



Department of  
Environmental  
Conservation

# New York's Great Lakes Action Agenda 2023

Kathy Hochul, Governor | Basil Seggos, Commissioner





# About the Great Lakes Program

New York's Great Lakes basin includes Lake Erie, the Niagara River, Lake Ontario, and the St. Lawrence River. The entire Great Lakes ecosystem spans two countries, including eight states and two provinces. The Great Lakes (Superior, Michigan, Huron, Erie, and Ontario) contain 20% of the world's available freshwater, are home to more than 3,500 native species of plants and animals, and support countless local communities and global economies. These important lands and waters are vital to our quality of life, and are valued by those who live, work, and play in this region.

Previously guided by New York's Great Lakes Action Agenda 2014 and now by the updated Great Lakes Action Agenda 2023, the New York State Department of Environmental Conservation's (NYSDEC) Great Lakes Program works with partners to:

- Improve the quality of the environment;
- Conserve and restore native ecosystems;
- Promote sustainable and resilient communities;
- Coordinate science and adaptive management;
- Provide research, education, and training;
- Coordinate community engagement and stewardship; and
- Provide and identify grant funding.

Implementation of the *Great Lakes Action Agenda 2023* (hereafter referred to as GLAA) relies on partnerships with federal and state agencies, local municipalities, nonprofits, academic and scientific institutions, businesses, landowners, and dedicated volunteers. The goals and actions within the GLAA have been identified by these partners and



represent a diversity of local, regional, state, and federal interests for the enhancement, restoration, and protection of New York's Great Lakes lands and waters. The GLAA leverages core New York State agency programs with federal and private partners to accelerate progress to ensure drinkable, swimmable, and fishable Great Lakes for current and future generations.

NYSDEC's Great Lakes Program thanks everyone who contributed to the GLAA, and for your continued commitment to the protection of our irreplaceable Great Lakes.

## Additional Information is Available From:

### NYSDEC – Great Lakes Program

700 Delaware Avenue  
Buffalo, NY 14209

**Website:** <https://www.dec.ny.gov/lands/25562.html>

**email:** [greatlakes@dec.ny.gov](mailto:greatlakes@dec.ny.gov)

**phone:** 716-851-7070

**fax:** 716-851-7009

# Table of Contents

<b>II. List of Abbreviations and Acronyms</b>	<b>4</b>
<b>III. About New York's Great Lakes</b>	<b>5</b>
A Short History of Great Lakes Management	5
New York's Approach to Great Lakes Management	7
Accomplishments to Date	7
<b>IV. Great Lakes Action Agenda</b>	<b>9</b>
Vision	9
Mission	9
Goals	9
Cross-Cutting Priorities	10
<b>V. Implementing the GLAA</b>	<b>12</b>
Applying Ecosystem-Based Management	12
Funding Approach	13
Partner Coordination and Information Flow	13
Great Lakes Action Team	14
GLAA Work Groups	14
How Can I Engage with the GLAA and Partner Network?	16
<b>VI. Great Lakes Action Agenda Organization</b>	<b>17</b>
Goals, Strategies, and Actions	17
Benefits and Progress Metrics	17
10-Year Targets and Outcomes	17
Partners	17
<b>VII. Great Lakes Action Agenda Goals, Strategies, and Actions</b>	<b>19</b>
Goal 1: Reduce or Eliminate Releases of Persistent Toxic Substances to protect ecological and human health.	19
Goal 2: Control Sediment, Nutrient, and Pathogen Loadings so that drinking water quality, aquatic life, recreational uses, and people are protected.	22
Goal 3: Prevent and Control Invasive Species Impacting Waterways and Riparian Areas to sustain a healthy Great Lakes ecosystem and economic and recreational opportunities.	27
Goal 4: Conserve and Restore Native Fish and Wildlife and Their Habitats to sustain diverse, resilient ecosystems and related uses.	30
Goal 5: Enhance Community Resiliency and Ecosystem Integrity through protection, restoration, and improved, science-informed resource management.	34
Goal 6: Revitalize Local Communities through Sustainable Management and stewardship of Great Lakes lands and waters.	39
<b>VIII. Evaluating GLAA Outcomes</b>	<b>42</b>
GLAA 10-Year Targets, Outcomes, and Data Sources	43
<b>IX. Call to Action</b>	<b>44</b>
<b>X. References</b>	<b>45</b>
<b>Appendix I. Great Lakes Water Quality Agreement: LAMPs and AOCs</b>	<b>50</b>
<b>Appendix II. Funding Resources</b>	<b>52</b>
<b>Appendix III. Research Agendas</b>	<b>54</b>
<b>Appendix IV. How Residents And Visitors Can Help New York's Great Lakes</b>	<b>55</b>

# I. Executive Summary

New York's west and north coasts are defined by the Great Lakes of Erie and Ontario and the great straits of the Niagara River and St. Lawrence River. These massive bodies of freshwater supply drinking water for millions of residents; support a multimillion-dollar tourism, fishing, and recreation economy; produce renewable hydroelectric energy; and provide a multitude of cultural, spiritual, and social benefits that often cannot be quantified but are invaluable to our quality of life.

New York is a front-line steward of 20% of the world's available surface freshwater. From Niagara Falls to the 11 Finger Lakes to the Thousand Islands, we, as New Yorkers, have a shared responsibility to protect our Great Lakes lands and waters.

The GLAA builds on the success of the GLAA 2014. Over 83% of the actions listed in the GLAA 2014 have made significant progress. This achievement, collectively advanced by New York's Great Lakes partner network, is something to celebrate and build upon.



Through the GLAA stakeholder work groups and other partner outreach, we continually learn about the unique opportunities and challenges within our region. The GLAA reflects lessons learned, while also integrating new state and federal plans and priorities, scientific findings, and solutions to address our most pressing environmental challenges. The six priority goals of the GLAA are:

1. Reduce or Eliminate Releases of Persistent Toxic Substances;
2. Control Sediment, Nutrient, and Pathogen Loadings;
3. Prevent and Control Invasive Species;
4. Conserve and Restore Native Fish and Wildlife and Their Habitats;
5. Enhance Community Resiliency and Ecosystem Integrity; and
6. Revitalize Local Communities through Sustainable Management.

These six goals highlight the most urgent actions needed to:

- Achieve water quality, resiliency, restoration, and sustainable management outcomes for New York's Great Lakes and communities;
- Promote coordination and collaboration among local, regional, state, and federal partners implementing these actions to achieve shared goals and sustainable outcomes; and
- Leverage the capacity, human capital, and financial resources needed to achieve results.

No one agency or entity has the resources, experience, and expertise to single-handedly achieve the ambitious goals included in the GLAA. The successful implementation of this plan depends on active partnerships of regional and local stakeholders, including but not limited to, federal and state agencies, Indian Nations, local governments, nonprofit organizations, academia, businesses, and residents.

In this next phase of implementation, we look forward to continuing and expanding the good work and partnerships started under the GLAA 2014 by engaging a more diverse partnership, applying new thinking and science to complex problems, and growing a stronger base of local champions to lead our Great Lakes communities forward.

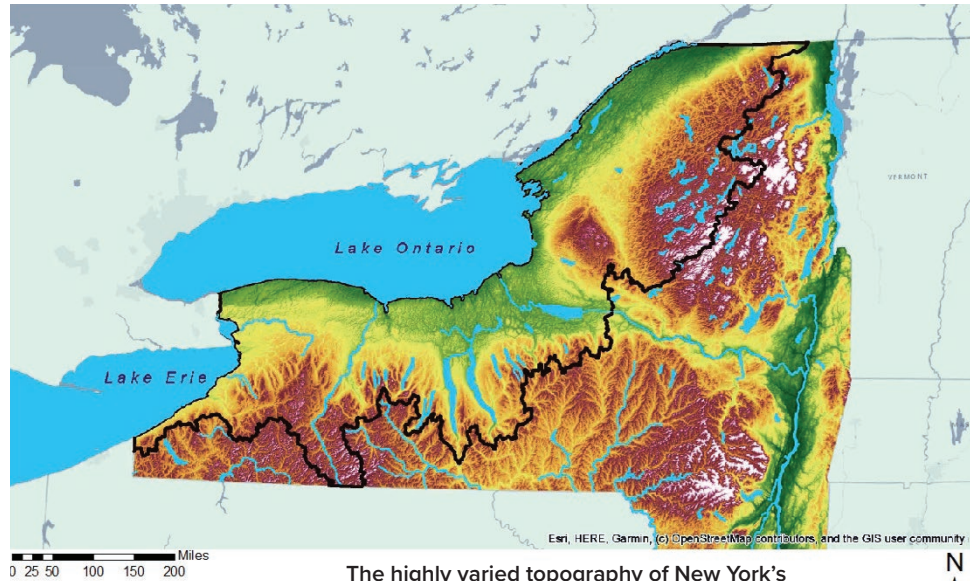


## II. List of Abbreviations and Acronyms

<b>AEM</b> . . . . .	Agricultural Environmental Management	<b>NYSDEC</b> . . . .	New York State Department of Environmental Conservation
<b>AOC</b> . . . . .	Area of Concern	<b>NYSDHSES</b> . . .	New York State Division of Homeland Security and Emergency Services
<b>BMP</b> . . . . .	Best Management Practice	<b>NYSDOH</b> . . . .	New York State Department of Health
<b>BUI</b> . . . . .	Beneficial Use Impairment	<b>NYSDOS</b> . . . .	New York State Department of State
<b>CEC</b> . . . . .	Contaminant of Emerging Concern	<b>NYSDOT</b> . . . .	New York State Department of Transportation
<b>CLEAR</b> . . . . .	Coastal Lakeshore Economy and Resiliency Initiative	<b>NYSEFC</b> . . . .	New York State Environmental Facilities Corporation
<b>CREP</b> . . . . .	Conservation Reserve Enhancement Program	<b>NYSERDA</b> . . .	New York State Energy Research and Development Authority
<b>CSO</b> . . . . .	Combined Sewer Overflow	<b>NYSG</b> . . . . .	New York Sea Grant
<b>CSP</b> . . . . .	Conservation Stewardship Program	<b>NYSOGS</b> . . . .	New York State Office of General Services
<b>EBM</b> . . . . .	Ecosystem-Based Management	<b>NYPA</b> . . . . .	New York Power Authority
<b>ECL</b> . . . . .	Environmental Conservation Law	<b>NYSP2I</b> . . . .	New York State Pollution Prevention Institute
<b>ENGO</b> . . . . .	Environmental Non-Governmental Organization	<b>OGLECA</b> . . . .	Ocean and Great Lakes Ecosystem Conservation Act
<b>EPA</b> . . . . .	U.S. Environmental Protection Agency	<b>NYSOPRHP</b> . .	New York State Office of Parks, Recreation and Historic Preservation
<b>EPF</b> . . . . .	Environmental Protection Fund	<b>PBDE</b> . . . . .	Polybrominated Diphenyl Ether
<b>FEMA</b> . . . . .	Federal Emergency Management Agency	<b>PCB</b> . . . . .	Polychlorinated Biphenyl
<b>GHG</b> . . . . .	Greenhouse Gas	<b>PRISM</b> . . . . .	Partnerships for Regional Invasive Species Management
<b>GLAA</b> . . . . .	Great Lakes Action Agenda	<b>RAP</b> . . . . .	Remedial Action Plan
<b>GLAT</b> . . . . .	Great Lakes Action Team	<b>RIBS</b> . . . . .	Rotating Integrated Basin Studies
<b>GLBAC</b> . . . . .	Great Lakes Basin Advisory Council	<b>RPC</b> . . . . .	Regional Planning Council
<b>GLEEE</b> . . . . .	Great Lakes Ecosystem Education Exchange	<b>SUNY</b> . . . . .	State University of New York
<b>GLRC</b> . . . . .	Great Lakes Research Consortium	<b>SWCD</b> . . . . .	Soil and Water Conservation District
<b>GLRI</b> . . . . .	Great Lakes Restoration Initiative	<b>TEK</b> . . . . .	Traditional Ecological Knowledge
<b>GLWQA</b> . . . . .	Great Lakes Water Quality Agreement	<b>TMDL</b> . . . . .	Total Maximum Daily Load
<b>HAB</b> . . . . .	Harmful Algal Bloom	<b>USACE</b> . . . . .	U.S. Army Corps of Engineers
<b>LAMP</b> . . . . .	Lakewide Action and Management Plan	<b>USFWS</b> . . . . .	U.S. Fish and Wildlife Service
<b>NOAA</b> . . . . .	National Oceanic and Atmospheric Administration	<b>USGS</b> . . . . .	U.S. Geological Survey
<b>NNBF</b> . . . . .	Natural and Nature-Based Features	<b>WWTP</b> . . . . .	Wastewater Treatment Plant
<b>NRCS</b> . . . . .	Natural Resource Conservation Service		
<b>NYSDAM</b> . . . .	New York State Department of Agriculture and Markets		

# III. About New York’s Great Lakes

The Great Lakes basin is of state, national, and international significance. Within New York, this basin includes over 700 miles of shoreline and 40% of the state’s surface area—second largest among all Great Lakes states. More than 4 million New Yorkers use the region’s waterbodies as a source of drinking water, for recreational activities, to support agricultural production, to transport people and goods, and for countless other activities.



The highly varied topography of New York’s Great Lakes basin supports a diversity of ecosystems.

## A Short History of Great Lakes Management

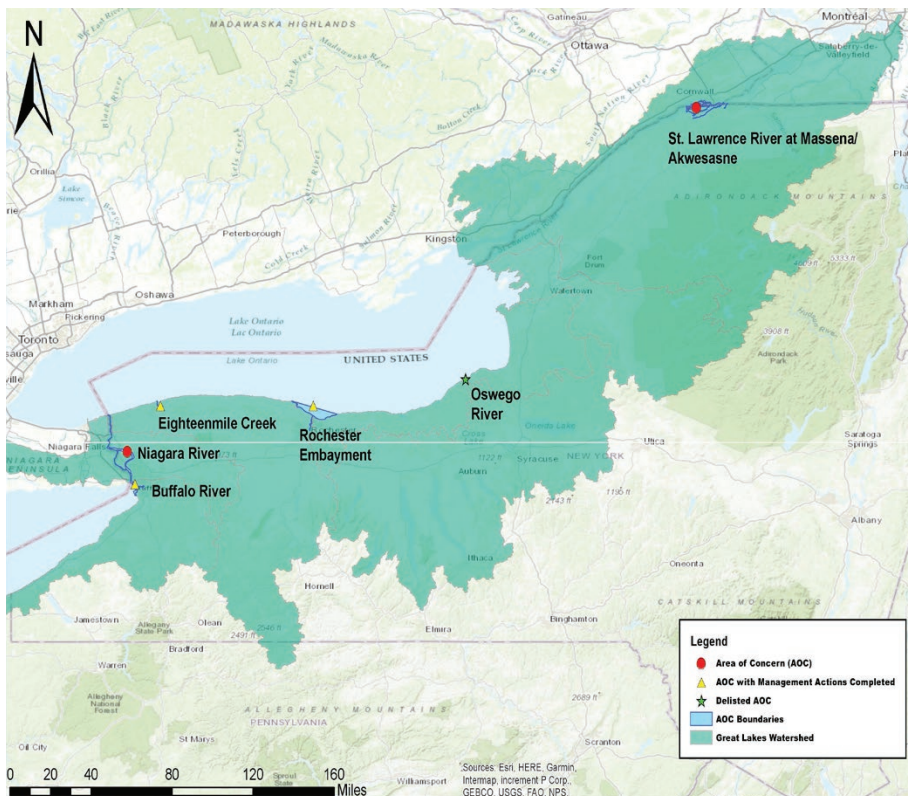
The Indigenous peoples of North America have stewarded the environment since time immemorial, and the Great Lakes basin has been directly influenced by the Haudenosaunee and Anishinaabeg member Nations. The Haudenosaunee Confederacy, also known as the People of the Longhouse, is made up of the Kanien’kehá:ka (Mohawk), On’nyota’a:ka (Oneida), Onoñda’gége (Onondaga), Gayogohó:no’ (Cayuga), Onöndowa’ga:’ (Seneca), and Ska:rù:rę’ (Tuscarora) Nations. The Haudenosaunee live in balance with these lands engaging in agriculture, fishing, gathering, hunting, and other subsistence activities in a way that honors all of creation. Living in this way, in accordance with their original instructions, allows for the fulfillment of their mandate to protect the earth for the next seven generations, with each new generation accepting that responsibility for the next seven into the future.

Today, the Haudenosaunee Environmental Task Force and member Nations continue to work together to ensure that the natural world is protected for those who will inherit the earth.

Some of the first non-Indigenous people to visit the Great Lakes were Jesuit missionaries who traveled to visit the Onondaga Nation on behalf of the French government in 1654. On their travels through Lake Ontario, they remarked how there was such an abundance of fish that they could be speared or clubbed with paddles from the deck of the boat, and the Onondaga people paddling on the Oswego River had their canoes filled with salmon. The waterways of the St. Lawrence, Lake Ontario, the Niagara River,







Currently, New York has five AOCs, in addition to a former/delisted AOC, Oswego Harbor. More information on New York's AOC program is available in Appendix I.

In the 1960s, growing public concern about deteriorating conditions in the lakes led to lengthy negotiations between the national governments of the United States and Canada. The groundbreaking 1972 [Great Lakes Water Quality Agreement](#) (GLWQA) established cooperative programs to address water quality impairments, particularly phosphorus and bacteria from municipal and industrial

sources. The agreement set binational, basin-wide water quality objectives. Canada and the United States committed to design, implement, and monitor municipal and industrial pollution control programs in conjunction with state and provincial governments, restore [Areas of Concern](#) (AOCs), and implement the Lake Erie and Lake Ontario [Lakewide Action and Management Plans](#) (LAMPs) (see Appendix I). A revised agreement, signed in 1978, added the goal of “virtually eliminating” the discharge of persistent toxic substances, as well as a broader goal “to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin ecosystem.” In 2012, the agreement was reaffirmed, to include an expanded binational focus on addressing the nearshore environment, aquatic invasive species, habitat degradation, and the effects of climate change. The updated agreement also supports continued work on harmful algal blooms (HABs), toxic and other chemicals of mutual concern, and discharges from vessels. The GLWQA guides many of the state’s activities, and new provisions have a direct bearing on the goals and actions outlined in the GLAA.

and tributaries to the lakes served as a route for ships to access the lands by early European settlers. By the 1800s, many immigrant communities were settling in the region and more intensive resource extraction and exploitation took place, often in conflict with the traditional practices of the Haudenosaunee and Anishinaabeg. Extensive logging, fishing, mining, and farming began to forever alter and degrade sensitive ecosystems, and by the end of the nineteenth century, the Atlantic salmon had been extirpated from the Lake Ontario ecosystem.

Non-Indigenous people’s concern for the ecological health of the Great Lakes took an organized stance shortly after the industrial revolution. The Boundary Waters Treaty of 1909 is the foundational United States-Canada Agreement to establish principles for international cooperation to sustainably manage shared waters. The Boundary Waters Treaty was followed by the binational Niagara River Water Diversion Treaty of 1950; the Convention on Great Lakes Fisheries of 1954, which created the Great Lakes Fishery Commission; and the Great Lakes Basin Compact of 1955, which created the Great Lakes Commission and yielded the Great Lakes-St. Lawrence River Ecosystem Charter in 1995.

Despite this progress, considerable work remains to fulfill the many goals for restoring and protecting the Great Lakes. As a result of piecemeal implementation activities and limited funding over many years, our collective efforts have yet to achieve the fundamental promise of the [Clean Water Act](#), the primary federal law governing water pollution in the United States, enacted in 1972 to “restore and maintain the chemical, physical and biological integrity of the Nation’s waters.”

In recognition of these challenges, in 2004, the governors of the Great Lakes states partnered with the federal government, mayors, leaders of Indian Nations, and stakeholders across the basin to develop a more comprehensive approach, entitled the [Great Lakes Regional Collaboration Strategy](#). This bipartisan strategy propelled the plan for the Great Lakes Restoration Initiative (GLRI). Enacted in 2009, the GLRI represented a renewed federal financial commitment to restoring and protecting the Great Lakes basin.

## New York’s Approach to Great Lakes Management

---

New York State’s priorities for the Great Lakes were first identified in New York State’s 1992 [25-Year Plan for the Great Lakes](#), which highlighted multiple government and private sector goals and objectives for improving the overall quality of New York’s Great Lakes region. Many elements of this plan are still relevant today and have been integrated into this GLAA.

By the early 2000s, there was increased recognition that complex, emerging issues, like climate change, invasive species, and nonpoint source pollution control, demanded holistic management solutions. Ecosystem-based management (EBM) is an integrated approach to natural resources management that considers the function of the entire ecosystem, including human activity, to both improve environmental conditions and achieve the sustained ecosystem services that support human needs and socioeconomic goals.

In 2006, New York became the second state in the country to mandate implementation of ecosystem-based management with the passage of Environmental Conservation Law (ECL) Article 14—The New York Ocean and Great Lakes Ecosystem

Conservation Act (OGLECA). As directed by this law, an interagency council was established, and a report, [Our Waters, Our Community, Our Future: Taking Bold Action Now to Achieve Long-term Sustainability of New York’s Ocean and Great Lakes](#), was developed to promote the coordination and implementation of EBM strategies at the state level. The EBM report recommended developing and implementing specific action plans for Great Lakes basin and ocean watersheds. In response, the first GLAA was released in 2014 and established a framework for achieving New York’s environmental, community, and economic priorities for the Great Lakes basin. State authority for the GLAA and Ocean and Great Lakes funding under the New York State Environmental Protection Fund (EPF) continues to be rooted in this landmark legislation.

