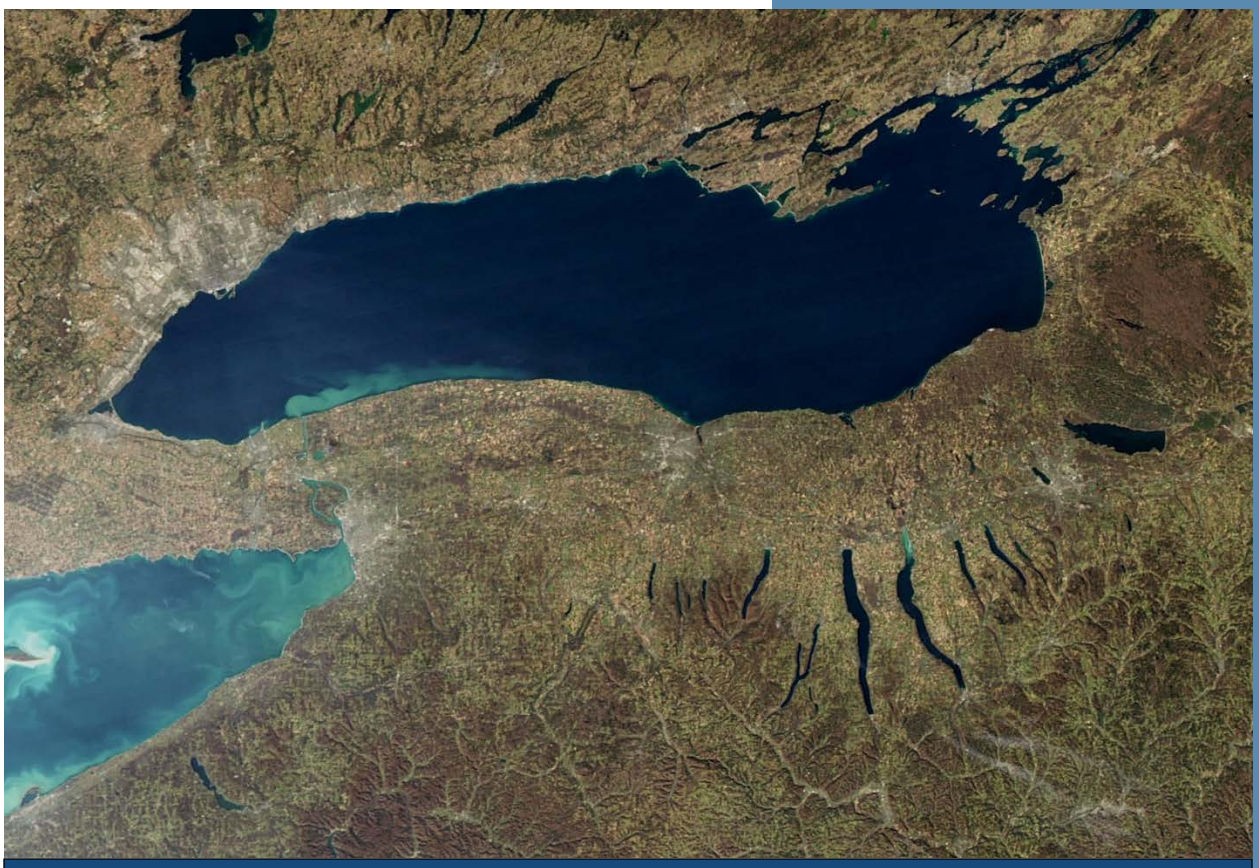

Proceedings Report on Great Lakes Coastal and Nearshore Habitat Assessment Project—New York

January 28, 2020

Syracuse Center of Excellence

727 East Washington St

Syracuse, NY 13120

9:00 am – 4:00 pm

Prepared for:

Coastal States Organization

FINAL

3/25/2020

LimnoTech

Water Environment | Scientists Engineers

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LimnoTech
501 Avis Dr
Ann Arbor, MI 48108

Funding for this project provided by Great Lakes Restoration Initiative

Workshop developed in partnership with:

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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Introduction

Many Great Lakes shoreline reaches have deteriorated in function and quality due in part to land use change, shoreline alterations, coastal infrastructure, and other influences. Effective restoration actions in these dynamic, complex systems require integrated approaches to enhance coastal biodiversity and promote ecological resilience. To help facilitate the development of these approaches, National Oceanic and Atmospheric Administration (NOAA), the Coastal States Organization (CSO), and Great Lakes Coastal Zone Management Programs conducted workshops in each of the eight Great Lakes states. These workshops were an opportunity for state-level partners to influence the direction of potential future restoration actions in the Great Lakes, and to advocate for funding to be spent at state-prioritized locations for coastal restoration and habitat objectives.

The overarching purpose of these workshops was to convene stakeholders and partners and to identify shared coastal management principles, goals, priorities, currently available data sources, and outstanding data needs. Emphasis was on identifying, to the extent possible, place-based actions; partners who could support the planning, execution, and maintenance of restoration actions; and identifying and describing data needs associated with these preferred actions. To meet these objectives, state partners developed invitee lists that drew from a wide range of partners, including representatives from local, state, federal, and tribal organizations. A full summary of the workshop invitees and attendees is provided in Section 5.

The workshop results are based on the events of the day and participants in attendance. Organizers made an effort to invite a representative, broad based group of experts. Results are not intended to replace or supplant any current or future planned processes. Many of the projects proposed during the workshop were purely conceptual—representing "best guesses" by workshop participants—and have not been fully vetted or sanctioned by all of the necessary resource agencies, landowners, etc. Therefore, project concepts identified in this report are not final and may be subject to change.

This report covers the proceedings of the one-day workshop held in Syracuse, NY on Tuesday, January 28, 2020 as well as the background materials used during the workshop.

1 Morning Session (9:00 AM – 12:00 PM)

1.1 Opening Remarks

Mike Molnar from the Coastal States Organization (CSO) started the meeting with introductions and by providing the following background on the workshops:

This series of workshops is an outgrowth of three years of work between CSO, the US Army Corps of Engineers (USACE), NOAA, other Federal Agency partners, and each of the Great Lakes State Coastal Programs to address coastal resiliency issues in the Great Lakes Region. Group efforts originally focused on developing scope of work, and securing funding for the Great Lakes Coastal Resiliency Study (GLCRS). The purpose of the proposed GLCRS was to assess coastal conditions, and develop a risk based management approach for the next 50 years. While the GLCRS did not receive funding in the FY20 USACE budget, and future direction is uncertain at this time; this workshop is an outgrowth of the GLCRS discussions and an opportunity to align state habitat restoration needs with the EPA Great Lakes Restoration Initiative (GLRI) Action Plan. Funding for the workshops provided by agreement with NOAA Office for Coastal Management via US EPA GLRI Focus Area 4. State-level partners worked together to identify and numerically rank habitat restoration projects that align with the restoration goals identified by the GLRI *Focus Area 4—Species and Habitat* in the draft GLRI Action Plan III (USEPA, 2019). The study area for restoration projects extends from the 80-m bathymetry contour in Lake Ontario waters and the 15-m bathymetry contour in Lake Erie waters to the ordinary high water mark including terrestrial or inland aquatic habitats including "connecting habitats for coastal species or critical zones of influence for priority nearshore areas" (FA4 Coastal Systems Work Group) (Figure 1).

The goals of this workshop are to:

1. Identify shared coastal restoration principles and goals for New York;
2. Develop a list of coastal and nearshore habitat restoration projects for funding in FY21 and beyond that target habitat benefits for lake trout, walleye, lake sturgeon, yellow perch, cisco, and migratory birds and waterfowl; and,
3. Develop a list of available data, identify gaps, and prioritize data needs.

At the conclusion of all state workshops, NOAA will coordinate with other state and federal partners to identify funding mechanisms and determine potential projects to fund. NOAA OCM, NOAA Restoration Center, USFWS, USACE, USGS, EPA, and NFWF, amongst other funders, will look to this list for projects to fund.

Figure 1. Map of the New York Study Area

1.2 Overview Workshop and Agenda

The workshop agenda is summarized in Table 1.

Table 1. Workshop Agenda

Workshop Segment	Purpose	Format
Introduction (9-9:20 AM)	Describe workshop purpose, preview agenda	Welcome and introductory statements
Icebreaker Activity (9:20-9:40)	Prepare group for interactive workshop	
Shared Principles and Goals: An overview of state and regional plans (9:40-10)	Prepare audience for discussions by providing overview of past communicated priorities, and identifying	Very brief presentation summarizing state-level reports and GLRI Action Plan III Focus Area 4

	alignments with GLRI Action Plan III Focus Area 4	
Identification of Coastal Habitat Principles (10-10:25)	Start prioritization process by considering high-level principles guiding action	Small group brainstorming and reporting cycles for two questions prompting discussion
Mid-Morning Break		
Identification of Coastal Habitat Goals (10:45-12:00)	Transition to identification of regional or species-specific goals, target 3-5 goals per region	Small group brainstorming organized by region
Lunch Break		
Identifying and Prioritizing Projects and Locations: An overview of state and regional plans (12:30-12:50)	Prepare audience for discussions of project prioritization and data needs by summarizing past projects	Very brief presentation summarizing past projects
Identification and Prioritization of Project Locations (12:50-2:20)	Roughly identify extent of potential projects and prioritize these. Complete worksheets summarizing potential project details.	Small group identification of potential projects on physical maps organized by region
Mid-Afternoon Break		
Overview of Data Availability (2:35-2:45)	Prepare audience for discussion of data gaps by summarizing presently available data	Very brief presentation of available data related to habitat
Collaborative Identification of Data Needs (2:45 – 3:45)	Identify data gaps and articulate why these data are needed. Complete worksheets summarizing data needs.	
Wrap-up and Evaluation (3:45 – 4)	Note forthcoming reports and request completion of evaluation forms	Paper evaluation form

1.3 Shared Principles and Goals: A Review of State and Regional Plans

Before working together to identify common habitat restoration goals and principles, LimnoTech staff gave a brief presentation highlighting regional principles and goals for habitat restoration in Lake Ontario. The purpose of this presentation was to help workshop attendees consider their own principles and goals related to habitat restoration in both Lake Ontario and Lake Erie.

LimnoTech first started by defining the terms "principles" and "goals", and then gave several examples from the GLRI Action Plan III, the Lake Ontario Biodiversity Conservation Strategy, and the Great Lakes Fishery Commission's Fish Community Objectives for Lake Ontario (LOBSWG, 2009; Stewart and LePan, 2017; USEPA, 2019). Principles were defined as foundational science-based ideas that would influence action. Goals were defined as the desired result of an action. Principles and goals from the GLRI Action Plan III and The Lake Ontario Biodiversity Conservation Strategy are summarized in Figures 2 and 3. To link the regional plans to state-level planning efforts, LimnoTech also presented several principles and goals from several state-level reports (LOLWG, 2011; NYSDEC, 2015; NYSDEC-GLWP, 2014). These principles and goals are summarized in Figure 4.

LimnoTech discussed how alignment exists between principles and goals defined in past reports and the objectives, commitments, and measures expressed in GLRI Action Plan III Focus Area 4 (Habitat and Species). Attendees were encouraged to identify alignment between their current principles and goals expressed during the workshop, and the GLRI action plan.

Focus Area 4: Habitats and Species	4.1. Protect and restore communities of native aquatic and terrestrial species important to the Great Lakes.	• Identify, restore, and protect habitats and provide habitat connectivity to support important species and associated habitats.
	4.2. Increase resiliency of species through comprehensive approaches that complement on-the-ground habitat restoration and protection.	• Update and implement recovery actions for federal threatened, endangered, and candidate species. • Support population-level protections, enhancements, and re-introductions for tribal, state, and Great Lakes native species of importance.

Figure 2. Summary of Focus Area 4—Species and Habitat Principles and Goals Excerpted from GLRI Action Plan III (USEPA, 2019)

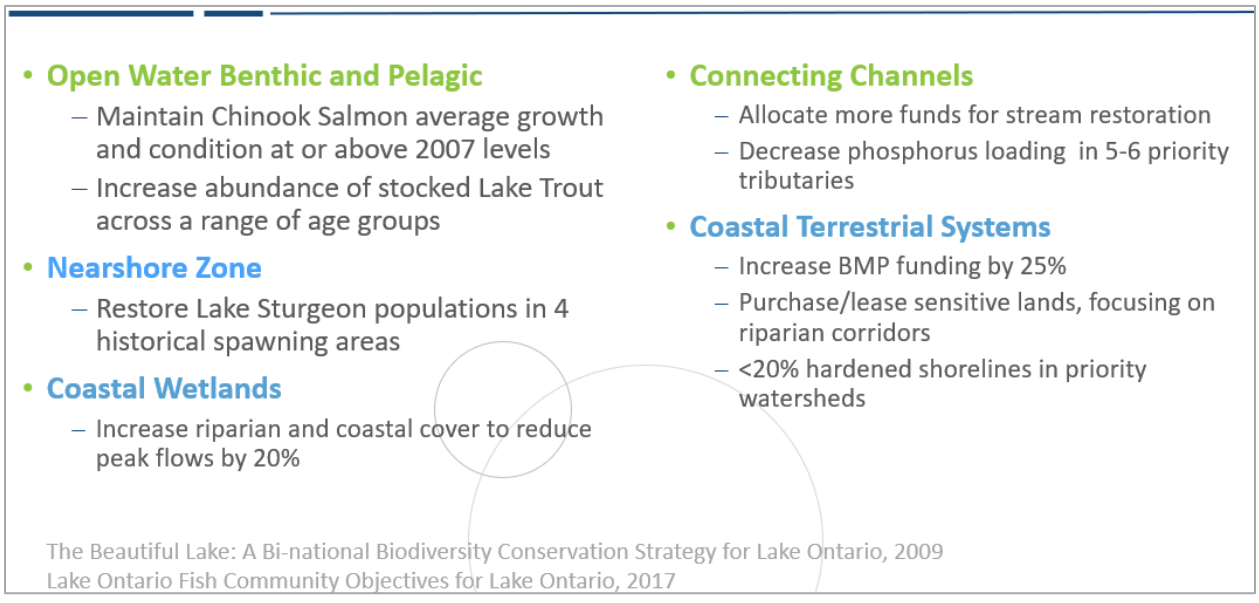

Figure 3. Summary of Select Habitat Restoration Goals Presented in the Bi-National Conservation Strategy for Lake Ontario (LOBSWG, 2009) and the Lake Ontario Fish Community Objectives (Stewart and LePan, 2017)

Figure 4. Summary of Select Principles and Goals from New York State-Level Reports (LOLWG, 2011; NYSDEC, 2015; NYSDEC-GLWP, 2014)

1.4 Identifying Principles

During an approximately 25-minute interactive session, workshop attendees organized themselves into groups of approximately six people and responded to the following prompt:

1. What do you think are the key principles for achieving success in nearshore habitat restoration in the great lakes and/or your state?

Each small group reported out on three words or phrases representing the key principles underlying successful habitat restoration projects (Figure 5 and 6). The words and phrases could generally be broken into four broad categories: partnerships and planning, support, science and data, and sustainability. The full results from the first prompt are summarized in Table 2.

After each group reported out their key principles for a successful habitat restoration project, participants were asked if any principles were missing. Workshop participants discussed the importance of land ownership. Many felt that a full understanding of land ownership issues was a key piece of successfully completing any project; especially an understanding of the jurisdictional issues related to a site. For example, a habitat restoration project on private property will require a different approach than a project on public lands. There was also a robust conversation around the principle of trust. The conversation on trust has been paraphrased in bullet points below:

- The simple notion of trust is important. Many of these [principles] can be boiled down to that. Time needs to be spent building trust across people located at the site, regulators, funders, etc.
- I'm struck by the contrast between building trust and partnerships and the technical component of this. There is a lot of middle ground in using the holistic ecosystem approach. The technical team should spend time making sure the local stakeholder groups and the technical team are speaking the same language. This is a key piece of building that trust, to me. Trying to take down the technical barriers, the language barriers, etc.
- With the issues going on in Lake Ontario, we run into issues with landowners who are interested in saving their property. We have had a hard time implementing "nature-based shorelines" for erosion protection. That makes it hard to implement these types of projects.

- I think this also ties into choosing the right team. As natural scientists we tend to think we know the best approach, but involving social scientists helps us with communication and outreach.

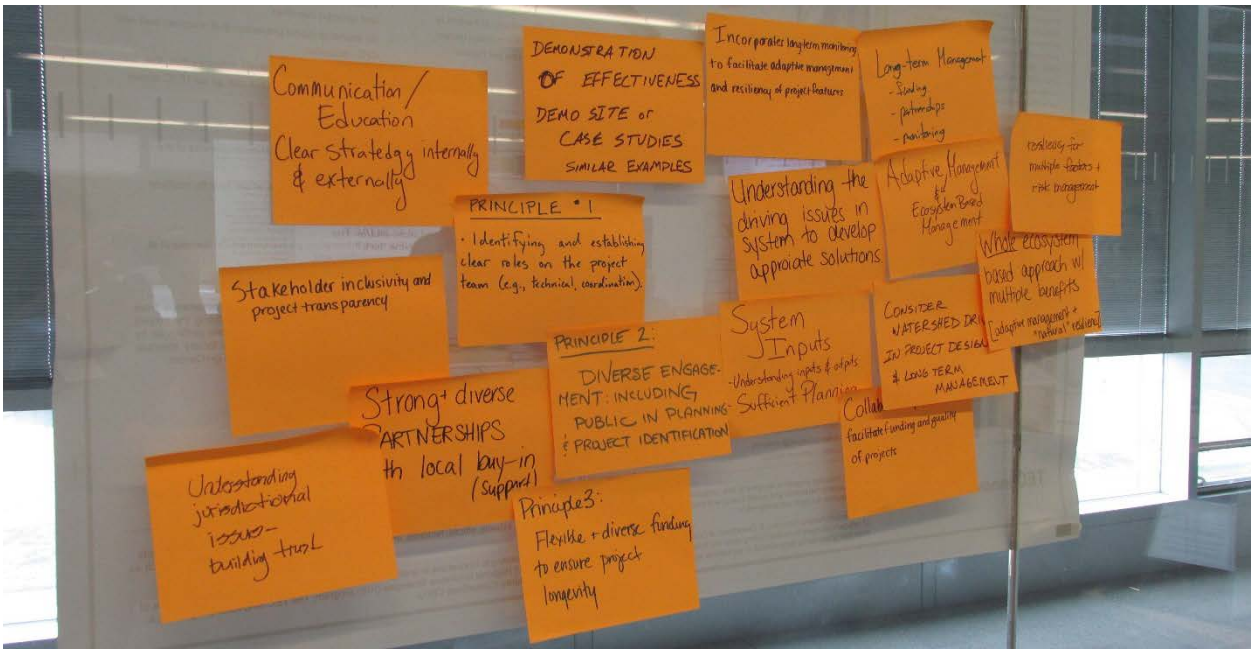

Figure 5. Snapshot of the Results from the Principles Discussion

Figure 6. Participants Working Together to Develop Common Principles

Table 2. Summary of Key Principles Reported by Working Groups

Category	Key Principle	Further Details
Partnerships and Planning	Collaborative partnerships	To facilitate funding and quality of projects
	Communication and education	A clear strategy internally and externally. Both among partners and to the community
	Developing trust around partnerships	
	Diverse engagement and public participation	Both in the project development stage, and project identification
	Identifying and establishing clear roles on the project team (technical vs communication)	For example, different organizations have different strengths
	Stakeholder inclusivity and project transparency	
	Strong and diverse partnerships with local buy-in and support	
	Understanding land ownership and jurisdiction	
Support	Funding that is flexible and diverse	To cover the lifetime of the project and in support of long-term management. Appropriate funding for each phase of a project. Sometimes it's hard to secure funding for all the project phases.
Data/Science	Adaptive and ecosystem-based management	For the long term the project needs adaptive management. You have to clearly understand the ecosystem. Identify the roles of who is going to do the adaptive management.
	Be sure to consider the whole watershed in project design	How does the upland area influence the coastal region and the location of your project?

Category	Key Principle	Further Details
	Demonstration on effectiveness using demo sites	Developing and using case studies. Providing something for people to see related to the outcome of your project.
	Incorporate long-term monitoring	To facilitate adaptive management and the resiliency of future projects
	Long-term management for project longevity	Need long term funding and partnerships. For example, if funding from one partner fails then another one can cover the gap.
	Understanding system inputs (e.g. sediment or nutrients)	
	Understanding what is driving system degradation	Developing appropriate solutions to prevent degradation. Project needs to fit the site
	Whole ecosystem approach with multiple benefits	Combining adaptive management and natural resiliency
Sustainability	Resiliency for multiple factors and risk management	

1.5 Break (15-min)

1.6 Identifying Goals

During an approximately 90-minute interactive session, workshop attendees worked together to identify a common set of goals that could be used to later prioritize habitat restoration projects. Participants self-organized into one of four groups: Western Lake Ontario and Niagara River, Central Lake Ontario, Eastern Lake Ontario and St. Lawrence River, and Lake Erie (Figure 7). The study area for restoration projects extended in from the 80-m bathymetry contour in Lake Ontario and the 15-m bathymetry contour in Lake Erie to one coastal county inland. Each group was asked to develop three goal statements related to their region of interest (Figures 8 through 12).

