

Great Lakes RESTORATION



Great Lakes Restoration Initiative Report to Congress and the President September 2022

Fiscal Year 2019



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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 2019 on: funding; project accomplishments; success stories; and actual results compared to planned targets under GLRI Action Plan II. Data on direct spending is taken from the U.S. Environmental Protection Agency financial system. Information on GLRI projects and activities is also 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 House Committee on Transportation and Infrastructure and the Senate Committee on Environment and Public Works. The report also satisfies the Measure of Progress under GLRI Action Plan II requiring issuance of annual GLRI reports to Congress and the President.

MESSAGE FROM THE CHAIR OF THE GREAT LAKES INTERAGENCY TASK FORCE

The Great Lakes Restoration Initiative continues to achieve unprecedented results in restoring and protecting the Great Lakes. Between the GLRI's inception in FY 2010 and the end of FY 2019, the U.S. Environmental Protection Agency and its partnering federal agencies have invested approximately \$3.16 billion from the GLRI to implement more than 5,000 projects across the Great Lakes basin.

In FY 2019, GLRI-funded projects:

- Cleaned up contaminated “areas of concern” – toxic hotspots which remained untouched and polluted for years but which are now being environmentally restored and economically revitalized.
- Kept silver carp, bighead carp, and black carp out of the region, preventing irreversible damage to the ecological and economic integrity of the Great Lakes.
- Reduced phosphorus loads and urban runoff – which contribute to harmful algal blooms – entering the Great Lakes.
- Restored and enhanced natural habitat across the Great Lakes basin.

I am proud of the EPA's role in leading the implementation of the GLRI, while recognizing the essential roles performed by our

federal, Tribal, state, local and private partners. These well-established, strong, and continuing partnerships have been the linchpin of the GLRI's success, and, along with the environmental benefits, are a key reason for the initiative's strong and widespread support.

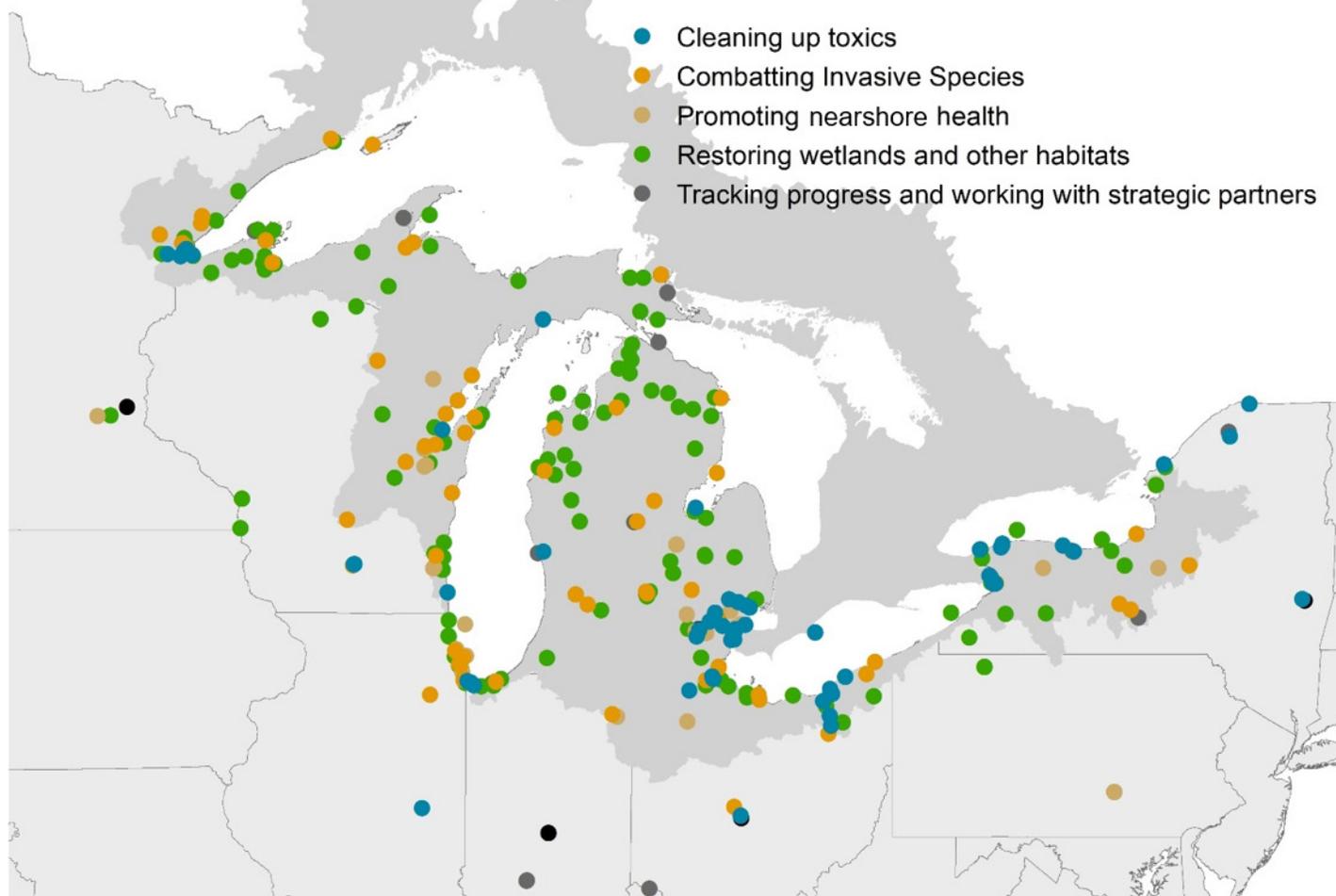
The Biden-Harris Administration will continue to support the Great Lakes by not only restoring and protecting the Great Lakes environment, but by recognizing and emphasizing the relationship between a restored environment and opportunities for economic, social, and cultural revitalization and environmental justice. Every person in the United States has the right to clean air, clean water, and a healthier life – no matter how much money they have in their pockets, the color of their skin, or their zip code. Across the Great Lakes, formerly degraded and economically abandoned waterfront areas are “coming back to life” as people take advantage of the recreational, social, and economic opportunities that these restored areas provide – opportunities made possible by the GLRI and the partnerships and hard work that are necessary to implement it.

The GLRI is proof that environmental protection and economic prosperity go hand in hand. EPA is committed to building on the GLRI's tremendous success, and I look forward to achieving even greater results in upcoming years.

Michael S. Regan



Great Lakes Restoration Initiative Projects (FY2019)



Section 1 – Executive Summary

The Great Lakes Restoration Initiative, or the GLRI, continues to achieve unprecedented results in restoring and protecting the Great Lakes – the largest system of fresh surface water in the world. The GLRI has advanced record-breaking efforts to protect and restore lakes Superior, Michigan, Huron, Erie and Ontario – the Great Lakes. Since its 2010 inception, the GLRI has tackled historically challenging environmental problems and imminent threats facing this indispensable ecosystem.

Under EPA’s leadership, the GLRI has been a catalyst for unparalleled coordination among the federal agencies and departments that make up the GLRI Interagency Task Force (IATF) and the GLRI Regional Working Group (RWG). Through FY 2019, GLRI has funded over 5,330 projects that focus on the most important Great Lakes environmental issues, including cleaning up highly contaminated Areas of Concern, reducing phosphorus contributions to harmful algal blooms, protecting and restoring native habitat and species, controlling existing invasive species and preventing the introduction of new invasive species.

In December of 2016, Congress amended Section 118 of the Clean Water Act to authorize GLRI funding and direct efforts across five priority areas, including: (i) the remediation of toxic substances and areas of concern; (ii) the prevention and control of invasive species and the impacts of invasive species; (iii) the 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 five priority areas correspond directly with the [Action Plan II](#) Focus Areas described below. This report provides an overview of progress during FY 2019 for each Focus Area within Action Plan II.

GLRI Action Plan II Focus Areas

1) Toxic Substances and Areas of Concern

During FY 2019, GLRI federal agencies¹ and their partners made significant progress completing sediment remediation and habitat restoration projects in Areas of Concern (AOCs) and surpassed the Action Plan II target of beneficial use impairment removals. Although the ambitious target for implementing all management actions necessary for delisting at five additional AOCs in FY 2019 was not met, completed and ongoing work is expected to position GLRI federal agencies and their partners to be able to complete all management actions necessary for delisting at three AOCs in FY 2020. The GLRI federal agencies and their partners also continued their work to protect human health from contaminants in Great Lakes fish and assess impacts of chemicals of emerging concern on fish and wildlife populations in the Great Lakes basin.

2) Preventing and Controlling Invasive Species

During FY 2019, GLRI federal agencies and their partners continued efforts to prevent the introduction of new invasive species and to control existing invasive species populations throughout the Great Lakes ecosystem. Ongoing work continues to aggressively prevent the migration into and establishment of invasive carp in the Great Lakes. Since the inception of the GLRI, federal agencies and their partners have taken actions to control invasive species on over 175,000 terrestrial and aquatic acres, including over 24,000 acres in FY 2019.

3) Nonpoint Source Pollution Impacts on Nearshore Health

During FY 2019, GLRI federal agencies and their partners implemented conservation activities to reduce sources of phosphorus loadings that threaten Great Lakes nearshore regions. These partners worked collaboratively to reduce nonpoint sources of excess phosphorus runoff that contribute to harmful algal blooms around the Great Lakes in priority watersheds such as the Lower Fox River, Saginaw River, and Maumee River. GLRI federal agencies estimate that over 1.5 million pounds of phosphorus have been prevented from leaving farms and entering the Great Lakes cumulatively as a result of GLRI-funded projects including over 400,000 pounds of phosphorus reductions in FY 2019 alone. In addition, during FY 2019, GLRI federal agencies and their partners worked collaboratively in urban areas to prevent over 20 million gallons of polluted storm water from entering the Great Lakes.

4) Habitat and Species

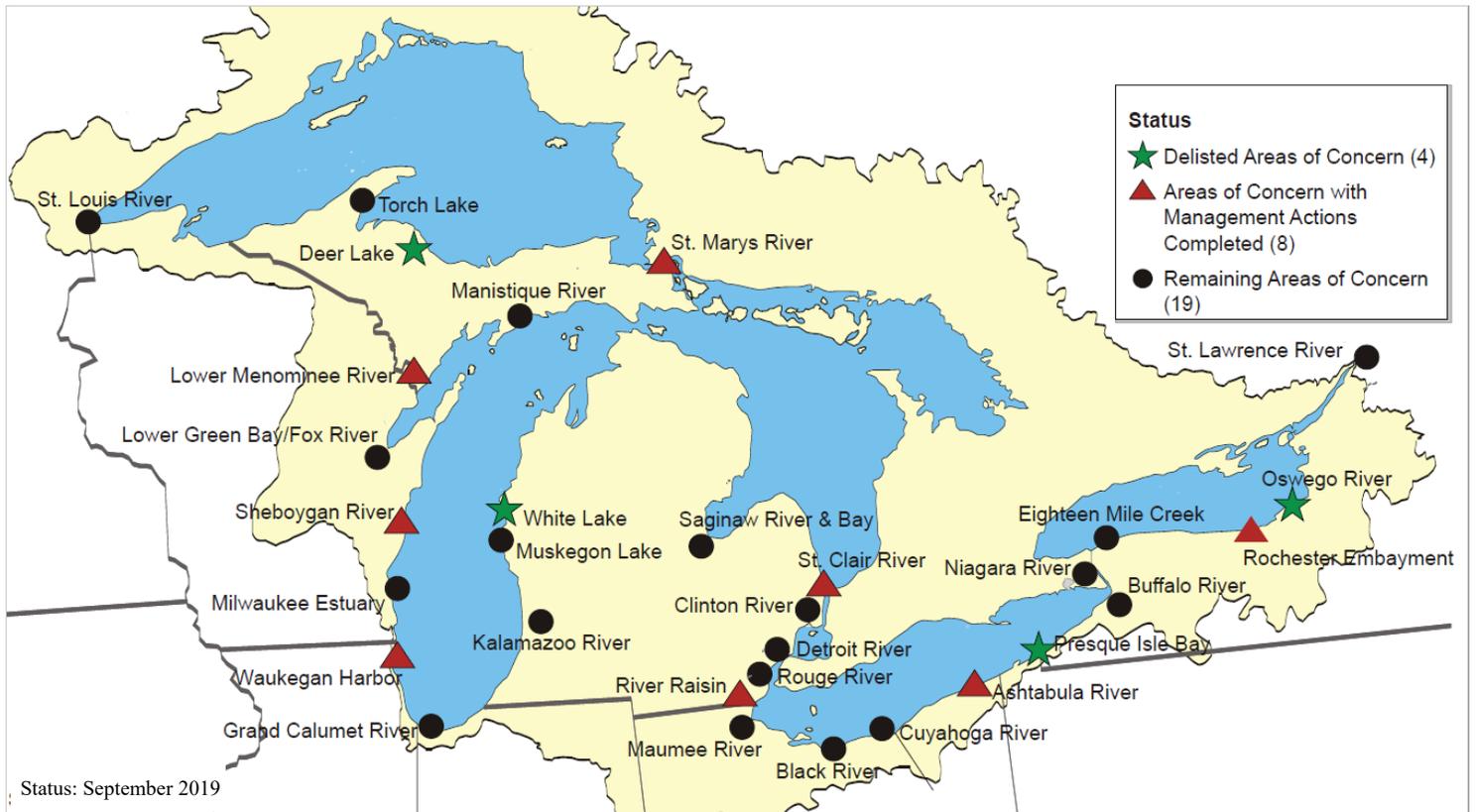
During FY 2019, GLRI federal agencies and their partners protected, restored, and enhanced habitats and native species throughout the Great Lakes basin. Since the start of the GLRI, these efforts have included protecting and restoring greater than 60,000 acres of coastal wetlands, with over 7,000 in FY 2019, that benefit a variety of native fish, bird, and amphibian species. Since the start of the GLRI, more than 5,400 miles of increased connectivity for aquatic organisms, including over 200 miles in FY 2019, has been created in streams and rivers.

5) Foundations for Future Restoration Actions

During FY 2019, GLRI federal agencies and their partners trained over 600 educators (with a general focus on grades K-12). In turn, these educators will reach over 42,000 students each year by incorporating Great Lakes-specific material into their environmental education curricula. More than 42,000 people were also educated on the Great Lakes ecosystem through place-based experiential learning activities provided via National Park Service (NPS) interpretive programs in FY 2019.

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 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 EPA (Great Lakes National Program Office).