Consistent with ECL Article 14, New York’s GLAA sets out to:

- Promote ecosystem-based management as a framework for implementing sustainable resource management;
- Integrate and identify the most urgent actions needed to achieve restoration, resiliency, and sustainable development outcomes for New York’s Great Lakes; and
- Expand collaboration and coordinated action to leverage capacity, resources, and expertise among a diverse, basin-wide partner network.

## Accomplishments to Date

---

Since New York’s first GLAA was released in 2014, numerous partnerships have been formed, programs have been created, and state and federal investments have been secured—and effectively directed—to achieve the ambitious goals of New York’s plan for the Great Lakes.

A 2020 program assessment revealed that progress has been made on more than 83% of the actions listed in the GLAA 2014. This is a significant achievement and something that our entire partner network should be proud of. The GLAA carries forward any outstanding actions that still warrant our collective action and updates other actions to ensure that they accurately represent current needs.



With annual support from the State's EPF, New York State agencies and other partners have leveraged hundreds of millions of dollars in federal GLRI funding since 2010 to implement projects that:

- Prevent and clean up toxic contamination;
- Restore AOCs;
- Reduce nutrient loading to improve nearshore health;
- Manage invasive species;
- Restore native fish and wildlife habitat;
- Educate the next generation; and
- Conduct important research and monitoring to inform resource management.

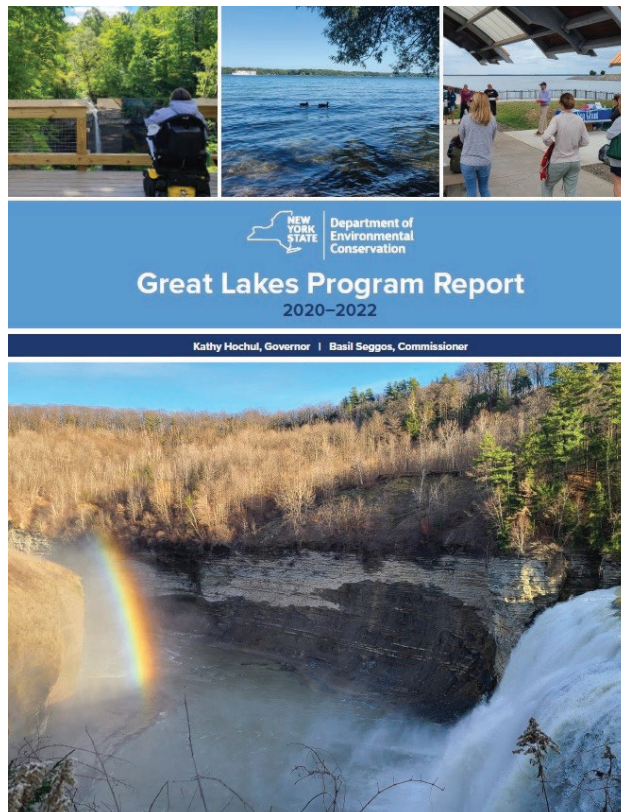
Implementation of the GLAA 2014 has been dependent on the participation and effective collaboration of our many partners located throughout the basin, including state agencies, Indian Nations, local governments, scientific and educational institutions, environmental nonprofit organizations, local watershed groups, volunteers, landowners, and residents. To date, NYSDEC's Great Lakes Program has engaged over 350 organizations and individuals in regional stakeholder meetings and implementation activities. These partnerships have, and will continue to be, critical for supporting competitive proposals for federal funding. Moving forward, the GLAA partner network will strengthen efforts to better engage environmental justice and other disadvantaged communities to achieve more diverse, representative participation in GLAA implementation.

Biennially, NYSDEC's Great Lakes Program highlights accomplishments and evaluates outcomes of GLAA implementation by state agencies and local partners. The biennial *Great Lakes Program Report* highlights significant achievements, including:

- Restoring habitats and recreational uses for environmental justice communities within New York's five AOCs;
- Adapting to storms and flooding by enhancing the resilience of Great Lakes coastal communities and ecosystems through technical assistance, funding, and research;

- Improving and protecting critical water resources in waterways that flow to Lake Erie, Niagara River, Lake Ontario, and the St. Lawrence River to ensure waters are swimmable, drinkable, and fishable; and
- Securing federal (GLRI) funding for projects, complementing the State's initiatives and commitment to restoring New York's Great Lakes.

To access the latest report, visit the NYSDEC [Great Lakes Program website](#).



**In 2022, New Yorkers approved a ballot proposition to make \$4.2 billion available for environmental and community projects. The Clean Water, Clean Air and Green Jobs Environmental Bond Act funding will support projects across the state, including GLAA implementation.**

# IV. Great Lakes Action Agenda

## Vision

To ensure that the quality of life and standard of living of people are improved by evolving a shared vision of the Great Lakes ecosystem so that society's actions and attitudes strengthen the viability and sustainability of this ecosystem's unique and valuable resources.

-New York State 25-Year Plan  
for the Great Lakes (1992)

## Mission

To protect, restore, conserve, and enhance the chemical, physical, and biological integrity of the waters and associated natural resources within the Great Lakes basin for sustainable use and enjoyment by the people of New York.

## Goals

Six priority goals, with corresponding strategies and actions, are identified for New York's Great Lakes basin. These goals integrate existing plans and priorities, local and state needs, and future opportunities to achieve clean water, natural resource conservation, and resilient and sustainable communities.

<b>Goal 1:</b>	<b>Reduce or Eliminate Releases of Persistent Toxic Substances</b> to protect biological and human health.
<b>Goal 2:</b>	<b>Control Sediment, Nutrient, and Pathogen Loadings</b> so that drinking water quality, aquatic life, recreational uses, and people are protected.
<b>Goal 3:</b>	<b>Prevent and Control Invasive Species</b> impacting waterways and riparian areas to sustain a healthy Great Lakes ecosystem and economic and recreational opportunities.
<b>Goal 4:</b>	<b>Conserve and Restore Native Fish and Wildlife and Their Habitats</b> to sustain diverse, resilient ecosystems and related uses.
<b>Goal 5:</b>	<b>Enhance Community Resiliency and Ecosystem Integrity</b> through protection, restoration, and improved, science-informed resource management.
<b>Goal 6:</b>	<b>Revitalize Local Communities through Sustainable Management</b> and stewardship of Great Lakes lands and waters.



## Cross-Cutting Priorities

---

Consistent with the adaptive management principle of EBM, we are always learning and adapting to improve our approach and impact. The cross-cutting priorities listed below represent key opportunities and challenges that will be considered and implemented across all six goals, supporting strategies, and actions of the GLAA.

### Promote Diversity, Equity, and Inclusion

A renewed, strengthened commitment to meaningful engagement with communities impacted by environmental justice issues, and other underrepresented and [disadvantaged communities](#) within the state's Great Lakes basin, will ensure that diverse values and perspectives are represented and that just, mutually beneficial outcomes are achieved. An environmental justice or disadvantaged community is one that experiences disproportionate adverse environmental impacts, which may include industrial air pollution, substandard water quality, and lack of access to open space. Tools have been developed to identify these areas, including [NYSDEC's Potential Environmental Justice Area map](#), and [USEPA's EJScreen](#). Within each strategy in this document, we will seek to maximize and track the benefits and metrics for environmental justice and disadvantaged communities.

**Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.**

## Educate the Next Generation of Great Lakes Stewards

All restoration and protection work that is achieved will be for naught if the next generation of stewards—our youth—are not fully educated, engaged, and empowered to act. Meaningful engagement of students in Great Lakes literacy education, critical thinking, and inquiry-driven solutions should be integrated into projects to the extent possible to ensure that stewardship of the basin will be sustained into the future. [New York's Great Lakes Ecosystem Education Exchange](#) (GLEEE) resources can help teachers and other education partners engage youth in project work and expand Great Lakes literacy. For each goal, there is an opportunity to consider how kindergarten through 12th grade curriculum, experiential education, and resources can promote long-term stewardship and implementation of GLAA goals.

### Integrate Traditional Ecological Knowledge (TEK)

Traditional Ecological Knowledge (TEK), as defined in GLWQA [guidance](#), is a subset of Indigenous Knowledge that is specific to ecology and encompasses knowledge, practice, and belief that have evolved adaptively over many generations through cultural transmission that foster a place-based understanding of the relationship between living beings and the environment. Indigenous Peoples' cultures promote teachings and values to manage natural resources in a way that preserves and protects them for future generations. Many of the actions and strategies of the GLAA are developed in line with EBM and will benefit from TEK-based knowledge because it relates to the relationship of living beings with their environment. Opportunities to integrate TEK into project decision-making, educational programming, and environmental messaging will be pursued in consultation and collaboration with Indian Nation partners, with the understanding that TEK will be respected as equally valid as scientific knowledge.

## Strengthen Local Capacity, Engagement, and Partnerships

In New York State, municipalities hold extensive authority for land use and development decisions within their boundaries. Because water management challenges transcend these political boundaries, it is imperative that towns and villages work together through intermunicipal partnerships to implement holistic solutions to basin issues such as flooding and impaired water quality. A combination of education and training, technical assistance, funding, and other resource support (such as circuit riders) is needed to promote and sustain productive partnerships and achieve basin-scale outcomes. Local capacity and stewardship to achieve and sustain management of New York's Great Lakes basin is a cross-cutting priority of the GLAA.

## Innovate, Elevate, and Maintain Great Lakes Restoration

To advance the practice of Great Lakes basin management, it is imperative that we develop and test new ideas, scale up successful models, and expand the adoption of impactful approaches. To this end, a guiding strategy for implementing the GLAA is to support pilot projects and studies that are scalable and transferable and can leverage state planning funds with federal implementation dollars. Planning grants and pilot/proof of concept projects will be promoted to advance innovative solutions to complex problems. Successful models, such as the AOC program, will be expanded and sustained through basin-wide partnerships, monitoring and assessment to maintain achievements, and support long-term stewardship, beyond short-term grants.

## Accelerate the Collection of and Access to Scientific Information

Decisions based on sound science are the foundations upon which all GLAA goals and actions are based. Because of its importance to numerous objectives, this EBM principle continues to be integrated throughout the GLAA through research, planning, assessments, communication with stakeholders, and the evaluation of actions towards achieving desired outcomes. An equal priority is ensuring that high-quality scientific information is readily and widely accessible to environmental managers, practitioners, and landowners throughout the region. Lastly, a focus on establishing baseline ecological health data and evaluating changes over time for our most sensitive ecosystems is a key priority.

## Prepare for and Adapt to a Changing Climate

Since the GLAA 2014 was issued, it is now broadly recognized that urgent action is needed to reduce the emissions of greenhouse gases, adapt, and become more resilient to changing natural conditions. Projected climatic changes and related (cumulative) impacts on water resources, wildlife and habitats, and human uses of ecosystems should be fully considered at the outset of every project design. Resilient solutions that are nature-based, dynamic, and multi-benefit will be most able to adapt to changing conditions. At the same time, more research is needed to fully understand and prepare for climate change and how ecosystems will be transformed by it. To this end, all work conducted under this GLAA should fully consider and integrate climate mitigation, adaptation, and resilience benefits to ensure sustainable outcomes, consistent with [state policy, plans, and programs](#).

# V. Implementing the GLAA

## Applying Ecosystem-Based Management

New York's ECL Article 14—OGLECA directed state agencies to apply EBM principles in state agency programs and to develop and implement regional EBM action plans. The principles of EBM, as outlined below, guide the implementation of the GLAA, and are intended to achieve sustainable, holistic solutions to complex environmental challenges.

Principles of EBM include:

- Place-based focus;
- Protection of ecosystem structure, function, and key processes;
- Interconnectedness within and among systems;
- Integration of ecological, social, economic, and institutional perspectives;
- Sustainable human use of the ecosystem;
- Stakeholder involvement;
- Collaboration;
- Scientific foundation for decision making; and
- Adaptive management.

**Ecosystem-based management (EBM) is a systems approach that strives to balance the needs of people, nature, and the economy through science-informed decision making.**





## Funding Approach

Implementation of the GLAA will continue to rely on a number of state and federal funding programs, existing organizational resources, public-private partnerships, and other innovative partnering solutions.

Utilizing the New York State EPF, NYSDEC's Great Lakes Program supports small grant programs to fund research, project planning, and implementation in partnership with the Great Lakes Research Consortium (GLRC), Cornell University's Water Resources Institute, and New York Sea Grant (NYSG). These grant programs and other federal and state grants are included on the [funding opportunities](#) list.

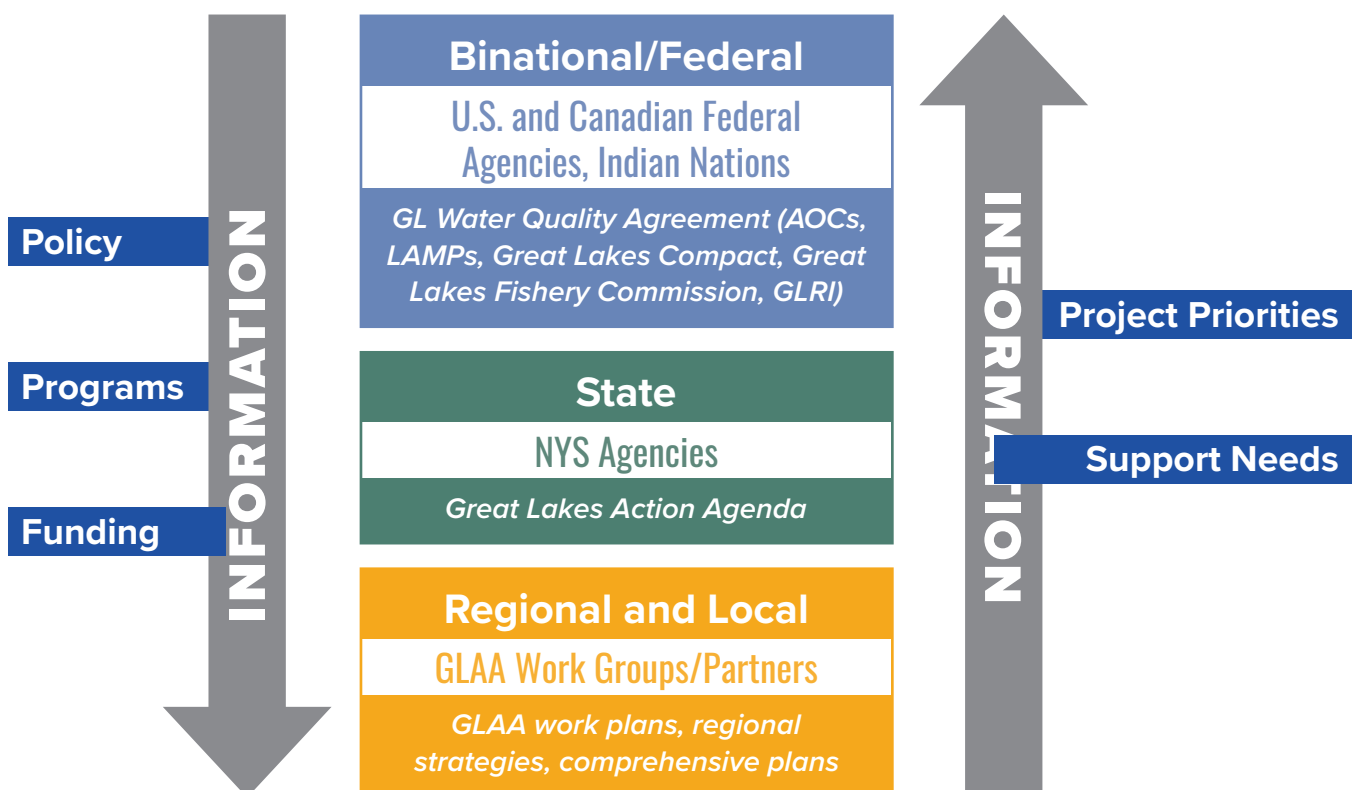
Federal funding programs are a key part to implementing the GLAA. The primary federal program is the GLRI administered by EPA's Great Lakes National Program Office, in partnership with multiple federal agencies.

Funding opportunities are also routinely shared with interested stakeholders as they become available through our NY Great Lakes News, Funding, and Events email list. You may sign up by using the DEC Delivers box on the NYSDEC Great Lakes Program webpage. Additional funding guidance and resources are included in Appendix II.

## Multilevel Coordination and Partnership

Implementation of the GLAA is dependent on effective communication, coordination, and collaboration among binational, federal, state, and local partners. GLAA work groups facilitate the flow of policy, program, and funding information from federal and state partners, to ensure that local needs, values, and priorities are reflected in state and federal programs and plans. The diagram below illustrates this multilevel coordination approach, as facilitated by the GLAA and NYSDEC's Great Lakes Program.

## Partner Coordination and Information Flow



## Great Lakes Action Team

ECL Article 14 established a team of representatives from nine state agencies, known as the Ocean and Great Lakes Ecosystem Conservation Council. The Council was responsible for guiding implementation of EBM within state programs to promote the understanding, protection, restoration, and enhancement of New York's ocean and Great Lakes ecosystems.

Within the context of the GLAA, this Council has evolved into the Great Lakes Action Team (GLAT), a steering committee of state agency representatives and other partners that provide overall strategic direction to the program and GLAA work groups, help the state define goals and align programs, and serve as a communication bridge to a wider group of partners and stakeholders.

Numerous state government and other partners have participated in previous GLAT meetings to help implement the GLAA 2014. Participating agency members have included, but are not limited to:

- New York State Department of Environmental Conservation (NYSDEC)
- Empire State Development (ESD)
- New York State Department of State (NYSDOS)
- New York State Department of Agriculture and Markets (NYSDAM)
- New York State Office of General Services (NYSOGS)
- New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP)
- New York State Energy Research and Development Authority (NYSERDA)
- New York State Department of Transportation (NYSDOT)
- New York State Department of Health (NYSDOH)
- State University of New York (SUNY)

### Benefits of the GLAA and Partner Network:

- Use one plan that integrates many federal, state, and regional priorities;
- Connect and collaborate with a diversity of partners;
- Leverage resources and expertise to achieve multi-benefit projects;
- Develop collaborative and competitive funding proposals; and
- Join and learn from a community of like-minded Great Lakes stewards.

## GLAA Work Groups

Implementation of the GLAA relies on the collective efforts of and partnerships with federal and state agencies, Indian Nations, local municipalities, nonprofits, academic and scientific institutions, businesses, landowners, and dedicated volunteers. [GLAA work groups](#) have been formed within each of New York's Great Lakes sub-basins to facilitate coordination and collaboration among regional stakeholders working to implement the GLAA.

This place-based work group structure ensures that implementation of the GLAA is responsive at the local, sub-basin level while maintaining important alignment with key state priorities and funding programs.

Work group meetings are held on a regular basis and are open to everyone.

## Sub-Basin Work Groups & EBM Partner Priority Areas



GLAA work groups are supported in each of New York's Great Lakes' four major sub-basins; within each sub-basin, partner priority areas for demonstrating EBM are shown in green. To learn more, visit the [Great Lakes Action Agenda website](#).

Work group partners meet to:

- Foster communication and collaboration among partners within each of the four sub-basins and across the state's Great Lakes basin;
- Implement and evaluate projects and programs to achieve the goals of the GLAA; and
- Connect stakeholders to resources, technical assistance, expertise, and information.

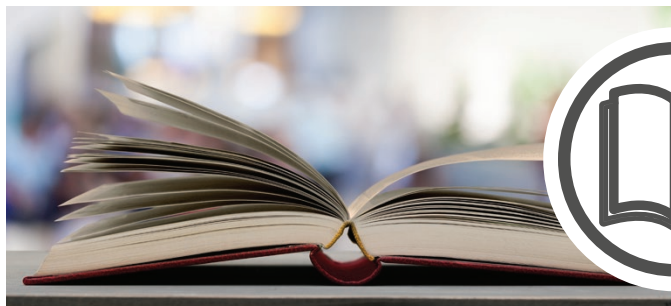
Regional work plans have been developed for each of the sub-basins to guide GLAA 2014 implementation and identify priority projects at the local level. These are working documents and will be updated in support of the new GLAA, and as local needs and opportunities change.

To learn more and get involved in the GLAA work groups, contact [greatlakes@dec.ny.gov](mailto:greatlakes@dec.ny.gov).



## How Can I Engage with the GLAA and Partner Network?

We invite everyone to join us in implementing the GLAA. Below is a framework for how an individual or organization may engage with the partner network to achieve sustainable, multi-benefit outcomes for their Great Lakes community.



**Read the GLAA and identify an issue of interest to you or your community.**



**Attend a GLAA work group meeting to connect with resources and partners.**



**Use an EBM approach to identify a solution that achieves community, economic, and ecological benefits (win-win-win).**



**Seek technical and funding guidance through GLAA partnership.**



**Implement and evaluate your project.**

# VI. Great Lakes Action Agenda Organization

## Goals, Strategies, and Actions

---

Selected goals, strategies, and actions within the GLAA integrate key priorities from federal and state plans, reflect local and regional priorities identified by the work groups and other partners, build on existing programs, and represent challenges that require a participatory, ecosystem-based approach to address.