When setting goals, participants were asked to be specific. Each goal statement needed to contain the following four elements:

1. The *subject or resource of concern*
2. The *characteristic or attribute* for the subject or resource of concern
3. The *desired future condition or conceptual target* for that attribute within a 10-year implementation timeframe
4. A measure, if possible

Using these four elements, an example of a full goal statement could be something like “hydrologic connectivity will be restored (by 10%) for fish species that spawn in upstream tributaries”. It should be noted that the fourth element of a complete goal statement (a quantitative measure) was challenging for all groups. There were two primary reasons for this difficulty: first and foremost, many attendees did not know if the data they needed to quantify their goals existed; second, for data that did exist, attendees did not have access to it during the workshop and therefore were not able to determine if their measures were reasonable. Ultimately, these goal statements were developed over a short period of time (<1.5 hours), and it was not possible to refine them in light of the best available data.

Each small group reported its goal statements to the full group, and a nominal voting process was conducted to prioritize goals. The nominal voting process allowed all workshop participants to comment on goal statements that they were not able to directly participate in identifying. To vote, participants were given two dots for each region: one green and one red. For each region, participants had to select their highest priority using a green dot and their lowest priority using a red dot. The goal statements and the results of the nominal voting process are summarized in Table 3.

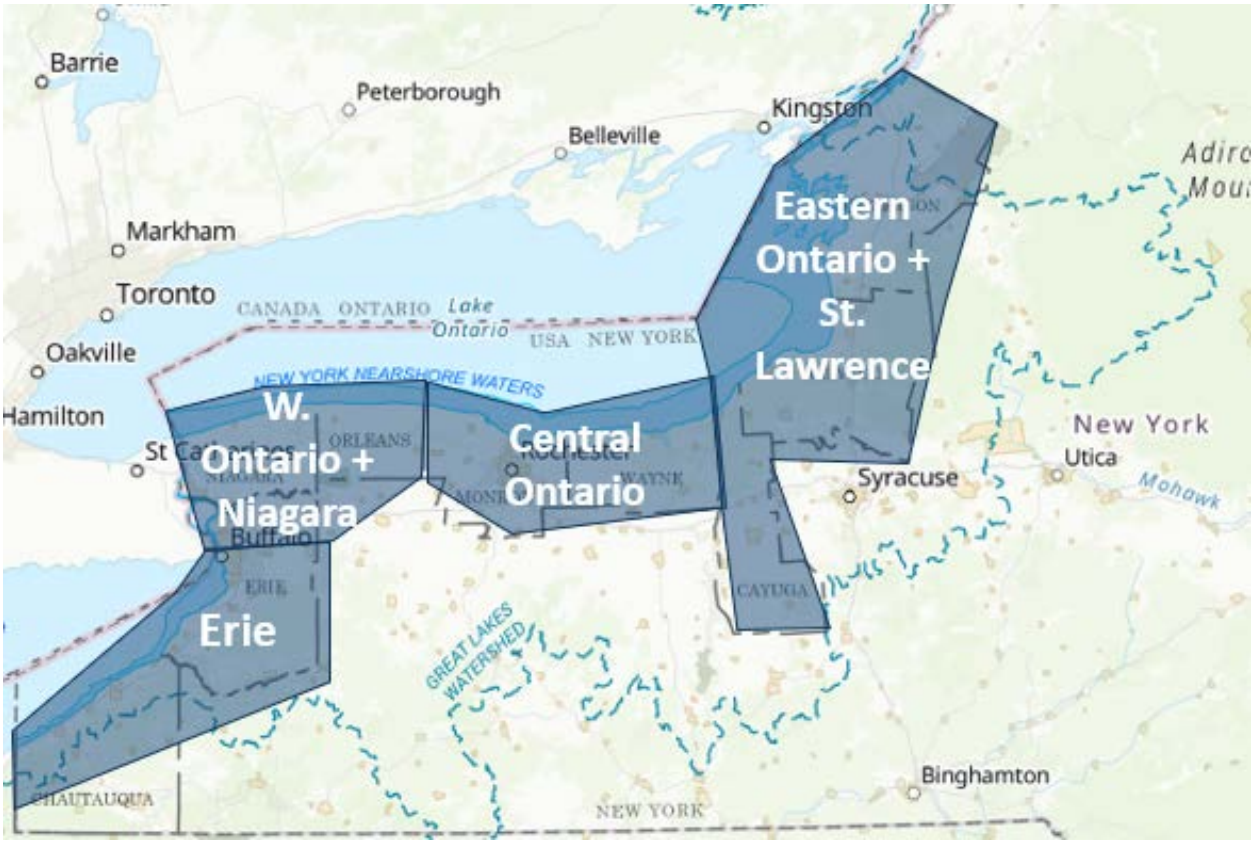

Figure 7. Map of New York Coastlines and the Approximate Geographic Extent of the Four Groups: Lake Erie, West Lake Ontario and Niagara River, Central Lake Ontario, and Eastern Lake Ontario and St. Lawrence River

Figure 8. Western Lake Ontario and Niagara River Group Three Developing Goal Statements

Figure 9. Eastern Lake Ontario and St. Lawrence River Group Developing Goals Statements

Figure 10. Central Lake Ontario Group Developing Goals Statements

Figure 11. Lake Erie Group Developing Goals Statements

Figure 12. Nominal Voting on Goal Statements by Group

Table 3. Summary of Goal Statements by Region and the Results of the Nominal Voting Process

Region	Goal	Additional Comments	Green Dot	Red Dot
Western Lake Ontario and Niagara River	Restore ecosystem function for shoreline and nearshore habitat in W. Ontario and Niagara Region. The measure would be to create a 10% increase in function from what we have now.		25	1
	Increase shoreline resiliency to impacts from boat wakes, ice scar, water level fluctuations, etc. The measure would be a 20% increase of native plants along the shoreline.		7	9
	Complete outreach that encourages and promotes native fisheries. The measure is to create "X" increases in native fish populations	We know that the data needed to quantify this is a data need	2	20
Central Lake Ontario	Enhance "X" acres of nearshore habitat in Sodus Bay (115 acres) and lakeshore (50% of wetlands) marsh	These areas haven't had as much work as others, so there is a lot of opportunity	19	4
	Restoration of a matrix of habitat types that includes sedge meadow ("X"% of acres), palustrine emergent marsh (PEM), submerged aquatic vegetation, and open water.		13	5
	Increase the amount of offshore rocky habitat for spawning (targeting lake trout and cisco)		14	8
Eastern Lake Ontario and St. Lawrence River	Increase wetland connectivity by 20% to the whole ecosystem by 2030 including the protection of species like migratory birds, breeding marsh birds, and northern pike.	Includes open, protected, riverine, and lake wetlands. Connectivity means within the wetland, and also between the wetland and the lake. This is helpful for the whole ecosystem and the target species	16	0

Region	Goal	Additional Comments	Green Dot	Red Dot
	Restore "X" (5?) acres of historically suitable, but currently degraded, spawning and egg incubation habitat to produce larval cisco, walleye, and lake trout by 2030	This is very similar to sediment cleaning goal from the other group	10	11
	Reduce hardened shorelines to less than 20% for key coastal areas along the lake and riparian zones that are dominated with native species. Hardened shorelines would be replaced with nature-based shorelines that include a 10-year monitoring and maintenance schedule. To reach this goal we could either remove currently hardened shorelines or prevent new ones from going in.	There is data available to quantify this. NOAA is about to publish the hardened shoreline assessment (using baseline of 2012). It will be served through Digital Coast. It builds on the US Army Corps' work.	8	18
Lake Erie	Delineate spawning habitat for native fish communities (walleye and whitefish) along eastern Lake Erie shoreline (New York) by 2025	This is more of a data need than a goal. We don't have a good understanding of the distribution related to this.	19	3
	Restore 300 acres of degraded habitat along eastern Lake Erie basin by 2030	Includes former industrial sites	10	5
	By 2030, restore nearshore habitat to establish detectable natural reproduction of Lake Trout in eastern Lake Erie	This pilot involves cleaning off mussels, and restoring interstitial spaces between rocks	0	22

2 Afternoon Session (12:30 PM – 4:00 PM)

2.1 Identifying and Prioritizing Projects and Locations: A Review of State and Regional Plans

Before working together to identify and prioritize habitat restoration projects, LimnoTech staff gave a brief presentation highlighting the different types of restoration projects targeted by the GLRI and examples of both GLRI-funded habitat restoration projects and other types of habitat restoration projects that have been funded in the state. The purpose of this presentation was to provide some background of recently completed and planned projects in the state to help spur conversations between participants.

According to GLRI Action Plan III, the GLRI funds habitat restoration projects that target the "...protection, enhancement, rehabilitation, and restoration" of ecosystems. LimnoTech provided definitions for the four types of projects and examples of projects recently completed in Figures 13 and 14 (USEPA, 2016).

Figure 13. Types of Habitat Restoration Projects as Defined by USEPA (USEPA, 2016)

Restoration Type	GLRI Funded Projects	Other New York Projects
Protection	Mother's Falls Preserve/Majors Park Cons. Area Acquire 57 acres of habitat…and protect 137 acres of Majors Park via deed restrictions	Genesee Land Trust Albright Farms II Conservation easements for 93 acres of farmland in Ontario, NY
Enhancement	Lake Shore Marshes Wetland Management Area Fish Habitat Enhancement …restore hydrologic function, improve fish migration, and enhance spawning, nursery, and rearing habitat within two coastal marsh systems	Lakeview Marsh Wildlife Management Area Northern Pike Spawning and Nursery Habitat Enhancement DEC will enhance fish habitat by creating potholes and connecting channels in Typha mats
Re-establishment	Trees for Tribs in Genesee River Basin Plant a minimum of 15,000 trees and shrubs…to restore 30,000 linear feet of…riparian buffer	Braddock Bay Barrier Beach Restoration …re-creation of a historic barrier beach which protects the Bay from…wind, waves, and winter damage or erosion.
Rehabilitation	Seneca and Cayuga Watersheds Stream Corridor Restoration …restore…fish habitat, re-establish, expand or protect riparian buffers, and improve water quality	Braddock Bay Habitat Improvements …extensive pot-holing, channeling and native plantings to slow cattail and Phragmites growth

Figure 14. Examples of Funded or Planned Projects in the State of New York

2.2 Identifying and Prioritizing Projects and Locations

During an approximately 90-minute interactive session, workshop attendees brainstormed potential project locations and concepts, and marked up maps to document them (Figures 15 through 17). Each group then presented three of their proposed projects, and summarized how these locations align with principles and goals for regional habitat restoration that were developed in the morning session. There was a brief question and answer period after each group presented their proposed projects. Answers to these questions were integrated into the project descriptions.

After each region pitched their top three projects, all workshop attendees were given the opportunity to vote on them using green, blue, and orange sticky dots. Attendees were asked to rank the projects within each region against each other in order to determine the top project within each region. After workshop attendees voted, each project then received a score according to the scoring system summarized in Table 4. The top projects from each region then went on to a second round of voting. Participants were each given one purple dot and asked to select their top project out of all the regions. This resulted in a ranking of all the top projects across all the regions. This information is also summarized in Table 5. To ensure that no project information was lost, all projects that were discussed by individual groups are included in Attachment A.

At the conclusion of the voting, there was a conversation around what influenced the voting choices of workshop attendees. These comments are paraphrased in the bullet points below:

- To me the threat of wind development added a level of urgency to the Lake Erie "Find My Fish" project
- When voting, I considered the acreage impacted and the level of project readiness.
- For me, I was interested in supporting projects related to connectivity. Addressing connectivity can be a self-sufficient project.
- Generally, none of the top regional projects focused on habitat for the target fish species, but I thought that the Lake Erie one might.

- I was thinking about visibility. Many of these [projects] are hard sells, and one seemed like it would be easier to generate support. It's a high visibility, and it's good "bang for the buck" in educating the public.
- On the Lake Erie project, I found that the current land use of inactive industrial was compelling for me.

Figure 15. Eastern Lake Ontario and St. Lawrence River Group Discussing Proposed Project Locations

Figure 16. Lake Erie Group Discussing Proposed Project Locations

Figure 17. Participant Voting on Proposed Project Locations

Table 4. Summary of Voting System

Dot Color	Rank	Point Value
Green	First	3
Blue	Second	2
Orange	Third	1

Table 5. Summary of Proposed Projects by Group

Region	Map #	Project	Further Details	Green (1st)	Blue (2nd)	Orange (3rd)	Region Specific Score	Region Specific Rank	Final Score	Final Rank
Western Lake Ontario and Niagara River	1	West Niagara River Habitat Restoration	This is the least impacted portion of the Niagara river and the project would mainly address the increased energy in the system (primarily from boat wake). This would benefit all spawning fish in the river, and migratory birds. The project would target 12 miles of restoration if we tackled the whole thing. NYS Parks would be a primary landowner and partner, as they own most of the upland area at this site. Objections from local landowners who prefer to mow could be possible. Outside of that we think we would political support. We would need detailed bathymetry and other geotechnical data sets, maybe historical photos.	15	12	3	72	1st	3	4th
	2	Buckhorn Marsh/Cove Restoration	This project would reconnect the nearshore waters of the east and west rivers of Grand Island. We would like to breach a sediment weir to re-establish connectivity in the cove.	12	13	6	68	2nd		

Region	Map #	Project	Further Details	Green (1st)	Blue (2nd)	Orange (3rd)	Region Specific Score	Region Specific Rank	Final Score	Final Rank
			We would also want to use recycled Christmas trees to act as a wave barrier and sediment trap. This method would help trap sediment where we want it without using an engineered structure. This would ultimately restore 40 miles of river.							
	3	Tonawanda Creek	This river is tributary to Niagara River. This project would target the area between the confluence of the creek. We would restore the riverbank, the wetlands, and work with local landowners to acquire land or move farmers back from the edge of the stream. We would want to reduce the degradation in the stream and thereby reduce nutrient loading. This could potentially restore 50 miles of stream. It would help warm water fish species and native mussels. We have some unmet biological data needs and hydrology data needs.	4	6	21	45	3rd		
Central Lake Ontario	3	Sawmill Cove rehabilitation through improved connectivity and hydrologic flow.	Currently the road bisecting Sodus Bay and the marsh has a culvert choked out by cattails.	16	10	4	72	1st	6	3rd

Region	Map #	Project	Further Details	Green (1st)	Blue (2nd)	Orange (3rd)	Region Specific Score	Region Specific Rank	Final Score	Final Rank
			This restoration would include new box culverts under Shaker Tract Rd. We would also add channels and potholes through new excavation. The land is publicly owned and there may be co-operative landowners in this region as well. We would need hydrologic modeling and culvert design support. This is a very expensive project, but we thought to shoot high. This project would restore 80 acres.							
	1	Restore/construct spawning habitat (rock/cobble) for cisco, lake whitefish, and walleye in Sodus Bay	For this project we would either clean the reefs that are there or we build new ones. We think the target area is around 5-20 acres. Sodus Bay is a historic spawning location for all these fish. The condition right now it is either degraded or unknown. We have some unmet biological data needs and hydrology data needs. This project would benefit cisco, lake whitefish, and walleye We would need more information on current reef and spawning locations.	11	9	11	62	2nd		
	3	Enhance quality of Lake Ontario connected	This is a patchwork along the shoreline. They have a mix of problems	6	10	15	53	3rd		

Region	Map #	Project	Further Details	Green (1st)	Blue (2nd)	Orange (3rd)	Region Specific Score	Region Specific Rank	Final Score	Final Rank
		wetlands in Lakeshore Marshes Wildlife Management Areas by improving connectivity	(connectivity, invasives, etc.) and are hydraulically disconnected so they don't experience the lake level fluctuations that you would like to see. Reconnecting them would improve water level fluctuations and nutrient exchange. This project would restore ~1,000 acres (at the top level). Land areas are currently managed by DEC on public property. Current data gaps are around how frequently the bars are breached.							
Eastern Lake Ontario and St. Lawrence River	2	Lakeview Wildlife Management Area wetland enhancement	We have noticed a lot of these connectivity projects; we have been working on for a while (they've either been done or are in the works). This hasn't been officially funded yet. It's would be a classic wetland connectivity project targeting a 500+ acre restoration area. Would affect terns, migratory birds, and fish. There is a lot of work to be done here and north/south of these areas that would help us reach our goals. We also have a lot of planning ideas for this area, but there hasn't been any design work.	15	11	6	73	1st	11	2nd

Region	Map #	Project	Further Details	Green (1st)	Blue (2nd)	Orange (3rd)	Region Specific Score	Region Specific Rank	Final Score	Final Rank
	1	Eastern Lake Ontario improvement of spawning and incubation habitat in known spawning areas	We thought many of the wetland connectivity issues were actively being worked on, so we wrote this for goal #1. We want to restore previously used shoals that are near currently active spawning grounds. The spawning shoals are pretty discrete. 5 acres doesn't seem like much, but right now the spawning area is ~50 ft x 50 ft (the size of the meeting room). This project matches the fish objectives identified for the lake (cisco, lake trout, walleye), and there are a large number of potential partners.	12	10	8	64	2nd		
	3	Restore floodplain connection between Tug Hill and E. Lake Ontario	This project will restore floodplain connection, and vernal pools. It's a huge area (~1,000 acres). The streams are disconnected from the floodplains and there are also problems with channelization. It would be a mix of public and private lands needed. This project is currently conceptual, so we would need a large feasibility here: land cover, hardened shorelines, and social data.	6	10	16	54	3rd		
Lake Erie	2	Buffalo Outer Harbor to Smokes Creek	This project concept would be a comprehensive restoration addressing	19	8	4	77	1st	13	1st

Region	Map #	Project	Further Details	Green (1st)	Blue (2nd)	Orange (3rd)	Region Specific Score	Region Specific Rank	Final Score	Final Rank
		restoration (reestablishment). Comprehensive wetland restoration/connecting hydraulic connectivity to restore habitat for early life stage fish (all target species)	multiple types of habitat restoration like wetland connectivity, and shoreline habitat restoration. Currently, there are many former industrial sites here and fragmented wetlands. it's also right next to a major urban environment and be a great project to have near Buffalo. We would like to restore 250 acres to provide early life stage habitat for muskies and other native fish, and provide habitat for migratory birds, and pollinators. To complete this we would need a characterization of the inactive industrial sites, and data about coastal processes in the region.							
	1	Find my fish (habitat): A pre-protection project.	This project addresses a critical data need for protection and enhancement of fish stocks through mapping, delineation, surveillance, and quantification of substrate/spawning habitat (walleye, whitefish/cisco). We would like to cover the entire New York portion of Lake Erie in three segments. This project is important because there is a push for offshore wind power in Lake Erie and we would like to know how that may impact fish that are	11	5	15	58	2nd		

Region	Map #	Project	Further Details	Green (1st)	Blue (2nd)	Orange (3rd)	Region Specific Score	Region Specific Rank	Final Score	Final Rank
			socially and economically important. We need to know what to protect if those projects go forward (even though it isn't a physical action-based project). This project would target 60+ miles of shoreline in Lake Erie.							
	3	Cattaraugus Creek Habitat Restoration/Re-establishment	Restoring degraded areas of the wetland complex at the mouth of the creek (regionally significant fishery). By enhancing the functionality, it would also help with water quality and flood mitigation. Targeting 20+ acres of restoration. The Seneca Nation of Indians has indicated interest in exploring this project need. Unmet data needs revolve around the former state of the wetland.	0	19	9	47	3rd		

2.3 Break

2.4 Overview of Data Availability

Before working together to identify data needs, LimnoTech staff briefly presented their understanding of data gaps for the state of New York

Data gaps were described in terms of presence/absence, spatial resolution (low to high), and temporal resolution (low to high). As part of the data gap analysis, LimnoTech identified thirty-four types of data that could be useful for planning habitat restoration projects. This list of data types was generated after a review of papers produced as part of the Great Lakes Aquatic Habitat Framework (GLAHF) (Kovalenko et al., 2018; Wang et al., 2015) and an in-house review by a LimnoTech fish biologist.

In summarizing datasets LimnoTech divided data sets into three groups: physical, biological, and environmental (Figures 18 through 21). A glossary of terms used in Figures 18 through 21 can be found in Section 6.

