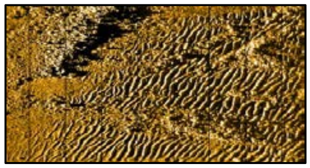
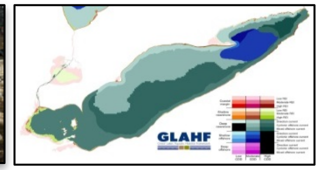
Report of the
Lake Erie Habitat Task Group
2016



Prepared by members:

Eric Weimer (co-chair), Ann Marie Gorman, Carey Knight, Scudder Mackey, Brandon Slone	*Ohio Department of Natural Resources*
Chris Castiglione (co-chair), Jim Boase	*US Fish and Wildlife Service*
Tom MacDougall, Yingming Zhao, Stephen Marklevitz	*Ontario Ministry of Natural Resources and Forestry*
Richard Kraus	*USGS – L.E. Biological Station*
Jim Markham	*New York Department of Environmental Conservation*
Ed Roseman	*USGS – Great Lakes Science Center*
Ed Rutherfod	*NOAA Great Lakes Environmental Research Laboratory*
Cleyo Harris	*Michigan Department of Natural Resources*
Mike Hosack	*Pennsylvania Fish and Boat Commission*

And contributors:

Catherine Riseng , Lacey Mason	*Great Lakes Aquatic Habitat Framework*
Rich Drouin, Christine Beniot	*Ontario Ministry of Natural Resources and Forestry*
Tim DePriest	*New York Department of Environmental Conservation*
Chris Vandergoot, Jeremy Pritt, Jeff Tyson	Ohio Department of Natural Resources
Christine Mayer, Jon Bossenbroek Todd Crail, Jessica Sherman, Brian Schmidt, Nicole R. King,	*University of Toledo*
Jason Fischer, Greg Kennedy, Wendylee Stott	*USGS – Great Lakes Science Center*
Justin Chiotti, Andrew Briggs	*US Fish and Wildlife Service*

Presented to:
Standing Technical Committee, Lake Erie Committee
Great Lakes Fishery Commission
Niagara Falls, ON – March 30th, 2016

Table of Contents

Section 1. Charges to the Habitat Task Group 2015-2016

1. Document habitat improvement projects and research into fish use of habitat in Lake Erie. Identify and prioritize potential projects and research for future funding.

2. Assist member agencies with the use of technology (*i.e.*, side-scan, GIS, remote sensing, *etc*.) to facilitate better understanding of habitat in Lake Erie, particularly in the Huron-Erie corridor, the nearshore, and other critical areas by participating in/supporting the following opportunities:
   a. Side-scan mapping techniques workshop.
   b. Lake Erie GIS/GLAHF development and deployment.
   c. Spawning habitat mapping.
   d. Nearshore substrate mapping.

3. Support other task groups by compiling metrics of habitat use by fish.

4. Develop a strategic research direction for the Environmental Objectives.

5. Develop and maintain a list of key functional habitats and priority management areas that would support LaMP and LEC Environmental Objectives.

Section 2. Document Habitat Improvement Projects

E. Weimer, C. Castiglione

The first charge to the Habitat Task Group (HTG) involves the documentation of habitat projects occurring throughout the Lake Erie and Lake St. Clair basins, including their associated watersheds. Although originally designed as a simple spreadsheet table, by 2007 it had evolved into an online, spatial inventory which, it was believed, would be an effective way of disseminating project information.

The habitat listing, presented as a spatial inventory presented with a map interface can be found online at:
http://www.glfc.org/lakecom/lec/spatial_inventory/inventory_index.html

In 2009, the LEC modified the charge to “Identify and prioritize relevant projects to take advantage of funding opportunities”. Currently, we are re-evaluating the objectives of this charge and believe it is essential to provide a tool that promotes collaboration and prevents duplication of effort. We continue to address the initial charge by documenting current habitat improvement and research projects identified by task group members and need to expand the inventory beyond the task group member knowledge. The following tables identify the number of projects within each basin (table 2-1), waterbody (table 2-2), and watershed (table2-3).

Table 2-1. Summary of Habitat Projects by Basin.

Basin	# of Projects
Central basin	11
East-Central	7
East basin	15
Huron-Erie corridor	19
Lake Erie basin	11
West-central basin	3
West basin	11

Table 2-2. Summary of Habitat Projects by Waterbody.

Waterbody	# of Projects
Crooked Creek	1
Detroit River	4
East Branch of Conneaut Creek, PA	2
Elk Creek	2
Four Mile Creek, PA	1
Lake Erie	13
Lake St. Clair	2
Middle Harbor	1
NA	39
Niagara River	2
North Maumee Bay	1
Sandusky River and Bay	1
Spooner Creek	1
St. Clair River	1
St. Clair River, Lake St. Clair	1
St. Clair River, Lake St. Clair, Detroit River	3
Walnut Creek, PA	1
Western and Central Basin of Lake Erie	1

Table 2-3. Summary of Habitat Projects by Watershed.

Watershed	# of Projects
Ashtabula-Chagrin	1
Big Creek	1
Big Creek, Lower Grand	1
Black-Rocky	1
Buffalo-Eighteenmile	1
Cattaraugus	2
Cedar-Portage	1
Cedar Creek	1
Cedar Creek, Rondeau, Big Creek	1
Chautauqua	1
Chautauqua-Conneaut	8
Clinton	1
Cuyahoga	2
Detroit	1
Halfway Creek, Ottawa River	1
Huron	1
Lake Erie basin	9
Lake St. Clair, Clinton, Syndenham, Lower Thames, Cedar Creek	1
Lower Grand	3
Lower Thames	1
Maumee	3
Maumee to Cuyahoga	1
Maumee, Ashtabula-Chagrin	1
NA	16
Niagara	2
Raisin	1
Rondeau	3
Sandusky	2
Sandusky River	1
St. Clair, Lake St. Clair, Clinton	1
St. Clair, Upper Thames, Syndenham, Lower Thames, Lake St. Clair, Clinton, Detroit, Cedar Creek	1
Syndenham, Lower Thames, Cedar Creek, Upper Thames	1
Toussaint River	1
Upper Grand, Lower Grand	1
Upper Grand, Lower Grand, Big Creek, Niagara	1
Upper Thames, Lower Thames	2

Building on the development of the Environmental Objectives detailed in Section 5 and the identification of Priority Management Areas in Section 6, the second responsibility of this charge is focused on identifying potential projects and gaps in research/restoration for future funding opportunities. These recommendations would be developed from expert opinion within the task group and prioritized within the framework of the Environmental Objectives.

Regardless of the state of our method of relaying the information, habitat related projects continue throughout the basin and we present a summary of notable ones below.

2a. Fish Community Assessments Associated with the Reef Projects in the St. Clair-Detroit River System

Justin Chiotti, Andrew Briggs, and James Boase

The U.S. Fish and Wildlife Service (Service) has been deploying gill nets to monitor the adult fish community before and after the construction of reefs within the St. Clair-Detroit River System (Figure 2a-1). In 2015, experimental gill nets were fished bi-weekly in the spring and fall at several locations in the St. Clair and Detroit Rivers. Locations in the St. Clair River include: the Middle Channel Reef, North Channel Control site, Hart's Light Reef, and Algonac Reef. Locations in the Detroit River include the East Belle Isle Reef (proposed reef), Fort Wayne Reef (proposed reef), the Fighting Island Reef, and Grassy Island Reef. Beginning in fall 2014, two minnow traps were attached to the gill nets in an effort to monitor the benthic fish community.