For each goal, implementation strategies and supporting actions have been identified to further specify how the goal will be achieved. Actions are classified by type into the following categories:

- **Research** – Foundational science needed to inform management of an issue;
- **Assess** – Assessment and characterization of an issue;
- **Plan** – The process of identifying and designing a solution to achieve a goal;
- **Implement** – A management action or on-the-ground project (e.g., restoration, remediation, protection, stewardship) to address a need, as supported by research, assessments, and plans;
- **Evaluate** – Evaluating or monitoring the implementation action to measure progress and manage adaptively; and
- **Education/Outreach** – Sharing results, engaging new audiences in strategy implementation, and promoting behavioral changes.

## Benefits and Progress Metrics

---

Within each strategy, benefits resulting from successful implementation of actions and suggested progress metrics are identified. Where applicable, the progress metrics align with the federal *GLRI Action Plan III*'s measures of progress, to serve as a useful tool for partners pursuing federally funded projects.

Progress metrics are intended to track our collaborative efforts towards implementing the actions within the GLAA and may be most effectively used to track project progress at the sub-basin scale, through the GLAA work group work plans. At this scale, it may be feasible to establish baselines and targets to track and evaluate progress metrics over time.

Progress reporting may occur through two-year progress reports, presentations, e-bulletins, and other outreach mechanisms.

## 10-Year Targets and Outcomes

---

In section VIII, 10-year targets and outcomes are proposed to assess improvements in environmental conditions and trends resulting from GLAA implementation over time. Periodic evaluation of these environmental targets and outcomes will help us determine if we're meeting our goals and adaptively manage our approach as needed. Outcomes and data sources may be further refined over time as new information becomes available.

## Partners

---

All are welcome to join in efforts, either as work group partners or through individual or organizational action. The successful implementation of the GLAA depends on the collective efforts and impact of many different local, regional, state, and federal partners.

The Partners table lists organizations that are already implementing the corresponding action or may be a likely partner based on their organizational mission. They are suggestions only and do not commit partners to implementing specific actions, nor do they limit the possibility of other organizations or individuals acting as partners on specific actions.

Partner Name (Abbrev.)	Description/Examples	Role
<b>Local government (Local govt)</b>	Counties, Towns, Villages, Cities, Municipalities, Hamlets and their respective boards, departments, and committees	Local decision-making authority and administration responsibility
<b>Soil and Water Conservation Districts (SWCDs)</b>	County-based units of government; also includes county-based coalitions such as the Lake Erie Watershed Protection Alliance, Finger Lakes-Lake Ontario Watershed Protection Alliance, and the St. Lawrence River Watershed Project	Provide programs and services to landowners to conserve, enhance, and protect soil and water resources across the state
<b>Regional Planning Councils (RPCs)</b>	Genesee-Finger Lakes RPC, Central NY Regional Planning and Development Board, Tug Hill Commission, Southern Tier West Regional Planning, etc.	Provide comprehensive planning for the coordinated growth and development of their regions, including water resources. Provide subject matter expertise, training, technical assistance, grant writing, public outreach, and other support to improve stewardship of land and water resources.
<b>Environmental Non-Governmental Organizations (ENGOS)</b>	Registered nonprofit organizations, consultants, local interest groups and volunteer-based watershed committees, and land trusts. Examples include The Nature Conservancy, Audubon, Buffalo Niagara Waterkeeper, Save the River, Genesee RiverWatch, lake associations, Thousand Islands Land Trust, Western NY Land Conservancy, etc.	Work to address interests related to a specific environmental resource or region
<b>Universities and Research Institutes (Universities)</b>	SUNY and private universities, GLRC members, NY Sea Grant, NYS Invasive Species Research Institute (NYSISRI) and extension support services such as Cornell Cooperative Extension	Provide academic research, science, technical and extension support, and education
<b>State Agencies (listed individually)</b>	NYSDEC, NYSDOS, NYSOPRHP, NYSDOH, NYSDOT, etc.	Provide resources, guidance, and program support consistent with their agency missions
<b>Federal Agencies (listed individually)</b>	U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA), U.S. Army Corps of Engineers (USACE), U.S. Forest Service (USFS), U.S. Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) and the U.S. Geological Service (USGS), etc.	Provide resources, guidance, and program support consistent with their agency missions
<b>Indian Nations</b>	Recognized Nations including Seneca Nation of Indians, Tonawanda Seneca Nation, Tuscarora Nation, Cayuga Nation, Onondaga Nation, Oneida Nation, Saint Regis Mohawk Tribe	Decision-making authority and administration responsibility for Nation lands and holders of <a href="#">TEK-based practices</a> .
<b><a href="#">Great Lakes Basin Advisory Council (GLBAC)</a></b>	A statutory body to assist and advise New York State to protect the environmental, social, and economic health of the Great Lakes region	Provides policy and communications support
<b><a href="#">Great Lakes Commission</a></b>	A U.S. interstate agency that works to collaboratively address issues of common concern and develop shared solutions to protect and enhance the Great Lakes region's economic prosperity and environmental health	Represents, advises, and assists its member states and provinces by fostering dialogue, developing consensus, facilitating collaboration, and communicating collective interests

**This table only represents some of the major players in New York's Great Lakes region. Many other public and private entities, including international organizations, landowners, and volunteers have been and will continue to be key partners in advancing the GLAA.**



# VII. Great Lakes Action Agenda

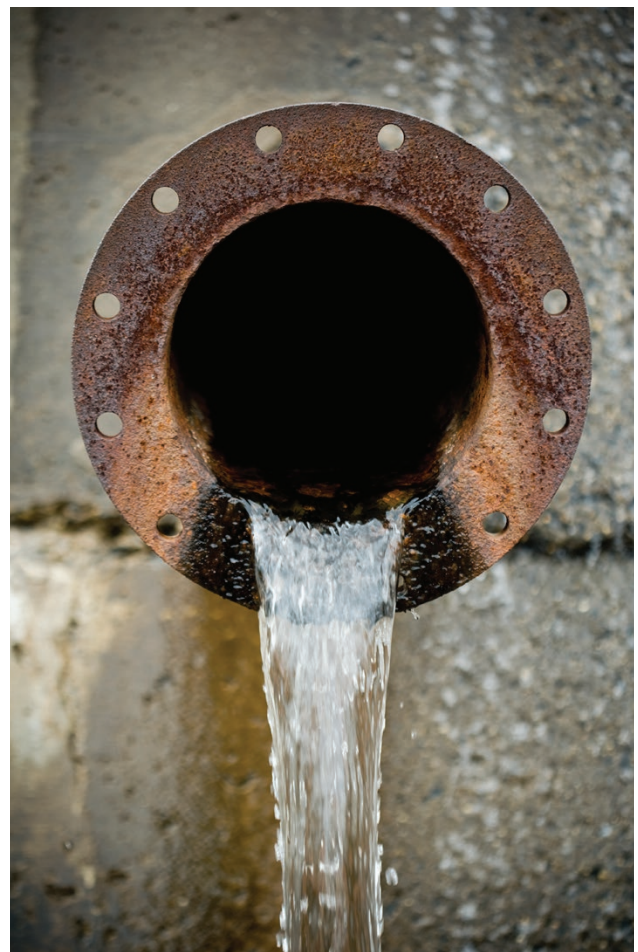
## Goals, Strategies, and Actions

### Goal 1: Reduce or Eliminate Releases of Persistent Toxic Substances to protect ecological and human health.

Throughout much of the twentieth century, industrial development supported the economy and prosperity of the Great Lakes region. One unfortunate legacy of this industrial activity is the well-documented contamination in places such as Buffalo, Niagara Falls, Rochester, Syracuse, and Massena. Persistent, bio-accumulative toxic substances that were released into the environment include mercury, polychlorinated biphenyls (PCBs), Mirex, pesticides, dioxins/furans, and others. The occurrence of these substances in the environment has necessitated restrictions on human consumption of fish and disposal of dredged sediments and poses [continued risks](#) to the public and ecosystem health. While the presence of legacy pollutants in waters and sediments of the Great Lakes basin has generally been declining, a variety of new “contaminants of emerging concern” (CECs) or compounds present in the environment that are not widely or consistently regulated, could have significant impacts on human, fish, and wildlife health. Pollutants may enter the Great Lakes from air deposition, surface water, groundwater, sediment, direct discharges, and other sources. CECs now being detected in Great Lakes fish, waters, and sediments include brominated flame retardants (PBDEs), perfluorinated chemicals (PFOA (perfluorooctanoic acid), PFOS (perfluorooctanesulfonic acid), and other substances), pharmaceuticals, microplastics, and other compounds. Although the presence of these chemicals is well documented, a greater understanding of how they may adversely affect aquatic organisms, other wildlife, plants, and humans is needed. A combination of research studies, risk assessments, source-tracking activities, and the promotion of public awareness is essential to better understand and ultimately address these complex water quality issues. NYSDEC is leading on many of these actions, as detailed on the [chemicals and pollution control website](#).

#### Supporting State and Federal Plans and Programs

- [2012 Great Lakes Water Quality Agreement](#)
  - [Areas of Concern \(Annex 1\)](#)
  - [Chemicals of Mutual Concern \(Annex 3\)](#)
- [NYSDEC's Brownfield Cleanup Program](#)
- [NYSDEC's Brownfield Opportunity Area Program](#)
- [NYSDEC's Drinking Water Infrastructure Needs of NYS](#)
- [NYSDEC/EFC Wastewater Infrastructure Needs of NYS](#)
- [GLRI Action Plan III](#) – Focus Area 1: Toxic Substances and Areas of Concern
- [U.S. EPA's Great Lakes Legacy Act Program](#) supports contaminated sediment remediation within NY's Areas of Concern (See Appendix I)
- [U.S. EPA's Superfund Program](#)
- [U.S. EPA's Safe Drinking Water Act](#)
- [U.S. EPA's Clean Watersheds Needs Survey](#)



## Implementation Strategies

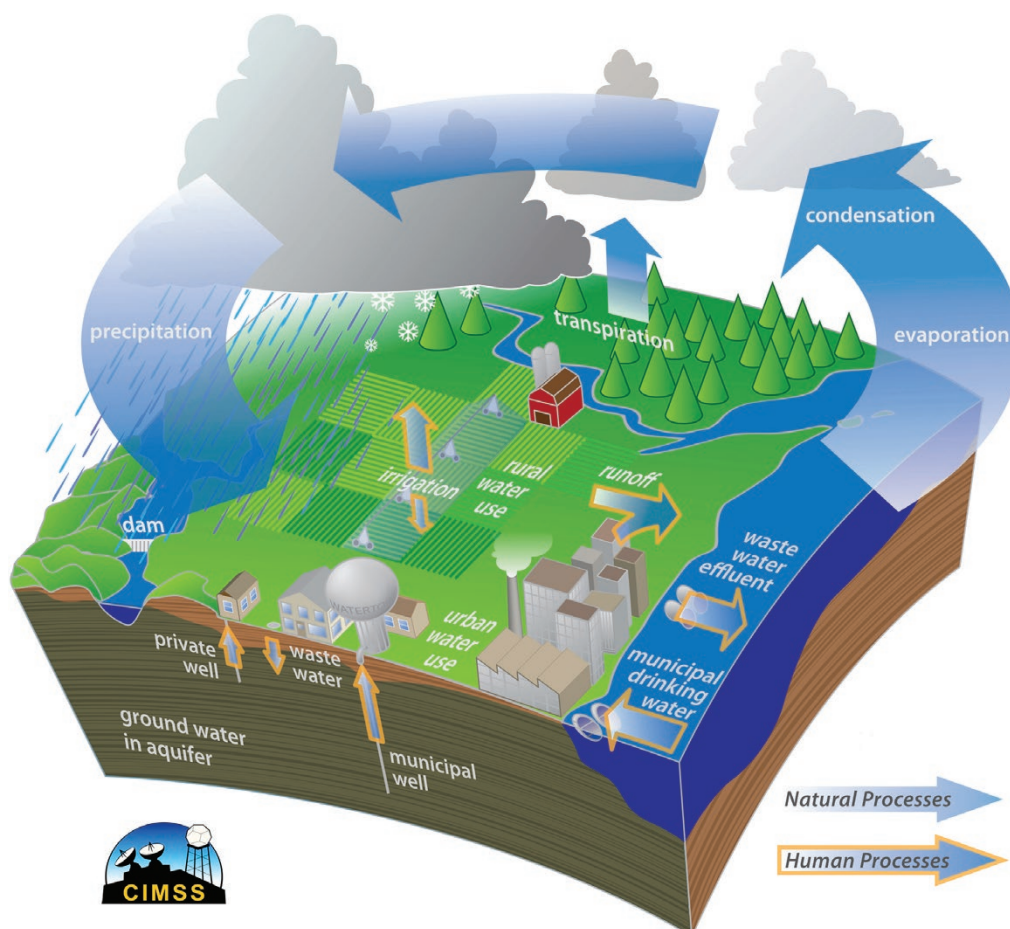
- 1.1** Increase understanding of the risks of CECs and other toxics on New York's Great Lakes people, fish, wildlife, and plants.
- 1.2** Control, reduce, and eliminate sources of legacy and emerging toxic contaminants to waterways and aquatic ecosystems.
- 1.3** Reduce toxic chemical use and discharge by industry and consumers through education and outreach, technical assistance, and funding support.

## Implementation Strategies, Actions, and Benefits

Strategy 1.1 Increase understanding of the risks of CECs and other toxics on New York's Great Lakes people, fish, wildlife, and plants.			
<b>Benefits &amp; Metrics</b>		<ul style="list-style-type: none"> <li>The risks, presence, and exposure pathways of CECs and other priority chemicals in fish, wildlife, plants, and human populations consuming these resources are better understood (<i># of studies conducted</i>)</li> <li>Vulnerable communities are aware of risks and benefits of consuming Great Lakes fish, wildlife, and plants (<i># of information campaigns or materials targeted at vulnerable populations</i>)</li> </ul>	
#	Type	Action	Partners
1.1.1	Assess	Assess the concentrations and significance of emerging contaminants and other priority chemicals in New York's Great Lakes fish, wildlife, plants, and vulnerable human populations consuming these resources.	EPA, NYSDEC, NYSDOH, Universities, USFWS, USGS
1.1.2	Educ/Outreach	Share information on the risks and benefits of consuming Great Lakes fish, wildlife, and harvested plant resources with the people who consume them.	ENGOS, EPA, NYSDEC, NYSDOH, Universities
Strategy 1.2 Control, reduce, and eliminate sources of legacy and emerging toxic contaminants to waterways and aquatic ecosystems.			
<b>Benefits &amp; Metrics</b>		<ul style="list-style-type: none"> <li>Sources of CECs and other toxic contaminants are better understood and mitigation measures are developed (<i># of studies conducted</i>)</li> <li>Contaminated sites are remediated, redeveloped, or restored (<i># of projects, cubic yards of sediment removed</i>)</li> <li>Adoption of water treatment processes and technologies, as necessary to reduce discharges of CECs and other contaminants to achieve compliance with water quality standards and guidance values (<i># of projects funded</i>)</li> </ul>	
#	Type	Action	Partners
1.2.1	Assess	Identify areas of contaminated soils/sediments, track down air deposition and other sources of contamination, monitor leachate from landfills and remediation projects, and assess risks and impacts to groundwater and surface water supplies.	EPA, NYSDEC, Others
1.2.2	Assess	Characterize WWTP effluent to assess levels of legacy (PCBs) and emerging contaminants (PBDEs, pharmaceuticals, microplastics) that are discharged.	EPA, Local govt, NYSDEC, NYSDOH, Universities
1.2.3	Implement	Develop and promote cost-effective wastewater and drinking water treatment systems, asset management practices, and technologies to meet standards and guidance values for CECs and other toxics in water.	NYSDEC, NYSDOH, Universities
1.2.4	Implement	Implement remedial actions where needed and feasible to reduce impacts of contaminated soils and sediments. Priorities include sites within environmental justice areas, New York's AOCs, and sites that are vulnerable to climate change impacts.	EPA, Local govt, NYSDEC, Others, USACE
1.2.5	Implement	Implement green infrastructure projects to reduce the impact of polycyclic aromatic hydrocarbons (PAHs), heavy metals, and other contaminants often found in urban stormwater runoff.	Local govt, Others

1.2.6	Implement	Pilot phytoremediation (using plants to remove pollutants from soil and water) projects to rehabilitate soil and groundwater contaminated by toxic metals and organic compounds.	ENGOS, Local govt, Universities, Others
1.2.7	Evaluate	Evaluate long-term social, ecological, and economic outcomes of remediation projects to increase public-private partnerships and investment in remediation and redevelopment or restoration.	Universities
<b>Strategy 1.3</b>	<b>Reduce toxic chemical use and discharge by industry and consumers through education and outreach, technical assistance, and funding support.</b>		
<b>Benefits &amp; Metrics</b>	<ul style="list-style-type: none"> <li>Reduced toxic chemical use and discharge by industry, commercial, and other businesses (<i># of companies participating in pollution prevention programs</i>)</li> <li>Increased participation in household hazardous waste, pharmaceuticals, and other waste disposal programs by consumers (<i>lbs. of waste collected, # of participants, # of collection events or ongoing programs</i>)</li> </ul>		
#	Type	Action	Partners
1.3.1	Implement	Provide assistance to businesses to reduce toxic chemical use in manufacturing and industrial processes.	NYSP2I
1.3.2	Educ/Outreach	Engage municipalities in product stewardship education and collection programs for homeowners to ensure safe disposal of e-waste and household hazardous waste and promote safe/non-toxic alternatives as applicable.	ENGOS, Local govt, NYSDEC, NYSP2I, Universities
1.3.3	Educ/Outreach	Develop and promote BMPs to prevent the discharge of pharmaceuticals and pesticides from livestock farms, industries, and private residences.	NYSDEC, NYSDOH, NYSP2I, Universities
1.3.4	Educ/Outreach	Provide outreach and education to schools, industry, and communities on green chemistry and engineering, other pollution-prevention practices, and the impact of pollution on our health and ecosystems.	NYSDEC, NYSP2I, Universities

## Great Lakes Water Cycle Diagram





## Goal 2: Control Sediment, Nutrient, and Pathogen Loadings so that drinking water quality, aquatic life, recreational uses, and people are protected.

Poor water quality in nearshore areas, including embayments (bays, river mouths, and wetlands), tributary areas (including headwaters), and inland waterbodies, impacts both aquatic and terrestrial ecosystems, limits recreational use, and ultimately affects quality of life and economic development. Although some indicators of water quality in the open waters of the lakes have improved in recent decades, water quality impairments remain an ongoing concern in some nearshore areas and certain tributaries within New York's Great Lakes basin.

Lake Ontario, Lake Erie, and smaller waterbodies in the basin like the Finger Lakes are impacted by nutrient and sediment loading, algal blooms, and pathogens. A certain level of nutrients is necessary to support the aquatic ecosystem, but an overabundance of phosphorus (the limiting factor for algae growth) has led to seasonal widespread blooms of nuisance algae and localized blooms of harmful algae in some New York waters. Similarly, although sediment transport is a normal process that shapes waterways and associated habitats, excessive sediment loads from tributaries can impact nearshore habitats, including fish spawning and foraging areas.

Nutrient dynamics within the lakes continue to be a complex issue. In Lake Ontario's offshore area, phosphorus levels have consistently remained at or below target levels established in the GLWQA, negatively impacting aquatic food webs and fish productivity. However, phosphorus levels are markedly higher in the nearshore area, leading to algal blooms. Lake Erie's phosphorus inputs and impacts vary widely across the lake, which is divided into three basins—the western, central, and eastern. While major tributary loadings from agricultural areas in Ohio have contributed to HABs in the shallow, warmer western basin, Lake Erie's deeper eastern basin (New York portion) only experiences occurrences of nuisance algae, or *Cladophora*, and generally maintains phosphorus at targeted levels.

Monitoring and research undertaken by U.S. and Canadian federal, state, and provincial agencies and academic partners has begun to uncover the complexity of nearshore nutrient cycling and the interactions between tributary inflows, stormwater

and wastewater management processes, lake currents, invasive quagga and zebra mussels, and the effects of climate change. Sediments, nutrients, and pathogens are some of the most common point and nonpoint pollutants that originate from a variety of sources including land runoff, precipitation, atmospheric deposition, sewage treatment plant outfalls, combined sewer overflows, waste sites, on-site septic systems, and groundwater discharge from urban and agricultural areas.

