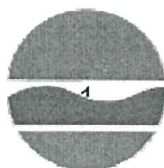


**New York State Department of Environmental Conservation
Great Lakes Program**



**New York's Great Lakes Basin:
Framework for Action
2011**

[2-1-2011 discussion draft]



NEW YORK'S GREAT LAKES BASIN: FRAMEWORK FOR ACTION 2011

EXECUTIVE SUMMARY

Numerous government and private organizations have worked for many years to achieve economic renewal and environmental restoration within New York's Great Lakes Basin. In 2009 the Federal government reinvigorated the national priority of restoring the Great Lakes through the Great Lakes Restoration Initiative (GLRI).

Answering the call to action under the GLRI, New York is ready to move ahead. This Action Agenda brings together many existing environmental, social and economic goals previously identified for New York's Great Lakes region, using an integrated ecosystem-based management approach. New investment and coordinated action can improve the health of the ecosystem, enhance economic vitality across the region, and yield important benefits for major upstate urban centers such as Buffalo, Rochester, Syracuse and Watertown, as well as waterfront communities all along the lakes and rivers of the region. We need to strengthen partnerships to attain identified goals, and to leverage needed funding from federal, state and other sources.

This Action Agenda is not a new planning exercise, but rather is a synthesis of numerous existing plans, developed over many years, that established a range of important restoration, protection, and sustainable development goals for New York's Great Lakes - St. Lawrence River region. The thirteen priority goals, and many of the identified actions, are drawn from those plans, and are aligned with the priorities in the GLRI. These goals establish a framework for New York's near-term priorities.

This Agenda:

- ✓ Highlights the most urgent actions needed to achieve restoration and sustainable management outcomes for the Great Lakes to benefit our communities;
- ✓ Promotes coordination between the multiple entities implementing these actions; and
- ✓ Seeks to leverage the capacity and financial resources needed to take action.

To finalize this Action Agenda, engagement with the region's stakeholders will help to identify the most appropriate and high priority actions needed to accomplish each goal. The final Action Agenda must include well-defined and geographically targeted steps.

Clearly, no one agency or entity has the resources to single-handedly achieve the region's desired ecosystem outcomes. This Action Agenda seeks an integrative approach by bringing together and rallying the diverse capacity and talents of the region's stakeholders, including federal and state agencies, local government, not-for-profit organizations, academia, business and citizens.

FRAMEWORK FOR ACTION: PRIORITY GOALS

CLEAN UP POLLUTION SOURCES AND RESTORE BENEFICIAL USES

1. **Virtually Eliminate Discharges of Persistent Toxic Substances** to protect biological and human health.
2. **Control Sediment, Nutrient and Pathogen Loadings** so that drinking water quality is protected, desired aquatic biotic communities flourish, humans and wildlife are protected from coastline health hazards, and natural processes are sustained.
3. **Accelerate the Delisting of New York's Areas of Concern** by implementing actions focused on restoring beneficial uses impaired by pollutants.

CONSERVE NATURAL RESOURCES

4. **Combat Invasive Species** to sustain a healthy Great Lakes ecosystem and to maintain diverse economic and recreational opportunities.
5. **Conserve and Restore Fish and Wildlife Biodiversity and Habitats** to achieve and sustain, to the extent possible, native biodiversity and resilient ecosystems.
6. **Conserve Great Lakes Water Supplies** in a manner that recognizes the renewable but finite supply of the waters of the Great Lakes Basin for the long-term sustainable use and enjoyment of the public.
7. **Restore the Lake Ontario-St. Lawrence River Shoreline** to enhance the ecological integrity of the shoreline biotic communities and to support sustainable human use and enjoyment.

PROMOTE SUSTAINABLE DEVELOPMENT

8. **Promote Smart Growth, Redevelopment and Adaptive Reuse** to create a sustainable and vibrant economy in the Great Lakes ecosystem.
9. **Enhance Recreation and Tourism Opportunities** that capitalize on the rivers and lakes, beauty, and the natural and cultural resources that defines the character of the Great Lakes - St. Lawrence River region.
10. **Plan for Energy Development** consistent with natural resource conservation and supportive of the State's energy and climate change goals.

FOSTER LONG-TERM COORDINATED ACTION

11. **Support Partnerships and Build Capacity** to ensure the collaboration and accountability necessary to achieve results.
12. **Promote Public Understanding of the Great Lakes Ecosystem**, including its important natural resources, challenges and value to the region's communities in order to enhance community stewardship.

MAINTAIN STRONG SCIENTIFIC BASIS FOR DECISIONS

13. **Enhance Coordinated Science, Monitoring and Information Management** to assess environmental conditions and trends, accelerate restoration progress and support natural resource management.

INTRODUCTION

*"THAT sentiment of the human heart which experiences pleasure in the sublime and the beautiful in nature, can find on the waters of the Great Lakes and in their environment a wealth of enjoyment that is offered nowhere else on the globe."*¹

The Great Lakes - St. Lawrence River Basin is an incredible asset of state, national and international significance. The freshwater resources of the Great Lakes are invaluable to two countries. The drainages of Lakes Ontario and Erie and the Niagara and St. Lawrence Rivers are complex ecosystems that support important habitats and biological communities, and comprise a vital part of New York's natural and cultural heritage and economy. Within New York, these basins total over 700 miles of shoreline and 40% of the State's surface area – second largest among all Great Lakes states. These watersheds encompass much of the geography of New York State, and consist of a rich diversity of communities and natural resources. The combination of diverse topography and geologic formations with abundant precipitation forms the basis for a complex system of groundwater and surface waters, which sustains an array of dependent ecosystems, including springs, streams, wetlands, and nearshore habitats. Over 4 million New Yorkers utilize the region's waterbodies as a source of drinking water, for recreational activities, support agricultural production, transport people and goods, and for countless other activities.

Attention to the ecological health of the Great Lakes has a long history. The Boundary Waters Treaty of 1909 was the first to establish principles for international cooperation to sustainably manage shared waters. The treaty was followed by the bi-national 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.

Concerns in the early 1960s about deteriorated conditions in the lakes led to lengthy negotiations between the national governments of the United States and Canada. The ground-breaking 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, on a bi-national basis, basin-wide water quality objectives and included commitments to design, implement and monitor municipal and industrial pollution control programs, in conjunction with state and provincial governments. 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." The GLWQA and its amendments remain in effect today and guide many of our activities.

A solid body of good work and environmental improvement has taken place since the bi-national agreements were first signed. An array of governance structures, advisory bodies and

¹ History of the Great Lakes, J. B. Mansfield, ed., Volume I, 1899, p 10.

scientific organizations have been established. Numerous analyses and studies have taken place, and an equivalent number of plans and strategies have been prepared to point the way to progress. Government at all levels, academia, and non-governmental organizations on both sides of the border have dedicated significant financial resources, and have successfully taken actions to improve environmental conditions in the Great Lakes.

Despite this progress, considerable work remains to be completed to fulfill the many restoration and protection goals for the Basin. Unfortunately, as a result of piecemeal implementation activities and limited funding over many years, our collective efforts in the Basin have yet to achieve the fundamental promise of the Clean Water Act “to restore and maintain the chemical, physical and biological integrity of the Nation’s waters.” Emerging issues, such as climate change environmental justice concerns, deposition of air-borne toxics, sustainable water quantity management, invasive species and pharmaceuticals found in our waterbodies have brought attention to the need to address growing threats to human and ecosystem well-being. Adequate public funding has not been consistently available to tackle the many actions that have been identified in the various Great Lakes plans, programs and strategies. President Obama’s Great Lakes Restoration Initiative (GLRI), enacted in 2009, brought a renewed federal commitment to restoring and protecting the Great Lakes-St. Lawrence River. Sustained federal investments in GLRI on a multi-year basis will be important to effectively implement plans for Great Lakes revitalization.

“Ecosystem-based management means an integrated approach to management that considers the entire ecosystem, including humans, to achieve improved environmental conditions and sustained ecosystem services that support human needs and social goals. Ecosystem-based management differs from current approaches that usually focus on a single species, sector, activity or concern; it considers the cumulative impacts of different sectors, including human, social and economic activities.”

from the “Scientific Consensus Statement on Marine Ecosystem-Based Management” (2005)

Over many decades, the Great Lakes region has been in economic transition. The region’s urban centers share many of the same characteristics and problems experienced by other older industrial urban economies throughout the “rust belt.” The economic stalwarts of the past, manufacturing and the use of waterways for transportation, have experienced declines. Contaminated industrial sites, job loss, demographic shifts, vacant property, and suburbanization have contributed to the economic stress and challenges faced by the region’s urban centers. By

emphasizing urban redevelopment and making important strategic investments, drawing on their existing competitive economic assets, these communities can accomplish their locally-driven community and economic goals consistent with the environmental restoration goals envisioned by the GLWQA.

To meet the challenges we still face in the Great Lakes Basin and to use our limited funding most effectively, New York’s Great Lakes Action Agenda will promote successful environmental protection, restoration and sustainable development in a manner that: 1) addresses needed actions on a priority basis, 2) provides for maximum coordination and collaboration between the many implementing entities throughout the region, and 3) seeks to identify the capacity and financial resources needed to act on the identified priorities.

Climate change, sound science and ecosystem-based management are key cross-cutting State priorities integrated into this Action Agenda. Overwhelming scientific evidence shows that New York State's air and water quality, forests, fish and wildlife habitats, people and communities are at risk from climate change. Continental-scale changes in climate may result in such impacts as changing lake conditions and lake levels, decreased winter ice cover, increased lake-effect snow events, and related water-management, navigation, and hydroelectric production issues. Longer shipping seasons may provide more opportunity for the introduction of invasive species.² Changes in the region's temperatures could affect fish communities, commercial and recreational fishing and the tree composition of the region's forests. Recognizing the relationship between the Great Lakes ecosystem and climate change, the Action Agenda seeks to support the State's dual climate change goals: to mitigate climate change, through reductions in greenhouse gas (GHG) emissions and enhancement of carbon sinks, and to adapt to the expected effects of climate change.

Principles of Ecosystem-based Management

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

Adaptive management

In an effort to promote a more integrated response to ecosystem problems, a 2006 New York State law³ directed State agencies to employ ecosystem-based management (EBM) principles in agency programs. Within this Action Agenda key EBM principles have been used to guide New York's future restoration, protection and conservation actions.

Sound scientific information and decision-making is the underpinning that supports all the Great Lakes Action Agenda's goals and actions. Because of its relative importance, it has been specifically identified as a priority goal.

All State agencies, local governments, scientific and educational institutions and other stakeholders are key partners that can help achieve the Action Agenda goals and priority actions. Through collaborative governance and ecosystem-based decision-making, we will be more effective in our planning and implementing our identified protection, restoration and development objectives. Integrating international, national, state and local goals and objectives will help ensure successful long-term sustainability and ecosystem health. Through a successful, coordinated effort, New York's Great Lakes region will be stronger and more resilient for future generations.

² NYSERDA ClimAID Team. 2010. Synthesis Report, Integrated Assessment for Effective Climate Change Adaptation Strategies in New York State. C. Rosenzweig, W. Solecki, A.DeGaetano, S. Hassol, P. Grabhorn, M. O'Grady, eds. NYSERDA, Albany, NY.

³ "New York Ocean and Great Lakes Ecosystem Conservation Act", Article 14, New York State Environmental Conservation Law.

"The Great Lakes are one of America's most important—and often-overlooked—natural features....[T]he restoration of the Great Lakes would yield numerous direct, specific economic benefits: Restoring the lakes will lead to direct economic benefits of \$6.5–11.8 billion dollars from tourism, fishing, and recreation alone...Restoring the Great Lakes will directly raise coastal property values \$12 billion to \$19 billion by remediating Areas of Concern (AOCs)...Restoring the Great Lakes will reduce costs to municipalities by \$50 to \$125 million dollars ... All told, the direct economic benefits of restoring the Great Lakes total at least \$50 billion."