- **X**
  - We have found a dataset that matches the metric
- **OK**
  - sufficient level of information for project-scale work
- **LOW**
  - The resolution of the data is technically insufficient to complete project-scale work
- **MODERATE**
  - The resolution of the data is more coarse than desired to complete project-scale work, but useable
- **HIGH**
  - There is sufficient high-resolution to use this dataset for project scale work

Spatial Resolution	Temporal Resolution
Ok	Ok
Low	Low
Moderate	Moderate
High	High

Figure 18. Summary of Shorthand Used in Data Gap Analysis Presentation

Data Type	Present?	Spatial Resolution	Temporal Resolution	Notes
Discharge infrastructure: volumes and types	X	Ok	Ok	NPDES permits
Ecoregions (ecoprovinces)	X	Ok	Ok	
Dams (river access)	X	Ok	Ok	
Road crossings	X	Ok	Ok	
Shoreline classification	X	Ok	Ok	
Stream mouths (watershed pour points)	X	Ok	Ok	
Watersheds	X	Ok	Ok	
Bottom ruggedness (rugosity)				GAP
Bottom slope	X	Low	Low	Derived depth & relief
Connectivity to adjacent habitats				GAP
Hydrogeoforms	X	Low	Low	Derived depth & relief
Relative exposure index (REI)				GAP
River substrate				GAP
Spawning reefs	X	Ok	High	
Substrate composition, variability, and distribution	X	Moderat	Moderate	2015, GLAHF 30-m
Water depth	X	High	Moderate	
Wave energy	X	Moderate	Moderate	USACE modeled results. USACE Ontario + Erie sediment budgets.
Wave height	X	Low	High	GLOS buoy (no win. data)

Figure 19. Data Gap Summary for Physical Data

Data Type	Present?	Spatial Resolution	Temporal Resolution	Notes
Benthos (trophic str/function)	X	Moderate	High	GLNPO points, most recent 2011
Coastal wetlands	X	Moderate	Ok	MTRI 12.5-m, high res in Old Woman Crk
Fish (trophic str/function)	X	High	High	Much data from NYSDEC Ontario partners (in PDF)
Plankton (trophic str/function)	X	High	High	GLNPO data, may not be sufficient depending on project location. Much data from NYSDEC Ontario + Erie partners (in PDF)
Prevalence of invasive species	X	Moderate	Moderate	GLANSIS, most recent 2014 Phragmites stands
Submerged aquatic vegetation (presence/absence)	X	Low	Low	Mich. Tech Research Inst, 2012, 30-m
Vegetation density				GAP (looking for SAV)
Vegetation heterogeneity				GAP (looking for SAV)
Vegetation morphotype				GAP (looking for SAV)
Vegetation species composition				GAP (looking for SAV)

Figure 20. Data Gap Summary for Biological Data

Data Type	Present?	Spatial Resolution	Temporal Resolution	Notes
Chlorophyll-a				GAP
Turbidity				GAP
Suspended minerals				GAP
Water temperature (incl. timing/variability)	X	High	High	Derived from NOAA coastwatch satellite and NYSDEC Ontario + Erie monitoring (pdf)
Dissolved oxygen	X	High	High	NYSDEC Ontario + Erie monitoring (pdf)

Figure 21. Data Gap Summary for Environmental Data

2.5 Collaborative Identification of Data Needs

Data was discussed two ways during the workshop. The two-step approach was used to try to encourage and capture conversations related to data throughout the course of the workshop. The first method was to use a data wall (Figures 22 and 23). On the data wall, workshop participants had the opportunity to identify two types of datasets: those that they needed and those that they had. Participants were also able to qualitatively identify the spatial resolution of the data (ranging from basin scale to local scale) and the temporal resolution of the data (ranging from sampled once to sampled annually). Table 6 summarizes the data needs identified using the data wall. Additional workshop discussion items related to data needs follow this table.

The second way that data was discussed was by having participants return to their project groups. Participants were asked to consider three questions:

1. Do you have data to fill the identified data gaps?
2. What data do you need to complete your proposed project?
3. What data do you need to identify and prioritize future projects?

The answers to these questions are summarized in Tables 7 and 8.

After each group discussed their data needs there was a brief reporting out period where each group expressed their top data needs. This conversation is summarized below:

- Western Lake Ontario and Niagara River
    - In this region we need historical ecological landscape data to figure out what needs to be restored and to what extent. We need this everywhere. This also includes data sets related to water levels, native plant species, etc. We need to know what to restore it to.
- Central Lake Ontario
    - Substrate mapping to identify lake trout spawning. We're the central region, but we really need this across the entire Lake Ontario shoreline from depths ranging from 3 ft to 90 ft.
    - We also want someone to coalesce the data. This is something that everyone is looking for.
- Eastern Lake Ontario and St. Lawrence River
    - We thought that we should support the NOAA effort to map the bottom of Lake Ontario in any form. It would help all of our projects and it is a huge need.
- Lake Erie
    - We really want to fund the "Find my Fish" data project that we pitched. We need nearshore substrate data to identify the best fish habitat.
    - We also need updated erosion rates based on the recent high water conditions (an update to the US Army Corps of Engineers coastal erosion work).

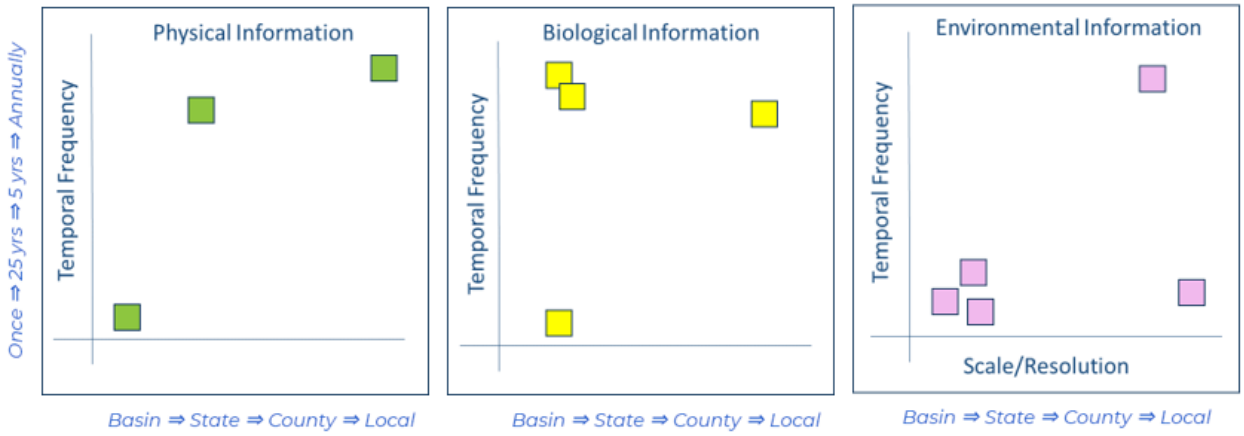

Figure 22. Conceptual Schematic of the Data Wall

Figure 23. Data Wall for Physical, Biological, and Environmental Data Sets

Table 6. Summary of Datasets Included on the Data Wall

Data Type	Have or Need	Description	Temporal Scale	Spatial Scale	Contact or Notes
Physical	NEED	Coastal morphology and sediment flow data needed to inform barrier bar projects	Once	County	
	NEED	Current status of Lake Ontario spawning habitat (quality, quantity, location) and rock/cobble substrate	Once	Basin	
	NEED	Distribution and density of suitable spawning habitat. Substrate and interstitial space, and depth in all Great Lakes	Once	Basin	
	NEED	Identify and consolidate data sources and their locations	Once	Local	
	NEED	Lacking data about existing habitats in the New York portion of Lake Erie (e.g., substrate information and spawning behavior)	Once	Local	
	NEED	Map nearshore walleye habitat in Lake Erie	Once	Local	
	NEED	Missing shoreline hardening data	Once	Local	Note – NOAA Project in process
	NEED	Topography, bathymetry, and geotechnical data along coastal areas/potential project sites	Once	Local	
	NEED	tracking shoreline hardening data basin-wide	Once	Local	Note – NOAA Project in process

Data Type	Have or Need	Description	Temporal Scale	Spatial Scale	Contact or Notes
	NEED	Use of comprehensive collaborative data collection of aquatic connectivity and resiliency	~10 years	Local	
	NEED	What percent of the Lake Ontario shoreline is currently developed in Central Ontario	~10 years	Local	
	HAVE	NOAA will be releasing a hardened shoreline assessment for the Great Lakes using 2012 as the baseline.	Once	Local	NOAA Digital Coast
	HAVE	North Atlantic Connectivity Collaborative database	~10 years	Local	North Atlantic Aquatic Connectivity Collaborative
	HAVE	Substrate data using old navigation charts--creating a GIS layer of substrate for each Great Lake	Once	Local	The Nature Conservancy
Biological	NEED	Comprehensive invasive species database	~10 years	County	
	NEED	Current spawning sites/habitats of lake trout in all US waters	~10 years	Basin	
	NEED	Data on native fish populations	Annual	Basin	
	NEED	Lacking data about existing habitats in the New York portion of Lake Erie (e.g., substrate information and spawning behavior)	Once	Local	
	NEED	What is the state of current nearshore/offshore rocky shoal habitats for spawning lake trout, sturgeon, and cisco in Central Lake Ontario?	~25 years	Local	

Data Type	Have or Need	Description	Temporal Scale	Spatial Scale	Contact or Notes
Environmental	NEED	Data to define all wetlands	Once	County	
	NEED	Frequency of breach at coastal marshes (drowned river marshes) in Central Lake Ontario. How often does it occur each year, and when?	~10 years	County	
	NEED	Groundwater contour data along Lake Erie and Lake Ontario shorelines	~10 years	Basin	
	NEED	Nutrient and sediment data	~10 years	Local	
	NEED	Nutrient data across the Great Lakes region. It exists but is not well documented (illegible).	~10 years	Basin	
	NEED	Sediment transport study with littoral cell needed in Central Lake Ontario	~10 years	County	
	NEED	Status of shoreline and nearshore habitat in W Ontario and Niagara region	Once	Basin	
	NEED	Update NOAA Environmental Sensitivity Index data	Once	County	
	NEED	Water quality data for surface and ground water sources	~10 years	Local	
	NEED	Water quality data on areas needed to improve habitat	~10 years	Local	

Table 7. Summary of Data Sets Available to Fill Data Gaps

Group		
Western Lake Ontario and Niagara River		Buffalo Niagara Waterkeeper, Emily Root (eroot@bnwaterkeeper.org) or Chris Murawski (cmurcawski@bnwaterkeeper.org)
	Submerged aquatic vegetation survey for Niagara River Area or Concern	Buffalo Niagara Waterkeeper, Emily Root (eroot@bnwaterkeeper.org) or Chris Murawski (cmurcawski@bnwaterkeeper.org)
	Niagara River shoreline condition	NYSDEC, Mark Filipski
Central Lake Ontario	2020 update to New York breeding bird atlas	New York Audubon
Eastern Lake Ontario and St. Lawrence River	Lake Ontario Chlorophyll-a for the whole lake, spanning many years	EPA GLNPO-Region 5, Beth Hinchey-Malloy
Lake Erie	Verified sediment data derived from old navigation maps	The Nature Conservancy, Gust Annis or Pippa Kohn
	Culvert and dam removal/repair/connectivity data set	North Atlantic Aquatic Connectivity Collaborative from University of Massachusetts-Amherst

Table 8. Summary of Data Needs by Region

Region	Need Type	What	Where	Why	Resolution (Spatial/ Temporal)	Availability
Western Lake Ontario and Niagara River	Project	A study to isolate the impacts of boating that measures the impacts of waves on water quality	Niagara River along the west side of Grand Island	To inform project design and priority areas for restoration	Local/Once	None mentioned
	Project	Full site characterization including bathymetry, topography, geotechnical, river bed substrate, historical conditions	Niagara River along the west side of Grand Island	To inform project design and priority areas for restoration	Local/Once	None mentioned
	Prioritization	Native fish species population survey	Statewide	To determine priority areas for restoration and help with design	State/Annual	None mentioned
	Prioritization	Put and take fishery data	Statewide	To determine priority areas for restoration and help with design	State/Annual	None mentioned
	Prioritization	Erosion hotspots	Statewide	To determine priority areas for restoration and help with design	State/Annual	None mentioned
	Project	Hydrologic data	Sawmill Cover in Sodus Bay	This will help us install appropriately sized	Local/Once	None mentioned

Region	Need Type	What	Where	Why	Resolution (Spatial/ Temporal)	Availability
Central Lake Ontario				bridges/culverts to achieve restoration goals		
	Project	Usage data – including recreation and traffic	Sawmill Cover in Sodus Bay		Local/Once	None mentioned
	Project	Wildlife pre- and post-monitoring	Sawmill Cover in Sodus Bay	To measure the response of target species	Local/Once	None mentioned
	Prioritization	Sediment transport model for Lake Ontario focusing on priority habitat types (e.g., marsh bird breeding sites)	Lake Ontario	To properly assess permitting decisions and habitat restoration projects, and resiliency projects	Local/~5 years	None mentioned
	Prioritization	Substrate mapping	Easter Basin, Mexico Bay, Central Lake Ontario (3-90 ft depth)	To identify lake trout habitat	Local/Once	None mentioned
Eastern Lake Ontario and St. Lawrence River	Project	Soil composition	Lakeview Wildlife Management Area	For planning purposes	State/Annual	None mentioned
	Project	Bathymetry	Lakeview Wildlife Management Area	For planning purposes	State/Annual	None mentioned
	Project	Threatened and endangered species	Lakeview Wildlife Management Area	For planning purposes	State/Annual	None mentioned

Region	Need Type	What	Where	Why	Resolution (Spatial/ Temporal)	Availability
	Project	Local water level	Lakeview Wildlife Management Area	For planning purposes	State/Annual	None mentioned
	Project	Updated flood maps	Lakeview Wildlife Management Area	For planning purposes	State/Annual	None mentioned
	Prioritization	Updated substrate maps for Lake Ontario (3-90 ft depth)	Lake Ontario	This would help all aspects of our project. It would also help prioritize fish habitat restoration sites	State/Once	None mentioned
Lake Erie	Project	Sediment transport model	Woodlawn Beach State Park to Buffalo Harbor	To understand the dynamics of the system and what factors might limit habitat restoration success	Local/~25 years	US Army Corps of Engineers might do this if they get the funding
	Project	Long-term index of Dreissenid mussel density	Woodlawn Breach State Park to Buffalo Harbor	We want to correlate this index to the impact on fish communities	Local/Annual	None mentioned
	Project	Update to the US Army Corps of Engineers sediment budget in light of recent, high water levels	Woodlawn Breach State Park to Buffalo Harbor		Local/Once	None mentioned
	Prioritization	Characterize shoreline substrate (our “Find My Fish” project)	New York State Lake Erie shoreline	We need to better understand the current condition of habitat availability	Local/Once	None mentioned

3 Workshop Summary

3.1 Workshop Findings

3.1.1 Common Principles

Workshop participants identified four common principles that underlie many successful habitat restoration projects:

1. They involve collaborative planning and stakeholder engagement that occurs early and often to make sure all voices are heard.
2. They require funding that is reliable so that planning for the future can occur. These funds should also be flexible enough to adapt to emerging project needs.
3. They use sound science and a data driven decision-making process so that the effects of the restoration process can be quantified. And,
4. They are sustainable into the future and take into account a wide variety of environmental conditions.

3.1.2 Common Goals

The top common goals identified by workshop participants are summarized in Table 9. It should be noted that while workshop attendees were able to come to consensus around common goals, they also recognized that, in many cases, the current data is insufficient to quantitatively assess these goals. The types of baseline data that workshop attendees would like to collect are outlined in section 2.5.

Table 9. Summary of Top Goals for Each Lake Identified by Workshop Participants

Region	Goal
Western Lake Ontario and Niagara River	Restore ecosystem function for shoreline and nearshore habitat in W. Ontario and Niagara Region. The measure would be to create a 10% increase in function from what we have now.
Central Lake Ontario	Enhance "X" acres of nearshore habitat in Sodus Bay (115 acres) and lakeshore (50% of wetlands) marsh
Eastern Lake Ontario and St. Lawrence River	Increase wetland connectivity by 20% to the whole ecosystem by 2030 including the protection of species like migratory birds, breeding marsh birds, and northern pike.

Lake Erie	Delineate spawning habitat for native fish communities (walleye and whitefish) along eastern Lake Erie shoreline (New York) by 2025

3.1.3 Identification of Workshop Priorities

The results from the habitat restoration project prioritization process are summarized in Table 10. For further details about the projects in the table, see section 2.2. For further information about projects that were not ranked, please see Attachment A.

Table 10. Summary of Ranked Habitat Restoration Priorities Developed by Workshop Participants

Region	Map #	Project	Further Details	Final Score	Final Rank
Lake Erie	2	Buffalo Outer Harbor to Smokes Creek restoration (reestablishment)	This would be a comprehensive restoration project addressing multiple types of habitat restoration like wetland connectivity, and shoreline habitat restoration. Currently, there are many former industrial sites here and fragmented wetlands. it's also right next to a major urban environment and be a great project to have near Buffalo. We would like to restore 250 acres to provide early life stage habitat for muskies and other native fish, and provide habitat for migratory birds, and pollinators. To complete this we would need a characterization of the inactive industrial sites, and data about coastal processes in the region.	13	1st
Eastern Lake Ontario and St. Lawrence River	2	Lakeview Wildlife Management Area wetland enhancement	We have noticed a lot of these connectivity projects; we have been working on for a while (they've either been done or are in the works). This hasn't been officially funded yet. It's would be a classic wetland connectivity project targeting a 500+ acre restoration area. Would affect terns, migratory birds, and fish. There is a lot of work to be done here and north/south of these areas that would help us reach our goals. We also have a lot of planning ideas for this area, but there hasn't been any design work.	11	2nd

Region	Map #	Project	Further Details	Final Score	Final Rank
Central Lake Ontario	3	Sawmill Cove rehabilitation through improved connectivity and hydrologic flow	Currently the road bisecting Sodus Bay and the marsh has a culvert choked out by cattails. This restoration would include new box culverts under Shaker Tract Rd. We would also add channels and potholes through new excavation. The land is publicly owned and there may be co-operative landowners in this region as well. We would need hydrologic modeling and culvert design support. This is a very expensive project, but we thought to shoot high. This project would restore 80 acres.	6	3rd
Western Lake Ontario and Niagara River	1	West Niagara River Habitat Restoration	This is the least impacted portion of the Niagara river and the project would mainly address the increased energy in the system (primarily from boat wake). This would benefit all spawning fish in the river, and migratory birds. The project would target 12 miles of restoration if we tackled the whole thing. NYS Parks would be a primary landowner and partner, as they own most of the upland area at this site. Objections from local landowners who prefer to mow could be possible. Outside of that we think we would political support. We would need detailed bathymetry and other geotechnical data sets, maybe historical photos.	3	4th

3.1.4 Data Needs

See section 2.5 for a tabular summary of data needs. For scanned copies of the data worksheets, see Attachment B.

3.2 Next Steps

At the end of the workshop, Mike Molnar, from CSO, briefly discussed the next steps involved in this process:

- Information organization: we will sort through all the great information and develop a report that is to be shared with the coastal program

- Data gap filling: select data gaps identified during this workshop and others will be addressed for a limited portion of the shoreline from April 2020 through March 2021
- NOAA will be able to fund some engineering and design work for a subset of projects.
- Federal partners, with funding available, will convene during the spring to discuss the project priorities identified in the state-specific workshop and their potential fit with various funding streams.
- Continue the conversation – today has been a great conversation starter. We encourage you to continue the discussion among yourselves and partners.