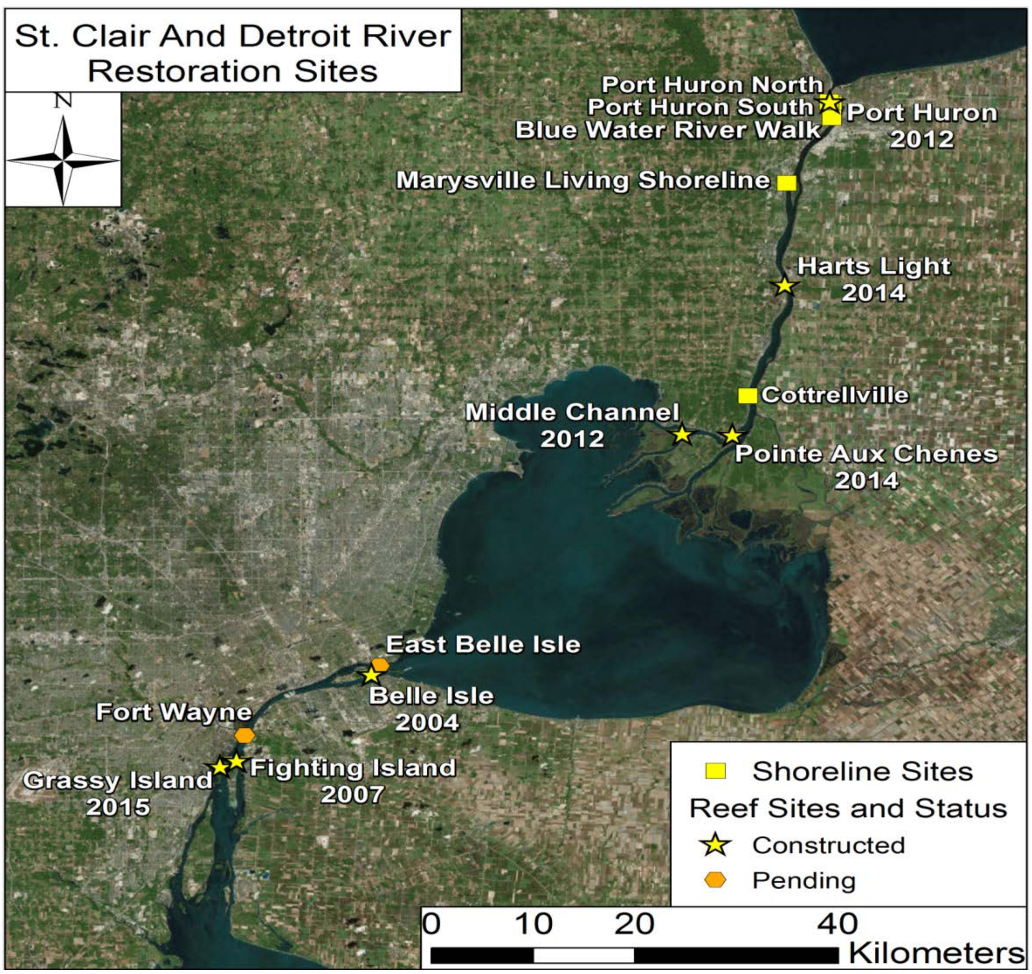


Figure 2a-1. Current and proposed reef projects in the St.Clair-Detroit River System

2015 St. Clair River Results: In the spring of 2015, 23 gill nets and 46 minnow traps were deployed between April 14th – June 16th at water temperatures ranging from 2.3 – 14.0°C. Spring species richness based on gill net catch at the St. Clair River sites in 2015 was highest at the Algonac Reef (9), followed by the Hart's Light Reef (8), Middle Channel Reef (7), and North Channel Control (4). Walleye were the most common fish captured at Algonac Reef (0.26/hour) and Middle Channel Reef (0.11/hour) while white sucker were the most common at Hart's Light Reef (0.24/hour) and North Channel Control (0.10/hour). Minnow traps captured round goby at Algonac Reef (0.008/hour), Hart's Light Reef (0.005/hour), Middle Channel Reef (0.013/hour), and North Channel Control (0.004/hour); creek chub at the Middle Channel Reef (0.004/hour); and northern madtom (endangered species in Michigan and Ontario) at Hart's Light Reef (0.005/hour).

In the fall of 2015, 12 gill nets and 24 minnow traps were deployed between November 3rd – December 2nd at water temperatures ranging from 6.6 – 11.7°C. Fall species richness based on gill net catch at the St. Clair River sites in 2015 was highest at Middle Channel Reef (5), followed by Algonac Reef (4), North Channel Control (2), and Hart's Light Reef (2). Walleye were the most common species captured at Hart's Light Reef (0.08/hour), Middle Channel Reef (0.05/hour), and Algonac Reef (0.01/hour; same CPUE as rock bass, shorthead redhorse, smallmouth bass, and white sucker). Minnow traps captured round goby at Algonac Reef (0.076/hour), Middle Channel Reef (0.156/hour), and North Channel Control (0.075/hour); logperch at Hart's Light Reef (0.008/hour) and Middle Channel Reef (0.006/hour); and spottail shiner at North Channel Control (0.088/hour).

2015 Detroit River Results: In the spring of 2015, 20 gill nets and 40 minnow traps were deployed between April 14th – June 3rd at water temperatures ranging from 5.8 – 15.4°C. Spring species richness based on gill net catch at the Detroit River sites in 2015 was highest at Fighting Island Reef (13), followed by East Belle Isle Reef (8), Grassy Island Reef (7), and Fort Wayne (7). Walleye were the most common species captured at East Belle Isle Reef (0.86/hour), Grassy Island Reef (0.41/hour), and Fort Wayne (0.22/hour) while quillback were the most common species at Fighting Island Reef (0.45/hour). Minnow traps captured round goby at East Belle Isle Reef (0.010/hour), Fort Wayne (0.015/hour), Grassy Island Reef (0.012/hour), and Fighting Island Reef (0.004/hour); rock bass at Grassy Island Reef (0.003/hour) and Fighting Island Reef (0.002/hour); and yellow perch at Fighting Island Reef (0.002/hour).

In the fall of 2015, 16 gill nets and 32 minnow traps were deployed between October 27th – December 8th at water temperatures ranging from 4.2 – 12.3°C. Fall species richness based on gill net catch at the Detroit River sites in 2015 was highest at Fighting Island Reef (4), followed by East Belle Isle Reef (3) and Fort Wayne (3). Grassy Island Reef was not sampled due to reef construction taking place. Walleye were the most common species captured at Fort Wayne (0.08/hour) and East Belle Isle Reef (0.04/hour) while white sucker were the most common species at Fighting Island Reef (0.02/hour). Minnow traps only caught round goby at East Belle Isle Reef (0.149/hour).

St. Clair River Pre/Post Reef Construction Comparisons: Since reef construction two additional species have been detected at each of the reef sites, while no additional species have been detected at the North Channel Control site. The additional species include logperch and channel catfish at the Middle Channel Reef, logperch and burbot at the Hart's Light Reef, and gizzard shad and burbot at the Algonac Reef.

Spring gill net CPUE comparisons for walleye, white sucker, and redhorse species can be seen in Figure 2a-2. In 2015, walleye CPUE increased at both the Middle Channel Reef and Algonac Reef sites. At the Middle Channel Reef site, more walleye were captured in 2015 than any other year, even though effort was lower than any year. At the Algonac Reef site, almost twice as many walleye were captured in 2015 than any other year. Walleye catch rates at the Hart's Light Reef site have decreased each year, with 42 walleye caught in 2013, 27 in 2014, and only 3 in 2015. Even though walleye catch rates did not increase at the North Channel Control site, we cannot determine whether the increased walleye CPUE at the reef sites were due to reef construction or system wide increases in walleye in the spring of 2015 in the St. Clair River. We will continue to monitor the reef sites in successive years to note changes in target species CPUE compared to reference/control locations.