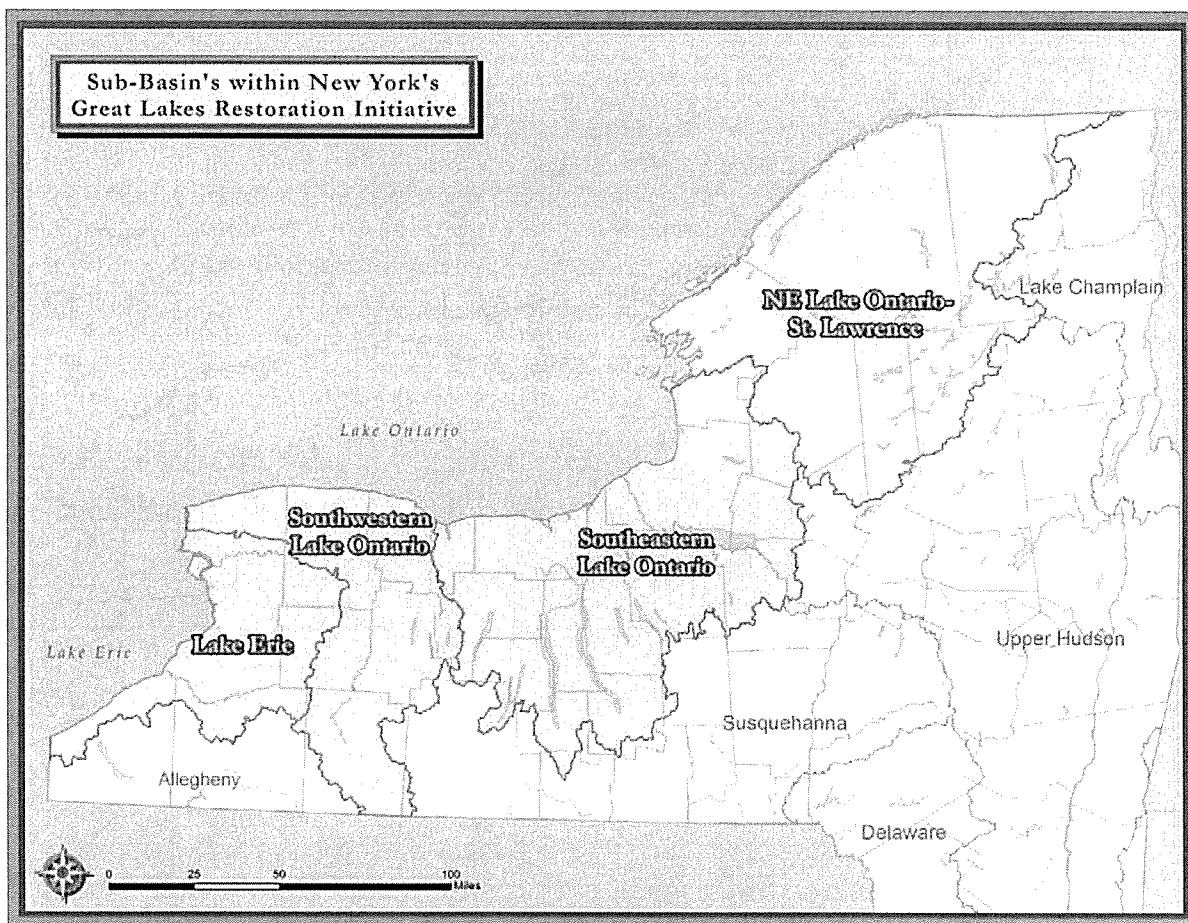
"Is an expenditure of this magnitude [\$26 billion] worth it? With so much at stake, the restoration plan [Great Lakes Restoration Strategy] clearly seems to be a worthwhile, indeed necessary, investment."

John C. Austin, Soren Anderson, Paul N. Courant, Robert E. Litan, September 2007, "Healthy Waters, Strong Economy: The Benefits of Restoring the Great Lakes Ecosystem" and "America's North Coast: A Benefit-Cost Analysis of a Program to Protect and Restore the Great Lakes", The Brookings Institution.

WATERSHEDS OF NEW YORK'S GREAT LAKES BASINS

Place-based, integrated and scientifically-grounded management of natural resources, human activities and environmental quality are fundamental elements of EBM which guide this Action Agenda. Many State and Federal programs have increasingly recognized that specific ecosystem resources can be more effectively managed through planning and implementation at a watershed scale. Using a watershed approach, managers have the advantage of being able to consider common variables, geographic features, history and the many linkages and relationships between aquatic environments, their associated terrestrial watersheds and the range of human activities affecting those areas.

New York's portion of the Great Lakes Basin can be divided into four sub-basins in order to more effectively organize future implementation efforts and to address important characteristics unique to each of them: Lake Erie (including the Niagara River); Southwest Lake Ontario (including the Genesee River); southeast Lake Ontario (including the Seneca, Oneida, and Oswego Rivers); and Northeast Lake Ontario (including the St. Lawrence and Black Rivers).⁴



⁴ Geographic descriptions can be found at: <http://www.dec.ny.gov/animals/30483.html>.

FRAMEWORK FOR ACTION: INTEGRATING EXISTING PLANS AND STRATEGIES

New York State recognizes its existing obligations and commitments to the many federal, interstate, regional and bi-national programs, plans and strategies developed over the past twenty years for the Great Lakes. This Agenda is not intended to create a new planning process, but rather, seeks to synthesize the goals of the range of existing plans into one common strategic agenda for action. The key goals and priority actions from the various

BENEFICIAL USE IMPAIRMENTS

As defined by the GLWQA, "impairment of beneficial use(s)" is a change in the chemical, physical, or biological integrity of the Great Lakes System sufficient to cause any of the following:

1. Restrictions on fish and wildlife consumption
 2. Tainting of fish and wildlife flavor
 3. Degradation of fish and wildlife populations
 4. Fish tumors or other deformities
 5. Bird or animal deformities or reproductive problems
 6. Degradation of benthos
 7. Restrictions on dredging activities
 8. Eutrophication or undesirable algae
 9. Restrictions on drinking water consumption, or taste and odor problems
 10. Closing of beaches
 11. Degradation of aesthetics
 12. Added costs to agriculture or industry
 13. Degradation of phytoplankton and zooplankton populations
 14. Loss of fish and wildlife habitat
-

existing plans have been integrated into this Action Agenda. Having a shared set of priorities will help to stimulate a more effective process for implementing the existing plans and should foster greater collaboration among involved organizations.

Lakewide Management Plans (LaMPs)

LaMPs are key mechanisms for the United States and Canada to fulfill their commitments under the Great Lakes Water Quality Agreement (GLWQA). LaMPs prioritize critical pollutants impairing "beneficial uses", and identify the actions necessary to restore those beneficial uses. Through the LaMPs, coordinated binational analyses of the biological, chemical and physical problems facing the lakes have been undertaken, leading to the formulation of ecosystem objectives for each lake. Over time, those objectives have been refined, and the plans have evolved to define goals for each lake's whole ecosystem, not just specific pollutants. Actions have been identified to restore beneficial uses of each lake, including those focusing on landscape and community-based actions that can be implemented through Local Waterfront Revitalization Programs, Agricultural Environmental Management Plans and farm best management practices (BMPs), protection of tributary streams, prevention of non-point and point source pollution, conservation of coastal wetlands and other upland habitats, and water infrastructure improvements (traditional, as well as "green" infrastructure) within New York.

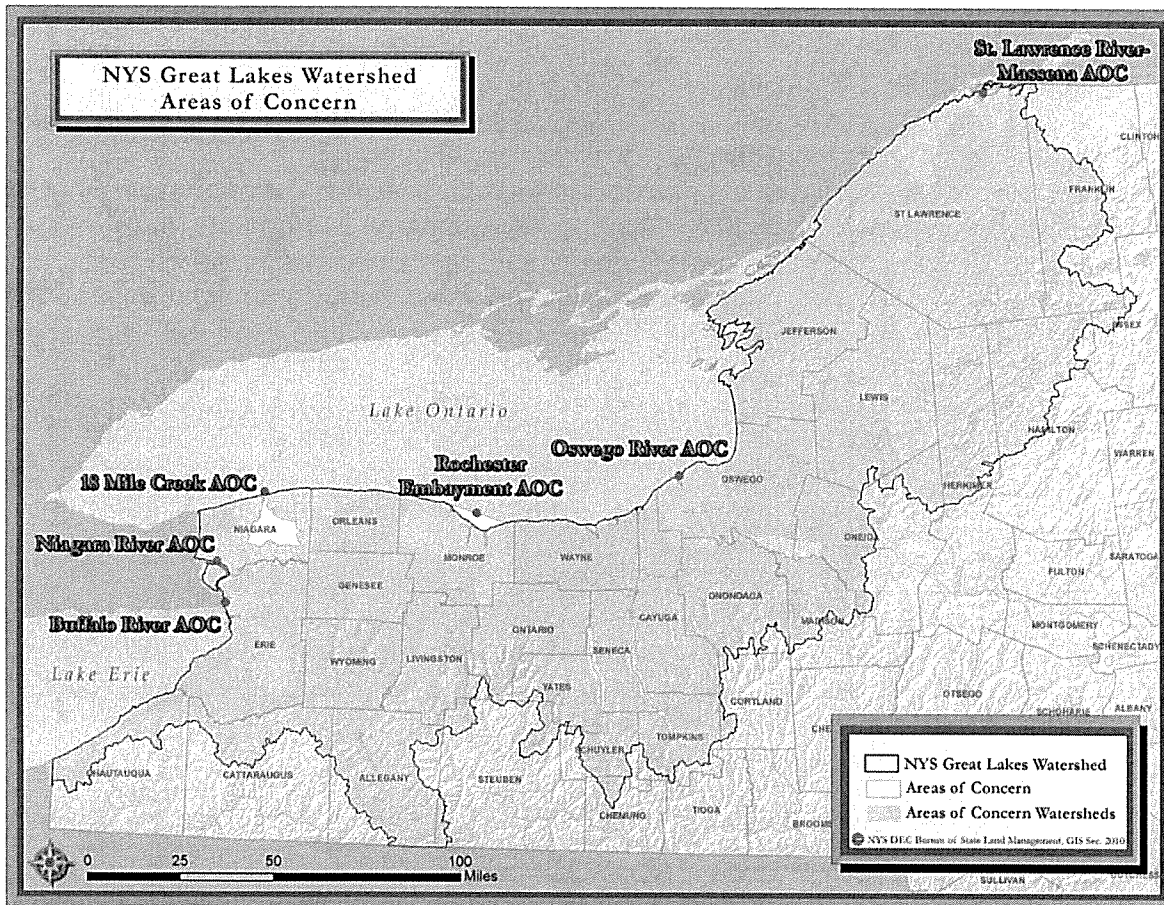
The Lake Ontario LaMP was first issued in 1998, following an extensive period of analysis, and the most recent update was in 2008. A list of ecosystem goals, objectives, impairments and initiatives are identified in the Lake Ontario LaMP and are summarized in Appendix 1.

The Lake Erie LaMP was issued in 2000, following a similar period of analysis, and was updated in 2008. A list of ecosystem goals, objectives, impairments and initiatives

are identified in the Lake Erie LaMP (see Appendix 2).

Remedial Action Plans (RAPs)

The GLWQA also required the development of Remedial Action Plans (RAPs) for each “Area of Concern” (AOC) to address localized environmental problems, targeting the specific stressors causing the impairments and their sources. Each of New York’s six AOCs are specific geographic areas where significant pollution problems have been identified as impairing beneficial uses such as swimming, eating fish, or drinking water. New York’s AOCs are: Buffalo River, Niagara River, Eighteen Mile Creek, Rochester Embayment, Oswego River/Harbor, and St. Lawrence River at Massena. The current status of the Beneficial Use Impairments (BUI) for Lake Ontario and Lake Erie are attached as Appendix 3. The Oswego AOC is the only U.S. AOC to have been de-listed. The types of actions identified in the RAPs range from monitoring, remediation of contaminated sediment, remediation of hazardous waste sites, controls on municipal and industrial wastewater discharges, and improvements to combined sewer overflows. A priority objective within this Action Agenda is to identify the actions necessary to de-list all the AOC’s with U.S. Environmental Protection Agency (EPA) and the International Joint Commission (IJC). Further, although the Oswego AOC has been delisted, continued attention must be given to assure past impairments do not recur.



Great Lakes Fisheries Management

The development of strategic fish community objectives (FCOs) for each Great Lake and the upper St. Lawrence River has been undertaken by the Great Lakes Fishery Commission and their bi-national Lake Committees (fisheries managers from the relevant state and provincial agencies). The FCOs are intended to provide a shared approach for the multiple fishery management agencies, providing a common set of goals:

“To secure fish communities, based on foundations of stable self-sustaining stocks, supplemented by judicious plantings of hatchery-reared fish, and provide from these communities an optimum contribution of fish, fishing opportunities and associated benefits to meet needs identified by society for: wholesome food, recreation, cultural heritage, employment and income, and a healthy aquatic ecosystem”⁵

FCOs consider historical conditions, the current and most-complete scientific understanding of each lake’s ecosystem, the inter-relationship of species and the extant environmental stressors, and seek to be responsive to the social, economic, and cultural needs and preferences of stakeholders

For Lake Erie and Lake Ontario, DEC holds annual “State-of-the-Lake” public meetings to convey the status, trends and developments in fish populations, angler activity, fish catch and harvest and ecological stressors. These meetings are also used to solicit public input on proposed changes to fisheries management regulations and to involve the public on necessary responses to emerging fisheries management and ecological issues.