### Supporting State and Federal Plans and Programs

- [\*GLRI Action Plan III - Focus Area 3: Nonpoint Source Pollution\*](#)
- [\*NYSDEC Nonpoint Source Management Program \(2020–2025\)\*](#)
- [\*Lake Erie Binational Phosphorus Reduction Strategy \(2019\)\*](#)
- [\*U.S. Action Plan for Lake Erie \(2018–2023\)\*](#)
- [\*2012 Great Lakes Water Quality Agreement\*](#)
  - [\*Lakewide Management \(Annex 2\)\*](#)
  - [\*Nutrients \(Annex 4\)\*](#)
  - [\*Discharges from Vessels \(Annex 5\)\*](#)
  - [\*Groundwater \(Annex 8\)\*](#)

**The Finger Lakes Watershed Program was established in 2017 within NYSDEC's Division of Water. The Program's main focus and role is to better understand, protect and address water quality issues confronting the Finger Lakes. The Program works throughout the Finger Lakes region, collaboratively, with NYSDEC's central office, Great Lakes Program, regional offices, and numerous other Finger Lakes stakeholders.**

## Green Infrastructure Approaches

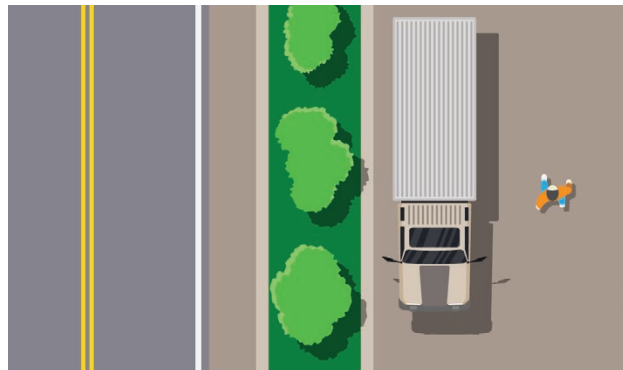
Green infrastructure describes a variety of site design techniques and structural practices for managing stormwater, used by communities, businesses, homeowners, and others, that can provide a multitude of benefits. On a larger scale, green infrastructure includes preserving and restoring natural landscape features (such as [riparian buffers](#), forests, floodplains, and wetlands), and reducing the amount of land covered by impervious surfaces. On a smaller scale, green infrastructure practices include green roofs, pervious pavement, rain gardens, vegetated swales, planters, and stream buffers.

### Key Benefits of Green Infrastructure

- Improves water quality by reducing runoff and filtering pollutants;
- Reduces flood risk by slowing and reducing stormwater discharges;
- Recharges groundwater through the infiltration of water into the soil;
- Vegetation can reduce urban heat island effects and improve air quality; and
- Can help to preserve a site's character, native habitats, and aesthetic appeal.

Learn more here: [epa.gov/green-infrastructure/benefits-green-infrastructure](https://epa.gov/green-infrastructure/benefits-green-infrastructure)

## Street Features



Green infrastructure approaches can be incorporated into street design with permeable pavements, bioswales, tree pits, green streets, green alleys, and green parking.

## Building Features



Buildings can be “greened” with green roofs, downspout disconnections, and rain barrels.

## Landscape Features



Landscapes can be used to manage stormwater with rain gardens, urban tree canopy, land conservation, stream buffers, and stormwater parks.

## Implementation Strategies

- 2.1** Identify sources of impairments and implement plans and projects to improve tributary and nearshore water quality.
- 2.2** Support municipal efforts to protect water quality through land use protection and policy and water infrastructure improvements.
- 2.3** Reduce sediment and nutrient runoff from agricultural sources through BMPs, comprehensive farm planning, and soil health programs.
- 2.4** Expand the protection, restoration, and maintenance of riparian buffers to benefit water quality, climate resiliency, and habitat.

## Implementation Strategies, Actions, and Benefits

Strategy 2.1 Identify sources of impairments and implement plans and projects to improve tributary and nearshore water quality.			
Benefits & Metrics			
<ul style="list-style-type: none"> <li>Polluted stormwater runoff to Great Lakes waters is reduced (<i>gallons of untreated stormwater captured or treated</i>)</li> <li>The causes, impacts, and solutions to address HABs and nuisance algae are better understood (<i># of research projects conducted</i>)</li> <li>Reduced closings of Great Lakes beaches (<i>trends in closure rates</i>)</li> <li>Watershed management plans are developed across New York's Great Lakes and nutrient/sediment/pathogen control projects are implemented (<i># of projects and funding amounts of projects</i>)</li> </ul>			
#	Type	Action	Partners
2.1.1	Assess	Expand surface water quality monitoring of unassessed stream segments of concern, to identify causes of impairments to waterways and protect water resources.	ENGOS, Local govt, NYSDEC, SWCDs
2.1.2	Assess	Conduct source track-down studies to identify major sources of bacteria that have resulted in closures of <a href="#">public beaches</a> . Develop mitigation strategies.	ENGOS, Local govt, NYSDEC, NYSDOH, SWCDs
2.1.3	Assess	Expand research on harmful and nuisance algal blooms and related climate change impacts to better understand, forecast, prevent, and rapidly respond to blooms of toxin-producing algae and nuisance conditions, in support of <a href="#">New York's HABs Research Guide</a> .	ENGOS, NYSDEC, Universities
2.1.4	Plan/Implement	Develop, implement, and evaluate watershed-based <a href="#">clean water plans</a> (Nine Element Watershed Plans and TMDLs) that incorporate resiliency, and EBM principals.	ENGOS, Local govt, NYSDEC, NYSDOS, Others
2.1.5	Implement	Remediate point and nonpoint pollution sources impacting nearshore health and swimming beaches, using green infrastructure to the extent possible.	Local govt, NYSDEC, NYSEFC, SWCDs
2.1.6	Implement	Implement roadway and ditch BMPs (i.e., hydroseeding, planting native vegetation) and support municipal training.	Local govt, NYSDOT, Others, SWCDs, Universities
2.1.7	Evaluate	Evaluate effectiveness of green infrastructure for water quality, considering climate change implications.	NYSDEC, NYSDOT, SWCDs, Universities
2.1.8	Educ/Outreach	Promote awareness and compliance with "No Discharge Zone" policy in harbors, marinas, and ports to prevent discharge of harmful bio-waste and bio-treatment chemicals. Actions being promoted may include installing pump out stations, signage, and other recommended BMPs.	ENGOS, Universities
2.1.9	Educ/Outreach	Promote septic system maintenance practices, replacement incentives, and upgrades where needed to reduce pathogen and nutrient loadings in high-priority areas. Promote innovative/alternative septic systems.	Local govt, NYSDEC, NYSDOH, NYSEFC, Universities



<b>Support municipal efforts to protect water quality through land use protection and policy and water infrastructure improvements.</b>			
	<ul style="list-style-type: none"> <li>• Reductions in polluted stormwater runoff to Great Lakes waters lead to improved water quality (<i>gallons of untreated stormwater captured or treated</i>)</li> <li>• Source water areas and other important lands are protected to prevent drinking water contamination (<i>acres of land protected</i>)</li> <li>• <a href="#">Drinking Water Source Protection Program</a> (DWSP2) plans are developed and implemented to protect sources of public drinking water (<i># of plans, # of implementation projects</i>).</li> <li>• Water infrastructure improvements reduce pathogens and other pollutants entering Great Lakes waters (<i># and funding amounts of projects, trends in CSOs and SSOs as reported by <a href="#">Sewage Pollution Right to Know</a></i>)</li> </ul>		
	<b>Type</b>	<b>Action</b>	<b>Partners</b>
	Plan	Assess and protect sources of public drinking water by developing drinking water source protection program plans using <a href="#">A Framework for Creating a Drinking Water Source Protection Program Plan</a> and associated resources for high-priority communities. Connect communities with technical service providers.	Local govt, NYSDEC, NYSDOH, RPCs
	Plan	Assist local governments in adopting local laws that promote on-site stormwater management and green infrastructure standards, limit development adjacent to streams, and restore riparian buffers.	ENGOS, Local govt, NYSDOS, RPCs
	Plan/ Implement	Encourage publicly owned treatment works (POTW), and publicly owned sewer systems (POSS) to implement long-range capital improvements, asset management plans, and innovative wastewater treatment practices to reduce nutrient and pathogen releases.	Local govt, NYSDEC
	Implement	Implement water infrastructure improvements and stormwater management strategies, including green infrastructure to the extent feasible, to abate combined and sanitary sewer overflows (CSOs and SSOs), in support of approved long-term control plans and municipal separate stormwater sewer system permits.	Local govt, NYSDEC
	Implement	Conserve, protect, and restore lands essential to maintaining water quality, flood mitigation, and important habitats. Priority should be given to unprotected source water areas, wetlands, forests, floodplains, and shorelines.	ENGOS, Local govt, NYSDEC, RPCs
	Implement	Support intermunicipal partnerships to implement watershed plans, TMDLs, and other water quality improvement initiatives.	ENGOS, Local govt, RPCs
	Implement	Implement protection and management methods identified in the community's DWSP2 Plan.	Local govt
<b>Reduce sediment and nutrient runoff from agricultural sources through BMPs, comprehensive farm planning, and soil health programs.</b>			
	<ul style="list-style-type: none"> <li>• Reduce excessive sediments and nutrients in waterways through improved agricultural management (<i># of lbs. of phosphorus and sediment reductions, # of AEM plans, # of agricultural nonpoint source grants</i>)</li> <li>• Increased adoption of soil health practices increases infiltration and water retention capacity, reduces runoff, and enhances climate resiliency (<i>participation in soil health networks</i>)</li> </ul>		
	<b>Type</b>	<b>Action</b>	<b>Partners</b>
	Implement	Expand farmer adoption of riparian buffers/agricultural BMPs and enrollment in agricultural management programs ( <a href="#">AEM</a> , <a href="#">CREP</a> , <a href="#">CSP</a> , etc.), with an emphasis on non-permitted farms in target areas.	ENGOS, Others, SWCDs, Universities, USDA
2.3.2	Evaluate	Evaluate and share multiple benefits of soil health BMPs to increase implementation.	ENGOS
2.3.3	Educ/Outreach	Encourage agricultural soil health networks that utilize farmer-to-farmer messaging to promote practices such as cover cropping, nutrient management, riparian buffers, conservation tillage, and conservation cropping systems.	ENGOS, NYSDAM, NRCS, SWCDs

Strategy 2.4	Expand the protection, restoration, and maintenance of riparian buffers to benefit water quality, climate resiliency, and habitat.		
Benefits & Metrics	<ul style="list-style-type: none"> <li>Riparian buffers are restored, protected, and expanded, improving water quality, climate resiliency, and habitat (<i>acres of riparian buffer restored or protected, # of trees planted</i>)</li> <li>More communities, homeowners, and land managers are aware of the benefits of riparian buffers and how to install them (<i># of outreach/training programs, # of informational materials distributed</i>)</li> </ul>		
#	Type	Action	Partners
2.4.1	Research	Identify economic incentives and policy recommendations to promote the broad-based protection and restoration of riparian buffers.	Universities
2.4.2	Implement	Expand implementation and evaluation of Trees for Tribes and other riparian buffer assistance programs in the Great Lakes basin. Use the <a href="#">Statewide Riparian Opportunity Assessment</a> to prioritize sites.	Local govt, NYSDEC, SWCDs
2.4.3	Implement	Employ a landscape stewardship approach on capital projects involving bridges and roads in riparian areas, including landscape protection, restoration with native species, and improvement of wildlife passage.	ENGOS, Local govt, Municipalities, NYSDOT, RPCs
2.4.4	Educ/Outreach	Develop and promote guidance, training programs, and behavioral change strategies to encourage public and private landowners and land managers to plant and maintain riparian buffers.	ENGOS, NYSDEC, SWCDs, Universities
2.4.5	Educ/Outreach	Expand participation of riparian landowners, land managers, and K–12 students in citizen science water quality monitoring through programs such as <a href="#">Water Assessments by Volunteer Evaluators</a> (WAVE), <a href="#">Citizens Statewide Lake Assessment Program</a> (CSLAP), and the <a href="#">Great Lakes Ecosystem Education Exchange</a> (GLEEE).	ENGOS, NYSDEC, Universities
2.4.6	Educ/Outreach	Engage K–12 students in tree planting, stewardship activities, and classroom learning that help them develop an understanding of water quality and basin stewardship in New York’s Great Lakes. Promote use of GLEEE curriculum in student engagement.	Education partners, ENGOS, Universities

### Goal 3: Prevent and Control Invasive Species Impacting Waterways and Riparian Areas to sustain a healthy Great Lakes ecosystem and economic and recreational opportunities.

Throughout the Great Lakes, [invasive species](#) are considered among the most significant causes of impairment to water quality and healthy fish and wildlife populations and habitats. Impacts to native ecosystem community structure and ecosystem function can lead to dramatically altered environmental conditions with serious socioeconomic impacts, and in some instances, may have implications for human health and safety.

The ecosystems of the Great Lakes have been altered by past invasive species introductions and remain vulnerable to future introductions through numerous pathways, such as maritime commerce, aquaculture, trans-basin canals and waterways, recreational activity, and even flooding. Recent studies through the [National Climate Assessment](#) have indicated that further introductions of invasive species are anticipated under a changing climate.

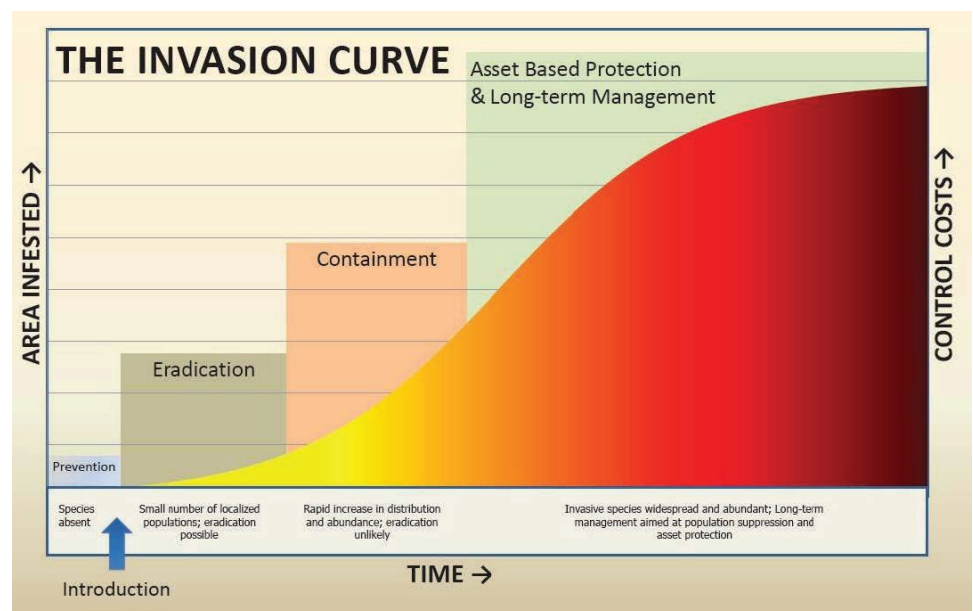
[Partnerships for Regional Invasive Species Management \(PRISMS\)](#) are leading regionally based stakeholder groups consisting of environmental organizations, academia, local governments, and others, working together to coordinate partner efforts, recruit, and train citizen volunteers, conduct education and outreach, establish early detection monitoring networks, implement direct eradication and control efforts, identify regional management priorities, and ensure the long-term effectiveness of control and prevention efforts. The majority of New York's Great Lakes basin is covered by four PRISMs: Adirondack Park Invasive Plant Program, Finger Lakes PRISM, Western NY PRISM, and St. Lawrence-

Eastern Lake Ontario PRISM. These partnerships depend on continued engagement and action from all sectors. [Become involved in your local PRISM](#) or visit the [New York Invasive Species Information Clearinghouse](#) to learn more and help combat invasive species in your community.

#### Supporting State and Federal Plans

- [GLRI Action Plan III – Focus Area 2: Invasive Species](#)
- [NYS Invasive Species Comprehensive Management Plan \(2018\)](#)
- [U.S. Dept. of the Interior Invasive Species Strategic Plan \(2021–2025\)](#)

Since the 1830s, over 180 aquatic invasive species have invaded the Great Lakes through the St. Lawrence Seaway and other pathways. These invasive species include sea lamprey, zebra and quagga mussels, round goby, hydrilla, spotted lanternfly, emerald ash borer, phragmites, and water chestnut. Control and prevention is needed to protect Great Lakes ecosystems, and economies valued at more than \$7 billion annually.



The invasion curve from the USACE portrays how infestations expand over time after introduction, and corresponding management actions needed.



## Implementation Strategies

- 3.1** Promote ecosystem-based, science-informed approaches to improve our understanding and management of invasive species.
- 3.2** Implement early detection/rapid response, spread prevention, and control projects in high-priority aquatic and riparian areas.
- 3.3** Establish comprehensive invasive species outreach and training programs to increase local engagement in invasive species prevention and control.

## Implementation Strategies, Actions, and Benefits

Strategy 3.1	Promote ecosystem-based, science-informed approaches to improve our understanding and management of invasive species.		
Benefits & Metrics	The impacts and risks of invasive species are better understood and considered in management ( <i># of research studies conducted</i> )		
#	Type	Action	Partners
3.1.1	Research	Support regional invasive species collaboratives conducting invasive species research to inform and innovate management approaches. Examples include the <a href="#">Great Lakes Phragmites Collaborative</a> , <a href="#">Great Lakes Hydrilla Collaborative</a> , <a href="#">Great Lakes Starry Stonewort Collaborative</a> , <a href="#">Asian Carp Regional Coordinating Committee</a> , and the <a href="#">Northeast Regional Invasive Species and Climate Change Network</a> .	NYSDEC, NYSDOT, Others, PRISMs
3.1.2	Research	Undertake studies to assess the ecological, economic, and/or human health impacts of invasive species and their management to inform decision-making.	Universities
3.1.3	Research	Assess the potential impact of climate change on the introduction, survival, establishment, and spread of priority “sleeper” species (such as kudzu, water hyacinth, and siren woodwasp) and determine proactive management actions to reduce impacts.	Universities
3.1.4	Research	Support continued biocontrol research for aquatic and riparian invasive species such as <i>Phragmites australis</i> (common reed) and black and pale swallow-worts.	ENGOS, NYSDEC, NYSDOT, Universities, USFWS
Strategy 3.2	Implement early detection/rapid response, spread prevention, and control projects in high-priority aquatic and riparian areas.		
Benefits & Metrics	<ul style="list-style-type: none"> <li>Reduce the spread of invasive species through targeted early detection/rapid response, prevention, and control projects (<i># of projects, # of acres controlled/restored</i>)</li> <li>Innovative control technologies are developed and deployed to control invasive species (<i># of projects incorporating new technologies</i>)</li> </ul>		
#	Type	Action	Partners
3.2.1	Research	Conduct research to improve early detection and rapid response of invasive species, and long-term success of control projects (e.g., identification of likely pathways of invasion, horizon scanning, predictive modeling, environmental DNA, seed-source tracking, and restoration of native habitats).	Universities, USGS
3.2.2	Research	Research, demonstrate, and evaluate innovative control technologies and methods, such as ballast water treatment, smart technology, and structural barriers.	NYSDEC, Universities, USACE
3.2.3	Research	Develop and evaluate methods to control the spread of aquatic invasive species through the canal system.	Local govt, Universities, USACE

3.2.4	Implement	Deploy steward networks, signage, boot brush stations, and other interception methods at high use areas (e.g., trailheads, fishing/boating access areas and campsites) to prevent and control the spread of aquatic and riparian invasive species.	ENGOS, Local govt, NYSDEC, NYSOPRHP
3.2.5	Implement	Expand boat launch stewardship program coverage throughout New York's Great Lakes basin to detect and prevent the spread of aquatic invasive species.	ENGOS, Local govt, NYSDEC, NYSOPRHP
3.2.6	Implement	Control or eradicate priority invasive species using integrated pest management (such as the <a href="#">Guidelines for Implementing Best Practices to Control Invasive Species on DEC Lands in the Adirondack Park</a> ) and habitat restoration approaches, in priority areas where eradication is feasible and where multiple benefits can be achieved.	ENGOS, NYSDEC, Others, USACE
3.2.7	Implement	Develop near real-time notification and response system for priority invasive species as identified by PRISMs, to improve rapid response actions that prevent new infestations from becoming established.	PRISMs, Universities
3.2.8	Implement	Implement mass rearing and field release of permitted biocontrol agents for aquatic and riparian invasive species such as Eurasian watermilfoil, <i>Phragmites australis</i> (common reed), and black and pale swallow-worts.	NYSDEC, Others, Universities
<b>Strategy 3.3</b>	<b>Establish comprehensive invasive species outreach and training programs to increase local engagement in invasive species prevention and control.</b>		
<b>Benefits &amp; Metrics</b>	<ul style="list-style-type: none"> <li>• Municipalities have knowledge and tools to help prevent and control invasive species in their communities (# of trainings provided)</li> <li>• Landowners have information and resources necessary to manage their land for habitat benefits, including invasive species management (# of outreach materials developed/distributed)</li> <li>• Public and K–12 youth engagement in invasive species citizen science and tracking is increased (# of iMapInvasives observations reported)</li> </ul>		
#	Type	Action	Partners
3.3.1	Educ/Outreach	Develop and share outreach and education materials that promote aquatic and riparian invasive species control and native habitat restoration actions to landowners.	ENGOS, NYSDEC
3.3.2	Educ/Outreach	Provide training and technical assistance to municipal staff (planners, highway departments, public works), to support early detection and management of invasive species in their communities.	ENGOS, NYSDEC, PRISMs
3.3.3	Educ/Outreach	Expand efforts to report and share information through <a href="#">iMapInvasives</a> and other coordinated volunteer monitoring activities.	ENGOS, NYSDEC, NYSOPRHP, NYSDOT, PRISMs
3.3.4	Educ/Outreach	Engage K–12 students in experiential activities and lessons that promote awareness of invasive species, and how students can help prevent their spread.	ENGOS Education partners, NYSDEC, Universities



## Goal 4: Conserve and Restore Native Fish and Wildlife and Their Habitats to sustain diverse, resilient ecosystems and related uses.

