for every 25 square meters of treated area, for a total of 70 willows, 81 dogwoods, and 130 sweet grass plugs at restored shoreline sites in 2022.



Native plant nursery with plants ready for placement after removal of invasive species. (Credit: Saint Regis Mohawk Tribe)

GLANSIS and Michigan Sea Grant Produce “Managing Great Lakes Invaders” Video Series in Michigan



In FY 2022, NOAA’s GLANSIS team and Michigan Sea Grant produced “[Managing Great Lakes Invaders](#),” a series of five short animated videos about success stories and ongoing challenges in managing aquatic invasive species in the Great Lakes region. Created in collaboration with experts from the Great Lakes Fishery Commission, U.S. Fish and Wildlife

Service (USFWS), Aquatic Nuisance Species Task Force, and other organizations, this series highlights management and ongoing research on invasive mussels, sea lamprey, ballast water invaders, invasive carp, and other species of concern. The video series is accompanied by an ArcGIS StoryMap that adds GLANSIS map data and links to partner programs.

Since its launch in February 2022, the video series has accrued more than 11,000 views on YouTube, been shared extensively on social media, and been used in K-12 classrooms as part of Great Lakes-centered learning plans.



A screen capture from the “Managing Great Lakes Invaders” animated video series showing collaboration between scientists, legislators, and industry to prevent the introduction and spread of aquatic invaders.

Enhancing Remnant Wetland Habitat in Indian Ridge Marsh in Illinois



In 2022, the Wetlands Initiative increased habitat quality and biodiversity in the Indian Ridge Marsh, Cook County, IL, through controlling invasive species and planting native plant species. Indian Ridge Marsh is a priority remnant wetland in the Calumet region that provides resting and feeding habitat to wetland-dependent birds and wildlife. This project enhanced 76 acres of marsh,

wet meadow, and upland prairie habitats. In addition to the wildlife benefits of on-the-ground invasive species control, the project benefits surrounding communities by providing a local natural area open for public access.



Volunteers with Faith in Place planting native plugs during a May 2022 stewardship day organized by the Wetlands Initiative with the Chicago Park District at Indian Ridge Marsh-North. (Credit: Vera Leopold/TWI)

Cooperative Weed Management Defends Biological Diversity in the Oak Openings Region in Ohio



The Oak Openings Cooperative Weed Management Area (CWMA) combines the expertise of the Ohio Chapter of The Nature Conservancy and Toledo Metroparks with other long-time CWMA members and other local organizations. Through a grant from the USFS, the CWMA demonstrated the benefit of using

a tool that enables them to quickly survey and map emerging nonnative invasive terrestrial plant species. This comes as part of an early-detection, rapid-response effort to assess on-the-ground impacts of high priority nonnative plant species, develop best management practices (BMPs) for their control, and make the data easily accessible to all partners. In 2022, partners surveyed over 2,200 acres and developed plans for on-the-ground control activities. This work resulted in the addition of 400 new invasive plant data points to the Midwest Invasive Species Information Network, a statewide partnership that shares easily accessible resources on invasive species.



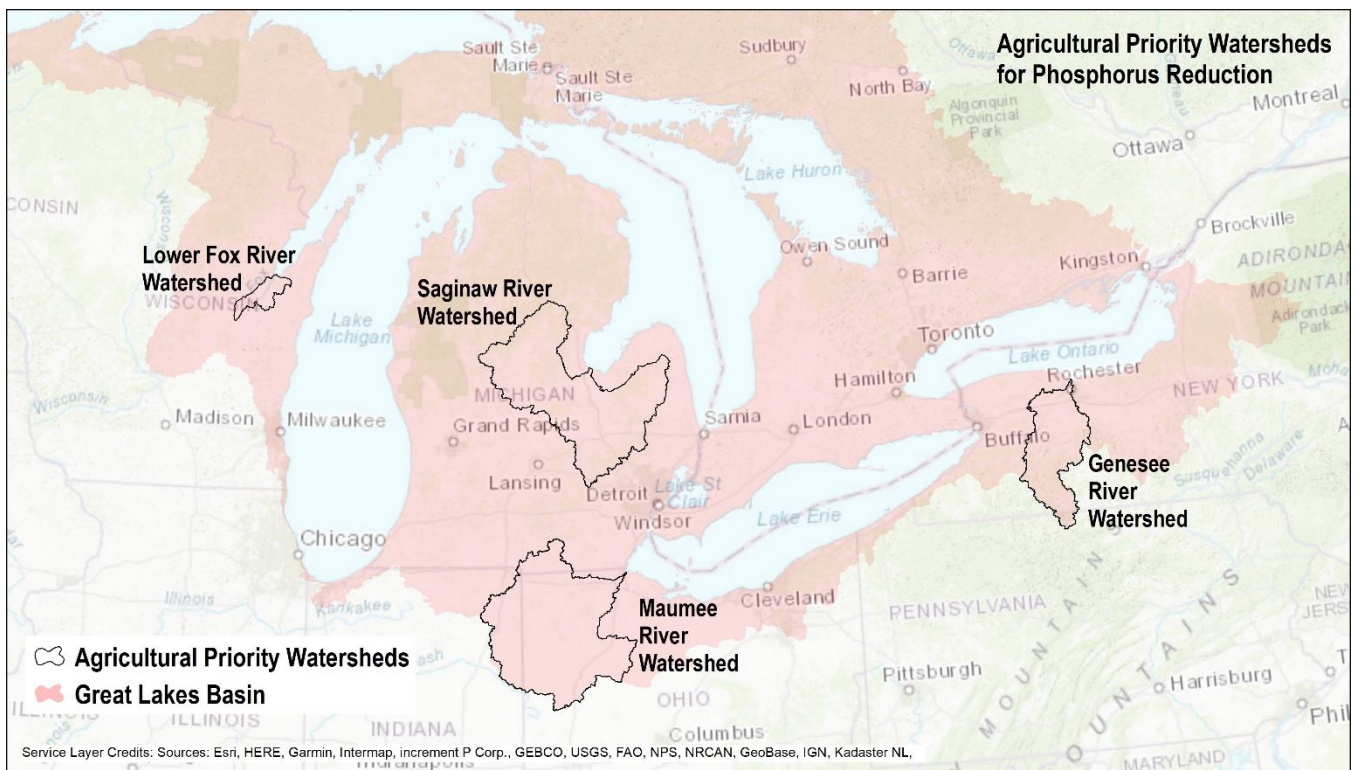
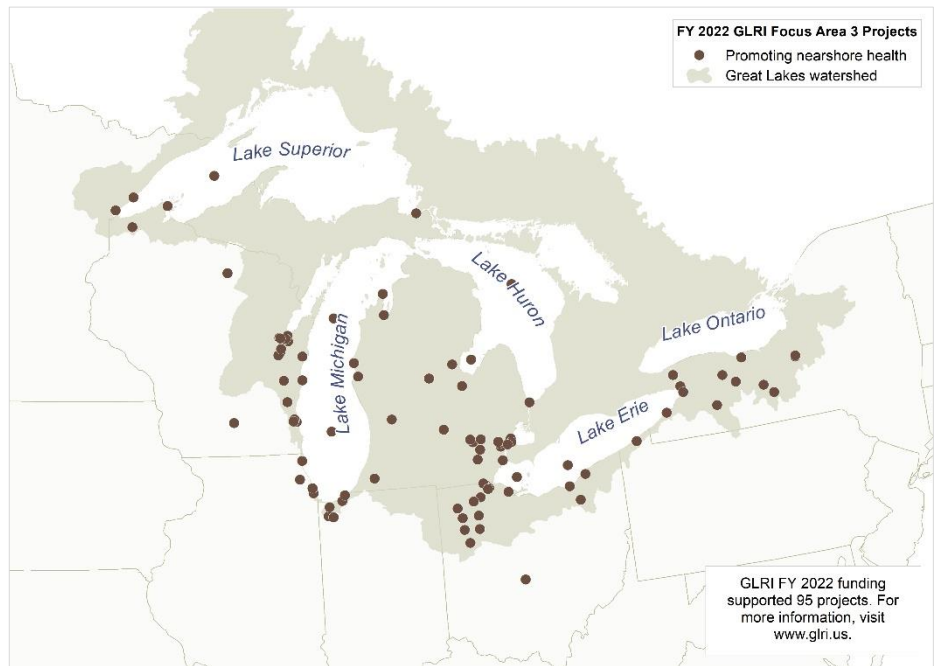
Oak Openings CWMA coordinator and a volunteer record the occurrence of an invasive species at The Nature Conservancy’s Kitty Todd Preserve. (Credit: The Nature Conservancy)

FOCUS AREA 3: Nonpoint Source Pollution Impacts on Nearshore Health

Polluted runoff, also known as nonpoint source pollution, threatens the Great Lakes ecosystem by contributing to HABs, nuisance algae, drinking water impairments, ecological dead zones, and beach closures that result in lost recreational opportunities. Runoff carries nutrients from fertilizer, sediment, bacteria, road salts, and other land-applied chemicals, such as herbicides and pesticides.

The pollutant carried by runoff that most significantly impacts the Great Lakes nearshore areas is phosphorus because it is the primary nutrient that drives algal growth. GLRI federal agencies and partners are working to reduce phosphorus loadings from agricultural watersheds in several ways. GLRI funding is used to supplement other prominent agricultural conservation programs, such as USDA’s

Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program, which provide technical and financial assistance to agricultural producers to plan and install conservation practices. In addition, GLRI federal agencies partner with and provide grants to support nongovernment programs and projects at the state and local levels, such as demonstration farms. Phosphorus reduction efforts to help prevent excess algae growth in the Great Lakes are prioritized in the four GLRI agricultural priority watersheds—the Lower Fox River, Saginaw River, Maumee River, and Genesee River watersheds.