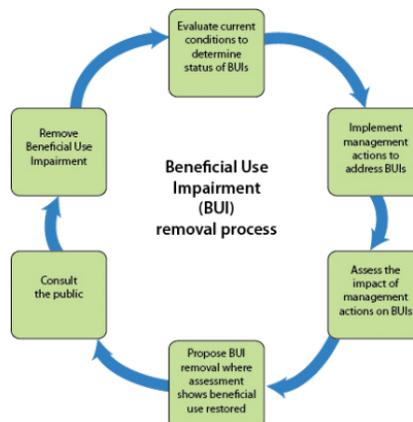
Section 2 – Program Accomplishments

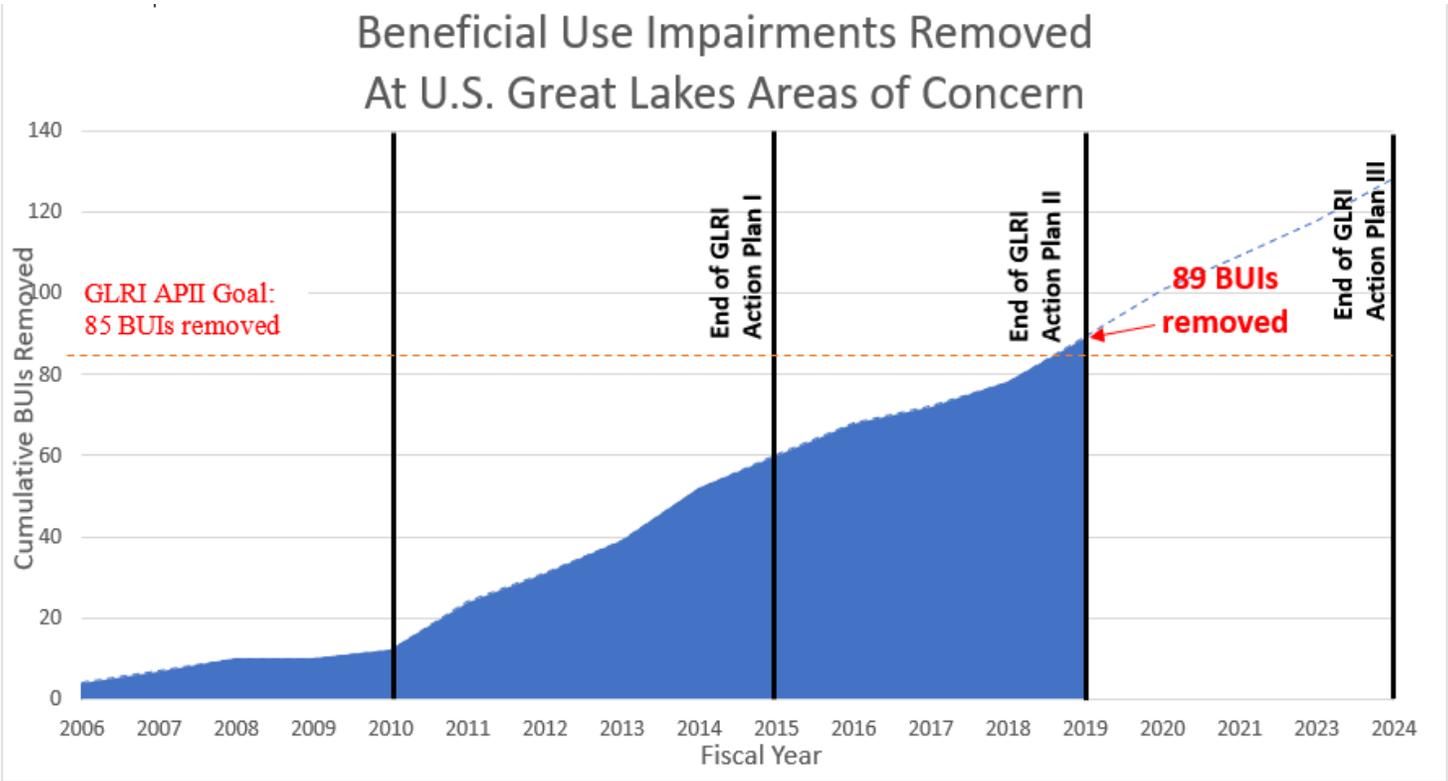


FOCUS AREA 1: Toxic Substances and Areas of Concern

First formally defined in the 1987 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 environmental degradation such as habitat loss and fish consumption advisories. Through the end of FY 2019, GLRI federal agencies and their partners have delisted four AOCs and have completed all management actions required to delist an additional eight AOCs.

In FY 2019, GLRI federal agencies and their partners removed nine Beneficial Use Impairments (BUIs), indicators of environmental harm, at five AOCs in five states, bringing the cumulative total of BUIs removed to 89. From FY 2010 to FY 2019, 79 BUIs have been removed, almost eight times the total removed since the inception of the GLRI. BUIs are indicators of environmental harm used to characterize an AOC. Once all BUIs associated with an AOC are removed, the AOC can move forward with delisting.





During FY 2019, GLRI federal agencies and their partners implemented one new project and continued to fund several ongoing projects that will further protect people from contaminants in Great Lakes fish. GLRI federal agencies and their partners conducted outreach activities targeting populations that consume high amounts of Great Lakes fish, including several sensitive populations and environmental justice communities, and provided the public with information on the health benefits as well as the risks of Great Lakes fish consumption. Specifically, these projects informed urban anglers in Detroit of current fish advisories by conducting educational and outreach activities; enhanced awareness and availability of consumption advice in Milwaukee’s Hmong community; and built upon earlier and highly successful GLRI projects that utilized health care providers as a resource for communicating fish consumption guidance.

GLRI federal agencies and their partners continued their integrated efforts to identify the extent to which chemicals of emerging concern (CECs), such as pharmaceuticals, pesticides, and flame retardants, threaten Great Lakes fish and wildlife populations and to develop biological effects surveillance tools to inform resource management decisions. Through these efforts, GLRI federal agencies and partners identified some CECs (e.g., example pesticides like atrazine and several polycyclic aromatic hydrocarbons (PAHs)) that are found throughout Great Lakes tributaries with the types of chemicals present depending on a variety of factors including the surrounding land use (e.g., urban vs. agricultural inputs). As a result of this work, GLRI partners are developing and refining biological surveillance tools that will allow resource managers to make better decisions about possible adverse effects from these chemicals.

Focus Area 1 Success Stories

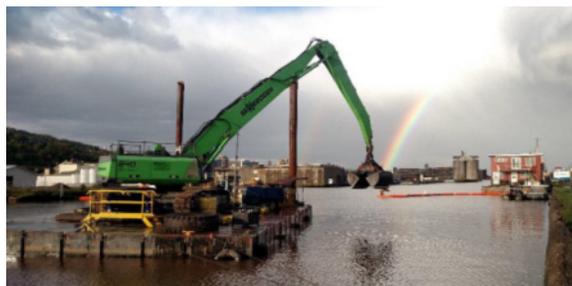
Restoration at the Former Otsego Township Dam Site: Kalamazoo River AOC

The Kalamazoo River's Otsego Township dam was removed in FY 2019 and the former spillway has been restored. The former dam was over 100 years old and failing. The state of Michigan provided \$1.2 million in dam management grant funding, along with \$2.4 million from a settlement tied to the 2010 Kalamazoo River oil spill, to remove the dam and route the river back to its original channel. EPA's Superfund program ordered a Time Critical Removal Action to remove polychlorinated biphenyl (PCB) -contaminated sediments in the impoundment and required potentially responsible parties to assist with the dam removal. In 2018, EPA provided the Michigan Department of Natural Resources (MI DNR) an additional \$275,000 in GLRI funds to complete the demolition and removal of the former spillway and restore floodplain habitat, building upon prior GLRI support for engineering and design work for the dam removal. Collectively, these efforts are now complete. The ecological functions of the river and floodplain system, and the quality of fishing and paddling opportunities have vastly improved. This project exemplifies the dramatic impacts of federal, state, and private industry partnerships. The natural resources and human use and enjoyment of the Kalamazoo River will continue to improve and benefit from this project for generations to come.



Sediment Remediation of Slip 3, Slip C, and Minnesota Slip: St. Louis River AOC

EPA partnered with the Minnesota Pollution Control Agency (MPCA) to remediate approximately 154,000 cubic yards of sediment contaminated with polycyclic aromatic hydrocarbons (PAHs), dioxins, PCBs, and heavy metals in three boat slips in the St. Louis River AOC in FY 2019. One slip is adjacent to the downtown Duluth waterfront, and the other two are located in the industrialized Duluth-Superior harbor. This remediation work included placement of over 10 acres of an environmental remedial cap to "isolate in place" contaminated material. The projects addressed areas with a long history of legacy contamination and are critical steps in the larger effort to restore the St. Louis River AOC.



Restoring the Clinton River AOC

EPA partnered with the U.S. Army Corps of Engineers (USACE), the State of Michigan, Shelby Township, and Oakland University to complete construction of three habitat restoration projects in the Clinton River AOC in FY 2019. These projects were identified as critical to the removal of the *Loss of Fish and Wildlife Habitat* and *Degraded Fish and Wildlife Populations* BUIs in the Clinton River AOC. Components of the projects included invasive species removal, beneficial use of dredged material to create emergent wetland habitat, stabilization of unstable riverbanks, creation of backwater habitat for various species of juvenile fish, improved stream crossings, and native plantings. In total, these projects have created 11 acres of wetland habitat, improved over 4 acres of coastal habitat, restored 14 acres of riparian habitat, and stabilized 1,200 feet of the Clinton River.



St. Clair-Detroit River System Fish Spawning Reefs: Detroit River AOC



Since 2012, an international and multi-agency collaborative has placed over 20 acres of fish spawning reefs in the St. Clair-Detroit River System to restore lost fish spawning habitats. Ecosystem monitoring in FY 2019 showed evidence that increased fishery production and added ecosystem resilience are being derived from the restored spawning reefs. Economically and ecologically important native fishes, such as walleye, lake whitefish, and lake sturgeon are now using the restored reefs for spawning. Standardized fisheries assessment surveys and angler catches show increased numbers of walleye and lake sturgeon. State and federally imperiled species such as northern madtom (a small catfish) and the mudpuppy (an aquatic salamander) are also using the reefs. Reef restoration projects are helping resource managers achieve habitat and fisheries



restoration goals, restoring lost ecosystem services to the Great Lakes, and demonstrating a strong return on investments for GLRI and local economies by increasing fisheries production, habitat diversity, and stakeholder satisfaction. Lessons learned from reef restoration projects conducted in the St. Clair-Detroit River System are being applied in other systems undergoing remediation efforts including: the Lower Green Bay/Fox River AOC in Wisconsin and the St. Lawrence River AOC in New York.

Barkers Island Beach Restoration Project Completed: St. Louis River AOC



The Wisconsin Department of Natural Resources (WDNR) and the City of Superior completed a beach restoration project with \$700,000 of GLRI funding at Barkers Island Beach in Superior, WI in FY 2019. The Barkers Island Beach had high bacteria levels that led to frequent swimming advisories and beach closures. The restoration project was implemented to reduce beach closures to help remove the *Beach Closings* BUI for the St. Louis River AOC. The project reduced bacteria through the creation of shoreline vegetation to deter waterfowl and gulls from using the area, vegetated swales, pervious parking lots,



wetland enhancements to reduce storm water runoff, and tree plantings. In addition to the habitat improvements, the City of Superior funded an elevated boardwalk and additional trash and bathroom facilities to further reduce bacteria inputs and enhance the beach recreational use. Local residents and tourists have been enthusiastically using the restored beach.

Lake Okonoka: Detroit River AOC

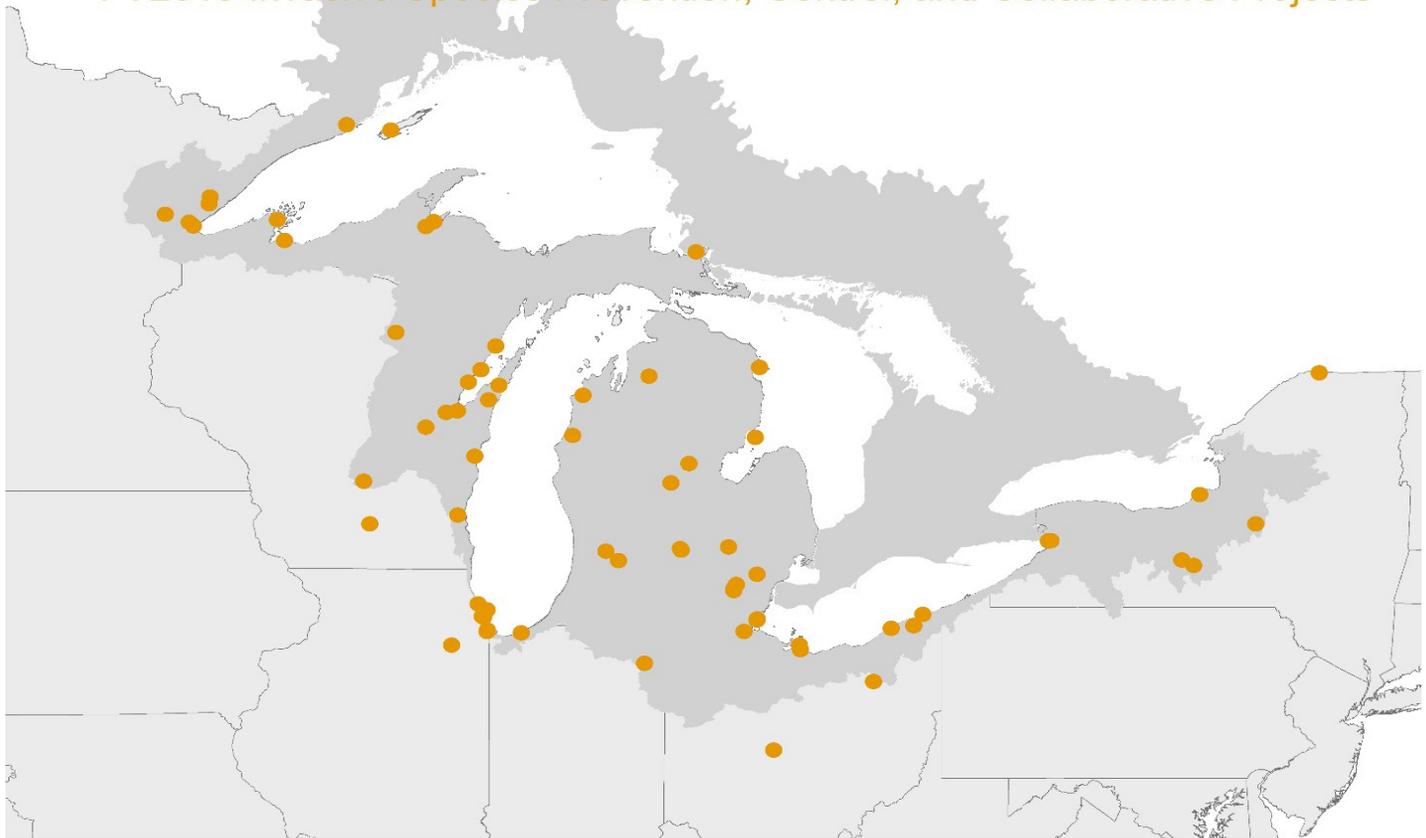


In FY 2019, a partnership between the NOAA Fisheries Office of Habitat Conservation's Restoration Center and the Friends of the Detroit River completed the originally conceived restoration for the \$4.9M Lake Okonoka Habitat Restoration Project on Belle Isle in the Detroit River AOC. The Belle Isle area provides critical Great Lakes fish spawning for a variety of sport fish. In the 1950s, Lake Okonoka was cut off from the Detroit River. The lake's isolation resulted in stagnant water conditions and eliminated the ability of Great Lakes fish from using the lake to spawn. The project reestablished the connection between the lake and the Detroit River to improve the variety of aquatic habitats in the lake and connect the lake's inlet and outlet to two previously completed Detroit River AOC habitat restoration projects: Blue Heron Lagoon and the South Fishing Pier. As a result, Lake Okonoka now



supports a number of specialized habitats for fish and wildlife species, including: 1) 3,800 linear feet of deep channeling to provide passageways for fish; 2) 3.2 acres of deep water pools to provide attractive areas for fish schooling; 3) 0.18 acres of gravel substrate over the lake bottom to provide fish spawning beds; 4) 1.5 acres of mudflats to enhance foraging opportunities for shorebirds; and 5) 2 acres of wet meadow to provide habitat for pollinators and amphibian passage between an adjacent forest and the lake. The Lake Okonoka project alone restored 28 acres of important lake and nearshore habitat.

