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

February 5, 2020

Tom Ridge Environmental Center

301 Peninsula Dr

Erie, PA 16505

9:00 am – 4:00 pm

Prepared for:

Coastal States Organization

FINAL

3/25/2020

LimnoTech

Water Environment | Scientists Engineers

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Funding for this project provided by Great Lakes Restoration Initiative

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pennsylvania
COASTAL RESOURCES MANAGEMENT

LimnoTech
Water | Scientists
Environment | Engineers

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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 management 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.

This report covers the proceedings of the one-day workshop held in Erie, PA on Wednesday, February 5, 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 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 management principles and goals for Pennsylvania;
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 Pennsylvania 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 alignments with GLRI Action Plan III Focus Area 4	Very brief presentation summarizing state-level reports and 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

Workshop Segment	Purpose	Format
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 Erie. The purpose of this presentation was to help workshop attendees consider their own principles and goals related to habitat restoration in the lake.

LimnoTech first started by defining the terms "principles" and "goals", and then gave several examples from the GLRI Action Plan III, and the Lake Erie Biodiversity Conservation Strategy (USEPA, 2019; Pearsall et al., 2012). 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 Erie 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 (LERC, 2008; PAGC and PAFBC, 2005). 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.

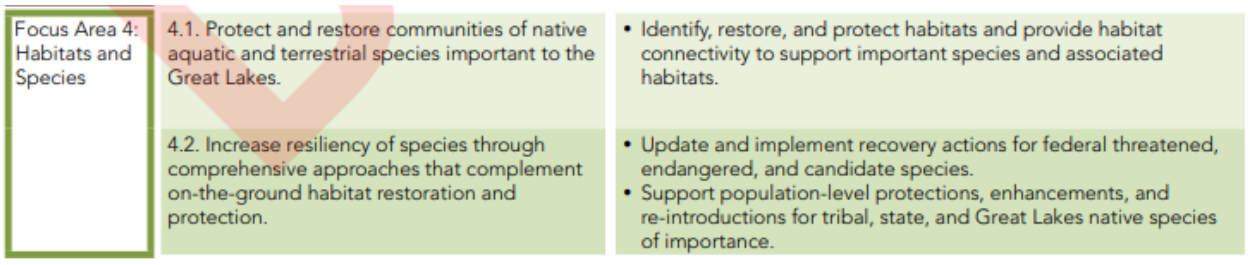

Figure 2. Summary of Focus Area 4—Species and Habitat Principles and Goals Excerpted from GLRI Action Plan III (USEPA, 2019)

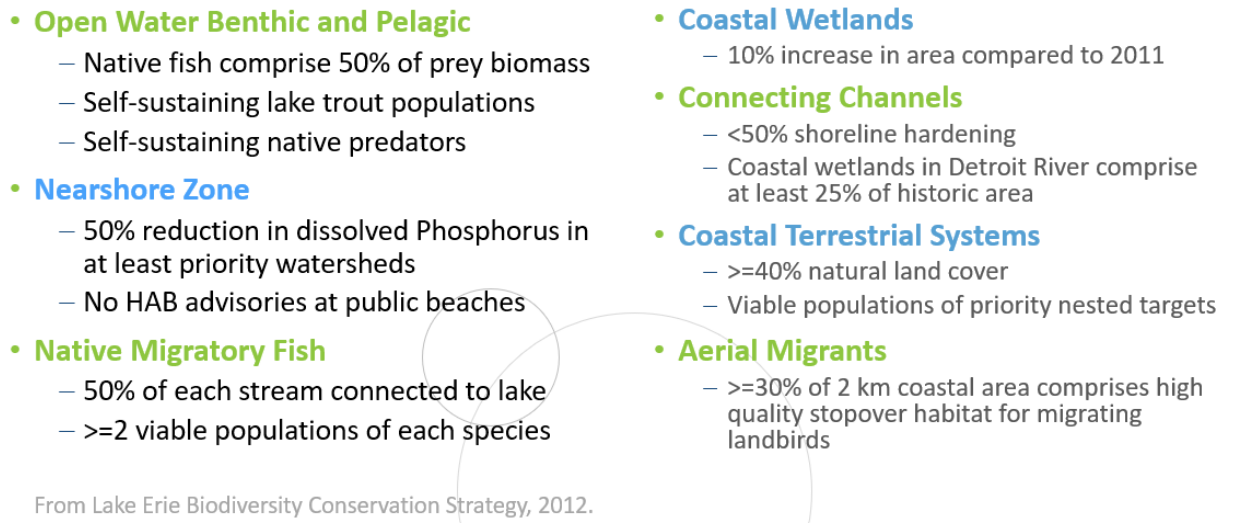

Figure 3. Summary of Select Habitat Restoration Goals Presented in the Lake Erie Biodiversity Conservation Strategy (Pearsall et al., 2012)

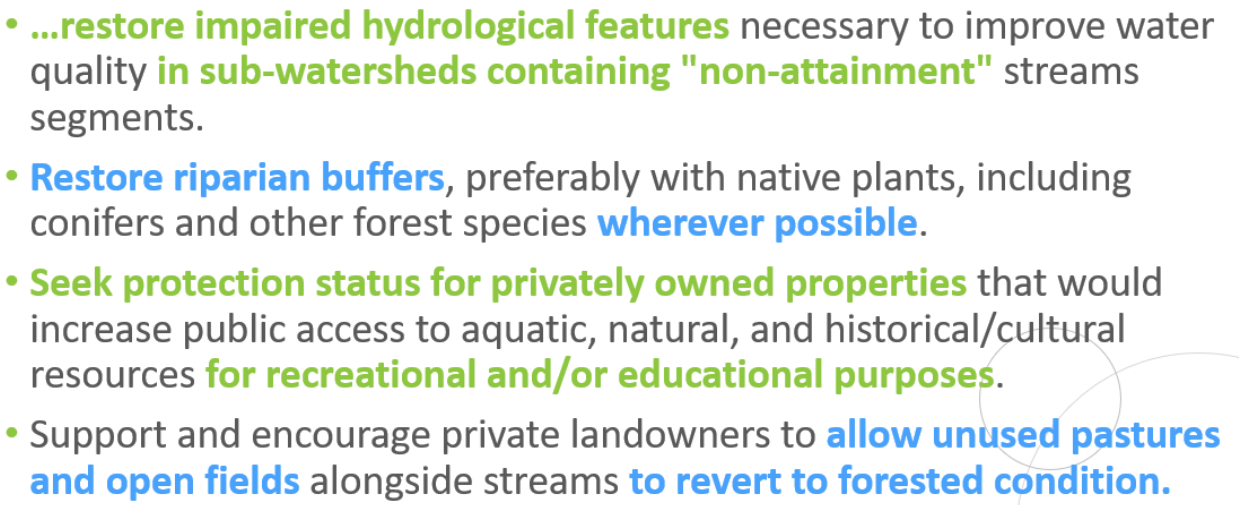

Figure 4. Summary of Select Principles and Goals from Pennsylvania State-Level Reports (LERC, 2008; PAGC and PAFBC, 2005)

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. A robust conversation around partnerships ensued. The conversation is paraphrased in the bullet points below:

- Maybe [we need to add] better coordination among agencies. We have agencies doing similar things, and there isn't always clear communication
    - This is an age-old problem. Do we have the infrastructure to do that? This piece never seems to get done. Right now, there is not an efficient way to do that.
    - Scalability would be an important part of this for me. On a statewide level, we could put together some coordination, but we require funding for this. The admin process right now limits our ability to coordinate across groups. In my opinion there are many barriers to successfully doing this.
    - Often research projects take place and they end up on the shelf. We do have a local consortium that presents local projects, maybe we need a better means to communicate out to the community.
    - We have WALTeR which tries to get at this issue. As we delisted Presque Isle Bay, we developed WALTeR which is a repository of geospatial info, research and other data. Locally, I think it is well known but we haven't publicized it yet
    - For those of us who work across the lakes, one issue is that federal agencies rarely coordinate with each other. It would be great if they could get together to fund one large study that meets everyone's needs.
    - We would like to see more coordination from the funding agencies themselves
    - I am here as a citizen. We have a number of agencies here that are state or federally related. They need to work together, instead of each working alone. Taking our $20 and working together, vs giving everyone $1. We really want to see more cooperation.
- I think the concept of demonstration projects is critically important for innovation. This ties into the desire for data and the desire for data-driven approaches. Then we can use adaptive management to evaluate these projects.
    - Successful projects need to be very well defined.
    - Transferability: it would be great if we could replicate projects from other lakes and implement them here?

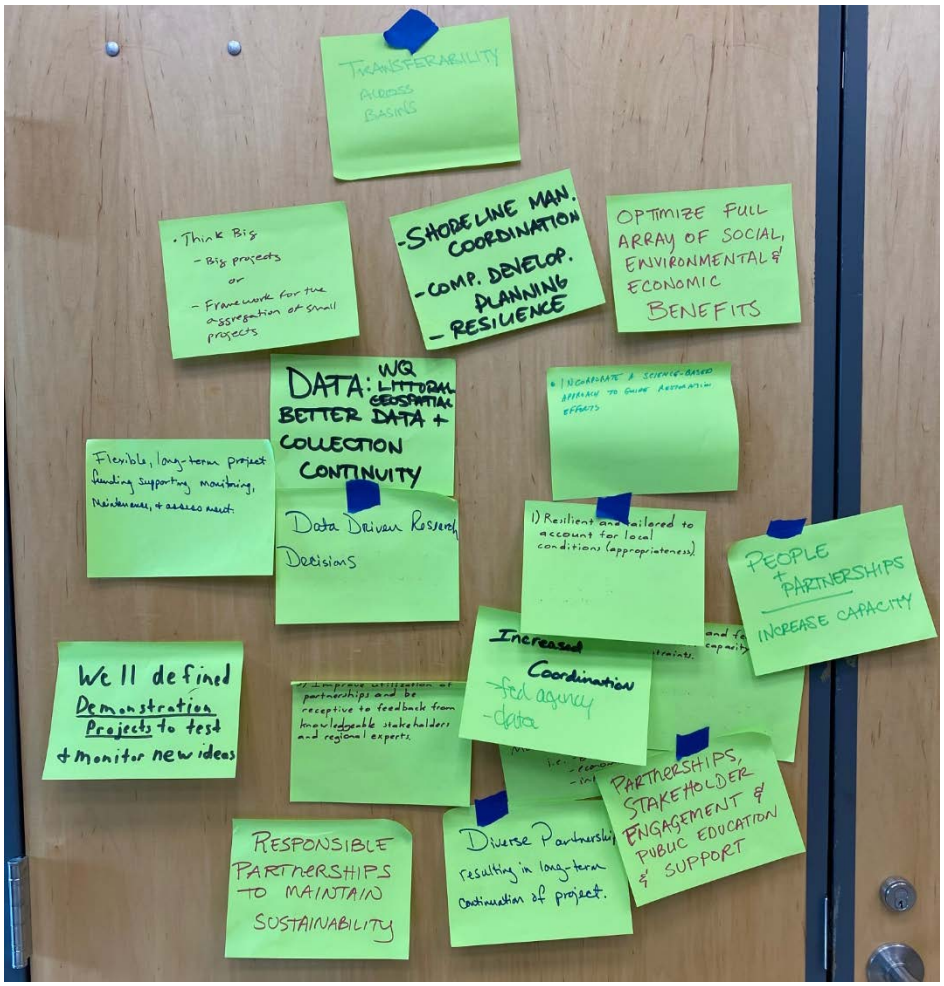

Figure 5. Snapshot of the Results from the Principles Discussion

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	Diverse partnerships that result in long-term continuation of partnerships and a more comprehensive view of the project	e.g., ensuring the success of the project into the future
	Projects should benefit multiple stakeholders	Thinking about more than just one set of needs. Does the project address economic, environmental, and infrastructure needs?
	Responsible partnerships to maintain sustainability	It's everyone's task and duty to maintain the area where they live. Fostering stewardship is really important
	Improved utilization of partnerships and be open to feedback from experts and knowledgeable stakeholders	
	Using people and partnerships to help increase capacity	There are fewer NGOs now than there were 2 decades ago. We need to increase the amount of community buy-in to help get these projects done.
	Partnerships, stakeholder engagement, and public education and support	
	Leveraging people and partnerships to expand capacity	
	Thinking big	Use big projects or frameworks to combine smaller projects. How do we integrate smaller projects together into a larger framework?
Support	Flexible long-term project funding	We need funding to support monitoring, maintenance, and assessment
	Increased coordination from the federal agencies	Both in terms of funding projects and collecting data.
Data/Science	Better data quality and frequency	We need better data related to water quality, the littoral zone, geospatial datasets, etc. We would also like better continuity related to data collection.

Category	Key Principle	Further Details
	Data driven research decisions	
	Incorporate a science-based approach to guide restoration efforts	
	Realistic and feasible projects given staff capacity and constraints	
	Demonstration projects to drive innovation	
	A well-defined project that has measurable objectives	
	Share learning and transferability across different regions	
Sustainability	Resilient and tailored to account for local conditions	Is the project/design appropriate for the location?
	Comprehensive planning and development tied to the shoreline management system	Including ecological goals into development/economic planning. How do we integrate development and habitat preservation? Also, trying to "future proof" ourselves against climate impacts. Improving resiliency
	Optimizing the full array of social, environmental, and economic development	Consider all of the values
	Shoreline management and coordination that results in comprehensive planning. Comprehensive planning would include accounting for both the environment and the development needs of a region.	

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 Pennsylvania Shoreline, Erie and Presque Isle, Eastern Pennsylvania Shoreline, and General (Figure 7). The study area for restoration projects extended in from the 15-m bathymetry contour in Lake Erie to the Great Lakes watershed boundary within Pennsylvania. The first three groups were limited to selecting projects within their defined regions, but the general group was allowed to consider goals that incorporated the entire Pennsylvania portion of the Lake Erie coast. 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 statement that received the most green dots and the fewest red dots was considered to the be top goal for a given region. The goal statements and the results of the nominal voting process are summarized in Table 3.