Accelerating Nutrient Reduction in Lake Erie

GLRI is partnering with the state of Ohio on several aspects of their nutrient reduction efforts under the H2Ohio Initiative. Key investments in 2022 included (i) constructing wetlands and other land-based structures to capture agricultural runoff; (ii) supporting the Ohio Department of Agriculture to oversee on-farm nutrient management; (iii) two pilot projects to demonstrate the efficacy of new fertilizer technologies; and (iv) enhancements to the Lake Erie and Aquatic Research Network's wetland monitoring program. These investments reflect GLRI's commitment to collaborate and leverage resources to accelerate nutrient reduction to reduce HABs in Lake Erie.

GLRI federal agencies estimate that over 268,000 pounds of phosphorus will be prevented from entering the Great Lakes as a result of projects in agricultural areas funded in FY 2022. This includes a renewed focus on improving on-farm nutrient management through technical and financial assistance to farmers on over 109,000 acres. Many of the conservation practices being adopted also reduce other pollutants like nitrogen and sediment.

GLRI federal agencies and their partners also use GLRI funding to support watershed-based projects to address nonpoint source pollution in urban areas. Projects started in FY 2022 will capture over 98 million gallons of untreated urban runoff per year and protect approximately 18 miles of streams and shoreline. These projects reduce flooding, increase green space in urban areas, reduce bacterial contamination, and return vacant properties to productive use. The types of BMPs implemented include tree plantings, bioretention ponds, and bioswales.

These projects reflect over \$10.2 million in investments to treat, slow, or capture untreated stormwater runoff, helping to improve water quality conditions in the following 16 areas:

- Chicago, IL
- Calumet Township, IN
- Michigan City, IN
- Brighton, MI
- Detroit, MI
- Grand Rapids, MI
- Saginaw, MI
- Traverse City, MI
- Ypsilanti, MI
- Buffalo, NY
- Syracuse, NY
- Toledo, OH
- Green Bay, WI
- Kenosha, WI
- Milwaukee, WI
- Sheboygan, WI

GLRI federal agencies conduct over 30 nutrient monitoring and assessment activities annually to evaluate the effectiveness of nutrient and stormwater reduction practices. These include an [edge-of-field monitoring network](#) in the agricultural priority watersheds and [urban stormwater monitoring](#) in Gary, IN; Detroit, MI; Buffalo, NY; and Milwaukee, WI.

Focus Area 3 Success Stories

Building Resilient Communities in Detroit, Michigan



USFWS, through a public-private partnership with the National Fish and Wildlife Foundation's Southeast Michigan Resilience Fund, leveraged GLRI funding to support installation of green infrastructure in a Detroit community. The National Wildlife Federation (NWF) successfully installed six rain gardens at houses of

worship in Detroit's Jefferson Chalmers neighborhood. The collaborative effort among the NWF, Friends of the Rouge, and Sierra Club of Michigan has facilitated a unique and innovative opportunity to engage Detroit's faith community in creating high-quality green spaces, while simultaneously increasing local resiliency, public engagement, and stewardship. While centering community needs and benefits in each garden design, this program has invested in the creation of wildlife habitat, reduction of flooding, and support of safe, peaceful spaces in the community. In addition, through these community-driven demonstration projects, the program engaged more than 200 Detroit residents, community members, congregants, and local youth through virtual and in-person programming (e.g., workshops, tours, and volunteer workdays). This project has ultimately increased citywide awareness and increased access to nature for all.



Rain garden in Detroit. (Credit: Erin Kirkland, courtesy of The Kresge Foundation)

Recognizing the Impact of Demonstration Farms in Wisconsin



With funding from the GLRI, Fox Demo Farms began in 2014 and was the first project of its kind in the Great Lakes basin. Wisconsin now has 33 farms participating in six demonstration networks. On June 14, 2022, Congressman Mike Gallagher and

Congressman Ron Kind introduced a bipartisan resolution highlighting the innovation of Wisconsin demonstration farmers. Just two weeks earlier, the University of

Wisconsin released a [report](#) evaluating the role of the Fox Demo Farms and their influence on other farmers within the Lower Fox River watershed. The report showed that the Fox Demo Farms prompted action by farmers who were not directly associated with the GLRI-funded project. These findings were highlighted at a [Save the Bay event](#) later that summer to recognize the important role demonstration farms play in expanding the adoption of conservation farming practices to reduce phosphorus, nitrogen, and sediment inputs to Green Bay and Lake Michigan. Visit the Natural Resources Conservation Service (NRCS) [Great Lakes Restoration Initiative-Wisconsin web page](#) to learn more.



More than 70 farmers, landowners, and partners attended the Save the Bay event held at Neighborhood Dairy, a GLRI demonstration farm. (Credit: NRCS)

Multiple Partners Collaborating on Conservation in the Genesee River Watershed in New York



GLRI has supported several projects to accelerate the adoption of soil health and nutrient management practices in the Genesee River watershed. Between 2017 and 2022, NRCS provided \$8.6 million in direct assistance to farmers and the EPA provided another \$2 million in grants to local Soil and Water Conservation Districts and nongovernmental organizations.



Soil testing and minimizing disturbance to the soil are key components of nutrient management. (Credit: American Farmland Trust)

Together, these projects have reduced over 100,000 pounds of phosphorus loading to the Genesee River. Currently, a project led by American Farmland Trust, in partnership with NRCS, the New York Farm Viability Institute, and the Corn and Soybean Growers Association, is providing farmer-led trainings and outreach on regenerative agriculture practices. Twelve farms representing 48,000 acres are participating in the Genesee River Demonstration Farms Network, from which early field trial results have shown real promise. Looking ahead, plans to add new farms to the network are underway, including greater representation of women farmers and a broader range of farm types, such as smaller farms, vegetable and grazing farms. These projects will continue to gather data to demonstrate the benefits to farm viability while reducing nutrient losses from agricultural soils to Lake Ontario. For more information, visit <https://farmland.org/project/genesee-river-demonstration-farms-network/>.

Increasing Conservation Assistance to Urban Farmers in the Western Lake Erie Watershed in Indiana



The Indiana Natural Resources Conservation Service is using GLRI funding to work directly with small and urban farmers in Allen County. While urban agriculture has been expanding in Indiana for several years, these farmers tend to be less familiar with the assistance available to them and the impact their operations have on water quality. Allen County, most of which is in the Lake Erie



Clay Bottom Farms, a micro farm in Goshen, IN, was subdivided into roughly half-acre plots and contracted out to Burmese refugees who live in the area and were looking for a way to return to their agricultural roots. (Credit: NRCS)

watershed, is unique within Indiana as it is home to both the state's second largest municipality, Fort Wayne, and more than 200,000 acres of cropland. As of FY 2022, the [Allen County Soil and Water Conservation District](#) had provided free soil testing to 23 small and urban farmers in the watershed, enabling them to make the necessary adjustments to both help their plants flourish and reduce nutrient losses. Allen County will continue to offer technical assistance and educational opportunities, including field trips for farmers to visit other farmers in the watershed to learn from each other.

Runoff Risk Forecast Tool Now Available in New York



With support from the GLRI, NOAA has partnered with states to develop [Runoff Risk decision support tools](#). The New York State tool was implemented in 2022, becoming the fifth real-time runoff tool available in the Great Lakes region. These tools help farmers and commercial applicators identify the best time to apply manure and other fertilizers in the upcoming week to avoid nutrient loss from rainfall or snowmelt



Example forecast from the New York State Runoff Risk Forecast Tool for a given day.

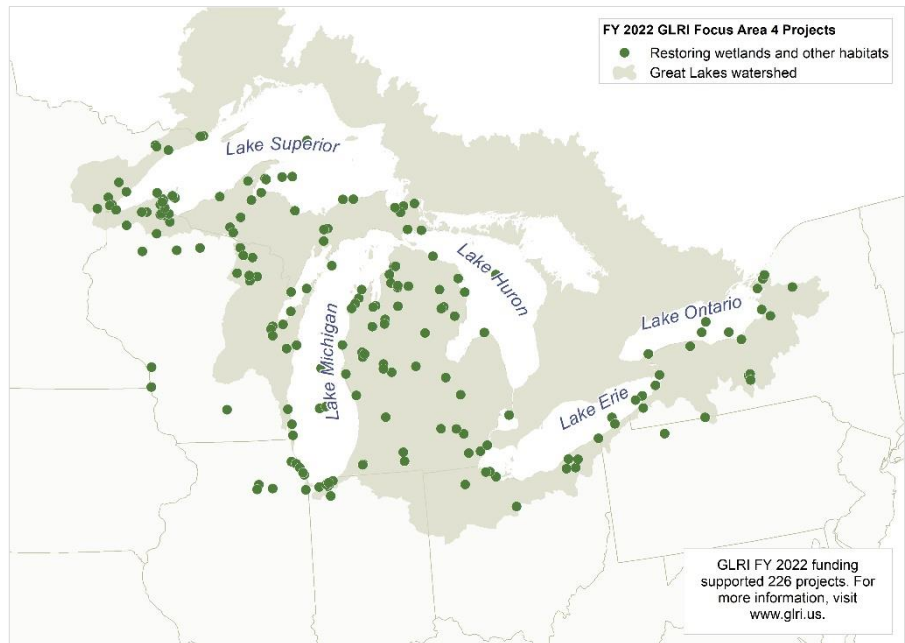
runoff. This is especially important in New York, where conditions can vary greatly between the northern and southern portions of the state. NOAA's National Weather Service, Cornell University (Northeast Regional Climate Center and ProDairy programs), the New York State Department of Environmental Conservation (NYSDEC), and the New York State Department of Agriculture and Markets worked together to develop and promote the tool. Real-time forecasts can be found at this website: <https://runoff-risk.nrcc.cornell.edu/ny>.