Great Lakes Restoration Initiative Projects FY2019 Invasive Species Prevention, Control, and Collaborative Projects



FOCUS AREA 2: Preventing and Controlling Invasive Species

During FY 2019, 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.

Early Detection and Rapid Response: During FY 2019, GLRI funded 53 early detection monitoring exercises that enhance the ability to detect and respond to new invasive species introductions. GLRI federal agencies and their partners also completed a total of 25 table-top exercises, field responses, and drills, exceeding the GLRI Action Plan II FY 2019 target of eight rapid responses and exercises.

Blocking Pathways: GLRI federal agencies and their partners have further reduced the risk of invasive species entering the Great Lakes watershed by funding 52 projects in FY 2019 that helped block pathways of invasive species introduction. These pathways include canals and water ways, recreational boating, commercial shipping, illegal trade of banned species, release of aquarium species, and release of live bait.

Restoration and Protection of Degraded Sites: GLRI federal agencies and their partners also restored sites degraded by aquatic, wetland, and terrestrial invasive species. 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 duration of the federally funded project lifespan. In addition, GLRI federal agencies directly implemented control projects in national forests, parks, and wildlife refuges. In FY 2019, GLRI funded projects that protected over 24,000 aquatic/terrestrial acres from invasive species for a cumulative total of more than 175,000 acres since the inception of GLRI.

In FY 2019, GLRI federal agencies and their partners maintained or enhanced their support of six species-specific “collaboratives,” through continued funding which helps communicate the latest control technologies and management techniques. Collaboratives that received continued funding included: invasive carp, phragmites, invasive mussels, invasive crayfish, monoecious hydrilla, and forest insects and pests. These collaboratives are actively involved in the protection and control efforts that are achieving results under the Action Plan.

Map of Case Study Locations



The Great Lakes Phragmites Collaborative provides a variety of online resources to entities wishing to understand previous efforts and implement a science-based approach to attacking this invasive species.

During FY 2019, GLRI federal agencies and their partners developed and refined invasive species control technologies and management techniques while effectively minimizing harm to other non-invasive fish species. Additional testing was also conducted on potential invasive species control technologies. In order to

evaluate their actual effectiveness in controlling invasive species, in FY 2019 GLRI federal agencies and their partners field-tested 13 different technologies and methods, including new ballast water management systems.



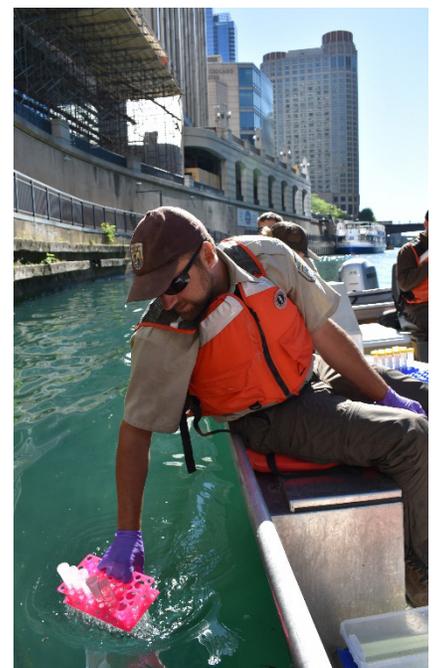
Protecting the Great Lakes from Invasive Carp

The GLRI provides support to the Invasive Carp Regional Coordinating Committee. More information about the ICRCC is available at <http://www.invasivecarp.us>.

Comprehensive Interagency eDNA Monitoring Program

Throughout FY 2019, U.S. Fish and Wildlife Service (FWS), in cooperation with other GLRI federal agency partners, continued monitoring for the presence of invasive carp environmental DNA (eDNA) in the Great Lakes basin, utilizing a statistically tenable sampling protocol. eDNA is a surveillance tool used to monitor for the genetic presence of an aquatic species. Currently, eDNA is used to monitor for the genetic presence of Bighead carp and Silver carp, two species of invasive carp. By sampling waters that could potentially be invaded by these species, the detection of their DNA can indicate the potential presence of the fish itself. FWS continued to upgrade its field sampling infrastructure and its collection and sample processing techniques as new technologies emerged. Results from individual eDNA sampling events and maps of results can be viewed at:

<https://fws.maps.arcgis.com/apps/dashboards/52b22abe9c4d4575adfe851a946f444d>



FWS scientist collects water for eDNA surveillance in the Chicago Area Waterway System.

Focus Area 2 Success Stories

Invasive Species Control to Protect Wild Rice

In FY 2019, the Saginaw Chippewa Indian Tribe, utilizing GLRI funding, continued implementation of their invasive species program in Michigan's Isabella, Arenac, and Iosco counties. This work included treatment of 151 acres of invasive phragmites along the shoreline of Lake Tawas, the home to the largest beds of wild rice located in Michigan. These treatments of phragmites have opened habitat up for native species that are important to the Tribe and which contribute to the overall biodiversity of the region. The Tribe's invasive species program will continue efforts to control and prevent the spread of invasive species in the Great Lakes, protecting native species that are culturally significant to the Saginaw Chippewa Indian Tribal community.



Proactive Steps to Address Invasive Carp Risk in the Ohio & Erie Canal



Proactive steps are being taken to keep aquatic nuisance species out of the Great Lakes by closing potential pathways connecting the Great Lakes and Mississippi River basins. The Great Lakes and Mississippi River Interbasin Study determined that the Ohio and Erie Canal near Akron, Ohio is a medium risk connection for transfer of Silver Carp, Bighead Carp, Black Carp, Northern Snakehead, and Skipjack Herring. Invasive Carp presence has been confirmed in the Ohio River and there is a moderate risk that Invasive Carp could move northward upstream through a series of tributaries and ultimately enter the Cuyahoga River in the Great Lakes basin. Addressing the risk now will help concerned parties be prepared for what could eventually become a much more immediate



threat to the ecology and economy of the Great Lakes. In 2019, the USACE began raising ground surfaces at various low points along about five miles of the Mississippi River basin/Great Lakes basin boundary, as well as installing screens or fencing at other locations. These extensive improvements maintain the scenic and historic significance of the area while reducing the potential for inter-basin movement of nuisance species.

Harpersfield Lamprey Barrier, Geneva, Ohio

In FY 2019, the USACE continued construction of an invasive species solution that will keep sea lamprey out of 103 miles of the Grand River and its tributaries in the State of Ohio. Sea lamprey are a parasitic invasive species that endanger native game fish within the Great Lakes. Using GLRI funding and the Great Lakes Fishery & Ecosystem Restoration authority, and in cooperation with non-Federal partners including Ashtabula Metro Parks and the Great Lakes Fishery Commission, the project will replace an existing deteriorated 118-year-old dam in Geneva, Ohio immediately upstream of the historic Harpersfield Covered Bridge. The new barrier will allow for sea lamprey capture, native fish passage, and greater public safety around the barrier. This restoration effort on the Grand River will contribute to protecting the ecological integrity of the Lake Erie watershed and eliminate the need to spend \$100,000/year on lampricide treatments which are currently expended to keep sea lamprey out of the Grand River.



Discovery World Event Promotes Public Awareness of Invasive Species Impacts to the Great Lakes



Discovery World in Milwaukee, Wisconsin offered free admission on May 5, 2019, opening its doors to 7,848 visitors from the public. U.S. Forest Service (USFS) staff were present at booths, educating visitors on the public’s role in helping to provide clean, abundant water as well as aquatic invasive species issues that impact the Great Lakes. USFS staff shared specific examples of benefits from invasive species projects and activities carried out through support of the GLRI. A dedicated, invasive species education and outreach component at the event was made possible by funding from the GLRI and a partnership between the USFS and Discovery World. Public education and outreach support the GLRI Action Plan II objective of preventing new invasive species introductions and the commitment to blocking pathways through which invasive species can be introduced into the Great Lakes ecosystem.



Providing Species-Specific Information to Great Lakes Stakeholders

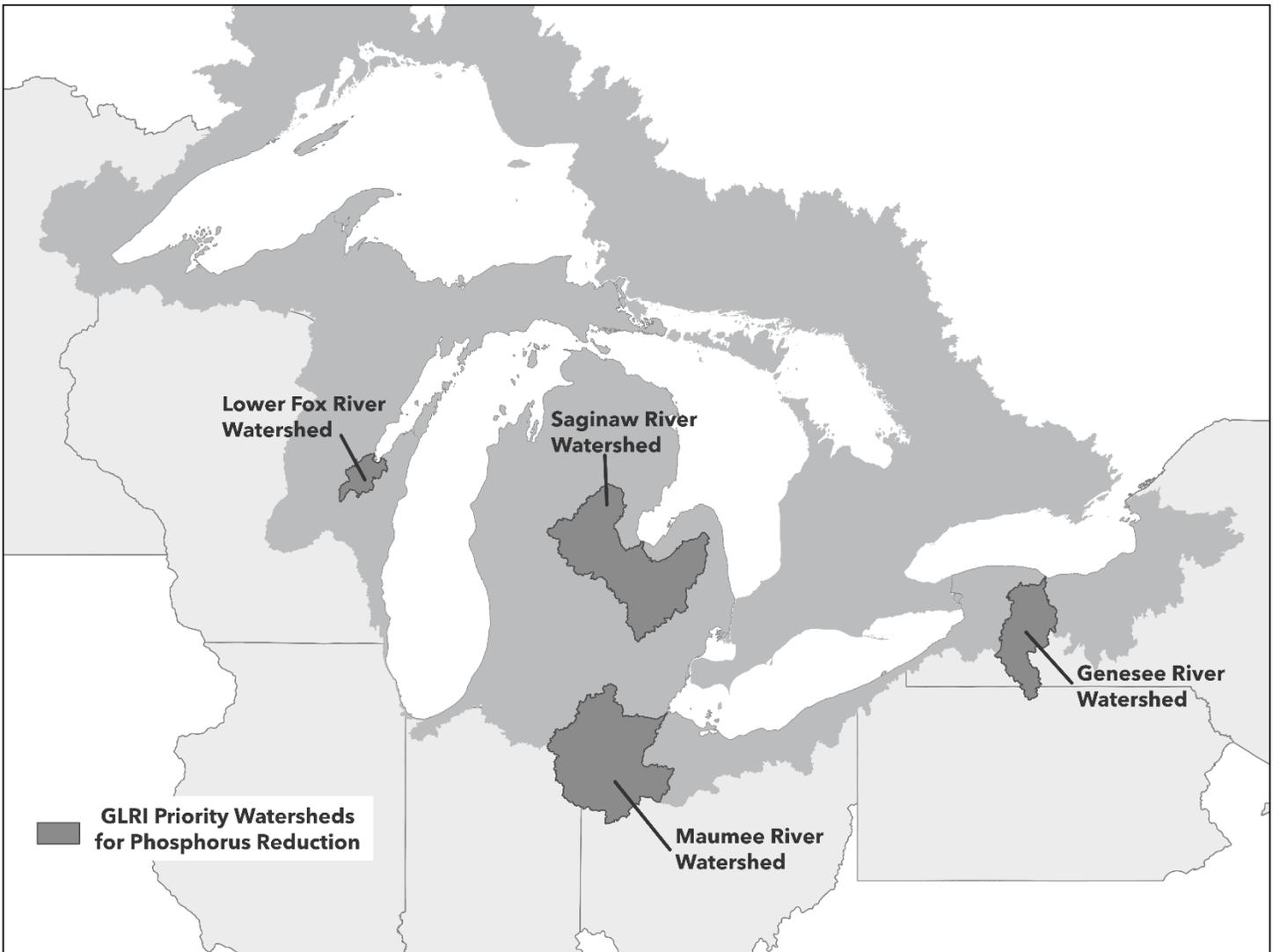
In FY 2019, National Oceanic and Atmospheric Administration’s (NOAA) Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS) piloted a new tool with GLRI funds to provide enhanced access to species-specific risk assessment data. The Great Lakes Panel on Aquatic Nuisance Species also supported the new GLANSIS tool using GLRI funds. The GLANSIS Risk Assessment Clearinghouse now contains more than 1,200 individual species risk assessment summaries in comparable tabular form. This new system saves a tremendous amount of time and resources for state resource managers because relevant invasive species risk assessment data is now at their fingertips in one convenient source' when considering new permits or particular management actions.

Great Lakes Grant Helps Restore Wetland after Emerald Ash Borer Damage



The emerald ash borer is an invasive insect in North America that kills ash trees. Native to Asia, they were first detected near Detroit, Michigan in 2002. Since then, the borer has killed tens of millions of ash trees in 35 States, the District of Columbia, and parts of Canada. The tiny insect can decimate woodlands that are dominated by native ash trees, leaving in its wake dead forests and standing fuel for wildfires. The Solution: While the emerald ash borer presents a major problem for forest health managers, its destructive aftermath offers an opportunity to increase biodiversity when replanting forests. The Genesee Land Trust, Inc. in New York received a GLRI grant for \$50,549 from USFS to restore a forested wetland habitat devastated by an emerald ash borer infestation. With the help of volunteers, the grant recipient planted 2,679 trees and shrubs across 20 acres in the Island Cottage Woods in Greece, NY. In all, 15 varieties of trees and 11 varieties of shrubs were planted during the project in FY 2019 providing critical habitat for migratory birds and a filter for surrounding urban runoff.





FOCUS AREA 3: Nonpoint Source Pollution Impacts on Nearshore Health

Polluted runoff, also known as “nonpoint source pollution” can cause a variety of negative impacts in the Great Lakes ecosystem including direct human health effects (e.g., *e. coli* related illnesses), drinking water impairments, harmful algal blooms (HABs), ecological dead zones, and beach closures. Runoff can carry 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 excess nutrients from agricultural watersheds, particularly phosphorus.

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 the *Conservation Technical Assistance Program* and *Environmental Quality Incentives Program*, which provide technical and financial assistance to agricultural producers to plan and install soil and water conservation practices. In addition, GLRI federal agencies partner with and provide grants to support non-government programs and projects at the state and local level, such as demonstration farms. Funding for agricultural conservation is targeted to four priority watersheds for phosphorus reduction (see map).