4 References

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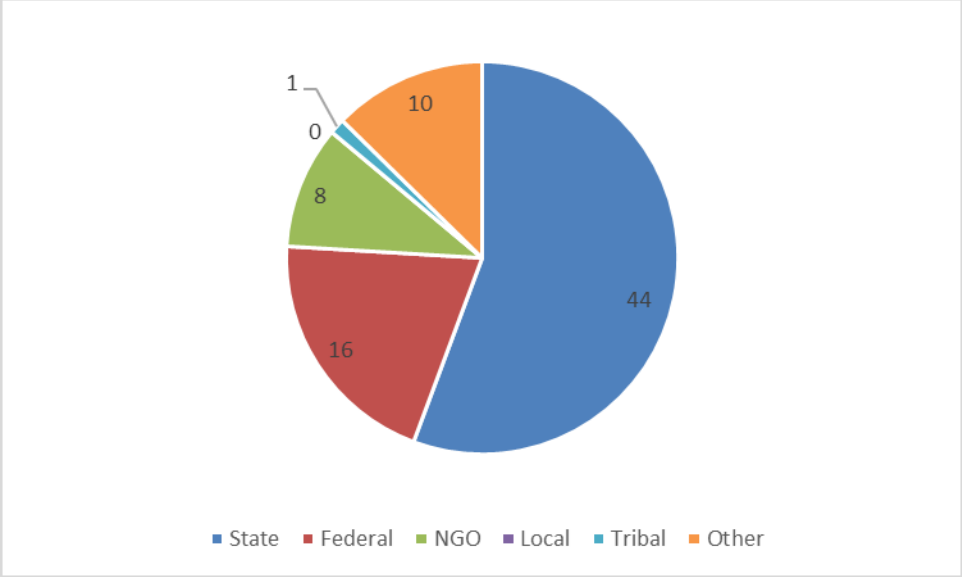
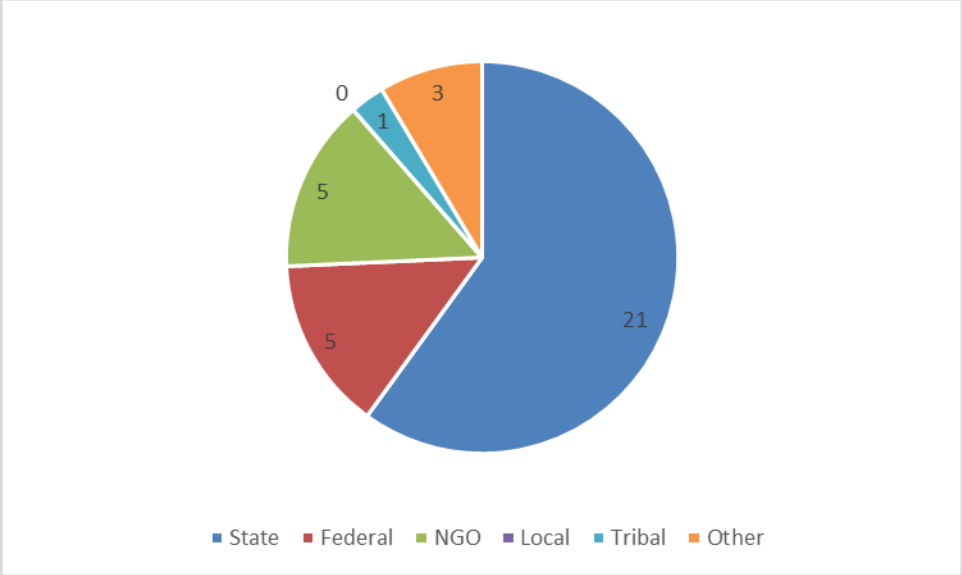
5 Workshop Attendee Summary

Breakdown of workshop invitees:



Breakdown of workshop participants:



The table below summarizes workshop participants and their contact information:

Last	First	Affiliation
Blackburn	Julie	RESPEC
Bradley	Doug	LimnoTech
Burns	Elaina	NYS Department of Environmental Cons.
Carlini	Molly	NYS DEC
Cebada Mora	Gabriella	NYSOPRHP
Darnton	Ryan	NOAA/ERT
Depriest	Tim	NYD DEC
Dougherty	Shannon	NYSDEC
Feldman	Leah	NYSDOS
Fleming	Sarah	Ducks Unlimited, Inc.
Fraioli	Carolyn	NYS Coastal Management Program
Hinterberger	Bryan	USACE
Hogle	Katherine	NYS Department of State
Hoh	Christina	NYSDEC Region 8
Kohn	Philippa	The Nature Conservancy
Kuzia-Carmel	Michael	NYSDEC Division of Water
Legard	Christopher	NYSDEC
Miller	Steven	NYSDEC Bureau of Ecosystem Health
Molnar	Mike	Coastal States Organization
Padilla	Julie	LimnoTech
Prindle	Scott	NYS DEC
Robinson	Jason	NYS DEC
Root	Emily	Buffalo Niagara Waterkeeper
Saavedra	Nikki	NYS Dept. of Environmental Conservation
Schulenberg	David	USACE
Smardon	Richard	SUNY/ESF
Stirratt	Heather	NOAA Office for Coastal Management
Wasilco	Mike	NYSDEC-DFW, Bureau of Wildlife
Widrig	Roy	NY Sea Grant
Kennedy	Joan	
Ruffino	Kelsey	NYS OPRHP
Spiering	Dave	NYSOPRHP
Dunn	Jennifer	NYS DEC
Lind	Eric	Audubon New York

6 Glossary

Benthos: biotic organisms that are found at the bottom of water bodies.

Ecoregion: A major ecosystem that has a unique geography and receives consistent sunlight and moisture.

Hydrogeoforms: Underwater geologic structures. Hydrogeoforms include features such as underwater reefs, plains, and ridges.

Relative exposure index (REI): The relative exposure index is the effective fetch of a waterbody scaled by mean wind speed. The effective fetch is the length of a waterbody where the wind blows in a consistent direction. Together, fetch and wind speed determine wave size and energy. Ultimately, areas with lower relative exposure index provide better fish habitat.

Trophic structure/function (trophic str/func): Describes the relationship between different organisms within the food web of an ecosystem.

Attachment A

Project Summary Worksheets

CO

Priority Project and Location Worksheet

Project number: 1

NUMBER THIS PROJECT ACCORDING TO DIRECTIONS PROVIDED DURING THE WORKSHOP. THEN WRITE THE SAME PROJECT NUMBER ON A STICKY DOT AND ATTACH THE STICKY DOT TO THE LOCATION ON THE MAP THAT CORRESPONDS TO THIS PROJECT.

1. Which goal statement does this this project *primarily* address? Central Ontario entrance nearshore habitat in Sodus Bay + Lake Shore marsh

2. The project category (circle one):
   Protection Enhancement (Restoration (reestablishment)) Rehabilitation

3. The proposed action (invasive species removal, wetland restoration, shoreline stabilization, fish barrier removal):
   Restore or construct spawning reefs (rocky/cobble) in Sodus Bay to improve cisco, lake whitefish, walleye spawning habitat

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Improve spawning habitat + increase fish populations

5. Targeted species that benefits from actions:
   Cisco, Lake Whitefish, Walleye

6. Spatial extent/acreage: 10-20 Acres

7. Current/past condition of the site:
   Sodus Bay is a historic spawning location for Cisco/Lake Whitefish
   - Current status - Degraded/Unknown

8. Social, political and physical context of the project:
   Project will likely be supported by most interest groups

9. Potential partners:
   USFWS/USGS/NYSDEC

10. Unmet data needs:
    Assessment of existing shoal habitat quality/quantity

11. Readiness (1=ready!; 5=concept stage): 1 2 (3) 4 5

CO

Priority Project and Location Worksheet

Project number: #2

NUMBER THIS PROJECT ACCORDING TO DIRECTIONS PROVIDED DURING THE WORKSHOP. THEN WRITE THE SAME PROJECT NUMBER ON A STICKY DOT AND ATTACH THE STICKY DOT TO THE LOCATION ON THE MAP THAT CORRESPONDS TO THIS PROJECT.

1. Which goal statement does this this project *primarily* address? Enhance coastal wetlands

2. The project category (circle one):
   Protection | Enhancement | Restoration (reestablishment) | Rehabilitation

3. The proposed action (invasive species removal, wetland restoration, shoreline stabilization, fish barrier removal):
   Wetland restoration of Lake Shore Marshes CMA units via improved connectivity to Lake Ontario + habitat improvements

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Improve lake influence (water level + nutrient exchange) and reconnect water bodies for fisheries

5. Targeted species that benefits from actions:
   Migratory birds + waterfowl

6. Spatial extent/acreage: up to 1000 acres of wetlands

7. Current/past condition of the site:
   Currently managed by DEC, some areas already channelled + potholes

8. Social, political and physical context of the project:
   Work on public properties used for recreation, not directly impacting residents or businesses otherwise

9. Potential partners:
   DU, Army Corps, local universities

10. Unmet data needs:
    Frequency of barrier bar breaches, quality of upstream wetlands

11. Readiness (1=ready!; 5=concept stage): 1 2 3 (4) 5

CO

Priority Project and Location Worksheet

Project number (3) Sawmill Cove @ Sodus. (~80-acres)

NUMBER THIS PROJECT ACCORDING TO DIRECTIONS PROVIDED DURING THE WORKSHOP. THEN WRITE THE SAME PROJECT NUMBER ON A STICKY DOT AND ATTACH THE STICKY DOT TO THE LOCATION ON THE MAP THAT CORRESPONDS TO THIS PROJECT.

1. Which goal statement does this this project *primarily* address? Enhance x acres at Sodus Bay

2. The project category (circle one):
   Protection Enhancement Restoration (reestablishment) (Rehabilitation)

3. The proposed action (invasive species removal, wetland restoration, shoreline stabilization, fish barrier removal):
   increase connectivity to Sodus Bay through increased culvertsand connectivity, -potholes→ channel excavation.

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   increase connectivity and hydrological flow. Increase Bio-diversity (add to work already advanced in area).

5. Targeted species that benefits from actions:
   mig Birds. N pike, waterfowl, Yellow perch.

6. Spatial extent/acreage: ~80-acres.

7. Current/past condition of the site:
   choked cattail matt w low flow through culvert.

8. Social, political and physical context of the project:
   Improved recreational opportunity - site is a cattail dominated coastal mash.

9. Potential partners:
   DOT, DEC Sodus cooperative, TNC, DU, Audubon SUNYESF (monitoring), DOS; Army Corps.

10. Unmet data needs:
    culvertoptions, hydrological models.

11. Readiness (1=ready!; 5=concept stage): 1 2 3 (4) 5

Priority Project and Location Worksheet

Project number: Central Ontario 4 offshore habitat + protection Berm LO.

NUMBER THIS PROJECT ACCORDING TO DIRECTIONS PROVIDED DURING THE WORKSHOP. THEN WRITE THE SAME PROJECT NUMBER ON A STICKY DOT AND ATTACH THE STICKY DOT TO THE LOCATION ON THE MAP THAT CORRESPONDS TO THIS PROJECT.

1. Which goal statement does this this project *primarily* address? 2 add matrix of hab types

2. The project category (circle one):
   Protection (Enhancement) Restoration (reestablishment) Rehabilitation

3. The proposed action (invasive species removal, wetland restoration, shoreline stabilization, fish barrier removal):
   creation of protected shallow water habitat (SAV, EV, spawning)

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   protect and add habitat that is historically lost in the system (nearshore/spawn)

5. Targeted species that benefits from actions:
   Migratory birds, Pike, walleye, waterfowl

6. Spatial extent/acreage: ? huge

7. Current/past condition of the site:
   bare

8. Social, political and physical context of the project:
   protection of shoreline that also adds a matrix of habitat types - perhaps offshore @ chimney Bluffs

9. Potential partners:
   ACOE, DU, TNC, Audubon, DOS, DOT, DEC

10. Unmet data needs:
    topography/bathy of nearshore project area, nearshore flow patterns / sediment patterns

11. Readiness (1=ready!; 5=concept stage): 1 2 3 4 (5)

ELO

Priority Project and Location Worksheet

Project number: ~~ELO~~ 3

NUMBER THIS PROJECT ACCORDING TO DIRECTIONS PROVIDED DURING THE WORKSHOP. THEN WRITE THE SAME PROJECT NUMBER ON A STICKY DOT AND ATTACH THE STICKY DOT TO THE LOCATION ON THE MAP THAT CORRESPONDS TO THIS PROJECT.

1. Which goal statement does this this project *primarily* address? 2

2. The project category (circle one):
   Protection Enhancement Restoration (reestablishment) Rehabilitation

3. The proposed action (invasive species removal, wetland restoration, shoreline stabilization, fish barrier removal):

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Restore floodplain connection + wetland vernal pool Restoration between Tug Hill + Eastern Lake Ontario

5. Targeted species that benefits from actions:
   migratory birds + ~~[illegible]~~ marsh breeding amphibeans, variety of fish + wildlife

6. Spatial extent/acreage: 1000 acres.

7. Current/past condition of the site:
   disconnected and channelized Rivers from historic floodplains

8. Social, political and physical context of the project:
   private + public, ag lands.

9. Potential partners:
   DEC, Ag + Markets, DOS, PRISM, The Nature Conservancy, Ducks Unlimited, Land Trusts

10. Unmet data needs:
    feasability study which would include landcover, hardened shoreline, development, community

11. Readiness (1=ready!; 5=concept stage): 1 2 3 4 (5?)

1

ELD

Eastern Lk Ont.

Priority Project and Location Worksheet

Project number: [redacted] Not the "most voted for"

NUMBER THIS PROJECT ACCORDING TO DIRECTIONS PROVIDED DURING THE WORKSHOP. THEN WRITE THE SAME PROJECT NUMBER ON A STICKY DOT AND ATTACH THE STICKY DOT TO THE LOCATION ON THE MAP THAT CORRESPONDS TO THIS PROJECT.

1. Which goal statement does this this project *primarily* address? Rehabilitate historic suitable spawning & incubation habitat to produce larval cisco & lake trout by 2025

2. The project category (circle one):
   Protection Enhancement Restoration (reestablishment) (Rehabilitation)

3. The proposed action (invasive species removal, wetland restoration, shoreline stabilization, fish barrier removal):
   Remove sediment to restore interstitial spaces in rocky substrate in Chaumont Bay; Henderson; Deep Shoal; & Stony Island

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   increase ~~native target~~ spawning & incubation success for ~~eggs~~ of targeted species

5. Targeted species that benefits from actions:
   Cisco Lake Trout Walleye

6. Spatial extent/acreage: Spawning shoals Discrete totalling ~5 acres (maybe less)

7. Current/past condition of the site:
   Interstices only exist where physical disturbance from waves maintains them; those same waves prevent survival.

8. Social, political and physical context of the project:
   Matches Fish Community Objectives identified by international mngmt. community; rehabilitate or enhance native fisheries

9. Potential partners:
   NYSDEC, USFWS, USGS, TNC; PEISM; CORNELL
   local lakeshore groups
   & site

10. Unmet data needs:
    Habitat specific incubation success index
    (i.e. % of eggs → larvae)

11. Readiness (1=ready!; 5=concept stage): 1 (2) 3 4 5

2

ELO

1 Lake Wide WMA

Priority Project and Location Worksheet

Project number: 2 ON MAP

NUMBER THIS PROJECT ACCORDING TO DIRECTIONS PROVIDED DURING THE WORKSHOP. THEN WRITE THE SAME PROJECT NUMBER ON A STICKY DOT AND ATTACH THE STICKY DOT TO THE LOCATION ON THE MAP THAT CORRESPONDS TO THIS PROJECT.

1. Which goal statement does this this project *primarily* address? 2) Increased Wetland Connectivity

2. The project category (circle one):
   Protection | Enhancement | Restoration (reestablishment) | Rehabilitation

3. The proposed action (invasive species removal, wetland restoration, shoreline stabilization, fish barrier removal):
   Invasive Spp., Wetland Restoration, Fish Passage Issue

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Improve Bird Habitat & Fish Passage

5. Targeted species that benefits from actions:
   Migratory Birds, Waterfowl, Black Tern, Northern Pike

6. Spatial extent/acreage: 500 + acres

7. Current/past condition of the site:
   Wetland DEC WMA now, extensive Cattail or other invasive spp reduces bird habitat and fish passage

8. Social, political and physical context of the project:
   State Land

9. Potential partners:
   DEC, NYSOPRHP? Ducks Unlimited, USFWS, Audubon, The Nature Conservancy, Land Trusts, PRISM

10. Unmet data needs:

11. Readiness (1=ready!; 5=concept stage): 1 (2) 3 4 5

(research) Find My Fish: Habitat & Nearshore Substrate Mapping LE

Priority Project and Location Worksheet

Project number: (1) whole shoreline covered in 3 reach segments

NUMBER THIS PROJECT ACCORDING TO DIRECTIONS PROVIDED DURING THE WORKSHOP. THEN WRITE THE SAME PROJECT NUMBER ON A STICKY DOT AND ATTACH THE STICKY DOT TO THE LOCATION ON THE MAP THAT CORRESPONDS TO THIS PROJECT.

1. Which goal statement does this this project *primarily* address? Erie #2

2. The project ~~category~~ (circle one):
Pre – (Protection) Enhancement Restoration (reestablishment) Rehabilitation

3. The proposed action (invasive species removal, wetland restoration, shoreline stabilization, fish barrier removal):
Priority: Walleye Secondary: White fish & Cisco
Mapping, delineation, ~~Some~~ surveillance, & quantification of substrate/spawning habitat

4. The desired change that the project intends to accomplish (improve/restore/reduce):
Fill critical data need in order to protect & enhance species of ~~get~~ regional significance & relevant to Lake Erie

5. Targeted species that benefits from actions:
Walleye, Whitefish, Cisco

6. Spatial extent/acreage: ~2 60 miles

7. Current/past condition of the site:
Unknown condition

8. Social, political and physical context of the project:
Walleye most valuable fish stock socially & economically
Help prioritize Shoreline NNBF & energy development decisions
Future public engagement needed

9. Potential partners:
DEC, NOAA, TNC, USACOE, DOS-future phase, Sea Grant

10. Unmet data needs:
This characterizes an unmet data need & fills the gap.

11. Readiness (1=ready!; 5=concept stage): 1 2 3 4 (5)

LE

Priority Project and Location Worksheet

Project number: (2) Buffalo Outer Harbor to Smokes Creek AQ Habitat Project

NUMBER THIS PROJECT ACCORDING TO DIRECTIONS PROVIDED DURING THE WORKSHOP. THEN WRITE THE SAME PROJECT NUMBER ON A STICKY DOT AND ATTACH THE STICKY DOT TO THE LOCATION ON THE MAP THAT CORRESPONDS TO THIS PROJECT.

1. Which goal statement does this this project *primarily* address? Restoration of degraded habitat

2. The project category (circle one):
   Protection Enhancement (Restoration (reestablishment)) Rehabilitation

3. The proposed action (invasive species removal, wetland restoration, shoreline stabilization, fish barrier removal):
   Comprehensive; wetland restoration/connectivity, shoreline habitat restoration

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Restore habitat connectivity, improve hydraulic connectivity, restore habitat for early life stage (native FrW).

5. Targeted species that benefits from actions:
   Muskies, native fish communities, migratory birds, pollinators.

6. Spatial extent/acreage: 250 acres

7. Current/past condition of the site:
   Numerous inactive/active (former) industrial sites, Fragmented wetland habitat.

8. Social, political and physical context of the project:
   Recreational use, "rust to green," adjacent to a major urban area

9. Potential partners:
   City of Buffalo, NYSDEC, Buffalo-Niagara Waterkeeper, Rust to Green, USACE

10. Unmet data needs:
    Characterization of inactive sites, coastal process data

11. Readiness (1=ready!; 5=concept stage): 1 2 3 (4) 5

LE

Priority Project and Location Worksheet

Project number: 3 - Cattaraugus Creek

NUMBER THIS PROJECT ACCORDING TO DIRECTIONS PROVIDED DURING THE WORKSHOP. THEN WRITE THE SAME PROJECT NUMBER ON A STICKY DOT AND ATTACH THE STICKY DOT TO THE LOCATION ON THE MAP THAT CORRESPONDS TO THIS PROJECT.

1. Which goal statement does this this project *primarily* address? _____

2. The project category (circle one):
   Protection Enhancement Restoration (reestablishment) Rehabilitation

3. The proposed action (invasive species removal, wetland restoration, shoreline stabilization, fish barrier removal):
   Aquatic habitat restoration

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Improve quality + availability of nearshore habitats for purposes such as fishery nursery habitat

5. Targeted species that benefits from actions:
   Native fish communities, migratory birds

6. Spatial extent/acreage: 20 acres +

7. Current/past condition of the site:
   Currently gone/degraded with potential to restore functionality

8. Social, political and physical context of the project:
   Area with having - may be stakeholder concerns. is support for project from the Seneca nation - to be confirmed.

9. Potential partners:
   Seneca Nation, NYDEC, USACE,

10. Unmet data needs:
    Current + historical extent

11. Readiness (1=ready!; 5=concept stage): 1 2 3 4 (5)

#1

WOW

Priority Project and Location Worksheet

Project number: #1 NIAGARA RIVER Habitat Restoration

NUMBER THIS PROJECT ACCORDING TO DIRECTIONS PROVIDED DURING THE WORKSHOP. THEN WRITE THE SAME PROJECT NUMBER ON A STICKY DOT AND ATTACH THE STICKY DOT TO THE LOCATION ON THE MAP THAT CORRESPONDS TO THIS PROJECT.