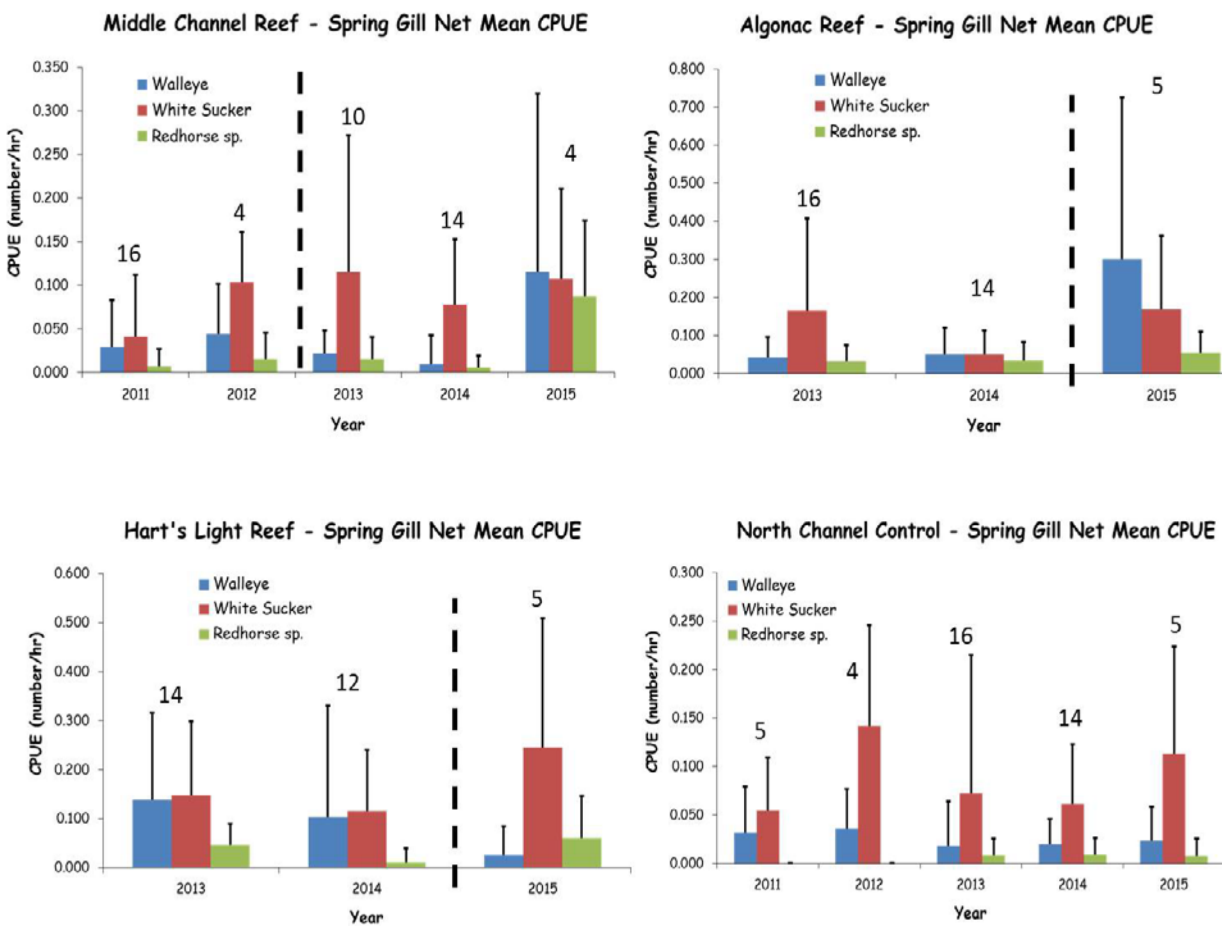
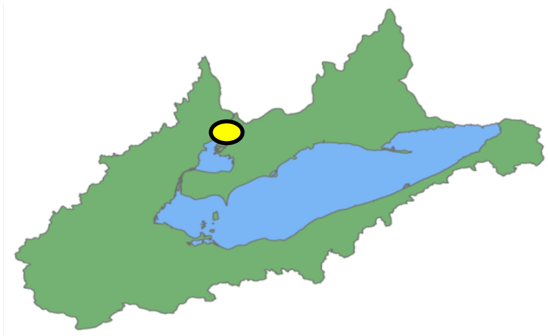


Figure 2a-2. Walleye, white sucker, and redhorse species gill net CPUE comparisons before and after construction of reef sites in the St. Clair River. The North Channel Control site is used to compare observations in CPUE at reef sites. Vertical dashed line represents pre and post reef construction periods. The numbers above the bars indicate the number of net sets for that spring.

Lake Sturgeon Use of Newly Constructed Artificial Reefs in the St. Clair River

E. Roseman

The USGS Great Lakes Science Center monitored lake sturgeon use of two newly-constructed artificial spawning reefs in the St. Clair River at Harts Light and Point aux Chenes in 2015. Egg deposition upstream, downstream, and on the reefs was assessed using egg mats, while larval drift was sampled using benthic D-frame and depth-stratified conical nets upstream and downstream of the reefs. Lake sturgeon eggs were not detected at either reef during pre-construction monitoring, but were detected on both reefs post-construction. Larvae were collected from early-June to mid-July upstream and downstream of both reefs in the D-frame nets and at all depths with the depth-stratified conical nets. Yolk-sac and post-yolk sac larvae were collected but collection of larvae >22 mm was rare. Significantly more lake sturgeon larvae were collected downstream of Harts Light reef than upstream; no significant difference was found at the Pointe aux Chenes reef. Egg and larval drift monitoring at these two newly constructed reef sites will continue in 2016.



2b. Habitat in the Maumee River

C. Mayer, B. Schmidt, J. Sherman, J. Bossenbroek

Assessing Walleye spawning habitat in the Maumee River

B. Schmidt, C. Mayer, E. Roseman, W. Stott, Jeremy Pritt

Despite a long history of anthropogenic degradation, the Maumee River continues to support one of the largest fish migrations in the Great Lakes, as approximately a half million walleye return from Lake Erie to spawn annually. However, the river has been highly altered by a variety of anthropogenic activities and habitat availability may be compromised. Therefore, the goal of our project is to determine if availability and quality of spawning habitat could limit production of Maumee River walleye by assessing longitudinal deposition of walleye and mapping of spawning substrates using side scan sonar.

We sampled eggs with a benthic pump in the springs 2014 and 2015 at ten and eight sites, respectively, to assess spatial and temporal trends in relative eggs abundances. All sites sampled were previously identified as having favorable walleye spawning substrate (gravel/cobble) and depth (Boase 2008). We also completed side scan sonar transects throughout the lower 56 kilometers of the Maumee River from the first dam to the mouth of the river, to create substrate and bathymetry maps of the lower river. In shallow, high velocity areas we quantified substrate types using a 0.5 m^2 quadrat (wading) or Eckman dredge (boat) at three or four points traversing the channel. Side scan sonar images are currently being processed in SonarWiz software. Preliminary maps presented here are based on Boase 2008 and our transect samples.

Results: We identified a longitudinal restriction point at approximately river kilometer 30, a section of the river known as Jerome Rapids. Despite large upstream areas identified as quality walleye spawning habitat, walleye egg deposition at these sites were low compared to downstream areas, especially under high discharge conditions. As a result, walleye spawning appears to be restricted to 3.34 million m^2 of spawning habitat in river kilometers 20-30. Given the most recent estimate of stock size (Pritt et al. 2013) at ~126,000 mature females, an average fecundity of 225,000 eggs from the literature, and the estimated carrying capacity of 4,325 walleye eggs per square meter in gravel/cobble substrates (Jones et al. 2003), we estimate that 6.55 million m^2 of preferred habitat would be optimal for the current population. Jerome Rapids may present a partial velocity barrier that limits walleye's ability to swim past this point under high flow conditions.

Implications: Habitat availability may be limiting production of larval walleye from the Maumee River.

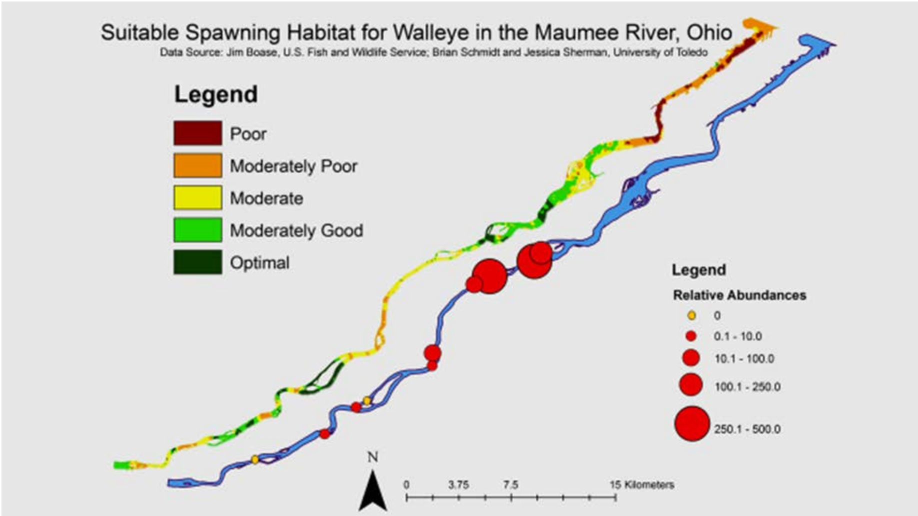


Figure 2b-1. Map of suitable walleye spawning habitat in the lower 56 km of the Maumee River, compared to actual mean walleye egg deposition per sample in 2014. Despite large areas of optimal spawning habitat, egg deposition is relatively low in the upstream of Jerome Rapids, rkm 30.