FOCUS AREA 4: Habitat and Species

By the end of FY 2022, GLRI federal agencies and their partners had implemented projects to protect, restore, and enhance Great Lakes habitats and species populations and reopened more than 7,175 miles of Great Lakes tributaries, which has increased aquatic connectivity for numerous fish species. Projects that addressed aquatic connectivity in FY 2022 supported continued restoration of native fish species, including brook trout and lake sturgeon.

With particular benefits to two Great Lakes species in FY 2022, the lake trout and Mitchell’s satyr butterfly, the GLRI continues emphasizing protecting and restoring Great Lakes species through comprehensive

approaches not possible through agency base-funded programs. Significant investments from the GLRI since 2010 have contributed to lake trout population restoration. Notable results from past investments to celebrate in 2022 included reproduction in wild lake trout documented in Lake Erie for the first time in 60 years, surveys indicating that more than 50% of lake trout in Lake Huron are wild and available to recreational fishing, increasing population trends in wild lake trout in the middle and southern sections of Lake Michigan, and lake trout populations in Lake Ontario exceeding target population levels set by fishery managers.



Significant investments from the Great Lakes Restoration Initiative since 2010 have contributed to Lake trout population restoration. Notable results from past investments in the Great Lakes to celebrate in 2022 include:



In Lake Huron, >50% of fish surveyed are wild and available to the fishery.



Lake trout reproduction in wild fish was documented for the first time in Lake Erie in 60 years.



Current evidence is showing increasing trends in wild lake trout in middle and southern Lake Michigan.



In Lake Ontario, lake trout populations have exceeded targets for 8 straight years.

In 2022, USFWS and partners increased the Mitchell’s satyr butterfly population size and number of sites necessary for life cycle requirements in Michigan and Indiana to at least three, all of which have long-term habitat protection in place. The Mitchell’s satyr is one of the rarest butterflies in the world and is known to exist at only 19 rare prairie fen habitats in Michigan and Indiana. Restoring and protecting those habitats will prevent the extinction of this species.

Since the GLRI began in 2010, the EPA has highlighted the importance of efforts to protect, restore, and enhance Great Lakes coastal wetlands. These wetlands provide residents of the Great Lakes with many environmental and economic benefits, including protecting property from high water levels and wave action, removing nutrients from rivers and the nearshore areas of the Great Lakes before they feed harmful and nuisance algae, and supporting fish nursery habitats necessary to support recreational and commercial fisheries. Nearly 80,000 acres of coastal wetlands have been protected, restored, and enhanced—aided by a GLRI-supported comprehensive annual binational monitoring effort of these habitats. Restoration and protection efforts continued to be aided and informed by the Great Lakes Coastal Wetland Monitoring Program. This program continues to provide a

comprehensive assessment of Great Lakes coastal wetland status and trends across the five Great Lakes.

Restoring a self-sustaining, native offshore aquatic food web—with lake trout as a top native predator and cisco and bloater as important native prey fish—continued to be a priority in FY 2022. A healthy native food web is critical to supporting a commercial and recreational fishery for Great Lakes residents, valued at \$7 billion annually. This food web restoration approach is comprehensive; it restores critical habitats needed by the native fish—propagating and stocking fish where and when necessary and monitoring the success of these efforts through tagging and recapturing fish to determine annual trends.

Habitat enhancement further supported fish populations by providing critical habitat for native species of importance to federal, state, and Tribal agencies. The USFWS, NYSDEC, and U.S. Geological Survey (USGS) collaborated to construct two spawning reefs in eastern Lake Ontario. The spawning habitats were constructed with material appropriately sized to promote spawning for walleye, lake sturgeon, lake whitefish, and cisco.



USFWS staff survey the Saginaw Bay fishery following recent reintroduction of native prey fish species and restoration of habitats important to spawning and reproduction. (Credit: USFWS)



Catching adult cisco, a native prey fish, in the Saginaw Bay, suggesting survival and reproduction are now possible due to GLRI-supported species restoration. (Credit: USFWS)

The Black River spawning bed was designed to remain in place during high flows, considering bathymetry, water velocities during high-flow events, sediment supply, and material sizes suitable for target species. The Chaumont Bay spawning reef design includes four separate reefs located across a range of depths. It will provide more spawning habitat for lake whitefish and cisco while also facilitating targeted research into the physical drivers of egg deposition, egg survival, and fry emergence to inform future habitat improvement projects in Lake Ontario.

Focus Area 4 Success Stories

Wildlife Services and Partners Work to Protect State Endangered Turtle Species in the Great Lakes Region in Illinois



In FY 2022, the Wildlife Services Program of the U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service collaborated with natural resources managers to protect populations of Blanding’s turtles, an endangered Great Lakes reptile requiring special conservation attention. Blanding’s turtles are semi-aquatic turtles that are experiencing population declines resulting



Blanding’s turtle. (Credit: USFWS)

from landscape modifications and loss of habitat in areas where they have historically been present. Wildlife Services scientists and the Lake County Forest Preserve District began research and population protection efforts on Blanding’s turtles within the forest preserves of Lake County, IL. Their efforts included tracking radio-marked turtles and monitoring nesting success. Additionally, partners hatched turtles in captivity and released them when they were large enough to be less vulnerable to predation. Wildlife Services and cooperating partners continue to effectively sustain the viability of threatened turtle populations.

Little Menomonee River Restoration in Wisconsin



The USFWS’s Coastal Program partnered with Ozaukee County to restore a portion of the Little Menomonee River in the City of Mequon, WI. In 2022, the Ozaukee County Planning and Parks Department completed restoration at the Mequon Road site, bringing benefits to fish, migratory birds, and other wildlife.



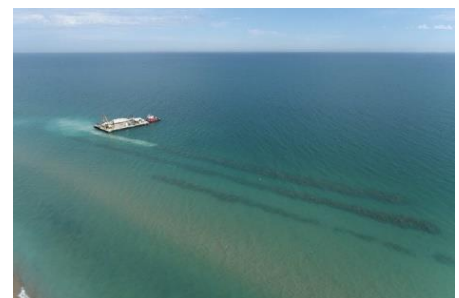
Restored floodplain wetlands along the Little Menomonee River. (Credit: Ozaukee County Planning and Parks Department)

Specifically, the project converted 1,400 feet of channelized ditch to 1,850 feet of meandered natural river channel, created 1.7 acres of waterfowl and shorebird wetland habitat, and restored 4.2 acres of adjacent wetlands. These floodplain wetlands provide spawning and nursery habitat for native fish and amphibians while also improving downstream water quality and increasing flood storage capacity.

Constructing Innovative Nearshore Habitat Enhancement and Protection in Lake Michigan



Completed in FY 2022, the Illinois Beach State Park pilot project involved constructing submerged stone berm structures off the shores of Zion, IL. The structures were designed to field-test innovative methods to attenuate wave action and reduce erosion and loss of critical nearshore and beach habitats in the selected impacted area. Using a design created by Healthy Port Futures, USACE combined in-



Construction of the Illinois Beach State Park pilot project. (Credit: Healthy Port Futures)

house floating crane barges and contract services to place 9,000 tons of stone, forming three rubble ridges. NOAA and the Illinois Department of Natural Resources then began a three-year monitoring program to assess the effectiveness of the project. Monitoring results will help determine whether this innovative technology could be applied elsewhere in the Great Lakes to improve coastal resilience.

Restoration of Meander Bends along the Dowagiac River in Southwestern Michigan



In 2022, the Pokagon Band of Potawatomi Indians completed the first phase of a long-envisioned project to restore historic meander bends in the Dowagiac River in southwestern Michigan. The Dowagiac River is an important resource for the Tribe and an



Restored river channel on the Dowagiac River. (Credit: Pokagon Band of Potawatomi Indians)

important habitat for fish and other wildlife resources in southwestern Michigan. Overall, the project will enhance 1.29 river miles while restoring hydrology to approximately 53 acres of wetland through the reconnection of the river to its floodplains. The re-meandering work will provide migratory and nonmigratory fish with habitats for refugia and spawning as well as opportunities for Tribal citizens to practice subsistence fishing. Accomplishments in 2022 included restoration of two river channel meander bends. Additional channel restoration and native planting are planned for future years to build upon these accomplishments.

Reversing Impairments to Kids Creek in Michigan



In FY 2022, the Watershed Center Grand Traverse Bay in partnership with NOAA completed a project to restore habitat and improve fish passage on Kids Creek in Traverse City, MI. Kids Creek is impaired as result of habitat degradation caused by sediment and stormwater runoff. In addition to a lack of habitat, portions of the creek are filled in with



Culvert replacement underway on Kids Creek. (Credit: Zach Cole)

sand or contain structures that impede movement of migrating native fish and cause the project area to flood frequently. The GLRI-funded project included replacing a series of three undersized culverts with appropriately sized structures. This upgrade will help restore the natural function of the stream, reducing sedimentation and providing a stable environment for fish and macroinvertebrates. It also will improve fish passage for existing brook trout populations. Close to 4,000 feet of the creek is expected to benefit from this work, and post-restoration monitoring is currently underway.