During FY 2019, GLRI federal agencies and their partners funded nutrient and sediment reduction projects on over 105,000 acres of targeted watersheds in the Great Lakes basin using GLRI funding. GLRI agencies have projected that over 400,000 pounds of phosphorus will be prevented from entering the Great Lakes as a result of these projects.

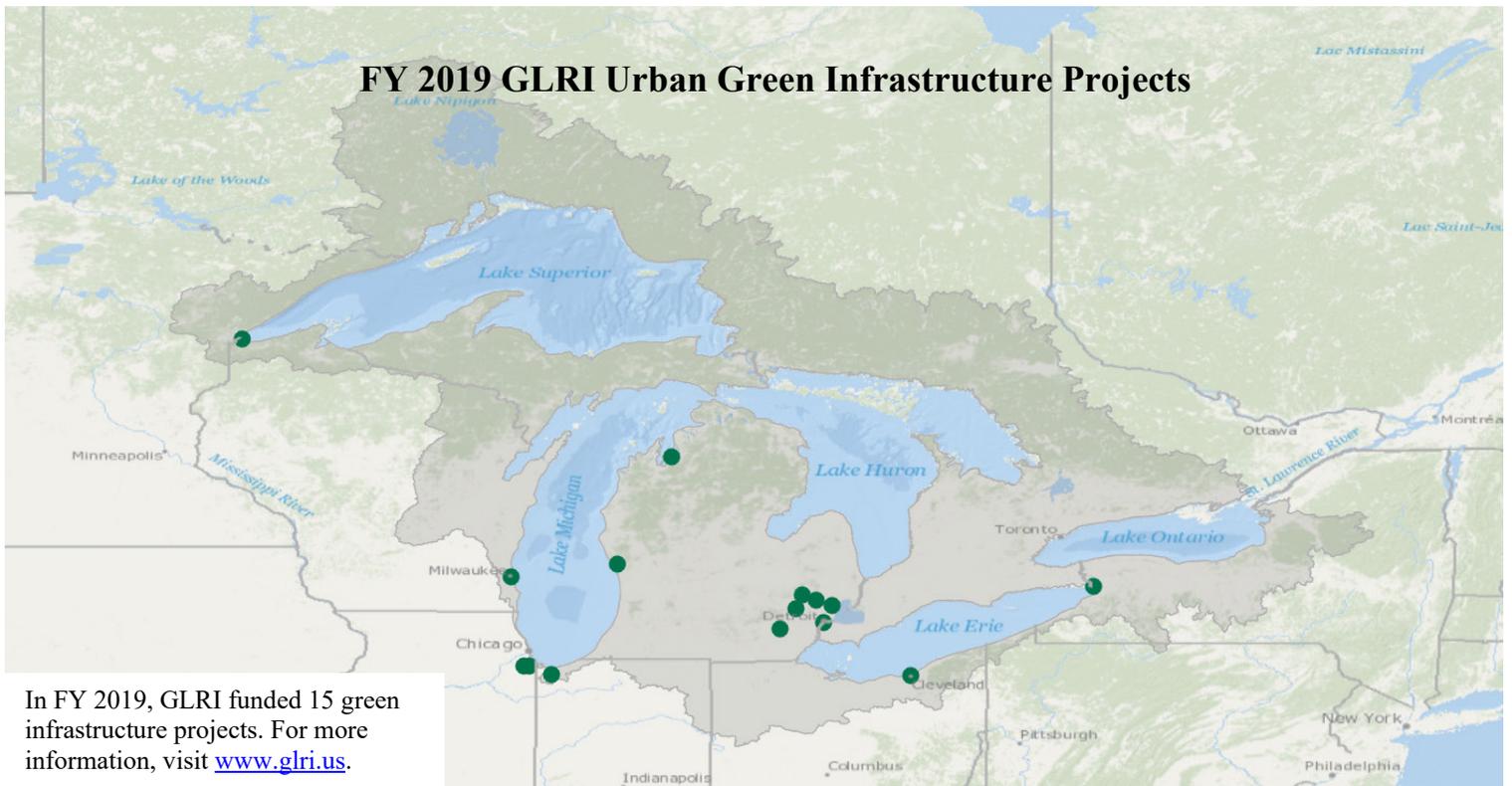
GLRI federal agencies and their partners also use GLRI funding to support watershed-based projects to address nonpoint source pollution in urban areas. Projects started in FY 2019 will capture approximately 20 million gallons of untreated urban runoff per year. These projects reduce flooding, increase green space in urban areas, reduce bacterial contamination, and return vacant properties to productive use. The types of “green infrastructure” best management practices implemented include:

- Tree plantings
- Bio retention ponds
- Bio swales
- Constructed wetlands
- Porous pavement
- Rain gardens

During FY 2019, 15 GLRI green infrastructure projects were implemented and reflect over \$4.5 million in investments in the following cities:

- Riverdale, IL
- Buffalo, NY
- Independence Township, MI
- Walled Lake, MI
- Robbins, IL
- Clinton Township, MI
- Muskegon, MI
- Milwaukee, WI
- Hobart, IN
- Detroit, MI
- Pittsfield Township, MI
- Superior, WI
- Cleveland, OH
- Elk Rapids, MI
- Rochester Hills, MI

These projects will treat, slow, or capture untreated stormwater runoff, helping to improve water quality conditions within the Great Lakes basin.



In FY 2019, GLRI funded 15 green infrastructure projects. For more information, visit www.glri.us.

Focus Area 3 Success Stories

Oneida Nation Great Lakes Tribal Nutrient Reduction

In FY 2019, the Oneida Nation received support from GLRI to convert 45 acres of previously row cropped agriculture field into a permanent pasture for managed grazing of beef cows and horses. By taking these Wisconsin fields out of row crop production and utilizing managed grazing for beef cows and horses, the project will reduce an estimated 35 lbs. of phosphorus from the Oneida Creek watershed and ultimately Green Bay annually. Oneida Eco-Services and Oneida Creek Equestrian partnered with the Natural Resources Conservation Service (NRCS) and the Outagamie County Landscape Conservation District to complete this portion of the project. This project is part of a larger effort by the Oneida Nation to reduce nutrients entering the Great Lakes system, which once fully realized is projected to reduce over 125 lbs of phosphorus into the Great Lakes annually.



Accelerating Farmer Adoption of Variable Rate Technology in Ohio

In 2016, EPA awarded the IPM Institute of North America, Inc. a grant with GLRI funding to support their Partnership for Ag Resource Management (PARM) project in four Ohio watersheds: Sandusky, Cedar-Portage, Blanchard, and Lower Maumee. The PARM project offers incentives through agricultural retailers to assist farmers to apply fertilizer more precisely by using variable rate technology (VRT). Within the first few months, VRT was applied on nearly 3,300 acres by first-time users. As retailers experienced the simplicity of the program, it grew rapidly. As of March 2019, the project had exceeded its goals of recruiting 250 growers and applying VRT on 20,000 acres, which represents over 3,400 pounds of phosphorus kept on cropland and out of waterways. Due to the success of the project, the project team created a waitlist of agricultural retailers that would likely participate again, expand participating acreage or add clientele. Additional project highlights included the completion of several videos and VRT testimonials from participants (and some non-participants) and their clients. These videos will be helpful for sharing the advantages of agricultural retailers offering VRT and the numerous benefits to their clients. Participant surveys indicate that over 50% of customers would continue with VRT after the grant period, which would be a major success.



Wisconsin Develops State's First Set of Blue-Green Algae Warning Signs

In FY 2019, the Harmful Algal Bloom (HAB) Program at the Wisconsin Department of Health Services, Division of Public Health was awarded GLRI funding through the Center for Disease Control and Prevention to develop the state's first blue-green algae warning signs for beaches. Blue-green algae are photosynthetic bacteria known as cyanobacteria, which can cause illness in humans and animals. The HAB Program had commissioned ten individuals representing seven local health agencies, one Tribe, and one natural resource department to review drafts of the blue-green algae warning signs and provide feedback on their design, layout, and language. Local public health agencies and Tribes have posted the warning signs at public access points along Green Bay and other water bodies within the Great Lakes basin where cyanobacterial blooms have become more prevalent and gained more public awareness.



Simmons Island Beach Restoration and Site Improvements



In FY 2019, the City of Kenosha, Wisconsin's Department of Public Works received GLRI funding to support the Simmons Island Beach Restoration and Site Improvements project. This project, which includes the construction of a series of stormwater best management practices, aimed to eliminate flooding, sand migration, and reduce runoff at the beach. The parking lot and roadway in front of the Simmons Beach House has historically been subject to flooding. Completion of the project, however, reduced flooding in those sensitive areas by raising the grade of the parking lot, installing porous panels to collect stormwater, and constructing a swale that discharges into an infiltration basin vegetated with native plants. To mitigate sand



migration across Simmons Island Road, sand dunes of various sizes were constructed and vegetated with native plants, which also purifies water as it infiltrates through the ground. Using the National Stormwater Calculator, the post-construction removed runoff was calculated to be 119,023 gallons. The completed project resulted in controlled site storm water runoff, reduced flooding in historically sensitive areas, and manageable sand migration.

Southeast Michigan Resilience Fund Awards \$1.46 Million to Improve Community and Habitat Resilience



The Southeast Michigan Resilience Fund is a public-private partnership supported by GLRI, local foundations and corporate partners. The Fund increases the resilience of communities and natural resources in Southeast Michigan by reducing the impact of stormwater, improving water quality, enhancing habitat, and increasing the accessibility and usability of public green space and natural areas. These actions help communities prepare for intensifying environmental stressors related to development, climate change, invasive species, nonpoint source pollution and other factors. In 2019, seven projects were awarded for a total of \$1.46 million, leveraging \$2.56 million in matching contributions from grantees to expand green infrastructure and enhance public space while improving habitat quality, connectivity and accessibility throughout Southeast



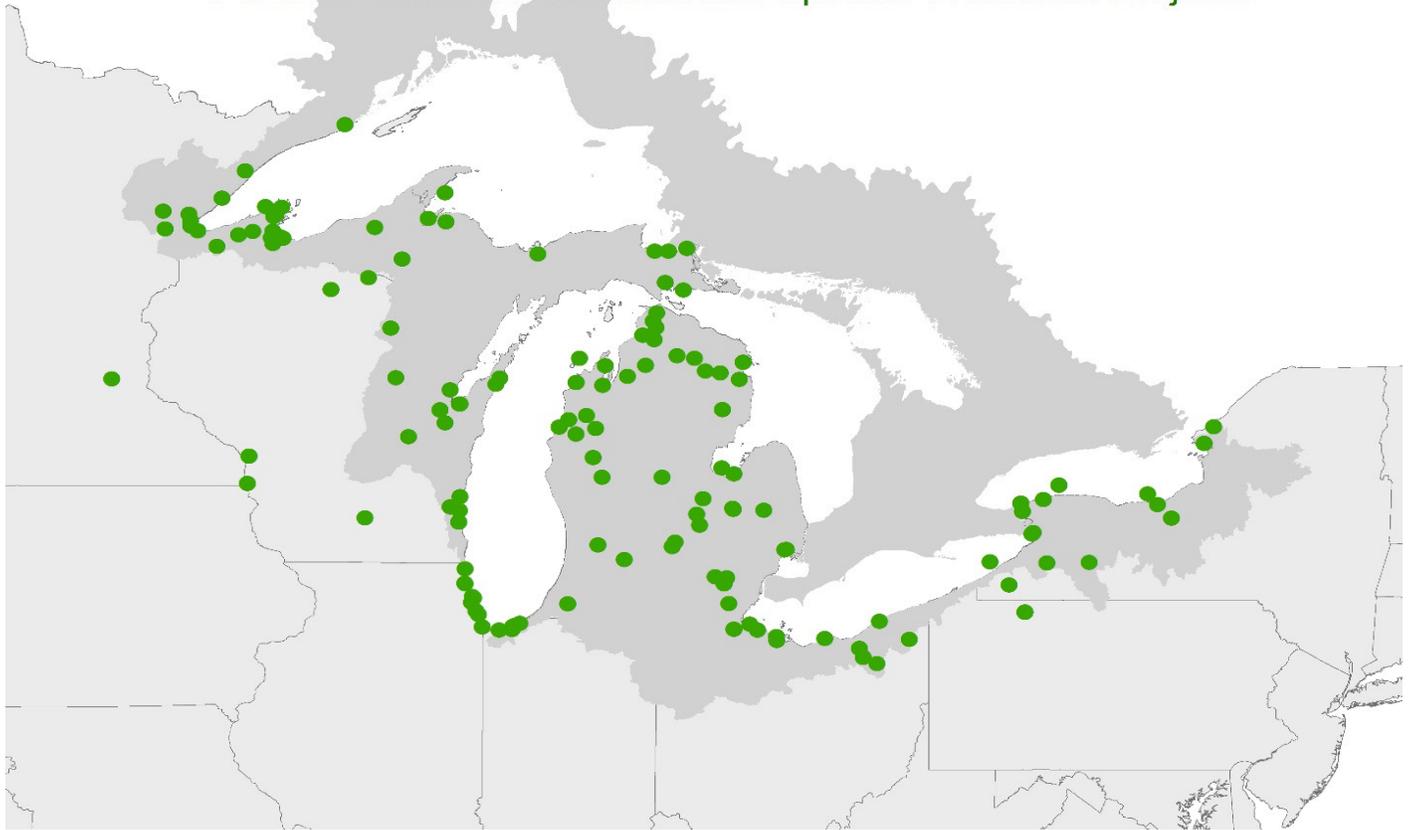
Michigan. The green infrastructure projects selected added more than 2.4 million gallons of stormwater storage and reducing the threat of flooding and other intensifying environmental stressors.

GLRI Provides Conservation Assistance to the Northern Indiana Amish Community

Indiana has the third largest Amish population in the nation, and a dense population in the state's portion of the western Lake Erie watershed. The Adams County Soil and Water Conservation District (SWCD) used GLRI funding to hire an outreach specialist to provide direct, one-on-one assistance to a Northern Indiana Amish Community. Many of the Amish livestock operations there do not have adequate manure storage nor sufficient acreage or equipment for appropriate manure application. Building relationships over the past few years, the Adams County SWCD conducted pasture walks and helped the Amish farmers improve their nutrient management practices with the assistance of soil maps, manure sampling, and specialized no-till and seeding equipment. In 2019, the community constructed two new emergency lagoons with GLRI funding. The community used this new storage capacity of over 10 million gallons to accept excess manure resulting from a very wet year and from the insufficient manure storage at livestock facilities, thus protecting water quality. The NRCS, Indiana State Department of Agriculture and other conservation partners in Indiana will continue to assist the Amish and other landowners in the western Lake Erie watershed with critical conservation practices to prevent nutrient runoff from farms.