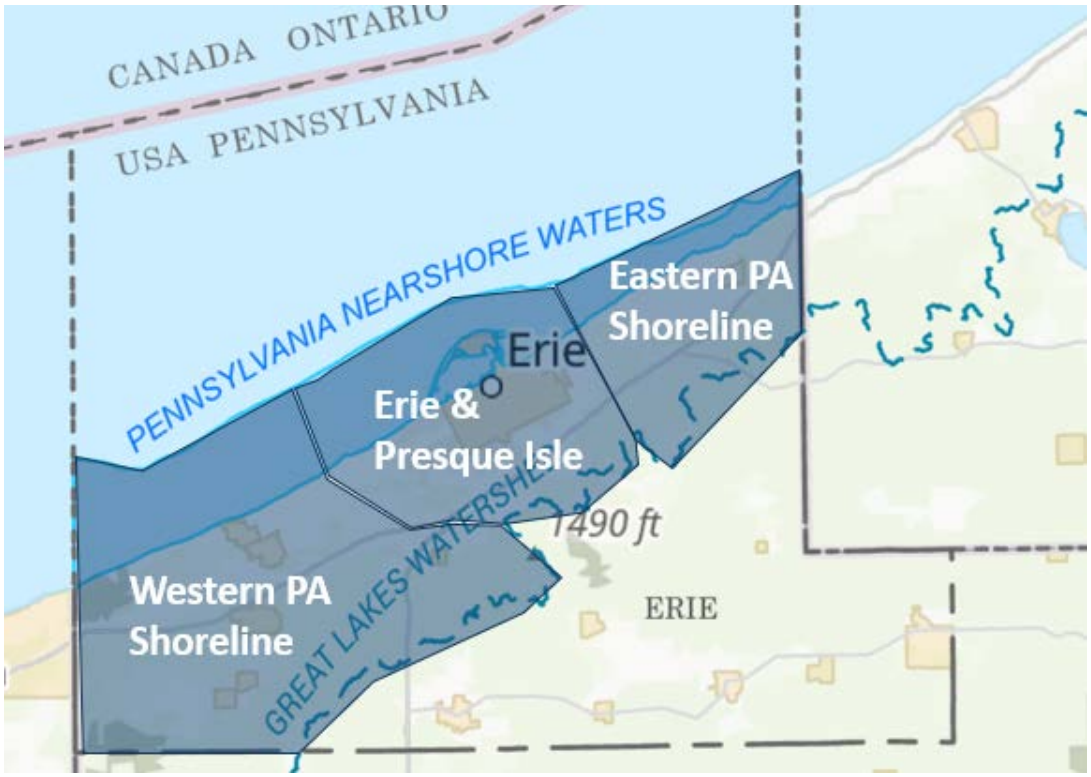

Figure 7. Map of Pennsylvania Coastlines and the Approximate Geographic Extent for Three of the Four Groups: Western Pennsylvania Shoreline, Erie and Presque Isle, and Eastern Pennsylvania Shoreline

Figure 8. Western Pennsylvania Shoreline Group Developing Goal Statements

Figure 9. Eastern Pennsylvania Shoreline Group Developing Goals Statements

Figure 10. Erie and Presque Isle Group Developing Goals Statements

Figure 11. General 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 Pennsylvania Shoreline	Improve nearshore habitat quality by restoring historic littoral sediment transport between Ohio line and Walnut Creek. The date of this goal is "to-be-decided".	This plays into the decreased sediment inputs we have coming in from the west and addresses that need. This is a big concern in the western part of the state, and it impacts structures and property. It would also influence habitat.	**18**	4
	Work to protect and enhance forested wetlands within the lake watershed. Through easement and acquisition by 2030. Working toward "no net loss" of wetlands.	There are already regulatory protections in place here. We need better protection overall. There are few wetlands we are thinking about targeting here for permanent long-term protection.	11	1
	Perform a biodiversity index for Western PA tributaries by 2025 that accounts for seasonality with a goal of enhancing total stream diversity	We want to enhance instream diversity, and we think it ties back into earlier examples where we don't have any baseline data. This project would address that need.	4	26
Erie and Presque Isle	Increase quality and quantity of coastal riparian buffers in the urban watershed by 25% by 2030	This looks more inland on the urban bay front.	**17**	3
	Soften urban shoreline hardscapes by 25% by 2030	This one targets the city shoreline. We are thinking about removing hard wall structures, and installing more natural structures	12	6
	Protect, enhance, or restore 25% of habitats and their ecosystem in the Presque Isle area by 2030	This is looking at Presque Isle state park area.	4	21
	Identify, protect, restore, and enhance high diversity habitats that support fish population		**15**	3

Region	Goal	Additional Comments	Green Dot	Red Dot
Eastern Pennsylvania Shoreline	Increase spawning and survival of fish communities with increased available artificial habitat		11	2
	Increase habitat quality at existing sites for targeted species (Lake Trout) to increase spawning		1	25
General	Enhance habitat for migratory birds and waterfowl by increasing the acreage of wetlands within the Lake Erie watershed by 15% by year 2030		**19**	4
	Restore the littoral system and sand supply through modification or management of man-made shoreline structures to improve nearshore habitat and health		13	3
	Employ meaningful measure to improve water quality at nonpoint source discharges resulting in measurable improvements to nearshore water quality		3	25

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 Ohio Projects
Protection	Roderick Reserve Expansion Acquire 197 acres of habitat (96 acres of wetlands) in Erie County, PA.	Bear Run Riparian Buffer Restoration Project restores or protects over 40 acres of riparian buffer in Bear Run watershed…
Enhancement	Presque Isle State Park Coastal Habitat Restoration …enhance and restore unique natural communities localed in the Lake Erie shoreline…	Culbertson Drive Stormwater Infrastructure …construction/replacement of a 6 foot diameter culvert that is…in poor condition and inhibiting natural streamflow…
Re-establishment	Partners for Fish and Wildlife is a voluntary habitat restoration program of the U.S. Fish and Wildlife Service. The PFW Program works with landowners and other partners to restore habitat on private lands.	Walnut Creek Streambank Stabilization and Habitat Restoration …conduct streambank stabilization, in-stream habitat construction, and riparian plantings on 4 sites in the Walnut Creek watershed
Rehabilitation	Presque Isle Coastal Wetland Restoration Restore 400 acres of coastal wetland habitat at Presque Isle State Park through the control of invasive species and planting of native vegetation.	Lower Elk Creek Streambank Stabilization and Riparian Restoration Western PA Conservancy…to…stabilize 700 feet of eroding stream bank on Elk Creek improving public access and safety

Figure 14. Examples of Funded Projects in the State of Pennsylvania

2.2 Identifying and Prioritizing Locations

During an approximately 90-minute interactive session, workshop attendees brainstormed potential project locations and marked up maps to document these projects (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 blue, orange, and yellow 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. At the conclusion of the voting, two projects were tied for second place: “Submerge, nearshore structures for fish habitat and littoral sediment retention” and “Cascade Creek restoration”. The tie between these two projects was broken using a hand raise. The results of the hand raise votes are also summarized in Table 5 (in parentheses). To ensure that no project information was lost, all projects that were discussed by individual groups are included in Attachment A.

Figure 15. Erie and Presque Isle Group Discussing Proposed Project Locations

Figure 16. Eastern Pennsylvania Shoreline Group Discussing Proposed Project Locations

Figure 17. Participant Voting on Proposed Project Locations

Table 4. Summary of Voting System

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

Table 5. Summary of Proposed Projects by Group

Region	Map #	Project	Further Details	Blue (1st)	Orange (2nd)	Green (3rd)	Region Specific Score	Region Specific Rank	Final Score	Final Rank
Western Pennsylvania Shoreline	1	Submerged, nearshore structures for fish habitat and littoral sediment retention	This project would be in-water. We want to build submerged, nearshore structures for fish habitat and to retain littoral sediment. This will benefit perch, walleye, lake trout, and maybe smelt. Right now we can't determine the extent because we don't have the data (the project is conceptual). These structures will help build and maintain beach heads and attenuate wave energy. The size and placement of the structures is also to be determined. During the design, we will need to consider the interstate issues, potential navigation hazards, and the potential benefits for recreation.	18	8	4	74	1st	7 (19)	2nd
	2	Beach nourishment using dredged materials	We want to use dredged materials to supplement sand supplies and build beachheads. This project will mitigate beach and bluff erosion in the area while also improving nearshore habitat for perch, walleye, smelt, and emerald shiner. We don't know the exact spatial extent, but it could extend from the Pennsylvania border to Presque Isle. Since this is conceptual right now, we would	9	7	10	51	2nd		

Region	Map #	Project	Further Details	Blue (1st)	Orange (2nd)	Green (3rd)	Region Specific Score	Region Specific Rank	Final Score	Final Rank
			need sediment transport modeling and a sediment budget analysis. We would also need to evaluate the potential source of dredged material to determine if it is suitable for placement							
	3	Large woody debris	This project will place large woody debris structures along the shoreline to retain beach heads/sediment and to augment nearshore fish habitat. It is in response to excessive beach loss and interrupted up drift of littoral sediment supply. This is also a conceptual project right now. We would need bathymetry, substrate analysis, and littoral sand budgets. We would also need to evaluate the optimum placement for fish habitat.	1	13	15	44	3rd		
Erie and Presque Isle	1	Cascade Creek restoration	This is a highly urban stream in the area where there has been a lot of habitat restoration in the vicinity. It's also part of the Presque Isle Bay watershed plan. This specific project would remove concrete restore riparian buffers and redirect storm water. This would benefit fish and macroinvertebrates. We have a lot of the data that we need. Once we have the design, it will be ready to go.	24	2	2	78	1st	7 (11)	3rd

Region	Map #	Project	Further Details	Blue (1st)	Orange (2nd)	Green (3rd)	Region Specific Score	Region Specific Rank	Final Score	Final Rank
	2	Scott Run restoration and stream bank stabilization	Scott Run is near the Tom Ridge Env. Center. Currently, most of it is tubed (resulting in high energy) and leads to erosion/sedimentation. The restoration would also involve the restoration of riparian buffer around the stream to further reduce erosion. It will benefit migratory fish. We have all the data to do this project. We just need the design and some funding.	1	19	8	49	2nd		
	3	McDaniel Run rehabilitation project	This is a highly urban stream that's included in the Lake Erie Watershed Management Plan. Right now it is an intermittent stream that is negatively impacted by storm water. We want to restore/repair the degraded habitat from the mouth to E. Lake Rd. We have fish and habitat data. The state should have some water quality data.	4	7	19	45	3rd		
Eastern Pennsylvania Shoreline	2	Construction and restoration of prime spawning habitat	We want to restore prime spawning habitat for lake trout and sturgeon by adding substrate of varying sizes (boulders, cobbles, etc.). It will also include the overall spawning area available. There are many potential partners for this, but we still have a number of unknowns. For example, we would like to know what the	25	3	2	83	1st	4	4th

Region	Map #	Project	Further Details	Blue (1st)	Orange (2nd)	Green (3rd)	Region Specific Score	Region Specific Rank	Final Score	Final Rank
			current spawning success rate is (in the degraded habitat).							
	1	Invasive species removal at known spawning shoals	This project will remove invasive species at spawning shoals in an area known for spawning habitat (but we haven't been able to verify). We want to target the removal of zebra and quagga mussels because the change the whole ecology of the shoal. We haven't settled on an exact methodology yet, but we intend to review the literature to choose the best method.	3	18	7	52	2nd		
	3	Rehabilitation and enhancement via long-term maintenance and management	We want to rehabilitate and enhance habitat in the nearshore region through continued maintenance and monitoring. If we implement these projects, we will need ongoing, period maintenance. If we don't, mussels will recolonize the spawning reefs.	1	7	21	38	3rd		
General	1	Conneaut Creek watershed wetland expansion	This project wetland creation/restoration for migratory shorebirds and waterfowl of approximately 500 acres. We want to convert agricultural land, degraded woodlands, and prior converted wetlands. This project is located in a rural, low-income area and is similar to the Elk Creek watershed wetland expansion.	15	10	4	69	1st	12	1st
	2	Elk Creek watershed	This project wetland creation/restoration for migratory shorebirds and waterfowl of	8	10	10	54	2nd		

Region	Map #	Project	Further Details	Blue (1st)	Orange (2nd)	Green (3rd)	Region Specific Score	Region Specific Rank	Final Score	Final Rank
		wetland expansion	approximately 500 acres. We want to convert agricultural land, degraded woodlands, and prior converted wetlands. This project is located in a rural, low-income area and is similar to the Conneaut Creek watershed wetland expansion.							
	3	Urban watershed and storm water management	This project will create 200 acres of urban wetlands between west 12th and west 26th streets for the purpose of water quality improvement, flood control, and migratory bird habitat.	6	8	15	49	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 Pennsylvania.

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 WALTeR
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	X	Moderate	Ok	Info about glacial deposits and unconsolidated deposits
Spawning reefs	X	Ok	High	
Substrate composition, variability, and distribution	X	High	High	2015, GLAHF 30-m
Water depth	X	High	Moderate	
Wave energy	X	Moderate	Moderate	USACE modeled results.
Wave height	X	Low	High	GLOS buoy (no win. data)
Bottom ruggedness (rugosity)				GAP
Bottom slope	X	Low	Low	Derived depth & relief
Connectivity to adjacent habitats				GAP

Figure 19. Data Gap Summary for Physical Data

Data Type	Present?	Spatial Resolution	Temporal Resolution	Notes
Benthos (trophic str/func)	X	Moderate	High	GLNPO points, most recent 2011
Coastal wetlands	X	Moderate	Ok	MTRI 12.5-m
Fish (trophic str/func)	X	High	High	Chapter 93 monitoring & WALTeR
Plankton (trophic str/func)	X	Moderate	High	GLNPO data, may not be sufficient depending on project location
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
Vegetation heterogeneity				GAP
Vegetation morphotype				GAP
Vegetation species composition				GAP

Figure 20. Data Gap Summary for Biological Data

Data Type	Present?	Spatial Resolution	Temporal Resolution	Notes
Chlorophyll-a		Moderate	Moderate	TMDL monitoring & WQN
Turbidity	X	High	High	303(d), Chapter 93, WALTeR
Suspended minerals				GAP
Water temperature (incl. timing/variability)	X	High	High	Derived from NOAA coastwatch satellite, WALTeR
Dissolved oxygen	X	High	High	303(d), Chapter 93, WALTeR

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 Pennsylvania Shoreline
    - Sediment transport modeling
        - Generally, we need this in the central Lake Erie basin from the edge of the state all the way over to Erie. Based on the amount of change and sediment movement in this region, it would be helpful if this could be updated every 10 years.
        - This type of modeling would help with project planning, design and engineering.
- Erie and Presque Isle
    - We are looking for existing conditions for submerged aquatic vegetation (SAV) mapping. This would include presence/absence and composition. Ideally, we would be able to have this seasonally.
    - We want to compare the SAV data to wave energy data and be able to identify potential wetland restoration spots.
- Eastern Pennsylvania Shoreline
    - We definitely need lakebed composition data. Right now, it exists in small chunks, but it isn't comprehensive.
    - We could use this to identify the priority habitat for spawning. It would help us focus on the next stage for enhancement and restoration of spawning locations.
- General
    - All of the data that we need is available, but to identify potential wetland creation spots we would need high density LiDAR and tax assessment parcels, and a wetland inventory baseline. We could use the layer of USGS coastal wetlands. Also, the shoreline classification scheme we have has a low spatial and temporal resolution.
    - We would like an update every 5 years
    - We don't have enough detail on the stratigraphic layers of our bluffs and we would like to know more about that.