25-Year Plan for the Great Lakes

In June of 1992 New York State issued its “25-Year Plan for the Great Lakes,” which described the significance of the Great Lakes ecosystem to New York State, as well as the inherent complexities of understanding and managing such an extensive area. The 25-Year Plan outlined a management framework to provide for long-term vitality of the ecosystem, to guide State actions to restore ecosystem components, and to secure ecological balance while benefiting human health and welfare. New York has made tremendous progress in implementing the many components of the 25-Year Plan. Yet New York has done so with no focused Great Lakes governance system. Many of the Plan’s recommendations remain relevant today, and thus have been incorporated into this Action Agenda.

Other Applicable Plans and Programs

There are many other plans, strategies and policies which have direct bearing on the goals of this Action Agenda. These include:

- New York State Energy Plan (2009);
- Executive Order 24 which established a State goal to reduce the emission of greenhouse gases by 80% from 1990 levels by 2050 and required the development of a

⁵ Great Lakes Fishery Commission 1980 and 1997.

Climate Action Plan to address greenhouse gas mitigation and climate change adaptation;

- New York State Comprehensive Wildlife Conservation Strategy (2005);
- North American Waterfowl Management Plan;
- New York State Open Space Conservation Plan (2009);
- New York State Priority Waterbodies List;
- Statewide Comprehensive Outdoor Recreation Plan (2009-2013);
- New York State Nonpoint Source Management Program;
- New York State Coastal Nonpoint Pollution Control Program (approved 2006);
- New York State Priority Waterbodies List;
- New York's Eastern Lake Ontario Dune and Wetland System: Guidelines for Resource Management in the 21st Century (December 2007);
- Upstate New York Groundwater Management Program (Final 1987);
- New York State Coastal Management Program;
- Local Waterfront Revitalization Programs;
- Promulgation of 6NYCRR Part 246, Mercury Reduction Plan for Coal-fired Electric Utility Steam Generators;
- Northeast Regional Mercury Total Maximum Daily Load (TMDL) Strategy;
- Baseline Mercury Deposition Monitoring Grant from the USEPA;
- New York State's Air Toxic Monitoring Network; and
- Numerous watershed management plans, regional and municipal plans.

NEW YORK'S GREAT LAKES ACTION AGENDA

The thirteen priority goals identified in this Action Agenda are drawn from numerous existing plans, developed over many years, which have established restoration, protection, and sustainable development goals for the Great Lakes and New York State. In the following pages, challenge statements for each goal provide the context and define the issues. The goals are intended to establish a framework for specific strategic actions that need to be undertaken in the near-term. This Agenda was purposely developed to align with the priorities identified in President Obama's Great Lakes Restoration Initiative (GLRI).

To be effective, we need to move beyond the aspirational goals and objectives embodied in the existing plans for the Great Lakes and define the most urgent concrete actions and measurable targets that should be undertaken in the near term. Active stakeholder engagement will continually update this Action Agenda, and will contribute to identification of additional specific priority actions measures that should be included.

CLEAN UP POLLUTION SOURCES AND RESTORE BENEFICIAL USES

Goal 1: Virtually Eliminate Discharges of Persistent Toxic Substances to protect biological and human health.

Challenge:

Throughout much of the 20th 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 and Massena. Persistent, bioaccumulative toxic substances that were released into the environment include mercury, polychlorinated biphenyls (PCBs), Mirex, chlorinated dioxins, dieldrin, and furans. The occurrence of these substances in the environment have necessitated restrictions on human consumption of fish and disposal of dredged sediments, and pose continued risks to the public's health and to wildlife.

The 1987 GLWQA established a joint U.S. and Canadian goal that "the discharge of any and all persistent toxic substances be virtually eliminated." Both countries committed to develop control programs related to these toxics. After many years of negotiation, they signed the Great Lakes Binational Toxics Strategy (GLBTS) in 1997 that laid out the collaborative process to pursue the "virtual elimination" goal.

Under the GLBTS, thirteen of the original seventeen challenge goals have been met for reducing sources and loadings of persistent toxic substances. For example, since 1987 there has been an 89% reduction of releases of dioxins and furans in the U.S. and since 1990 an estimated reduction of more than 50% of mercury releases. By 1998, the use or release of all five Level 1 pesticides, such as aldrin, dieldrin, chlordane, DDT, mirex, and toxaphene, had

ceased in the U.S. portion of the Great Lakes Basin. Past usage of these pesticides caused significant environmental contamination in the Great Lakes during the years of their use. ⁶

The continued presence of toxic substances in Great Lakes fish, such as mercury and PCBs, serves as a reminder that despite the many regulatory and remediation efforts of the past decades, there is much more work to do. Additional clean-up and prevention of exposure to past discharges remains a fundamental priority.

In Lake Ontario and its immediate watershed, critical pollutants are continuing to decline, as evidenced by a variety of indicators. Many of these substances are still present at levels above established criteria and continue to contaminate fish and wildlife, underscoring their continued ecological effects. Inputs of toxics from various sources to the Niagara River have declined significantly from 1960 levels. Nevertheless, fish consumption advisories are still in effect, due to the levels of PCBs, dioxins, mirex and mercury. The air-borne deposition of mercury, PCBs and dioxin/furans has been documented by the USEPA as part of its regulatory commitment to reduce these toxics from coal-fired electric utilities and other sources. Due to the persistence of these contaminants, elimination of new inputs will not suffice to eliminate the ecological impacts of formerly discharged substances. Continuing source control and remediation activities are needed. In certain cases, natural attenuation or biodegradation and periodic monitoring are the most viable response actions.

The Niagara River Toxics Management Plan identified 18 priority toxics targeted for reduction and established a goal of a 50% reduction of ten specific priority toxics believed to be from significant Niagara River sources by 1996. Overall, that goal has been met, with some of these toxics seeing a more than 75% reduction through actions targeted to point and non-point sources. In order to meet the “virtual elimination” goal, reductions in the release of “legacy” pollutants, including mercury, cadmium, PCBs, dioxin/furans, hexachlorobenzene and benzo(a)pyrene into New York’s Great Lakes watersheds must continue.

While legacy pollutants have been declining, a variety of new substances of emerging concern” could significantly impact biological and human health within the region. Chemicals used in manufacturing and in domestic settings now are being detected in Great Lakes fish and other media. These chemicals include brominated flame retardants, brominated degreasing and dry-cleaning fluids, chlorinated compounds, fluorinated compounds, pharmaceuticals, personal care products, chlorinated naphthalenes, and other compounds.

An inherent tenet of the GLBTS and this Action Agenda, as explicitly stated in the GLRI, is that “restoration of degraded, damaged or destroyed water and lands is more costly than protection of resources before damage occurs.”⁷ The costs and consequences of past chemical discharges demonstrate the importance of emphasizing precautionary and preventative approaches to the use, discharge, as well as the wet and dry deposition, of toxic substances.

⁶ All of the Level 1 pesticides are highly chlorinated organic compounds, which makes them degrade very slowly, and as a result, persistent in the environment. (USEPA National Action Plan for Level 1 Pesticides, August 2000).

⁷ FY2010 – FY2014 Great Lakes Restoration Initiative Action Plan, p. 8.

Actions and Measurable Targets:

- Collaborate with Great Lakes Commission and RAP coordinators to develop five year prioritized action-plans and processes to achieve remediation steps necessary to achieve AOC de-listing; Identify opportunities to more closely involve related programs and agencies in developing and implementing the five year plans.
- Provide additional support to RAP coordinators to ensure necessary financial and personnel resources to accomplish prioritized AOC de-listing action plans.
- Continue to monitor mercury air concentrations and deposition in Rochester to track the effectiveness of regional mercury emission reduction programs.
- Implement actions to achieve TMDLs for mercury and PCBs within waterbody segments on New York State's 303d list.
- Periodically assess the concentrations and significance of emerging chemicals of concern in New York's Great Lakes fish and wildlife.
- Reduce contaminant levels in Great Lakes waterbodies and sediments to levels which would eliminate the need for fish advisories.
- Continue to identify areas of contaminated sediments and groundwater, and to quantify discharge to surface waters in order to direct remedial actions where needed and feasible.
- Continue to document the work which was accomplished under the Great Lakes Regional Collaboration (GLRC) to identify sources and reduction strategies for mercury.
- Significantly reduce toxic chemical use from industrial and commercial sources by providing tax incentives, loans and grants to New York businesses, as well as direct technical assistance through the New York State Pollution Prevention Institute, the state's network of Manufacturing Extension Partnership centers, and other programs.
- Promote the adoption of alternatives to toxics used in products or processes through green engineering, green chemistry, product stewardship initiatives, and government green purchasing programs.
- Establish "No Discharge Zones" throughout the State's Great Lakes waters to prevent dumping of biological wastes and harmful bio-treatment chemicals.
- Implement educational programs to encourage homeowners and land care providers to adopt organic land care practices through the "Be Green in the Great Lakes" project and other similar efforts.
- Reduce pesticide/herbicide/fertilizer use by implementing the law which bans pesticides on school playing fields and by implementing best management practices as part of Agricultural Environmental Management (AEM) plans.
- Build on DEC's "Don't Flush Your Drugs" campaign to prevent the discharge of pharmaceuticals from major sources through community education and collection programs, best management practices at health care institutions and process changes by manufacturers.
- Provide outreach and education to the community, schools and other institutions on green chemistry and other pollution prevention practices.
- Additional actions to be added through public comment.

Goal 2: Control Sediment, Nutrient and Pathogen Loadings so that drinking water quality is protected, desired aquatic biotic communities flourish, humans and wildlife are protected from coastline health hazards, and natural processes are sustained.

Challenge:

Although water quality in the open waters of the lakes has greatly improved in recent decades, it remains an ongoing concern in the near-shore environment, where most people interact with the water. Poor water quality in near-shore areas, including embayments (bays, river mouths and wetlands), reduces aquatic life, limits recreational use, and ultimately affects economic development in the region. Both Lakes suffer from microbial and chemical contamination and algal blooms. Pollutants enter the lakes via rivers, precipitation, atmospheric deposition, sewage treatment plant outfalls, combined sewer overflows, waste sites, contaminated sediment and surface runoff and groundwater discharge from urban and agricultural areas.

Near-shore algal blooms have resulted in beach closures, drinking water quality concerns, added costs to industry, and disrupted lower food webs. A top Lake Erie and Lake Ontario LaMP priority remains better management of nutrients, and an examination of linkages to land-based sources of nutrient loadings, particularly near-shore, so that management actions can be properly targeted. Several State University of New York (SUNY) researchers, led by SUNY Brockport, are working to assess phosphorous loadings to Lake Ontario from various tributaries and the transport dynamics within the nearshore zones, including hypothetical “phosphorous shunting” by zebra and quagga mussels.

Phosphorus remains a key issue in Lake Erie, primarily in the lake’s western and central basins. Great progress was made over many years to reduce phosphorus levels and loadings from anthropogenic sources, meeting the goals of the GLWQA and reducing the effects of eutrophication. But in the past decade total phosphorus levels have been on the rise. As a result, recent harmful algal blooms rival those of the 1970s. In 2005, new research and monitoring was undertaken to help forecast hypoxic conditions and harmful algal blooms, and to assess their consequences for the aquatic food web. The impact of zebra and quagga mussels on the nutrient dynamics in the near-shore areas, timing of major storms, changes in the food web, and changes in the type of phosphorus inputs to the Lake appear to be major causes of the current problems. The Lake Erie LaMP is producing a Nutrient Management Strategy that will drive commitments by all levels of government around the basin to undertake more stringent controls of non-point pollution, excessive nutrient run-off and shoreline erosion.

Many beaches still experience closings due to microbiological contamination. Combined sewer overflows (CSOs) are important contributors to that problem. A number of Great Lakes municipalities, such as Buffalo and Syracuse, are currently implementing mitigation plans. Nevertheless, without additional action, beach water quality could become a more significant problem, due to the expected increase of severe weather events resulting from climate change. EPA recently assessed the impact climate change would have on communities in the Great Lakes region that are trying to achieve CSO mitigation by designing systems to permit no more than four overflow events per year. With expected effects of climate change, these communities may find it necessary to consider design modifications to ensure this standard can be met in the future.