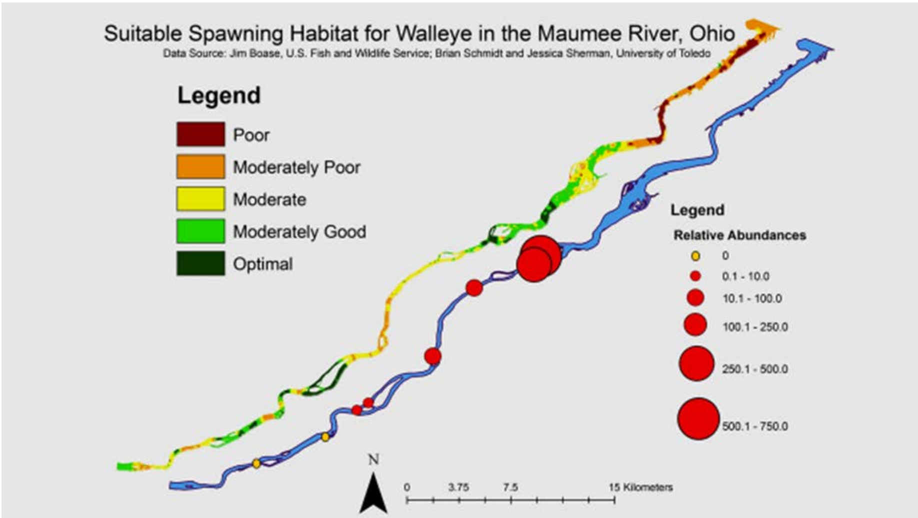


Figure 2b-2. Map of suitable walleye spawning habitat in the lower 56 km of the Maumee River, compared to actual mean walleye egg deposition per sample in 2015. Much like the previous year, despite large areas of optimal spawning habitat, egg deposition appears restriction to the downstream sites.

References:
Boase, J. 2008. 2008 Annual Report: evaluation of lake sturgeon spawning in the Maumee River, Ohio. U.S. Fish and Wildlife Service.

Jones, M.L., J.K. Netto, J.D. Stockwell, J.B. Mion. 2003. Does the value of newly accessible spawning habitat for walleye (Stizostedion vitreum) depend on its location relative to nursery habitat? Canadian Journal of Fisheries and Aquatic Sciences 60(12): 1527-1538

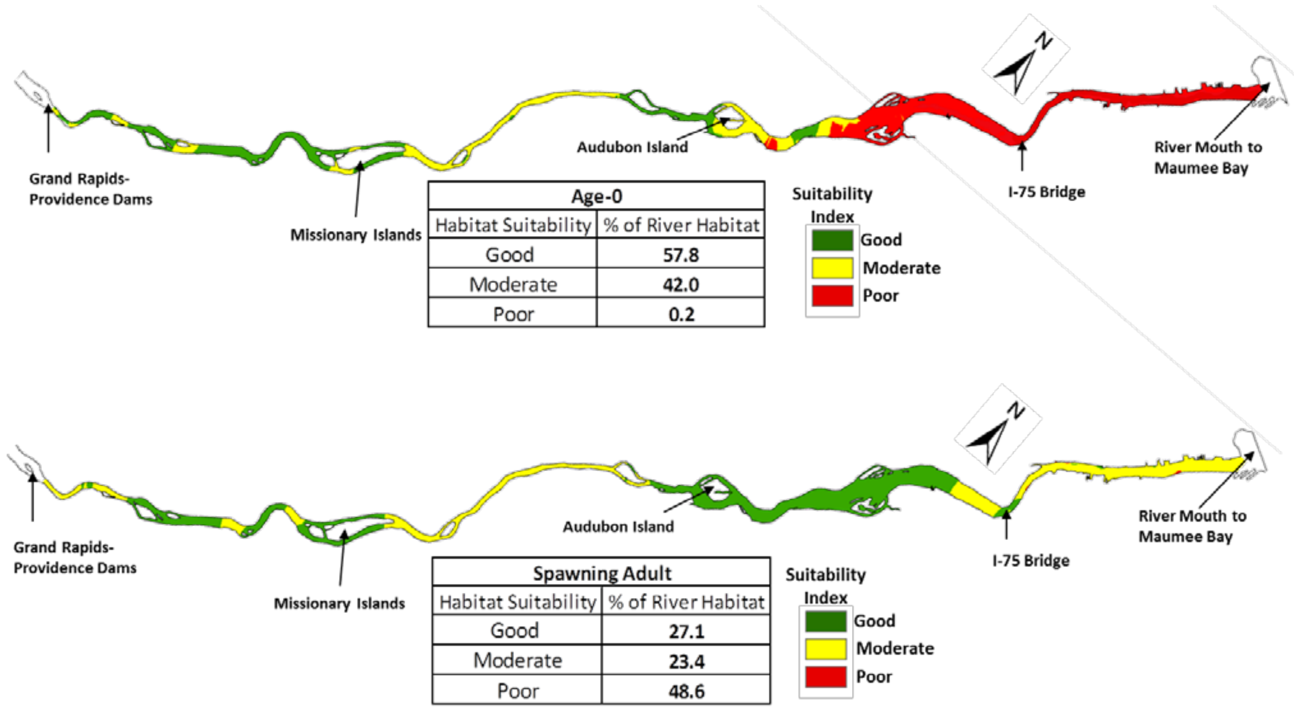
Pritt, J.J., M.R. DuFour, C.M. Mayer, P.M. Kocovsky, J.T. Tyson, E.J. Weimer, C.S. Vandergoot. 2013. Including independent estimates and uncertainty to quantify total abundance of fish migrating in a large river system: walleye (Sander vitreus) in the Maumee River, Ohio. Canadian Journal of Fisheries and Aquatic Sciences 70(5): 803-814

A habitat suitability model for possible lake sturgeon (Acipenser fulvescens) reintroduction in the Maumee River

Jessica Sherman, Jonathan Bossenbroek, Todd Crail, Christine Mayer, James Boase, Justin Chiotti, Christopher Vandergoot

Lake sturgeon, *Acipenser fulvescens*, are a candidate for reintroduction in the Maumee River where they were historically abundant but are currently absent from the system. In order to determine if current habitat quantity and quality are sufficient to support reintroduction, we are constructing a spatially explicit habitat suitability model for spawning adult and age-0 lake sturgeon for the lower Maumee River. Habitat layers include substrate composition, water depth, water velocity, water quality characteristics, and habitat size and connectivity. A combination of survey methods including side-scan sonar, visual observation, and benthic grabs were used to assess substrate composition while data loggers and a multi-parameter sonde measure a suite of water quality characteristics. Water depth was measured simultaneously with side-scan data and was standardized to the USGS Gage at the Waterville, OH station and water velocity was calculated for individual points throughout the system using discharge data, water depth, and bankfull width measurements.

We have collected near-continuous side-scan sonar video of the lower Maumee River and are currently in the process of hand-delineating each substrate type throughout the river. Substrate data from visual observation and benthic grabs will be used to validate substrate classification from the sonar images. Each habitat characteristic is interpolated as a spatially explicit layer in ArcGIS given a suitability index number ranging from 0 – 1. Each layer is combined using geometric mean calculations to provide an overall assessment of habitat suitability and connectivity. Habitat suitability is delineated as good (0.8 – 1), moderate (0.3 – 0.8), or poor (0 – 0.3). We have conducted preliminary analysis using the validation data for substrate and water depth. The results of this analysis suggest that 27% and 58% of the Maumee River is classified as good for spawning adults and age-0 lake sturgeon, respectively (Figure 2b-3). The model needs to be completed with the remaining habitat variables and with the substrate classification delineated from sonar images instead of the validation data. We plan to have the model completed and a Restoration Plan for lake sturgeon reintroduction in the Maumee River developed by summer 2016.