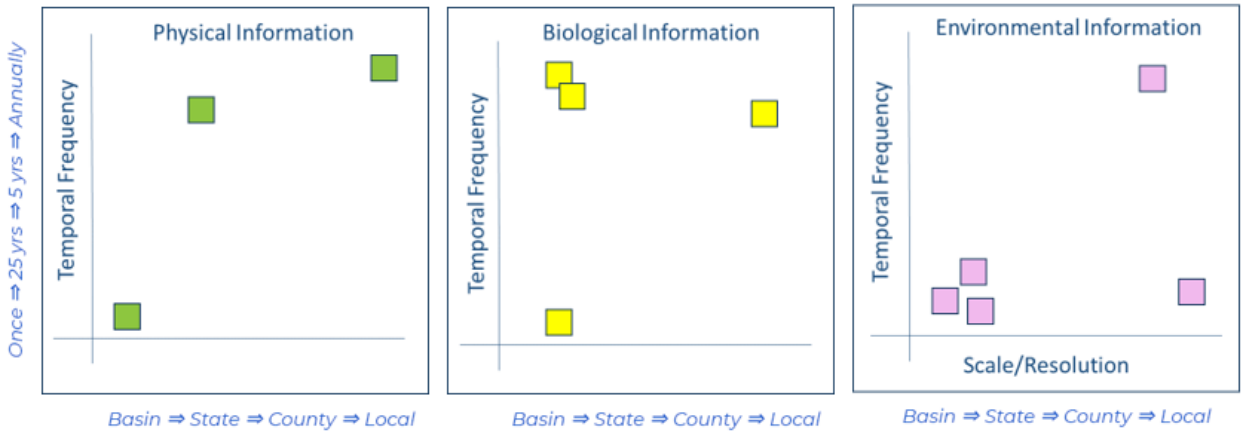

Figure 22. Conceptual Schematic of the Data Wall

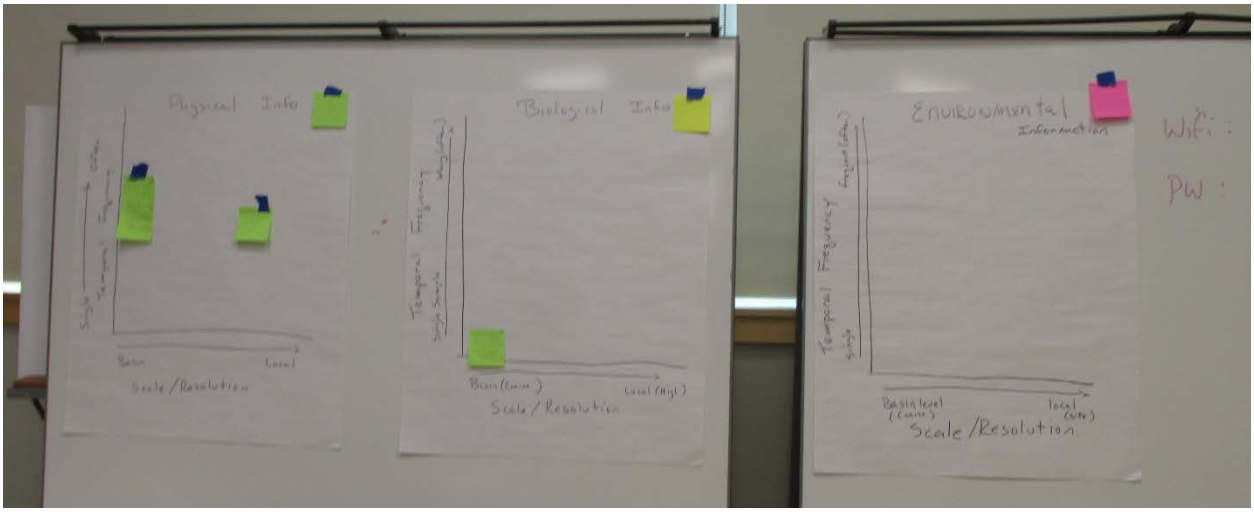

Figure 23. Data Wall for Physical, Biological, and Environmental Data Sets

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	Feasibility study of living shorelines along bay side of Presque Isle State Park and urban shoreline	No info	No info	
	NEED	Nearshore bathymetry and substrate classification for the western section of PA	~5 years	County	
	NEED	Research demonstrating the connection/effects of the upper watershed on the waterway. E.g., influence of developed vs green space lots. Pervious vs impervious spaces, riparian buffers vs no riparian buffers (or mowed buffers).	~5 years	Basin	
Biological	NEED	Research the connection of upper watershed to the water specific to terrestrial plants (e.g., natives vs invasives, trees vs perennials and annuals)	Once	Basin	
	HAVE	Fish diversity data for PA tributaries	No info	No Info	PA Sea Grant
Environmental	No datasets listed				

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

Group	Data Set	Contact
Western Pennsylvania Shoreline	Underwater video at isolated sites	PA Coastal Resources Management (but limited by staff time to help make public)
	Sediment samples at isolated sites	PA Coastal Resources Management (but limited by staff time to help make public)
	Side scan sonar at isolated sites	PA Coastal Resources Management (but limited by staff time to help make public)
Erie & Presque Isle	No data sets listed	
Eastern Pennsylvania Shoreline	Amphibian and wetland data	Regional Science Consortium
	Four buoys and 2 weather stations	Regional Science Consortium
	Presque Isle submerged aquatic vegetation: density and species composition	Regional Science Consortium
	Yellow perch populations collector database	PA Fish and Boat Commission
	PA Department of Conservation and Natural Resources (PA DCNR) collector app	PA DCNR
General	High density LiDAR	Pennsylvania Spatial Data Access (PASDA)
	Hydrology, 2015	PA Sea Grant
	4-Band digital orthophotography	PASDA
	Tax assessment parcels	Erie County Department of Planning (Sean Rafferty)

Table 8. Summary of Data Needs by Region

Region	Need Type	What	Where	Why	Resolution (Spatial/ Temporal)	Availability
Western Pennsylvania Shoreline	Project	Sediment transport modeling	Western Pennsylvania shoreline	This will help with project planning, design, and engineering	County/~5 years	None mentioned
	Prioritization	Fine scale bathymetry	Western Pennsylvania shoreline	This will help site future projects	Local/ ~10 years	None mentioned
	Prioritization	Current related data	Western Pennsylvania shoreline	This will help site future projects	Local/ ~10 years	None mentioned
Erie and Presque Isle	Project	Current conditions for submerge aquatic vegetation (presence and composition)	Entire PA shoreline of Lake Erie	We want to compare it with wave energy to assess functionality for attenuation and wetland creation/potential shoreline softening	None listed	None mentioned
Eastern Pennsylvania Shoreline	Project	Wetland data for Conneaut Creek	Eastern PA shoreline	This will support multiple data-driven projects and justify funding needs	Local/~5 years	None mentioned
	Project	Sediment type data for lake floor	Eastern PA shoreline	This will support multiple data-driven projects and justify funding needs	State/~5 years	None mentioned
	Project	Fish habitat utilization	Eastern PA shoreline	This will support multiple data-driven projects and justify funding needs	None listed	None mentioned

Region	Need Type	What	Where	Why	Resolution (Spatial/ Temporal)	Availability
	Project	Plankton data	Eastern PA shoreline	This will support multiple data-driven projects and justify funding needs	Basin/Annual	None mentioned
	Project	Plant survey	Eastern PA shoreline	This will support multiple data-driven projects and justify funding needs	Local/~5 years	None mentioned
	Project	Bat survey	Eastern PA shoreline	This will support multiple data-driven projects and justify funding needs	None listed	None mentioned
	Prioritization	Data repository/clearing house	Entire state	Would help determine the path of future projects and identify more/new species to focus on	None listed	None mentioned
	Prioritization	Nutrient input data	Entire state	Would help determine the path of future projects and identify more/new species to focus on	None listed	None mentioned
General	Project	Wetland inventory baseline for Pennsylvania	Entire state	Will allow evaluation of existing wetlands to encourage habitat continuity and baselining	Basin/~5 years	None mentioned
	Project	Updating GIS data with new acquisitions in the future	Entire state	Will allow evaluation of existing wetlands to encourage habitat continuity and baselining	Basin/~5 years	None mentioned

Region	Need Type	What	Where	Why	Resolution (Spatial/ Temporal)	Availability
	Prioritization	Nearshore sidescan sonar, photomapping, LiDAR	Entire coast, from 0-15 m depth	Will help with substrate mapping, habitat classification, sand resources, and navigation hazards	None listed	None mentioned
	Prioritization	Nearshore current mapping	~10 sites along the coast	Will help understand sediment transport, algal blooms, search and rescue	None listed	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 Pennsylvania Shoreline	Improve nearshore habitat quality by restoring historic littoral sediment transport between Ohio line and Walnut Creek. The date of this goal is "to-be-decided".
Erie and Presque Isle	Increase quality and quantity of coastal riparian buffers in the urban watershed by 25% by 2030
Eastern Pennsylvania Shoreline	Identify, protect, restore, and enhance high diversity habitats that support fish population
General	Enhance habitat for migratory birds and waterfowl by increasing the acreage of wetlands within the LE watershed by 15% by year 2030

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
General	1	Conneaut Creek watershed wetland expansion	This project wetland creation/restoration for migratory shorebirds and waterfowl of approximately 500 acres. We want to convert agricultural land, degraded woodlands, and prior converted wetlands.	12	1st
Western Pennsylvania Shoreline	1	Submerged, nearshore structures for fish habitat and littoral sediment retention	This project would be in-water. We want to build submerged, nearshore structures for fish habitat and to retain littoral sediment. This will benefit perch, walleye, lake trout, and maybe smelt.	7 (19)	2nd
Erie and Presque Isle	1	Cascade Creek restoration	This is a highly urban stream in the area where there has been a lot of habitat restoration in the vicinity. It's also part of the Presque Isle Bay watershed plan. This specific project would remove concrete restore riparian buffers and redirect storm water. This would benefit fish and macroinvertebrates.	7 (11)	3rd
Eastern Pennsylvania Shoreline	2	Construction and restoration of prime spawning habitat	We want to restore prime spawning habitat for lake trout and sturgeon by adding substrate of varying sizes (boulders, cobbles, etc.). It will also include the overall spawning area available.	4	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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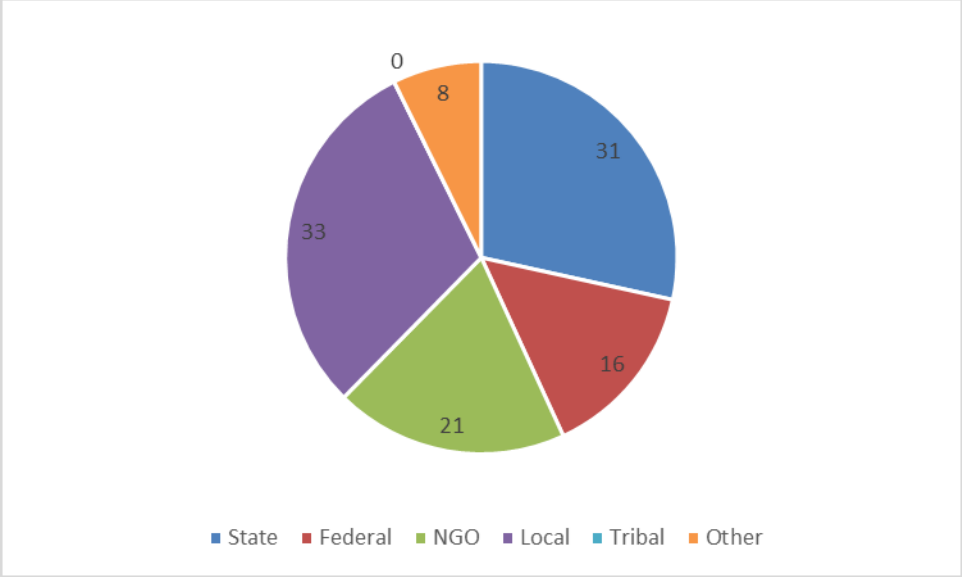
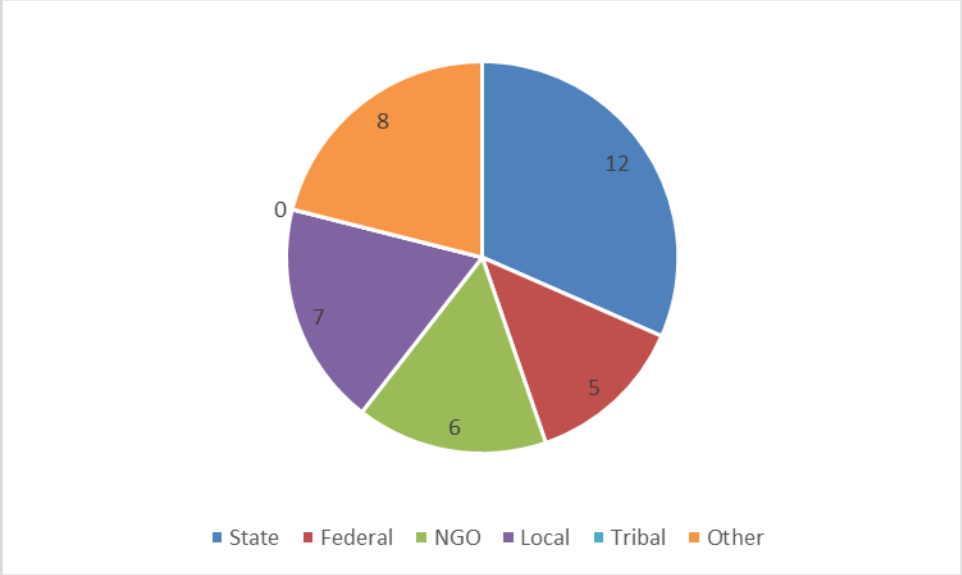
5 Workshop Attendee Summary