Addressing CSOs is just one of the several documented needs for identified increased wastewater infrastructure funding; within the New York's Great Lakes drainage basin this need is estimated at \$3.1 billion. Investments are needed in land use planning and management, water reuse and recycling, "green" infrastructure⁸ and traditional engineered solutions.

To best target the most needed water quality improvements in the near term, existing plans and assessments should be used to target actions to the locations with the most severe impairments or the greatest need, such as impaired waterbody segments included in New York State Waterbody Inventory/Priority Waterbodies Lists⁹, the Intended Use Plan for the Clean Water State Revolving Fund, LaMPs, RAPs and watershed programs and plans.

Actions and Measurable Targets:

- Upgrade wastewater and stormwater infrastructure, based on existing identified needs.
- Develop phosphorus TMDLs for impaired segments on New York State's 303(d) list.
- Work with federal and state agencies to target increased funding for urban and agricultural best management to priority watersheds, such as the watersheds recommended in the Lake Ontario Binational Biodiversity Conservation Strategy: 18-Mile Creek (Niagara County), Oak Orchard Creek, Johnson Creek, Salmon Creek (Monroe County).
- Purchase or lease sensitive lands in priority watersheds, with an emphasis on restoring the natural cover of riparian buffers, in order to reduce peak flows by 10% by 2020.
- Complete EBM watershed plans for coastal watersheds, with early emphasis on priority watersheds listed above.
- Organize state, county, municipal agencies to propose new urban stormwater standards for water balances in new developments, using widely accepted LEEDS standards.
- Invest in outreach programs to encourage action by municipalities and individual landowners to reduce peak flows in high-risk streams.
- Acquire river, stream and wetland conservation easements.
- Identify and map groundwater recharge and discharge areas, dependent ecosystems, and biological diversity.
- Promote infiltration and restoration of the natural hydrologic cycle within the watershed, in part by protecting and restoring coastal and upland wetlands.
- Address deficient public and commercial septic systems.
- Implement Lake Ontario Coastal Initiative Action Plan (LOCI 2006)

⁸ The network of existing and to be restored natural lands that provide ecosystem services, such as the provision for clean water.

⁹ The following documents provide the listings of impaired waters within the Great Lakes Basin:

http://www.dec.ny.gov/docs/water_pdf/pwlbcklist.pdf

http://www.dec.ny.gov/docs/water_pdf/pwlgeneislist.pdf

http://www.dec.ny.gov/docs/water_pdf/pwllontlist.pdf

http://www.dec.ny.gov/docs/water_pdf/pwlniaq10list.pdf

http://www.dec.ny.gov/docs/water_pdf/pwlorfillist.pdf

http://www.dec.ny.gov/docs/water_pdf/pwlstlwlist.pdf

- Implement the stewardship vision from “New York’s Eastern Lake Ontario Dune and Wetland System Guidelines for Resource Management in the 21st Century”.
- Clean up point and non-point source pollution in the watersheds that have resulted in closures of town, county and State Park beaches. This includes conducting surveys to identify sources of pollution and mitigating and expanding outfall and capacity at sewage pump stations to reduce the number of wet weather overflows and protect beach water quality.
- Expand routine water quality monitoring in at least 5 State Parks including: identify pollution sources; recommend pollution remediation measures; and develop predictive models of beach water quality based on the measurement and analysis of environmental factors.
- Study and remediate non-point pollution sources affecting at least 4 State Park beaches: reduce nutrient load in the appropriate watersheds; study and reduce *Cladophora* blooms in State Park swim areas; and determine water quality improvements.
- Conduct sanitary surveys at beaches to identify pollution sources. Reduce the number of beach closures at Great Lake sites by remediating pollution sources.
- Implement the new State law which bans phosphorous in detergents.
- Provide outreach and education to communities on pollution prevention practices.
- Work with food processing industry to reduce BOD/COD discharges.
- Additional actions to be added through public comment.

Goal 3: Accelerate the **Delisting of New York’s Areas of Concern** by implementing actions focused on restoring beneficial uses impaired by pollutants.

Challenge:

“Areas of Concern” (AOCs) were first designated on a binational list more than twenty years ago to focus federal, state and local government efforts within those designated geographic areas most impacted by chemical and other pollution. Since then, the Oswego River is the only AOC in the U.S. to have been officially de-listed. In order to achieve full de-listing of New York’s other five AOCs, (i.e., Buffalo River, Niagara River, Eighteen Mile Creek, Rochester Embayment and the St. Lawrence River at Massena) many implementation projects are needed to restore the identified beneficial use impairments (BUIs) specific to each AOC. The range of necessary actions is described in the draft New York AOC Addenda to Stage 2 RAP Reports available on DEC’s Great Lakes webpage.

The de-listing process requires the concurrence of the EPA and the IJC. To support a de-listing proposal, New York must complete needed implementation projects and provide monitoring data showing a beneficial use is no longer impaired. When the data shows all BUI delisting targets have been achieved, then DEC can submit a proposal to the EPA and IJC for removing the AOC designation for that area in its entirety. New York has created a handbook “Guidance for (Redesignation) Delisting of Great Lakes Areas of Concern (AOCs) and their Beneficial Use Impairment (BUI) Indicators in New York State” to guide local communities and advisory committees through the documentation and review process.

In each AOC, the State in cooperation with the AOC Coordinator and local citizens' Remedial Advisory Committee (RAC), has developed a Stage 2 Report describing the problems and causes of the impairments and recommends various remedial or regulatory measures to satisfactorily resolve the problems so conditions in the AOC are no longer significantly worse than elsewhere in the Great Lakes. Efforts are underway to create a supplementary Strategic Action Plan or addendum to the AOC's Remedial Action Plan that identifies priority actions needed to restore beneficial uses. These plans will be the critical guide to direct federal funding to accomplish local restoration projects within each AOC.

Actions and Measurable Targets:

- Accelerate completion of Stage 2 Strategic Action Plans for each AOC that identify specific actions needed to delist BUIs.
- Reassess the status of impairments of beneficial uses in Areas of Concern caused by chemical pollutants.
- Lead aggressive efforts to remediate contaminated sediments that are the most significant cause of BUIs in each AOC.
- Prioritize Clean Water State Revolving Fund loans, grants and other investment programs to accomplish needed water infrastructure improvements that abate or eliminate CSO/SSOs contributing to chemical and biological pollution within AOC watersheds.
- Accomplish public outreach to achieve strategic approach, consensus and beneficial results.
- Conduct periodic air and water re-monitoring for specific compounds as well as data synthesis to document transboundary sources and impacts, as well as progress towards desired end-points.
- Demonstrate "life after delisting" through follow-up actions by core State and local environmental programs and involved organizations.
- Measure and track progress in reducing ecosystem contaminant availability by monitoring levels of contaminants, including PCBs, mercury and organochlorine pesticides, in fish and other wildlife. Monitoring should occur every five years to enable trend assessment and should take place in New York's portion of Lake Erie, the Niagara River, Lake Ontario, the St. Lawrence River, each AOC, and in a selection of streams without known impairment in order to track background levels. Use data to update fish consumption advisories issued by the Department of Health.
- Monitor fish for contaminants on which data are lacking and for emerging chemical contaminants of concern. These include chlorinated dioxins and furans (PCDD/Fs), polybrominated diphenyl ethers (PBDEs), polychlorinated naphthalenes (PCNs), perfluoro-compounds (PFCs), hexabromocyclodecane (HBCD) and tetrabromobisphenol A (TBBPA). As analytical methods for fish tissue become available, monitor fish for pharmaceuticals, nanomaterials and personal care products. Monitoring should be repeated every five years to track changes in New York's portion of Lake Erie, the Niagara River, Lake Ontario, the St. Lawrence River and in a selection of streams. Use data to update fish consumption advisories issued by the Department of Health.

- Wherever feasible, integrate pollutant reduction with other relevant ecosystem and brownfield restoration, urban redevelopment, and environmental justice community revitalization efforts to achieve maximum leverage and benefits from public-private investments.
- Additional actions to be added through public comment.

CONSERVE NATURAL RESOURCES

Goal 4: Combat Invasive Species to sustain a healthy Great Lakes ecosystem and to maintain diverse economic and recreational opportunities.

Challenge:

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. Preventing the introduction of new invasive species populations is a key State priority for restoring New York's AOC BUIs, lakewide ecosystem quality and biodiversity objectives, and revitalizing urban communities.

Once introduced, these species can spread rapidly and potentially alter the integrity of natural ecosystems and water quality. Newly introduced species often go undetected until their populations are large and well-established, facilitated by a lack of natural predators, pests and parasites in the new location; thus, eradication is rarely a viable option. Impacts on native community structure and ecosystem function can lead to dramatically altered environmental conditions with serious socio-economic impacts, and in some instances, may have implications for human health.

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 commercially sold organisms. More than 180 non-native aquatic species have become established in the Great Lakes. In recent decades the average rate of discovery has been one species every eight months and the economic losses in the Great Lakes Basin are estimated at \$5 billion annually.

Invasive species currently impacting the aquatic resources of Lakes Ontario and Erie include alewife, rainbow smelt, zebra and quagga mussels, sea lamprey, round goby, spiny and fish-hook waterfleas, bloody-red shrimp, viral hemorrhagic septicemia virus, Eurasian water chestnut and Eurasian watermilfoil. The establishment of quagga mussels and round goby populations throughout the Great Lakes has increased water clarity but decreased water quality by establishing a water column transport mechanism for type E botulinum toxin, resulting in annual large scale fish and waterbird mortality events. Species with a high potential for introduction in the near future include Asian carp (bighead, silver and black), Amur sleeper, Asian swamp eel, killer shrimp, golden mussel, northern snakehead, water chestnut, hydrilla, and european frogbit.

Terrestrial invasive species, such as Emerald ash borer, Sirex woodwasp, Asian longhorn beetle, black swallowwort, kudzu and buckthorn are, or could become established in the New York portions of the Great Lakes Basin. The emerald ash borer poses serious risk to the Great Lakes by destroying ash trees that commonly protect riparian shorelines, floodplains and emergent wetlands. Asian longhorn beetle, which attacks over a dozen hardwood species, including all maples, could invade New York's Great Lakes watersheds. Significant changes to the upland landscape and tributaries to the Lakes could occur if these, or other terrestrial invasive species spread through or invade New York State's forests.

The restoration of native fish species and biological communities in the Great Lakes has been made more difficult by the presence and impacts of non-native invasive species that alter breeding habitats, out-compete native species for food resources and transmit disease. In addition, municipal and recreational boating infrastructure has been negatively impacted, requiring millions of dollars in maintenance costs annually.

Anticipated changes in environmental conditions due to climate change will have consequences throughout the ecosystems of the Great Lakes Basin. These include land use and water quality changes, as well as human-induced disturbances which may result in new, or altered, transport and introduction mechanisms and have the potential to increase introduction, establishment and distribution of invasive species.

The Invasive Species Council and Advisory Committee were established in State law in 2008, modeled after a similar federal structure. The mission of the Office of Invasive Species Coordination is "to prevent or minimize the harm caused by invasive species on New York's environment by collaborating and coordinating efforts with all stakeholders across the State." The recommendations of the 2005 report of the Invasive Species Task Force remains relevant to the issues still faced within the Great Lakes Basin:

- Collaborate and communicate with government and non-government partners to prepare New York to meet the many challenges presented by invasive species;
- Contribute to the development and implementation of an effective Comprehensive Invasive Species Management Plan;
- Support workshops, conferences and professional meetings in New York State that focus on invasive species issues;
- Engage in strategic programs and actions to effectively prevent the spread of invasive species, detect invasive species before they spread, and manage species when spread prevention has failed;
- Coordinate within DEC and within New York State agencies and other parties to facilitate rapid response to invasions and provide capacity for rapid, effective response to new invasions anywhere in the State;
- Coordinate and manage delivery of research services and allocate research funding for strategically critical projects; and
- Serve internal and external customers and partners by appropriate, timely and efficient administrative actions.