Our diverse Great Lakes ecosystems support a range of ecosystem services or benefits for human communities that include hunting, fishing, wildlife observation, water filtration, flood control, nutrient cycling, and cultural uses (such as sustainable plant harvesting). Wetlands and riparian buffers serve an important role in filtering contaminants from runoff, maintaining water quality, and slowing stormwater flows. Freshwater wetlands provide important food sources for many organisms, offer refuge for migratory waterfowl, and serve as breeding, spawning, and nursery grounds for native fish and wildlife species. Tributaries and nearshore habitats in the lakes are critical to the reproduction of many Great Lakes fish during their most vulnerable life stages. Headwaters provide important coldwater fish habitats, and serve as source waters for drinking water in many communities. Blocks of connected, diverse forests provide breeding and nesting habitats for important bird species, while offering forest-based recreation opportunities.

Significant amounts of nearshore and wetland habitats have been lost or fundamentally altered in the Great Lakes due to development, incompatible land use, altered hydrology, increased runoff of nutrients and sediment, invasion by non-native species, and artificial flow management. In addition, changing storm frequencies and intensities, and altered temperature patterns resulting from projected climatic changes will place additional stress on sensitive nearshore and coastal areas. Coastal erosion, sediment transport regimes, and stream flow characteristics may be significantly altered as a result of these changes. Furthermore, warmer water temperatures may lead to a northward shift in the distribution of both coldwater and warmwater fisheries, while making conditions more favorable for the spread of invasive species.

Healthy Great Lakes ecosystems are diverse, connected assemblages of species and their habitats. If we are to sustain these important fish and wildlife resources into the future, and the many benefits they provide to people, we must similarly emphasize the attributes of connectivity and diversity

in our efforts as we seek to achieve broad-based public support and engagement in pursuing the ambitious strategies outlined in this goal.

### Supporting State and Federal Plans

- [\*GLRI Action Plan III - Focus Area 4, Habitats and Species\*](#)
- [\*Returning to a Healthy Lake – An International Biodiversity Conservation Strategy for Lake Erie \(2013\)\*](#)
- [\*New York State Wildlife Action Plan \(2015\)\*](#)
- [\*Implementing a Lake Ontario Lakewide Management Plan Biodiversity Conservation Strategy \(2011\)\*](#)
- [\*Great Lakes Fishery Commission: Lake Erie Committee Plans, Lake Ontario Committee Plans\*](#)
- [\*NYSDEC Fisheries Management Plans and Reports\*](#)
- [\*Niagara River Habitat Conservation Strategy \(2014\)\*](#)
- [\*NYSDEC/NYS DAM NYS Pollinator Protection Plan \(2020\)\*](#)

In 2019, the U.S. side of the Niagara River Corridor was designated as a Wetland of International Importance under the Ramsar Convention, a global treaty supporting the conservation and sustainable use of wetlands and related waters. Find more information at: <https://rsis Ramsar.org/ris/2402>





## Implementation Strategies

- 4.1** Conduct applied research to support science-based management of native aquatic and terrestrial Great Lakes fish and wildlife species.
- 4.2** Conserve, protect, restore, and maintain coastal, stream, and other priority habitats to support key Great Lakes species and healthy ecosystems.
- 4.3** Improve aquatic connectivity of streams to support fish and aquatic species passage and natural stream flows.
- 4.4** Engage communities, students, and the public in habitat conservation through citizen/community science, education programs, and land stewardship trainings.

## Implementation Strategies, Actions, and Benefits

Conduct applied research to support science-based management of native aquatic and terrestrial Great Lakes fish and wildlife species.			
Key science and information needs are addressed to inform management and protection of native Great Lakes species ( <i># of published research studies or assessments that are specific to Great Lakes species</i> )			
	Type	Action	Partners
	Research	Study and monitor spatial and temporal (seasonal and annual) changes in zooplankton community composition and distribution to better understand impacts on prey fish abundance and growth.	NYSDEC, Universities, USGS
4.1.2	Research	Identify factors limiting native fishes of conservation interest such as lake trout and coregonines. Characterize environmental conditions, life cycle state, and other factors to determine where and when population losses are occurring.	ENGOS, NYSDEC, Universities, USGS
4.1.3	Research	Develop solutions to reduce hydroelectric turbine mortality of out-migrating American eel at the Moses/Saunders Dam on the St. Lawrence River.	Universities
4.1.4	Research/ Evaluate	Research diseases (e.g., <a href="#">VHS</a> ), toxins and contaminants (e.g., endocrine disruptors) impacting fish and bird health. Evaluate management/mitigation strategies.	NYSDEC, Universities, USFWS
4.1.5	Assess	Assess mitigation alternatives of potential adverse impacts to fish and wildlife associated with alternative energy development (e.g., wind, hydropower, transmission).	ENGOS, NYSDEC, NYSDOS, NYSEDA, Universities
4.1.6	Assess	Conduct targeted movement studies of migrating fish and wildlife in and over Lake Erie, Lake Ontario, Niagara River, and St. Lawrence River to identify high-usage times, areas, and corridors.	ENGOS, NYSDEC, Universities, USFWS
4.1.7	Assess	Use available monitoring data and risk assessments to determine which Great Lakes species are most vulnerable to climate change impacts, to inform and prioritize restoration and management strategies.	ENGOS, NYSDEC, Universities, USFWS
4.1.8	Assess	Update the Significant Coastal Fish and Wildlife Habitat reports and assess the need to expand designations.	NYSDEC, NYSDOS
4.1.9	Implement	Implement and/or develop species recovery and management plans for sensitive native species such as lake sturgeon, inland trout, Atlantic salmon, American eel, sauger, herring, deepwater ciscoes, and Great Lakes piping plover. Monitor to evaluate recovery progress.	ENGOS, NYSDEC, USFWS

Strategy 4.2	Conserve, protect, restore, and maintain coastal, stream, and other priority habitats to support key Great Lakes species and healthy ecosystems.		
Benefits & Metrics	High-priority habitats are restored, protected, or enhanced ( <i>acres of coastal wetland, nearshore, riparian, and other priority habitats</i> )		
#	Type	Action	Partners
4.2.1	Plan	Develop a nearshore and coastal habitat plan to identify projects and data needs essential for supporting key resident and migratory coastal species and habitats, climate resilience, and sustainable recreation.	ENGOS, NYSDEC, NYSDOS, NYSOPRHP
4.2.2	Implement	Support the acquisition, conservation, restoration, and maintenance of high-priority habitats and connecting corridors, as identified in state and regional habitat plans (SWAP, GLRI, etc.).	ENGOS, NYSDEC, NYSOPRHP
4.2.3	Implement	Restore degraded riparian habitat and natural stream hydrology, install fish and aquatic species habitat improvement structures, and enhance native fish spawning substrate in streams.	ENGOS, NYSDEC, NYSOPRHP, SWCDs, USFWS
4.2.4	Implement	Restore the ecological function of coastal wetlands and nearshore spawning and nursery habitats to support native and sport fish production. Target species include northern pike, muskellunge, lake trout, lake whitefish, smallmouth bass, walleye, yellow perch, and cisco.	ENGOS, NYSDEC, NYSOPRHP
4.2.5	Evaluate	Expand coastal wetland monitoring to assess condition, adaptively manage restoration and stewardship activities, and evaluate benefits of healthy wetland ecosystems.	NYSDEC, Universities, USFWS
4.2.6	Evaluate	Evaluate long-term responses of indicator species to habitat restoration and management activities to evaluate trends and inform future management decisions.	ENGOS, NYSDEC, USFWS
Strategy 4.3	Improve aquatic connectivity of streams to support fish and aquatic species passage and natural stream flows.		
Benefits & Metrics	<ul style="list-style-type: none"> <li>Opportunities to restore aquatic connectivity and mitigate localized flooding concerns are identified through plans and assessments (<i># of North American Aquatic Connectivity Collaborative assessments, # of feasibility studies conducted</i>)</li> <li>Aquatic connectivity is re-established, and natural stream flows are restored through implementation of aquatic passage projects (<i># of stream miles of connectivity restored, # of barrier removal/mitigation projects implemented</i>)</li> </ul>		
#	Type	Action	Partners
4.3.1	Assess	Assess and prioritize road-stream crossings for right-sizing using the North Atlantic Aquatic Connectivity Collaborative protocols.	ENGOS, Local govt, NYSDEC, NYSOPRHP, SWCDs, USFWS
4.3.2	Assess	Assess dam removal and/or fish and aquatic species passage opportunities, in consideration of invasive species (including maintaining sea lamprey control), sediment contamination, and flood risk. Target species include American eel, Atlantic salmon, trout, and other native fish and aquatic species.	Local govt, NYSDEC, NYSOPRHP, NYPA, USFWS
4.3.3	Implement	Remove and/or modify fish and aquatic species passage barriers such as road-stream crossings, culverts, and where appropriate, dams.	ENGOS, Local govt, NYSDEC, NYSOPRHP, USFWS

Strategy 4.4	Engage communities, students, and the public in habitat conservation through citizen/community science, education programs, and land stewardship trainings.		
Benefits & Metrics	<ul style="list-style-type: none"> <li>Municipalities, land managers, and landowners have knowledge, tools, and resources to integrate habitat conservation into land use planning (<i># of training tools, resources, or programs provided, # of participating municipalities</i>)</li> <li>Increased engagement in stewardship activities and citizen science programs (<i># of stewardship projects/events engaging the public, # participants, # of observations reported</i>)</li> </ul>		
#	Type	Action	Partners
4.4.1	Implement	Provide training, tools, and resources to municipalities and land managers to promote land use planning for conservation to conserve important habitat and water resources.	ENGOS, NYSDEC, NYSDOS, Others, RPCs, Universities
4.4.2	Implement	Implement trash removal and pollution prevention practices to reduce impacts of human activities, such as trash, litter, and debris, to native aquatic and terrestrial species in the Great Lakes.	ENGOS, Local govts
4.4.3	Educ/ Outreach	Promote participation in citizen science monitoring programs such as eBird, iNaturalist, and NYSDEC's angler diary program to address monitoring gaps and inform management.	ENGOS, NYSDEC, Universities
4.4.4	Educ/ Outreach	Promote stewardship practices by landowners within and adjacent to priority habitats and AOCs that protect and conserve fish and wildlife habitat, including forests, pollinator habitat, and cultural uses of plant resources.	ENGOS, NYSDEC, SWCDs





## Goal 5: Enhance Community Resiliency and Ecosystem Integrity through protection, restoration, and improved, science-informed resource management.

---

Along Lake Ontario, the Niagara River, and the St. Lawrence River, the loss of coastal wetlands over the last century as a result of development, degradation, and unnatural water flow management has significantly reduced the natural protective functions and flood-absorption capacity of coastal ecosystems, placing natural and human communities at considerable risk. Similarly, many inland communities are impacted by flooding and erosion as a result of wetland loss and degradation, stream constrictions, and inappropriate development of floodplains and other high-risk flooding and erosion areas.

The ability of our natural environment to withstand and recover from climate-related stressors and extreme weather events is directly linked to and dependent on the overall health of our natural systems. Communities with healthy, intact ecosystems are better able to withstand and mitigate the impacts of coastal and tributary flooding, erosion, drought, and other environmental conditions that place people and infrastructure at risk. On the other hand, areas that have experienced a high level of land degradation, fragmentation, and overdevelopment have less natural adaptive capacity and are less resilient to climate changes and other stressors.

Resilience is defined by [\*New York's Coastal Management Program Plan\*](#) as:

The capacity for a community and its ecosystem to withstand extreme events and other forces or risks; quickly recover the interconnected social, economic, and ecological systems' structure and function in the aftermath of a disaster; and develop ongoing adaptability to rapidly changing environmental conditions and forces.

Enhancing the community resiliency and ecosystem integrity of our Great Lakes region requires participation, planning, and implementation by all stakeholders—and especially by local municipalities that have “home rule” authority to make land use decisions that will help their residents prepare for and adapt to climate change. Land use policies

and [\*local laws\*](#) that steer development away from vulnerable areas and promote sustainable land-use decisions can reduce risk to people and property and enhance natural resiliency. Likewise, community vulnerability assessments, adaptation and resilience planning, and implementation of climate-smart adaptation projects are essential tools for achieving resilient communities and ecosystems.

**Higher highs and lower lows – Recent scientific studies ([\*U.S. EPA Climate Change in the Great Lakes\*](#)) suggest that the Great Lakes will likely experience more rapid transitions between extreme high and low water levels under a changing climate. Shoreline communities will need to prepare and adapt to both high- and low-water impacts.**

Because a community's resiliency is inextricably tied to the health and integrity of ecosystems, key strategies and actions within this goal are focused on conserving and restoring natural features (such as floodplains, wetlands, dunes, and beaches) or constructing nature-based features to maintain and strengthen the protective functions and processes these features provide (such as flood mitigation, wave attenuation, and sediment management), consistent with [\*New York's Community Risk and Resiliency Act \(CRRRA\) guidance\*](#). Collectively, these practices are referred to as natural resilience measures, and are used to conserve, restore, and mimic natural and nature-based features (NNBF).

Taking a holistic, ecosystem-based approach to resiliency can be a win-win strategy for communities and the environment, resulting in numerous co-benefits including but not limited to enhanced public safety, flood mitigation, erosion control, water filtration, aquifer recharge, healthy fisheries, bird and wildlife habitat, robust outdoor recreation economies, and productive agricultural soils.



Andrew M. Cuomo, Governor | Basil Seggos, Commissioner | Rossana Rosado, Secretary of State



This document features information on natural resilience measures to reduce risk from storm surge, flooding, erosion, and extreme weather events.

## What Are Natural Resilience Measures?

Natural resilience measures are actions to conserve, restore, or mimic natural landforms (or features) and natural processes that reduce risk from flooding and erosion. They work with nature to reduce risk while providing other benefits, or co-benefits, to society, including cleaning our water and air, mitigating drought, and enhancing spaces for outdoor recreation.

Examples of natural resilience measures include:

- Elevating or relocating a structure to enhance floodplain functions and reduce flood damages;
- Floodplain protection and reconnection;
- Wetland restoration and protection;
- Dune restoration and beach nourishment;
- Right-sizing of culverts and bridges to restore natural stream hydrology; and
- Maintaining or planting riparian/shoreline buffers (vegetation) to slow erosion and filter runoff.

## Supporting State and Federal Plans and Programs

- [GLRI Action Plan III - Focus Area 5, Foundations for Future Restoration Actions](#)
- [Community Risk and Resiliency Act \(2014\)](#):
  - [Using Natural Measures to Reduce the Risk of Flooding \(2020\)](#)
  - [State Flood Risk Management Guidance \(2020\)](#)
- [Responding to Climate Change in New York State \(ClimAID\) \(2014\)](#)
- [New York's Climate Leadership and Community Protection Act \(2019\)](#)
- [Coastal Lakeshore Economy and Resiliency \(CLEAR\) Initiative](#)

## Implications of a Changing Climate in the Great Lakes Basin

### Airshed Effects:

- Increase in air temperatures
- Increase in precipitable water in warmer atmosphere
- Change in frequency and intensity of storms

### Watershed Effects:

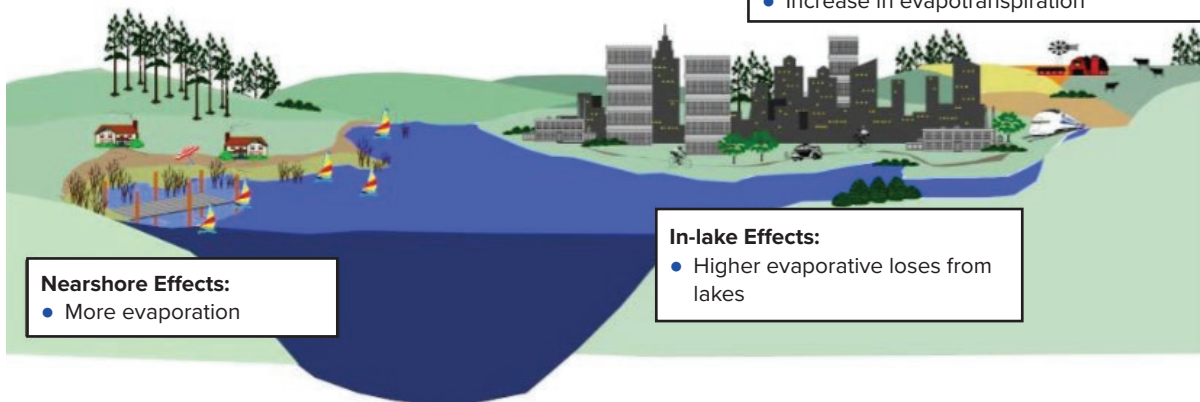
- Warmer air temperatures
- More precipitation
- Less winter snowfall and more rain
- More intense precipitation events
- Increase in evapotranspiration

### Nearshore Effects:

- More evaporation

### In-lake Effects:

- Higher evaporative losses from lakes



Credit: Climate Adaptation Knowledge Exchange.

## Implementation Strategies

- 5.1** Prepare communities to adapt to the impacts of climate change through implementation of climate-smart projects, land use policies, and adaptation planning.
- 5.2** Advance the practice of nature-based shorelines and integrated coastal management along Great Lakes shorelines.
- 5.3** Expand local implementation of natural resilience measures at the watershed scale to achieve sustainable solutions to localized flooding and erosion issues.

## Implementation Strategies, Actions, and Benefits

Strategy 5.1	Prepare communities to adapt to the impacts of climate change through implementation of climate-smart projects, land use policies, and adaptation planning.		
Benefits & Metrics	<ul style="list-style-type: none"> <li>Risk/vulnerability assessments and resilience/adaptation plans are completed for high-risk communities (<i># of assessments/plans completed</i>)</li> <li>More communities are implementing actions to prepare and adapt to the impacts of climate change (<i># of Climate Smart Communities enrolled and/or grants awarded, enrollment in FEMA's Community Rating System</i>)</li> </ul>		
#	Type	Action	Partners
5.1.1	Evaluate	Evaluate long-term economic, ecological, and resiliency benefits of non-structural flood and erosion mitigation strategies including buyouts, elevation, and relocation of built infrastructure in high-risk areas.	Universities
5.1.2	Assess	Conduct community infrastructure and ecosystem vulnerability analyses to prepare for climate-related stressors (e.g., extreme high and low water levels, flooding, coastal erosion, drought, etc.) and their effects on communities and ecosystems. Ensure vulnerable communities have access to updated risk information.	Local govt, NYSDEC, NYSDHSES, NYSDOS, RPCs, Universities
5.1.3	Plan	Develop a fine-scale coastal assessment to identify projects and data needs essential for supporting dynamic sediment processes, resilient natural features and habitats, and sustainable coastal management.	ENGOS, NYSDEC, NYSDOS, NYSOPRHP
5.1.4	Implement	Promote adoption of land use zoning, comprehensive plans, and laws to increase community resiliency to flooding, erosion, and other climate stressors, utilizing New York's <a href="#">Model Local Laws to Increase Resilience</a> . Develop or update policies to prevent and potentially relocate development in the 100-year and 500-year floodplain.	ENGOS, Local govt, NYSDOS, RPCs, Universities
5.1.5	Implement	Promote implementation of <a href="#">Climate Resilient Farming</a> to reduce greenhouse gas footprints of farms, mitigate environmental impacts of agriculture-related activities, and enhance farm resiliency.	NYSDAM, SWCDs
5.1.6	Implement	Promote implementation of long-term resiliency and restoration strategies and actions for Lake Erie, Lake Ontario, the lower Niagara River, and the upper St. Lawrence River, as identified by the CLEAR Initiative and other coastal resilience plans.	ENGOS, Local govt, NYSDOS, NYSOPRHP, RPCs, Universities
5.1.7	Educ/ Outreach	Increase participation in New York's <a href="#">Climate Smart Communities</a> program and accelerate implementation of certification actions that enhance community resiliency and adaptation capacity.	Local govt, NYSDEC, RPCs, Universities
5.1.8	Educ/ Outreach	Encourage communities to go beyond floodplain management requirements through participation in FEMA's <a href="#">Community Rating System (CRS)</a> , to mitigate flooding and lower flood insurance costs. Identify incentives and barriers to participation.	Local govt, NYSDEC, RPCs

Strategy 5.2	Advance the practice of nature-based shorelines and integrated coastal management along Great Lakes shorelines.		
Benefits & Metrics	<ul style="list-style-type: none"> <li>Nature-based demonstration projects are implemented and shoreline monitoring protocols are applied to advance this practice (<i># of projects monitored, # of demonstration projects</i>)</li> <li>Updated coastal data is collected and widely available to inform management (<i># of new coastal data sets collected</i>)</li> </ul>		
#	Type	Action	Partners
5.2.1	Assess	Collect data and develop decision-support tools to inform resilient coastal and tributary management, such as high-resolution sediment budgets, aerial imagery to evaluate shoreline change, seamless topo-bathymetry of entire New York's Great Lakes shorelines, and hydraulic and reach-scale flood studies.	ENGOS, NYSDEC, NYSDOS, NYSOPRHP, NOAA, Universities, USACE, USGS
5.2.2	Implement	Develop engineering design guidance to support implementation of nature-based shorelines and best shoreline management practices.	NYSDEC, NYSDOS, Universities
5.2.3	Implement	Promote the beneficial reuse of dredge material, and optimal placement of dredged material to achieve multiple benefits. Integrate recommendations into dredge management plans.	Local govt, NYSDEC, NYSDOS, NYSDOT, USACE
5.2.4	Implement	Identify and pilot innovative and effective nature-based shoreline and offshore solutions to reduce wave forces, sustain aquatic habitat, and restore littoral processes along Great Lakes shorelines. Develop, implement, and evaluate pilot projects.	ENGOS, NYSDEC, NYSOPRHP, NYSDOS, Others
5.2.5	Evaluate	Evaluate the resiliency performance and ecological, structural, and social benefits of nature-based shoreline stabilization and other NNBF, using the <a href="#">Statewide Shoreline Monitoring Framework</a> and other suitable monitoring protocols.	NYSDOS, SWCDs, Universities
5.2.6	Educ/ Outreach	Form a New York Great Lakes coastal resiliency network that brings local officials, scientists, and outreach specialists together to learn about, share experiences with, and develop approaches to address coastal hazards and management issues.	ENGOS, NYSDOS, Others, Universities