Breakdown of workshop invitees:



Breakdown of workshop participants:



The table below summarizes workshop participants and their contact information:

Last	First	Affiliation
Benczkowski	Donald	PADEP, Coastal Resources Management Program
Blackburn	Julie	RESPEC
Bradley	Doug	LimnoTech
Bruno	Timothy	PADEP, Office of the Great Lakes
Burton	Samantha	PADEP, Coastal Resources Management Program
Clark	Shelby	PADEP, Northwest Regional Office
Clark	Darin	PA Game Commission, Northwest Region
Darnton	Ryan	NOAA Restoration Center
Foyle	Anthony	Penn State Behrend
Grazio	James	PADEP, Northwest Regional Office
Hinterberger	Bryan	US Army Corps of Engineers
Hoppe	Timothy	PA Game Commission
Hudson	Joseph	Erie Conservation District
Irwin	Nate	PADEP, Northwest Regional Office
Krumwiede	Brandon	NOAA
Latimer	Roger	
Liggett	Maria	Erie County Dept of Planning
Luegering	Michael	Michael Van Volkenburg and Associates (MVVA)
Lybrook	Ron	PADEP, Northwest Regional Office
Molnar	Mike	Coastal States Organization
Olinger	Diana	NOAA
Padilla	Julie	LimnoTech
Rafferty	Sean	Penn State
Reed	Andy	Erie County Dept of Planning
Rinkevich	Michael J	Erie County
Schnars	Jeanette	Regional Science Consortium
Silver	Elizabeth	Michael Van Volkenburg and Associates (MVVA)
Walderon	Matthew	PADEP, Coastal Resources Management Program
Covert	Jerry	Pennsylvania Steelhead Assn
illegible	illegible	Pennsylvania Steelhead Assn
Stilwell	Amber	Regional Science Consortium
Dalton	Sean	Regional Science Consortium
Schnuars	Jeanette	Regional Science Consortium
Salem	Jen	Regional Science Consortium
Palmar	Sarah	City of Erie
Pratt	Brandon	Fairview Twp
Susann	Lisa	ECDH
Hinds	Gerlyn	US Army Corps of Engineers

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

E. PA

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? Identify, protect, restore, + ~~enhance~~ high diversity fish 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): Invasive Species removal at Spawning Shoals

4. The desired change that the project intends to accomplish (improve/restore/reduce): free up interstitial spaces to allow fish to use the habitat

5. Targeted species that benefits from actions: Lake trout + several other species of fish

6. Spatial extent/acreage: Nearshore area east of Peninsula

7. Current/past condition of the site: degraded & spawning site however not sure if successful spawning

8. Social, political and physical context of the project: tourism; "healthy Lake"; Lake Erie "Sport fishing Capital of the World"

9. Potential partners: PA DEP, PA Fish + Boat, Regional Science Consortium, Sportsmans Clubs, ~~PA~~ Erie County Dept. Healthy Visit Erie

10. Unmet data needs: Unknown habitat (habitat sediment mapping); existing utilizing of habitat, spawning success, site fidelity

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

E. PA

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? Identify, protect, restore + enhancement of high diversity fish 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): Construction + restoration of prime spawning habitat by adding boulders, cobble, + artificial habitat

4. The desired change that the project intends to accomplish (improve/restore/reduce): Restore spawning habitat + Lake trout start to utilize (spawn) in habitat

5. Targeted species that benefits from actions: Lake trout + several other species of fish

6. Spatial extent/acreage: Nearshore area east of peninsula

7. Current/past condition of the site: degraded spawning site; however may be improved by project #1 (invasive species removal)

8. Social, political and physical context of the project: tourism; "healthy Lake"; Lake Erie "Sport fishing Capital of the World"

9. Potential partners: PA DEP, PA Fish + Boat Commission, Regional Science Consortium, Sportsmen Clubs, ECDH, Visit Erie

10. Unmet data needs: Current Success of Spawning in degraded habitat

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

E.PA

Priority Project and Location Worksheet

Project number: #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? Identify, protect, restore & enhancement of high diversity fish 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):
   Rehab. + Enhancement by long-term maintenance; long-term management

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Restoration is maintained by continued monitoring

5. Targeted species that benefits from actions:
   Lake trout + other fish species

6. Spatial extent/acreage: Nearshore area east of Peninsula

7. Current/past condition of the site:
   degraded spawning site; however may be restored + utilized by project #1 + #2

8. Social, political and physical context of the project:
   tourism; "healthy lake"; Lake Erie "Sport fishing Capital of the World"

9. Potential partners:
   PA DEP, PA Fish + Boat Commission, Regional Science Consortium, Sportsman's Groups, ECDH, Visit Erie

10. Unmet data needs:
    Continued monitoring of Spawning + long-term success (survivorship) continued monitoring + maintenance

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

Erie + PI

Priority Project and Location Worksheet

Project number: Cascade Creek - West Erie Plaza (#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? _____

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):
   Riparian buffer establishment

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Restore buffers and reduce stormwater runoff

5. Targeted species that benefits from actions:
   fish and macros

6. Spatial extent/acreage: _____

7. Current/past condition of the site:
   Highly urbanized. Concrete riprap and streambank

8. Social, political and physical context of the project:
   Have fish, macro, habitat data. Project being completed. Included in Presque Isle Bay watershed Plan

9. Potential partners:
   PA DEP, Erie County Conservation District, Sea Grant, City of Erie, Property Owners

10. Unmet data needs:

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

Erie + PI

Priority Project and Location Worksheet

Project number: Scott Run Restoration (#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? _____

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):
   Riparian Restoration design

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Restore riparian buffer and reduce sedimentation

5. Targeted species that benefits from actions:
   Migratory fish

6. Spatial extent/acreage: _____

7. Current/past condition of the site:
   impaired / highly eroding

8. Social, political and physical context of the project:
   Should be no opposition. Maybe component would have an issue. Included in prospectus for Bay Restoration Plan

9. Potential partners:
   PA DEP, Sea Grant, Erie County Conservation District, Property Owners

10. Unmet data needs:
    Design. We have fish, macro, habitat data and in Prospectus for BRP

11. Readiness (1=ready!; 5=concept stage): 1 (2) 3 4 5
    Just need design so can implement

Erie+ PI

Priority Project and Location Worksheet

Project number: #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? McDaniel Run watershed (mouth to E. Lake Rd)

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):

   Restoration - Rehabilitation - Repair the degraded habitat of McDaniel Run.

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

   Restore - repair the degraded habitat.

5. Targeted species that benefits from actions: NATIVE

   Native Trees, macroinvertebrates, Fish, Birds

6. Spatial extent/acreage: ~~entire watershed~~ mouth to E. Lake Rd Rd.

7. Current/past condition of the site:

   Intermittent stream affected by stormwater runoff.

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

   City and private owners

9. Potential partners:

   City, Port Auth, private landowners

10. Unmet data needs:

    feasibility assessment, landowner info, ~~species~~ species inventory

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

General

Priority Project and Location Worksheet

Project number: 1 - Conneaut Creek Watershed

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? General

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 creation / restoration

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Restore / improve / increase wetlands

5. Targeted species that benefits from actions:
   Migratory Shorebirds and waterfowl

6. Spatial extent/acreage: Conneaut Creek Watershed > 500 Acres

7. Current/past condition of the site:
   Agriculture, degraded wood land, prior converted wetlands

8. ~~Social~~, political and physical context of the project:
   Rural, low income

9. Potential partners:
   USFWS, Ducks Unlimited, PA Waterfowl Assoc. DEP, Conneaut Twp, PGC, Mitigation Banks, NRCS

10. Unmet data needs:

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

General

Priority Project and Location Worksheet

Project number: 2 - Elk Creek Watershed

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? General

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):

5. Targeted species that benefits from actions: AS 1

6. Spatial extent/acreage: SAME

7. Current/past condition of the site:

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

9. Potential partners:

10. Unmet data needs:

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

General

Priority Project and Location Worksheet

Project number: 3 - Urban Wetland / Stormwater Mgt

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? General

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 / Creation

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Create 200 acres of urban wetlands between W 12th & W 26th Street for purposes of WQ Improvement flood control and migratory bird habitat

5. Targeted species that benefits from actions:
   migratory bird.

6. Spatial extent/acreage: 200 Acres

7. Current/past condition of the site:
   Urban

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

9. Potential partners:
   Millcreek Twp, PGC

10. Unmet data needs:

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

WEST PA

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? WEST #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):
   Implement in water structures for sediment retention and fish habitat.

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Improve nearshore habitat quality and retain littoral sediments.

5. Targeted species that benefits from actions:
   Perch, walleye, ~~darter~~ smelt?, emerald, shiner, lake trout

6. Spatial extent/acreage: TBD → don't have the data

7. Current/past condition of the site:
   Too much beach loss & bluff erosion.

8. Social, political and physical context of the project:
   Interstate issues, recreation enhancement, potential navigation hazard

9. Potential partners:
   USACE, NOAA, Fish & Boat Comm., GLRI, DEP, Steelheaders, OH DNR?

10. Unmet data needs:
    Bathymetry, Substrate Classification, Critical habitat identification

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

WEST PA

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? WEST #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):
   Beach nourishment using dredge materials.

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Improve nearshore habitat with supplement sediment.

5. Targeted species that benefits from actions:
   Perch, walleye, smelt?, emerald, shiner

6. Spatial extent/acreage: All the way to Presque Isle.

7. Current/past condition of the site:
   Too much beach loss & bluff erosion.

8. Social, political and physical context of the project:
   Improved recreation opportunities.

9. Potential partners:
   USACE, DEP, DCNR, OH DNR

10. Unmet data needs:
    Sediment transport modeling & budget analysis.

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

WESTRA

Priority Project and Location Worksheet

Project number: 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? WEST #2

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

3. The proposed action (invasive species removal, wetland restoration, shoreline stabilization, fish barrier removal):
   Large woody debris placement for beach retention

4. The desired change that the project intends to accomplish (improve/restore/reduce):
   Retain barbheads and sediments and augment nearshore fish habitat

5. Targeted species that benefits from actions:
   Perch, Walleye, smelt, emerald shiner

6. Spatial extent/acreage: TBD

7. Current/past condition of the site:
   Excessive beach loss and interrupted updrift littoral sediment supply

8. Social, political and physical context of the project:
   Beach development, recreation, fishing opportunity

9. Potential partners:
   PADEP, USACE, PFBC, PAGC (Roderick Fierman),

10. Unmet data needs:
    Bathymetry, substrate, littoral sand budgets

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: East

DO YOU HAVE DATA TO FILL OUR DATA GAPS?

1. Data description:
- Submerged veg, density veg., veg. sp. composition → Presque Isle specific
- Fish pop (yellow perch) - PA F+B Commission (collector database)
- Macroinvertebrates - AIS; - PA DCNR - Collector App; DMR - discharge
- PADEP - WQN data; tropicleap
- Erie Bird Observatory - Bird pops.
- Carnegie List of fen plants
- Regional Science Consortium - 4 buoys, 2 weather stations → amphibian/wetland data

2. Location:
Presque Isle, Lake Erie

3. Contact:
Regional Science Consortium, PA Fish+Boat, Commission, DCNR

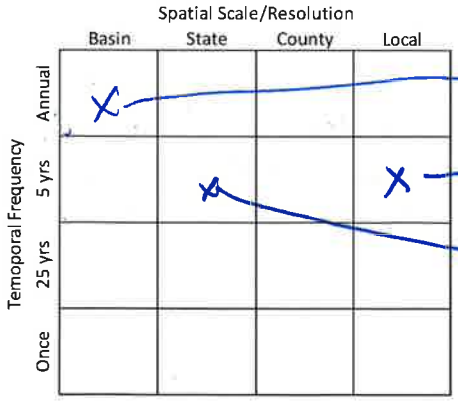
WHAT DATA DO YOU NEED TO COMPLETE YOUR PROPOSED PROJECT?

4. Data description:
Wetland data (Conneaut Creek); more sediment-type data; fish habitat utilization/available habitat; Plankton data only 1x/yr; plant survey; bat surveys; or lake floor

5. Location:
Lake Erie Shoreline

6. Why is this data important:
Comprehensive view of EcoSystem; to support multiple data driven projects; justification of funding needs

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



→ plankton; more than 1x/yr.
→ plant; wetland data
→ lake floor (portions)

8. Additional Notes:
- More data is better!
- Seasonal data
- Data georeferenced
- Data during unique events (high water, etc.)

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

9. Data description:
- data repository: clearinghouse
- nutrient input data (for Blue-green algae monitoring)

10. Location:
- Lake Erie

11. Why is this data important:
helps determine path of future projects; identify more/new species to focus on

12. 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				

← same

13. Additional Notes:
We talked about data generally — including our "East" project as well as other projects. Sorry, slight misunderstanding — We gave you more than you asked for! ☺

Data Needs for Projects and Planning Worksheet

Group: ERIE & PI

DO YOU HAVE DATA TO FILL OUR DATA GAPS?

1. Data description:
   Existing conditions SAV mapping → presence and species composition – seasonal and multi-year

2. Location:
   Entire PA shoreline of Lake Erie

3. Contact:

WHAT DATA DO YOU NEED TO COMPLETE YOUR PROPOSED PROJECT?

4. Data description:

5. Location:

6. Why is this data important:
   Compare with wave energy to assess functionality for attenuation and wetland creation / potential shoreline softening

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				
5 yrs				
25 yrs				
Once				

8. Additional Notes:

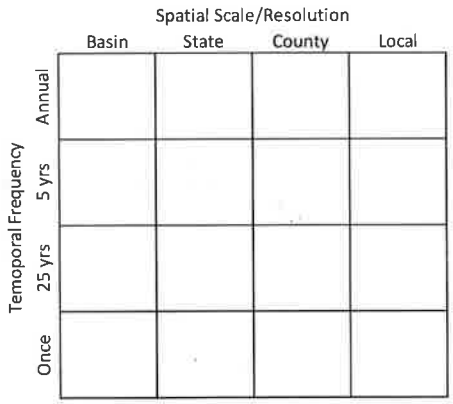
WHAT DATA DO YOU NEED TO IDENTIFY AND PRIORITIZE FUTURE PROJECTS?

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):



13. Additional Notes:

Data Needs for Projects and Planning Worksheet

Group: General - Conneaut Creek

DO YOU HAVE DATA TO FILL OUR DATA GAPS?