1. Which goal statement does this this project *primarily* address? _____

2. The project category (circle one):
   Protection Enhancement Restoration (reestablishment) Rehabilitation

3. The proposed action (invasive species removal, wetland restoration, shoreline stabilization, fish barrier removal):
   Create Rock barriers along the West bank of Grand Island to protect and enhance the near shore habitat.

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Coastal Resiliency (Coastal Marsh)

5. Targeted species that benefits from actions:
   All species Divers, Birds, Fish

6. Spatial extent/acreage: ± 12miles by 100-200ft wide.

7. Current/past condition of the site:
   State park mowed to the edge actively eroding
   Highly fluctuating H_2O levels

8. Social, political and physical context of the project:
   Adjacent landowners may object, politically supportive.
   Sensitive Archeological Area

9. Potential partners:
   Parks, DOT, DEC, Grand Island, CORPS, DU, Audubon
   Waterkeeper, Senecas

10. Unmet data needs:
    Topography Bythemetry Historic Imagery

11. Readiness (1=ready!; 5=concept stage): 1 2 3 (4) 5
    Need design work
    Data collection

WON

Priority Project and Location Worksheet

Project number: #2 Buckhorn Marsh/Cove Restoration

NUMBER THIS PROJECT ACCORDING TO DIRECTIONS PROVIDED DURING THE WORKSHOP. THEN WRITE THE SAME PROJECT NUMBER ON A STICKY DOT AND ATTACH THE STICKY DOT TO THE LOCATION ON THE MAP THAT CORRESPONDS TO THIS PROJECT.

1. Which goal statement does this this project *primarily* address? _____

2. The project category (circle one):
   Protection Enhancement (Restoration (reestablishment)) Rehabilitation

3. The proposed action (invasive species removal, wetland restoration, shoreline stabilization, fish barrier removal):
   Wetland restoration & fish barrier removal to Arch culvert through barrier

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Reconnect the nearshore waters of East and West Rivers of Grand Islands

5. Targeted species that benefits from actions:
   Nursery habit for fish

6. Spatial extent/acreage: Confluence of river - reconnect 40 mi of river

7. Current/past condition of the site:
   Jetty directing water flow to intakes, blocks easy movement from E/W River

8. Social, political and physical context of the project:
   Sensitive archeological, state-owned

9. Potential partners:
   State Parks, NYPA, Audubon, Ducks Unlimited

10. Unmet data needs:
    Hydrology modelling

11. Readiness (1=ready!; 5=concept stage): 1 2 3 4 (5)

WON

Priority Project and Location Worksheet

Project number: #3 WON1 Niagara River

NUMBER THIS PROJECT ACCORDING TO DIRECTIONS PROVIDED DURING THE WORKSHOP. THEN WRITE THE SAME PROJECT NUMBER ON A STICKY DOT AND ATTACH THE STICKY DOT TO THE LOCATION ON THE MAP THAT CORRESPONDS TO THIS PROJECT.

1. Which goal statement does this this project *primarily* address? Restore Eco system function

2. The project category (circle one):
   (Protection) (Enhancement) Restoration (reestablishment) Rehabilitation

3. The proposed action (invasive species removal, wetland restoration, shoreline stabilization, fish barrier removal):
   Tonawanda Creek Enhancement (NIAGARA COUNTY)
   Land agri. bank and channel stabilization

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   River bank stabilization and wetland Improvements/restoration
   Reduce Farm impacts.

5. Targeted species that benefits from actions:
   Warm water fish & Mammals.

6. Spatial extent/acreage: 50+ miles of stream

7. Current/past condition of the site:
   long term Degradation

8. Social, political and physical context of the project:
   landowner.

9. Potential partners:
   Seneca, DEC, Land trust. Tonawanda watershed Coalition
   NOAA CORPS

10. Unmet data needs:
    Biological Hydrology

11. Readiness (1=ready!; 5=concept stage): 1 2 3 4 (5)

Attachment B

Data Summary Worksheets

Data Needs for Projects and Planning Worksheet

Group: Central Lake Ontario

DO YOU HAVE DATA TO FILL OUR DATA GAPS?

1. Data description:

2. Location:

3. Contact:

WHAT DATA DO YOU NEED TO COMPLETE YOUR PROPOSED PROJECT?

4. Data description: Hydrologic data

5. Location: Sawmill Cove in Sodus Bay

6. Why is this data important: Install appropriately sized bridge/culvert to achieve restoration goals

7. Estimate of temporal frequency and scale ("X" the box that matches your preferred spatial and temporal scale):

Temporal Frequency \ Spatial Scale/Resolution	Basin	State	County	Local
Annual				
5 yrs				
25 yrs				
Once				X

8. Additional Notes:
USAGE DATA - Traffic / recreational user

Wildlife PRE + POST Monitoring to measure response of target species (ie. #'s INCREASE, RETURN OF FORMER NESTING SITES..)

WHAT DATA DO YOU NEED TO IDENTIFY AND PRIORITIZE FUTURE PROJECTS?

9. Data description:
Sediment Transport Model For LAKE ONTARIO
PRIORITY HABITAT TYPES ie. Marshbird Breeding sites

10. Location:
LAKE ONTARIO

11. Why is this data important:
To properly assess permitting decisions & habitat restoration projects, and resiliency projects

12. Estimate of temporal frequency and scale ("X" the box that matches your preferred spatial and temporal scale):

Temoporal Frequency \ Spatial Scale/Resolution	Basin	State	County	Local
Annual				
5 yrs				X
25 yrs				
Once				

13. Additional Notes:
ADDITIONAL DATA Need
- SUBSTRATE MAPPING TO IDENTIFY LAKE TROUT SPAWNING HABITAT IN LAKE ONTARIO
- SPECIFIC AREAS include eastern BASIN, MEXICO BAY, Central LAKE ONTARIO Approx DEPTH ~~20-80~~ 3-90 FEET

NY BREEDING BIRD ATLAS IS BEING UPDATED, STARTING IN 2020

Data Needs for Projects and Planning Worksheet

Group: Eastern Lake Ontario & St. Law Riv

DO YOU HAVE DATA TO FILL OUR DATA GAPS?

1. Data description:
Chlorophyll-a

2. Location: (All of Lake Ontario)
Whole-lake, spanning many years

3. Contact:
EPA GLNPO Region 5 - Beth Hinchey-Malloy

WHAT DATA DO YOU NEED TO COMPLETE YOUR PROPOSED PROJECT?

4. Data description:
Soil composition, bathymetric data, T&E Species, local water levels, flood maps (updated)

5. Location:
Lakeview WMA

6. Why is this data important:
Planning purposes

7. Estimate of temporal frequency and scale ("X" the box that matches your preferred spatial and temporal scale):

Temoporal Frequency \ Spatial Scale/Resolution	Basin	State	County	Local
Annual		X		
5 yrs				
25 yrs				
Once				

8. Additional Notes:

WHAT DATA DO YOU NEED TO IDENTIFY AND PRIORITIZE FUTURE PROJECTS?

9. Data description:

10. Location:

11. Why is this data important:

12. Estimate of temporal frequency and scale ("X" the box that matches your preferred spatial and temporal scale):

Temporal Frequency	Basin	State	County	Local
Annual				
5 yrs				
25 yrs				
Once				

Spatial Scale/Resolution

13. Additional Notes:

Portions of our projects would Greatly Benefit from updated substrate maps for all of Lake Ontario. There is rumor NOAA may be able to accomodate some of this; doing so would improve all aspects of native fish restoration.

3-90

Data Needs for Projects and Planning Worksheet

Group: Erie (winners ★)

DO YOU HAVE DATA TO FILL OUR DATA GAPS?

1. Data description:
1) Sediment data derived from old navigation maps / verified
NAACC - North Atlantic Aquatic Connectivity Collaborative

2. Location:
1) All the great Lakes
2) North Atlantic States

3. Contact:
1) TNC - Gust Annis (Pippa Kohn)
2) UMass Amherst

WHAT DATA DO YOU NEED TO COMPLETE YOUR PROPOSED PROJECT?

4. Data description:
1) Modeling sediment transport along from Woodlawn Beach SP to Buffalo Harbor ★ possibly being done by USACE if they receive funding
2) Long term) index of dreissinid mussel density (verify data is available & analyze). also for future projects

5. Location:
1) See above Woodlawn Beach SP to Buffalo Harbor
2) Specific habitats as study sites: rocky shoal & sill

6. Why is this data important:
1) Understand dynamics of system for limiting factors & success
2) impacts on fish

7. Estimate of temporal frequency and scale ("X" the box that matches your preferred spatial and temporal scale):

Temporal Frequency \ Spatial Scale/Resolution	Basin	State	County	Local
Annual				2
5 yrs				
25 yrs				1
Once				

8. Additional Notes:
*Updating of existing datasets specifically for erosion rates (USACE sediment budgets) considering current flood events on Lake Ontario

WHAT DATA DO YOU NEED TO IDENTIFY AND PRIORITIZE FUTURE PROJECTS?

9. Data description:
1) Shoreline substrate project (Find My fish)
2) see # 4 #7

10. Location:
1) NYS Lake Erie shoreline
2)

11. Why is this data important:
1) Understand habitat availability
2)

12. Estimate of temporal frequency and scale ("X" the box that matches your preferred spatial and temporal scale):

Temoporal Frequency	Basin	State	County	Local
Annual				2
5 yrs				
25 yrs				
Once				1

Spatial Scale/Resolution

13. Additional Notes:
See # 8

Data Needs for Projects and Planning Worksheet

Group: W. Ontario + Niagara

DO YOU HAVE DATA TO FILL OUR DATA GAPS?

1. Data description:
BNW Riverwatch data - volunteer WQ sampling program, along Niagara River (US side)
SAV survey for Niagara River AOC
Shoreline condition
erost@bnwaterkeeper.org

2. Location:
Niag. River watershed
Niagara AOC

3. Contact:
cmurawski@bnwaterkeeper.org, Chris Murawski
Mark Kilipski, DEC

WHAT DATA DO YOU NEED TO COMPLETE YOUR PROPOSED PROJECT?

4. Data description:
topography, bathymetry, geotechnical, river bed substrate
historical conditions, water levels, wave study - water quality impacts of recreational boating on the Niagra?

5. Location:
Niagara River along West side of Grand Island (~12 m)

6. Why is this data important:
to inform project design + priority areas to restore along this stretch

7. Estimate of temporal frequency and scale ("X" the box that matches your preferred spatial and temporal scale):

Temporal Frequency	Basin	State	County	Local
Annual				
5 yrs				
25 yrs				
Once				X

(design study to isolate impacts of boating - measuring wave impacts on water quality)

8. Additional Notes:

WHAT DATA DO YOU NEED TO IDENTIFY AND PRIORITIZE FUTURE PROJECTS?

9. Data description:
native fish species / pops, put & take fishery data
erosion hot spots, historical ecological landscape,
long term water level data

10. Location:
Niagara river basin, including tribs
Lake Ontario basin

11. Why is this data important:
to inform priority flows areas for restoration + design development

12. Estimate of temporal frequency and scale ("X" the box that matches your preferred spatial and temporal scale):

Temporal Frequency	Basin	State	County	Local
Annual		X		
5 yrs				
25 yrs				
Once				

13. Additional Notes:

Attachment C

Presentation Slides

GREAT LAKES COASTAL AND NEARSHORE HABITAT ASSESSMENT WORKSHOP—NEW YORK

JANUARY 28, 2020

SYRACUSE CENTER OF EXCELLENCE

727 EAST WASHINGTON ST

SYRACUSE, NY 13120

9:00 AM – 4:00 PM

WORKSHOP CONTEXT

1. Collect data
2. Identify and fill data gaps
3. Develop priorities
4. **Tee up future projects**

WORKSHOP CONTEXT

- Project Priorities
- U.S. portion of GL Basin
- Nearshore area:
  - 15 M depth – Lake Erie
  - 80 M depth – others Lakes
  - Ordinary High Water Mark – shoreline
- Data
  - All the above
  - Plus Coastal Counties

Terrestrial or inland aquatic habitats including: "connecting habitats for coastal species or critical zones of influence for priority nearshore areas."
– FA4 Coastal Systems Work Group

Ken Winters, U.S. Army Corps of Engineers [Public domain]

PURPOSE OF THE WORKSHOP

Identify:

- shared coastal management principles, goals, priorities, and data needs.
- specific place-based actions and people who can support these actions, and
- data needs associated with these preferred actions.

The targeted habitats for lake trout, walleye, lake sturgeon, yellow perch, cisco, and migratory birds and ducks.

ANTICIPATED OUTCOMES

- Identify shared coastal management principles and goals for each state.
- Develop a list of coastal and near shore habitat projects for funding in FY21 and beyond that target habitat benefits for lake trout, walleye, lake sturgeon, yellow perch, cisco, migratory birds, and other species of interest.
- Develop a list of available data, identify data gaps, and prioritize data needs.

AGENDA

9:00	Welcome and introductions
9:40	Overview of state and regional plans
10:00	Identifying principles
10:30	Break
10:45	Identifying Goals
12:00	Lunch
12:30	Identifying and prioritizing projects and locations
2:20	Break
2:35	Identifying and Prioritizing Needed Data and People
3:45	Closing Remarks
3:55	Evaluation and Adjourn

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce

Coastal States Organization CSO

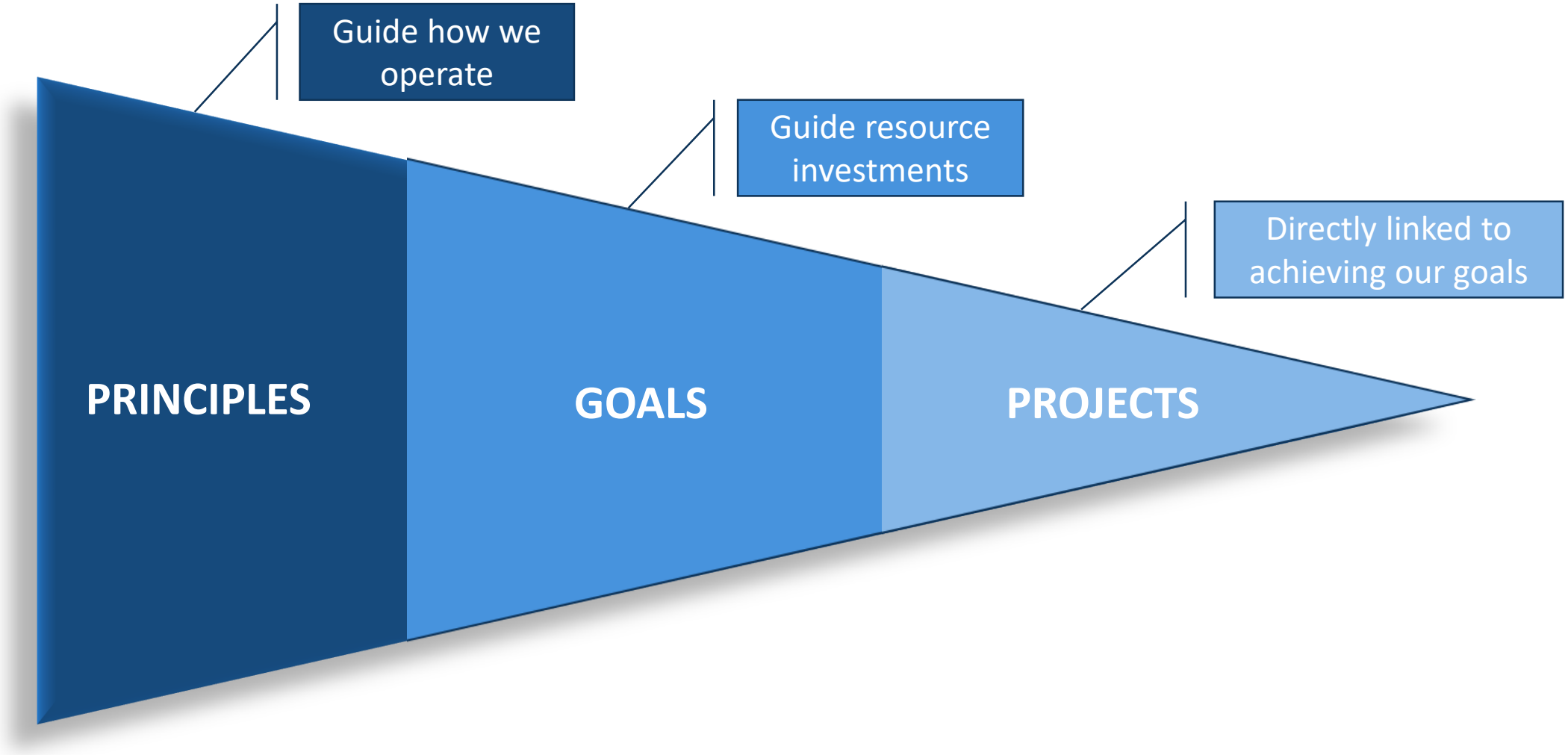
New York State of Opportunity. Department of State

New York State of Opportunity Department of Environmental Conservation

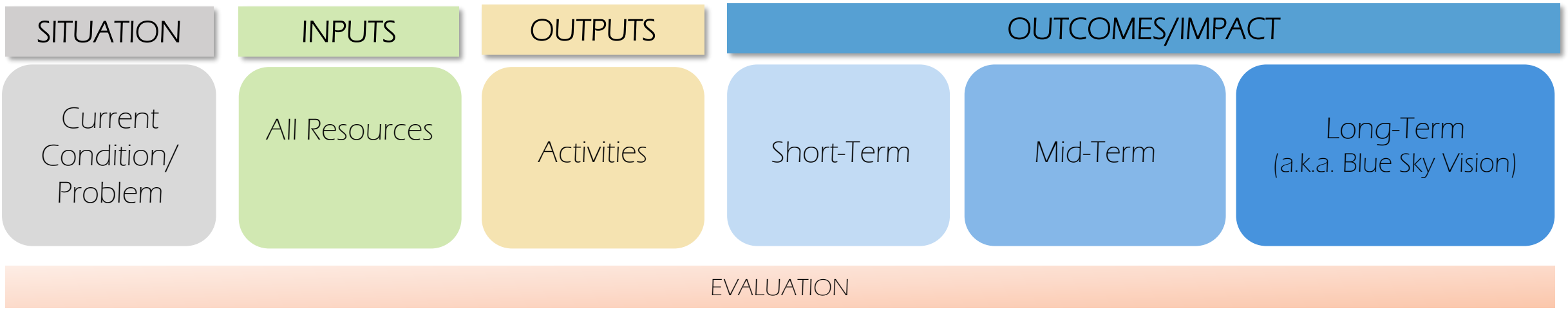
LimnoTech Water Environment | Scientists Engineers