Actions and Measurable Targets:

- Minimize ship and barge-mediated introductions, and spread, of invasive species through the promulgation and implementation of environmentally protective standards for ballast water and the implementation of effective ship-board management / treatment.
 - Encourage the development of environmentally protective national ballast water discharge standards by providing input to US EPA and Coast Guard regulatory initiatives.
 - Facilitate the development, testing and implementation of shipboard ballast water treatment technology for use in freshwater by participation in the Great Ships' Initiative and Ballast Water Collaborative.
 - Require exchange/ flushing, use of Best Management Practices, and installation of appropriate ballast water treatment technology for ballasted vessels operating in New York waters.
- Evaluate technical alternatives to ensure the region's canals and waterways are not vectors for spreading invasive species.
- Take steps to prevent the introduction and spread of invasive species through trade and potential release of live organisms.
 - Enact a transport law, and appropriate regulations, to minimize the introduction and spread of invasive species via boats and motor vehicle transport.
 - Enact a list law, and appropriate regulations, to minimize the introduction of invasive species via commercial activity.
 - Increase enforcement of existing related laws and regulations, e.g. ballast water management, live bait, firewood import/movement restrictions and EAB quarantine regulations.
- Implement rapid response/control/management programs through Partnerships for Regional Invasive Species Management (PRISMs) and assess the effectiveness of those programs.
 - Supporting research to improve early detection and management of invasive species, e.g. identification of likely pathways of invasion, development of innovative control tools, quantify the impacts and benefits of a range of established and potential invasive species, and support the Invasive Species Research Institute through contract with Cornell University.
 - Improve invasive species monitoring and data management efforts, e.g. document the distribution of existing invasive species, conducting forest and water body inventories, survey for invasive species and diseases in Great Lakes watersheds, and support the Natural Heritage Program IMap Invasives initiative.
 - Support the development of a comprehensive invasive species management plan, a framework for the coordination of rapid response initiatives and, as needed, developing pathway/species/place based plans and strategies.
 - Increase State, regional and local capacity to respond to new or additional invasive species discoveries, e.g. increase State and local response coordination, increase funding for response activities, facilitate creation of regional rapid response teams through partnerships.
 - Provide technical and financial assistance to Great Lakes watershed communities impacted by invasive species, e.g. remove EAB infested or at risk

- trees, identify and chemically treat high value urban trees, restore green infrastructure by replacing impacted trees with non-host species.
- Promote, and as available provide adequate support to conduct and evaluate cost-effective invasive species vector-specific outreach and education programs.
 - Implement an Invasive Species Outreach Program via contract with Sea Grant and Cornell Cooperative Extension. Support federal, state and county initiatives and existing PRISMs.
 - Participation in the development and implementation of social marketing campaigns to reduce introduction of invasive species by live bait, firewood movement and other vectors.
- Control and study zebra and quagga mussels in at least 5 State Park swimming areas to protect public health and safety.
- Remove aquatic and terrestrial invasive species in at least 5 State Parks along the Great Lakes shorelines in order to restore and protect native wildlife and habitats including dunes and wetlands.
- Install boat cleaning stations and informational kiosks regarding invasive species in at least 5 State Park boat launches and marinas.
- Develop educational materials (signs and brochures) about invasive species spread through boat launching activities and make them available at sites throughout NY's great lakes region.
- Assess the impact of the spread of emerald ash borer in State Parks.
- Detect and remove feral swine in the Great Lakes Basin to prevent ecosystem and economic degradation.
- Research the causes and methods of control of the round goby, and its association with botulism in State Parks.
- Additional actions to be added through public comment.

Goal 5: Conserve and Restore Fish and Wildlife Biodiversity and Habitats to achieve and sustain, to the extent possible, native biodiversity and resilient ecosystems.

Challenge:

Successful fish and wildlife management and conservation in the Great Lakes Basin is dependent on managing assemblages of species and their habitats. This requires a continued focus on a holistic view of ecosystems and habitat protection which fully considers relationships between species and their habitat needs over the course of their lifecycles, as well as managing land use and the cumulative impact of human activities, thereby best enhancing native biodiversity and habitats, as well as managing the impacts of established invasive species where possible.

Significant amounts of near-shore and wetlands 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 unnatural water level regulation by the International Joint Commission (IJC). Wetlands and the near-shore waters are two of the most biologically productive habitat types. 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. In addition, wetlands and riparian buffers and their plant communities serve an important role in filtering contaminants from runoff, maintaining water quality, and slowing stormwater flows. Tributaries and near-shore habitats in the lakes are critical to the reproduction of many Great Lakes fish during their most vulnerable life stages. Nearshore or coastal areas are also important feeding areas for many species of shorebirds. Maintaining the relationships and interconnections between the terrestrial and aquatic environments are important to sustain the habitats and native biodiversity within the lakes. Local land use decisions, altered hydrology, dams and barriers such as inappropriately designed culverts can result in habitat fragmentation and adversely impact the connectivity within and between habitats.

In addition, climate change predictions for the Great Lakes region suggest decreases in summer water levels, increased frequency and severity of storms leading to increased runoff, diminished recharge of groundwater supplies, flow reductions in small streams and decreases in wetland area, all of which could result in poorer water quality and loss of critical fish and wildlife habitat. Land-use change and habitat fragmentation combined with climate change-induced shrinking of streams and wetlands may decrease the areas available to aquatic organisms, especially those with limited dispersal capabilities such as amphibians, reptiles and mollusks.¹⁰

For Lake Ontario, existing lakewide plans establish key ecosystem components (or “biodiversity targets”). These targets are imperiled by five critical threats: incompatible development, invasive species, dams and barriers, non-point source pollution, and climate change. For each ecosystem component, existing biodiversity conservation strategies identify threats and corresponding actions.

According to the 2005 State Comprehensive Wildlife Conservation Strategy, the greatest threat to both aquatic and terrestrial species in the Lake Erie and Lake Ontario Basins is the loss of habitat due to conversion to human dominated land uses. Habitat restoration and improvements in aquatic habitat connectivity have been identified as key objectives for the restoration of Atlantic salmon, lake sturgeon, American eel and lake trout.

Fish Community Objectives (FCOs) seek to balance competing human uses, including the desire to restore native fish populations while maintaining a viable, productive sportfishery. The popularity of the sport fishery relies, in part, on stocked or naturalized non-native species. Ecosystem-based monitoring, coupled with habitat and population restoration projects, are needed to meet the FCOs for each lake.

Lake Erie historically supported an important commercial lake trout fishery. A Lake Erie Lake Trout Restoration Plan was adopted in 1985 and has been revised several times since, reflecting a considerable body of new research and the impacts of invasive mussels and sea lamprey predation. Decisions for lake trout restoration may require trade-offs that reflect

¹⁰ Union of Concerned Scientists and Ecological Society of America. 2005. Confronting Climate Change in the Great Lakes Region: Impacts on our Communities and Ecosystems.

broader fish community goals for the Lake. The Lake Erie Committee is also contemplating efforts to restore native populations of lake herring and lake sturgeon.

An important goal for Lake Ontario is restoration of naturally reproducing populations of lake trout. While natural reproduction is occurring, their abundance is well below targeted levels and the number of adult fish has declined since the early 1990s. Numbers of lake trout stocked have been reduced, and the survival of stocked fish remains low likely due to changes to the offshore food web caused by invasive species. A revised management plan is currently under review, which recommends increased stocking and improving strain diversity. The Lake Ontario Committee is also currently engaged in research supporting the reintroduction of native deepwater ciscoes. Draft plans supporting this effort, lake sturgeon restoration and American eel recovery are currently under review.

In addition, New York's 2005 Comprehensive Wildlife Conservation Strategy, along with the Lake Ontario LaMP's Binational Biodiversity Conservation Strategy, should serve as key frameworks for promoting habitat restoration, connectivity, protection and conservation of the variety of other species of concern. Additionally, the State's Bird Conservation Area program identified lands that provide important habitat for migrating birds. With GLRI support, agencies, stakeholders and NGOs also will be developing a binational biodiversity strategy for Lake Erie, and this strategy may join the Lake Erie LaMP as a useful framework for habitat protection and restoration.

Actions and Measurable Targets:

- By 2020, protect 50% of unprotected and vulnerable wetlands, tributary floodplains, islands and coastal terrestrial habitats as identified by the State 2009 Open Space Conservation Plan. Focus on islands, unprotected shorelines and 5,000 acres of lands buffering aquatic systems in priority watersheds and coastal reaches.
- Develop a research and adaptive monitoring plan to detect, record, and analyze changes in fish and wildlife populations, species range, habitat composition, natural cycles, and fish and wildlife health in order to assess the impacts of climate change.
- In tributary streams and groundwater systems, maintain hydrologic flows consistent with the needs of fish and wildlife and human communities and other users.
- Continue to fund the preparation and implementation of local and intermunicipal watershed management plans which encourage integrating restoration and protection of surface water, groundwater and biodiversity, and promote compatible economic development and green infrastructure in appropriate areas.
- Pursue restoration of selected native Coregonid species, with monitoring to assess the effectiveness of juvenile stocking compared to egg releases, and experimental site-specific management of invasive species, to test potential benefits for coregonid spawning.
- Finalize and implement restoration plans for the American eel and lake sturgeon in Lake Ontario and St. Lawrence River.
- Engage sportfishing stakeholders to enlist public support for the restoration of native species.

- Implement specific recommended actions identified for targeted priority locations, as identified in 2009 Lake Ontario Biodiversity Conservation Strategy (e.g., Ontario Bays, Salmon River, Sandy Creeks, Black River, Oswego River, Lakeshore marshes, Irondequoit Creek, Lower Genesee River and Braddock Bay).
- Implement management guidance summaries on state Bird Conservation Areas in the Great Lakes Basin to sustain the habitats important species rely on.
- Reduce streambank erosion and create habitat by expanding the Trees for Tribes program to the Great Lakes Basin.
- Acquire ecologically significant land by creating parks or through conservation easements along coastal and estuarine lands as well as rivers and tributaries in order to protect coastal ecosystems, enhance habitat connectivity and afford opportunities to reforest land that promotes recreation and economic revitalization.
- Expand acres of wetlands and dunes in at least two State Parks to help improve wildlife habitat and control pollution.
- Maintain and enhance biodiversity and wildlife habitats in at least five State Parks.
- Assess mitigation of potential adverse impacts to wildlife associated with land-based and offshore wind farm operations near State Parks.
- Remove fish passage barriers, stabilize stream banks, improve in-stream habitat and restore wetland and upland areas to benefit priority species such as walleye, lake sturgeon, American eel, and northern pike whose spawning habitat is affected by water level issues in at least three State Parks.
- Undertake community-based coastal debris prevention activities and restoration projects in at least five State Parks including trash removal activities along waterways, pharmaceutical and electric waste collection days, and educational programs.
- By 2012, State agencies should identify public lands in priority watersheds that are most in need of management plans, and initiate planning.
- Additional actions to be added through public comment.

Goal 6: Conserve Great Lakes Water Supplies in a manner that recognizes the renewable but finite supply of the waters of the Great Lakes Basin for the long-term sustainable use and enjoyment of the public.

Challenge:

Although New York is a water-rich state, it must continue to strengthen its capabilities to better understand and manage its water resources in the Great Lakes region. This is especially true given the growing demand for water, including water for human consumption and energy production. As other parts of the country experience large 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 the State. This may bring some economic benefits, but will also present new challenges as pressure on water resources increases.

The potential for greater pressure, and perhaps unsustainable, use of Great Lakes water resources led to international actions to ensure that effective safeguards are put into place to protect these resources on a regional basis. On December 13, 2005, the Great Lakes

Governors and Premiers signed two agreements to protect the waters of the Great Lakes: 1) *Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement* and 2) *Great Lakes-St. Lawrence River Basin Water Resources Compact*. During 2008, New York joined the other Great Lakes states and Congress in ratifying the *Compact*. The *Compact* provides a comprehensive management framework for achieving sustainable water use and resource protection in the Great Lakes Basin, including both its surface and groundwater resources. The *Agreement* and the *Compact* deal with water supply issues, including out-of basin diversions, the management and regulation of water withdrawals and the assessment of significant impacts due to water withdrawals and consumptive uses.

As required under the *Compact*, New York established baseline volumes for existing water withdrawals in December of 2009. The Parties to the *Compact* and *Agreement* also established “Goals and Objectives for Water Conservation and Efficient Use,” and “Water Withdrawal Information Reporting and Management Protocols” to be used across the basin. Work is currently underway to develop protocols for cumulative impact assessment of water withdrawals and consumptive uses.