1. Data description:

(A) HIGH DENSITY LIDAR - PASDA (A) HYDROLOGY (2015) - PA SEA GRANT
(A) 4 BAND DIGITAL ORTHOPHOTOGRAPHY - PASDA (A) TAX ASSESSMENT PARCELS - ERIE CO. DEPT. PLANNING

2. Location:

VARIOUS - SEE ABOVE

3. Contact:

DEP - OFFICE OF THE GREAT LAKES - TIM BRUNO 814-835-1477
PA SEA GRANT - SEAN RAFFERTY

WHAT DATA DO YOU NEED TO COMPLETE YOUR PROPOSED PROJECT?

4. Data description:

(A) WETLAND INVENTORY BASELINE FOR PENNSYLVANIA
USGS - COASTAL + NEAR COASTAL WETLANDS?
(A) UPDATING EXISTING GIS DATA WITH NEW ACQUISITIONS IN THE FUTURE

5. Location:

USGS? NWI? GREAT LAKES COMMISSION?

6. Why is this data important:

WILL ALLOW EVALUATION OF EXISTING WETLANDS TO ENCOURAGE HABITAT CONTINUITY + BASELINING

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

PA LAKE ERIE

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

8. Additional Notes:

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

9. Data description:

1) Nearshore sidescan sonar (± photomapping) ± Lidar
2) Nearshore current mapping

10. Location:

1) Water depths 0–15 m; entire coast
2) ~10 sites along coast

11. Why is this data important:

1) Substrate mapping, habitat types, sand resources, NAV hazards
2) Transport of seds, algal blooms, Search/Rescue

12. 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				

13. Additional Notes:

- Shoreline Classification Spat Res = Low Temp Res = Low
- Bottom Ruggedness SR = LOW TR = LOW
- Substrate Comp. (nearshore) SR = Low TR = LOW
- Bluff/Cliff stratigraphy/geotech properties = GAP

Data Needs for Projects and Planning Worksheet

Group: WEST

DO YOU HAVE DATA TO FILL OUR DATA GAPS?

1. Data description:
Underwater video, sediment samples, side scan sonar

2. Location:
Isolated sites

3. Contact:
PA CRM (but limited by staff time to help make public)

WHAT DATA DO YOU NEED TO COMPLETE YOUR PROPOSED PROJECT?

4. Data description:
Sediment transport modeling

5. Location:
Central Basin of Lake Erie, PA waters

6. Why is this data important:
Help with project planning, design, and engineering

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

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

Spatial Scale/Resolution

8. Additional Notes:

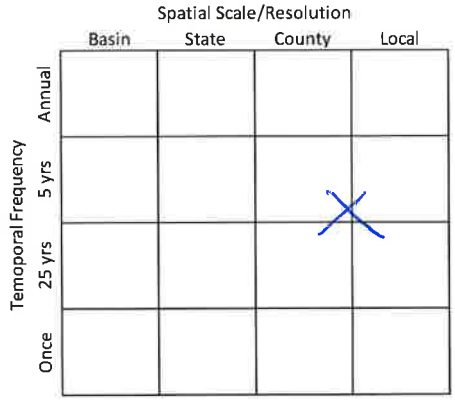
WHAT DATA DO YOU NEED TO IDENTIFY AND PRIORITIZE FUTURE PROJECTS?

9. Data description:
Fine scale bathymetry
Current related data

10. Location:
Nearshore areas

11. Why is this data important:
Siting in locations for projects

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



13. Additional Notes:

Attachment C

Presentation Slides

GREAT LAKES COASTAL AND NEARSHORE HABITAT ASSESSMENT WORKSHOP—PENNSYLVANIA

FEBRUARY 5, 2020

TOM RIDGE ENVIRONMENTAL CENTER

301 PENINSULA DR

ERIE, PA 16505

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

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.

Tomdonohue1 [Public domain]

AGENDA

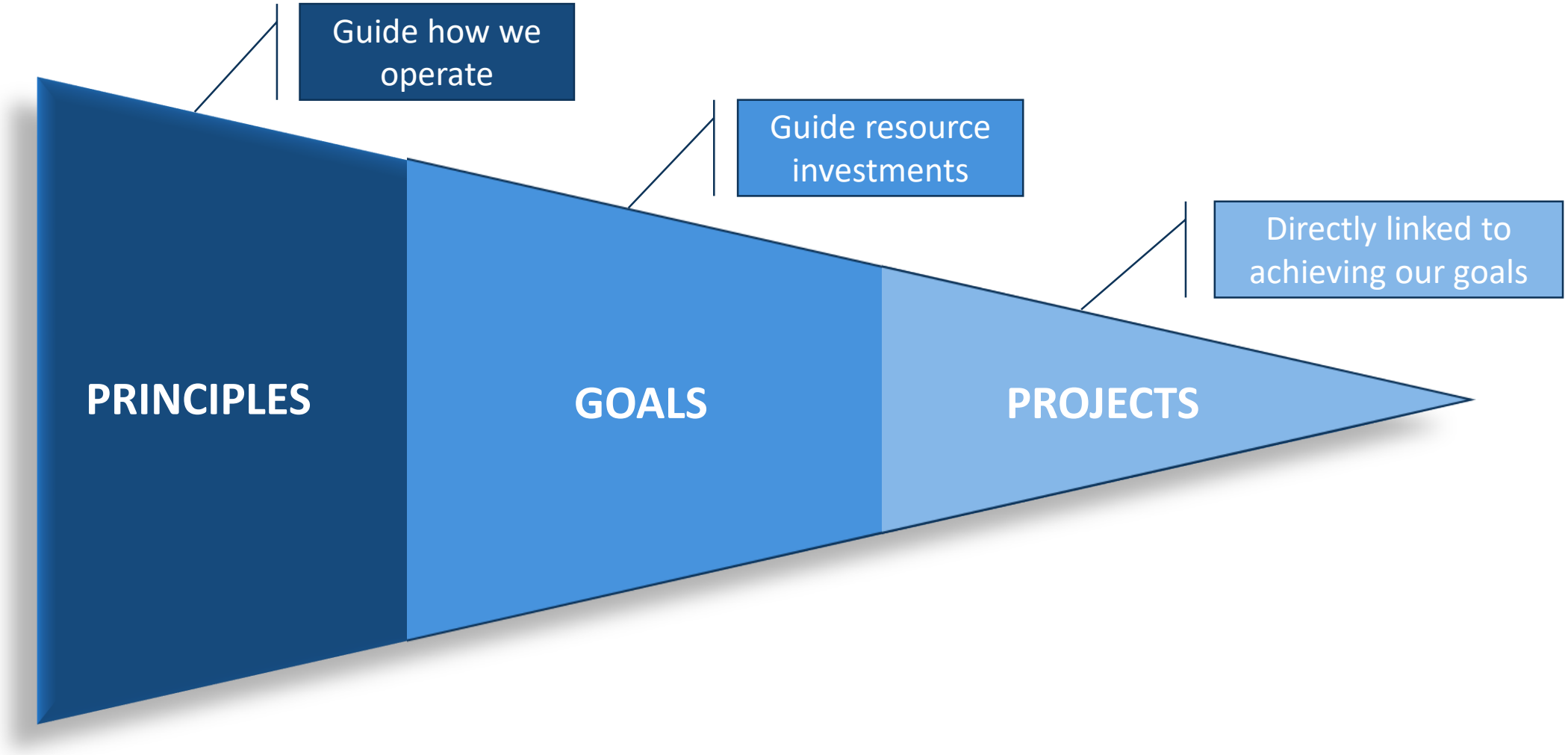
9:00	Welcome and introductions
9:40	Overview of state and regional plans
10:00	Identifying principles
10:30	Break
10:45	Identifying Goals
12:00	Lunch
12:30	Identifying and prioritizing projects and locations
2:20	Break
2:35	Identifying and Prioritizing Needed Data and People
3:45	Closing Remarks
3:55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

pennsylvania
COASTAL RESOURCES MANAGEMENT

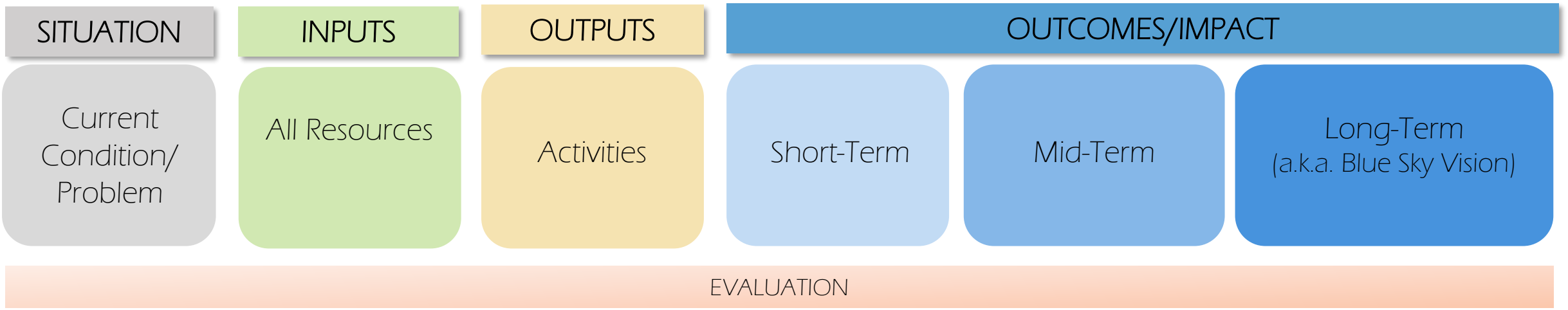
LimnoTech
Water Environment | Scientists Engineers

RESPEC

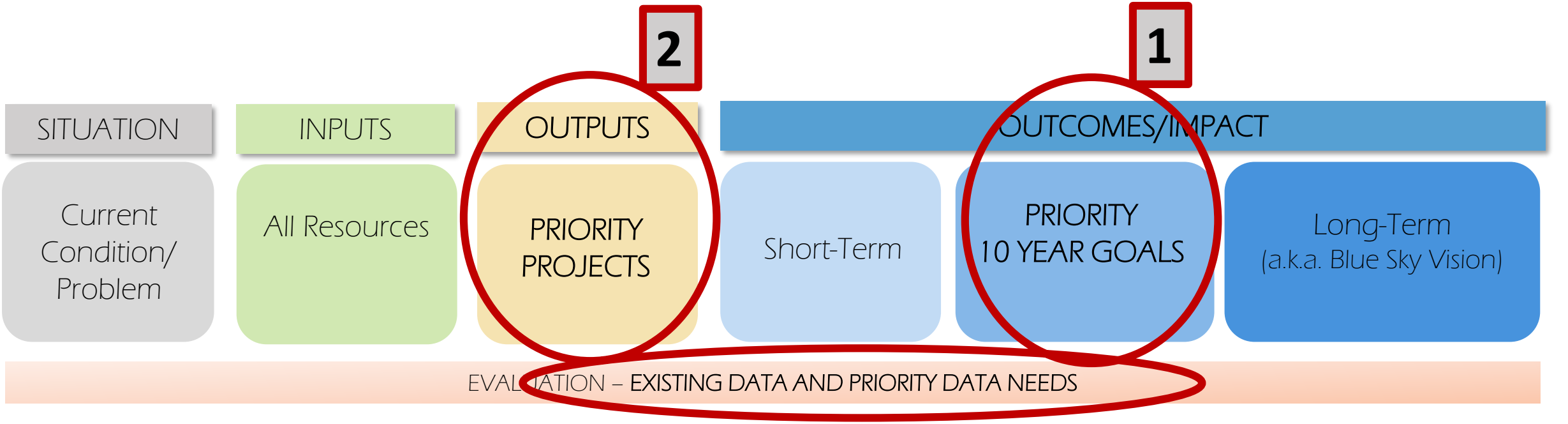
KEY ASPECTS OF AGENDA AND APPROACH



FRAMEWORK FOR TODAY'S ACTIVITIES



FOCUS OF TODAY'S ACTIVITIES



Etiquette

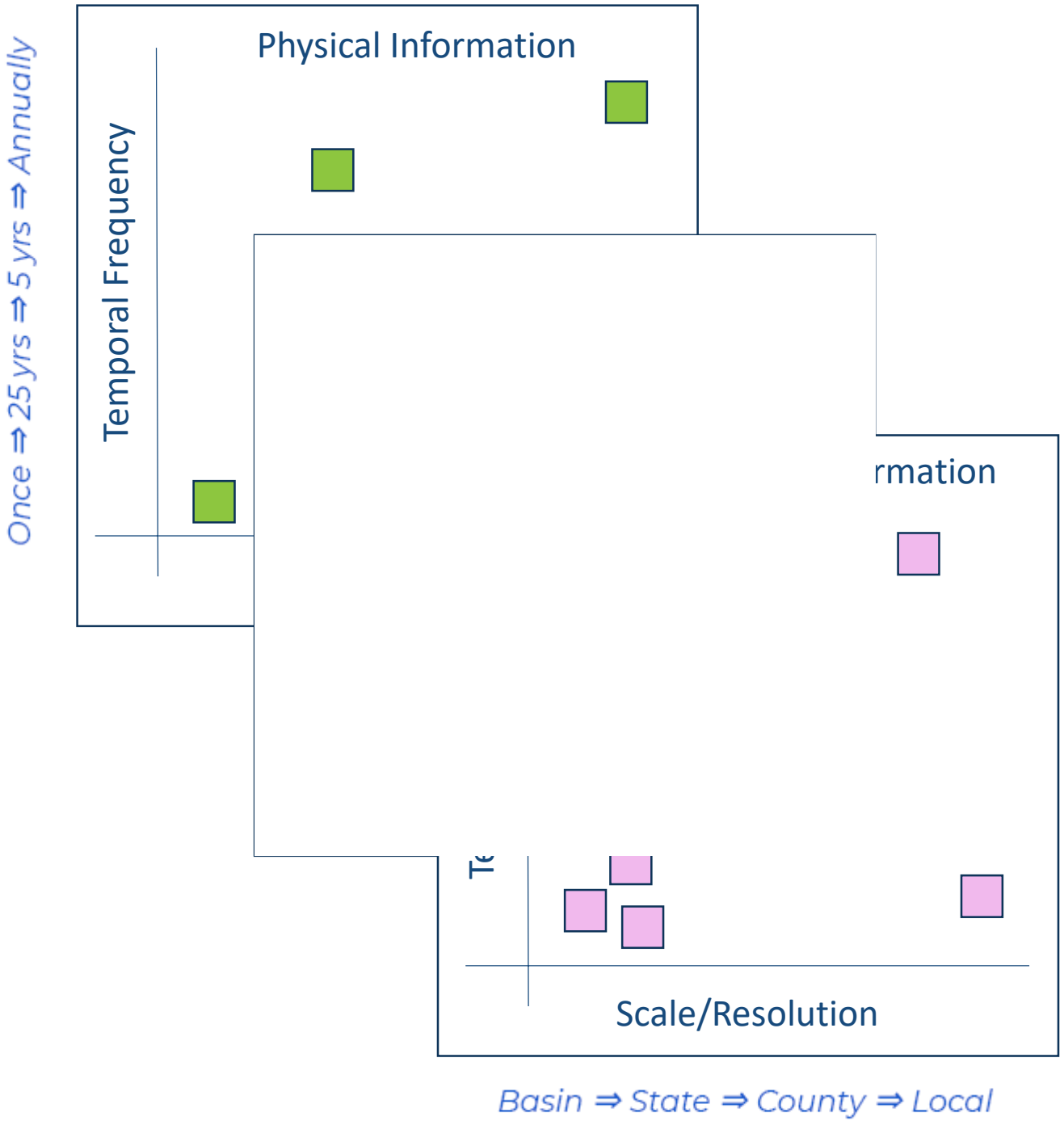
- **Contribute** your thinking and experience
- Listen to **understand**
- **Connect** ideas
- Listen together for **patterns, insights and deeper questions**
- Play, doodle, draw