Enhancing Pollinator Habitat at Hedmark Pines State Natural Area in Wisconsin



During FY 2022, USFS staff and volunteers continued to build upon previous pollinator habitat enhancement efforts at a 70-acre opening within Hedmark Pines State Natural Area in the Chequamegon-Nicolet National Forest, WI. Historically a farm and homestead, Hedmark Pines is now home to many rare and declining pollinators, including Fernald cuckoo bumble



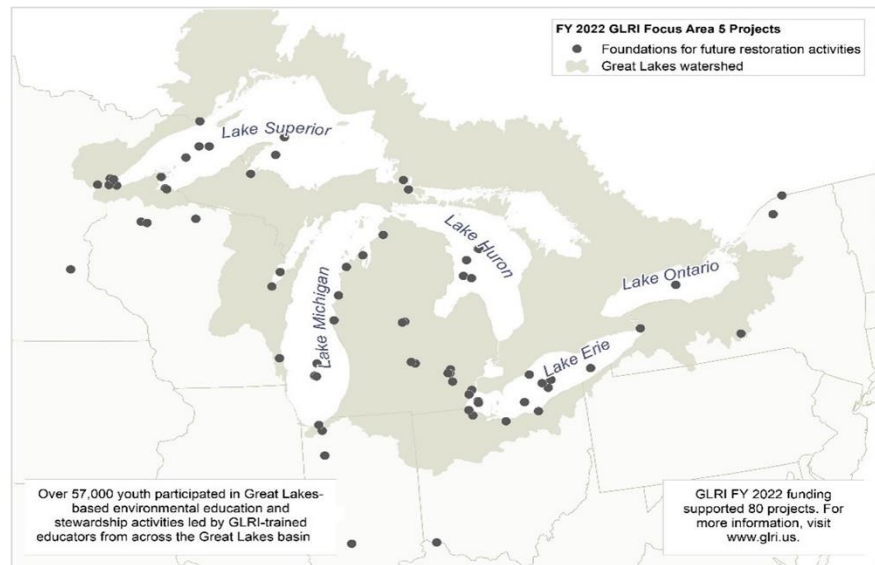
Aphrodite fritillaries and bumble bees nectaring on wild bergamot within the pollinator habitat enhancement plots at Hedmark Pines State Natural Area. (Credit: Nick Gremban/USFS)

bee, the yellow-banded bumble bee, and the monarch butterfly. In FY 2022, partners planted 150 seedlings and sowed one pound of seeds within four enhancement plots at Hedmark Pines. Each enhancement plot serves as a resource “island” of rich floral abundance that pollinators can travel between. Since 2017, GLRI funding has been used to plant more than 650 native forb seedlings and sow seed mixes from more than 20 species, along with reducing the nonnative invasive plant infestations at Hedmark.

FOCUS AREA 5: Foundations for Future Restoration Actions

As a foundation for future restoration, the GLRI continues to promote Great Lakes-based ecosystem education and stewardship. During FY 2022, GLRI federal agencies and their partners educated over 57,000 youth through NOAA’s Great Lakes Bay Watershed Education and Training (B-WET) program; National Park Service (NPS) interpretive programs; Great Lakes Sea Grant’s Center for Great Lakes Literacy (CGLL); and state educational programs led by the Ohio Department of Natural Resources, Michigan Department of Natural Resources, and Michigan

Department of Environment, Great Lakes, and Energy. These programs provide hands-on experiences for youth, educational resources, and networking opportunities to promote Great Lakes literacy among an engaged community of educators, students, and citizens.



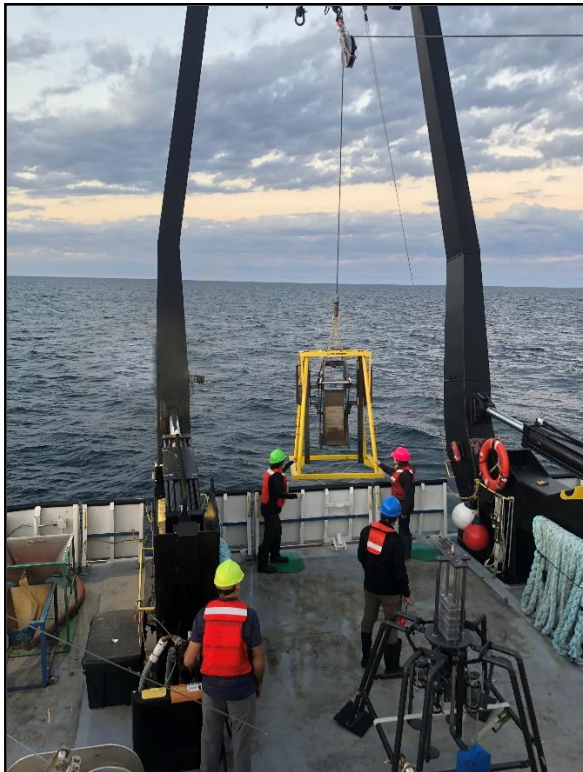
Sixth-grade students explore an ancient Lake Superior shoreline in Calumet Township Park in May 2022. (Credit: MiSTEM Network)

The From Students to Stewards (FS2S) Initiative is a collaboration between the Michigan Department of Environment, Great Lakes, and Energy’s Office of the Great Lakes and the Michigan Department of Labor and Economic

Opportunity’s MiSTEM Network. FS2S teaches students about the Great Lakes, Michigan watersheds, and the impact people can have on water resources. The program engages students and prepares them for careers in the science, technology, engineering, and math (STEM) fields with hands-on experiences that integrate water literacy principles into place-based, problem-based, and project-based (3P) STEM learning across all grade levels. This program also connects 3P learning to the Michigan Integrated Continuous Improvement Process, which is an essential element of the collaborators’ strategy to establish and sustain Great Lakes learning and freshwater stewardship throughout Michigan’s K-12 schools.



High school students deploy water quality sampling equipment in Lake Michigan. Their teacher borrowed the equipment from the Limno Loan program, a NOAA Sea Grant–EPA partnership that provides monitoring equipment for hands-on, student-led data collection activities. In FY 2022, the Limno Loan program helped 16 schools bring real-world science and enhanced water quality lessons to 1,442 students. (Credit: Cheryl Dudeck, Chicago Public Schools)



Scientists from the EPA Great Lakes National Program Office, USGS Mercury Research Lab, and University of Minnesota Duluth collect sediment for the EPA's Great Lakes Sediment Surveillance Program (GLSSP) survey in Lake Superior aboard the R/V Lake Guardian. Surface sediments and sediment cores are collected to characterize the spatial distribution and trends through time of persistent, and bioaccumulative and/or toxic chemicals in the Great Lakes. Over the next 4 years, the GLSSP will monitor more than 250 contaminants in sediment at 157 sites within all five Great Lakes. (Credit: USGS)

In FY 2022, GLRI federal agencies and their partners continued tracking the progress of GLRI-funded projects. GLRI federal agencies used an improved relational database, Environmental Accomplishments in the Great Lakes 2 (EAGL2), an accountability system, to track results from GLRI-funded projects against the GLRI Action Plan III Measures of Progress. To evaluate and improve the quality of reporting, the EPA conducts annual systemwide audits of the accountability system in accordance with the EAGL2 implementation manual.

Science is another key piece of the GLRI activities in this Focus Area. During FY 2022, GLRI federal agencies and their partners conducted comprehensive monitoring to assess the status and trends of the Great Lakes ecosystem. GLRI federal agencies and their partners monitored coastal wetlands, contaminants, nutrients, hypoxia, HABs, zooplankton, phytoplankton, benthic communities, and prey fish, among many other components of the Great Lakes ecosystem. Monitoring data are used to prioritize future GLRI-funding decisions by identifying the ecosystem's most significant ongoing and emerging problems.

GLRI Action Plan III incorporates science-based adaptive management to guide restoration and protection actions by using the best available science and lessons learned from GLRI investments. In FY 2022, GLRI federal agencies continued implementing projects to address cross-focus area science priorities: HABs/nuisance algae and the need for coastal resilience. These priorities were identified in coordination with Tribal, state, and Lakewide Action and Management Plan partners and, along with results of annual science and monitoring, are used to guide GLRI project planning.

In FY 2022, USGS and NOAA continued their collaborative efforts to better understand and predict the toxicity of HABs in Lake Erie and Saginaw Bay. The project aims to establish a baseline understanding of cyanotoxins, HAB microbial communities, and cyanotoxin producers and how they change under different environmental and nutrient conditions. The resulting data will be used to quantify and characterize HAB toxicity and support restoration of the Great Lakes by improving the understanding of the relation between drivers of toxicity and management options to control those drivers.



Lake Erie algal bloom near a NOAA sampling site, August 2022. (Credit: Kent Baker)

Focus Area 5 Success Stories

Framework for Resilient GLRI Investments



In FY 2022, a second year of GLRI funding supported a team of experts from USACE, NOAA, USGS, Cornell University, and the University of Michigan working to identify how total Great Lakes water levels may change under a range of possible future conditions. This four-year study will provide managers and decision-makers with critical information to evaluate and prioritize management of

natural and cultural resources, habitat, and other coastal investments throughout the Great Lakes region. Accompanying design guidance checklists also will inform the design of future resilient GLRI projects. FY 2022 activities included the initiation of modeling that will inform the range of possible future scenarios and lake level modeling for the Great Lakes basin; ongoing development of a USGS Coastal Change Likelihood methodology for the Great Lakes; and creation of a digital elevation model for Lake Ontario (models for remaining lakes are to be developed in subsequent fiscal years). Since June 2020, the team has met quarterly to share study progress with Great Lakes stakeholders and anticipates completion of study tasks in FY 2025.