New York must fulfill two near-term deliverables due under the *Agreement* and *Compact*:

- New York needs to adopt water conservation and efficient use program goals and objectives consistent with Compact guidance; and
- By December 2013, New York needs to adopt a management or regulation program to implement all other provisions of the *Compact*; this program should seek to enhance consistency in water supply management on a statewide basis. In response to this requirement, in 2009 the Governor proposed legislation (S.8280-A/A.11436-B), which would authorize DEC to implement a statewide water withdrawal permitting program, consistent with the provisions of the *Compact*.

Actions and Measurable Targets:

- Continue to work with the Great Lakes-St. Lawrence River Basin Water Resources Compact Council and Regional Body to achieve the shared vision for sustainable water resource management.
- Pursuant to the *Compact* and statewide water resource management objectives, establish a water withdrawal and diversion management program and water conservation/efficient use program.
- Delineate and adopt strategies to protect source waters, water supply aquifers and critical watershed supplies.
- Further assess New York State’s “water budget” to better understand the availability, limitations, and allocations of water and how that budget intersects with economic development, population growth, and ecological health.
- Consider, and where appropriate, implement the recommendations of GLBAC 2010 report.
- Develop and adopt stream flow monitoring system to collect data for statistical analyses, regulatory guidelines, gauging networks and estimation tools to evaluate the hydrological impacts of climate change, individual and cumulative water withdrawals, and unsustainable land uses upon aquatic biodiversity and water supply.

These flow guidelines or recommendations should be complete by early 2013, so that they can support the State's commitments under the *Compact*.

- Work with New York manufacturers and other large water users to reduce their water "footprint" in production processes.
- Additional actions to be added through public comment.

Goal 7: Restore the Lake Ontario-St. Lawrence River Shoreline to enhance the ecological integrity and resiliency of the shoreline biotic communities and to support sustainable human use and enjoyment.

Challenge:

The *Boundary Waters Treaty of 1909* between the United States and Canada governs the regulation of water levels and water quantity of the shared resource of Lake Ontario and the St. Lawrence River. Unfortunately, the existing lake level regulations have resulted in an overall degradation of the shoreline and wetland ecosystem of the Lake and the River. The existing regulations are based on a fifty year-old policy that did not consider the ecosystem impacts. With improved scientific information, the importance of an approach that moves toward the restoration of a more natural range of water levels and natural seasonal and long-term variation of water levels is more apparent.

Restoration of natural water level variability can have economic benefits for the region. It will improve overall environmental quality that is a cornerstone for businesses, the recreational well-being of the residents and an important attraction for visitors. Property values, tourism, recreation and economic development all depend on maintaining high environmental quality. In addition to these direct economic impacts, the barrier sand dunes and coastal wetland systems provide valuable flood storage capacity; buffer uplands from wave and storm impacts; serve as critical habitat for bird, mammal, fish, amphibian and reptile species of special concern; filter upland storm water runoff; and contribute significantly to the maintenance of the entire ecosystem.

Studies by the IJC and others demonstrate the continuing risk of damages to property along the Lake Ontario shoreline from elevated water levels and storm waves. It has been estimated that 50% of the Lake Ontario shoreline has protective structures erected in an attempt to reduce these impacts.¹¹ Regardless of any water level management plan, storm damages and the direct and indirect costs of these shore defense structures will continue despite these individual efforts. Shore defense structures contribute to down drift erosion, loss of beaches and bank habitats, and impairment of near-shore sediment processes.

In the face of intense pressure from climate change, invasive species, water withdrawals and multiple uses, more sustainable management practices need to be implemented for these water bodies and their associated human and natural communities. A holistic approach to

¹¹ International Lake Ontario–St. Lawrence River Study Board. 2006. *Options for Managing Lake Ontario and St. Lawrence River Water Levels and Flows: Final Report*. Prepared for the International Joint Commission, Annex 2, p. 59.

integrating water level regulation and community land use management of shoreline properties are needed that will provide sustainable conditions now and in the future.

Actions and Measurable Targets:

- Support IJC adoption of a more sustainable, Plan B+ type, water level management plan, which would have both environmental and economic benefits.
- Plan and implement actions to protect, restore and improve resiliency of 50,000 acres of coastal wetlands and natural shoreline in the Lake Ontario-St. Lawrence River watershed pursuant to implementation of a new water level/flow management initiative by the IJC that restores natural water level fluctuation.
- Target resources to Lake Ontario shoreline communities for infrastructure improvements and improved shoreline stewardship.
- Work with the pertinent federal agencies to update floodplain maps and to develop sediment budgets for Lakes Erie and Ontario, identifying sources of sediment, and “sinks” where sediment should accumulate. These efforts should (1) identify reaches of the shoreline that are particularly susceptible to flooding and erosion under more varied climate conditions, (2) assemble seamless topo-bathymetry of the shorelines of the Great Lakes to enable effective modeling and assessment of the probable impacts of climate change on the coastlines, and (3) assemble bathymetric maps of the nearshore zone, identifying critical habitats to guide infrastructure and energy development in nearshore waters.
- For both lakes, investigate and promote voluntary implementation of beneficial management practices to protect vulnerable reaches of the shoreline, including offshore wave attenuation, “soft engineering” methods, and conservation easements specifically targeted to shoreline conservation with local land trusts.
- Additional actions to be added through public comment.

PROMOTE SUSTAINABLE DEVELOPMENT

Rather than looking at social and economic activities as separate and distinct from the natural ecosystem, this Action Agenda purposely integrates relevant social, environmental and economic goals. By undertaking a more coordinated approach to improving the health of the Great Lakes ecosystem (i.e., a premise of EBM), many related human and community goals for this region will be addressed, especially economic development and environmental justice. Clearly, people and communities derive important, and often overlooked, services from the ecosystems we live in. Integration and balancing economic, social and environmental goals will help to achieve a healthy and sustainable future for the people of New York's Great Lakes region.

Goal 8: Promote Smart Growth, Redevelopment and Adaptive Reuse to create a sustainable and vibrant economy in the Great Lakes ecosystem.

Challenge:

Over the course of several decades, many Great Lakes urban centers have experienced a dramatic decline of the manufacturing sector, population out-migration, suburbanization, shrinking revenues and overall economic distress. Cities in the region host many under-utilized "brownfield" sites, vacant industrial buildings, and distressed or abandoned residential buildings. A focus on re-development of urban centers offers the opportunity to improve the economy and ecosystem health and address environmental justice at the same time.

New York State agencies have been exploring how to use good planning to create livable communities, protect natural resources, and promote economic growth. Through the application of smart growth principles, State and municipal government can use planning, zoning, property tax, and infrastructure investment policies¹² to encourage redevelopment and concentrate new development near transportation nodes and existing infrastructure, promote the use of public transit, avoid sprawl, and create sustainable communities. Smart growth approaches have clear environmental benefits: improved air and water quality, reduction of greenhouse gas emissions, greater habitat and open space protection, farmland preservation, clean-up and re-use of brownfield sites, elimination of blight, and fish and wildlife protection.

By strategically focusing State financial support and land use development to existing urban areas, the Great Lakes region can accomplish its economic development goals, leverage the value of existing infrastructure, reduce development pressure in greenfields, and support the State's climate change mitigation goals. Also, smart growth development patterns can have the benefit of reducing the costs of providing public infrastructure and delivering services thereby enhancing the region's economic competitiveness.

¹² In August of 2010 the "State Smart Growth Public Infrastructure Policy Act" was enacted (Chapter 433). The new law establishes state smart growth criteria, in order to direct public infrastructure investments toward existing infrastructure, developed areas and municipal centers, such as downtowns, main streets, central business districts and brownfield areas.

Actions and Measurable Targets:

- Implement a program to encourage communities to develop regional sustainable growth strategies, which would provide funding for innovative comprehensive regional plans that coordinate sustainability efforts in housing, transportation, emissions control, energy efficiency and job creation, while taking into account the cumulative impact of prior development.
- Promote strategies that integrate brownfield redevelopment, green infrastructure principles/practices and local waterfront redevelopment planning.
- Identify options to enable and expand the use of public transit and to reduce run-off of pollutants from highways and other paved urban areas.
- Implement mixed-use, smart-growth, land-use and planning policies that result in reduction of vehicle-miles-traveled within the region.
- Invest in environmental remediation and reuse in urban centers, economic justice communities and distressed waterfronts.
- Encourage/capitalize local programs that invest in affordable housing and residential energy conservation in existing buildings.
- Additional actions to be added through public comment.

Goal 9: Enhance Recreation and Tourism Opportunities that capitalize on the rivers and lakes, beauty and natural and cultural resources that define the character of the Great Lakes-St. Lawrence region.

Challenge:

New York's Great Lakes region offers outstanding tourism and recreation opportunities: world-class freshwater fishing and boating; eco-tourism and agri-tourism experiences such as birding, winery tours and hiking trails, heritage tourism, and beautiful state parks. Lakefront communities are increasingly seen as attractive places, with municipalities emphasizing waterfront revitalization as a key economic development strategy.

Water resources provide the backdrop for many of the wonderful tourism offerings of the Great Lakes Basin. The location of urban centers such as Buffalo, Rochester, Oswego and Niagara Falls fronting on the major lakes and rivers provides opportunities to capitalize on the growing interest in accessing waterfront areas for commercial and recreational uses.

The enjoyment of the Great Lakes ecosystem provides substantial economic benefits to the region. Based on the 2007 New York Statewide Angler Survey, the New York Great Lakes sport fishery was valued at \$170 million annually. In total, over 4 million angler days were spent fishing on our Great Lakes waters, representing about 22% of all freshwater fishing in New York. Recreational boating in the region, similarly, provides substantial positive economic impact. Expenditures related to recreational boating in New York areas bordering the Great Lakes and Finger Lakes amounted to \$600 million in 2003.¹³

¹³ "Great Lakes Recreational Boating's Economic Punch" Great Lakes Commission, July 2007. "Recreational Boating Expenditures in 2003 in New York State and Their Economic Impacts"

The broader Great Lakes watersheds have varied landscapes that are the underlying assets that generate significant recreational and tourism activity. The Tug Hill Plateau is famous for its natural beauty, skiing, and snowmobiling. Tourism and recreation are important economic drivers for both the Finger Lakes and St. Lawrence-Thousand Island regions.

Additional boating access and shore fishing opportunities are needed throughout the Great Lakes system. The most recent thorough analysis of the need and opportunities for improving waterfront access was completed in 1982.¹⁴ While many access sites were accomplished, as result of that evaluation, additional public access is still needed. With funding from a Natural Resources Damages settlement with Occidental Chemical Corp., boating and shore fishing access sites along Lake Ontario and the St. Lawrence River are being created and improved.¹⁵

Public access to desirable swimming, fishing, and boating recreation opportunities is vital to maintain and enhance recreation and tourism opportunities in the region. Improving access to the water needs to be balanced with the danger of increasing the spread of aquatic invasive species.

- **Demand:** The Statewide Comprehensive Outdoor Recreation Plan (SCORP) assesses the projected Relative Index of Need (RIN) for recreation opportunities of various types through statistical analysis of public recreation demands. Use SCORP to demonstrate a high demand for water related recreation such as fishing, boating, swimming, and beach going..
- **Competition:** High demands for these types of recreation opportunities can, in turn, provide further validation for programs that improve water quality. Maintaining excellent water quality is an important factor in bringing tourism and recreation dollars to the region given that there is competition in the area from other water related recreation centers.

Increasing public appreciation and stewardship of the natural resources of the Great Lakes region should be part of any efforts to enhance recreation and tourism in the region.

Recreation opportunities and sustainable development in parks and recreation areas should not be overlooked. Boating access facilities should be constructed or improved to remain functional under the various water level regimes. Also, existing and future park master plans in the Great Lakes Basin should balance promoting tourism enhancement at State parks while at the same time protecting their natural resources.

Education and interpretation of resources within the basin can also be regarded as a recreation and tourism enhancement. Again, this type of activity will be directly related to an

¹⁴ Recommendations for New York Waterway Access Development Phase 1. Great Lakes System (Lake Erie, the Niagara River, Lake Ontario, the St. Lawrence River and important tributary stream), NYSDEC publication, May 1982.

¹⁵ "Final sportfishing restoration and spending plan for the Lake Ontario System", NYSDEC publication, October 2007.

assessment of the demand. Highly sought after activities such as bird watching, nature hikes and cultural resource tours depend on the protection of the resources.