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:

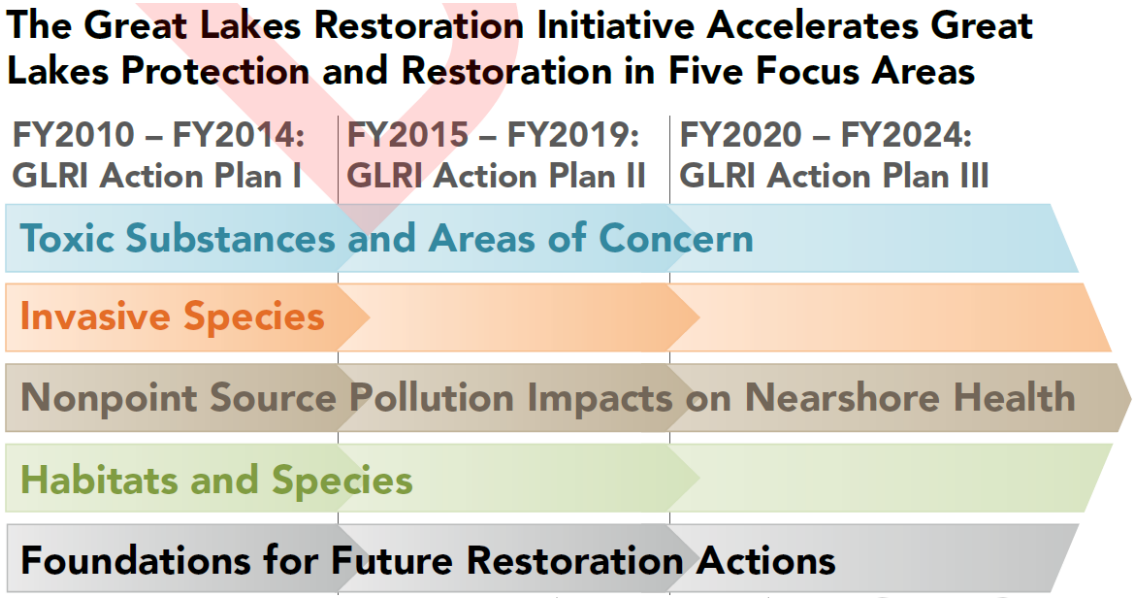
Take action to reduce shoreline hardening to less than 20% by 2030.

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 Pennsylvania
  - 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 Erie **habitat and species goals**

- **Open Water Benthic and Pelagic**
  - Native fish comprise 50% of prey biomass
  - Self-sustaining lake trout populations
  - Self-sustaining native predators
- **Nearshore Zone**
  - 50% reduction in dissolved Phosphorus in at least priority watersheds
  - No HAB advisories at public beaches
- **Native Migratory Fish**
  - 50% of each stream connected to lake
  - >=2 viable populations of each species
- **Coastal Wetlands**
  - 10% increase in area compared to 2011
- **Connecting Channels**
  - <50% shoreline hardening
  - Coastal wetlands in Detroit River comprise at least 25% of historic area
- **Coastal Terrestrial Systems**
  - >=40% natural land cover
  - Viable populations of priority nested targets
- **Aerial Migrants**
  - >=30% of 2 km coastal area comprises high quality stopover habitat for migrating landbirds

From Lake Erie Biodiversity Conservation Strategy, 2015.

Regional examples of Lake Erie habitat and species goals

GLRI Statements of Direction

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

Pursue innovation related to natural and natured based features

- **Open Water Benthic and Pelagic**
  - Native fish comprise 50% of prey biomas
  - **Self-sustaining lake trout populations**
  - Self-sustaining native predators
- **Nearshore Zone**
  - 50% reduction in disso at least priority water
  - No HAB advisories at public
- **Native Migratory Fish**
  - **50% of each stream connected to lake**
  - >=2 viable populations of each species

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

- **Connecting Channels**
  - **<50% shoreline hardening**
  - Coastal wetlands in Detroit least 25% of historic a
- **Coastal Terrestrial Syste**
  - >=40% natural land cover
  - **Viable populations of priority nested targets**
- **Aerial Migrants**
  - >=30% of 2 km coastal area comprises high quality stopover habitat for migrating landbirds

Identify key habitats and limiting factors

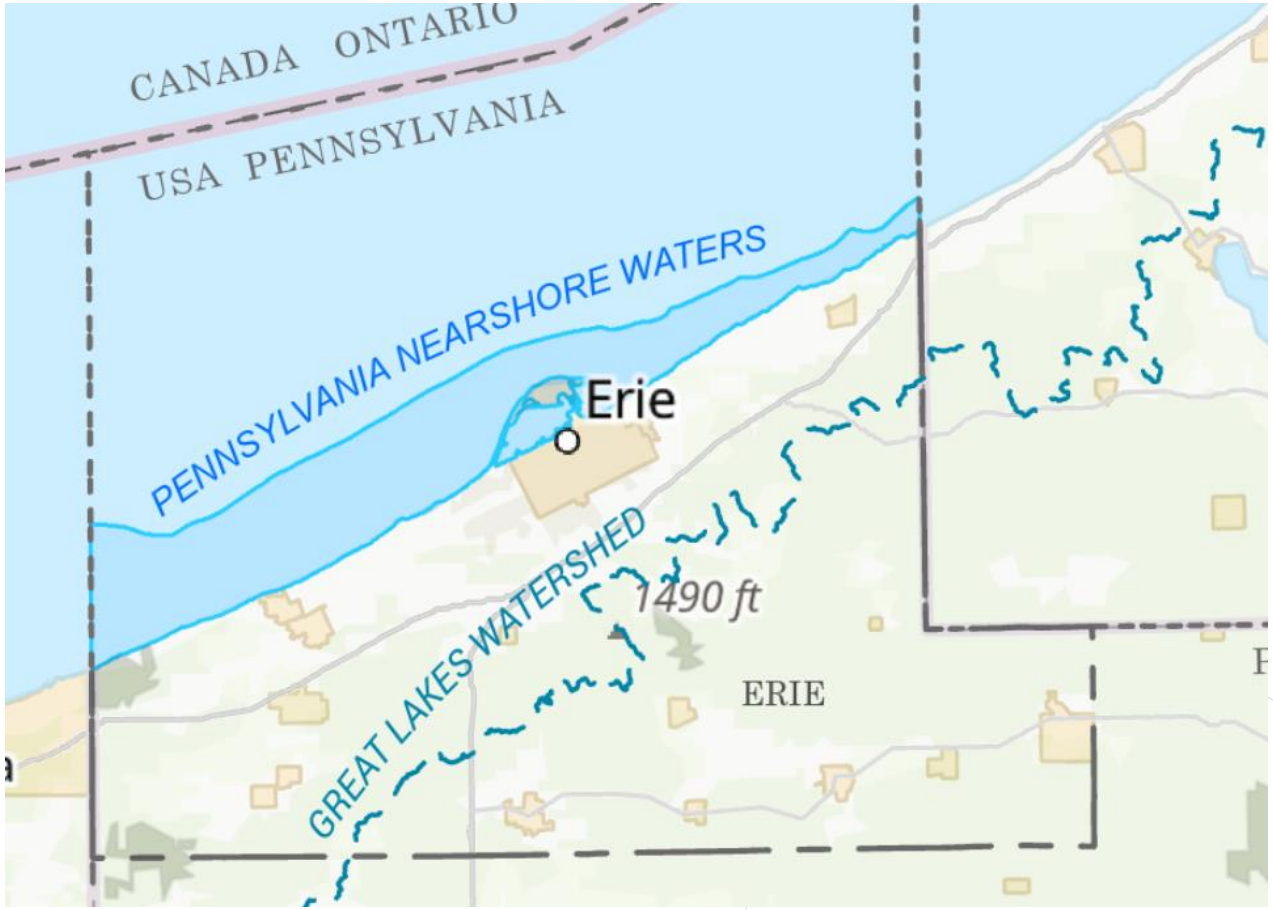
From Lake Erie Biodiversity Conservation Strategy, 2015.

Pennsylvania state plans – example statements of direction

- **…restore impaired hydrological features** necessary to improve water quality **in sub-watersheds containing "non-attainment"** streams segments.
- **Restore riparian buffers**, preferably with native plants, including conifers and other forest species **wherever possible**.
- **Seek protection status for privately owned properties** that would increase public access to aquatic, natural, and historical/cultural resources **for recreational and/or educational purposes**.
- Support and encourage private landowners to **allow unused pastures and open fields** alongside streams **to revert to forested condition.**

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 Pennsylvania 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 Pennsylvania?

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.

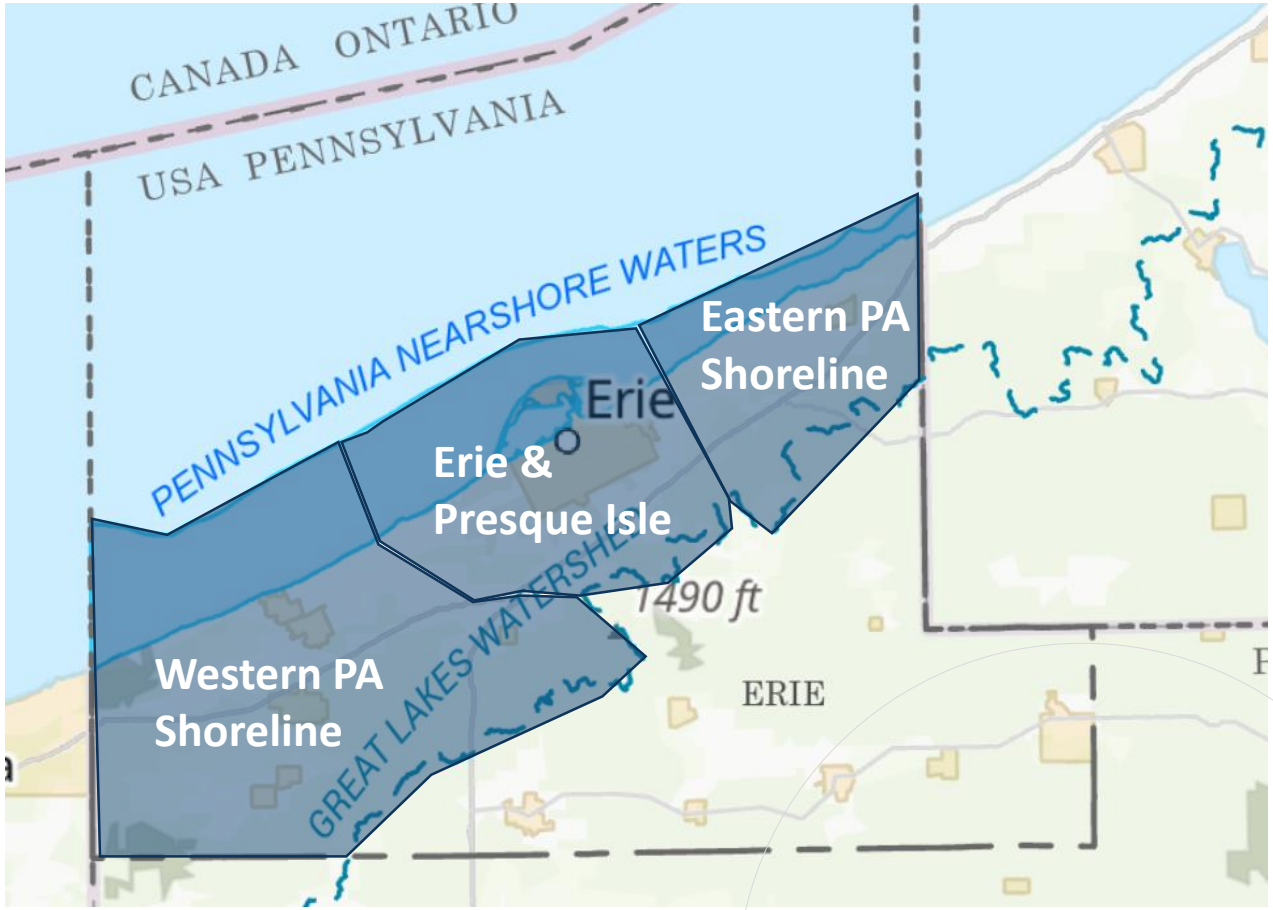
Goals

- ✓ 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

Group options

- Western PA shoreline
- Erie/Presque Isle
- Eastern PA shoreline



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

Group options

- Western PA shoreline
- Erie/Presque Isle
- Eastern PA shoreline

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:

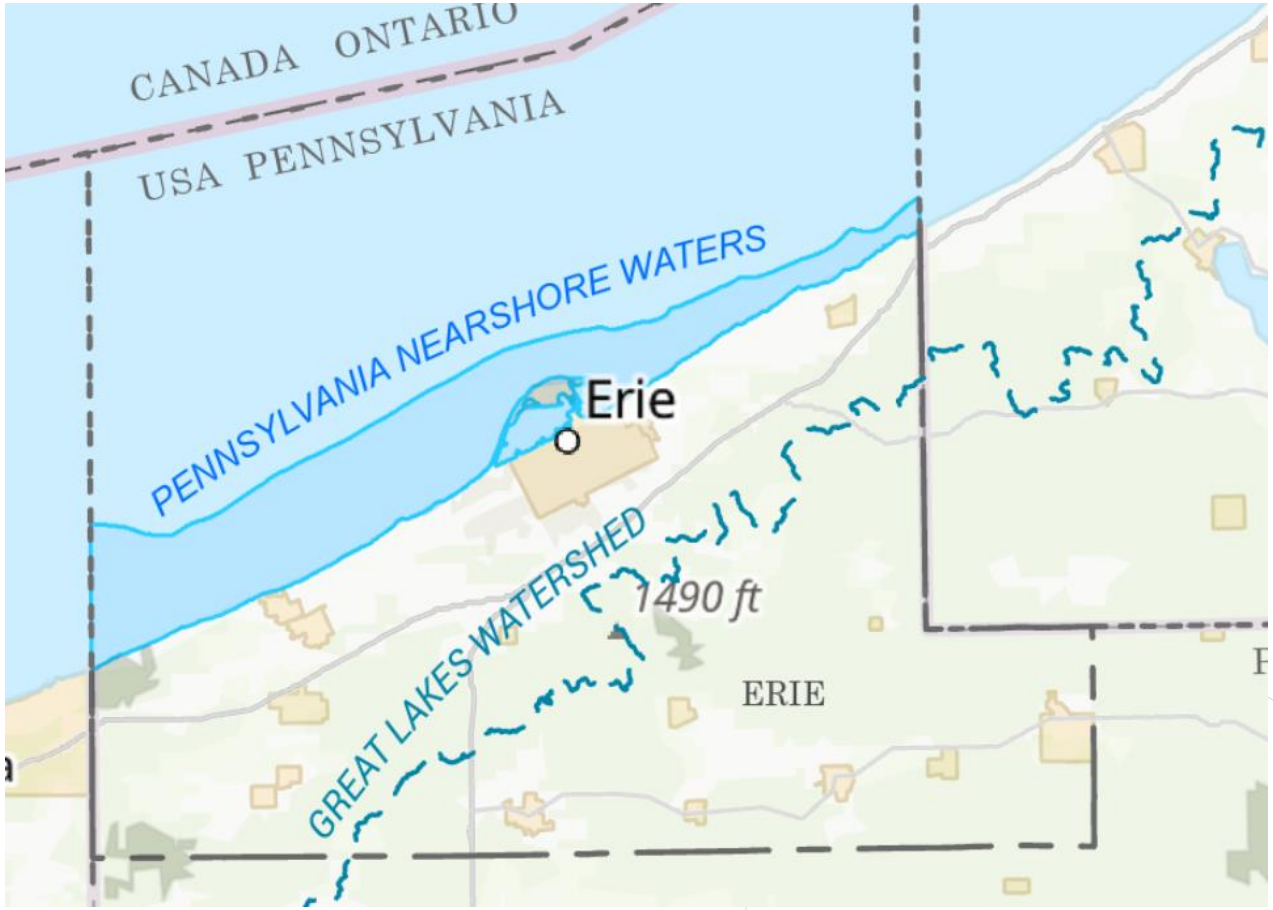
- New York: Increase spawning habitat for native fish communities for walleye and whitefish by 2025
- Ohio: Protect, restore, and enhance habitat on tributaries in the central Lake Erie basin that currently have high/the highest ecosystem function

IDENTIFYING AND PRIORITIZING PROJECTS AND LOCATIONS

- An overview of state and regional plans

GLRI and Ohio Project Types and Priorities

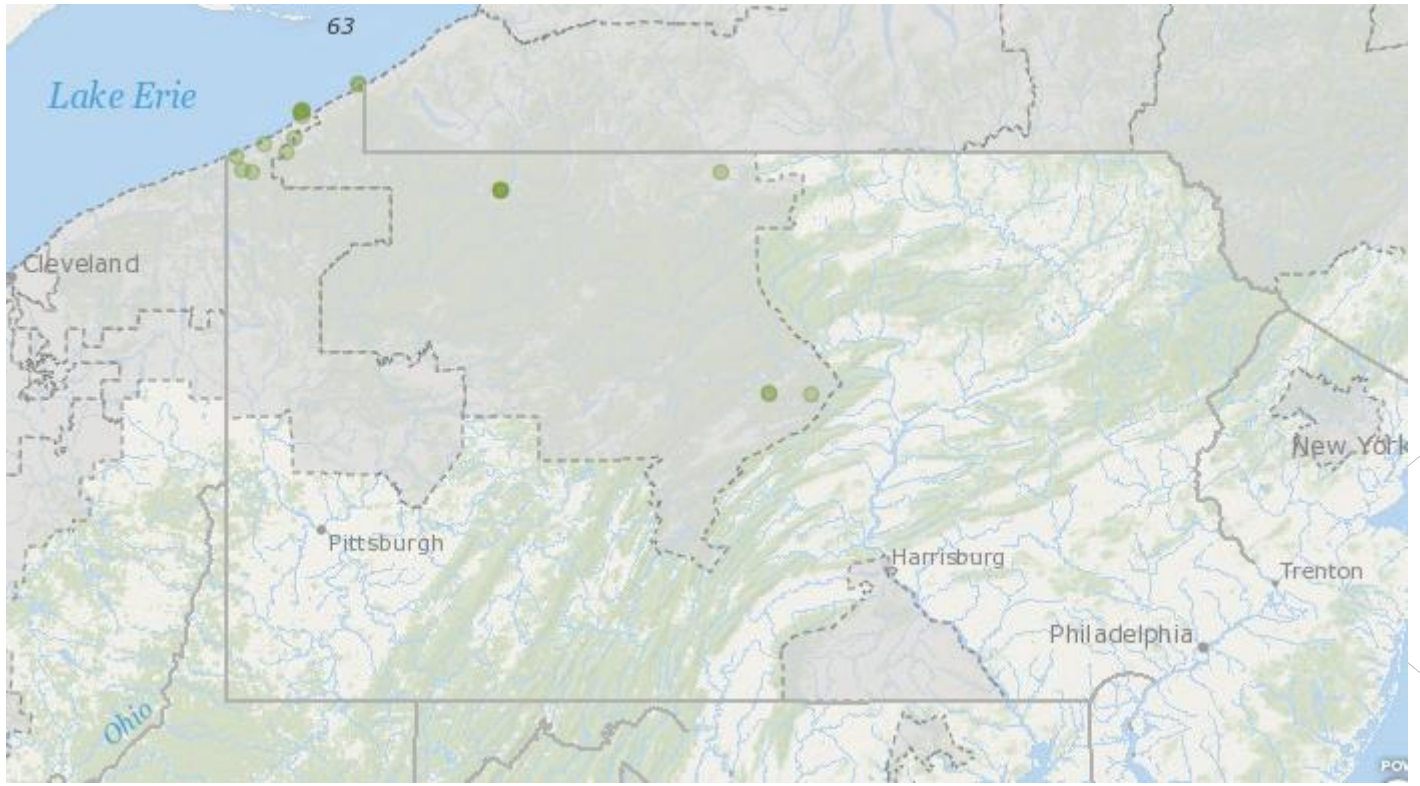
- Resources that help to articulate coastal habitat project priorities in Pennsylvania
  - Project types supported by GLRI Action Plan 3, Focus Area 4: Habitat and Species
  - Completed Pennsylvania projects from reports
  - Transition to discussion of your current project priorities



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:

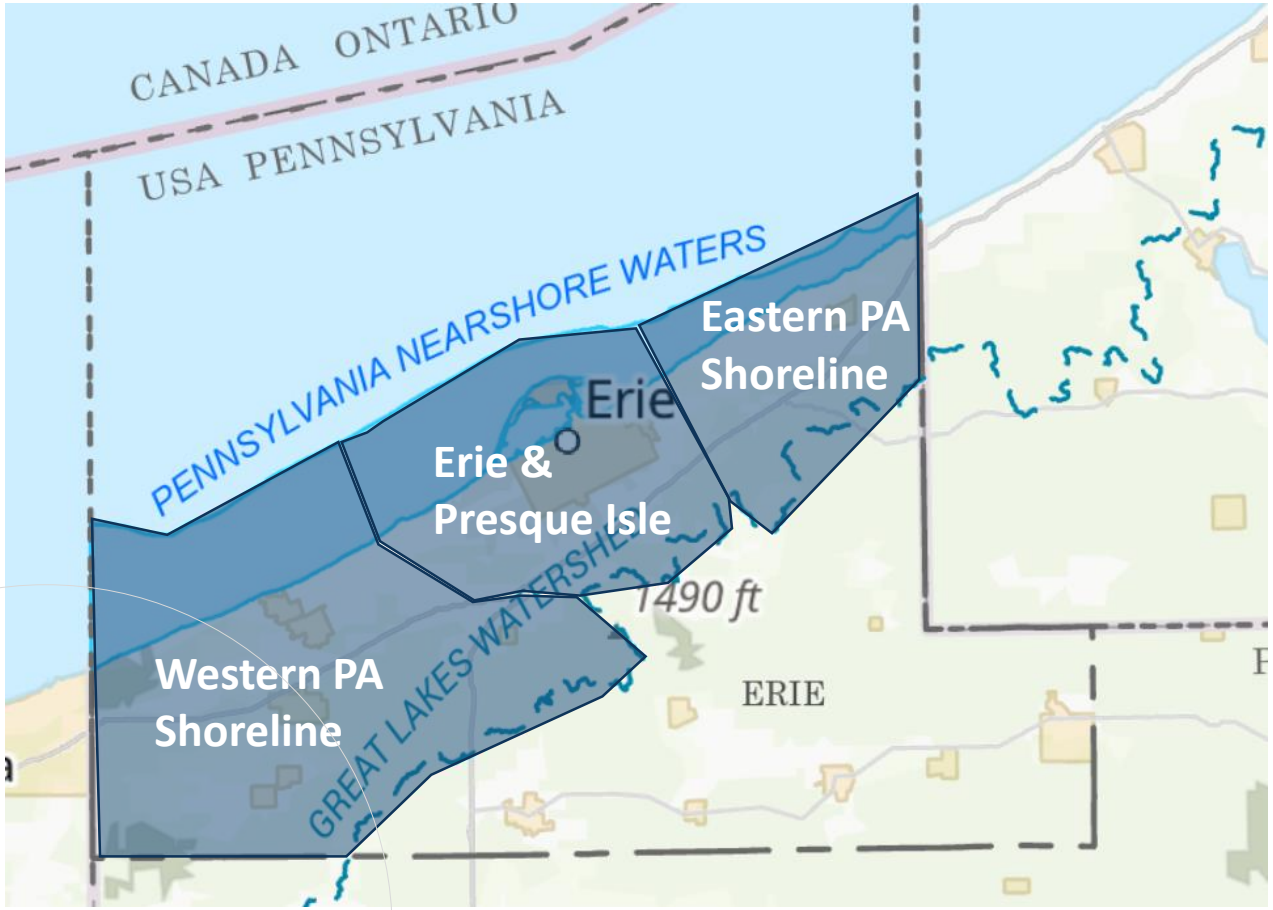
Removing invasive species that prevent native species from thriving

Funded projects in Pennsylvania

Restoration Type	GLRI Funded Projects	Other Ohio Projects
Protection	Roderick Reserve Expansion Acquire 197 acres of habitat (96 acres of wetlands) in Erie County, PA.	Bear Run Riparian Buffer Restoration Project restores or protects over 40 acres of riparian buffer in Bear Run watershed…
Enhancement	Presque Isle State Park Coastal Habitat Restoration …enhance and restore unique natural communities located in the Lake Erie shoreline…	Culbertson Drive Stormwater Infrastructure …construction/replacement of a 6 foot diameter culvert that is…in poor condition and inhibiting natural streamflow…
Re-establishment	Partners for Fish and Wildlife is a voluntary habitat restoration program of the U.S. Fish and Wildlife Service. The PFW Program works with landowners and other partners to restore habitat on private lands.	Walnut Creek Streambank Stabilization and Habitat Restoration …conduct streambank stabilization, in-stream habitat construction, and riparian plantings on 4 sites in the Walnut Creek watershed
Rehabilitation	Presque Isle Coastal Wetland Restoration Restore 400 acres of coastal wetland habitat at Presque Isle State Park through the control of invasive species and planting of native vegetation.	Lower Elk Creek Streambank Stabilization and Riparian Restoration Western PA Conservancy…to…stabilize 700 feet of eroding stream bank on Elk Creek improving public access and safety

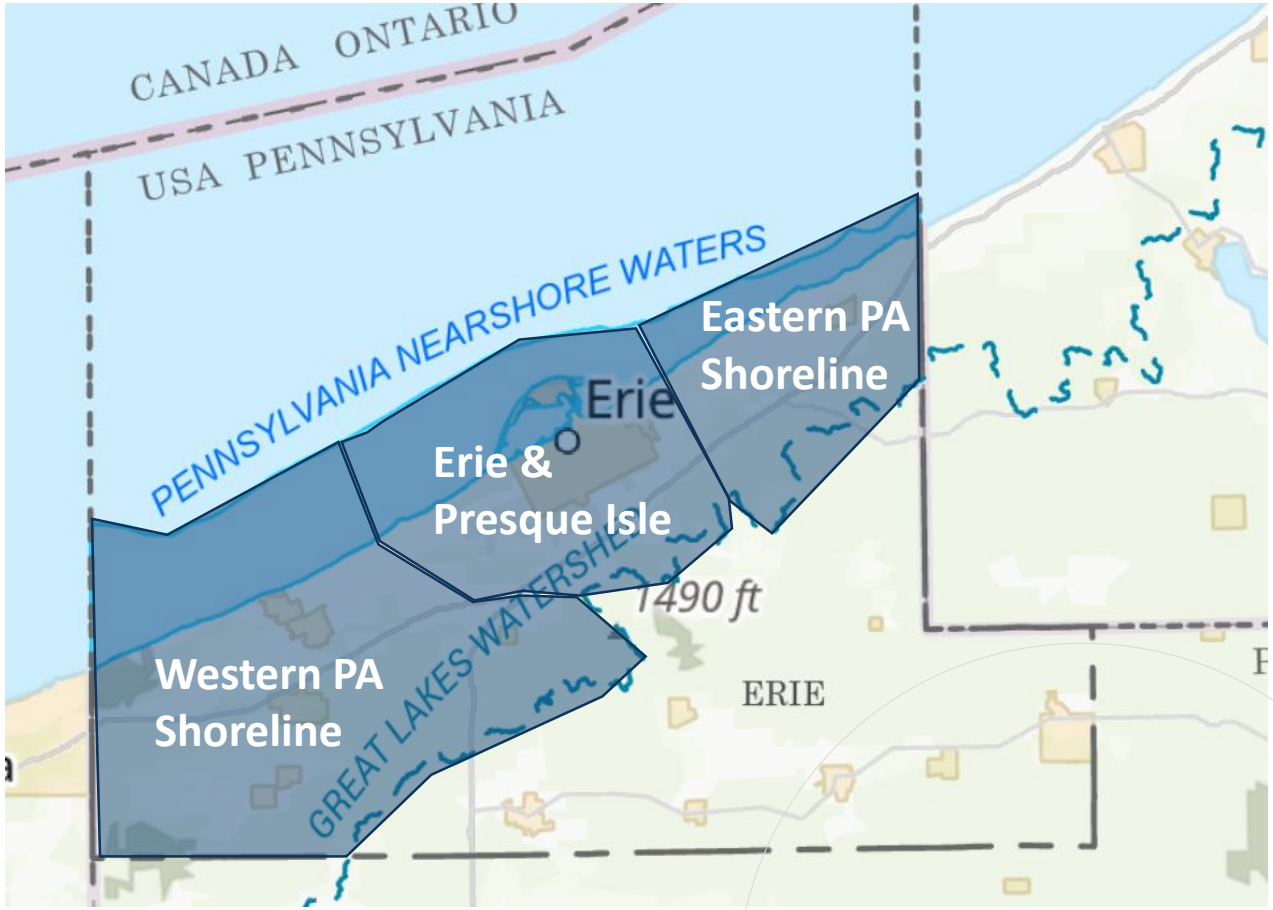
Project priorities in Pennsylvania

- Woodcock Habitat Restoration
  - 2021: 104 ac re-establishment of shrubland; 241 ac invasive treatment
  - 2022: 150 ac restoration of shrubland
  - 2023: 62 ac re-establishment of shrubland; 166 ac invasive treatment
  - 2024: 12 ac re-establishment of herbaceous opening