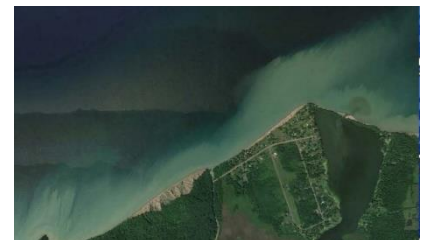
Multiple record high-water levels were set on the Great Lakes in 2019 and 2020, resulting in increased risks from erosion and coastal flooding. (Credit: USACE)

Great Lakes Sediment Budget Framework



The movement of sediment in the Great Lakes can have a direct effect on the health of nearshore ecosystems, on sustainable navigation and commerce, and on the success of coastal restoration project implementation. Sediment budgets are valuable planning tools that account for how sediment enters a lake and is either lost to deep water or deposited along the shore. In FY 2022,

GLRI federal partners developed a Great Lakes Sediment Budget framework, which centralized data sets and methodologies used to create sediment budgets in the Great Lakes. Historically, only small portions of Great Lakes shoreline have had sediment budgets developed, with no standardized methodology employed. The Great Lakes Sediment Budget framework now provides a [publicly accessible website](#) that shares a methodology and access to many necessary datasets for Great Lakes sediment budget development. The project was led by USACE and its Engineering Research Development Center in partnership with NOAA and USGS, with participation from state experts. As a result of this effort, Great Lakes stakeholders at the federal, state, and local level will have the necessary tools to advance sediment budget development in the Great Lakes to strategically plan future navigation, commerce, resiliency, and restoration activities in coastal areas.



Aerial photo showing sediment plume and sediment loss at Chimney Bluffs in Lake Ontario. (Credit: USACE)

Middle School Students Participate in a New Coastal Engineering Education Program in Wisconsin



Through their NOAA Great Lakes B-WET grant and Wisconsin Sea Grant, schoolteachers and the Great Lakes Community Conservation Corps partnered to engage students in meaningful watershed educational experiences during the 2021–2022 school year through a new program called Coastal Engineering Education: People, Place and Practice. Partners reinforced classroom curricula on field trips to North

Beach in Racine, WI, where students performed scientific investigations of the coastal ecosystem along Lake Michigan. The educational experience culminated in a dune grass restoration stewardship project at North Beach. Students planted native dune grass and removed invasive dune grass that out-competes the native species. About 140 students participated in the pilot program and their experiences were documented in a series of [videos](#).



Middle school students from Jerstad-Agerholm Middle School in Racine, WI, pulling invasive dune grass and planting native species as part of their stewardship project. (Credit: Wisconsin Sea Grant)

Mentor Teachers Help Expand Great Lakes Literacy



Teachers with a passion for the Great Lakes shared their expertise across the basin with fellow educators as part of the CGLL mentor program. These experienced, CGLL alumni teachers worked closely with mentees during the 2021–2022 school year, guiding them on how best to incorporate Great Lakes education and stewardship into the classroom.

This led to more students experiencing hands-on, feet-wet lessons on important issues such as invasive species, marine debris, and water quality. The mentor-mentee pairs found this relationship valuable, citing inspiration, support, and empowerment among the benefits of the experience. [CGLL](#) is a collaborative effort led by NOAA Sea Grant education specialists to develop a community of Great Lakes literate educators and students dedicated to Great Lakes stewardship.



Ohio mentor with mentee teachers conducting beach cleanup with students along Lake Erie. (Credit: Thomas DeHaas)

Capacity Support for Tribal Communities



Indian country, comprised of reservation land bases and ceded territories where Tribes retain rights, represents millions of acres within the Great Lakes basin. Since 2010, the GLRI has been instrumental in building Tribal capacity to participate in intergovernmental stewardship of our relatives (often referred to as resource management) across the Great Lakes. Under the GLRI Distinct Tribal

Program, which provides greater flexibility and further supports Tribal self-determination, 20 Tribes have received capacity support to maintain and enhance participation in and provide meaningful Tribal input in support of stewarding our relatives across the Great Lakes. Through this support, Tribes have participated and become leaders in the Great Lakes Water Quality Agreement Lake Partnerships, a multinational effort to restore and maintain the health and wellness of all relatives and beings who are connected to water in the Great Lakes. Tribes also have participated in AOC implementation, cooperative invasive species management groups, and other intergovernmental stewardship groups across the Great Lakes. Tribes have unique expertise and valuable place-based and traditional ecological perspectives for understanding and protecting Great Lakes resources. Ongoing support will ensure Tribes can continue to significantly contribute to shared protection and restoration goals for the Great Lakes and its ecosystems for future generations.



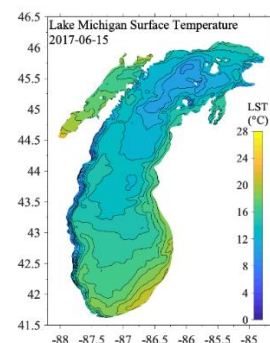
Sturgeon captured on a setline. (Credit: 1854 Treaty Authority)

New Lake Michigan Water Temperature and Currents Database



The NOAA Great Lakes Environmental Research Laboratory, in collaboration with Michigan Technological University, created a long-term database of Lake Michigan physical limnological conditions. The [publicly available database](#) combines state-of-the-art hydrodynamic modeling with quality-controlled observational data sets to produce a comprehensive record of three-

dimensional water temperatures and currents (speed and direction) from 1995 to 2020. The resulting data set supports stakeholders on a wide variety of restoration projects by improving understanding of localized conditions affecting nutrient or pollutant transport, the suitability of portions of the lake as habitat for native or invasive species, and the drivers of HABs. The database both characterizes site-specific physical conditions throughout Lake Michigan and provides an understanding of how those conditions are changing over time.



Modeled Lake Michigan surface water temperature (June 15, 2017), showing spring warming in the southern portion of Lake Michigan and Green Bay and cooler temperatures in the northern portion of the lake. (Credit: NOAA GLERL)

Section 3 – Regional Partner Engagement

The GLRI federal agencies collaborate and coordinate extensively with numerous entities each fiscal year to address the challenging ecosystem problems that affect the Great Lakes. This section provides a few examples of this engagement with Great Lakes Tribes and states.

Great Lakes Tribes

The GLRI support for Tribal nations within the Great Lakes basin has created and enhanced valuable partnerships and resulted in implementing important restoration and protective actions, including controlling invasive species, reducing nutrient and phosphorous loadings into waterways, reopening tributaries to restore fish passage, protecting Lake Superior coastal wetlands, and restoring several culturally significant species, such as lake sturgeon, moose, and wild rice.

Accompanying the GLRI's FY 2019 enacted appropriation (Public Law [PL] 116-6) was explanatory language (House Report [HR] 116-9) calling for the EPA to follow directions in Senate Report 115-276 that encourage the EPA to:

...work with Tribal governments and the Bureau of Indian Affairs to develop a proposal for the creation of a distinct GLRI Tribal program through which GLRI funds would be provided to allow Tribes the flexibility to develop the programs that are of the highest priorities to their communities, and which fulfill the spirit of self-determination, meet treaty obligations, and carry out Federal trust responsibilities.

The EPA continues to work with Tribal governments and the Bureau of Indian Affairs (BIA) to create that program. Explanatory language (HR 116-448) associated with the EPA's FY 2021 enacted appropriation (PL 116-260) directed the EPA to maintain funding for Tribal-related activities at not less than \$15 million. In FY 2021, the EPA and BIA, working with Great Lakes Tribes, produced the penultimate draft of a GLRI Distinct Tribal Program Framework outlining principals, projects, and a funding commitment of \$15 million to be allocated specifically for the operation of a GLRI Distinct Tribal Program. Since the GLRI's inception in FY 2010, Tribes have received a total of over \$136 million in GLRI funding, including nearly \$20 million directed to Tribes in FY 2022. This funding has been key in building Tribal resource management capacity and contributing to protecting and restoring treaty-reserved resources and culturally significant habitats and species that support Tribal lifeways.

Great Lakes States

GLRI federal partners are committed to working with all eight states within the Great Lakes basin. These states—Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin—play a critical role in restoring and protecting the health of the Great Lakes to ensure the quality of their economies and the health of their citizens. The partnership between Great Lakes states and the GLRI continues to result in important work activities, including controlling invasive species, protecting fisheries, reducing nutrient and phosphorous loadings into waterways, capturing and treating urban runoff, and delisting AOCs. Since the GLRI's inception in FY 2010, over \$521 million of GLRI funds have been awarded to Great Lakes states through the end of FY 2022, including over \$21 million from the FY 2022 appropriation.



Section 4 – Financial Reporting

Annual GLRI Appropriations

From FY 2010 to FY 2022, annual GLRI appropriations were approximately \$4.1 billion. The GLRI federal agencies that receive those GLRI funds use multiple funding mechanisms, including interagency agreements, fund transfers, competitive grants, and capacity-building grants to Tribes and states.

Table 1 and Chart 1 provide information on FY 2018–FY 2022 GLRI funding by focus area. Table 2 provides summary information for FY 2018–FY 2022 GLRI funding by individual agency.