## Natural and Nature Based Shorelines

**Structure Relocation and Raising**



**Native Plantings and Large Woody Habitat Structures**



**Sediment Management and Beach Nourishment**



**Rock Sills and Toes**



**Vegetation and Slope Regrading**



Examples of natural and nature-based features for shoreline management



Strategy 5.3	Expand local implementation of natural resilience measures at the watershed scale to achieve sustainable solutions to localized flooding and erosion issues.		
Benefits & Metrics	<ul style="list-style-type: none"> <li>Widespread adoption of natural resilience measures to reduce risk, preserve natural ecosystems, and provide community benefits (<i># of projects</i>)</li> <li>Municipalities, land stewards, and landowners have knowledge and tools to implement natural resilience measures to reduce flooding and erosion risks (<i># of training tools, resources or programs provided, # of participating municipalities</i>)</li> </ul>		
#	Type	Action	Partners
5.3.1	Plan	Complete flood studies and hydrologic and hydraulic modeling on flood prone tributaries to identify flood mitigation projects, based on the <a href="#">Resilient NY</a> stream model.	ENGOS, Local govt, NYSDEC, SWCDs
5.3.2	Implement	Implement projects that reconnect and restore floodplains, right-size culverts and bridges, and restore natural stream meanders and hydrology to reduce peak flows.	ENGOS, Local govt, NYSDEC, NYSDOT, SWCDs
5.3.3	Implement	Provide technical assistance, training, tools, and resources to communities, land managers, and landowners to implement nature-based approaches for flood mitigation and erosion management, as guided by the <a href="#">CRRRA Using Natural Measures to Reduce the Risk of Flooding guidance</a> .	ENGOS, NYSDEC, NYSDOS, RPCs, SWCDs, Universities
5.3.4	Implement	Promote and implement natural stream channel restoration to improve habitat, water quality filtration, and flood resilience potential of streams. Conduct reach-scale planning, training, and knowledge transfer activities.	ENGOS, Local govt, NYSDAM, NYSDEC, NYSDOT, SWCDs, Universities
5.3.5	Implement	Promote and expand the use of site-specific and landscape-scale green infrastructure by municipalities and land stewards to mitigate flooding and erosion, improve water quality and habitat, and revitalize streetscapes and community green spaces.	ENGOS, Local govt, Others, RPCs, SWCDs, Universities
5.3.6	Implement	Promote and evaluate the flood reduction potential of agricultural and roadside BMPs such as cover crops, wetlands, ditch management, etc., to reduce peak flows in high-risk areas.	SWCDs, Universities
5.3.7	Educ/Outreach	Provide training and technical assistance to contractors and other practitioners on nature-based shoreline stabilization and other NNBf.	ENGOS, NYSDEC, NYSDOS, SWCDs, Universities
5.3.8	Educ/Outreach	Engage local schools in service-learning opportunities to teach students about natural systems, their protective functions and benefits, and how they can be monitored and managed to improve natural resiliency.	ENGOS, RPCs, SWCDs, Universities



## Goal 6: Revitalize Local Communities through Sustainable Management and Stewardship of Great Lakes lands and waters.

### Sustaining Abundant Water Resources

Although New York is a water-rich state, we must continue to strengthen our capabilities to better understand and sustainably manage water and land resources in the Great Lakes region. As other parts of the country experience significant changes in drought frequency and intensity, New York's water resources may become a defining economic asset, resulting in the migration of people and businesses into this water-rich region. New York's Water Resources Law and the [Great Lakes-St. Lawrence River Basin Agreement and Compact](#) provide regulatory oversight and coordination across the Great Lakes basin to ensure that these important water resources, which more than 40 million people depend on, are sustained, protected, and continue to support regional economies. The GLAA builds on these efforts by seeking to inform sustainable water resource management and promote conservation.

### Promoting Sustainable Land Uses

A 2004 [Smart Growth in New York State discussion paper](#) found that sprawl—defined as the continuing urbanization of forest and farmland at the fringe of metropolitan areas—is accelerating even as population growth declines, and that it is undermining the economic health and quality of life in the region, and causing environmental degradation. This occurs at the same time “brownfields” (environmentally compromised industrial/commercial sites), “grayfields” (empty malls, failed office complexes, and other unused or underutilized commercial properties), and vacant housing in cities has increased. Unfortunately, these development trends are still prevalent almost 20 years later. A continued focus on redevelopment of urban centers offers the opportunity to bolster city economies and protect ecosystems, while addressing environmental justice and pervasive equity issues.

[Renewable energy](#) is critical to the future of the Great Lakes region and local economies, creating jobs and providing energy for the state. Under the [Climate Leadership and Community Protection Act](#) (CLCPA), New York enacted bold requirements towards mitigating climate change by adopting clean energy standards, goals for reducing emissions, and [just](#)

[transitioning](#) to provide a shift to the clean energy workforce. The GLAA recognizes that local communities will need support, expertise, and science to pursue sustainable, renewable energy development that is protective of natural lands and ecosystem processes and supportive of local community development goals.

### Supporting State and Federal Plans

- [Our Great Lakes Water Resources: Conserving and Protecting Our Water Today for Use Tomorrow \(2010\)](#)
- [New York State Energy Plan \(2015\)](#)
- [New York State Open Space Conservation Plan \(2016\)](#)
- [New York's Statewide Comprehensive Outdoor Recreation Plan \(2020–2025\)](#)
- [2020 Statewide Greenways Plan](#)
- [Great Lakes Commission Action Plan for Growing the Great Lakes Blue Economy \(2021\)](#)

### The Climate Leadership and Community Protection Act supports multiple GLAA priorities for EBM decision making:

- NYSERDA, as directed by the New York State Public Service Commission, completed the [Great Lakes Wind Feasibility Study](#).
- A series of expert advisory panels developed sector-specific recommendations for Agriculture and Forestry, Land Use and Local Government, Climate Justice, and other sectors to meet the CLCPA's ambitious GHG targets and support climate adaptation and resilience under [New York's Scoping Plan](#).

### Expanding and Enhancing Outdoor Recreation

New York's Great Lakes region offers outstanding tourism and recreation opportunities: world-class freshwater fishing and boating; eco-tourism experiences such as birding, hiking, biking, skiing, and snowshoeing; heritage and agri-tourism activities; and beautiful state parks. Visitors and residents alike make substantial contributions to the regional economy through participation in a variety of recreational activities. In a 2012 study by [The Trust for Public Land](#), researchers found that for every \$1 invested in conservation, nearly \$7 is returned in ecosystem services like recreation, flood prevention, and water quality protection. Expanding access that achieves multiple benefits and promotes stewardship of recreation resources will help ensure that these important benefits are sustained for generations to come. New York State outdoor recreation management and stewardship is guided by New York's [Statewide Comprehensive Outdoor Recreation Plan](#), and the GLAA seeks to build on and promote this framework.



## Implementation Strategies

- 6.1** Evaluate and promote actions to protect and sustain drinking source waters, including water supply aquifers and surface waters.
- 6.2** Promote sustainable land use practices, plans, and policies to revitalize communities, conserve open space, protect viable agricultural lands, and inform renewable energy development.
- 6.3** Enhance and expand access to fishing, swimming, boating, and wildlife-dependent recreation along Great Lakes waters, to promote stewardship and enhance local tourism economies.

## Implementation Strategies, Actions, and Benefits

Strategy 6.1	Evaluate and promote actions to protect and sustain drinking source waters, including water supply aquifers and surface waters.		
	<ul style="list-style-type: none"> <li>Water resource management decisions are informed by science (<i># of studies or assessments completed</i>)</li> <li>Plans are developed and implemented to protect drinking source waters (<i># of source water protection plans developed</i>)</li> <li>Increased public awareness of how and why to conserve water resources (<i># of outreach materials distributed, # of events promoting awareness</i>)</li> </ul>		
#	Type	Action	Partners
6.1.1	Research	Support research actions under the Regional Body Compact Council science strategy, including assessing New York's water budget, land use and climate change impacts, stream flow monitoring, aquifer mapping, and social science research to improve water conservation messaging.	NYSDEC, NYSEFC, Universities, USGS
6.1.2	Assess	Identify and assess groundwater and surface water supplies vulnerable to drought and other stressors. Identify alternative supplies and conservation strategies as needed.	Local govt, Others, USGS
6.1.3	Plan	Work with municipalities in the Great Lakes to develop <a href="#">Drinking Water Source Protection Plans</a> that consider water supply vulnerabilities, water conservation, and long-term use. Integrate into applicable watershed plans as needed.	Local govt, NYSDAM, NYSDEC, NYSEFC, RPCs
6.1.4	Implement	Promote incentives for business, residential, municipal, and agricultural water users to increase water use efficiency and conservation through leak detection programs, low-flow devices, rainwater harvesting, and equitable water-pricing programs. Identify additional incentives needed.	Local govt, NYSDEC, NYSEFC, Others
6.1.5	Implement	Manage water resources in accordance with the <a href="#">Great Lakes-St. Lawrence River Basin Water Resources Compact Council</a> and Regional Body to sustain water resource supplies consistent with <a href="#">New York's Water Resource Law</a> .	Local govt, NYSDEC
Strategy 6.2	Promote sustainable land use practices, plans, and policies to revitalize communities, conserve open space, protect viable agricultural lands, and inform renewable energy development.		
<b>Benefits &amp; Metrics</b>	<ul style="list-style-type: none"> <li>Communities develop and implement comprehensive plans, zoning codes, and model local laws that support smart growth and sustainable land use (<i># of plans completed</i>)</li> <li>Communities are implementing actions to sustain land use and adapt to and mitigate climate change (<i># of Climate Smart Communities and Clean Energy Communities projects</i>)</li> <li>Businesses adopt and implement sustainable practices that help them save money and reduce GHGs (<i># of initiatives targeting businesses</i>)</li> </ul>		
#	Type	Action	Partners
6.2.1	Plan	Integrate <a href="#">smart growth principles</a> and resiliency considerations into comprehensive plans, local waterfront revitalization plans, and land use planning tools (such as zoning, model ordinances, conservation subdivision codes, and ecosystem service analyses).	Local govt, NYSDEC, NYSDOS, RPCs

	Implement	Encourage municipalities to participate in New York's Climate Smart Communities and NYSEERDA's Clean Energy Communities programs to leverage incentives and implement actions that promote sustainable land use.	ENGOS, Local govt, NYSDEC, NYSDOS, NYSEERDA, RPCs, Universities
	Implement	Implement sustainable land use projects that redevelop underused or vacant developed areas, conserve open spaces, and preserve farmland and community character.	ENGOS, Local govt, NYSDOS
	Implement	Encourage businesses to adopt <a href="#">sustainable</a> facility designs and practices that reduce emissions, conserve energy and water, enhance worker safety, and support urban greening efforts.	ENGOS, Universities
	Implement	Evaluate the environmental, social, and economic impacts and benefits of expanded renewable energy development. Implement offshore and land-based spatial planning, conduct comprehensive analyses, and collect needed data to inform siting, in consideration of habitat protection, aesthetics, human health, recreational uses, cultural resources, and cumulative impacts.	Local govt, NYSDEC, NYSDOS, NYSEERDA, Universities
6.2.6	Implement	Implement best practices and planning guidance to inform local siting of generation and transmission facilities for solar, wind, and other renewable sources. For solar development, refer to the <a href="#">New York State Solar Guidebook</a> .	ENGOS, Local govt, RPCs
6.2.7	Implement	Work with the NYS Climate Action Council and stakeholders to implement recommended actions that achieve land use and local governance goals under the <a href="#">CLCPA</a> .	ENGOS, Local govt, NYS Agencies, RPCs
<b>Strategy 6.3</b>	<b>Enhance and expand access to fishing, swimming, boating, and wildlife-dependent recreation along Great Lakes waters, to promote stewardship and enhance local tourism economies.</b>		
<b>Benefits &amp; Metrics</b>	<ul style="list-style-type: none"> <li>Expanded and enhanced access to outdoor recreation for all (<i># of new/improved recreational access facilities</i>)</li> <li>Public stewardship of recreation areas improves aesthetics and promotes sustainable uses (<i># of participants engaged in citizen science and stewardship events</i>)</li> <li>Preservation of scenic vistas (<i># of vistas enhanced or expanded</i>)</li> </ul>		
<b>#</b>	<b>Type</b>	<b>Action</b>	<b>Partners</b>
6.3.1	Implement	Expand access to outdoor recreation opportunities along Great Lakes waters, such as fishing, boating, swimming, hiking, skiing, and wildlife viewing, using principles of <a href="#">universal design</a> . Enhance access for <a href="#">environmental justice</a> and other underserved communities.	ENGOS, Local govt, NYSDEC, NYSOPRHP
6.3.2	Implement	Revitalize, expand, and develop publicly accessible waterfront green spaces, riparian trails ( <a href="#">greenways</a> ), and water trails (blueways) to connect communities, cultural resources, and natural systems.	ENGOS, Local govt, NYSDEC, NYSDOS, NYSDOT NYSOPRHP
6.3.3	Implement	Preserve Great Lakes natural scenery, <a href="#">scenic vistas</a> , and <a href="#">areas of statewide significance</a> , and corridors through mapping, land acquisition, land use planning, and stewardship for enjoyment by tourists and residents.	ENGOS, Local govt, NYSDOS, NYSOPRHP, RPCs
6.3.4	Implement	Support the implementation and evaluation of coastal cleanup and litter prevention programs to enhance and steward outdoor recreation areas. Engage the public and youth in stewardship activities.	ENGOS, NYSOPRHP, Universities
6.3.5	Educ/ Outreach	Provide educational resources and interpretation opportunities at tourism and recreation destinations. Promote the "Leave No Trace"™ ethic and best practices for sustainable outdoor recreation.	ENGOS, Local govt, NYSDEC, NYSOPRHP, Universities



## VIII. Evaluating GLAA Outcomes

***“You can’t manage what you don’t measure”***

***~Peter Drucker***

The ultimate measure of success, which is the long-term sustainability of ecosystem functions and services, can only be evaluated decades into the future. It is with this understanding that 10-year targets and outcomes are proposed to evaluate the health of New York’s Great Lakes land and water resources resulting from the cumulative impact of GLAA implementation by partners over time.

Targets identified within this section are intended to supplement—rather than replace—existing evaluation programs, such as the [State of the Great Lakes](#) and [Blue Accounting](#), binational efforts to track the status and trends of the Great Lakes ecosystem. They represent key focal areas of the GLAA that are currently being measured and tracked through existing state programs and resources, and therefore are well suited to evaluate ecosystem improvements and partnership accomplishments within New York’s Great Lakes basin. These targets, long-term outcomes, and data sources may be further modified and adapted with additional input from GLAA partners.

These targets and outcomes provide a foundation for the GLAA partner network to track and report progress on a proposed 10-year basis. Evaluation of long-term trends will ensure that we’re addressing gaps, celebrating “wins,” and adaptively managing the program over time so that it remains responsive to changing conditions and new challenges.

### Metric or Outcome? An Example:

For Goal #2, which is focused on nonpoint source management, a progress metric might be lbs. of phosphorus reductions achieved for a given project. The long-term outcome might be that the nutrient impairment for the receiving waterbody is removed or improved. The data source is the measurable data used to evaluate progress towards achieving the outcome, which in this case would be the waterbody monitoring data collected by NYSDEC’s Rotating Integrated Basin Studies (RIBS) program (available on DECinfo Locator).

Under the GLWQA, [State of the Great Lakes](#) reports are periodically released to evaluate progress towards shared goals, using indicators of ecological health such as clean drinking water, native fish and wildlife populations, and beach closures.



## GLAA 10-Year Targets, Outcomes, and Data Sources

	Decreasing trends in toxic impacts to aquatic life (surface waters and sediments), as determined by <a href="#">RIBS</a>	<a href="#">DECinfo Locator: Aquatic Toxicity Monitoring</a>
	Declining contaminants in fish/less restrictive fish consumption advisories (more fish can be eaten from more waterways)	<a href="#">NYSDEC Division of Fish and Wildlife reporting</a> , <a href="#">NYSDOH Health Advice on Eating Fish You Catch</a>
<b>2: Improved Water Quality</b>	Decline in the number of impaired stream segments caused by nutrients, sediments, and/or pathogens	<a href="#">NYSDEC RIBS</a> , <a href="#">Division of Water Monitoring Data Portal</a>
	Decreasing trends in beach advisories issued and closure rates	<a href="#">NYSOPRHP Water Quality: Beach Results</a> , <a href="#">NYSDOH Beach Water Quality Information</a>
	Decreasing trends of HABs reports	<a href="#">NYSDEC HABs Reporting</a>
	Declining trends in new infestations of aquatic and terrestrial invasive species in New York State	<a href="#">Nys.info clearinghouse iMapInvasives: Not Detected Species</a>
<b>4: Increased Natural Resources Conserved and Restored</b>	Increasing populations of sensitive Great Lakes fish and wildlife (such as Great Lakes piping plover, lake sturgeon, coldwater trout species and freshwater mussels)	<a href="#">NY Natural Heritage Program species surveys</a> , <a href="#">Lake Erie and Lake Ontario fisheries reports</a> , <a href="#">New York Nature Explorer</a>
	Increase in coastal wetland coverage and health indicators	<a href="#">Great Lakes Coastal Wetland Monitoring Program</a> , <a href="#">NYS DOS 309 Assessment and Strategy</a>
	Improved coastal wetland and coldwater fisheries habitats	<a href="#">DECinfo Locator: Aquatic Biological Monitoring</a>
	Unchanging or increasing trends in riparian forest and forest cover	<a href="#">NOAA C-Cap Land Cover Atlas</a> , <a href="#">MRLC National Land Cover Database</a>
	Increase in protected lands toward achieving the 30x30 goal for land conservation in New York	<a href="#">New York Protected Areas Database</a>
<b>5: Increased Ecosystem Resiliency</b>	Unchanging or decreasing trends in percent of hardened shorelines	<a href="#">NOAA U.S. Hardened Shorelines Classification</a>
	Increasing trends in acres of protected or undeveloped land within floodplains and the Great Lakes coastal zone	GIS analyses/risk assessments, <a href="#">NYS DOS 309 Assessment and Strategy</a>
<b>6: Increased Sustainable Communities</b>	Unchanging or decreasing trends in developed land/reduced urban sprawl	<a href="#">NOAA C-Cap Land Cover Atlas</a> , <a href="#">MRLC National Land Cover Database</a>
	Increased civic engagement, capacity, and community-based partnerships in Great Lakes communities, including environmental justice areas, and New York's Great Lakes AOCs	<a href="#">DECinfo Locator: Public Involvement EJScreen</a>

## IX. Call to Action

Never before have we experienced the incredible level of investment, resources, and collective action for restoring and stewarding the Great Lakes that we are experiencing today. It's up to each of us to keep this momentum going—and growing—to ensure that our irreplaceable Great Lakes remain healthy and abundant for future generations.

Although much has been accomplished since New York State first released the *25-Year Plan for the Great Lakes* in 1991, much work remains to be done. New York's *Great Lakes Action Agenda 2023* builds on the successes of past efforts and sets forth an ambitious vision and framework for protection, restoration, and enhancement of our shared Great Lakes basin.

The plan is new, but the approach is not. It will take collective action by all of us to implement the many actions set forth in the GLAA, to ensure that our waters remain fishable, swimmable, and drinkable; fish and wildlife habitats are restored; open spaces are preserved; and communities from all corners of the basin are engaged and empowered to steward and sustainably use our shared lands and waters into the future.

We challenge you to answer the call to action outlined in the GLAA. Learn more about the Great Lakes. Attend a GLAA work group meeting. [Subscribe to our email list](#). Help take care of our Great Lakes water and land resources (see Appendix IV). One small act often leads to the next. We invite everyone to work with us to help keep our Great Lakes great!





# X. References

4 Directions of Conservation Consulting Services. 2021. *Indigenous Conservation Strategies and Practices*. Accessed November 2021 at: <https://cela.ca/wp-content/uploads/2020/11/Conservation-Strategies-and-Practices-Jan-28.pdf>

Alliance for the Great Lakes. 2011. *Emerging Contaminant Threats for the Great Lakes*.