Age-0	
Habitat Suitability	% of River Habitat
Good	57.8
Moderate	42.0
Poor	0.2

Spawning Adult	
Habitat Suitability	% of River Habitat
Good	27.1
Moderate	23.4
Poor	48.6

Figure 2b-3. Maumee River Suitability Index for Age-0 lake sturgeon (top) and spawning adult lake sturgeon (bottom).

The next step for this project is to test the utility of the habitat suitability index model developed for lake sturgeon by determining if the model can be transferred to other species. Successfully transferring the HSI model to sport fish, invasive species, or rare/cryptic species would be beneficial for monitoring and restoration work in the Maumee River and other river systems. We are going to test the transferability of the model using characteristics cited for native unionid (freshwater clam) communities. Field surveys will be conducted in summer 2016 to determine if the model accurately classifies habitat for unionid communities and if transfer was successful.

2c. Other Notable Habitat Projects in Brief

- ***Wetland Re-connection and Fish Passage Projects, OH*** (E.Weimer):
  In the past decade, several wetland restoration projects in Ohio have included re-establishing hydraulic connection with Lake Erie or a tributary. These connections have the possible benefits of restoring natural water levels and flows, as well as allowing fish passage. Types of connections being used include open culverts, swing gates, stop logs, and screw gates, and even include a fish ladder. Fisheries staff encouraged the use of these structures, though without evaluating how they influence fish communities within wetlands, or whether fish use these structures for ingress or egress from wetlands.

  In 2015, researchers from Ohio Sea Grant, The Nature Conservancy, and the Ohio DNR, began a collaborative effort to evaluate how these structures influence wetland fish communities. Comparing the fish community inside and outside wetlands with connective structures, they found that fish communities inside a wetland were most similar to those outside the wetland where an open culvert was the structure used for re-connection.

Larger fish community differences were found where the fish ladder or closed swing gates were in place. Their results will be used to direct future restoration and reconnection activities in the future.

During the winter of 2016, structure at Middle Harbor, Ohio, was opened, allowing for free exchange of water with West Harbor/Lake Erie for the first time since construction began in 2011. With the connection open, fisheries personnel with ODNR and Bowling Green State University have begun preliminary research to document usage of the fish passage by installing a Didson Acoustic sampler in the structure. The Didson unit uses sound to generate images of fish moving through the field, which allows for quantification and fish identification. The Didson unit is focused at the mouth of the opening into the wetland, and will remain operational until the unit is needed elsewhere, or until the structure is closed due to high water or carp spawning activities.

- ***Detroit River Habitat Survey*** *(*Rich Drouin, Christine Beniot)
  The Detroit River is listed as an area of concern (AOCs) in the Great Lakes basin. Remedial action plans (RAP) have been developed with the identification of impaired or degraded beneficial uses of the river; referred to as beneficial-use-impairments (BUIs). Degradation of Fish and Wildlife Populations, and the Loss of Fish and Wildlife Habitat have both been identified as BUI's (RAP Stage 2 Report, 2010) that must be addressed before the river can be de-listed as an AOC.

In 2015, the Ontario Ministry of Natural Resources and Forestry (OMNRF) collected habitat and fish community composition data from 22 prioritized sites on the Detroit River (Fig 2c-1). Sites were prioritized by members of the Detroit River Canadian Clean-Up based on a 1993 MNRF survey and proprietary access.

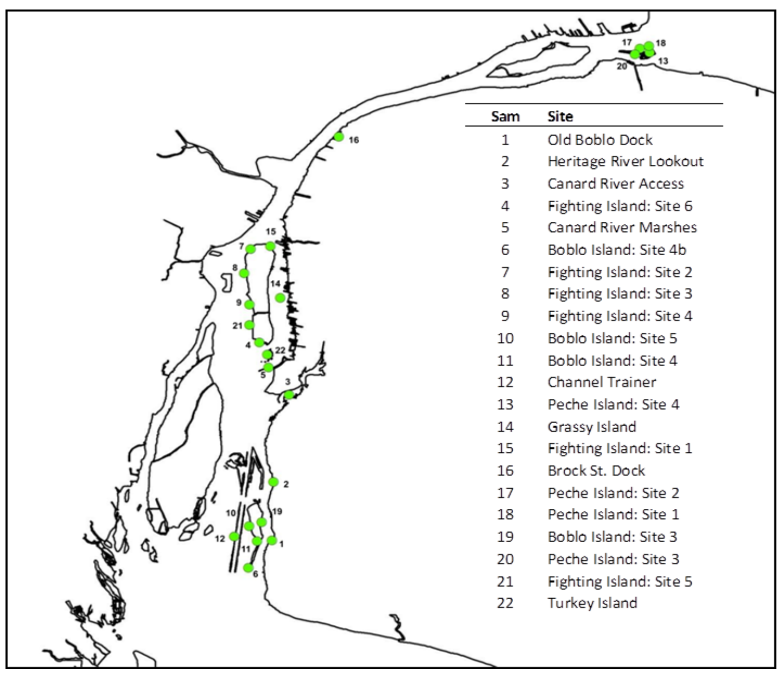


Figure 2c-1. OMNRF 2015 Detroit River Survey Sites

Based on work completed in 2015 the Detroit River Canadian Clean-up working group has identified 10 potential sites for rehabilitation projects. Feasibility for proposed site-specific rehabilitation /enhancement projects is being assessed through modeling, engineer design, and project costing. By implementing these rehabilitation /enhancement projects the goal is to de-list the Detroit River within 5-10 years.

- ***Strawberry Island Wetland Restoration*** (Timothy DePriest):
  The Strawberry Island project is being implemented by the NY Power Authority in collaboration with NYS DEC, USFWS, Tribal Nations, and local organizations in partial fulfillment of their Re-licensing agreement for the Niagara Power Project. The scope of this project is to build on past work to restore emergent wetland habitat in the shallow water areas around the perimeter of the island as well as inside the "lagoon." By amending the substrate with coarse sediment, constructing rock berms, and anchoring large wood, the goal is to mitigate wave and ice scour in this high energy, mid-river environment. This will promote growing conditions in which emergent wetland vegetation can be established successfully as well as creating complexity and diversity in the plant community with variable water depth and physical structure. The newly established wetlands will support the native fish community by creating foraging, spawning, and nursery habitat in locations that have experienced habitat degradation due to past and current practices related to mining, commercial shipping, and recreational boating. The earth work was largely completed in 2015 with the final planting taking place in 2016.

- ***Fish Attraction Structures, Phase 2*** *(Timothy DePriest):*
  The Niagara Musky Association received a funding award from the Habitat Enhancement and Restoration Fund to implement the construction of additional aquatic habitat features that were previously implemented in 2008 by NYPA as re-licensing HIP. The current project utilizes the successful design of rock structures from the previous project that are located in areas of high velocity flows to create hydraulic cover. These areas attract juvenile as well as adult sport fish and are intended to enhance angling success. These structures range from a simple boulder field to rock piles and ridges in four separate locations in the upper Niagara River in the vicinity of public fishing areas. The structures were built at four different locations in the East (Tonawanda) Channel of the upper Niagara River in 2016.

- ***Sandy Beach Club Shoreline and Aquatic Habitat Restoration*** (Timothy DePriest):

  The Buffalo Niagara Riverkeeper is collaborating with the Sandy Beach Club in the Town Of Grand Island to remove 200 liner feet of a large concrete bulkhead to restore the natural gradient of the shoreline and create aquatic habitat. Shallow water areas are being enhanced and protected from ice and waves with the construction of protective rock berms and large logs anchored in place. The newly protected shallow water areas will then be planted with emergent and submerged vegetation that will provide enhanced foraging and spawning habitat for the local fish community.

- ***Status of Chautauqua Creek Fish Passage Project*** (Jim Markham):

  A fish passage project on Chautauqua Creek (Chautauqua County, New York) was completed by the Army Corp of Engineers (ACOE) during July, 2012. This project was initially started in 2006 through the Great Lake Fisheries and Ecosystem Restoration (GLFER) program and was a collaboration between the ACOE, the NYSDEC (non-federal sponsor), and the Village of Westfield. The goal of the project was to restore connectivity and provide fish access to approximately 10 miles of high quality spawning areas in the upper portion of Chautauqua Creek. The design involved two separate dams and included creating a notch in the lowermost dam and a rock ramp at the uppermost dam to promote fish passage of all species. Measures were also added to prevent the upstream migration of invasive Sea Lamprey.