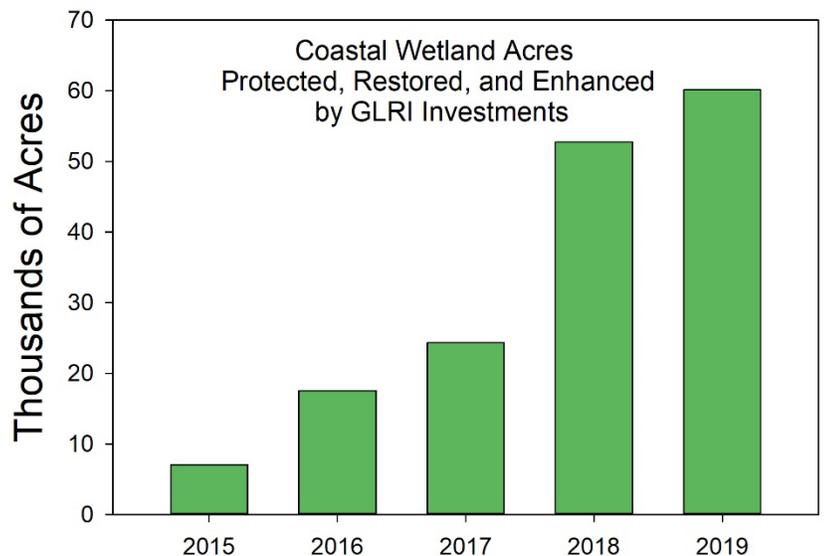
Great Lakes Restoration Initiative Projects FY2019 Habitat Restoration and Species Protection Projects



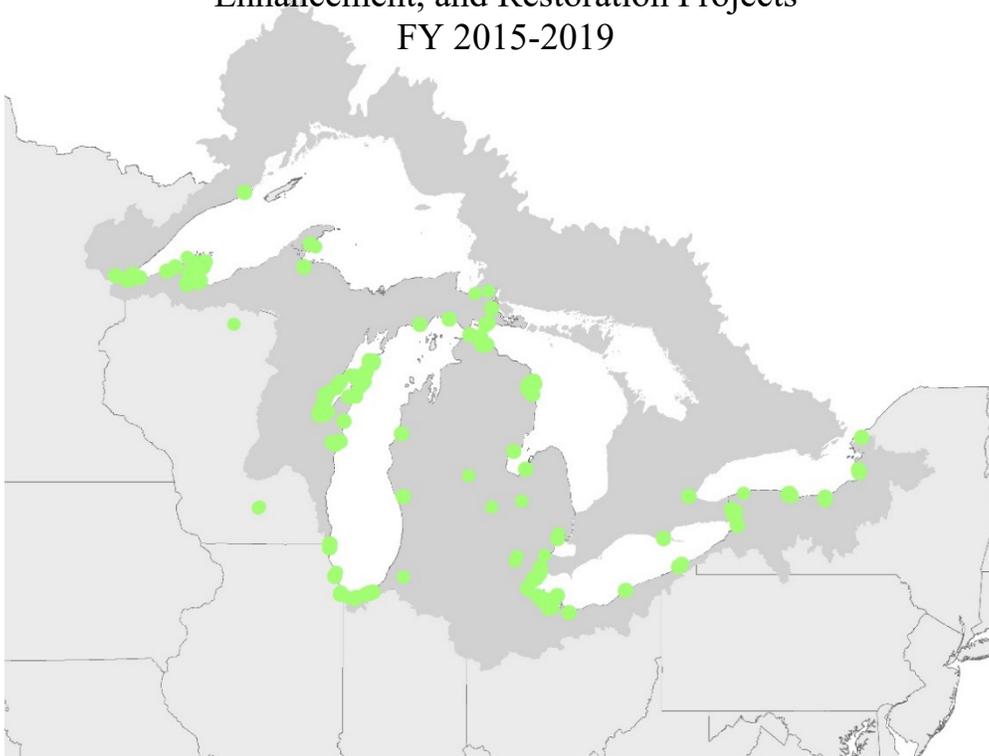
FOCUS AREA 4: Habitat and Species

During FY 2019, GLRI federal agencies and their partners protected, restored, and enhanced habitats and native species throughout the Great Lakes basin. In FY 2019, GLRI federal agencies and their partners implemented 107 habitat and native species projects resulting in more than 1,200 habitat and native species projects underway or completed since the inception of the GLRI.

By the end of FY 2019, GLRI federal agencies and their partners implemented projects that have protected, restored, and enhanced Great Lakes habitats and species, including projects that have reopened more than 5,400 miles of Great Lakes tributaries and increased aquatic connectivity for numerous fish species. Projects that addressed aquatic connectivity in FY 2019 assisted local dam owners, states, and conservation entities seeking to address aging infrastructure while simultaneously restoring rivers.



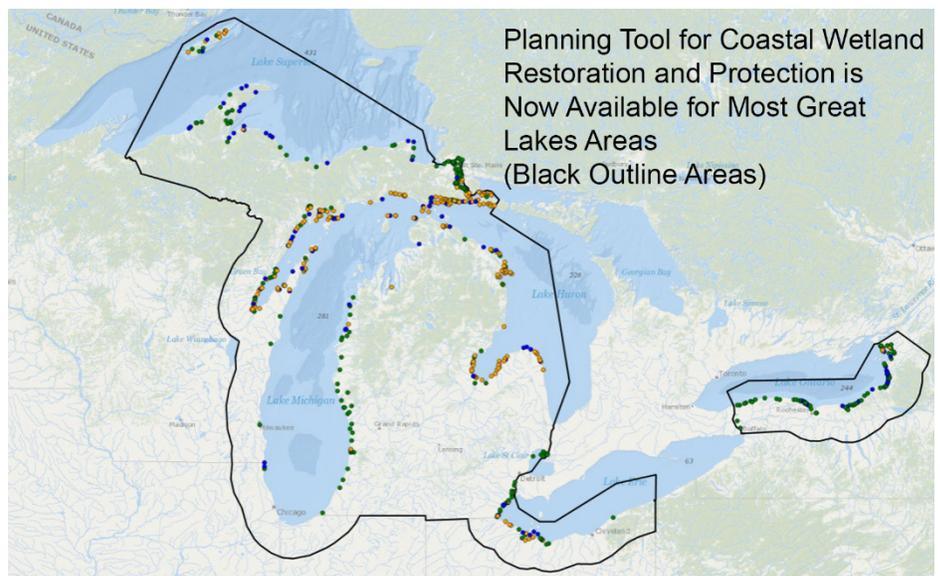
Great Lakes Restoration Initiative Coastal Wetland Protection, Enhancement, and Restoration Projects FY 2015-2019



GLRI Action Plan II was successful in emphasizing efforts that protect, restore, and enhance coastal wetlands using available science and monitoring of sites. This prioritization of work in the coastal habitats began in 2015 in the early stages of the GLRI Action Plan II and resulted in a significant acceleration of attention and action over this five-year period (FY 2015 - FY 2019). Great Lakes coastal wetlands provide residents of the Great Lakes with many economic benefits including property protection against high water levels and wave action; removal of nutrients from rivers and the nearshore areas of the Great Lakes before they feed harmful and nuisance algae; and fish nursery habitats necessary to support recreational and commercial

fisheries. Great Lakes coastal wetlands are also of great ecological and cultural importance, providing unique resources to many Great Lakes Tribal nations and habitats for species that depend entirely on coastal wetlands for survival. Through FY 2019, GLRI federal agencies and their partners have protected, restored, and enhanced over 60,000 acres of Great Lakes coastal wetlands and completed nine years of comprehensive monitoring at over 1,000 coastal wetlands. GLRI federal agencies and their partners have also developed decision support tools for large portions of the Great Lakes to guide future protection and restoration by interested entities and local land managers.

In FY 2019, projects implemented in the Great Lakes basin were directed towards protecting and restoring critical species and important habitats. Piping plovers, a federally endangered shorebird, are now found at the highest numbers in decades. A number of successes in 2019 are described in the following pages including: finding piping plovers in all five Great Lakes; advancements by an interagency working group in restoring private lands; and increasing habitat for pollinator species.



Focus Area 4 Success Stories

Chicago's Montrose Beach Piping Plovers

During the summer of 2019, GLRI supported efforts by staff from U.S. Department of Agriculture's Animal and Plant Health Inspection Service (USDA APHIS) (working alongside staff from FWS and many volunteers) to monitor and protect a pair of Federally Endangered Great Lakes Piping Plovers nesting on Montrose Beach in Chicago. USDA APHIS collaborated with FWS and the Illinois Department of Natural Resources (IL DNR) to provide camera traps, also known as trail cameras. These motion-activated cameras monitor nests for potential threats to these birds, which chose to nest on one of the busiest beaches in Chicago. FWS and IL DNR had already implemented procedures to protect these tiny bird's nest, using a 1" x 2" woven wire enclosure and a two-strand rope fence to keep potential predators and humans away. The two birds, named "Monty" and "Rose", were the first pair of piping plovers to nest in Chicago in 64 years and provided a unique educational opportunity for thousands of beach goers that stopped by to learn more about this rare species. The pair successfully fledged two chicks and the Governor of Illinois declared November 18th, 2019 to be "Piping Plover Day".



Long-term Coastal Land Protection



Four properties totaling 273 acres were conserved in perpetuity through NOAA's Coastal and Estuarine Land Conservation Program in FY 2019 using GLRI funds. The conservation of these coastal properties protects an undeveloped shoreline of Green Bay (WI, Lake Michigan); a freshwater estuary in Michigan's fastest growing county (Ottawa County, MI); a 1.5-mile stretch of Red Brook, a tributary of Lake Erie (OH); and a series of 13 small acquisitions that consolidate ownership and more than double the size of the Middle Bass Island Forested Wetlands Preserve (OH, Lake Erie). Not only do these properties provide important ecological values that will be restored



and maintained, but they also afford a range of recreational opportunities including hiking, cross-country skiing, and kayaking.

Restoring Wetlands on Private Lands in Wisconsin and Providing Future Educational Opportunities

In FY 2019, NRCS began the restoration of a wetland on private farmland in Bayfield County, Wisconsin by constructing a 3 x 850 foot earthen embankment to collect runoff into excavations of varying depths, creating diverse habitat for aquatic plants and animals. NRCS also partnered with FWS to create sandy habitat for turtle nesting and other habitats using a linear mound with tree snags and rock clusters. The embankment was seeded and mulched and will be used as a walkway for educational tours. The wetland project borders the cluster of buildings comprising the Oulu Cultural and Heritage Center. The Center partners with the South Shore School District for three weeks of summer school programming. The new wetlands will enable expansion of the summer science curriculum. Over the next year as the wetlands are restored, the landowner and the Center will be documenting the transformation to use in future educational programs for summer school and the general public.



Accelerating Resource Management Strategies for Native Pollinators

Using GLRI funding, the FWS led the effort to form the interagency *Great Lakes Restoration Initiative Pollinator Task Force*. This collaborative group includes biologists, ecologists, entomologists, botanists, GIS specialists and habitat managers from FWS, NPS, USFS, U.S. Geological Survey (USGS), and NRCS. In FY 2019, the Task Force developed a comprehensive, landscape-scale pollinator strategy and action plan with an initial focus on native bee conservation. Additional efforts completed in 2019 include conducting native bee surveys as part of the Great Lakes Bee Inventory, compiling the best-known native bee habitat, distribution, and threat data within the Great Lakes basin. The Task Force also collaborated with the *Partners for Fish and Wildlife Program* in Michigan to restore 85 acres of historic black-oak habitat, which is important for pollinators. The information that the Task Force has gathered will help develop maps for more targeted habitat enhancement, restoration and protection projects to benefit native bees and other pollinators. While working on the Bee Inventory, the Task Force also discovered a rare species of cuckoo bee, *Epeoloides pilosulus*, in the Chequamegon-Nicolet National Forest. This cuckoo bee is one of the rarest bees in North America and this is the first confirmed sighting in Wisconsin since 1910.



Understanding Moose Population Dynamics in the Great Lakes Basin



In FY 2019, the Grand Portage Band of Lake Superior Chippewa continued to use GLRI funding to support a long term, regional moose research and management program begun in 2010 in Minnesota. Moose populations in northwestern Minnesota collapsed in the 1990s and have experienced significant declines over the last decade in the Great Lakes basin. The research, funded primarily by GLRI from 2010 to the present, has resulted in the collaring of 95 moose that have helped to determine the causes of moose population decline, identify essential moose habitats, and understand factors impacting moose health. Results from this work have shown low moose calf recruitment due to high predation rates from black bears and wolves. Annual adult moose mortality rates have been high and variable but are largely a result of poor moose health. Nearly one-third of adult moose mortality is due to rainworm, a parasite that is carried by, but not lethal to, white-tailed deer. This work has led to changes in management of black bears and white-tailed deer, resulting in reduced moose mortality. Data from collared moose have provided information about important calving habitats, thermal refuge, and preferred foraging habitats. Forest managers now use this information to protect and maintain critical habitats and promote the regeneration of important browse species.



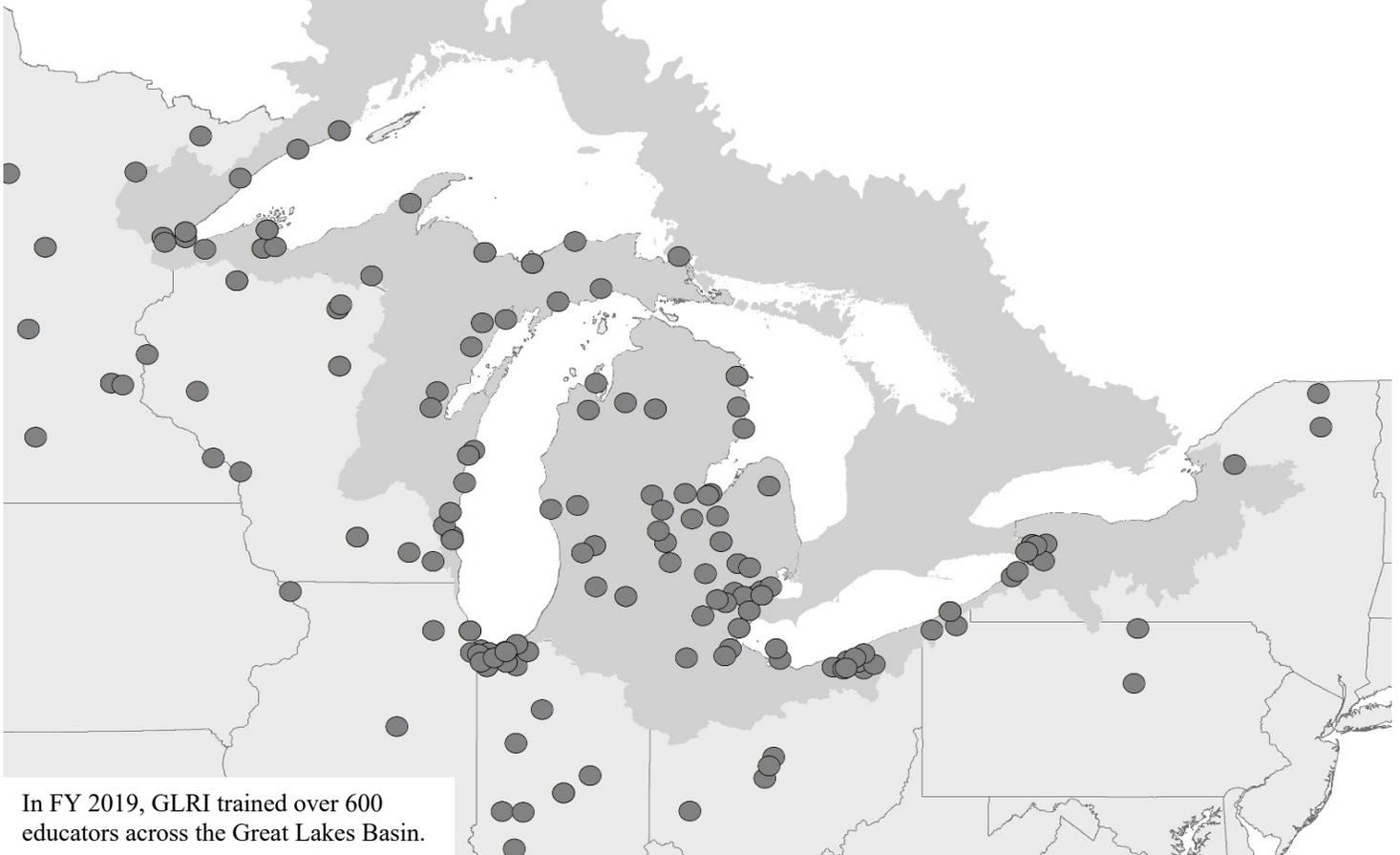
Forest managers now use this information to protect and maintain critical habitats and promote the regeneration of important browse species.