Angradi, Ted & Williams, Kathleen & Hoffman, Joel & Bolgrien, David. 2019. *Goals, Beneficiaries, and Indicators of Waterfront Revitalization in Great Lakes Areas of Concern and Coastal Communities*. Journal of Great Lakes Research. 45. 10.1016/j.jglr.2019.07.001. <https://www.researchgate.net/publication/335006690>

Antololini et al. 2019. Flood Risk Reduction from Agricultural Best Management Practices. Journal of the American Water Resources Association. Accessed January 2022 at: <https://onlinelibrary.wiley.com/doi/full/10.1111/1752-1688.12812>

Atlantic Coast Joint Venture. 2007. Lower Great Lakes-St. Lawrence Bird Conservation Region (BCR13).

Bradley et al. 2018. *Preparing for Sleeper Species*. ScholarWorks@ UMassAmherst. Accessed January 2022 at: [http://scholarworks.umass.edu/eco\\_ed\\_materials/2/](http://scholarworks.umass.edu/eco_ed_materials/2/)

Buffalo Niagara Waterkeeper. 2022. Niagara River Habitat Conservation Strategy. Accessed April 2023 at: <https://bnwaterkeeper.org/niagara-river-habitat/>

Central Michigan University Institute for Great Lakes Research. ND. Great Lakes Coastal Wetland Monitoring Program. Accessed April 2021 at: <https://greatlakeswetlands.org/Home.vbhtml>

Center for Outdoor Ethics. 2021. Leave No Trace Principles. Accessed April 2021 at: <https://lnt.org/>

Cornell University and NY Sea Grant. ND. NY Invasive Species Clearinghouse. Accessed April 2021 at: <http://nyis.info/>

Cornell Waste Management Institute. 2009. *Sources and Impacts of Contaminants in Soils*. Accessed March 2022 at: <https://cwmi.css.cornell.edu/sourcesandimpacts.pdf>

Department of Interior. 2020. *Invasive Species Strategic Plan: 2021-2025*. Accessed April 2021 at: <https://www.doi.gov/ppa/doi-invasive-species-strategic-plan>

Mason et al. 2019. *Plastics. Plastics Everywhere*. American Scientist. 2019. <https://www.americanscientist.org/article/plastics-plastics-everywhere>

ECCC and U.S. EPA. 2019. *Lake Erie Lakewide Action and Management Plan: 2019–2023 Draft*. Accessed April 2021 at [www.binational.net](http://www.binational.net).

ECCC and U.S. EPA. 2018. *Lake Ontario Lakewide Action and Management Plan 2018-2022*. Accessed April 2021 at [www.binational.net](http://www.binational.net).

Elliot et al. 2018. Environmentally relevant chemical mixtures of concern in waters of United States tributaries to the Great Lakes. <https://setac.onlinelibrary.wiley.com/doi/abs/10.1002/ieam.4041>

Environment and Climate Change Canada (ECCC) and the U.S. EPA. 2021. *State of the Great Lakes 2019 Technical Report*. Cat No. En161-3/1E-PDF. EPA 905-R-20-044. Accessed April 2021 at [www.binational.net](http://www.binational.net).

ECCC and the U.S. EPA. 2020. *State of the Great Lakes 2019 Highlights Report*. Accessed April 2021 at [binational.net](http://binational.net).

Federal Emergency Management Agency. 2021. National Flood Insurance Program Community Rating System. Accessed April 2021 at: <https://www.fema.gov/floodplain-management/community-rating-system>

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety. ND. WISE-UP to Climate: *Water Infrastructure Solutions from Ecosystem Services*. Accessed April 2021 at: <https://www.iucn.org/theme/water/our-work/current-projects/wise-climate>

Great Lakes Basin Advisory Council. 2010. *Our Great Lakes Water Resources: Conserving and Protecting Our Water Today for Use Tomorrow*. Accessed April 2021 at: <https://www.dec.ny.gov/lands/25585.html>

Great Lakes Commission and The Nature Conservancy. ND. Blue Accounting. Accessed April 2021 at: <https://www.blueaccounting.org>



Great Lakes Compact Council. 2019. *Regional Body Compact Council Science Strategy*. Accessed April 2021 at: <https://www.glscompactcouncil.org/>

Great Lakes St. Lawrence Governor's and Premiers. 2005. Great Lakes Regional Collaboration Strategy. Accessed April 2021 at: <https://www.gsgp.org/projects/protection-and-restoration/great-lakes-regional-collaboration/glrc-strategy/>

Great Lakes Fishery Commission. 2019. *Sea Lamprey: What's at Risk?* Accessed April 2021 at: <http://www.glfc.org/what-is-at-risk.php>

US Government. ND. Great Lakes Restoration Initiative. Documents. Accessed March 2021 at: <https://www.gleri.us/documents>

Great Lakes-St. Lawrence Water Resources Council. 2005. Great Lakes-St. Lawrence River Basin Water Resources Compact. Accessed March 2021 at: <https://www.glscompactcouncil.org/compact-agreement/>

Great Lakes Water Quality Agreement Nutrient Annex Subcommittee. 2019. Lake Erie Binational Phosphorus Reduction Strategy. Accessed April 2021 at: [www.binational.net](http://www.binational.net).

Haudenosaunee Environmental Task Force. ND. About Us. Accessed April 2021 at: <http://www.hetf.org/about-us>

Haudenosaunee Environmental Task Force. 1992. *Words That Come Before All Else: Environmental Philosophies of the Haudenosaunee*. Native North American Traveling College.

ILoveNY. New York Scenic Vistas. ND. Accessed April 2021 at: <https://www.iloveny.com/things-to-do/fall/scenic-vistas/>

International Joint Commission. 2020. *An Evaluation of stressor Interactions in the Great Lakes*. Accessed March 2021 at: <https://ijc.org/>

International Joint Commission. ND. Great Lakes Water Quality Agreement Reports. Accessed March 2021 at: <https://www.ijc.org/en/what/glwq-reports>

International Panel on Climate Change (IPCC). 2019. *Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*. Accessed February 2022 at: <https://www.ipcc.ch/srccl/>

Labor Network for Sustainability. 2018. *Just Transition- Just What is it?*. Accessed April 2021 at: <https://www.labor4sustainability.org/uncategorized/just-transition-just-what-is-it/>

Multi Resolution Land Characteristics Consortium. 2016. National Land Cover Data. Accessed April 2021 at: <https://www.mrlc.gov/tools>

National Disability Authority. 2020. 7 Principles of Universal Design. Accessed April 2021 at: <https://universaldesign.ie/home/>

NOAA. Coastal Change Analysis Program (CCAP) Land Cover Analysis. 2016. Accessed April 2021 at: <https://coast.noaa.gov/digitalcoast/tools/lca.html>

National Oceanic and Atmospheric Administration (NOAA). ND. Resilience Metrics. Accessed April 2021 at: <https://resiliencemetrics.org/>

NOAA. 2019. US Great Lakes Hardened Shoreline Classification. Accessed April 2021 at: <https://coast.noaa.gov/digitalcoast/data/hardened-shorelines.html>

New York Parks and Conservation Association. 2008. *Greenways and Trails Bringing Economic Benefits to New York*. Accessed April 2021 at: <https://www.ptny.org/>

NYS. *Sustainable Development and Collaborative Governance Handbook for New York*. 2016. Accessed April 2021 at: <https://www.ny.gov/programs/sustainable-development-collaborative-governance>

NYS. Climate Smart Communities Certification Actions. <https://climatesmart.ny.gov/actions-certification/actions/>

NYS. 2015. *New York State Energy Plan*. Accessed April 2021 at: <https://energyplan.ny.gov/>

NYS DAM. ND. Agricultural Environmental Management. Accessed April 2021 at: <https://agriculture.ny.gov/soil-and-water/agricultural-environmental-management>

NYS DAM. 2020. *2020 New York State Pollinator Protection Plan Update*. Accessed April 2021 at: <https://agriculture.ny.gov/plant-industry/pollinator-protection>

NYS DEC. 1992. *25-Year Plan for the Great Lakes. Executive Summary*. Accessed February 2022 at: [https://www.dec.ny.gov/docs/regions\\_pdf/25year.pdf](https://www.dec.ny.gov/docs/regions_pdf/25year.pdf)

NYSDEC. ND. Areas of Concern. Accessed March 2021 at: <https://www.dec.ny.gov/lands/91213.html>

NYSDEC. ND. Brownfield Cleanup Program. Accessed April 2021 at: <https://www.dec.ny.gov/chemical/8450.html>

NYSDEC. 2020. Clean Water plans. Accessed March 2020 at: <https://www.dec.ny.gov/chemical/23835.html>

NYSDEC. 2014. Community Risk and Resiliency Act. Accessed April 2021 at: <https://www.dec.ny.gov/energy/102559.html>

NYSDEC. 2019. NYS Climate Leadership and Community Protection Act. Accessed April 2021 at: <https://www.dec.ny.gov/energy/99223.html>

NYSDEC. ND. DECinfoLocator. Accessed April 2021 at: <https://www.dec.ny.gov/pubs/109457.html>

NYSDEC. ND. Environmental Justice. Accessed April 2021 at: <https://www.dec.ny.gov/public/333.html>

NYSDEC. ND. Fisheries Management and Reports. Accessed March 2021 at: <https://www.dec.ny.gov/outdoor/7730.html>

NYSDEC. ND. *Framework for Completing A Drinking Water Source Protection Plan*. Accessed April 2021 at: <https://www.dec.ny.gov/chemical/115250.html>

NYSDEC. 2019. *2018 Finger Lakes Water Quality Report*. Accessed April 2021 at <https://www.dec.ny.gov/>

NYSDEC. 2021. *Harmful Algae Blooms Research Guide*. Accessed April 2021 at: <https://www.dec.ny.gov/chemical/77118.html>

NYSDEC. 2021. *Inland Strout Tream Management in NY*. Accessed March 2021 at: <https://www.dec.ny.gov/outdoor/111015.html>

NYSDEC. 2020. Great Lakes. Accessed April 2021 at: <https://www.dec.ny.gov/lands/25562.html>

NYSDEC. ND. Greening Your Business. Accessed April 2021 at: <https://www.dec.ny.gov/chemical/52717.html>

NYSDEC. 2018. Lake Sturgeon Recovery Plan. Accessed April 2021 at: <https://www.dec.ny.gov/outdoor/111557.html>

NYSDEC. 2016. *New York State Open Space Conservation Plan* Accessed April 2021 at: <https://www.dec.ny.gov/lands/98720.html>

NYSDEC. 2018. *NYS Invasive Species Comprehensive Management Plan*. Accessed April 2021 at: <https://www.dec.ny.gov/animals/265.html>

NYSDEC. ND. Nonpoint Source Management Program. Federal Fiscal Year 2020-2025. Accessed April 2021 at: <https://www.dec.ny.gov/chemical/>

NYSDEC. ND. Resilient NY. Accessed April 2021 at: <https://www.dec.ny.gov/lands/121102.html>

NYSDEC. ND. Riparian Buffers. Accessed February 2022 at: <https://www.dec.ny.gov/chemical/106345.html>

NYSDEC. 2015. *State Wildlife Action Plan*. Accessed April 2021 at: <https://www.dec.ny.gov/animals/7179.html>

NYSDEC. ND. Viral Hemorrhagic Septicemia (VHS) in New York. Accessed April 2021 at: <https://www.dec.ny.gov/animals/25328.html> DRAFT DECEMBER 2021

NYSDEC. ND. Water Quality Monitoring and Assessment. Accessed April 2021 at: <https://www.dec.ny.gov/chemical/8459.html>

NYSDEC. ND. Water Quantity Management. Accessed April 2021 at: <https://www.dec.ny.gov/lands/313.html>

NYSDEC. ND. What is New York Doing About Climate Change? Accessed April 2021 at: <https://www.dec.ny.gov/energy/43384.html>

NYSDOH. 2021. Health Advice on Eating Fish you Catch. Accessed April 2021 at: [https://www.health.ny.gov/environmental/outdoors/fish/health\\_advisories/](https://www.health.ny.gov/environmental/outdoors/fish/health_advisories/)

NYSDOH. 2021. Beach Water Quality Information. Accessed April 2021 at: [https://ny.healthinspections.us/ny\\_beaches/](https://ny.healthinspections.us/ny_beaches/)

NYSDOS. ND. Brownfield Opportunity Area Program. Accessed April 2021 at: <https://www.dos.ny.gov/opd/programs/brownFieldOpp/index.html>

NYSDOS. 2017. Coastal Management Program and Final Environmental Impact Statement.

NYSDOS. 2020. *Coastal Management Program 309 Assessment and Strategies: 2021–2025*. Accessed November 2021 t: <https://dos.ny.gov/system/files/documents/2021/06/nys-2021-5-yr-assessment-and-strategy.pdf>

NYSDOS. 2019. Model Local Laws to Increase Resilience.

Great Lakes Basin Advisory Council. 2010. *Conserving and Protecting our Water Resources Today for Use Tomorrow*. Accessed April 2023 at: [https://www.dec.ny.gov/docs/regions\\_pdf/glbacfrpt.pdf](https://www.dec.ny.gov/docs/regions_pdf/glbacfrpt.pdf)

NYSDOS. 2020. Statewide Shoreline Monitoring Framework. Accessed February 2022 at: <https://dos.ny.gov/statewide-shoreline-monitoring-framework>

NYSDOT. 2005. NYS Scenic Byways. Great Lakes Seaway Trail.

NYSERDA. 2018. *Preparing for Climate Change*. Accessed April 2021 at: <https://www.nyclimatescience.org/sectors/energyhttps://www.nyclimatescience.org/sectors/energy>

NYSERDA. 2014. *Responding to Climate Change in New York State: The ClimAID Integrated Assessment for Effective Climate Change Adaptation*.

NYSERDA. 2020. *Solar Guidebook*. Accessed April 2021 at: <https://www.nysenda.ny.gov/All%20Programs/Programs/Clean%20Energy%20Siting/Solar%20Guidebook>

NYS Natural Heritage Program and SUNY ESF. ND. NY iMapInvasives. Accessed April 2021 at: <https://www.nyimapinvasives.org/>

NYS Natural Heritage Program. 2018. *Statewide Riparian Opportunity Assessment*. Accessed April 2021 at: <https://www.nynhp.org/projects/statewide-riparian-assessment/>

NYS Natural Heritage Program. ND. Request Natural Heritage Information. Accessed April 2021 at: <https://www.nynhp.org/request-information/>

NYSOPRHP. 2019. *Statewide Comprehensive Outdoor Recreation Plan: Improving Our Visitors' Experience through Inclusivity, Diversity, and Resiliency: 2020-2025*. Accessed March 2021 at: <https://parks.ny.gov/>

NYSOPRHP. ND. Water Quality- Beach Results. Accessed April 2021 at: <https://parks.ny.gov/recreation/swimming/beach-results/>

NYS Regional Economic Development Councils. 2019. Available Consolidated Funding Application Resources. Accessed April 2021 at: <https://regionalcouncils.ny.gov/cfa/process-guide>

NY Sea Grant. ND. Great Lakes Ecosystem Education Exchange. Accessed April 2021 at: <https://seagrant.sunysb.edu/articles/t/new-york-s-great-lakes-ecosystem-education-exchange-about-nygle3>

NY Ocean and Great Lakes Ecosystem Conservation Council. 2009. *Our Waters, Our Community, Our Future: Taking Bold Action Now to Achieve Long-term Sustainability of New York's Ocean and Great Lakes*. Accessed June 2021 at: [https://soar.suny.edu/bitstream/handle/20.500.12648/4393/tech\\_rep/55/fulltext%20%281%29.pdf?sequence=1&isAllowed=y](https://soar.suny.edu/bitstream/handle/20.500.12648/4393/tech_rep/55/fulltext%20%281%29.pdf?sequence=1&isAllowed=y)

Office of the NYS Comptroller. 2004. *Smart Growth in NYS: A Discussion Paper*. Accessed February 2022: [https://www.osc.state.ny.us/files/localgovernment/publications/pdf/smart\\_growth.pdf](https://www.osc.state.ny.us/files/localgovernment/publications/pdf/smart_growth.pdf)

Parks and Trails NY. ND. Greenways and Trails: Bringing Economic Benefits to New York: [https://www.ptny.org/application/files/5914/3585/3053/economic\\_benefits.pdf](https://www.ptny.org/application/files/5914/3585/3053/economic_benefits.pdf)

Pimentel et al. 2005. *Update on the environmental and economic costs associated with alien species in the United States*. ScienceDirect. Volume 2, Issue 3. Accessed January 2022 at: <https://www.sciencedirect.com/science/article/abs/pii/S0921800904003027>

Pearsall et al. 2012. *Returning to a Healthy Lake: An International Biodiversity Conservation Strategy for Lake Erie Technical Report*. A joint publication of The Nature Conservancy, Nature Conservancy of Canada, and Michigan Natural Features Inventory. Accessed January 2022 t: <https://binational.net/wp-content/uploads/2015/02/LakeErieBCSen.pdf>

Ramsar Site Information Services. 2019. Niagara River Corridor. Accessed February 2022 at: <https://rsis.ramsar.org/ris/2402>

*Services, and Biodiversity*. Accessed January 2022 at: <https://nca2018.globalchange.gov/chapter/7/>

Syracuse University Environmental Finance Center. 2015. *NYS Comprehensive Plan Development*. Accessed February 2022 at: <https://efc.syr.edu/wp-content/uploads/2015/03/june14.html>

Trust for Public Land. 2012. *The Economic Benefits of New York's Environmental Protection Fund*. Accessed April 2021 at: <https://www.tpl.org/economic-benefits-new-yorks-environmental-protection-fund>

United Nations. 2015. *Transforming Our World: 2030 Agenda for Sustainable Development*. Accessed April 2021 at: <https://sdgs.un.org/>

U.S. Caucus of the Traditional Ecological Knowledge Task Team Annex 10 Science Subcommittee. 2021. *Guidance Document on Ecological Knowledge Pursuant to the Great Lakes Water Quality Agreement*. Accessed February 2022 at: [https://www.bia.gov/sites/default/files/dup/assets/bia/wstreg/Guidance\\_Document\\_on\\_TEK\\_Pursuant\\_to\\_the\\_Great\\_Lakes\\_Water\\_Quality\\_Agreement.pdf](https://www.bia.gov/sites/default/files/dup/assets/bia/wstreg/Guidance_Document_on_TEK_Pursuant_to_the_Great_Lakes_Water_Quality_Agreement.pdf)

U.S. Department of Agriculture. ND. Conservation Programs. Accessed April 2021 at: <https://www.fsa.usda.gov/programs-and-services/conservation-programs/index>

U.S. EPA. 2018. *Action Plan for Lake Erie*. Accessed April 2021 at: <https://www.epa.gov/glwqa/us-action-plan-lake-erie>

U.S. EPA. 2021. Climate Change Adaptation Resource Center. Accessed April 2021 at: <https://www.epa.gov/arc-x>

U.S. EPA. 2021. Climate Change Indicators: Great Lakes Water Levels and Temperatures. Accessed October 2021 at: <https://www.epa.gov/climate-indicators/great-lakes>

U.S. EPA. 2017. *Consideration of Tribal Treaty Rights and Traditional Ecological Knowledge in the Superfund Remedial Program*. <https://semspub.epa.gov/work/HQ/500024668.pdf>

U.S. EPA. 1995. *Great Lakes Environmental Atlas and Resource Book*. Accessed April 2021 at: <https://nepis.epa.gov/>

U.S. EPA. 2019. *Great Lakes Restoration Initiative GLRI Action Plan III*. Accessed November 2021 at: <https://www.epa.gov/sites/default/files/2019-10/documents/glri-action-plan-3-201910-30pp.pdf>

U.S. EPA. 1997. *Great Lakes Binational Toxics Strategy: United States-Canada Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes*.

U.S. EPA. 2021. Great Lakes Legacy Act. Accessed April 2021 at: <https://www.epa.gov/great-lakes-aocs>

U.S. EPA. 2021. *Great Lakes Water Quality Agreement*. Accessed April 2021 at: <https://www.epa.gov/glwqa>

U.S. EPA. 2009. *Implementing a Lake Ontario LAMP Biodiversity Conservation Strategy*. Accessed November 2021 at: <https://www.epa.gov/sites/default/files/2015-10/documents/lake-ontario-biodiversity-conservation-strategy-201104-38pp.pdf>

U.S. EPA. 2020. National Coastal Condition Assessment. Accessed April 2021 at: <https://www.epa.gov/national-aquatic-resource-surveys/ncca>

U.S. EPA. 2014. Region 2 Environmental Justice Action Plan. Accessed April 2021 at: <https://www.epa.gov/>

U.S. EPA. 2011. Reusing potentially contaminated Landscapes: Growing Gardens in Urban Soils.