RESPEC

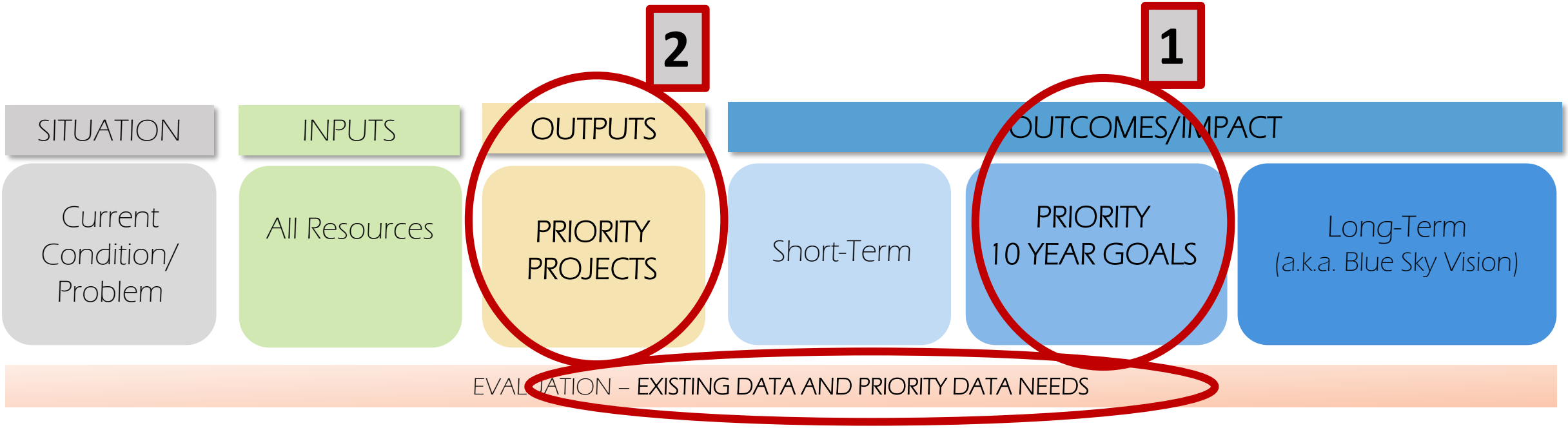
KEY ASPECTS OF AGENDA AND APPROACH



FRAMEWORK FOR TODAY'S ACTIVITIES



FOCUS OF TODAY'S ACTIVITIES



Etiquette

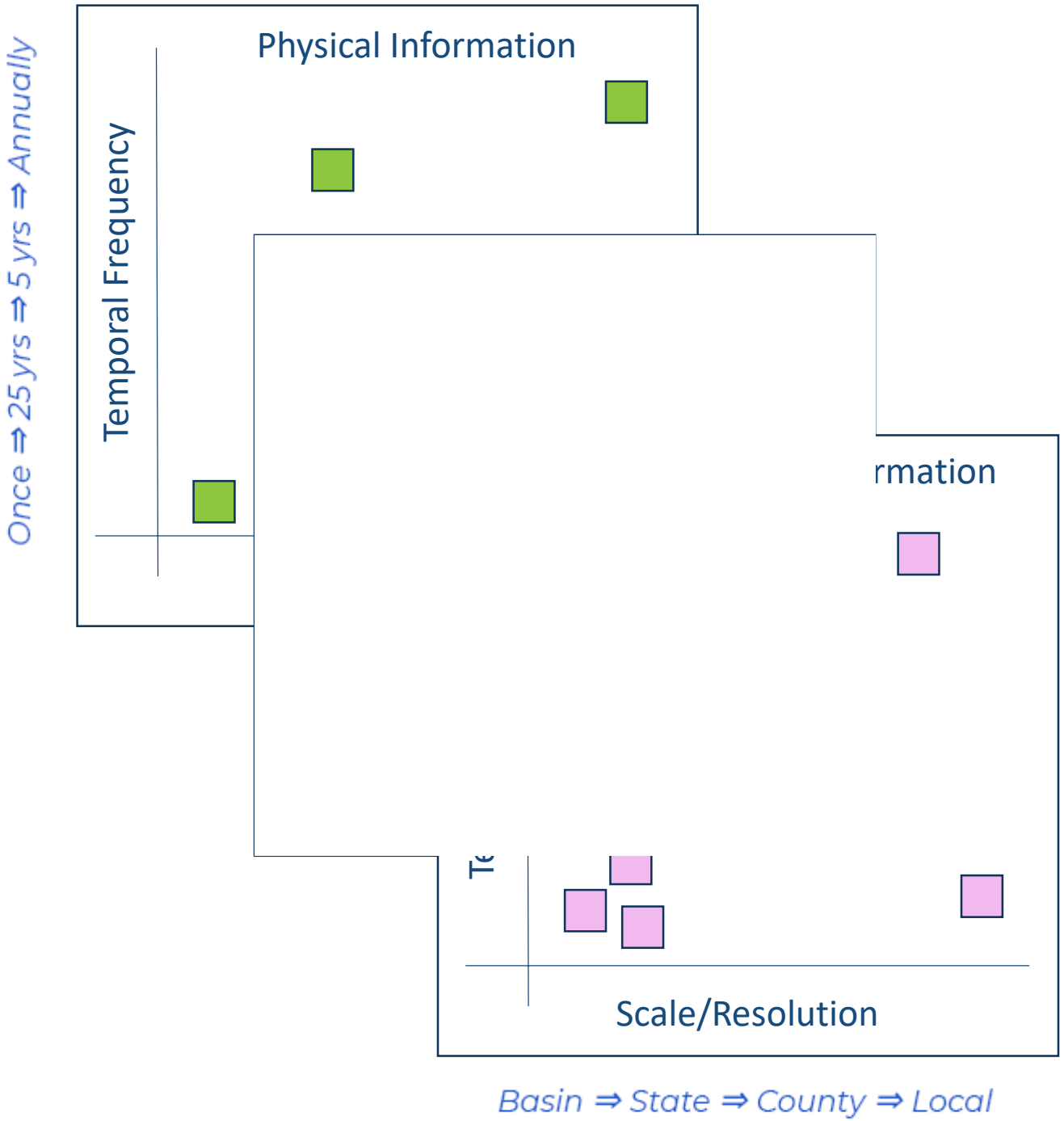
- **Contribute** your thinking and experience
- Listen to **understand**
- **Connect** ideas
- Listen together for **patterns, insights and deeper questions**
- Play, doodle, draw

KEYS TO SUCCESS

- Write legibly
- Complete thoughts in details
- Limited use of local/regional acronyms

DATA

- What scale? What frequency?
- Data types
  - Physical
    - Bathymetry
    - Substrate
  - Biological
    - Fish & benthos
  - Environmental
    - Dissolved oxygen
    - Water temperature



SHARED PRINCIPLES AND GOALS

- An overview of state and regional plans

Some definitions and examples for use and reference today

Principle:
a foundational idea
that influences action.

Goal:
the desired result
of an action.

Principles Examples:

Shoreline development can disrupt natural processes which can in turn limit habitat quality.

Habitat is often limited by fragmentation.

Science-based Goals Examples:

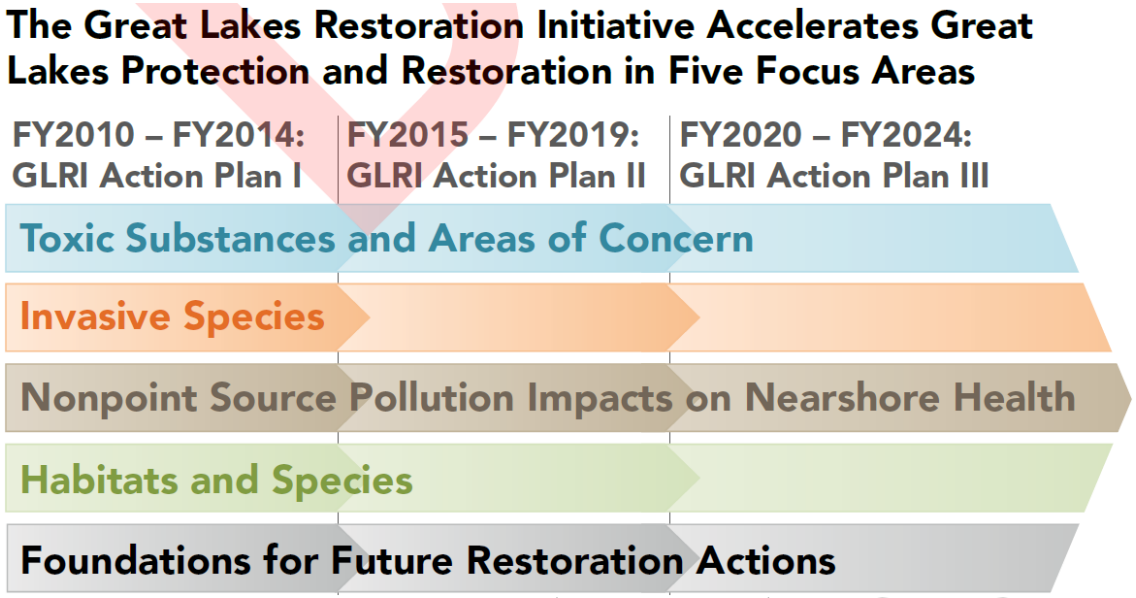
Take action to reduce shoreline hardening to less than 20% by 2030.

Maximize tributary connectivity for Lake Michigan migratory fish, while minimizing increased risk of invasive species.

Past principles and goals guiding habitat action

- Resources that have helped to articulate coastal habitat principles and goals in New York
  - GLRI Action Plan 3 (2020-2024), Focus Area 4: Habitat and Species
  - State and Regional Plans: LAMPs, Biodiversity Reports, and several other state plans

- **Workshops objective:**
  Identify principles, goals, projects and data needs
  that fit into a larger, shared, organized framework



Excerpt from 2019 GLRI Action Plan III

GLRI Action Plan III, Focus Area 4 – general statements of direction

- **Objectives**
  - **Protect and restore** communities of native **aquatic and terrestrial** species
  - Increase **resiliency** of species
- **Commitments**
  - **Identify, restore, and protect habitats** and provide **habitat connectivity**
  - Update and implement recovery actions for **federal threatened, endangered, and candidate species**.
  - Support **pop.-level protections, enhancements, and re-introductions**

GLRI Action Plan III, Focus Area 4 – example **statements of direction**

- Restoring **riparian habitat corridors**, further connecting **high-quality aquatic and terrestrial** habitat.
- Pursuing **innovation related to natural- and nature-based features** to enhance coastal ecosystem function.
- Considering **beneficial use of dredged material** to create new habitats.
- **Assessing** top-level predators, assisting in **re-introduction of native prey species**.
- Avoiding species extinction, **identifying key habitats and limiting factors**, increasing or protecting population levels
- Evaluating **population dynamics** (fish and wildlife)

Regional examples of Lake Ontario habitat and species goals

- **Open Water Benthic and Pelagic**
  - Maintain Chinook Salmon average growth and condition at or above 2007 levels
  - Increase abundance of stocked Lake Trout across a range of age groups
- **Nearshore Zone**
  - Restore Lake Sturgeon populations in 4 historical spawning areas
- **Coastal Wetlands**
  - Increase riparian and coastal cover to reduce peak flows by 20%
- **Connecting Channels**
  - Allocate more funds for stream restoration
  - Decrease phosphorus loading in 5-6 priority tributaries
- **Coastal Terrestrial Systems**
  - Increase BMP funding by 25%
  - Purchase/lease sensitive lands, focusing on riparian corridors
  - <20% hardened shorelines in priority watersheds

The Beautiful Lake: A bi-national Biodiversity Conservation Strategy for lake Ontario, 2009
Lake Ontario Fish Community Objectives for Lake Ontario, 2017

Regional examples of itat and species goals

GLRI Statements of Direction

Support protection of native species that have cultural, subsistence, and economic value

- **Open Water Benthic and Pelagic**
  - Maintain Chinook Salmon aver e growth and condition at or above 200 levels
  - **Increase abundance of stocked Lake Trout across a range of age groups**
- **Nearshore Zone**
  - **Restore Lake Sturgeon populations in 4 historical spawning areas**
- **Coastal We ands**
  - arian and coastal cover to reduce %

Identify key habitats and limiting factors

- **Connecting Channels**
  - Allocate more funds
  - Decrease phosphorus tributaries

Restore riparian habitat corridors, further connecting high quality aquatic and terrestrial habitat

- **Coastal Terrestrial Systems**
  - Increase BMP funding by 25%
  - **Purchase/lease sensitive lands, focusing on riparian corridors**
  - **<20% hardened shorelines in priority watersheds**

Pursue innovation related to natural and natured based features

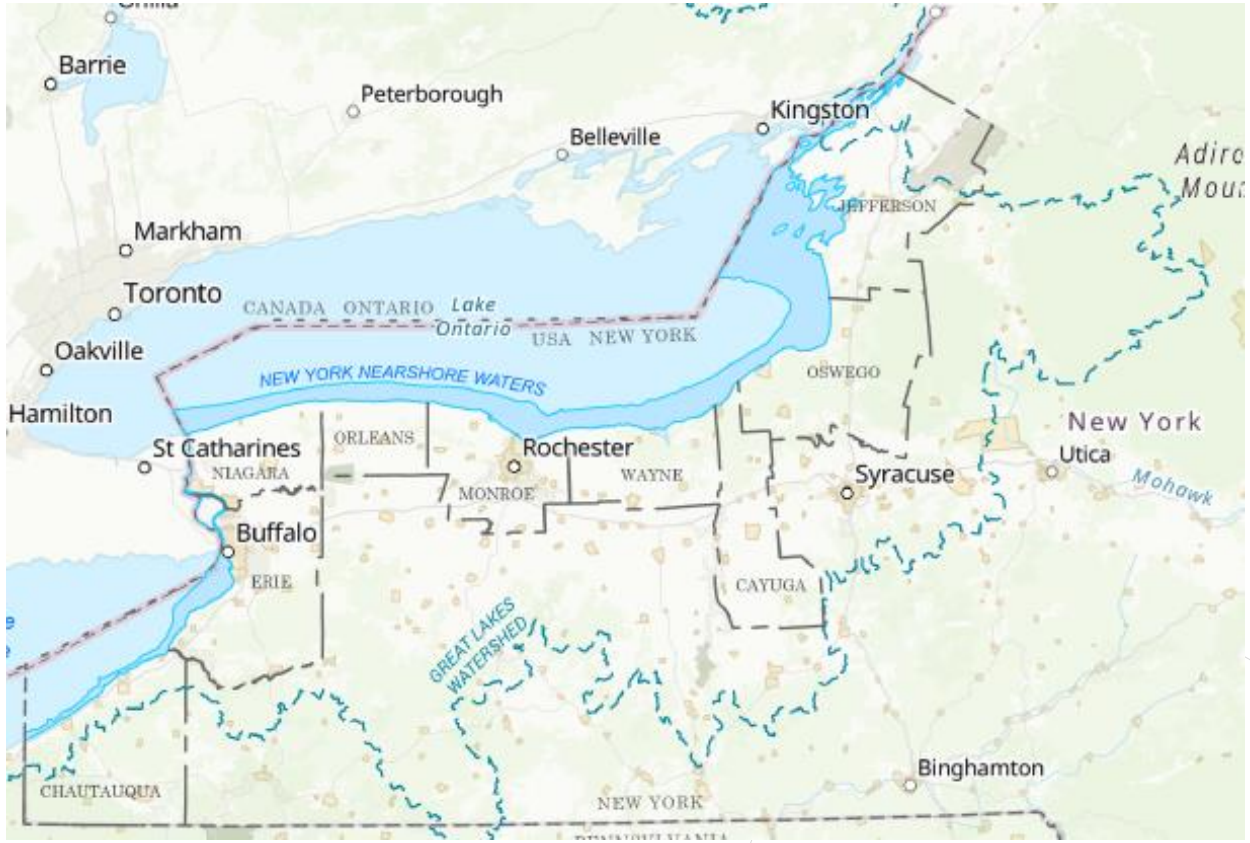
The Beautiful Lake: A bi-national Biodiversity Conservation Strategy for lake Ontario, 20
Lake Ontario Fish Community Objectives for Lake Ontario, 2017

New York state plans – example statements of direction

- **Restore** and **maintain natural habitats** in linkage areas between large blocks of habitat **for species of greatest concern**
- **Combat invasive species** to sustain a healthy Great Lakes ecosystem and to maintain **diverse economic and recreational opportunities**.
- Restore **aquatic connectivity** in support of **LAMP, RAP** and other biodiversity strategies.
- **Incorporate wildlife habitat needs** into the **design and re-use** of land reclamation and brownfield redevelopment activities.

Transition to breakout sessions – principles and goals

- Discussing principles and goals one way to place habitat actions into larger framework
  - May help to communicate about project benefits at larger scales
  - May help to identify common directions of New York agencies, common directions of multiple Great Lakes states
  - May help to identify linkages between state priority projects and GLRI Action Plan III



Principles

- ✓ A few minutes on your own
- ✓ Group conversation & noodling
- ✓ Choose 3/table
- ✓ Transfer to large green sticky notes (1 per sheet)
- ✓ Report out

What do you think are the key principles for achieving success in nearshore habitat restoration in the Great Lakes and/or the state of New York?

Consider:

- People
- Partnerships
- Data
- Science
- Funding

Examples:

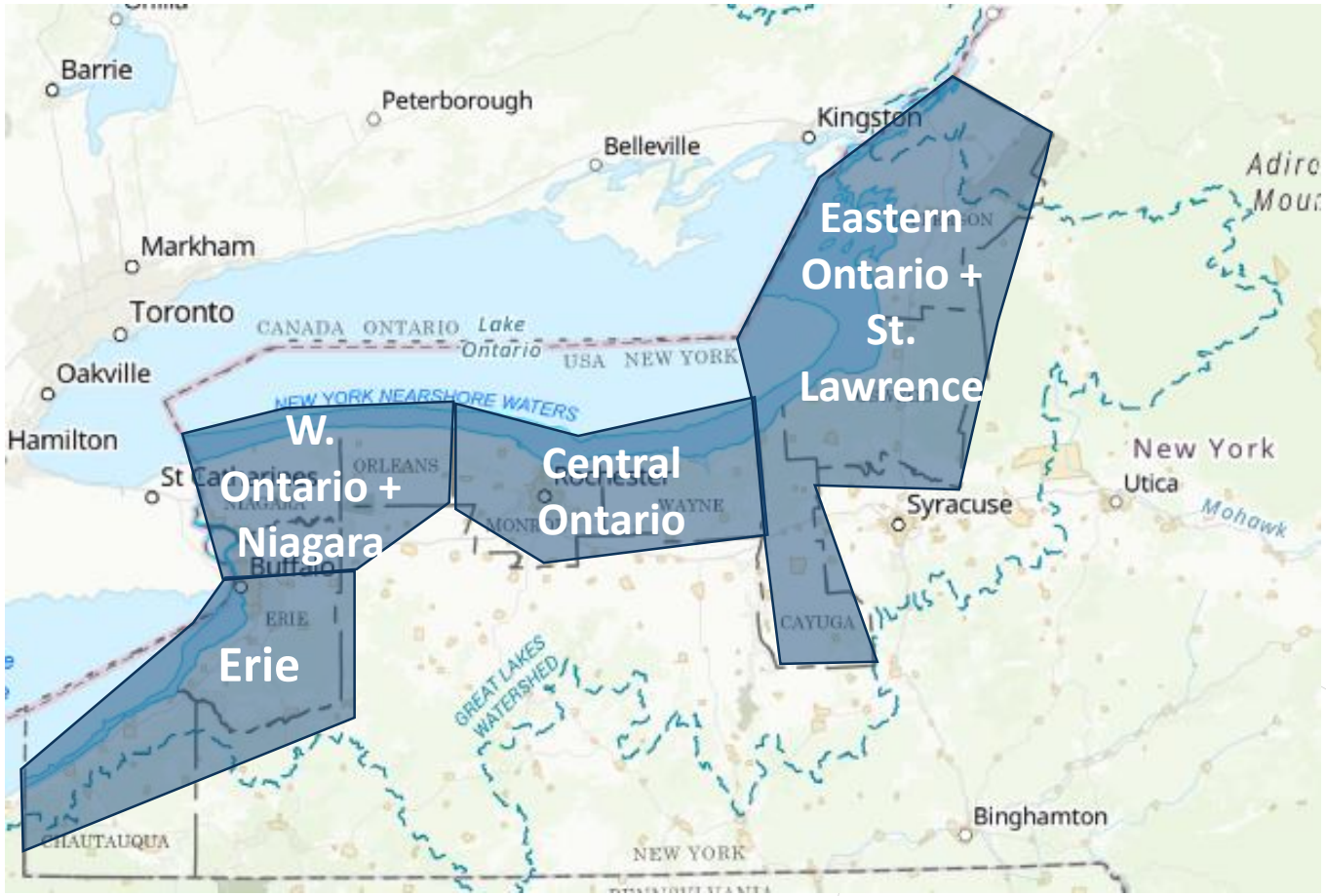
- Ecosystem approach that incorporates multiple benefits.
- Innovative, science-based approaches.
- Adaptive management to maximize benefits.
- Realistic and feasible.
- Sustainable design that uses natural features.
- Uses the strength of partnership.

Goals

Develop up to 3 goal statements per group

Groups

- Erie
- West Ontario + Niagara R.
- Central Ontario
- East Ontario + St Lawrence R.



Goals

- ✓ Self select table
- ✓ 45 minutes group conversation & noodling
- ✓ Chose 3 well-written goals/table
- ✓ Transfer to sticky flip chart – leave room for voting dots!
- ✓ Report out

Develop up to 3 goal statements per group

Groups

- Erie
- West Ontario + Niagara R.
- Central Ontario
- East Ontario + St Lawrence R.

Goal Statements Must Be Explicit and Contain:

- Subject or resource of concern,
- Characteristic or attribute for the subject or resource of concern,
- Desired future condition for conceptual target (10-year timeframe) for the subject or resource of concern, and
- A measure, if possible.