Woodland Dunes Nature Center Restores Threatened Coastal Habitat in Wisconsin

In FY 2019, the Woodland Dunes Coastal Wetland project enhanced the resiliency of 50 acres of ridge and swale habitat near the Wisconsin Lake Michigan shoreline, with support from a GLRI grant through the USFS. This unique coastal ridge and swale habitat in Two Rivers, Wisconsin lies within a designated State Natural Area and is considered globally significant habitat for migratory and breeding birds and rare plants. However, with a tree canopy comprised of over 80% ash species, the forest faces a significant threat from the invasive emerald ash borer. The anticipated loss of this ash canopy would change habitat structure, hydrology, and physical conditions critical to this rare habitat type. The Woodland Dunes Nature Center is proactively improving habitat by planting diverse tree species and controlling invasive plants in the understory, wrapping up the first phase of its efforts in 2019. The Nature Center's success to date relied on over 2,000 volunteer hours, bringing together hunters, students, and local residents who care about this resource.



Great Lakes Restoration Initiative Trained Educators Across the Great Lakes Basin in FY 2019



FOCUS AREA 5: Foundations for Future Restoration Actions

In order to improve transparency and fiscal stewardship, federal agencies have established accountability mechanisms and internal controls to effectively manage the GLRI. GLRI Action Plan II laid out steps for agencies to develop and incorporate climate resiliency criteria in project selection, planning, and implementation. During FY 2019, GLRI federal agencies and their partners continued to use a standardized set of criteria to help GLRI-funded projects be more resilient to the effects of more frequent and intense storms and shifts in ranges of particular species.

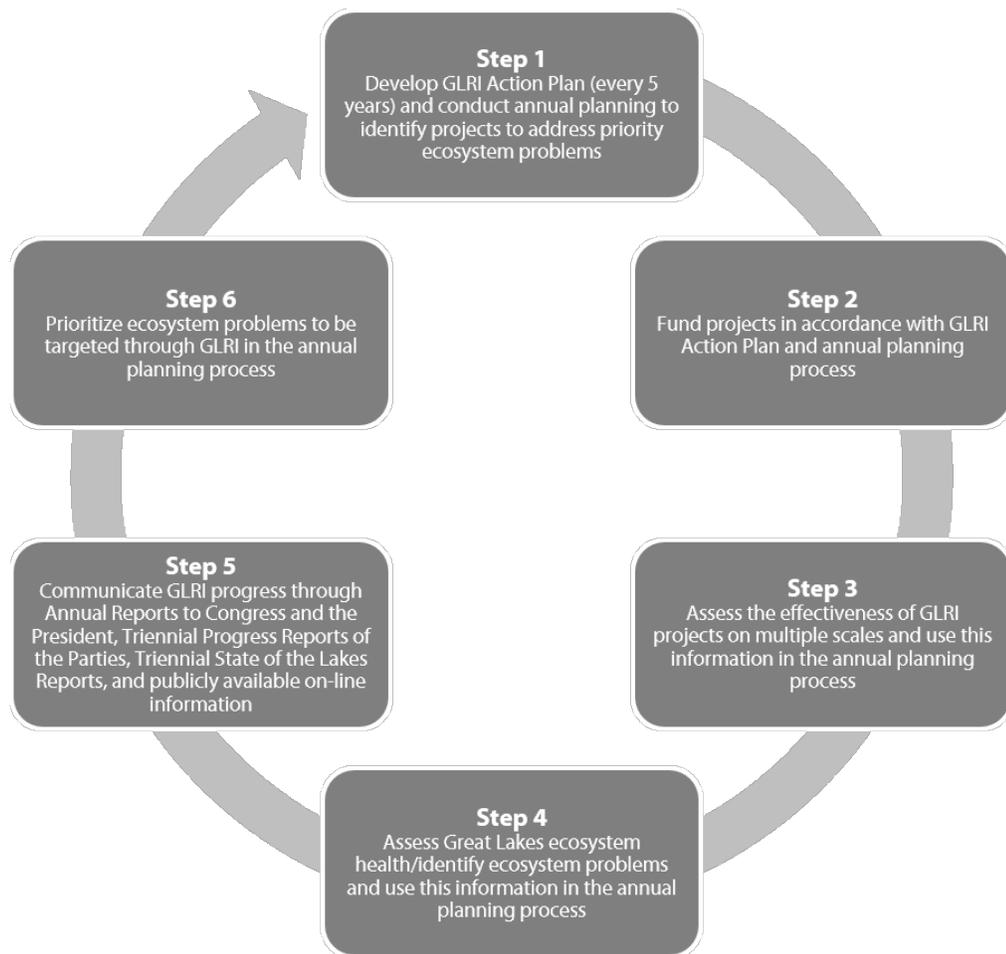
The GLRI continues to promote Great Lakes-based ecosystem education and stewardship. During FY 2019, GLRI federal agencies and their partners trained over 600 educators through the Center for Great Lakes Literacy, a Great Lakes Sea Grant program, NOAA’s Great Lakes Bay Watershed Education and Training (B-WET) Program and NPS interpretive programs. These programs provide hands-on experiences, educational resources, and networking opportunities to promote Great Lakes literacy among an engaged community of educators, scientists, and citizens.

In addition, federal agencies and their partners educated over 84,000 students and people about the Great Lakes ecosystem through place-based experiential learning activities, primarily through interpretative programs at national parks and lakeshores. During FY 2019, GLRI federal agencies and their partners conducted comprehensive monitoring to assess the status and trends of environmental indicators in the Great Lakes ecosystem. Monitoring data is used to prioritize future GLRI-funding decisions by identifying the most significant ongoing and emerging problems in the ecosystem.

The GLRI agencies and partners identified watersheds, habitats, and species to be targeted for potential additional restoration activities using monitoring data, assessments, models, and other decision support tools. Tribes, states, and other stakeholders also provided input to the GLRI agencies on a variety of topics including restoration priorities, project longevity and duration, and the next GLRI Action Plan.

During FY 2019, GLRI federal agencies and their partners continued to track the progress of GLRI-funded projects. GLRI federal agencies utilized the Environmental Accomplishments in the Great Lakes (EAGL) tracking system, an accountability system, which tracks the effectiveness of GLRI-funded projects in meeting the Measures of Progress defined in GLRI Action Plan II. To improve the quality of reporting, in FY 2019 EPA conducted a third annual system wide EAGL audit in accordance with the EAGL Implementation Manual.

The GLRI Action Plan II incorporates a science-based adaptive management framework that is designed to guide restoration and protection actions by using the best available science and lessons learned from GLRI investments. Additionally, in FY 2019 GLRI federal agencies began developing science priorities to be addressed in GLRI Action Plan III. These priorities are being developed with coordination of Tribal, state, and Lakewide Action and Management Plan (LAMP) partners and will be used to guide funding under Focus Area 5 in Action Plan III.



Focus Area 5 Success Stories

Cladophora Monitoring and Assessments

Since FY 2018, the GLRI has funded the USGS Great Lakes Science Center to conduct a basin-wide assessment of the alga *Cladophora* throughout the Great Lakes basin. Overgrowth of *Cladophora* in nearshore environments has negatively impacted fisheries, wildlife, and coastal areas by altering food webs, harboring pathogens, and fouling shorelines. There has been a substantial increase in *Cladophora* occurrence in recent years, largely as a result of the complex influence of invasive zebra and quagga mussels. Mussel filtration has altered coastal light regimes and physical habitat, allowing *Cladophora* to colonize deeper areas of the lakebed.

Binational efforts are underway to understand the conditions that lead to *Cladophora* growth throughout the Great Lakes. During the FY 2019 *Cladophora* growth season, USGS scientists and divers collected samples each month in lakes Michigan, Huron, Erie, and Ontario to examine the influence of nutrient concentrations and invasive mussels on *Cladophora* growth. In this second year of field assessments, the project was expanded through university collaborations to include additional investigations to help managers understand the microbial ecology of *Cladophora* (i.e., how microbes interact with the algae to encourage *Cladophora* growth). The field data is now being assessed by scientists and used to populate models that can assist entities in the development of *Cladophora* management strategies to address the impacts noted above. This broad-scale, logistically-complex effort was made possible with the help of multiple agency partners, including EPA, NPS, and state agencies.



Assessment of Fish Spawning and Larval Production in the St. Marys River Rapids Area



The second year of GLRI-funded research investigating the ecology of fish spawning and larval fish production in the upper St. Marys River, the outlet of Lake Superior, was conducted in FY 2019 to provide baseline information about effects of changing Great Lakes water level management on spawning success of important fish species. Fish eggs and larvae were sampled throughout the upper St. Marys River by GLRI federal agencies (USGS, FWS, and USACE) and Lake Superior State University. Lake sturgeon, sucker, and trout-perch eggs were found near the St. Marys River Rapids and their larvae were collected downstream, indicating successful reproduction occurred in and near the rapids. Additionally, salmonid, lake whitefish, sculpin, yellow perch, and rainbow smelt larvae were collected near the St. Marys Rapids and the Little Rapids, a



recently completed GLRI-funded habitat restoration project. Sample processing continues and a third year of field collection is planned. Findings from this study are being used to identify characteristics of important habitats, document the timing of fish life history events (e.g., the patterns of development, growth, maturation, reproduction, survival, and lifespan), and provide measures of larval fish abundances and distributions that can be related to flow regimes in the river. Additionally, these new data can be compared with previous larval fish studies to evaluate changes in fish community structure.

Experimental Reef Studies at Good Harbor, Sleeping Bear Dunes, Lake Michigan

In FY 2019, GLRI funds allowed the NPS to convene a gathering of coastal science partners (the Sleeping Bear Dunes Coastal Monitoring and Research Symposium), maintain critical beach and nearshore monitoring stations, and conduct innovative research and restoration efforts at Good Harbor Reef. In 2016, areas of Good Harbor reef were cleared of invasive mussels. As of FY 2019, the invasive mussels had not recolonized areas. The team began experiments to test if predation by round gobies is responsible for keeping the mussel population in check. Additionally, the team leveraged funding from the Invasive Mussel Collaborative to test other removal techniques and their impacts on invasive mussel populations and cladophora growth. These experiments started in August of 2019. Collectively, these innovative experiments offer hope that high priority fish spawning reef habitats like Good Harbor Reef may one day be restored.



Connecting Youth with Nature at Grand Portage National Monument



Grand Portage National Monument and Isle Royale National Park, units of the National Park Service, partnered with the Grand Portage Band of Lake Superior Chippewa, MN Sea Grant, MN Department of Natural Resources and the 1854

Treaty Authority to deliver a multi-day education event to youth ages 9-12 at the Grand Portage National Monument. Area youth, native communities, and educators participated in the event for the purpose of removing barriers to nature exploration and personal connections to the environment such as fees and costs and the lack of wilderness camping knowledge, skill, and ability. The event included educational activities to better understand matters such as watershed connectivity to Lake Superior, nearshore geological processes, traditional cultural connections to natural resources, and predator prey ecology.



NOAA Bay Watershed Education and Training Program



Using a NOAA Bay Watershed Education and Training (B-WET) grant, Grand Valley State University’s Groundswell “Get Outside and Learn” program engaged over 800 students and 62 teachers in ecological restoration projects throughout Grand Rapids, Michigan in FY 2019.



Throughout the program, the Groundswell team developed lesson plans for engaging students in meaningful watershed educational experiences. The program began with a Water Festival attended by students and teachers in the fall, where students learned about Great Lakes ecological issues from environmental organizations and learned about stewardship projects that could potentially combat these problems. Following the festival, classes chose a stewardship project, conducted research on the topic, then implemented, and ultimately shared the stewardship action project as the culmination of the program. Stewardship projects included restoring campus landscapes by removing invasive species and replanting with native species, monitoring and testing the water quality of streams, cleaning up degraded areas, and building trails.

Place-based Learning for Nearshore Ecosystems in Great Lakes National Parks



One of the most successful programs at Pictured Rocks National Lakeshore on Lake Superior in Michigan is the interagency fourth grade field trip program. NPS partners include Hiawatha National Forest, Seney National

Wildlife Refuge, and Michigan State University – Extension. In this program, schools participate in a three-part program that includes a classroom pre-site visit, a field visit to one of three neighboring federal agency sites in the central Upper Peninsula area, and a teacher-led post-site activity. At every stage of the program, students learn about Great Lakes federal lands and waters and why they are important. In FY 2018 and FY 2019, 1,178 students were educated through this program. Stewardship of Great Lakes federal lands is a primary educational message that is woven into each part of the program and during field trips, students learn about the principle of stewardship through hands-on activities and practice stewardship through seven “Leave No Trace” principles.



Section 3 – GLRI Regional Partner Engagement

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

Great Lakes Tribes

GLRI support for Tribal Nations within the Great Lakes basin has encouraged valuable partnerships and resulted in the implementation of important restoration and protective actions, including controlling invasive species, reducing nutrient and phosphorus 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 (P.L.116-6) was explanatory language (H.R. Report 116-9) directing the Agency to follow a direction in Senate Report 115–276 that:

encourages the Agency 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.

In FY 2019, EPA and the Bureau of Indian Affairs (BIA) developed a “framework” for a GLRI Distinct Tribal Program to outline key concepts and principles that are consistent with the Congressional direction. Since the inception in FY 2010, Tribes have directly received a total over \$85 million in GLRI funding. This funding has been instrumental in building Tribal resource management capacity and contributing to the protection and restoration of treaty-reserved resources and culturally significant habitats and species that support Tribal lifeways.