Table 1. FY 2018–FY 2022 Annual GLRI Appropriations Focus Area Allocations as of September 30, 2022 (Dollars in Thousands)

| Focus Area | FY 2018 | FY 2019 | FY 2020 | FY 2021 | FY 2022 |
|---|------------------|------------------|------------------|------------------|------------------|
| Toxic Substances and Areas of Concern | \$105,600 | \$107,400 | \$115,800 | \$121,400 | \$76,000 |
| Invasive Species | \$56,700 | \$57,000 | \$62,900 | \$65,700 | \$76,000 |
| Nonpoint Source Pollution Impacts on Nearshore Health | \$50,600 | \$51,200 | \$51,000 | \$53,000 | \$78,200 |
| Habitat and Species | \$52,400 | \$51,400 | \$54,500 | \$56,500 | \$80,600 |
| Foundations for Future Restoration Actions | \$34,700 | \$33,000 | \$35,800 | \$33,400 | \$37,200 |
| Totals: | \$300,000 | \$300,000 | \$320,000 | \$330,000 | \$348,000 |

Chart 1. FY 2018–FY 2022 Annual GLRI Appropriations Focus Area Allocations as of September 30, 2022 (Dollars in Thousands)

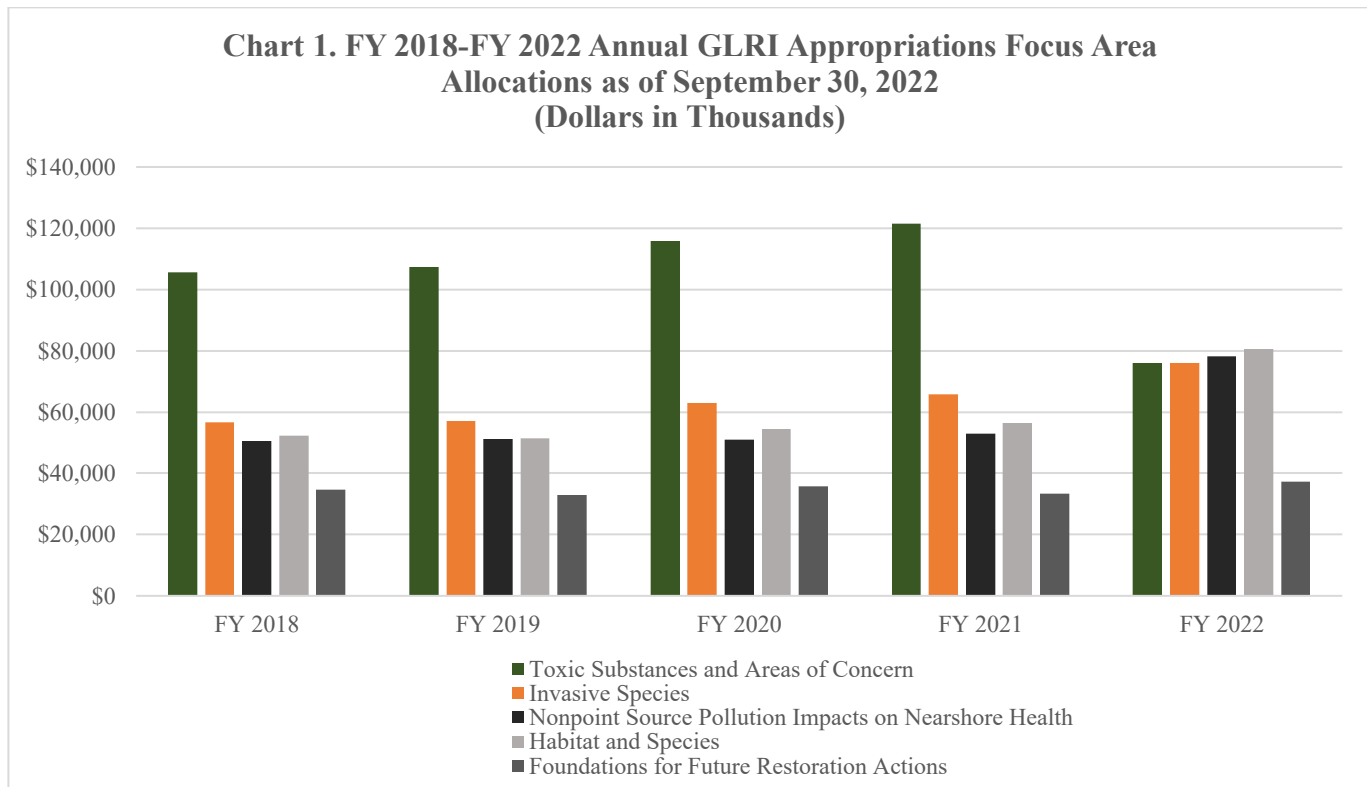


Table 2. FY 2018–2022 Annual GLRI Appropriations Funding by Agency as of September 30, 2022 (Dollars in Thousands)

| Agency ^a | Obligations ^b | | | | |
|--|--------------------------|------------------|------------------|------------------|------------------|
| | FY 2018 | FY 2019 | FY 2020 | FY 2021 | FY 2022 |
| DHS-USCG | \$500 | \$1,661 | \$1,250 | \$1,300 | \$1,200 |
| DOC-NOAA | \$24,629 | \$29,405 | \$28,163 | \$16,621 | \$30,361 |
| DOD-USACE | \$43,187 | \$37,335 | \$30,563 | \$42,798 | \$32,690 |
| DOI-BIA | \$11,617 | \$9,842 | \$15,840 | \$15,765 | \$19,724 |
| DOI-NPS | \$3,940 | \$3,822 | \$3,794 | \$4,968 | \$6,560 |
| DOI-USFWS | \$52,902 | \$47,272 | \$53,523 | \$59,288 | \$68,083 |
| DOI-USGS | \$25,724 | \$21,603 | \$19,780 | \$19,790 | \$24,980 |
| DOT-MARAD ^f | \$675 | \$803 | \$5,500 | \$8,000 | \$0 |
| HHS-ATSDR | \$590 | \$0 | \$0 | \$0 | \$0 |
| USDA-APHIS | \$1,166 | \$1,308 | \$1,378 | \$1,459 | \$1,832 |
| USDA-NRCS | \$25,096 | \$20,697 | \$22,239 | \$24,374 | \$31,824 |
| USDA-USFS | \$10,153 | \$11,646 | \$9,921 | \$12,464 | \$12,958 |
| IA Totals: | \$200,177 | \$185,393 | \$191,952 | \$206,826 | \$230,933 |
| EPA, GLFC, and miscellaneous IAs^c | \$97,865 | \$113,878 | \$127,089 | \$121,833 | \$76,600 |
| Total obligated | \$298,042 | \$299,271 | \$319,041 | \$328,660 | \$307,526 |
| Returned^d or remaining^e | \$1,958 | \$729 | \$959 | \$1,340 | \$40,474 |
| GLRI Grand Totals: | \$300,000 | \$300,000 | \$320,000 | \$330,000 | \$348,000 |

Notes: ^aDHS = U.S. Department of Homeland Security; USCG = U.S. Coast Guard; DOC = U.S. Department of Commerce; NOAA = National Oceanic and Atmospheric Administration; DOD = U.S. Department of Defense; USACE = U.S. Army Corps of Engineers; DOI = U.S. Department of the Interior; BIA = Bureau of Indian Affairs, NPS = National Park Service, USFWS = U.S. Fish and Wildlife Service, USGS = U.S. Geological Service; DOT = Department of Transportation; MARAD = Maritime Administration; HHS = U.S. Department of Health and Human Services; ATSDR = Agency for Toxic Substances and Disease Registry; USDA = U.S. Department of Agriculture; APHIS = Animal and Plant Health Inspection Service, NRCS = Natural Resources Conservation Service, USFS = U.S. Forest Service; GLFC = Great Lakes Fishery Commission; IA = interagency agreement.

^bObligations are the dollar amount of orders placed; interagency agreements, contracts, or grants awarded; and similar transactions by the EPA. The amount also reflects deobligations, which generally result from events such as completing a project under budget, contract termination, changes in project scope or focus, or other unforeseeable circumstances.

^cComponents include (i) grants totaling approximately \$43.1 million (including funding for the GLFC, an organization identified in the President's budget); (ii) Great Lakes National Program Office support costs (payroll, travel, general expenses, and working capital) totaling approximately \$16 million; and (iii) contracts and miscellaneous interagency agreements (other than those above) totaling approximately \$17.5 million.

^dReturned funds (FY 2018–2021) are determined by subtracting obligations as of October 11, 2022, from appropriated funds. Returned funds generally result from deobligating funds as a result of completing a project under budget, contract termination, changes in project scope or focus, or other unforeseeable circumstances. The amount in this line also can include reserves established to provide for contingencies or to effect savings under the Antideficiency Act.

^eRemaining funds (FY 2022) have been carried over by the EPA to fund priority projects, including competitively selected projects and state projects.

^fDOT-MARAD received \$6.5 million of FY 2022 GLRI funds. This amount will be reflected in FY 2023 and future Reports to Congress.

GLRI Appropriations as Part of the Bipartisan Infrastructure Law

From FY 2022 through FY 2026, the EPA expects to receive \$200 million each year in additional GLRI funds. The GLRI federal agencies that receive GLRI funds use multiple funding mechanisms, including interagency agreements, fund transfers, competitive grants, and capacity-building grants to Tribes and states.

Table 3 provides summary information for FY 2022 GLRI BIL funding by AOC and by project.