Actions and Measurable Targets:

- Promote development of local waterfront revitalization plans as well as updating and promotion of adherence to existing waterfront plans consistent with smart growth principles.
- Inventory cultural resources within the region and develop for connectivity with each other and with community centers
- Use the Relative Index of Need and Activity Analysis in SCORP as a means to measure progress in meeting demand for recreation activities in the Basin.
- Measure user satisfaction at recreation areas across the Basin as an indicator of improved or impacted resources – especially in St. Lawrence River and Lake Ontario.
- Achieve a balance of recreational use and resource protection through proper planning, monitoring techniques.
- All public boat landings need to be accompanied with signage to encourage best management practices for prevention of invasive species, including facilities for inspection and water craft cleaning and for controlled pump-out of bilge/sewage waters to allow effective treatment. Such facilities also need to be added to existing high use private landings around the basin.
- Build on existing State plans and programming that promote tourism in the region.
- Include Great Lakes initiatives in all plans for park and recreation areas in the basin.
- Increase public access to Great Lakes waterfronts consistent with Smart growth principles, and in a manner that incorporates strategies to ensure that increased access does not lead to increased spread of aquatic invasive species.
- Implement State Park master plans to enhance recreational access.
- Fund SCORP to provide local governments and non-profits opportunity to advance community recreational projects.
- Enhance trails that connect communities and natural systems.
- Create long-term dredge management plans for commercial and recreational harbors along Lake Ontario and Lake Erie.
- Additional actions to be added through public comment.

Goal 10: Plan for Energy Development consistent with natural resource conservation and supportive of the State's energy and climate change goals.

Challenge:

Energy is critical to the future of the Great Lakes region by supporting the local economy, creating jobs, and providing energy for the State. Government's challenge is to ensure that the energy demands of New York State are met, while emphasizing energy efficiency and the use of clean and renewable technologies. Future energy development activities in the Great Lakes

region must also take into account the other ecosystem goals, enumerated in this Agenda, which are directed to ensure ecosystem integrity and public health. Energy planning needs to integrate the State's energy and climate change goals by accelerating the introduction of zero- or low-carbon sources of power such as renewable energy, and potentially nuclear energy, while maintaining the reliability of the electric grid.

As the energy market continues to evolve, New York will need to find ways to balance increasing energy demand with other priorities. There are currently over 200 operating land-based wind generators taking advantage of Lake Erie and Lake Ontario winds; several nuclear and coal fired power plants that use lake water for cooling; hydroelectric dams on the Niagara and St. Lawrence Rivers; and a biofuel plant in Oswego. Many proposals are being considered for additional generation and transmission facilities in the Great Lakes region, including lake-based offshore wind energy production. It is important to acknowledge that all energy related activities in the region will affect Great Lake ecosystems in some way. It is essential that a comparison of life-cycle impacts be considered in decision-making and that the siting of new technologies and upgrading of existing technologies be evaluated for local, regional, national and global impacts.

There are two core challenges facing the energy sector. The first is to determine how existing energy facilities can be modified to reduce their human and environmental impacts, while maintaining their regional and local benefits. The second challenge is to develop new energy-generating facilities that incorporate EBM principles, consider potential climate-change impacts and build resilience for meeting peak demand.

It is essential that all energy production and transmission facilities minimize both their direct and indirect environmental impacts to the extent practical. Examples of direct impacts include disruption of fish life-cycle stages, habitat fragmentation, point-source thermal discharge, and avian strikes. Indirect impacts include acid and mercury deposition, degradation of air quality and aquatic habitats, alteration of productive agricultural and forested landscapes that provide corridors for wildlife mobility and recreational use and climate change.

While future changes to the climate of the Great Lakes Basin are difficult to quantify, it is clear that expected higher seasonal average temperatures and increased frequency of extreme heat events will result in increased energy use and/or increased reliance on demand response mechanisms, energy storage and other energy resources to meet peak electrical demand. New York's existing and future energy development projects must balance the need to meet the demands of the energy marketplace and provide jobs and local tax revenue, while minimizing environmental impacts and being resilient to climate change effects. It is imperative to assess the cumulative impacts of existing and future energy projects in New York through the application of EBM principles.

There has been increasing interest in the potential to use the Great Lakes to meet the renewable energy needs of the region, especially offshore wind development. Underwater lands near shore are under the jurisdiction of the Office of General Services (OGS), and the State has the authority to grant leases for the use of underwater lands targeted for offshore wind development. To best guide potential future developments and to address possible user

conflicts and resource protection, New York State should undertake a lake-based spatial planning process for its portion of Lakes Erie and Ontario. This planning should take a proactive approach to protecting ecological health, appropriate siting of energy facilities and transmission lines, and acknowledgement of the many existing, and sometimes competing, uses of the lakes. Comprehensive analyses should address: impacts on habitats and biota, visual aesthetics, sound related issues, commercial and recreational fishing, recreational boating, shipping and transportation, and submerged cultural resources. The cumulative impacts of offshore wind development in New York and Ontario waters must be addressed and considered against other energy alternatives and their associated impacts on ecosystems.

Actions and Measurable Targets:

- Implement spatial planning for offshore areas within the Lakes that integrates energy generation and transmission, with habitat protection and other uses.
- In combination with statewide policy initiatives, make investments within the region which could improve and maintain the performance of the grid (e.g., transmission and distribution network upgrading, energy storage) with increasing use of intermittent energy sources such as wind generation.
- Incorporate best available projections of changes in seasonal average temperatures and increased frequency of extreme heat events in near- and long-term demand forecasting for electricity and natural gas.
- Plan to meet regional demand growth and improved system resiliency by expanding local implementation of demand response and energy efficiency measures, localized distributed generation, energy storage, other energy-supply technologies, and smart-grid technologies.
- Additional actions to be added through public comment.

FOSTER LONG-TERM COORDINATED ACTION

Goal 11: Support Partnerships and Build Capacity to ensure the collaboration and accountability necessary to achieve results.

Challenge:

The condition of the Great Lakes ecosystem is constantly evolving in response to chemical and biological threats and new physical and other anthropogenic impacts that alter the natural watersheds. An effective response to these new challenges demands a broad array of expertise and depth of resources beyond what any single agency or organization can contribute. Thankfully, there are a great number of organizations that have been working for many years to restore and protect the Great Lakes ecosystem — federal, state, and local agencies, numerous non-profit organizations, diverse educational institutions, and private entities. As mentioned earlier, there are a great many published Great Lakes plans, agreements, and strategies. Our challenge in New York is to maximize the effectiveness of these organizations. This will require new mechanisms that get these diverse groups to work collaboratively toward well-known, common goals and to build the capacity for action on

priority implementation measures. This Action Agenda is one important step toward that achieving efficient collaboration.

The importance of effective collaboration cannot be overstated. Partnerships can avoid duplicative efforts and address the need for efficient and effective use of resources, especially in a tight fiscal climate. The variety of partners can each bring their own knowledge and skills, and the integration of actions by numerous partners can bring better solutions and well-grounded decisions. Frameworks should be encouraged and supported for communication and collaboration between agency and external organizations to advance this Action Agenda and to make more aggressive progress.

For example, many federal funding opportunities now promote “implementation-oriented” projects. But such projects typically require extensive planning, design and organization before a major project can be implemented. Most non-government organizations, although able to muster the resources needed for implementation, lack the management and scientific capacity to accomplish these up-front activities. Universities and scientific institutions can offer scientific and technical expertise to project design and monitoring but are limited in offering sufficient teams of people that can perform over extended or sporadic timeframes. Likewise, although state and local governments can offer limited capacity to formulate and plan projects, they lack the capacity to implement and monitor the long-term effectiveness of projects.

Therefore, new approaches for achieving effective and cost-efficient partnerships must be created to span such “capacity gaps” and to enable comprehensive planning, performance and demonstration of success at various state, regional and local levels.

Actions and Measurable Targets:

- Continue the activities of the NY Ocean and Great Lakes Ecosystem Conservation Council as a mechanism to promote ecosystem-based management and to coordinate State level actions within the Great Lakes Basin.
- Form a Lake Erie Watershed Alliance, to complement FL-LOWPA, by facilitating more effective and efficient resource actions are implemented at the local government level within Lake Erie Basin.
- Enhance the use of SUNY Centers of Excellence to provide specialized public policy, scientific and technical assistance.
- Highlight the role and fill vacancies on the Great Lakes Basin Advisory Council to improve stakeholder oversight and advisory communications.
- Reinvigorate the NYS Coalition of Great Lakes Legislators to use their collective strength from around the basin to enact effective programs and policies that protect and restore our Great Lakes.
- Create a New York Great Lakes Institute that coordinates the efforts of multiple non-government organizations, provides capacity for project administration, planning and design, and reports on overall progress to improve the public understanding of Great Lakes benefits, threats and successes.
- Additional actions to be added through public comment.

Goal 12: Promote Public Understanding of the Great Lakes Ecosystem, including its important natural resources, challenges, and value to the region's communities in order to enhance community stewardship.

Challenge:

The wealth of scientific information and plans for the Great Lakes may be compelling, but their value will not be realized if they are not accessible, widely known, and put to good use. Moving forward on a collaborative action agenda requires a shared understanding of the region's issues and broad public support for the identified actions.

The multitude of existing plans, amount of data and breadth of identified actions over such a large geographic region is staggering for many. To make progress in a manner that maintains the strategic vision, stakeholders need readily accessible information about the state of each lake and its ecosystem, including existing conditions, stressors and their trends, progress over time, and emerging issues. To the degree it is available, access to such information at a more localized scale, can also be useful to assist management agencies and local organizations as they consider choices for restoration and implementation that are consistent with a shared vision.

Public communication of such information is important to build support for needed actions and to encourage future stewardship by residents and user groups. Thus, environmental education and communication is a key component of this overall Action Agenda.

Actions and Measurable Targets:

- Synthesize and publicize existing information on conditions in Lake Erie and Lake Ontario ecosystems and the Niagara and St. Lawrence Rivers.
- Create education and interpretation programs and informational resource tool-kits for curriculum development on basin-wide issues
- Create web-based applications and public events that bring diverse partners and stakeholders together to update progress, share best practices, celebrate exemplar cases, provide trainings, and build linkages.
- Enhance the distribution of the New York State Department of Health's public advisory on recreational fishing which is given with every purchased fishing license.
- Develop a website to educate the public about the water quality of State Park coastal beaches and provide the public with water quality results and potential pollutant sources.
- Support environmental education staffing at visitor centers, and other locations for school groups and others to increase understanding of Great Lakes.
- Develop a web-based GIS application that lets the public query local water bodies for data, including summarizing information on water quality and threats, fish contaminants, and emerging issues in need of research and surveillance.
- Continue to participate in the Great Lakes Consortium of State Fish Advisory Programs, funded by a GLRI grant to Minnesota, to share and coordinate information on fish consumption advisories and data on fish contaminants among the Great Lakes states.

Use Consortium and other resources to increase public awareness and understanding of fish consumption advisories.

- Additional actions to be added through public comment.

MAINTAIN STRONG SCIENTIFIC BASIS FOR DECISIONS

Goal 13: Enhance Coordinated Science, Monitoring and Information Management to document environmental conditions and progress and to support decision-making on natural resource management and implementation measures.

Challenge:

The Great Lakes region has seen substantial improvements in environmental quality since the 1970s. The results have derived from the enactment of federal and state laws, bi-national programs deriving from the GLWQA, and investment by all levels of government.

Maintaining and improving the base of scientific information about the Great Lakes ecosystem is essential, in order to document success and support future management actions. Research and monitoring programs, including the Great Lakes Observing System, are critical to provide information on air deposition, climate change, the status of wildlife and habitats, invasive species and water quality and to increase management effectiveness. Better knowledge of the interconnections between all components of the ecosystem is important to making accurate predictions of change and to evaluate risks. The findings of scientific research and long-term monitoring need to inform better management planning and decision-making for Great Lakes resources.

Management approaches to environmental quality, wildlife, and other Great Lakes natural resources require enhanced data collection and monitoring and a determination of the desired restoration and management goals.

Actions and Measurable Targets:

- Convene an annual Great Lakes scientific conference or summit within New York State to inform multiple stakeholders about coordinated scientific and monitoring priorities of the lakes, to recognize exemplary research projects and EBM projects and to share research findings related to the Great Lakes ecosystem.¹⁶
- Through the assistance of the various scientific institutions and organizations within New York, develop a targeted set of research needs that will be pursued in the short term, are consistent with the Lake Erie and Lake Ontario LaMPs' Coordinated Science and Monitoring priorities, that reflect current state management efforts, and promote effective collaboration of funding and partnerships.

¹⁶ Build on existing annual State of the Lakes Conferences (DEC and GLFC), annual International Association of Great Lakes Research conference, State of the Lakes Ecosystem Conference, etc.