Great Lakes State Partners

GLRI federal partners are committed to working with all eight states that fall within the Great Lakes Basin. Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania, and New York have a critical role in the health, restoration, and protection of the Great Lakes in order to ensure the quality of their economies and the health of their citizens. The partnership between Great Lakes states and the GLRI federal agencies continues to result in important work activities including delisting AOCs; controlling invasive species; protecting fisheries; reducing nutrient and phosphorus loadings into waterways; capturing and treating urban runoff; and addressing environmental justice concerns. From FY 2010 to FY 2019, over \$423 million of GLRI funds have been awarded to Great Lakes states.

Section 4 – Financial Reporting

From FY 2010 to FY 2019, the EPA has been appropriated approximately \$3.16 billion in GLRI funds. The agencies that receive GLRI funds use multiple funding mechanisms, including interagency agreements, competitive grants, and capacity-building grants to Tribes and states.

Table 1 and Chart 1 provide information on FY 2015 - FY 2019 GLRI funding by focus area. Amounts for fiscal years 2014-2018 have been updated to report allocations at the end of applicable obligation periods. Table 2 provides summary information for fiscal years 2015 -2018 of GLRI funding by Agency (more detailed information can be found in the GLRI Reports to Congress and the President for FY 2010 through FY 2018). Table 3 provides more detailed information for FY 2019 by Agency.

Focus Area	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Toxic Substances and Areas of Concern	\$120,200	\$106,600	\$107,500	\$105,600	\$107,500
Invasive Species	\$53,600	\$56,400	\$62,200	\$56,700	\$56,900
Nonpoint Source Pollution Impacts on Nearshore Health	\$51,000	\$51,700	\$47,900	\$50,600	\$51,700
Habitat and Species	\$49,000	\$54,200	\$49,500	\$52,400	\$50,200
Foundations for Future Restoration Actions	\$26,200	\$31,100	\$32,900	\$34,700	\$33,700
TOTAL	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000

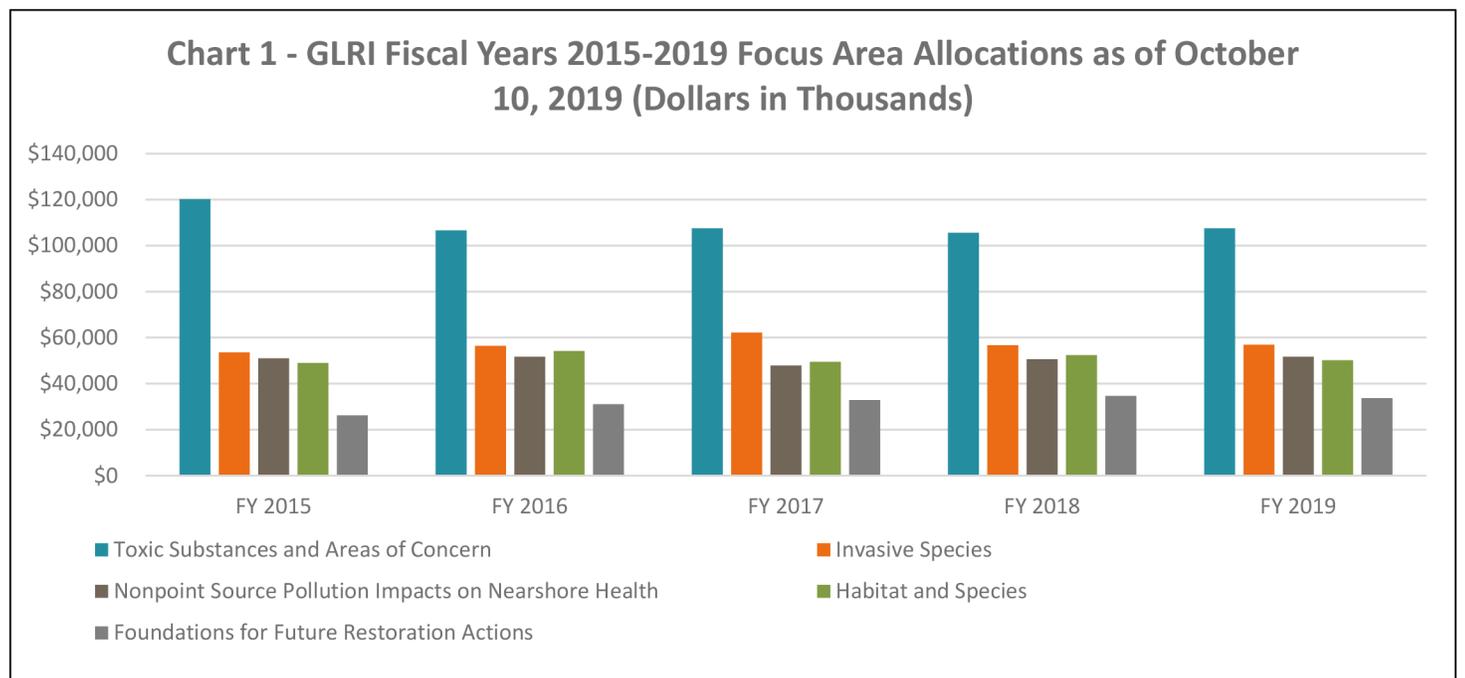


Table 2- FY 2015 – FY 2018 Great Lakes Restoration Initiative Funding by Agency as of October 10, 2019
(Dollars in Thousands)

Agency ^[a]	Obligations ^[b]				
	FY 2015	FY 2016	FY 2017	FY 2018	Total
DHS-USCG	\$2,006	\$1,274	\$1,580	\$500	\$5,361
DOC-NOAA	\$24,818	\$30,740	\$12,027	\$24,629	\$92,213
DOD-USACE	\$47,868	\$33,317	\$53,047	\$43,559	\$177,792
DOI-BIA	\$4,750	\$6,203	\$10,904	\$11,617	\$33,473
DOI-NPS	\$3,142	\$3,799	\$4,379	\$3,940	\$15,260
DOI-USFWS	\$41,393	\$48,118	\$41,794	\$52,902	\$184,207
DOI-USGS	\$23,433	\$22,960	\$26,817	\$25,724	\$98,934
DOT-FHWA	\$0	\$0	\$0	\$0	\$0
DOT-MARAD	\$1,291	\$2,106	\$800	\$675	\$4,872
HHS-CDC/ATSDR	\$1,738	\$1,692	\$593	\$590	\$4,613
USDA-APHIS	\$1,235	\$1,078	\$1,260	\$1,176	\$4,749
USDA-NRCS	\$23,281	\$19,062	\$22,072	\$25,096	\$89,511
USDA-USFS	\$6,290	\$10,822	\$11,355	\$10,153	\$38,619
IA Totals:	\$181,244	\$181,172	\$186,628	\$200,560	\$749,604
EPA, GLFC, IJC, Misc. IA	\$116,532	\$116,155	\$110,134	\$98,614	\$441,435
Total Obligated	\$297,776	\$297,326	\$296,762	\$299,174	\$1,191,039
Returned^[c]	\$2,224	\$2,674	\$3,238	\$826	\$8,961
GLRI Totals	\$300,000	\$300,000	\$300,000	\$300,000	\$1,200,000

^[a] Individual Agency allocations from each appropriation can be found in previous Reports to Congress and the President.

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

^[c] Returned funds are determined by subtracting obligations as of October 10, 2019 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 that have been established to provide for contingencies or to effect savings under the Antideficiency Act.

**Table 3 - Great Lakes Restoration Initiative Fiscal Year 2019 Funding by Agency as of October 10, 2019
(Dollars in Thousands)**

Agency	FY 2019 Initial Allocation^[a]	FY 2019 Actual Allocation^[b]	FY 2019 Total Obligations
DHS-USCG	\$1,661	\$1,661	\$1,661
DOC-NOAA	\$16,276	\$16,967	\$16,967
DOD-USACE	\$57,765	\$60,336	\$60,336
DOI-BIA	\$9,243	\$9,842	\$9,842
DOI-NPS	\$3,604	\$3,822	\$3,822
DOI-USFWS	\$45,303	\$45,897	\$45,897
DOI-USGS	\$15,619	\$21,603	\$21,603
DOT-MARAD	\$803	\$803	\$803
HHS-CDC	\$605	\$605	\$0
USDA-APHIS	\$1,312	\$1,312	\$1,312
USDA-NRCS	\$20,747	\$20,697	\$20,697
USDA-USFS	\$11,221	\$11,646	\$11,646
<i>IA Totals:</i>	\$184,159	\$195,190	\$194,585
EPA, GLFC, and Misc. IAs	\$115,841	\$104,810	\$75,226 ^c
<i>GLRI Grand Totals:</i>	\$300,000	\$300,000	\$269,811

^[a] Based on allocations to each Agency approved by the Regional Working Group December 2018.

^[b] Federal agencies work collaboratively to ensure that funding is used for the highest priority Great Lakes projects. The “Actual Allocations” (funding provided to each agency) reflect adjustments made to address emerging priorities (e.g., keep invasive carp from becoming established in the Great Lakes) and to maximize environmental outcomes.

^[c] Components are: (i) grants totaling approximately \$45 million (including funding for the Great Lakes Fishery Commission, 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 \$12 million and (iii) contracts and miscellaneous interagency agreements (other than those above) totaling approximately \$18 million.

APPENDIX A – GLRI ACTION PLAN II: MEASURES OF PROGRESS

This table provides an overview of the results achieved for each of the 34 Measures of Progress in the Great Lakes Restoration Initiative Action Plan II. Targets for Measures of Progress were established under assumptions contained in Action Plan II. Ten Measures of Progress have annual targets. The remaining Measures of Progress will be reported annually to track progress towards long-term goals that will take more than five years to reach. Detailed information is provided in the following pages. *Red, italicized indicates the target was not met; green, bold indicates the target was met, and unshaded indicates that only results will be provided since a target does not apply. Cumulative measures indicated with an *.*

Focus Area	GLRI Action Plan II Measures	Result/Target				
		FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Toxic Substances	1.1.1 AOC Management Actions*	7/8	8/9	11/11	12/12	12/17
	1.1.2 BUIs*	60/60	65/65	73/72	80/78	89/85
	1.2.1 People Provided Fish Consumption Information	221,230	207,953	98,942	118,361	794,810
	1.2.2 Fish/Wildlife Emerging Contaminant Projects	14	7	9	11	9
Preventing and Controlling Invasive Species	2.1.1 Rapid Response Exercises	21/8	11/8	25/8	12/8	37/8
	2.1.2 Projects Blocking Pathways	8	14	15	28	80
	2.1.3 Early Detection Activities	15	3	7	24	53
	2.2.1 Aquatic /Terrestrial Acres*	101,392/94,500	115,889/110,000	134,856/120,000	153,569/80,000	178,258/140,000
	2.2.2 Invasive Tributary Miles	0	0	0	69	76
	2.3.1 Invasive Technologies*	62	65	70	92	105
	2.3.2 Invasive Collaboratives*	4	4	4	10	16
Nonpoint Source Pollution Impacts on Nearshore Health	3.1.1 Ag. Phosphorus Reduction* (lbs.)	160,117/130,000	402,943/310,000	767,864/525,000	1,113,603/795,000	1,551,605/1,070,000
	3.1.2 Nutrient/Sediment Reduction (acres)	101,574	89,211	169,045	115,519	105,241
	3.1.3 Measured Nutrient/Sediment Reductions* (lbs.)	NA	NA	NA	138	NA
	3.2.1 Urban Runoff* (millions of gallons)	37/30	116/70	239/120	252/185	274/250
	3.2.2 Urban Runoff Projects	18	36	36	22	33
	3.2.3 Measured Urban Runoff*	NA	NA	NA	46,964	2,816,500
Habitats and Species	4.1.1 Habitat Tributary Miles*	3,855/2,200	4,615/4,200	4,967/4,900	5,289/3,100	5,497/5,500
	4.1.2 Shoreline Miles*	313/75	662/350	947/725	1,046/225	1,477/875
	4.1.3 Coastal Wetland Acres*	7,033/7,000	17,540/15,000	24,306/30,000	52,755/52,000	60,531/60,000
	4.1.4 Other Habitat Acres*	146,815/127,000	167,218/167,000	201,663/187,000	317,733/187,000	381,205/227,000
	4.2.1 Federally-Listed Species Projects	10	17	24	31	50
	4.2.2 Self-Sustaining Species Projects	47	28	23	38	71
Foundations for Future Restoration	5.1.1 Climate Resiliency Criteria Developed	NA	Developed	NA	NA	NA
	5.1.2 Climate Resiliency Criteria Incorporated	NA	NA	Incorporated	Incorporated	Incorporated
	5.2.1 Trained Educators	331	407	611	914	677
	5.2.2 People Educated	24,785	27,989	35,078	40,480	84,654
	5.3.1 Evaluations	Completed	Completed	Completed	Completed	Completed
	5.3.2 Annual Monitoring	Conducted	Conducted	Conducted	Conducted	Conducted
	5.3.3 Targeted Watersheds, Habitats, Species to prioritize Funding	Identified	Identified	Identified	Identified	Identified
	5.3.4 Annual GLRI Reports	Issued	Issued	Issued	Issued	Issued
	5.3.5 Triennial GLWQA Reports	NA	Issued	NA	NA	Issued
	5.3.6 Triennial State of the Lakes Report	NA	NA	Issued	NA	NA
5.3.7 Online Information	Updated	Updated	Updated	Updated	Updated	

GLRI Action Plan II Measures of Progress – Detailed Information

Measure	Target	Result	Explanation/Additional Information
1.1.1 Areas of Concern in the Great Lakes where all management actions necessary for delisting have been implemented (cumulative) ^[a]	FY 19: 17 FY 18: 12 FY 17: 11 FY 16: 9 FY 15: 8 Baseline: 7 ^[c]	FY 19: 12 FY 18: 12 FY 17: 11 FY 16: 8 FY 15: 7	Although the ambitious target for implementing all management actions necessary for delisting at five additional AOCs in FY 2019 was not met, completed and ongoing work is expected to position GLRI federal agencies and their partners to be able to complete all management actions necessary for delisting at three AOCs in FY 2020.
1.1.2 Area of Concern Beneficial Use Impairments Removed (cumulative) ^[a]	FY 19: 85 FY 18: 78 FY 17: 72 FY 16: 65 FY 15: 60 Baseline: 52 ^[c]	FY 19: 89 FY 18: 80 FY 17: 73 FY 16: 65 FY 15: 60	<p><i>Restrictions on Fish and Wildlife Consumption:</i> Cuyahoga River AOC (OH); 12/28/18</p> <p><i>Degraded Fish and Wildlife Populations:</i> Lower Menominee River AOC (WI/MI); 2/7/19</p> <p><i>Loss of Fish and Wildlife Habitat:</i> Lower Menominee River AOC (WI/MI); 2/7/19</p> <p><i>Restrictions on Dredging Activities:</i> Rochester Embayment AOC (NY); 2/7/19</p> <p><i>Fish Tumors or Other Deformities:</i> St. Louis River AOC (MN/WI); 2/11/19</p> <p><i>Beach Closings:</i> Rochester Embayment AOC (NY); 8/5/19</p> <p><i>Degraded Fish and Wildlife Populations:</i> St. Marys River (MI); 9/23/19</p> <p><i>Loss of Fish and Wildlife Habitat:</i> St. Marys River (MI); 9/23/19</p> <p><i>Eutrophication or Undesirable Algae:</i> Rochester Embayment AOC (NY); 9/23/19</p>
1.2.1 Number of people provided information on the risks and benefits of Great Lakes fish consumption by GLRI-funded projects	NA	FY 19: 794,810 FY 18: 118,361 FY 17: 98,942 FY 16: 207,953 FY 15: 221,230	Information was provided by HHS- ATSDR and EPA. Results reflect the efforts of GLRI federal agencies and their partners to provide information on the risks and benefits of Great Lakes fish consumption to the public. The FY 2015 result is a correction to the number previously reported.
1.2.2 Number of GLRI-funded projects that identify and/or assess impacts of emerging contaminants on Great Lakes fish and wildlife	NA	FY 19: 9 FY 18: 11 FY 17: 9 FY 16: 7 FY 15: 14	Project partners include EPA (GLNPO and ORD), NOAA, USGS, FWS, and USACE.