  Unfortunately the project didn't have a long wait to find out if the fish passage design would hold up to a serious flooding event. A combination cold front and the remnants of Superstorm Sandy dumped approximately seven inches of rain over a 24 hour period, and ten inches over a week, in Western New York during late October 2012, causing a major flooding event on all the streams including Chautauqua Creek. The most extensive damage at the fish passage project was to the rock ramp at the uppermost dam where a major portion of the rocks were displaced. Some of the rocks measuring feet in diameter were actually moved several hundred feet downstream below the lowermost dam, an indication of the severity of the flooding event, while others traveled over three miles to the mouth of the stream in Lake Erie. While there was not any physical damage to the notch at the lowermost dam, there were several trees and a large boulder that were stuck in the notch which hindered any upstream fish passage.

  In Spring 2013, the ACOE, the NYSDEC, and the Village of Westfield reviewed the status of the project and discussed the possibility of restoring the project back to its original state, and if possible incorporate modifications for withstanding future flooding events. The preferred improvements included repositioning of the stones in the rock ramp and pinning them in place, and adding additional rocks below the lower dam to raise the pool height to promote better passage of non-jumping species.

In 2014, the Chautauqua County Soil and Water District applied for and received funding through the Great Lake Basin Fish Habitat Partnership to repair the upper dam and raise the pool height at the lower dam in order to restore functionality back to the project. In addition, another fish passage impediment downstream at a railroad trestle will be improved through raising the pool height to allow access to additional prime spawning habitat for non-jumping lake run species such as smallmouth bass and white suckers. Several other agencies are providing funds and services for this project including NYSDEC, Village of Westfield, USFWS, and local TU chapters.

The first phase of this project was completed in August 2015. A combination of existing rock and new rock were used to reconstruct the rock ramp, and pinning was used at critical locations to avoid movement of the stone (Figure 2c-2). At the lower site, a series of large rocks were pinned at the lower end of the pool to raise the pool height at the dam by several feet, and a rock ramp was built into the western side to allow upstream migration of fish into the raised pool (Figure 2c-3). This additional project at the railroad trestle is scheduled for construction during summer 2016(Figure 2c-4).

Figure 2c-2. Rock ramp on the uppermost dam pre-repair (left) and post-repair (right). Rocks are now pinned to prevent movement during flood events.

Figure 2c-3. Notching in the lower dam pre-repair (left) and post-repair (left – downstream view). The pool height was raised to promote fish passage by all species. A natural rock ramp on the left side of the photo allows fish to move upstream into the pool.

Figure 2c-4. A pool downstream of the railroad trestle on Chautauqua Creek. Fish passage will be improved at this site in 2016 through raising of the water level to promote passage of non-jumping lake run species such as smallmouth bass, white suckers, and redhorse.

Section 3. Assist Member Agencies with Technology Use

Members of the HTG are involved in a variety of projects, often using specialized equipment and techniques to identify, survey, and modify aquatic habitat in Lake Erie and its surrounding watersheds. The HTG desires to assist interested agencies and researchers with the selection, use, and analysis of data collected with these technologies in a standardized fashion. What follows is a brief synopsis of how the HTG is working toward this charge.

3a. Sidescan Sonar Comparison

E. Weimer, S. Mackey

Sidescan sonar technology is an increasingly popular and important tool for evaluating habitat in aquatic systems. Sidescan has been used on Lake Erie to map substrate distributions, target potential Lake Trout spawning habitat, and evaluate habitat in the nearshore. Historically, this work has required the use of specialized, stand-alone sidescan systems that have been cost prohibitive for many agencies to purchase. In recent years, manufacturers have begun to integrate sidescan technology into sonar/chart plotter systems that mount on vessel hulls. These integrated sidescan systems are relatively inexpensive, and many agencies around Lake Erie have begun using these systems to collect data. The HTG encourages these activities, but understands that integrated sidescan systems may perform differently at various depths, ranges, and frequencies compared to traditional, stand-alone systems. Recognizing this, the HTG has begun a series of exercises that will establish recommendations for collecting, processing, and analyzing sidescan data in Lake Erie.

Members of the HTG gathered in Fairport, Ohio on July 11, 2015 to collect data using a stand-alone L3-Klein sidescan unit and an integrated Humminbird system with the intent of identifying relative strengths, weaknesses, and recommendations for using each type of system. Three unique locations were surveyed using both systems; the Fairport Harbor breakwall, nearshore area adjacent to Painesville Township Park (Figure 3a-1), and a deeper water area north of Painesville Township Park (Figure 3a-2). These sites represent varying depths and substrate types that are typically found in nearshore areas of the Central Basin.

Range settings for both systems were similar at 25m range (50m swath width) and boat speed around 5 mph. Frequencies varied slightly: the L3-Klein unit collected data at 500 kHz at all transects, while the Humminbird unit collected data at 455 kHz at all sites. Chesapeake Technologies SonarWiz Map sidescan processing software was used to process and mosaic both the L3-Klein sidescan sonar data and the Humminbird sidescan sonar data. Comparisons suggest that at shallow depths/short ranges, the two systems collect somewhat comparable data. But in deeper water the Humminbird data is less detailed and exhibits reduced contrast when compared to the L3-Klein data (Figure 3a-2). Based on these results, fine-scale habitat mapping would be difficult using the Humminbird data in moderate to deep water. At longer ranges, the stand-alone Klein system is superior. Also, for general survey work, the 455 kHz setting on the Humminbird system provides a wider swath of useable data than the 800 kHz setting. However, the 800 kHz setting may be superior for SAV mapping at very shallow depths (future investigation).

Figure 3a-1. Map of comparison site at Painesville Township Park (east of Fairport Harbor). Comparison sidescan sonar data were collected on July 11, 2015. White rectangle shows area of proposed nearshore habitat enhancement work by Lake County MetroParks. Construction of a public access pier is scheduled to begin summer 2016.

In the upcoming year, the HTG intends to further process the data collected in 2014-15 for comparative purposes. In addition, we plan on conducting further comparative surveys using other systems including EdgeTech and Marine Sonics equipment. It is anticipated that a guidance document identifying recommended sidescan systems and settings for a particular data collection need can be developed, and that options for data processing can be evaluated. Once this process is completed, the HTG is planning to host a workshop (perhaps in the fall of 2016) for those interested in collecting sidescan data throughout the Great Lakes.

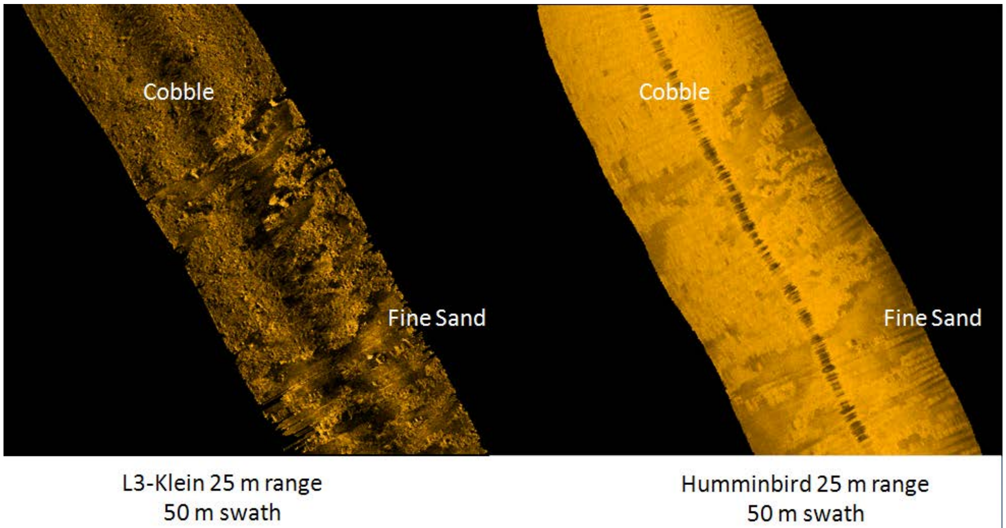


Figure 3a-2. Side-by-side comparison of mosaicked sidescan sonar images collected north of Painesville Township Park. Water depth is approximately 25 feet. Images were collected along the same survey line using a L-3 Klein stand-alone system at 500 kHz (left image) and an integrated Humminbird sidescan/chart plotter at 455 kHz (right image).