Table 3. GLRI FY 2022 Project-level Reporting on BIL Funding as of September 30, 2022 (Dollars in Thousands)

| AOC ^a | Project Name ^b | Total Spending ^c |
|---------------------|---|-----------------------------|
| Cuyahoga River | Boston Mills Habitat Restoration Construction | \$7,200 |
| | E. 185th Spillway/Euclid Creek Habitat Restoration Design | \$400 |
| | GLLA Cuyahoga River Old Channel Remedial Design | \$1,000 |
| | Total | \$8,600 |
| Detroit River | GLLA Wilson Park Remedial Action | \$15,081 |
| | Total | \$15,081 |
| Grand Calumet River | GLLA East Branch Grand Calumet Phase Two Remedial Design | \$800 |
| | Total | \$800 |
| Maumee | Collins Park Stream Restoration Design | \$332 |
| | GLLA Swan Creek Site Characterization | \$242 |
| | University of Toledo Medical Center Swan Creek Habitat Restoration Design | \$203 |
| | Total | \$777 |
| Milwaukee Estuary | GLLA Milwaukee Pre-Design Investigation | \$1,537 |
| | Total | \$1,537 |
| Niagara River | R.C. Wilson Park Habitat Restoration | \$10,000 |
| | Total | \$10,000 |
| Rouge River | GLLA Rouge River Mainstem Feasibility Study | \$182 |
| | Total | \$182 |
| St. Louis River | GLLA Munger Landing Remedial Action | \$21,858 |
| | GLLA Scanlon Reservoir Remedial Action | \$5,372 |
| | GLLA Spirit Lake Remediation Action | \$50,267 |
| | GLLA Thomson Reservoir Remedial Design Review | \$108 |
| | Total | \$77,605 |
| | Grand Total | \$114,582 |
| | NOAA, USACE, and EPA Programmatic^d | \$4,401 |
| | Amount Available^e | \$81,017 |
| | Budget Authority^f | \$200,000 |

Notes: GLLA = Great Lakes Legacy Act; NOAA = National Oceanic and Atmospheric Administration.

^a The U.S.-Canada Great Lakes Water Quality Agreement (Annex 1 of the 2012 Protocol) defines AOCs as "geographic areas designated by the Parties where significant impairment of beneficial uses has occurred as a result of human activities at the local level." An AOC is a location that has experienced environmental degradation.

^b The name of each project describes the phase of the project, the site where the work is taking place, and the type of work being done.

^c The dollar amount committed, obligated, and expended; interagency agreements, contracts, or grants awarded; and similar transactions by the EPA. The amount also reflects deobligations, which generally result from events such as completing a project under budget, contract termination, changes in project scope or focus, or other unforeseeable circumstances.

^d EPA programmatic costs include payroll, travel, general expenses, and working capital.

^e Resources currently available for spending or allocation within a specific budgetary period. This portion represents the portion of the Total Authority that has not been committed, expended, or obligated.

^f The amount of money available to a federal agency for a specific purpose. The authority to commit to spending federal funds is provided to agencies by law. The budget authority is provided to agencies through the annual appropriations process.

Appendix – GLRI Action Plan III: Measures of Progress

Table A-1 provides an overview of the results achieved for each of the 23 Measures of Progress in GLRI Action Plan III. Targets for Measures of Progress were established under assumptions contained in Action Plan III. Fourteen measures have annual targets; the rest track progress toward long-term goals that will take more than five years to reach. Table A-2 provides detailed information.

Table A-1. Overview of the Results Achieved for the 23 Measures of Progress in GLRI Action Plan III

| Focus Area | Measure ^a | Baseline/ Universe ^b | FY 2020 Result/Target ^c | FY 2021 Result/Target ^d | FY 2022 Result/Target ^e |
|--|---|------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Toxic Substances and Areas of Concern | 1.1.1. AOC management actions* | B: 12/ U: 31 | 14/16 | 15/18 | 16/19 |
| | 1.1.2. BUIs* | B: 80/ U: 225 | 97/93 | 106/101 | 113/109 |
| | 1.1.3. AOC management action lists* | B: 18/ U: 31 | 22/22 | 24/24 | 24/26 |
| | 1.2.1. Organizations sharing consumption information with vulnerable populations | NA | 9 | 7 | 13 |
| | 1.3.1. Chemical monitoring and assessment activities | NA | 15 | 12 | 11 |
| Preventing and Controlling Invasive Species | 2.1.1. Rapid responses or exercises | B: 8 | 20/8 | 57/8 | 47/8 |
| | 2.1.2. Projects managing pathways | B: 16.25 avg. | 38 | 28 | 58 |
| | 2.1.3. Early detection activities | B: 12.25 avg. | 14 | 32 | 45 |
| | 2.2.1. Aquatic/terrestrial acreage controlled* | B: 153,569 | 201,991/ 165,000 | 216,839/ 171,000 | 238,077/ 177,000 |
| | 2.3.1. Technologies and methods field tested | B: 10 avg. | 14 | 7 | 5 |
| | 2.3.2. Collaboratives developed/enhanced* | B: 10 | 17 | 19 | 20 |
| Nonpoint Source Pollution Impacts on Nearshore Health | 3.1.1. Phosphorus reduction throughout Great Lakes watersheds* (pounds) | B: 1,113,603 | 1,784,790/ 1,600,000 | 2,066,521/ 1,900,000 | 2,334,783/ 2,200,000 |
| | 3.1.2. Nutrient management assistance in priority Great Lakes watersheds* (acres) | B: 1,614,511 U: 10,711,434 | 1,762,484/ 2,200,000 | 1,831,158/ 2,370,000 | 1,940,785/ 2,515,000 |
| | 3.2.1. Stormwater captured or treated* (millions of gallons) | B: 252 | 372.4/350 | 413.6/400 | 511.3/450 |
| | 3.2.2. Shoreline restored or protected* (miles) | B: 26 | 34.3/33 | 43.6/40 | 61.1/47 |
| | 3.3.1. Nutrient monitoring and assessment activities | B: 30 | 31/30 | 31/30 | 33/30 |
| | 3.3.2. Nutrient/stormwater practices or tools | B: 10 | 14/10 | 12/10 | 15/10 |
| Habitats and Species | 4.1.1. Habitat restored, protected, or enhanced* (acres) | B: 370,488 U: 1,550,000 | 463,058/ 394,000 | 479,293/ 406,000 | 506,113/ 418,000 |
| | 4.1.2. Aquatic connectivity* (miles) | B: 5,289 | 6,052/ 5,700 | 6,727/ 5,900 | 7,175/ 6,100 |
| | 4.2.1. Species benefited* | B: 0 | 1/1 | 2/2 | 4/4 |
| Foundations for Future Restoration | 5.1.1. Youth impacted through education/ stewardship* | B: 377,000 | 578,559 | 627,106 | 685,007 |
| | 5.2.1. Annual monitoring | NA | Yes | Yes | Yes |
| | 5.2.2. Identify and address science priorities | NA | Yes | Yes | Yes |

Notes: avg. = average; B = baseline; NA = not applicable; U = universe.

Shaded cells display results achieved/targets. Unmet targets are italicized in red-shaded cells. Green-shaded cells indicate targets have been met. Cells without denominators show results for measures that do not have targets.

^a Cumulative measures are indicated with an asterisk (*).

^b Baselines for cumulative measures identify results through FY 2018 except for measures 1.1.1 and 1.1.2 (through FY 2009). Baselines for noncumulative measures identify regularly expected annual results. The baseline and universe for measure 3.1.2 have been updated from GLRI Action Plan III to use an FY 2018 baseline and correctly account for eligible acreage. The “universe” is not available if not provided.

^c The FY 2020 column identifies targets and results through September 30, 2020, for GLRI Action Plan III measures.

^d The FY 2021 column includes targets and results through September 30, 2021, for GLRI Action Plan III measures.

^e The FY 2022 column includes targets and results through September 30, 2022, for GLRI Action Plan III measures.