- Develop improved understanding of the region's biodiversity and relationships between species and their habitats.
- Make appropriate investments, which complement existing programs that would effectuate a unified and spatially extensive network to monitor physical and biotic variables in the nearshore zone of Lake Ontario.
- Improve understanding of the spatial and temporal trends in nutrient concentrations in Lake Ontario's nearshore zone, and correlate to non-point source pollution which derives from particular watersheds.
- Undertake an ecosystem modeling analysis of the effects of climate change, in order to predict the potential impacts of flooding, erosion, and altered precipitation quantities that may occur and their affects on communities and infrastructure, habitats, fish and wildlife.
- Define the trophic pathway of botulism toxin to fish and birds, thereby leading to management practices that could prevent and/or at least predict future outbreaks. In particular, a rapid, sensitive, and inexpensive assay for quantification of the botulism toxin needs to be developed for tracking the toxin's transmission pathway through the aquatic food web.
- Redesign the fish contaminants database to take advantage of modern database technology to enable efficient data loading, management, query, analysis and distribution of fish contaminant data.
- Assess presence and population effects of environmentally available endocrine disruptors by determining the prevalence of intersex individuals in fish populations in the Great Lakes and selected tributary streams.
- Continue to document progress and outstanding issues such as work which was accomplished pursuant to the Great Lakes Binational Toxics Strategy and Great Lakes Regional Collaboration (GLRC) Strategy on identifying sources and reduction strategies for mercury.
- Develop a GIS-based database on all potential pollution sources in watersheds surrounding at least six State Parks, Forests and/or Wildlife Conservation Areas within the Great Lakes watersheds.
- To support adaptive management of the shorelines of both lakes, and responsive regulation of the levels and flows of Lake Ontario and the St. Lawrence River, work with federal, state, and Canadian partners to design, support, and implement by 2012 scientific monitoring of coastal wetlands, other coastal habitats, and human infrastructure.
- Develop a statewide early-detection, rapid response surveillance program for invasive species, particularly high-risk aquatic invasive species.
- Additional actions to be added through public comment.

LOOKING TO THE FUTURE

The importance of aggressively moving to act on the priorities identified in this Action Agenda cannot be overstated. To be effective, methods for coordination and integration of effort, on a basin-wide basis, will need to be put into place. The involvement of stakeholders and the

creation of partnerships with established programs and organizations will be vital to our success to act on the identified priority actions measures.

Elements for future discussion include:

- Governance/coordination;
- Process for updating the Action Agenda;
- Results and Accountability;
- Reporting.

REFERENCES FOR MORE INFORMATION

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

Great Lakes Restoration Initiative Action Plan, FY2010-2014 (February 2010)

Great Lakes Regional Collaboration Strategy (December 2005)

Great Lakes Binational Toxics Strategy: Canada - United States Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes (April 7, 1997; December 2008 status report)

Joint Strategic Plan for Management of Great Lakes Fisheries (1981; revised 1997)

Fish-Community Goals and Objectives for Lake Erie (2003)

Lake Erie Environmental Objectives (2005)

A Strategic Plan for the Rehabilitation of Lake Trout in Lake Erie, 2008-2020 (December 2008)

Fish-Community Objectives for Lake Ontario (1999; 2003 Update)

Fish-Community Objectives for the St. Lawrence River (December 14, 2001 draft)

"The Beautiful Lake: A Biodiversity Conservation Strategy for Lake Ontario" (April 2009; update July 2009)

Great Lakes-St. Lawrence River Basin Water Resources Compact

Lake Erie Lake Management Plan (LaMP) (2000; 2008 Update)

Lake Ontario Lake Management Plan (LaMP) (1998; 2008 Update)

Niagara River Toxics Management Plan (November 1998; 2009 Annual Status Report)

Buffalo River Remedial Action Plan (RAP) (1989; 2005 Status Report)

Eighteenmile Creek Remedial Action Plan (RAP) (1997; 2001 Update)

Niagara River Remedial Action Plan (RAP) (2000)

Rochester Embayment Remedial Action Plan (RAP) (Stage 1 1993; Stage 2 1997)

St. Lawrence River at Massena Remedial Action Plan (RAP) (Stage 1 1990; Stage 2 1991; 2006 Status Report)

International St. Lawrence River Board of Control Water Level/Flow Control Plan

International Niagara River Board of Control Water Level/Flow Control Plan

Lake Erie Millennium Plan

Our Great Lakes Water Resources: Conserving and Protecting Our Water Today for Use Tomorrow (July 2009)

Our Waters, Our Communities, Our Future: Taking Bold Action Now to Achieve Long-term Sustainability of New York's Ocean and Great Lakes (April 2009)

New York State Comprehensive Wildlife Conservation Strategy (September 2005)

North American Waterfowl Management Plan (1986; 1998 update; 2004 Implementation Framework)

New York State Open Space Conservation Plan (2009)

State Of the Lakes Ecosystem Conference (SOLEC) reports (1993, 1995, 1997, 1999, 2001, 2003, 2005, 2007, 2009)

IJC Biennial Reports on Great Lakes Water Quality

National Assessment of Water Availability and Use: Great Lakes Basin Pilot

The Importance of Ground Water in the Great Lakes Region (U.S. Geological Survey, 2000, N.G. Grannemann, R.J. Hunt, J.R. Nicholas, T.E. Reilly, and T.C. Winter)

Appendix 1: Ecosystem-based Management Vision, Goals and Objectives of Lake Ontario Lakewide Management Plan (LaMP)¹⁷

Ecosystem Goals:

- The Lake Ontario ecosystem should be maintained and, as necessary, restored or enhanced to support self-reproducing and diverse biological communities;
- The presence of contaminants shall not limit uses of fish, wildlife and waters of the Lake Ontario basin by humans, and shall not cause adverse health effects in plants and animals;
- We, as a society, shall recognize our capacity to cause great changes in the ecosystem and we shall conduct our activities with responsible stewardship for the Lake Ontario basin.

Ecosystem Objectives:

1. Aquatic Communities - The waters of Lake Ontario shall support diverse and healthy, reproducing and self-sustaining communities in dynamic equilibrium, with an emphasis on native species. Also, support Lake Ontario Committee's Fish Community Objectives.
2. Wildlife - The perpetuation of a healthy, diverse and self-sustaining wildlife community that uses the lake habitat and/or food shall be ensured by attaining and sustaining the waters, coastal wetlands, and upland habitats of the Lake Ontario basin in sufficient quantity and quality.
3. Human Health - The waters, plants and animals of Lake Ontario shall be free from contaminants and organisms resulting from human activities at levels that affect human health or aesthetic factors, such as tainting, odor and turbidity.
4. Habitat - Lake Ontario offshore and nearshore zones, surrounding tributary, wetland and upland habitats shall be of sufficient quality and quantity to support ecosystem objectives for the health, productivity and distribution of plants and animals in and adjacent to Lake Ontario.
5. Stewardship - Human activities and decisions shall embrace environmental ethics and a commitment to responsible stewardship.

Ecosystem Indicators:

1. Critical Pollutant Concentrations in (a) offshore waters, (b) young-of-year fish, (c) herring gull eggs, (d) lake trout, and (e) as compared to existing agency guidelines.
2. Lower Foodweb Status & Trends in (a) nutrients, (b) zooplankton and phytoplankton, and (c) prey fish.
3. Upper Foodweb Status & Trends in the health of (a) herring gulls, (b) lake trout, (c) bald eagles, and (d) mink and otter populations.
4. Coastal Wetlands (a) periodicity of low level events, (b) percent meadow marsh cover, and (c) changes in total wetlands surface area.

¹⁷ <http://epa.gov/greatlakes/ontario.html>

Appendix 2: Ecosystem-based Management Vision, Goals and Objectives of Lake Erie Lakewide Management Plan (LaMP)¹⁸

Vision – is a Lake Erie basin ecosystem where ...

- All people, recognizing the fundamental links among the health of the ecosystem, their individual actions, and the economic and physical well-being, work to minimize the human impact in the Lake Erie basin and beyond;
- Natural resources are protected from known, preventable threats;
- Native biodiversity and the health and function of natural communities are protected and restored to the greatest extent feasible;
- Natural resources are managed to ensure that the integrity of existing communities is maintained or improved;
- Human-modified landscapes provide functions that approximate natural ecosystem processes;
- Land and water are managed so water flow regimes and associated amount of materials transported mimic natural cycles; and
- Environmental health continually improves due to virtual elimination of toxic contaminants and remedial actions at formerly degraded and/or contaminated sites.

Ecosystem Management Objectives:

1. Land Use

Strategic Objective (SO) – Land-based activities enhance native biodiversity and ecosystem integrity.

Tactical Objective (TO) – Land use activities result in gains in the quantity and quality of natural habitat in order to support the maximum amount of native biodiversity and community integrity that can be achieved and be sustained for the benefit of future generations.

2. Nutrients

SO – Nutrient levels are consistent with ecosystem goals (watershed and basin-wide).

TO – Nutrient inputs from both point and non-point sources are managed to ensure that ambient concentrations are within bounds of sustainable watershed management and consistent with the Lake Erie vision.

3. Natural Resource Use and Disturbance

SO – Ecologically wise and sustainable use of natural resources.

TO – Natural resource use (e.g. commercial and sport fishing, hunting, trapping, logging, water withdrawal, mining, etc.) and disturbances by human presence or activity

¹⁸ <http://epa.gov/greatlakes/erie/html>

be managed to ensure that the integrity of existing healthy ecological communities be maintained and/or improved, and provide long-term benefits to consumers, and to support the Lake Erie Committee's Fish Community Objectives.

4. Chemical & Biological Contaminants

SO – Virtual elimination of toxic chemicals and biological contaminants.

TO – Toxic chemicals and biological contaminant concentrations within the basin must be continually reduced.

5. Non-Native Species

SO – Prevent further invasions of non-native species. Control existing invasive non-native species where possible.

TO – Non-native invasive species should be prevented from colonizing the Lake Erie ecosystem. Existing non-native invasive species should be controlled and reduced where feasible and consistent with other objectives.

6. Areas of Concern (AOC)

SO – Delist all designated Areas of Concern within the Lake Erie basin.

TO – Restore the Beneficial Use Impairments (BUI) designated within each AOC's Remedial Action Plan (RAP) to meet their respective target objectives.

Appendix 3

Beneficial Use Impairment (BUI) Indicators Status of New York State AOCs - January 2010

Use Impairment	Niagara River (U.S.)	St. Lawrence at Massena+ (U.S.)	Eighteen-mile Creek	Rochester Embayment	Buffalo River	Oswego River (Delisted '06)
1. Restrictions on Fish and Wildlife Consumption	I	I	I	I to D®w	I	I to D®
2. Tainting of Fish and Wildlife Flavor	N	N	N	I*	I* to Dw	I* to D
3. Degradation of Fish and Wildlife Populations	I* to DRw or D®w	I* to DRwo or D®wo	I* to I	I to Dw	I*	I to D®
4. Fish Tumors or Other Deformities	I	I*	I* to N	I* to I	I	I* to D
5. Bird / Animal Deform. or Reproductive Problems	I*	I*	I*	I	I* to Dw	I* to D
6. Degradation of Benthos	I	I*	I	I*∞	I	I* to D
7. Restrictions on Dredging Activities	I	N	I	I	I	N
8. Eutrophication or Undesirable Algae	N	N	N	I to D®w	I* to N	I to D
9. Drinking Water Consumption Restrictions, or Taste and Odor Problems	N	N	N	I to Dp (only T&O)	N	N
10. Beach Closings	N	N	N	I	N	N
11. Degradation of Aesthetics	N	N	N	I	I	I* to D
12. Added Costs to Agriculture or Industry	N	N	N	I to Dp	N	N
13. Degradation of Phytoplankton and Zooplankton Populations	N	I* to Dw	N	I*∞	I* to N	I* to D
14. Loss of Fish and Wildlife Habitat	I	I to DRwo or D®wo	N	I to Dw or DRw	I	I to D®

BUI Indicator Status Key 2010:

I = Impaired
D = Delisted
N = Not Impaired

Other Notations:

® = Delisted (Restoration by Other Responsibility)
R = Delisted in Recovery (Remedial Work Accomplished)
* = Inconclusive (Needs Further Assessment)
+ = Transboundary Impacts are an added consideration
p = pending
w = working on
∞ = Lower Genesee River Impaired, Embayment Needs Study
o = may apply to only part of the AOC

USEPA AOC Website: <http://www.epa.gov/glnpo/aoc/>