Examples:

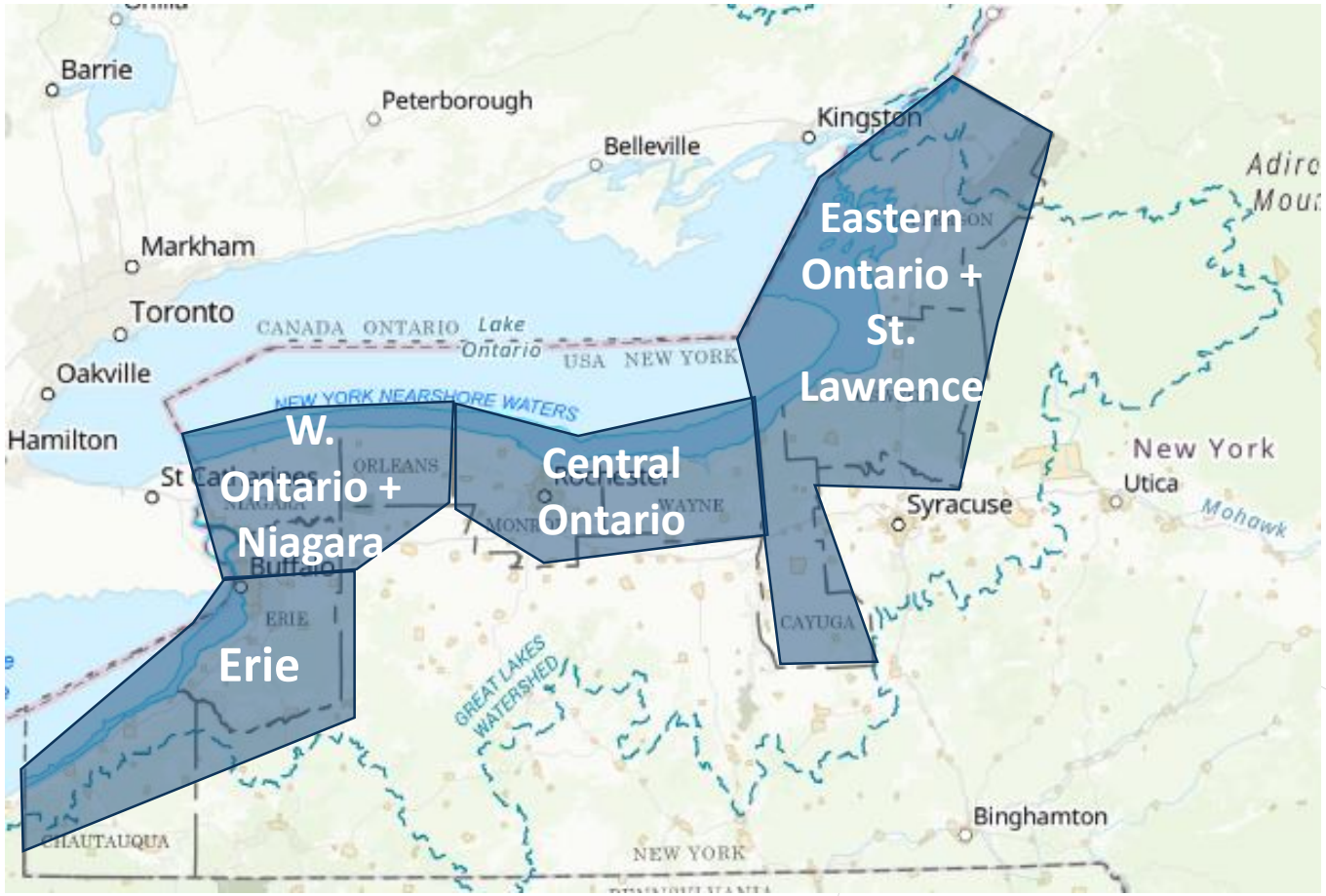
- Indiana: “Surface water will be restored to increase stormwater storage by 5% so that diverse, self-sufficient biological communities are supported.”
- Michigan: protect, enhance, and/or restore “…4,000 acres of coastal and nearshore habitat by 2030” in St Clair/Detroit River corridor

IDENTIFYING AND PRIORITIZING PROJECTS AND LOCATIONS

- An overview of state and regional plans

GLRI and New York Project Types and Priorities

- Resources that help to articulate coastal habitat project priorities in New York
  - Project types supported by GLRI Action Plan 3, Focus Area 4: Habitat and Species
  - Completed New York projects from reports
  - Transition to discussion of your current project priorities



Project Types Supported by GLRI

"Restoration under the GLRI includes ecosystem **protection**, **enhancement**, **rehabilitation**, and **restoration**."

Draft GLRI Action Plan III, 2019

Definition of GLRI Project Types by EPA

Protection:
The removal of a threat or prevention of decline in habitat quality. No net gain.

Example:

Purchase of land or easement

Enhancement:

The improvement of a specific function in existing habitat. No net gain.

Example:

Flow alterations in a wetland

Restoration (Re-establishment):
Rebuilding a former habitat. Net gain.

Example:

Removing shoreline hardening and restoring natural shoreline

Restoration (Rehabilitation):
Repairing natural/historic function in a degraded habitat. No net gain.

Example:

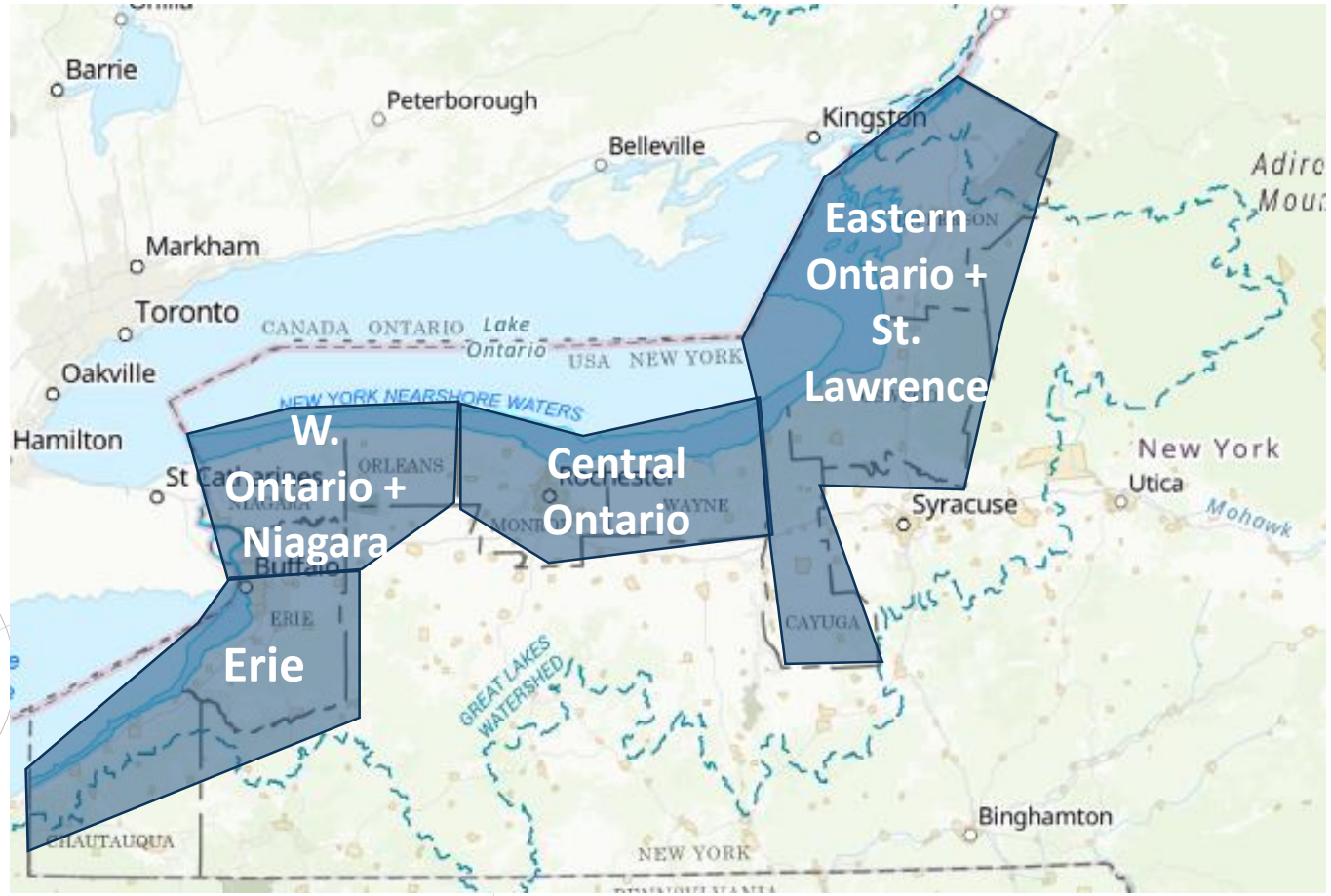
Removing invasive species that prevent native species from thriving

Select projects in New York

Restoration Type	GLRI Funded Projects	Other New York Projects
	Mother's Falls Preserve/Majors Park Cons. Area Acquire 57 acres of habitat…and protect 137 acres of Majors Park via deed restrictions	
Enhancement	Lake Shore Marshes Wetland Management Area Fish Habitat Enhancement …restore hydrologic function, improve fish migration, and enhance spawning, nursery, and rearing habitat within two coastal marsh systems	Lakeview Marsh Wildlife Management Area Northern Pike Spawning and Nursery Habitat Enhancement DEC will enhance fish habitat by creating potholes and connecting channels in Typha mats
Re-establishment	Trees for Tribs in Genesee River Basin Plant a minimum of 15,000 trees and shrubs…to restore 30,000 linear feet of…riparian buffer	Braddock Bay Barrier Beach Restoration …re-creation of a historic barrier beach which protects the Bay from…wind, waves, and winter damage or erosion.
Rehabilitation	Seneca and Cayuga Watersheds Stream Corridor Restoration …restore…fish habitat, re-establish, expand or protect riparian buffers, and improve water quality	Braddock Bay Habitat Improvements …extensive pot-holing, channeling and native plantings to slow cattail and Phragmites growth

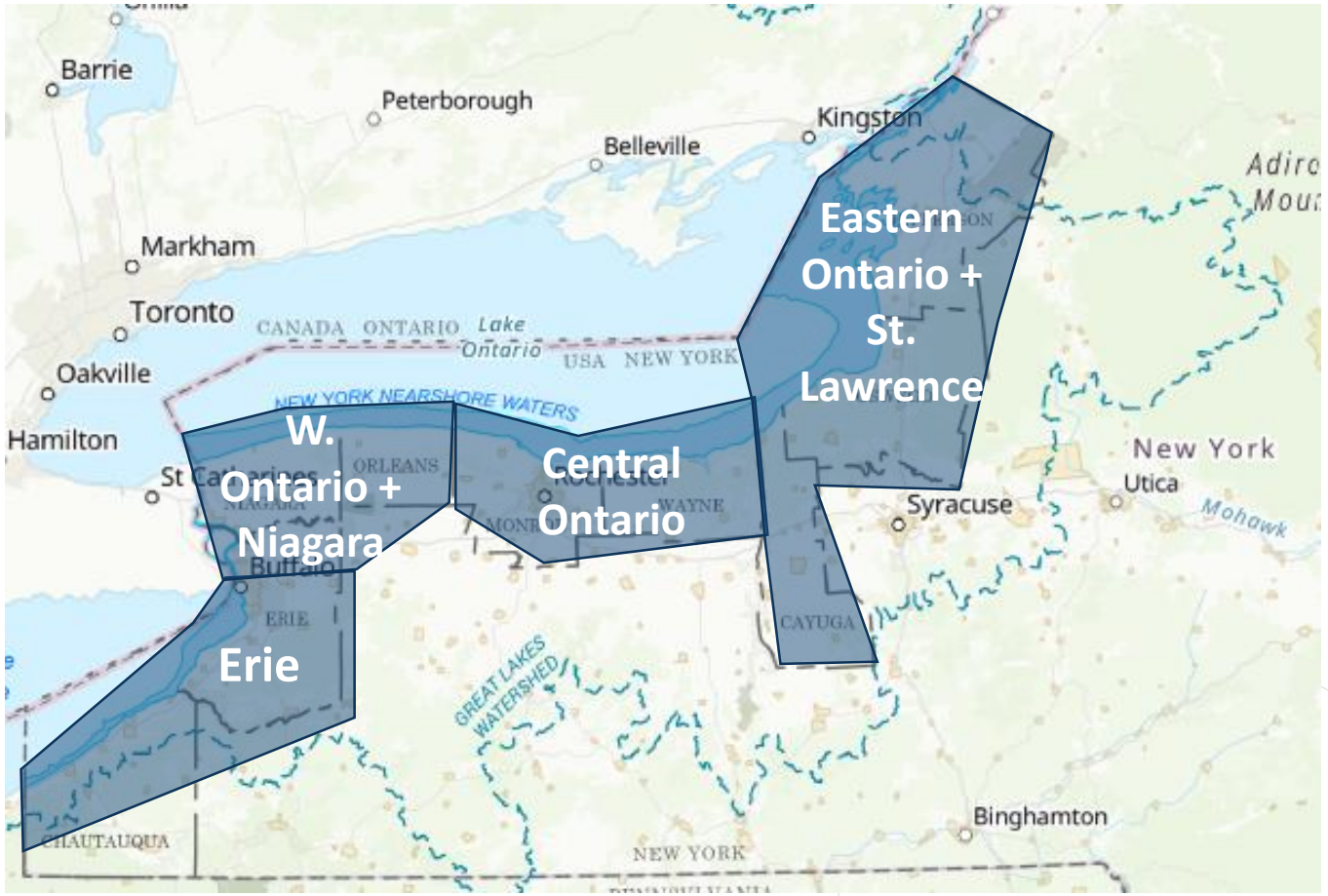
Project priorities in New York

- Lake Erie
  - Big Sister Creek Constructed Wetland
  - Hamburg Beach Habitat and Water Quality Improvements
- Lake Ontario
  - Port Bay East Barrier Bar Restoration
  - Black River Walleye and Lake Sturgeon Spawning Habitat Enchancement



Transition to breakout sessions – Identifying priority restoration sites

- **Time now to discuss ideas for future projects!**
- Breakout groups will organized by goal groups
- Please provide as much detail as possible – helps to increase likelihood of project realization



IDENTIFYING AND PRIORITIZING DATA

- An overview of data gaps

Identifying existing habitat-related data

- **WHY** we are reviewing this
  - Successful habitat restoration projects need data
    - For identifying and describing current habitat locations and planning project locations
    - For supporting project design
    - For post-auditing project effectiveness
  - Some apparent data gaps are due to lack of discoverability – help us locate data if possible!

Identifying types of habitat data

- **Targeting data that impact fish communities in the coastal zone**
  - **Review** of Great Lakes Aquatic Habitat Framework (GLAHF)
  - **Review** fisheries biologist
  - **Resulting in** 34 data types

- **Types of gaps**
  - Presence/absence
  - Temporal resolution
  - Spatial resolution

- **WHAT** we intend to have at the end of the discussion
  - **Do you have** state-level data to fill our data gaps?
  - Which data gaps are **most important to fill**?

Identifying types of habitat data

- **Targeting data that impact fish communities in the coastal zone**
  - **Review** of Great Lakes Aquatic Habitat Framework (GLAHF)
  - **Review** fisheries biologist
  - **Resulting in** 34 data types

- **Types of gaps**
  - Presence/absence
  - Temporal resolution
  - Spatial resolution

- **Where we have been:**
  - Regional data sources:
    - NOAA Digital Coast
      - Coastal Change Analysis Program
    - Great Lakes Aquatic Habitat Framework (GLAHF)
    - Great Lakes Observation System (GLOS)
    - USGS Great Lakes Sci Center
    - US Army Corps of Engineers
  - State data sources:
    - **NYS DEC**
    - USGS NY Water Science Center
    - Open Data NY

- **We have found many maps, but can't always get the underlying data**

Identifying types of habitat data

- Key questions to answer
  - Do you have any data to fill these gaps?
  - What data do you need to execute the projects we have proposed?
  - What data would you need to identify future projects in the future?

Review of spatial/temporal resolution

- **X**
  - We have found a dataset that matches the metric
- **OK**
  - sufficient level of information for project-scale work
- **LOW**
  - The resolution of the data is technically insufficient to complete project-scale work
- **MODERATE**
  - The resolution of the data is more coarse than desired to complete project-scale work, but useable
- **HIGH**
  - There is sufficient high-resolution to use this dataset for project scale work

Spatial Resolution	Temporal Resolution
Ok	Ok
Low	Low
Moderate	Moderate
High	High

Definitions & Abbreviations

- **CSMI (Cooperative science and monitoring initiative):** research efforts derived from Lakewide Action Management Plans (LAMPs)
- **Ecoregion:** a major ecosystem defined by distinctive geography
- **GLANSIS:** Great Lakes Aquatic Nonindigenous Species Information System
- **Hydrogeoforms:** underwater structures. These can be natural or manmade.
- **Relative exposure index:** is a wind speed, direction, and frequency weighted measure of effective fetch
- **USACE:** US Army Corps of Engineers

Physical habitat data—”static”

Data Type	Present?	Spatial Resolution	Temporal Resolution	Notes
Discharge infrastructure: volumes and types	X	Ok	Ok	NPDES permits
Ecoregions (ecoprovinces)	X	Ok	Ok	
Dams (river access)	X	Ok	Ok	
Road crossings	X	Ok	Ok	
Shoreline classification	X	Ok	Ok	
Stream mouths (watershed pour points)	X	Ok	Ok	
Watersheds	X	Ok	Ok	

X = present

ok = sufficient level of information for project-scale work

Physical habitat data—”dynamic”

Data Type	Present?	Spatial Resolution	Temporal Resolution	Notes
Bottom ruggedness (rugosity)				GAP
Bottom slope	X	Low	Low	Derived depth & relief
Connectivity to adjacent habitats				GAP
Hydrogeoforms	X	Low	Low	Derived depth & relief
Relative exposure index (REI)				GAP
River substrate				GAP
Spawning reefs	X	Ok	High	
Substrate composition, variability, and distribution	X	Moderat	Moderate	2015, GLAHF 30-m
Water depth	X	High	Moderate	
Wave energy	X	Moderate	Moderate	USACE modeled results. USACE Ontario + Erie sediment budgets.
Wave height	X	Low	High	GLOS buoy (no win. data)

Biological habitat data

Data Type	Present?	Spatial Resolution	Temporal Resolution	Notes
Benthos (trophic str/function)	X	Moderate	High	GLNPO points, most recent 2011
Coastal wetlands	X	Moderate	Ok	MTRI 12.5-m, high res in Old Woman Crk
Fish (trophic str/function)	X	High	High	Much data from NYSDEC Ontario partners (in PDF)
Plankton (trophic str/function)	X	High	High	GLNPO data, may not be sufficient depending on project location. Much data from NYSDEC Ontario + Erie partners (in PDF)
Prevalence of invasive species	X	Moderate	Moderate	GLANSIS, most recent 2014 Phragmites stands
Submerged aquatic vegetation (presence/absence)	X	Low	Low	Mich. Tech Research Inst, 2012, 30-m
Vegetation density				GAP (looking for SAV)
Vegetation heterogeneity				GAP (looking for SAV)
Vegetation morphotype				GAP (looking for SAV)
Vegetation species composition				GAP (looking for SAV)

Is there a state-wide database available? Missing spatial data? Remote sensing?

Environmental habitat data

Chlorophyll-a				GAP
Turbidity				GAP
Suspended minerals				GAP
Water temperature (incl. timing/variability)	X	High	High	Derived from NOAA coastwatch satellite and NYSDEC Ontario + Erie monitoring (pdf)
Dissolved oxygen	X	High	High	NYSDEC Ontario + Erie monitoring (pdf)

Is there a state-wide database available? Missing spatial data? Remote sensing?