3b. Continued support of Lake Erie GIS/GLAHF development and deployment

C. Riseng, L. Mason, E. Rutherford

The Lake Erie GIS has been incorporated into a larger initiative, the Great Lakes Aquatic Habitat Framework (GLAHF). The GLAHF is a spatial framework and GIS database of geo-referenced data for Great Lakes coastal, large rivermouth, and open water habitats being developed by the University of Michigan, along with multiple partners including researchers, universities, and agencies in the U.S. and Canada. The goal of the GLAHF is to develop and provide access to a Great Lakes aquatic habitat database and classification framework. GLAHF provides a consistent geographic framework to integrate and track data from habitat monitoring, assessment, indicator development, ecological forecasting, and restoration activities across the Great Lakes. The project was funded by the Great Lakes Fishery Trust and recently received additional funding from the UM Water Center to develop a web-accessible Decision Support Tool. The GLAHF framework and summarized habitat data are available at the GLAHF website: glahf.org.

The GLAHF framework is a gridded network of cells that has been attributed with existing available georeferenced physical, chemical and biological data including GL GIS data. The project has been identifying, acquiring, and geo-processing biological data, especially fish community data, and data collected in recent surveys of nearshore areas (Environment Canada, U.S. EPA, state DNRs, USGS). The GLAHF has received and incorporated several datasets from the Lake Erie Habitat Task Group (HTG) including data on total phosphorus and chlorophyll a (2001-2011), updated substrate (Habitat Solutions, Mackey), and benthic invertebrate densities (1999-2011). Data important for fisheries management and restoration has been included in GLAHF including substrate and habitat mapping, and walleye and yellow perch harvest by grid data. The GLAHF team has also been developing an ecological habitat classification advised by a working group of Great Lakes scientists and agency experts. The Classification Framework is composed of several hierarchical layers including lake, sub-basin, coastal, nearshore and offshore habitat zones. The team identified four key drivers of ecological habitat conditions (temperature, depth, circulation patterns and waves, and tributary influence), identified categories for each variable, and has assembled the variables into a set of Aquatic Ecological Units (AEUs). The hierarchy is shown below (Figure 3b-1) followed by an image of the AEUs for Lake Erie (Figure 3b-2). The AEUs are draft as they have not yet been reviewed by the workgroup.

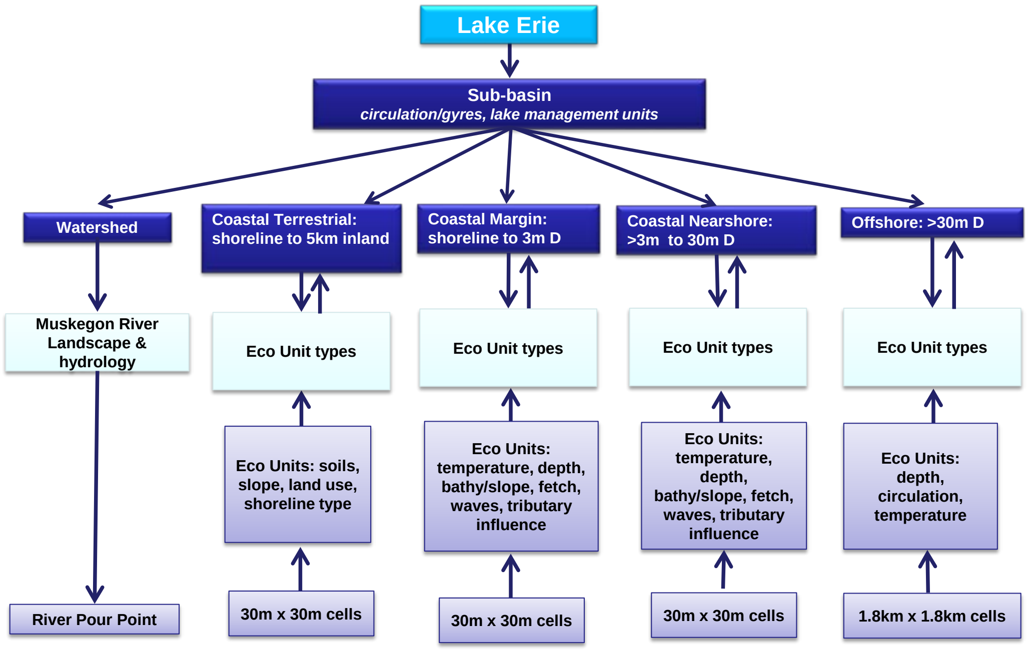


Figure 3b-1. GLAHF ecological classification framework

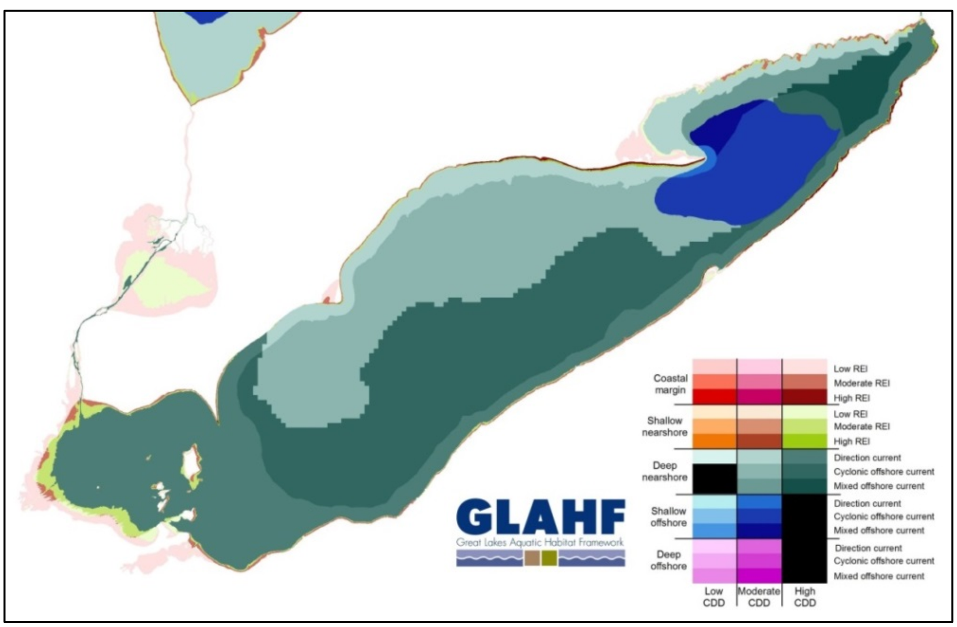


Figure 3b-2. GLAHF Draft Aquatic Ecological Units for Lake Erie

Additional work to develop a web-based Decision Support Tool (DST) was undertaken in 2014. In July and October 2015, GLAHF staff with help from the HTG hosted workshops with biologists in the U.S. and Canada to identify what kinds of DSTs would help managers in their work and provide information at appropriate scales useful for decision making. GLAHF staff met again with the HTG in February 2016 to share the draft tool and get feedback before public release. The Decision Support System (DSS) includes both a visualization tool for GLAHF spatial data as well as a tool specifically for Lake Erie that allows users to specify habitat layers and criteria to create user-specified habitat. This portion of the tool also includes known fish habitat units or Habitat Suitability Index (HSI) models although, to date, it only includes habitat layers for walleye developed from the 13 m depth limit (GLFC) and from Pandit et al, 2013. The GLAHF DSS would like to add more HSIs for Lake Erie fish. Contact Dr. C. Riseng (criseng@umich.edu) if you are aware of other HSI models that could be incorporated into the DSS. The web tool will be available April 1, 2016 and accessible through glahf.org.

A conceptual manuscript for the GLAHF is published in the Journal of Great Lakes Research (Wang et al, 2015, JGLR 41(2) 584-596. In another collaboration between U.S. and Canadian hydrologists, the GLAHF team has developed a set of harmonized watershed boundaries for the entire Great Lakes basin (US and Canada) that incorporates the NHD+v2 and provides watershed boundaries at the same spatial scale across the basin. The watershed dataset is also available on glahf.org and a manuscript outlining the approach and methods has been accepted at JAWRA. The GLAHF team, with others, has received a grant to conduct a Coastal Condition Assessment of coastal and nearshore fish habitats of the Great Lakes from the Great Lakes Basin Fish Habitat Partnership and the Great Lakes Fishery Trust. This assessment is scheduled to be completed by December of 2016. This team will work with the HTG and may use the Lake Erie fish and habitat data as a focal area for more detailed assessment.