Table A-2. GLRI Action Plan III Measures of Progress – Detailed Information

| Measure | Target/Baseline/ Universe ^b | Result ^c | Explanation/Additional Information |
|--|---|--|---|
| 1.1.1. Areas of Concern where all management actions necessary for delisting have been implemented (cumulative) ^a | FY 2022: 19 FY 2021: 18 FY 2020: 16 Baseline: 12 Universe: 31 | FY 2022: 16 FY 2021: 15 FY 2020: 14 | Buffalo River, NY – 03/2022 |
| 1.1.2. Beneficial Use Impairments removed in Areas of Concern. (cumulative) ^a | FY 2022: 109 FY 2021: 101 FY 2020: 93 Baseline: 80 Universe: 225 | FY 2022: 113 FY 2021: 106 FY 2020: 97 | <i>Bird or Animal Deformities or Reproduction Problems:</i> Rochester Embayment, NY – 09/2022 <i>Degradation of Aesthetics:</i> Lower Green Bay/Fox River, WI – 04/2022; Muskegon Lake, MI – 10/2021; Rochester Embayment, NY – 06/2022 <i>Restrictions on Dredging Activities:</i> Black River, OH – 04/2022; Buffalo River, NY – 09/2022 <i>Restrictions on Fish & Wildlife Consumption:</i> Maumee, OH – 08/2022 |
| 1.1.3. Areas of Concern with a complete and approved list of all management actions necessary for delisting. (Cumulative) | FY 2022: 26 FY 2021: 24 FY 2020: 22 Baseline: 18 Universe: 31 | FY 2022: 24 FY 2021: 24 FY 2020: 22 | No additional Areas of Concern had all management action lists completed and approved in FY 2022. |
| 1.2.1. Number of state and tribal organizations that collect and share information with vulnerable populations regarding the consumption of Great Lakes fish, wildlife, and harvested plant resources. | No targets Baseline: NA Universe: NA | FY 2022: 13 FY 2021: 7 FY 2020: 9 | The GLRI funded several Great Lake states to help develop and enhance fish consumption advisory outreach material, including the development of new fish consumption advice messaging for Hmong, Karen, and Chinese communities in the State of Wisconsin. The GLRI also funded contaminant monitoring, including monitoring of per- and polyfluoroalkyl substances (PFAS) in fish in Michigan to determine if fish consumption advisories are warranted. |
| 1.3.1. Discrete chemical monitoring and assessment activities conducted. | No targets Baseline: NA Universe: NA | FY 2022: 11 FY 2021: 12 FY 2020: 15 | The GLRI placed an emphasis on chemicals of mutual concern (CMC) monitoring and assessment that included assessing PFAS and other priority contaminants in Lake Superior and Lake Huron fish-eating birds; PFAS impacts on native mussels; and the status of CMCs and other priority contaminants in Great Lakes tributaries. |
| 2.1.1. Rapid responses or exercises conducted. | FY 2022: 8 FY 2021: 8 FY 2020: 8 Baseline: 8 Universe: NA | FY 2022: 47 FY 2021: 57 FY 2020: 20 | The eight Great Lakes states have committed to conducting annual training exercises but prioritize activities to respond to detections of new invasive species. The content of the Result column is the actual number completed each year by multiple state agencies and others. |
| 2.1.2. Projects that manage pathways through which invasive species can be introduced to the Great Lakes ecosystem. | No targets Baseline: 16.25 avg. Universe: NA | FY 2022: 58 FY 2021: 28 FY 2020: 38 | Projects included work to reduce the spread of invasive species by hunters, anglers, organisms-in-trade, bait dealers, canals and waterways, and recreational boat pathways. |
| 2.1.3. Early detection and surveillance activities conducted. | No targets Baseline: 12.25 avg. Universe: NA | FY 2022: 45 FY 2021: 32 FY 2020: 14 | Early detection activities were conducted in FY 2020 through FY 2022. Activities included both conventional monitoring techniques (nets, traps, and electroshocking) as well as eDNA sampling. |
| 2.2.1. Aquatic/terrestrial acreage controlled. (Cumulative) | FY 2022: 177,000 FY 2021: 171,000 FY 2020: 165,000 Baseline: 153,569 Universe: NA | FY 2022: 238,077 FY 2021: 216,839 FY 2020: 201,991 | Collaborations among GLRI federal agencies, Tribes, state agencies, and the general public continue to protect high-value ecological and recreational sites from establishment of invasive species while promoting reestablishment of native species. |

| Measure | Target/Baseline/ Universe ^b | Result ^c | Explanation/Additional Information |
|--|---|--|---|
| 2.3.1. Technologies and methods field tested. | No targets Baseline: 10 avg. Universe: NA | FY 2022: 5 FY 2021: 7 FY 2020: 14 | Technologies included ballast water treatment systems, species-specific toxicants, behavioral fish barriers, and forest planting BMPs to offset forest pests. |
| 2.3.2. Collaboratives developed/enhanced. (Cumulative) | No targets Baseline: 10 Universe: NA | FY 2022: 20 FY 2021: 19 FY 2020: 17 | Greater Tribal participation in the Midwest Invasive Species Network. |
| 3.1.1. Estimated pounds of phosphorus reductions from conservation practice implementation throughout Great Lakes watersheds. (Cumulative) | FY 2022: 2,200,000 FY 2021: 1,900,000 FY 2020: 1,600,000 Baseline: 1,113,603 Universe: NA | FY 2022: 2,334,783 FY 2021: 2,066,521 FY 2020: 1,784,790 | Contributing agencies: BIA, EPA, NRCS, and USFWS. Results can vary each year due to the nature of voluntary conservation assistance programs. |
| 3.1.2. Acres receiving technical or financial assistance on nutrient management in priority watersheds. (Cumulative) | FY 2022: 2,515,000 FY 2021: 2,370,000 FY 2020: 2,200,000 Baseline: 1,614,511 Universe: 10,711,434 | FY 2022: 1,940,785 FY 2021: 1,831,158 FY 2020: 1,762,484 | Contributing agencies: EPA and NRCS. This measure focuses on improving long-term adoption of nutrient management. Ambitious targets were set based on phosphorus reduction needs in the priority watersheds. The result through FY 2022 is 77% of the target, due, in part, to elimination of duplicative reporting; agencies expect to institute program adjustments that will improve the results for this measure. |
| 3.2.1. Estimated gallons (in millions) of untreated stormwater runoff captured or treated. (Cumulative) | FY 2022: 450 FY 2021: 400 FY 2020: 350 Baseline: 252 Universe: NA | FY 2022: 511.3 FY 2021: 413.6 FY 2020: 372.4 | Contributing agencies: EPA, NRCS, USFS, and USFWS. Results for on-the-ground construction projects are reported at time of award. Actual results may vary as projects are implemented. |
| 3.2.2. Miles of Great Lakes shoreline and riparian corridors restored or protected. (Cumulative) | FY 2022: 47 FY 2021: 40 FY 2020: 33 Baseline: 26 Universe: NA | FY 2022: 61.1 FY 2021: 43.6 FY 2020: 34.3 | Contributing agencies: APHIS, EPA, NRCS, USACE, and USFWS. Results for on-the-ground construction projects are reported once implemented. |
| 3.3.1. Nutrient monitoring and assessment activities conducted. | FY 2022: 30 FY 2021: 30 FY 2020: 30 Baseline: 30 Universe: NA | FY 2022: 33 FY 2021: 31 FY 2020: 31 | Contributing agencies: NOAA and USGS. This measure tracks ongoing monitoring and assessment activities. Actual results may vary each year as new projects are added. |
| 3.3.2. Nutrient or stormwater runoff reduction practices or tools developed or evaluated. | FY 2022: 10 FY 2021: 10 FY 2020: 10 Baseline: 10 Universe: NA | FY 2022: 15 FY 2021: 12 FY 2020: 14 | Contributing agencies: EPA, NOAA, USACE, and USGS. This measure tracks multiyear projects that evaluate or develop new tools or management practices. Actual results may vary each year as new projects are added. |
| 4.1.1. Acres of coastal wetland, nearshore, and other habitats restored, protected, or enhanced. (Cumulative) | FY 2022: 418,000 FY 2021: 406,000 FY 2020: 394,000 Baseline: 370,488 Universe: 1,550,000 | FY 2022: 506,113 FY 2021: 479,293 FY 2020: 463,058 | Significant on-the-ground restoration was accomplished each year, largely as a result of previous planning and design activities. |
| 4.1.2. Miles of connectivity established for aquatic species. (Cumulative) | FY 2022: 6,100 FY 2021: 5,900 FY 2020: 5,700 Baseline: 5,289 Universe: NA | FY 2022: 7,175 FY 2021: 6,727 FY 2020: 6,052 | Completion of dam removal and small barrier, bridge, and culvert replacements benefited important native species, including brook trout and native mussels. |

| Measure | Target/Baseline/ Universe ^b | Result ^c | Explanation/Additional Information |
|--|---|--|--|
| 4.2.1. Species benefited where actions have been completed to significantly protect or promote recovery of populations. (Cumulative) | FY 2022: 4 FY 2021: 2 FY 2020: 1 Baseline: 0 Universe: NA | FY 2022: 4 FY 2021: 2 FY 2020: 1 | Lake trout and Mitchell's satyr butterfly in FY 2022. |
| 5.1.1. Youth impacted through education and stewardship projects. (Cumulative) | No targets Baseline: 377,000 Universe: NA | FY 2022: 685,007 FY 2021: 627,106 FY 2020: 578,559 | This measure is supported by Great Lakes Sea Grant Center for Great Lakes Literacy, NOAA's Great Lakes Bay Watershed Education and Training program, NPS interpretive programs, Ohio Department of Natural Resources, and Michigan Department of Environment, Great Lakes, and Energy. |
| 5.2.1. Annual Great Lakes monitoring conducted and used to prioritize GLRI funding decisions. | No targets Baseline: NA Universe: NA | FY 2022: Yes FY 2021: Yes FY 2020: Yes | GLRI federal agencies and partners conducted comprehensive monitoring to assess the status and trends of the Great Lakes ecosystem. Monitoring of coastal wetlands, contaminants, nutrients, hypoxia, HABS, zooplankton, phytoplankton, benthic communities, and prey fish, among many other components, was conducted throughout the Great Lakes basin. The monitoring data and information from previous years were used to identify the most significant Great Lakes problems and prioritize funding decisions to address those problems. |
| 5.2.2. Identify and address cross-Focus Area science priorities to support implementation of GLRI and the Great Lakes Water Quality Agreement. | No targets Baseline: NA Universe: NA | FY 2022: Yes FY 2021: Yes FY 2020: Yes | GLRI federal agencies and partners conducted several projects addressing the established science priorities under this Focus Area. Projects included studies on <i>Cladophora</i> nuisance algae, monitoring HABS in Lake Erie, identifying the need for coastal resilience; and modeling future lake level conditions. |

Notes: avg. = average; NA = not applicable.

^a Results from this Action Plan III measure are achieved through GLRI funding as well as other non-GLRI federal and/or state funding.

^b Baselines for cumulative measures identify results through FY 2018 except for measures 1.1.1 and 1.1.2 (through FY 2009, the year before the GLRI was launched) and measure 3.1.1 (through FY 2017). Baselines for noncumulative measures identify regularly expected annual results. The baseline and universe for measure 3.1.2 have been corrected from Action Plan III to exclude acreage outside Great Lakes priority watersheds. The "universe" is not available if not provided.

^c Results are included for FY 2020–FY 2022. The methods for calculating results can be found in the GLRI Action Plan III Measures Reporting Plan – September 2021 (<https://gtri.us/documents>).