THANK YOU

Shannon.Dougherty@dec.ny.gov

Attachment D

Workshop Data Catalog

NEW YORK GREAT LAKES COASTAL AND NEARSHORE HABITAT ASSESSMENT WORKSHOP—KNOWN DATA SETS

Workshop Class	Source	Collected_by	Type	Data Layer	Metadata	Year	Notes
Biological	Audubon Society	Audubon Society	Regional	Important bird areas	NA	2019	Obtained after IL workshop
Biological	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Regional	Lake Ontario lower food web monitoring	Yes	2018	Unable to download
Biological	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Regional	Lake Ontario quantifying cisco and bloater habitat use	Yes	2018	Unable to download
Biological	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Regional	Lake Huron Lower food web monitoring	Yes	2017	Unable to download
Biological	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Regional	Lake Huron linking fish to lower trophic level variability	Yes	2017	Unable to download
Biological	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Regional	Lake Huron assessment of round goby abundance and distribution	Yes	2017	Unable to download
Biological	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Regional	Lake Huron assessment of piscivore diets	Yes	2017	Unable to download
Biological	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Regional	Lake Superior lower food web monitoring	Yes	2016	Unable to download
Biological	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Regional	Lake Superior pelagic fish monitoring and assessment	Yes	2016	Unable to download
Biological	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Regional	Lake Superior benthic monitoring and assessment	Yes	2016	Unable to download
Biological	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Regional	Lake Michigan lower food web monitoring	Yes	2015	Unable to download
Biological	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Regional	Lake Erie lower food web monitoring	Yes	2014	Unable to download
Biological	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Regional	Lake Erie central basin hypoxia monitoring	Yes	2014	Unable to download
Biological	Cooperative Science and Monitoring Initiative (CSMI)	Collaboration	Lake Erie	Assessment of critical habitats for species, as well as how lower food web health, invasive species, harmful algal blooms and hypoxia impact fish production	Yes	2019	Unable to access data
Biological	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Lake Ontario	Lower food web monitoring	Yes	2018	Unable to access data
Biological	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Lake Ontario	Quantifying Cisco and Bloater habitat use	Yes	2018	Unable to access data
Biological	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Lake Erie	Lower food web monitoring	Yes	2014	Unable to access data
Biological	Fish and Wildlife Service (FWS)		Regional	Great Lakes Lake Sturgeon Tributary Database and GIS			Unable to access data

Workshop Class	Source	Collected_by	Type	Data Layer	Metadata	Year	Notes
Biological	Great Lakes Aquatic Habitat Framework (GLAHF)	Compiled data from: US EPA Great Lakes National Program Office (GLNPO) NOAA Great Lakes Env. Research Lab (GLERL) Cooperative Science and Monitoring Initiative (CSMI) Lake Erie Forage Task Group Lake Michigan mass Balance	Regional	Benthos	Yes	1972-2012	
Biological	Great Lakes Aquatic Habitat Framework (GLAHF)	Compiled data from: USGS Lake Erie state and provincial sampling Michigan DNR Goodyear spawning atlas additional published sources	Regional	Fish	Yes	1982-2011	
Biological	Great Lakes Aquatic Habitat Framework (GLAHF)	Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS)	Regional	Invasives	Yes	2014	
Biological	Great Lakes Aquatic Habitat Framework (GLAHF)	Compiled from: National Wetland Inventory WI Wetland Inventory OH Wetland Inventory US Fish and Wildlife Service additional published sources	Regional	Coastal wetlands	Yes	2003	
Biological	Great Lakes Aquatic Habitat Framework (GLAHF)	Compiled from: National Hydrography Dataset National Anthropogenic Barrier Dataset US Dam Inventory	Regional	Fish access to Great Lakes	Yes	2012-2016	
Biological	Great Lakes Fishery Commission	GLFC USFWS	Regional	Great Lakes Sturgeon Tag Identification Database	Yes	1950-2018	Online data access
Biological	Great Lakes Fishery Commission	GLFC USFWS	Regional	Great Lakes Fish Stocking Database	Yes		Online data access
Biological	Great Lakes Fishery Commission	GLFC USFWS	Regional	Great Lakes Fin Clip Database	Yes		Not publicly available
Biological	Great Lakes Fishery Commission	GLFC USFWS	Regional	Commercial Fish Production In The Great Lakes 1867-2015	Yes	2018	
Biological	Lake Erie Lower Trophic Monitoring Program	New York Dept of Env. Conservation (NYSDEC) Lake Erie Fisheries Unit Partners	New York	Basic water quality	Yes	Multiple years through 2018	PDF report, not data layer (would need to inquire about availability)
Biological	Lake Erie Lower Trophic Monitoring Program	New York Dept of Env. Conservation (NYSDEC) Lake Erie Fisheries Unit Partners	New York	Plankton assessments	Yes	Multiple years through 2018	PDF report, not data layer (would need to inquire about availability)

Workshop Class	Source	Collected_by	Type	Data Layer	Metadata	Year	Notes
Biological	Lake Erie Lower Trophic Monitoring Program	New York Dept of Env. Conservation (NYSDEC) Lake Erie Fisheries Unit Partners	New York	Fish assessments	Yes	Multiple years through 2018	PDF report, not data layer (would need to inquire about availability)
Biological	Lake Ontario Lower Trophic Monitoring Program	New York Dept of Env. Conservation (NYSDEC) Lake Ontario Fisheries Unit Partners	New York	Basic water quality	Yes	Multiple years through 2018	PDF report, not data layer (would need to inquire about availability)
Biological	Lake Ontario Lower Trophic Monitoring Program	New York Dept of Env. Conservation (NYSDEC) Lake Ontario Fisheries Unit Partners	New York	Plankton assessments	Yes	Multiple years through 2018	PDF report, not data layer (would need to inquire about availability)
Biological	Lake Ontario Lower Trophic Monitoring Program	New York Dept of Env. Conservation (NYSDEC) Lake Ontario Fisheries Unit Partners	New York	Fish assessments	Yes	Multiple years through 2018	PDF report, not data layer (would need to inquire about availability)
Biological	Michigan Tech Research Institute (MTRI)	MTRI	Regional	Coastal wetlands	Yes	2019	
Biological	Michigan Tech Research Institute (MTRI)	MTRI	Regional	Submerged aquatic vegetation	Yes	2008-2011	1 - Light SAV 3 - Sand/uncolonized substrate 7 - Dense SAV 9 - No data values derived from visual inspection of MTRI website
Biological	National Fish Habitat Partnership (NFHP)	NFHP	Regional	Contiguous U.S. Inland Assessment of Streams Habitat Condition Index and Limiting Disturbances	Yes	2016	Failed to download from NFHP on 30 Sept 2019. Sent note to Partnership asking for help, 30 Sept 2019.
Biological	National Fish Habitat Partnership (NFHP)	NFHP	Regional	Contiguous U.S. Inland Assessment of Streams Disturbance Data	Yes	2016	Failed to download from NFHP on 30 Sept 2019. Sent note to Partnership asking for help, 30 Sept 2019.
Biological	National Fish Habitat Partnership (NFHP)	NFHP	Regional	Contiguous U.S. Stream Fragmentation and Flow Alteration Statistics	Yes	2016	Failed to download from NFHP on 30 Sept 2019. Sent note to Partnership asking for help, 30 Sept 2019.
Biological	New York Dept of Env. Conservation (NYSDEC)	NYSDEC	New York	New York Natural Heritage Program	Yes		
Biological	New York State Department of Environmental Conservation	New York State Department of Environmental Conservation	New York	Breeding Bird Atlases	Yes	1980-1985 2000-2005	
Biological	Upper Midwest and Great Lakes Landscape Conservation Cooperative	Ewert	Regional	Prioritizing migratory bird habitat along Great Lakes shoreline	Yes	2012	Unable to download. Many website links are broken.
Biological	US Environmental Protection Agency (USEPA)	USEPA GLNPO	Regional	Phytoplankton monitoring	Yes		Unable to access data
Biological	US Environmental Protection Agency (USEPA)	USEPA GLNPO	Regional	Zooplankton monitoring	Yes		Unable to access data
Biological	US Environmental Protection Agency (USEPA)	USEPA GLNPO	Regional	Benthos monitoring	Yes		Unable to access data

Workshop Class	Source	Collected_by	Type	Data Layer	Metadata	Year	Notes
Biological	US Environmental Protection Agency (USEPA)	USEPA GLNPO	Regional	Chlorophyll-a monitoring	Yes		Unable to access data
Biological	US Environmental Protection Agency (USEPA)	USEPA GLNPO	Regional	Mysis monitoring	Yes		Unable to access data
Biological	US Fish and Wildlife Service (USFWS)	USFWS	Regional	Bird point count database			Unable to download
Biological	US Geological Survey (USGS)	USGS	Regional	Phragmites stands > 0.2 ha	No		
Biological	USEPA GLENDA database	USEPA	Regional	Fish Tissue Chemistry	Yes		
Biological	USEPA GLENDA database	USEPA	Regional	Fish Sample Information	Yes		
Biological	USGS - New York Water Science Center	USGS - New York Water Science Center	New York	Data for Assessing the Status of Macroinvertebrate Communities and Sediment Toxicity in the Buffalo River Area of Concern, New York	Yes	2017	
Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Lake Erie Fish Community Data, 2013-2018	Yes	2013-2018	
Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Historical Spawning Sites for Lake Whitefish (Coregonus clupeaformis) and Cisco (Coregonus artedi) in Lake Erie and Connecting Channels, 1850-1960	Yes	1850-1960	
Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Lake Erie Ecological Investigations 1980-2000: Benthic Invertebrate Community Analysis		1980-2000	
Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Lake Erie Ecological Investigations 1980-2000: Fish Community Analysis	Yes	1980-2000	
Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Lake Erie Ecological Investigations 1980-2000: Fish Health Evaluation	Yes	1980-2000	
Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Lake Erie Ecological Investigations 1980-2000: Reference Tables	Yes	1980-2000	
Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Zooplankton of the St. Clair-Detroit River System (2012-2015)	Yes	2012-2015	
Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Diets of Silver Chub (Macrhybopsis storeriana) in western Lake Erie, 2014	Yes	2014	
Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Round goby eDNA survey, evaluation, and laboratory data in Lakes Michigan and Huron 2016-2017	Yes	2016-2017	
Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Lake Erie Fish Community Data, 2013-2016	Yes	2016-2017	

Workshop Class	Source	Collected_by	Type	Data Layer	Metadata	Year	Notes
Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	St. Clair River Shoreline Remediation Evaluation Site And Sample Data 2015-2016	Yes	2015-2016	
Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Densities of Hexagenia mayfly nymphs in western Lake Erie, 1999-2014	Yes	1999-2014	
Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Fish eggs collected in the St. Clair and Detroit rivers, 2005-2016	Yes	2005-2016	
Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	USGS Lake Erie East Harbor bottom trawl data series, 1961-2011	Yes	1961-2011	
Biological	USGS Great Lakes Science Center	USGS	Regional	Great Lakes Commercial Fishing Catch 1929-2014	Yes	1929-2014	
Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Lake Erie Fish Community Data, 2013-2015	Yes	2013-2015	
Biological Environmental	US Environmental Protection Agency (USEPA)	USEPA	Regional	National aquatic resource survey (NARS)		1999-2001 2005-2006 2010	
Biological Physical	National Oceanic and Atmospheric Admin (NOAA)	NOAA	Regional	Environmental sensitivity index (ESI)	Yes	1985-2019	
Environmental	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Regional	Lake Ontario baseline nutrient and contaminanct concentrations in select tributaries	Yes	2018	Unable to download
Environmental	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Regional	Lake Superior baseline nutrient and contaminant concentrations in select tributaries	Yes	2016	Unable to download
Environmental	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Regional	Lake Michigan PCB and mercury concentrations in select tributaries	Yes	2015	Unable to download
Environmental	Cooperative Science and Monitoring Initiative (CSMI)	Collaboration	Lake Erie	Improved understanding of nutrient dynamics (sources, sinks, pathways and loadings) and nutrient-related issues (harmful algal bloom toxicity, nuisance algae growth, and hypoxia)	Yes	2019	Unable to access data
Environmental	Cooperative Science and Monitoring Initiative (CSMI)	Collaboration	Lake Erie	Characterization of chemical contaminant loading and cycling	Yes	2019	Unable to access data
Environmental	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Lake Ontario	Baseline nutrient and contaminant concentrations in select tributaries	Yes	2018	Unable to access data
Environmental	Cooperative Science and Monitoring Initiative (CSMI)	USGS	Lake Erie	Central basin hypoxia monitoring	Yes	2014	Unable to access data
Environmental	Great Lakes Observation System (GLOS)	Multiple partners	Regional	Great Lake buoy data including winds, waves, water temperature, water levels, air temperature, dissolved oxygen, streamflow, and turbidity	Yes	2019	

Workshop Class	Source	Collected_by	Type	Data Layer	Metadata	Year	Notes
Environmental	US Environmental Protection Agency (USEPA)	USEPA	Regional	303(d) Listed Impaired Waters NHDPlus Indexed Dataset with Program Attributes	Yes	2015	
Environmental	US Environmental Protection Agency (USEPA)	USEPA	Regional	305(b) Waters As Assessed NHDPlus Indexed Dataset with Program Attributes	Yes	2014	
Environmental	US Environmental Protection Agency (USEPA)	USGS - New York Water Science Center	New York	Water Quality Data for Tributaries to Lake Ontario in New York-- Great Lakes Restoration Initiative, Lakewide Impairment Study	Yes	2016	
Environmental	USEPA GLENDA database	USEPA	Regional	Water Quality Survey Chemistry	Yes		
Environmental	USEPA GLENDA database	USEPA	Regional	Lake Michigan Mass Balance Projects Data	Yes		
Environmental	USEPA GLENDA database	USEPA	Regional	Sediment Chemistry (limited)	Yes		
Physical	Ducks Unlimited	Ducks Unlimited	Regional	Conservation and Recreation Lands (CARL)	Yes	2017	Available in ArcGIS Online.
Physical	Esri	Esri	Regional	Parks	Yes	2019	Originally created 2010. Last updated June 18, 2019.
Physical	Great Lakes Acoustic Telemetry Observation System (GLATOS)	GLATOS	Regional	Receiver locations	No	2019	
Physical	Great Lakes Aquatic Habitat Framework (GLAHF)	NOAA	Regional	Lake bottom - bathymetry	Yes	2014	each lake has its own gdb
Physical	Great Lakes Aquatic Habitat Framework (GLAHF)	Derived from NOAA	Regional	Lake bottom - bottom slope	Yes	2014	
Physical	Great Lakes Aquatic Habitat Framework (GLAHF)	Derived from NOAA	Regional	Lake bottom - bottom relief	Yes	2014	
Physical	Great Lakes Aquatic Habitat Framework (GLAHF)	NOAA National Geophysical Data Center	Regional	Lake bottom - hydrogeoforms	Yes	2014	Hydrogeoforms are the end product of bathymetry and relief
Physical	Great Lakes Aquatic Habitat Framework (GLAHF)	Compiled from: US Geographic Naming Information System US Fish and Wildlife Reports Great Lakes Fishery Commission USGS additional published sources	Regional	Lake bottom - known reef locations	Yes	2014	
Physical	Great Lakes Aquatic Habitat Framework (GLAHF)	US Army Corps of Engineers	Regional	Shoreline - shoreline classifications	Yes	1987-1990s	
Physical	Great Lakes Aquatic Habitat Framework (GLAHF)	Compiled from: USGS National Hydrography Dataset	Regional	Shoreline - shoreline and islands	Yes	2014	
Physical	Great Lakes Aquatic Habitat Framework (GLAHF)	Derived from National Hydrography Dataset	Regional	Shoreline - sinuosity	Yes	2014	
Physical	Great Lakes Aquatic Habitat Framework (GLAHF)	Compiled from multiple agencies	Regional	Substrate	Yes	1968-2015	
Physical	Great Lakes Coastal Flood Study (GLCFS)	USACE, FEMA, et al.	Regional	Shoreline classifications	Yes	2012	

Workshop Class	Source	Collected_by	Type	Data Layer	Metadata	Year	Notes
Physical	Great Lakes Oblique Photo Viewer	USACE	Regional	Oblique air photos of Great Lakes shorelines			Failed to load.
Physical	Great Lakes Restoration Initiative (GLRI)	GLRI	Regional	Inventory of GLRI-funded projects	No	2019	
Physical	National Boundary Dataset (NBD)	USGS	Regional	Political boundaries	Yes	2019	
Physical	National Conservation Easement Database (NCED)	Multiple partners	Regional	Private conservation easements	Yes	2017	
Physical	National Oceanic and Atmospheric Admin (NOAA)	NOAA	Regional	Coastal digital elevation models for the Great Lakes	Yes	2016	Contact Brandon Krumwiede
Physical	NOAA Coastal Change Analysis Program (C-CAP)	NOAA	Regional	C-CAP Regional land cover data	Yes	2016	
Physical	NOAA Coastal Change Analysis Program (C-CAP)	NOAA	Regional	Potential Wetlands	Yes	2014	
Physical	NOAA Coastal Change Analysis Program (C-CAP)	NOAA	Regional	C-CAP Regional land cover change data	Yes	2016	
Physical	NOAA Coastal Change Analysis Program (C-CAP)	NOAA	Regional	C-CAP land cover of Old Woman Creek, Ohio NERR	Yes	2006	
Physical	NOAA National Centers for Environmental Information	NOAA	Regional	Bathymetry contours	Yes		
Physical	NOAA Office of Coast Survey	NOAA	Regional	Coastal Maintained Channels	Yes	2015	
Physical	NYS Department of Environmental Conservation	USGS - New York Water Science Center	New York	Lake Ontario Flood Monitoring and Mapping	Yes	2018-2019	
Physical	University of Wisconsin-Madison		Regional	Fishwerks	No	2016	
Physical	US Army Corps of Engineers (USACE)	USACE	Regional	Maintained channels	Yes	2019	
Physical	US Army Corps of Engineers (USACE)	USACE	Regional	Channel Line, area, reach and quarter for USACE maintained channels			
Physical	US Environmental Protection Agency (USEPA)	USEPA	Regional	Areas of Concern boundaries	Yes	2019	
Physical	US Environmental Protection Agency (USEPA)	USEPA	Regional	NPDES General Permit Web Inventory		2019	
Physical	US Fish and Wildlife Service (USFWS)	USFWS	Regional	Critical habitat	Yes		
Physical	US Geological Survey (USGS)	USGS	Regional	Protected Areas Database (PADUS)	Yes	2018	
Physical	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Lake Erie Ecological Investigations 1980-2000: Sediment Analysis	Yes	1980-2000	
Physical	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Water Depths and Velocities at Fish Egg Sampling Sites in the St. Clair-Detroit River System, 2005-2016	Yes	2005-2016	
Physical	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Saginaw Bay Restoration Assessment Composite Model	Yes	2016	
Physical	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Connecting River Systems Restoration Assessment Composite Model	Yes	2016	
Physical		Multiple partners	Regional	Lakebed 2030	NA		Materials not available as of 2019-10-07

Workshop Class	Source	Collected_by	Type	Data Layer	Metadata	Year	Notes
Physical		Multiple partners	Regional	Great Lakes Bottom Mapping	NA		Materials not available as of 2019-10-07
Physical Biological	USGS Great Lakes Science Center	USGS	Michigan Ohio New York	Hydrospatial Framework for the Laurentian Great Lakes	Yes	1980-2010	
Unknown	US Army Corps of Engineers (USACE)	USACE	Michigan Ohio New York	Lake Erie and Ontario Sediment Budget		2018	Tim Noon - Project Manager - USACE Buffalo Timothy.w.noon@usace.army.mil 716-879-4261
Unknown	US Army Corps of Engineers (USACE)	USACE	New York	Lake Ontario extension to the Coastal Wetland Decision Support Tool (Project Number 455171)		2019	Tim Noon - Project Manager - USACE Buffalo Timothy.w.noon@usace.army.mil 716-879-4261; LimnoTech- Jeremy Grush
Unknown	US Army Corps of Engineers (USACE)	USACE	New York	Lake Ontario Natural and Nature Based Feature Opportunity Viewer (Project Number 455171)		2019	Tim Noon - Project Manager - USACE Buffalo Timothy.w.noon@usace.army.mil 716-879-4261
Unknown	US Army Corps of Engineers (USACE)	USACE	New York	Lake Ontario Coastal Wetlands Mapping (473994)		2020	Tim Noon - Project Manager - USACE Buffalo Timothy.w.noon@usace.army.mil 716-879-4261
Unknown	US Army Corps of Engineers (USACE)	USACE	New York	Buffalo River Aquatic Habitat Restoration		2018	
Unknown	US Army Corps of Engineers (USACE)	USACE	New York	Seneca Bluffs (Buffalo River) (455358)		2018	
Unknown	US Army Corps of Engineers (USACE)	USACE	New York	Squaw (Unity) Island ecosystem restoration, with Buffalo River dredged spoil (454931)		2018	
Unknown	US Army Corps of Engineers (USACE)	USACE	New York	Bird Island Pier, Buffalo, NY - Section 506 Federal interest determination (464559)			
Unknown	US Army Corps of Engineers (USACE)	USACE	New York	Springville Dam (Cattaraugus Creek) (332955)		2016	
Unknown	US Army Corps of Engineers (USACE)	USACE	New York	Springville Dam (Cattaraugus Creek) (126974)		2015	
Unknown	US Army Corps of Engineers (USACE)	USACE	New York	Braddock Bay Ecosystem Restoration (Lake Ontario) (395893)		2014	
Unknown	US Army Corps of Engineers (USACE)	USACE	New York	Chautauqua Creek Fish Ladder (137903)			
Unknown	US Army Corps of Engineers (USACE)	USACE	New York	Lye Creek (372322)		2015	
Unknown	US Army Corps of Engineers (USACE)	USACE	New York	Niagara River - Emerald Shiner passage (475389)		2015	
Unknown	US Army Corps of Engineers (USACE)	USACE	New York	Cherry Farm (Tonawanda) (464547)		2018	