Measure	Target	Result	Explanation/Additional Information
2.1.1 Number of GLRI-funded Great Lakes rapid responses or exercises conducted	FY 19: 8 FY 18: 8 FY 17: 8 FY 16: 8 FY 15: 8 Baseline: NA ^[c]	FY 19: 37 FY 18: 12 FY 17: 25 FY 16: 11 FY 15: 21	The eight Great Lakes states have committed to conducting annual training exercises but prioritize activities to respond to detections of new invasive species. In FY 2019, multiple state agencies and others completed 12 actual responses.
2.1.2 Number of GLRI-funded projects that block pathways through which aquatic invasive species can be introduced to the Great Lakes ecosystem	NA	FY 19: 80 FY 18: 28 FY 17: 15 FY 16: 14 FY 15: 8	Projects included work to reduce the spread of invasive species by hunters, anglers, and the recreational boat pathways.
2.1.3 Number of GLRI-funded early detection monitoring activities conducted	NA	FY 19: 53 FY 18: 24 FY 17: 7 FY 16: 3 FY 15: 15	Early detection activities were conducted in FY 2019. Activities included both conventional monitoring techniques (nets, traps, electroshocking) as well as eDNA sampling.
2.2.1 Number of aquatic/terrestrial acres controlled by GLRI-funded projects (cumulative)	FY 19: 140,000 FY 18: 80,000 FY 17: 120,000 ^[b] FY 16: 110,000 ^[b] FY 15: 94,500 ^[b] Baseline: 36,000 ^[c]	FY 19: 178,258 FY 18: 153,569 FY 17: 134,856 FY 16: 115,889 FY 15: 101,392	Although FY 2017 results exceeded previously set cumulative targets, the target was not reset during President's budget development. Federal agencies allocated additional funding to on-the-ground work with local partners, resulting in an exceedance of the FY 2019 target.
2.2.2 Number of tributary miles protected by GLRI-funded projects	NA	FY 19: 76 FY 18: 69 FY 17: 0 FY 16: 0 FY 15: 0	Efforts by Tribes, Tribal organizations, and Tribal youth in FY 2019 led to tributary miles protected from invasive species. This project's complexity including incorporation of native fish passage, coordination among federal, Tribal, state, county, and other entities demonstrate the time and resources needed to successfully implement these projects.
2.3.1 Number of technologies and methods field tested by GLRI-funded projects	NA	FY 19: 105 FY 18: 92 FY 17: 70 FY 16: 65 FY 15: 62	Technologies were field tested by GLRI federal agencies and their partners. Technologies included ballast water management systems and a tool for detecting non-native species at harbor sites.
2.3.2 Number of collaboratives developed or enhanced with GLRI funding	NA	FY 19: 16 FY 18: 10 FY 17: 4 FY 16: 4 FY 15: 4	Invasive species collaboratives counted under this measure include the Invasive Carp Regional Coordinating Committee led by FWS and EPA, the Monoecious Hydrilla Collaborative led by USACE, the Invasive Mussels Collaborative led by USGS, the Forest Insect and Pest Collaborative led by USFS and the Phragmites Collaborative led by USGS.

Measure	Target	Result	Explanation/Additional Information
3.1.1 Projected phosphorus reductions from GLRI-funded projects in targeted watersheds (measured in pounds) (cumulative)	FY19: 1,070,000 FY 18: 795,500 FY 17: 525,000 FY 16: 310,000 FY 15: 130,000 Baseline: NA ^[c]	FY 19: 1,551,605 FY 18: 1,113,603 FY 17: 767,864 FY 16: 402,943 FY 15: 160,117	Results can vary each year due to the nature of voluntary conservation assistance programs. The targets for 3.1.1 were developed based on assumptions about the types of conservation practices that would be adopted by private landowners, and their effectiveness. In some years, the practices adopted resulted in an exceedance of performance goals for phosphorus reduction.
3.1.2 Number of GLRI-funded nutrient and sediment reduction projects in targeted watersheds (measured in acres)	NA	FY 19: 105,241 FY 18: 115,519 FY 17: 169,045 FY 16: 89,211 FY 15: 101,574	Contributing agencies: NRCS, EPA, and USACE. Practices implemented include: cover crops, filter strips and buffers, nutrient management, constructed wetlands, and streambank restoration.
3.1.3 Measured nutrient and sediment reductions from monitored, GLRI-funded projects in targeted watersheds (measured in pounds)	NA	FY 19: NA FY 18: 138 FY 17: NA FY 16: NA FY 15: NA	No results were available during FY 2015-2017 while baseline monitoring and statistical designs were still under development. Results are reported for this measure from a small number of monitored sites as a test of how well calculated predictive values match actual values. FY 2019 results have been determined to be inconclusive for various reasons such as the implementation of management practices that differed from what was planned, due to actual field conditions.
3.2.1 Projected volume of untreated urban runoff captured or treated by GLRI-funded projects (measured in millions of gallons) (cumulative)	FY 19: 250 FY 18: 185 FY 17: 120 FY 16: 70 FY 15: 30 Baseline: NA ^[c]	FY 19: 274 FY 18: 252 FY 17: 239 FY 16: 116 FY 15: 37	Results includes grant projects in: Robbins, and Riverdale, IL; Hobart, IN; Clinton Township, MI; Detroit, MI; Elk Rapids, MI; Independence Township, MI; Muskegon, MI; Pittsfield Township, MI; Rochester Hills, MI; and Walled Lake, MI; Cleveland, OH; Buffalo, NY; Milwaukee, WI; and Superior, WI. GLRI federal agencies have learned more about which management practices work best and have used opportunities to implement projects with these best management practices, thus yielding better results than originally projected.
3.2.2 Number of GLRI-funded projects implemented to reduce the impacts of untreated urban run-off on the Great Lakes.	NA	FY 19: 33 FY 18: 22 FY 17: 36 FY 16: 36 FY 15: 18	Practices implemented include: bioswales, rain gardens, bioretention ponds, porous pavement, tree plantings and constructed wetlands.

Measure	Target	Result	Explanation/Additional Information
3.2.3 Measured volume of untreated urban runoff captured or treated by monitored GLRI-funded projects.	NA	FY 19: 2,816,500 FY 18: 46, 964 FY 17: NA FY 16: NA FY 15: NA	No results were available during FY 2015-2017 while baseline monitoring and statistical designs were still under development. Results are reported for this measure from a small number of monitored sites as a test of how well calculated predictive values match actual values. FY2018 results include data from 1 of 4 monitored sites. FY2019 results are larger because they include data from three monitored sites. These data were used to validate modeled projections.
4.1.1 Number of miles of Great Lakes tributaries reopened by GLRI-funded projects (cumulative)	FY 19: 5,500 FY 18: 3,100 FY 17: 4,900 ^[b] FY 16: 4,200 ^[b] FY 15: 2,200 Baseline: 1,900 ^[c]	FY 19: 5,497 FY 18: 5,289 FY 17: 4,967 FY 16: 4,615 FY 15: 3,855	Significant emphasis on removal of dams, bypassing impediments, and replacing undersized culverts continued in FY 2019 but accomplishments landed just short of the target. Noteworthy efforts included strategic barrier removal in northeast Michigan, Tribal efforts to replace culverts and bridge crossings in Wisconsin, and USFS efforts to increase connectivity of streams for sensitive species in National Forest.
4.1.2 Number of miles of Great Lakes shoreline and riparian corridors protected, restored and enhanced by GLRI-funded projects (cumulative)	FY 19: 875 FY 18: 225 FY 17: 725 ^[b] FY 16: 350 ^[b] FY 15: 75 Baseline: 0 ^[c]	FY 19: 1,477 FY 18: 1,046 FY 17: 947 FY 16: 662 FY 15: 313	Although FY 2017 results exceeded previously set cumulative targets, the target was not reset during President's budget development. In FY 2019, GLRI agencies continued to accelerate projects to protect, restore, and/or enhance targeted coastal habitats and key river corridors in the Great Lakes.
4.1.3 Number of acres of Great Lakes coastal wetlands protected, restored and enhanced by GLRI-funded projects (cumulative)	FY 19: 60,000 FY 18: 52,000 FY 17: 30,000 FY 16: 15,000 FY 15: 7,000 Baseline: 0 ^[c]	FY 19: 60,531 FY 18: 52,755 FY 17: 24,306 FY 16: 17,540 FY 15: 7,033	In FY 2019, in addition to significant on-the-ground restoration accomplishments, projects benefiting from previous planning and design activities were completed resulting in reaching target acres this year.
4.1.4 Number of acres of other habitats in the Great Lakes basin protected, restored and enhanced by GLRI-funded projects (cumulative)	FY 19: 227,000 FY 18: 187,000 FY 17: 187,000 FY 16: 167,000 ^[b] FY 15: 127,000 Baseline: 117,000 ^[c]	FY 19: 381,205 FY 18: 317,733 FY 17: 201,663 FY 16: 167,218 FY 15: 146,815	Although FY 2017 results exceeded previously set cumulative targets, the target was not reset during President's budget development. In FY 2019, GLRI federal agencies completed work in terrestrial and aquatic Great Lakes systems as well as targeted actions on federal and state protected lands.
4.2.1 Number of GLRI-funded projects that promote recovery of federally-listed endangered, threatened, and candidate species (cumulative)	NA	FY 19: 50 FY 18: 31 FY 17: 24 FY 16: 17 FY 15: 10	In FY 2019, continued significant progress was made on the recovery of piping plover. GLRI federal agencies reprioritized actions for an additional seven federally listed species.

Measure	Target	Result	Explanation/Additional Information
4.2.2 Number of GLRI-funded projects that promote populations of native non- threatened and non-endangered species self-sustaining in the wild	NA	FY 19: 71 FY 18: 38 FY 17: 23 FY 16: 28 FY 15: 47	Projects focused efforts on protecting lake sturgeon, lake trout, and deep-water native prey fish. Actions were undertaken by GLRI federal agencies guided by emerging science, needs of individual states, and directions from multi-state fishery agencies.
5.1.1 By 2016, a standardized set of climate resiliency criteria will be developed for GLRI projects	FY 19: NA FY 18: NA FY 17: NA FY 16: Developed FY 15: NA	FY 19: NA FY 18: NA FY 17: NA FY 16: Developed FY 15: NA	GLRI federal agencies developed climate resiliency criteria in FY 2016.
5.1.2 Starting in 2017, projects will include climate resiliency criteria in planning and implementation	FY 19: Incorporated FY 18: Incorporated FY 17: Incorporated FY 16: NA FY 15: NA	FY 19: Incorporated FY 18: Incorporated FY 17: Incorporated FY 16: NA FY 15: NA	Climate resiliency criteria were incorporated by all of the 14 applicable GLRI agencies.
5.2.1 Number of educators trained through GLRI-funded projects	NA	FY 19: 677 FY 18: 914 FY 17: 611 FY 16: 407 FY 15: 331	GLRI funding helped train 677 educators in FY 2019.
5.2.2 Number of people educated on the Great Lakes ecosystem through GLRI-funded place-based experiential learning activities	NA	FY 19: 84,654 FY 18: 40,480 FY 17: 35,078 FY 16: 27,989 FY 15: 24,785	GLRI-funded place-based experiential learning activities were supported through the Center for Great Lakes Literacy, NPS, NOAA, and BIA.
5.3.1 Project evaluations completed and used to prioritize GLRI funding decisions each year	NA	FY 19: Completed and used FY 18: Completed and used FY 17: Completed and used FY 16: Completed and used FY 15: Completed and used	GLRI-funded projects were routinely evaluated to ensure that they will be implemented as proposed. Progress in achieving objectives for existing projects was used to prioritize GLRI-funding decisions.
5.3.2 Annual Great Lakes monitoring conducted and used to prioritize GLRI funding decisions each year	NA	FY 19: Conducted FY 18: Conducted FY 17: Conducted FY 16: Conducted FY 15: Conducted	GLRI federal agencies and partners conducted comprehensive monitoring to assess the status and trends of the Great Lakes ecosystem. Long-term monitoring of coastal wetlands, contaminants, nutrients, zooplankton, phytoplankton, harmful algal blooms, benthic communities, and prey fish, among many other components, was conducted throughout the basin. The monitoring data and information from previous years was used to identify the most significant Great Lakes problems and prioritize funding decisions to address those problems.

Measure	Target	Result	Explanation/Additional Information
5.3.3 GLRI-targeted watersheds, habitats and species identified and used to prioritize GLRI funding decisions	NA	FY 19: Identified and used FY 18: Identified and used FY 17: Identified and used FY 16: Identified and used FY 15: Identified and used	GLRI federal agencies and partners identified watersheds, habitats, and species to be targeted in FY 2019 and beyond. Tribes, states, and other stakeholders provided input to the agencies on how best to target GLRI resources. As part of efforts in all five focus areas, GLRI continues to prioritize work to accelerate the cleanup of AOCs, reduce harmful algae, and prevent the introduction of new invasive species.
5.3.4 Issue Annual GLRI Reports to Congress and the President	NA	FY 19: Issued FY 18: Issued FY 17: Issued FY 16: Issued FY 15: Issued	The Great Lakes Restoration Initiative Report to Congress and the President is issued annually.
5.3.5 Issue Great Lakes Water Quality Agreement Triennial Progress Reports of the Parties	NA	FY 19: Issued FY 18: NA FY 17: NA FY 16: Issued FY 15: NA	The Great Lakes Water Quality Agreement Triennial Progress Reports of the Parties were issued in June of 2019.
5.3.6 Issue triennial State of the Lakes reports	NA	FY 19: NA FY 18: NA FY 17: Issued FY 16: NA FY 15: NA	The Triennial State of the Lakes Reports , under the 2012 Great Lakes Water Quality Agreement, were issued in FY 2017.
5.3.7 Periodically update publicly available online information about GLRI	NA	FY 19: Updated FY 18: Updated FY 17: Updated FY 16: Updated FY 15: Updated	Updates included: project updates; glri.us enhancements: and links to information from other agencies.

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

^[b] This target has been adjusted from the Action Plan.

^[c] Baseline year is FY 10, the first year of GLRI.