U.S. EPA. 2021. Smart Growth. Accessed April 2021 at: <https://www.epa.gov/smartgrowth>

U.S. EPA. Summary of the Clean Water Act. Accessed June 2021 at: <https://www.epa.gov/laws-regulations/summary-clean-water-act>

U.S. EPA. 2021. Superfund. Accessed April 2021 at: <https://www.epa.gov/superfund>

U.S. EPA. 2016. *Technical Memorandum: National Coastal Condition Assessment, Great Lakes*. Accessed April 2021 at: <https://www.epa.gov/national-aquatic-resource-surveys/national-coastal-condition-assessment-2010-results>

U.S. EPA. 2003. *Wastewater Technology Fact Sheet: Disinfection for Small Systems*. Accessed August 2021 at: [https://www.epa.gov/sites/default/files/2015-06/documents/disinfection\\_small.pdf](https://www.epa.gov/sites/default/files/2015-06/documents/disinfection_small.pdf)

U.S. FWS. *North American Waterfowl Management Plan. 2018 update*. Accessed April 2021 at: <https://www.fws.gov/birds/management/bird-management-plans/north-american-waterfowl-management-plan/plan-documents.php>

U.S. Global Change Research Program. 2018. *Fourth National Climate Assessment. Chapter 7: Ecosystems, Ecosystem Services, and Biodiversity*. Accessed January 2022 at: <https://nca2018.globalchange.gov/chapter/7/>

Grannemann et al. 2000. *The Importance of Ground Water in the Great Lakes Region*. U.S. Geological Survey. Accessed January 2022 at: <https://pubs.er.usgs.gov/publication/wri004008>

U.S. Geological Survey. 2017. *National Assessment of Water Availability and Use: Great Lakes Basin Pilot*. Accessed April 2021 at: <https://mi.water.usgs.gov/>

U.S. Geological Survey. 2018. Environmental Health-Toxic Substances Hydrology Program. Tackling Fish Endocrine Disruption. Accessed February 2022 at: <https://toxics.usgs.gov/highlights/fish-endocrinedisruption.html>



# Appendix I. Great Lakes Water Quality Agreement: LAMPs and AOCs

## Great Lakes Water Quality Agreement

The [Great Lakes Water Quality Agreement \(GLWQA\)](#) is a commitment between the U.S. and Canada to protect the physical, chemical, and biological integrity of the waters of the Great Lakes. Authorities for the Areas of Concern (AOCs) program and the Lakewide Action and Management Plans (LAMPs) are included among the priorities for implementation, identified by the 10 Annexes below:

- Annex 1: Areas of Concern
- Annex 2: Lakewide Management
- Annex 3: Chemicals of Mutual Concern
- Annex 4: Nutrients
- Annex 5: Discharges from Vessels
- Annex 6: Aquatic Invasive Species
- Annex 7: Habitat and Species
- Annex 8: Groundwater
- Annex 9: Climate Change
- Annex 10: Science

## Lakewide Action and Management Plans (LAMPs)

[LAMPs](#) are binational plans of action to assess, restore, protect, and monitor the ecosystem health of each Great Lake and its connecting river system. A LAMP coordinates the work of all the government and non-government partners working to improve the lake's ecosystem. Within New York, the [Lake Erie LAMP](#) and the [Lake Ontario LAMP](#) guide our actions for restoring and protecting the Lakes' ecosystems. Each LAMP contains a specific list of actions that multiple jurisdictions and agencies have committed to implementing, including New York State. These actions will be a priority within New York's Great Lakes Action Agenda 2023. More information is available from [binational.net](#), and from [NYSDEC's Managing the Lakes website](#).

Under the Science Annex of the 2012 GLWQA, the [Cooperative Science and Monitoring Initiative \(CSMI\)](#) is a binational effort to coordinate science and monitoring activities in one of the five Great Lakes each year to generate data and information for environmental management agencies. CSMI's science and monitoring activities are conducted in response to priorities established by the LAMPs under the Lakewide Management Annex. CSMI partners include federal and state agencies, Indian Nations, non-governmental organizations, and academic researchers.

## Areas of Concern (AOCs)

AOCs were first designated on a binational list more than 30 years ago to focus cleanup and restoration efforts within these geographic areas where significant impairment of beneficial uses has occurred as a result of human activities at the local level. Of the 43 AOCs originally designated within the U.S. and Canada, only a few have been "delisted" (meaning all beneficial use impairments (BUIs) have been restored), including New York's former Oswego River AOC. To delist [New York's five remaining AOCs](#) (i.e., Buffalo River, Niagara River, Eighteenmile Creek, Rochester Embayment, and the St. Lawrence River at Massena/Akwesasne) New York must complete needed remedial and restorative actions within each AOC and demonstrate that beneficial uses are no longer impaired. Once these actions have been completed and monitoring has shown that the restoration targets for all BUIs have been met, the process of formally delisting an AOC can begin. New York has created a handbook, [Guidance for \(Re-designation\) Delisting of Great Lakes Areas of Concern \(AOCs\) and their Beneficial Use Impairment \(BUI\) Indicators in New York State](#), to guide the documentation and review process.

## What is a Beneficial Use Impairment (BUI)?

A BUI is a reduction in the chemical, physical, or biological integrity of the waters of the Great Lakes sufficient to cause any of the following:

- Restrictions on Fish and Wildlife Consumption;
- Tainting of Fish and Wildlife Flavor;

- Degradation of Fish and Wildlife Populations;
- Fish Tumors or Other Deformities;
- Bird or Animal Deformities or Reproduction Problems;
- Degradation of Benthos;
- Restrictions on Dredging Activities;
- Eutrophication or Undesirable Algae;
- Restrictions on Drinking Water Consumption or Taste and Odor Problems;
- Beach Closings;
- Degradation of Aesthetics;
- Added Costs to Agriculture or Industry;
- Degradation of Phytoplankton and Zooplankton Populations; or
- Loss of Fish and Wildlife Habitat.

## Remedial Action Plans (RAPs) Guide AOC Implementation

For each AOC, a Remedial Action Plan (RAP) has been developed that identifies the BUIs that exist and the conditions that caused them, and guides efforts to restore them. The ideal approach to RAP implementation is rooted in EBM principles, and effectively integrates AOC projects and associated pollutant reduction strategies with other related community redevelopment efforts, including local waterfront revitalization plans, brownfield restoration efforts, and environmental justice initiatives to be mutually supportive of local priorities and plans.

RAPs were initially developed for all AOCs in the 1980s–1990s but have been amended over time to reflect changes in our understanding of AOC conditions and the measures needed to restore them. This is a dynamic process with significant ongoing collaboration between federal, state, and local government agencies, Indian Nations, and other partners/stakeholders. A Remedial Advisory Committee exists for each AOC, to provide technical guidance and allow local citizens a voice in the process and opportunities to communicate directly with NYSDEC and other agencies. RAP documents are available on NYSDEC’s [Areas of Concern webpage](#).

Many of the actions needed to restore BUIs are implemented as part of ongoing agency activities, including remediation of hazardous waste sites under state and federal regulatory programs, and habitat restoration as part of Natural Resource Damage settlements. However, other priority actions are often needed, such as sediment remediation and habitat restoration in areas where no responsible party exists. Additional actions required to remove the remaining BUIs and delist each AOC are currently being identified, and implementation will be pursued over the next several years.

## Strategies for Continued Progress Toward Delisting

- **Project Implementation:** Continue implementation of agency remedial program efforts and implementation of additional priority actions identified through the RAP process for each AOC.
- **Monitoring and Evaluation:** Establish an integrated monitoring program to track and evaluate contaminant trends in water quality, fish and wildlife, and vulnerable human populations, to support sustained environmental health after delisting.
- **Share Results:** Report progress on AOC delisting and share results from ecological assessments/monitoring with local, impacted communities and the public.
- **Sustain Progress:** Engage the Remedial Advisory Committees and local partners as long-term stewards of delisted AOCs and develop strategies, including watershed-based approaches, that can be applied to sustain the environmental health of each AOC after delisting.

# Appendix II. Funding Resources

NYSDEC's Great Lakes Program maintains a list of funding opportunities that can be leveraged to support implementation of the GLAA goals and actions.

## Funding Opportunity Matrix by GLAA Goal

	GOAL 1:	GOAL 2:	GOAL 3:	GOAL 4:	GOAL 5:	GOAL 6:
Funding Opportunity	Toxics	Nutrients and Sediment	Invasive Species	Natural Resources	Community Resiliency	Sustainable Land Use
<a href="#">EPA Great Lakes Restoration Initiative</a>						
<a href="#">Great Lakes Fish and Wildlife Restoration Act Grants</a>						
<a href="#">Sustain Our Great Lakes</a>						
<a href="#">GLRI Cooperative Weed Management Areas</a>						
<a href="#">NOAA Great Lakes Bay Watershed Education and Training</a>	Funds education and engagement projects relevant to all goals					
<a href="#">GLRI Northeastern Area State and Private Forestry Grants</a>						
<a href="#">Northeast Area State and Private Forestry Landscape Scale Restoration Grants</a>						
<a href="#">Great Lakes Protection Fund</a>	Funds innovative research and management relevant to all goals					
<a href="#">NY's Great Lakes Basin Small Grants</a>	Varies on an annual basis					
<a href="#">NY's Great Lakes Research Consortium Small Grants</a>	Funds research projects relevant to all goals					
<a href="#">Natural Resources Conservation Service Financial Assistance Programs</a>						
<a href="#">USFWS National Fish Passage Program</a>						
<a href="#">US EPA Environmental Education Grants</a>	Awards education grants across multiple goals annually					
<a href="#">NYSDEC Agricultural Nonpoint Source Abatement and Control</a>						
<a href="#">NYSDEC Source Water Buffer Program</a>						
<a href="#">NYSDEC Conservation Partnership Program</a>						
<a href="#">NYSDEC Trees for Tribes Program and School Seedling Program</a>						
<a href="#">NYSDEC Urban and Community Forestry Program</a>						
<a href="#">NYSDEC Climate Smart Communities Program</a>						
<a href="#">NYSDEC Environmental Justice Grant Programs</a>						

	GOAL 1:	GOAL 2:	GOAL 3:	GOAL 4:	GOAL 5:	GOAL 6:
Funding Opportunity	Toxics	Nutrients and Sediment	Invasive Species	Natural Resources	Community Resiliency	Sustainable Land Use
<a href="#">NYSDEC Water Quality Improvement Project (WQIP) Grant Program</a>						
<a href="#">NYSDEC Non-Agricultural Nonpoint Source Planning and MS4 Mapping Grant</a>						
<a href="#">NYSEFC Green Innovation Grant Program</a>						
<a href="#">NYSEFC Septic System Replacement Fund</a>						
<a href="#">NYSEFC Water Infrastructure Improvement and Intermunicipal Grants</a>						
<a href="#">NYSERDA Clean Energy Communities Program</a>						
<a href="#">NYSOPRHP Grant Programs</a>						

## Additional Funding Resources and Guidance

- A recent report, [Paying for Water Quality Improvements and Resilience in the Great Lakes: A Toolkit for Green Stormwater Infrastructure](#), details how local funding strategies through new or existing revenue sources, traditional public bonds and loans, private financing, and procurement strategies (including public-private partnerships and credit trading) can be used to finance projects.
- In the [Federal Resources for Nature Based Solutions to Climate Change fact sheet](#) published in 2020 by the Environment and Energy Study Institute, sources of federal support are listed that will allow communities to develop projects which draw on the multiple, interrelated benefits of nature-based solutions.
- [U.S. EPA Environmental Financing Tool](#)
- [Project Planning Tools for New York's Great Lakes watershed](#) (NYSDEC Great Lakes Program)
- [Clean Water, Clean Air and Green Jobs Environmental Bond Act](#)



## Appendix III. Research Agendas

Successful implementation of New York's Great Lakes Action Agenda depends on up-to-date scientific information. The following research agendas include research priorities that would advance multiple GLAA goals. This is not an exhaustive list, and more work to identify research priorities is needed.

Research Agenda	Focus
<a href="#"><u><i>NYSDEC HABs Research Guide</i></u></a>	The guide prioritizes research focus areas to advance the study, mitigation, and management of HABs in New York, including prevention and mitigation, causes of HABs, monitoring and modeling, and engagement.
<a href="#"><u><i>Great Lakes Regional Body and Compact Council Science Strategy</i></u></a>	The Science Strategy highlights a variety of needs and challenges to strengthen the scientific basis for sound water management decision making under the Great Lakes-St. Lawrence River Basin Agreement and Compact.
<a href="#"><u><i>Great Lakes Binational Priorities for Science and Action</i></u></a>	Under the GLWQA, the governments of Canada and the U.S. periodically agree on priorities for science and action that will guide their work.



# Appendix IV. How Residents And Visitors Can Help New York's Great Lakes

## Go Fertilizer-Free

---

Nitrogen and phosphorus contribute to the growth of algae, which in a balanced aquatic ecosystem provides food for fish and other aquatic life. However, too much nitrogen and phosphorus entering our waterways as runoff pollution from fertilizers can create an overabundance of algae. Toxic algal blooms can poison fish, contaminate drinking water, and shut down beaches. Choose a phosphorus-free fertilizer, or better yet, skip the fertilizer altogether and replace your lawn with native plants to filter out pollutants.

## Ditch the Aquatic Hitchhikers

---

Humans have introduced more than 186 invasive species to the Great Lakes ecosystem. You can help prevent their spread by rinsing and wiping down your boats, paddleboards, kayaks, and other watercraft after use. Be sure to remove all visible plant and animal species, and let the watercraft dry completely before setting out in a new body of water. Don't forget that parts of the craft not exposed to the sun or proper air circulation—such as ballast and bait tanks, live wells, and bilge areas—will take extra time to dry.

## Turn Out Your Lights

---

We can all take action to help reduce bird mortalities due to migrating birds being disoriented by bright lights. These actions include:

- Turning off exterior decorative lighting,
- Down-shielding exterior lighting to eliminate horizontal glare and light directed upward,
- And installing automatic motion sensors and controls so lights are on only when they are needed.

New York State is leading by example by requiring State-owned and managed buildings to take measures to reduce light and prevent bird collisions. For more information about reducing impacts to migratory birds, visit the Audubon's page for their Lights Out [Program](#).

## Watch What You Wash

---

One load of laundry can release more than [700,000 microscopic plastic fibers](#) into the water system, polluting our waterways and disrupting the food chain. These fibers are shed in the wash from clothing made from synthetic textiles like fleece, acrylic, nylon, and polyester. They're too small to be filtered out by most wastewater treatment plants, so they end up in our rivers and lakes. To minimize shedding, wash synthetic clothes less frequently, and wash full loads in cold water with liquid—not powder—detergent. Bonus points for installing a washing machine filter to capture the microplastics released with each load of laundry!

## Maintain Your Septic System

---

You can avoid contaminating groundwater and nearby lakes and rivers by getting your [septic inspected](#) regularly (check with your municipality for your local requirements), and [pumped out](#) every 3–5 years. Don't dispose of household hazardous wastes in sinks and toilets. Paints, varnishes, waste oil, grease, baby wipes, and pesticides can clog your system and interfere with the bacterial reactions that break down waste. Dispose of these products at [household hazardous waste](#) facilities and events.

## Dispose of Drugs Safely

---

Low levels of drugs have been detected in New York's Great Lakes waters due to consumers flushing unused medications. Fish and other aquatic wildlife experience behavioral and physical changes through continuous exposure to low levels of medications. Households are strongly encouraged to [dispose of any unwanted pharmaceuticals](#) through a take-back program. [Click here to find a drop site near you.](#)

## Hold Onto Rain

---

You can reduce runoff in two ways: Replace concrete paths and driveways with permeable paving material (such as wood chips and small pebbles) or install a beautiful rain garden on wet areas to catch overflowing rain. These actions allow runoff to soak into the soil, rather than running straight into the lake, while filtering pollutants, reducing shoreline erosion, and protecting water quality from excess sediment.

## Plant Native and Mow Less

---

[Native wildflowers, trees, and shrubs](#) are beautiful, are adapted to local climate conditions, hold in water, provide habitat and food for butterflies and birds, help reduce greenhouse gas emissions, and reduce stormwater runoff. Mowing less to allow native plants and habitats to thrive can save you time and money while helping the ecosystem.

In addition to the benefits mentioned above, planting trees and providing more natural spaces in urban areas can have a multitude of benefits, including reducing the urban heat island effect and improved student performance. All these benefits highlight the importance of incorporating native trees in areas that are undergoing development or revitalization.

## Get Involved in Stewardship and Volunteer

---

There are many opportunities to volunteer within your community or with local environmental non-profit organizations to help clean up or enhance an outdoor area, educate others on the actions they can take, help monitor ecosystem conditions, and share your observations through citizen science, such as [Water Assessments by Volunteer Evaluators](#), [iMapInvasives](#), and [iNaturalist](#). Upcoming volunteer events to get involved with in New York include local [Earth Day](#) cleanups, local [Arbor Day](#) tree planting events, [I Love My Park Day](#), [NYSDEC's Adopt a Trailhead Program](#), and Invasive Species Awareness Week. Learn more about being a watershed steward at: <https://www.dec.ny.gov/lands/25604.html>.



## Visit an Environmental Education Center, Nature Center, Fish Hatchery, or Wildlife Refuge

---

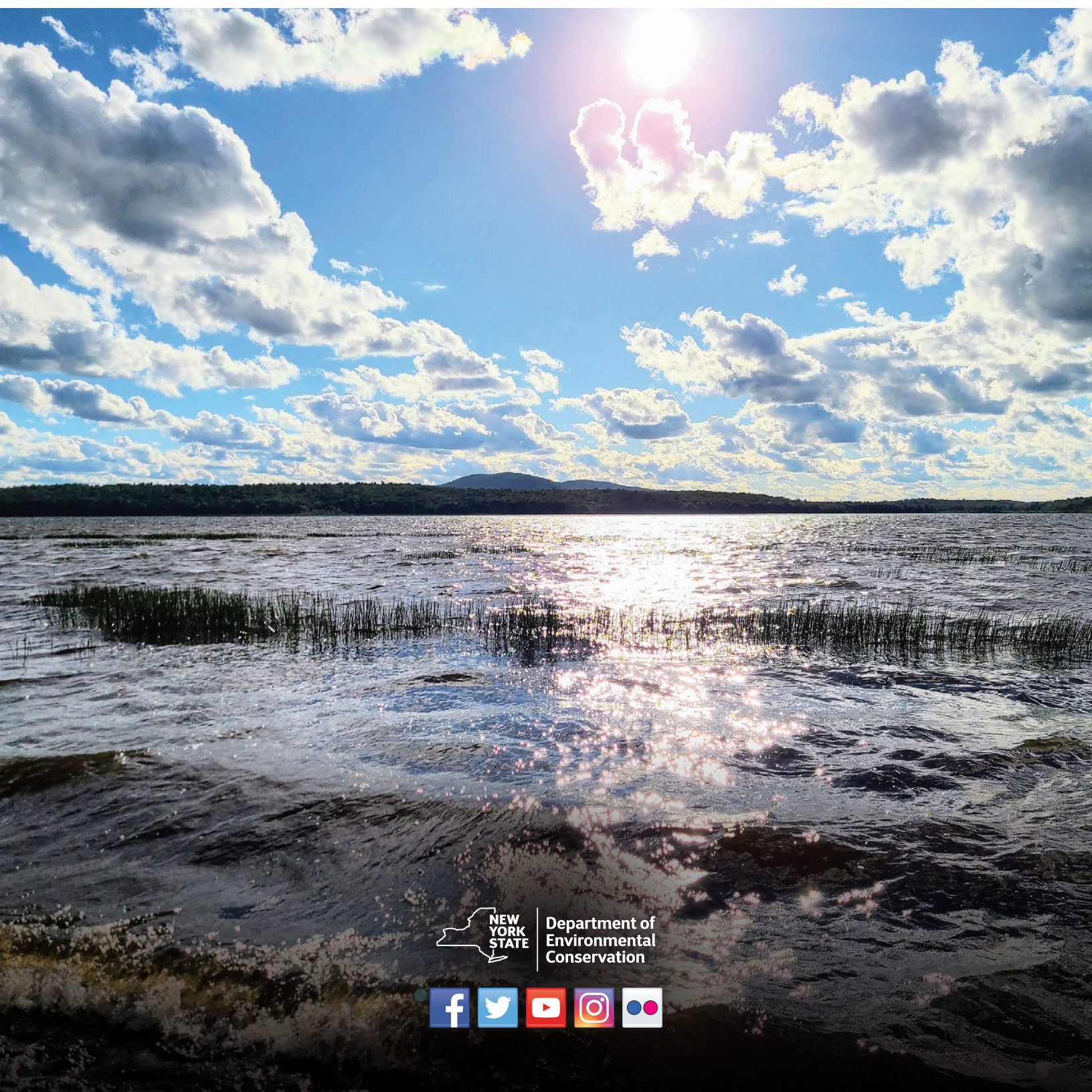
[Environmental education centers, nature centers, and wildlife refuges](#) offer the public opportunities to explore and learn about natural areas and the species that inhabit them. Education and recreation programs will vary by location, but activities focused on birding, plant identification, and conservation are common. [NYSDEC fish hatcheries](#) are open to the public (some year-round and some from spring through fall) and provide additional opportunities to learn about aquaculture and fish stocking programs. We encourage you to visit one of these valuable resources to learn more about natural areas, wildlife, and ways to ensure they are protected for future generations. The [Connect-Kids-to-Parks Field Trip Grant Program](#) provides funding to connect K–12 students with natural areas in New York State. More information is available from the Great Lakes Ecosystem Education Exchange [place-based education and stewardship website](#).

## Leave No Trace™

---

New York's Great Lakes and the waterways that drain to them offer an abundance of outdoor recreation opportunities for all, including swimming, fishing, kayaking, hiking, and much more. The Leave No Trace™ ethic is the practice of leaving our unique outdoor recreation areas in the same condition as, if not better than, we found them, and minimizing our impact to nature and the environment. After your outdoor activity, make sure you carry out what you carried in, avoid stepping on vegetation by staying on the trail and in designated use areas, and observe wildlife from a distance. Avoid spreading harmful [invasive species](#) by cleaning equipment, vehicles, and shoes after visiting each place.





Department of  
Environmental  
Conservation