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

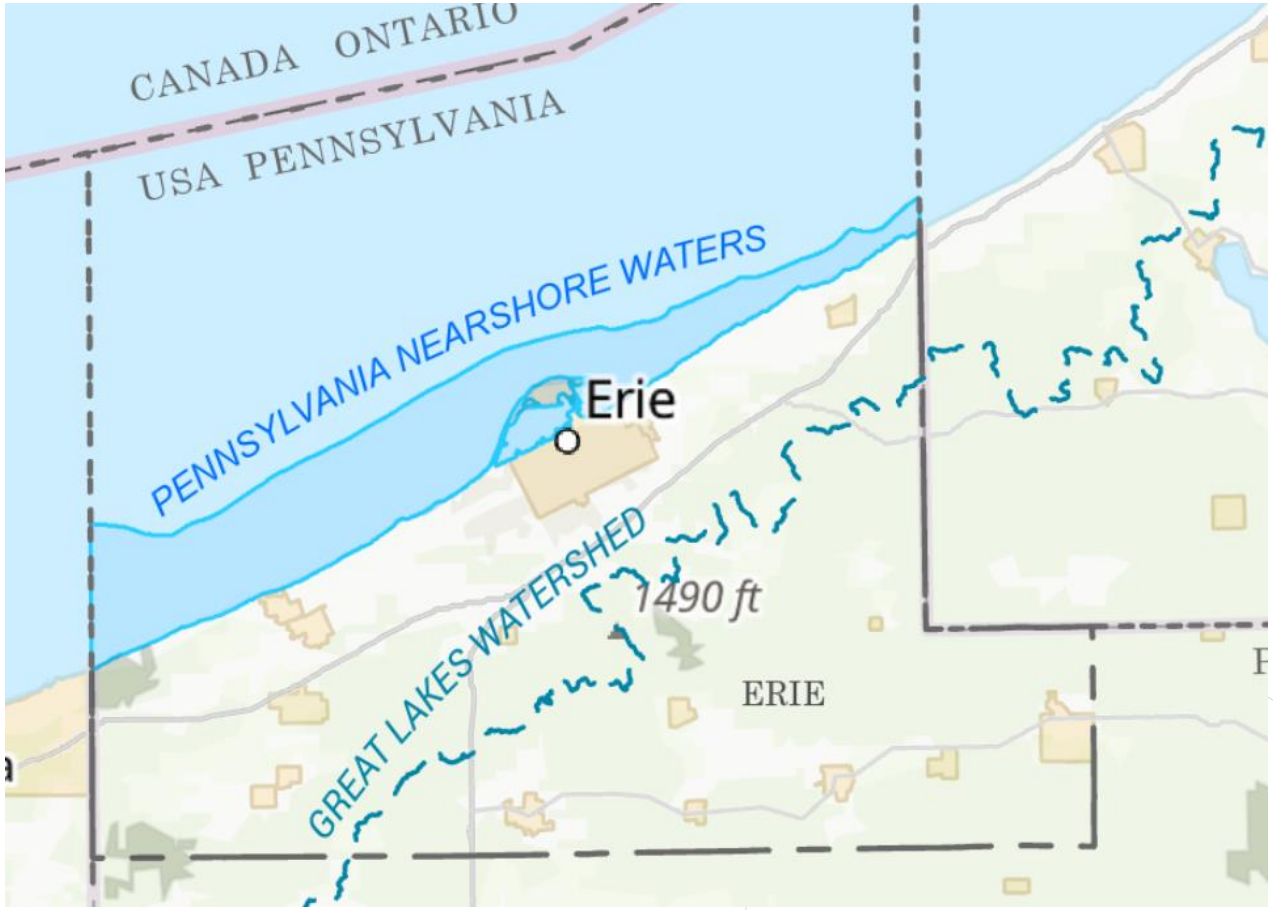


IDENTIFYING AND PRIORITIZING DATA

- 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

Identifying types of habitat data

- **Targeting data that impact fish communities in the coastal zone**
  - **Review** of Great Lakes Aquatic Habitat Framework (GLAHF)
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  - **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:
    - PA Dept of Environmental Protection
    - PA Spatial Data Access (PASDA)
    - Pennsylvania Great Lakes Water and Land Technical Resources (WALTeR)

- **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 WALTeR
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	X	Moderate	Ok	Info about glacial deposits and unconsolidated deposits
Spawning reefs	X	Ok	High	
Substrate composition, variability, and distribution	X	High	High	2015, GLAHF 30-m
Water depth	X	High	Moderate	
Wave energy	X	Moderate	Moderate	USACE modeled results.
Wave height	X	Low	High	GLOS buoy (no win. data)

Biological habitat data

Data Type	Present?	Spatial Resolution	Temporal Resolution	Notes
Benthos (trophic str/func)	X	Moderate	High	GLNPO points, most recent 2011
Coastal wetlands	X	Moderate	Ok	MTRI 12.5-m
Fish (trophic str/func)	X	High	High	Chapter 93 monitoring & WALTeR
Plankton (trophic str/func)	X	Moderate	High	GLNPO data, may not be sufficient depending on project location
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
Vegetation heterogeneity				GAP
Vegetation morphotype				GAP
Vegetation species composition				GAP

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

Environmental habitat data

Data Type	Present?	Spatial Resolution	Temporal Resolution	Notes
Chlorophyll-a		Moderate	Moderate	TMDL monitoring & WQN
Turbidity	X	High	High	303(d), Chapter 93, WALTeR
Suspended minerals				GAP
Water temperature (incl. timing/variability)	X	High	High	Derived from NOAA coastwatch satellite, WALTeR
Dissolved oxygen	X	High	High	303(d), Chapter 93, WALTeR

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

THANK YOU

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pennsylvania
COASTAL RESOURCES MANAGEMENT

LimnoTech
Water Environment | Scientists Engineers

RESPEC

Attachment D

Workshop Data Catalog

PENNSYLVANIA 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 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
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	

Workshop Class	Source	Collected_by	Type	Data Layer	Metadata	Year	Notes
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	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.

Workshop Class	Source	Collected_by	Type	Data Layer	Metadata	Year	Notes
Biological	Pennsylvania Natural Heritage Program	PADEP PA Game Commission PA Fish and Boat Commission Western PA Conservancy	Pennsylvania	Natural Heritage Program	Yes	2016	
Biological	Pennsylvania Spatial Data Access (PASDA)	Pennsylvania Fish and Boat Commission	Pennsylvania	Erie Tributaries Open Fishing - Access Points	Yes	2016	
Biological	Pennsylvania Spatial Data Access (PASDA)	Pennsylvania Fish and Boat Commission	Pennsylvania	Erie Tributaries Open Fishing - Access Polygons	Yes	2016	
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
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 Great Lakes Science Center	USGS	Regional	Great Lakes Commercial Fishing Catch 1929-2014	Yes	1929-2014	
Biological Environmental	US Environmental Protection Agency (USEPA)	USEPA	Regional	National aquatic resource survey (NARS)		1999-2001 2005-2006 2010	
Biological Environmental Physical	Penn State University	Penn State University SeaGrant-PA PADEP	Pennsylvania	Pennsylvania Great Lakes Water and Land Technical Resources (WALTeR)	Yes	2020	
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

Workshop Class	Source	Collected_by	Type	Data Layer	Metadata	Year	Notes
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 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	
Environmental	Pennsylvania Department of Environmental Protection (PADEP)	PADEP	Pennsylvania	303(d) Integrated List Non Attaining	Yes	2020	
Environmental	Pennsylvania Department of Environmental Protection (PADEP)	PADEP	Pennsylvania	303(d) Integrated List Attaining	Yes	2020	
Environmental	Pennsylvania Department of Environmental Protection (PADEP)	PADEP	Pennsylvania	Total Maximum Daily Load (TMDL)	Yes	2020	
Environmental	Pennsylvania Department of Environmental Protection (PADEP)	PADEP	Pennsylvania	Chapter 93 Designated Use Streams	Yes	2020	
Environmental	Pennsylvania Department of Environmental Protection (PADEP)	PADEP	Pennsylvania	Chapter 93 Existing Use - Streams	Yes	2020	
Environmental	Pennsylvania Department of Environmental Protection (PADEP)	PADEP	Pennsylvania	Chapter 93 Existing Use - Streams Migratory Fish	Yes	2020	
Environmental	Pennsylvania Department of Environmental Protection (PADEP)	PADEP	Pennsylvania	The Pennsylvania Water Quality Network (WQN)	Yes	2020	
Environmental	Pennsylvania Spatial Data Access (PASDA)	FEMA	Pennsylvania	National Flood Hazard Layer - Erie County	Yes	2017	
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	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	

Workshop Class	Source	Collected_by	Type	Data Layer	Metadata	Year	Notes
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	
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	

Workshop Class	Source	Collected_by	Type	Data Layer	Metadata	Year	Notes
Physical	Pennsylvania Department of Environmental Protection (PADEP)	PA Coastal Resources Mgmt Program	Pennsylvania	Lake Erie Shipwreck confirmed locations	Yes	2013-2017	
Physical	Pennsylvania Department of Environmental Protection (PADEP)	PA Coastal Resources Mgmt Program	Pennsylvania	PA Lake Erie Shoreline Structure Database	Yes	2007-2008	
Physical	Pennsylvania Department of Environmental Protection (PADEP)	PA Coastal Resources Mgmt Program	Pennsylvania	Bluff Recession Control Point Monitoring	Yes	1980s-2019	
Physical	Pennsylvania Department of Environmental Protection (PADEP)	PADEP	Pennsylvania	Historic bluff lines	Yes	1930-2020	
Physical	Pennsylvania Spatial Data Access (PASDA)	Pennsylvania Emergency Management Agency	Pennsylvania	PEMA 2018 0.5ft 4-band orthoimagery	Yes	2018	
Physical	Pennsylvania Spatial Data Access (PASDA)	United States Department of Agriculture	Pennsylvania	USDA NAIP 2017 1m 4-band orthoimagery	Yes	2017	
Physical	Pennsylvania Spatial Data Access (PASDA)	United States Department of Agriculture	Pennsylvania	USDA NAIP 2015 1m 4-band orthoimagery	Yes	2015	
Physical	Pennsylvania Spatial Data Access (PASDA)		Pennsylvania	Lake Erie Watershed 2015 0.5ft 4-band orthoimagery	Yes	2015	
Physical	Pennsylvania Spatial Data Access (PASDA)		Pennsylvania	Lake Erie Watershed 2012 0.5ft 4-band orthoimagery	Yes	2012	
Physical	Pennsylvania Spatial Data Access (PASDA)	United States Department of Agriculture	Pennsylvania	USDA NAIP 2010 1m 4-band orthoimagery	Yes	2010	
Physical	Pennsylvania Spatial Data Access (PASDA)	PA Sea Grant/PennState University	Pennsylvania	Lake Erie Watershed 2015 Lidar (LAS, DEM, breaklines, intensity)	Yes	2015	
Physical	Pennsylvania Spatial Data Access (PASDA)	PA Sea Grant/PennState University	Pennsylvania	Lake Erie Watershed 2012 Lidar (LAS, DEM (16 bit & 32 bit)	Yes	2012	
Physical	Pennsylvania Spatial Data Access (PASDA)	PA Sea Grant/PennState University	Pennsylvania	Lake Erie Watershed Impervious Surfaces	Yes	2012	
Physical	Pennsylvania Spatial Data Access (PASDA)	Erie County	Pennsylvania	Erie County - Parcels	Yes	2020	
Physical	Pennsylvania Spatial Data Access (PASDA)	Allegheny College	Pennsylvania	Glacial Deposits of Northwestern Pennsylvania	Yes	2018	
Physical	Pennsylvania Spatial Data Access (PASDA)	Allegheny College	Pennsylvania	Thickness of Unconsolidated Deposits of Erie County, Pennsylvania	Yes	2010	
Physical	Pennsylvania Spatial Data Access (PASDA)	PA Dept of Conservation and Natural Resources	Pennsylvania	Bedrock Geology of Pennsylvania	Yes	2001	
Physical	Pennsylvania Spatial Data Access (PASDA)		Pennsylvania	Erie Tributaries	Yes	2013	
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		

Workshop Class	Source	Collected_by	Type	Data Layer	Metadata	Year	Notes
Physical	US Geological Survey (USGS)	USGS	Regional	Protected Areas Database (PADUS)	Yes	2018	
Physical		Multiple partners	Regional	Lakebed 2030	NA		Materials not available as of 2019-10-07
Physical		Multiple partners	Regional	Great Lakes Bottom Mapping	NA		Materials not available as of 2019-10-07