Information about GLAHF, the watersheds, the GIS database, and the DSS can be found at: glahf.org.

References

Pandit, S.N., Y. Zhao, J.J.H. Ciborowski, A.M. Gorman, and C. Knight. 2013. Suitable habitat model for walleye (Sander vitreus) in Lake Erie: Implications for inter-jurisdictional harvest quota allocations. Journal of Great Lakes Research 39 (4):591–601.

Section 4. Support Other Task Grouped by Compiling Metrics of Habitat

Habitat influences the distribution of fish species. Evaluating how fish relate to habitat can play an important role in assessing and modeling key fish species in Lake Erie, particularly walleye and yellow perch. The HTG has been tasked with assisting other task groups in understanding the role of habitat in assessing these key species where appropriate. What follows is a review of HTG activities towards this charge.

4a. Central Basin Hypoxia and Yellow Perch

R. Kraus, A. M. Gorman, and C. Knight

Seasonal hypoxia in the hypolimnion of the central basin of Lake Erie has been increasing in extent and severity over the past decade. This situation represents a problem not only for the bi-national water quality agreement, but also for fishery independent population assessments. In particular, avoidance of low oxygen appears to concentrate Yellow Perch at the edge of hypoxia, and may bias recruitment predictions. Further, evidence suggests that catchability of Yellow Perch in the trap net fishery may be increased through strategic gear placement at the edge of the hypoxic zone (Kraus et al. 2015). Efforts to develop more data on dissolved oxygen effects on commercial trap nets will continue in 2016. Further, NOAA-GLERL is leading a new effort to improve existing physical-biological coupled models to provide a nowcast or forecast of hypoxia in the central basin.

References

Kraus, R. T., C. T. Knight, T. M. Farmer, A. M. Gorman, P. D. Collingsworth, G. J. Warren, P. M. Kocovsky, and J. D. Conroy. 2015. Dynamic hypoxic zones in Lake Erie compress fish habitat, altering vulnerability to fishing gears. Canadian Journal of Fisheries and Aquatic Sciences 72:797-806.

4b. Identify Metrics Related to Walleye Habitat

A.M. Gorman, R. Kraus, Y. Zhao, and C. Knight,

The HTG was charged with assisting the Walleye Task Group (WTG) with identifying metrics related to walleye habitat for the purpose of re-examining the extent of suitable adult walleye habitat in Lake Erie. Presently, quotas are allocated proportionally based on surface area of waters less than or equal to 13 m deep by jurisdiction (Figure 4b-1; STC 2007), yet the accuracy of this model has not been evaluated in comparison with alternative habitat models for Walleye. The LEC assigned the HTG this charge in an attempt to further improve estimates of suitable walleye habitat through an expanded definition of habitat based on recent literature, geospatial analyses, and historic datasets. To date, a habitat suitability model developed from gill net catch data has been published (Pandit et al. 2013).

Since 2010, an extensive acoustic telemetry tagging program has developed in Lake Erie as a part of the Great Lakes Acoustic Telemetry Observation System (GLATOS). GLATOS is providing an infrastructure for understanding the behavior, survival, and habitat use of Walleye in Lake Erie, without the biases associated with gill net survey gear. A manuscript quantifying the vertical habitat use of walleye from throughout the lake is currently in preparation.

References

Pandit, S.N., Y. Zhao, J.J.H. Ciborowski, A.M. Gorman, and C. Knight. 2013. Suitable habitat model for walleye (Sander vitreus) in Lake Erie: Implications for inter-jurisdictional harvest quota allocations. Journal of Great Lakes Research 39 (4):591–601.

STC. 2007. Quota Allocation Strategies. Report of the Standing Technical Committee to the Lake Erie Committee. 8pp.

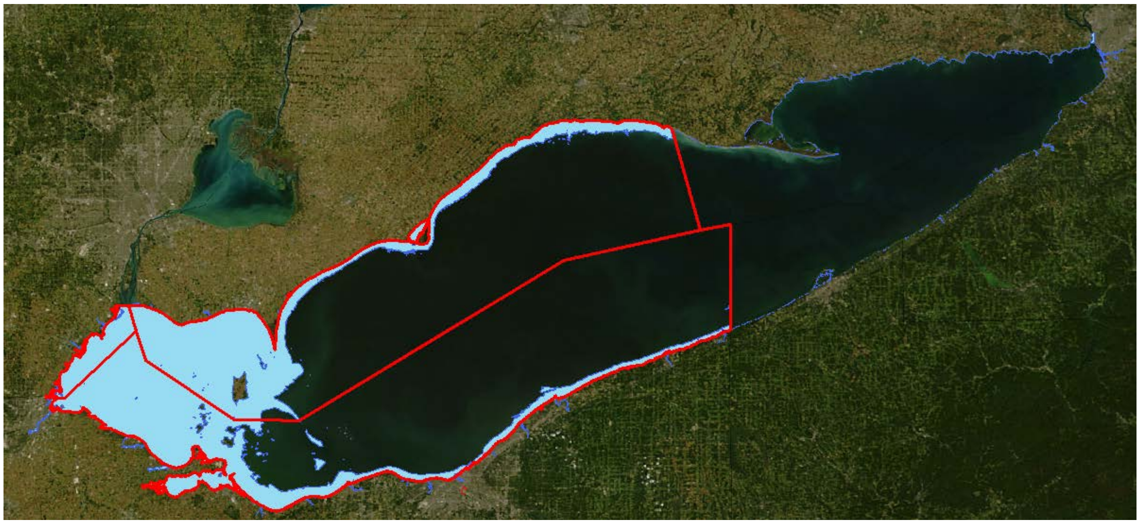


Figure 4b-1. This map represents the present quota sharing allocation scheme, which is proportionally based on surface area of waters less than or equal to 13 m deep (area in light blue) by jurisdiction for Ohio, Ontario and Michigan (outlined in red).

Section 5. Strategic Research Direction for the Environmental Objectives

S.D. Mackey

Introduction

The Lake Erie Environmental Objectives provide guidance to fishery and environmental management agencies in the form of descriptions of the various environmental conditions affecting Lake Erie fisheries resources and conditions needed to ensure that Lake Erie's Fish Community Goals and Objectives (FCGO) will be achieved. For Lake Erie, the Environmental Objectives sub-committee (now the HTG) identified ten Environmental Objectives in support of the thirteen FCGOs. The rationale behind each of the Environmental Objectives was described in a white paper released in July 2005.

Protect and Restore Physical Processes

1. Restore natural coastal systems and nearshore hydrological processes;
2. Restore natural hydrological functions in Lake Erie rivers and estuaries; and
3. Recognize and anticipate natural water level changes and long-term effects of global climate change and incorporate these into management decisions.

Recover and Restore Fish Communities

4. Re-establish open water transparency consistent with mesotrophic conditions that are favorable to walleye in the central basin and areas of the eastern basin;
5. Maintain dissolved oxygen conditions necessary to complete all life history stages of fishes and aquatic invertebrates;
6. Restore submerged aquatic macrophyte communities in estuaries, embayments, and protected nearshore areas; and
7. Minimize the presence of contaminants in the aquatic environment such that the uptake of contaminants by fishes is significantly reduced.

Halt Habitat Degradation

8. Halt cumulative incremental loss and degradation of fish habitat and reverse, where possible, loss and degradation of fish habitat;
9. Improve access to spawning and nursery habitat in rivers and coastal wetlands for native and naturalized fish species; and
10. Prevent the unauthorized introduction and establishment of additional non-native biota into the Lake Erie basin, which have the capability to modify habitats in Lake Erie.

Process

The HTG continues to employ a process designed to systematically identify and address data gaps, knowledge gaps, and lack of understanding by evaluating past, current, and potential future threats and trends for the Environmental Objectives, and how those threats and trends may impact the ability of Lake Erie Committee to achieve the stated Lake Erie FCGOs.

Discussion

Review of ongoing Great Lakes habitat restoration projects and literature reveals a paucity of techniques for in-water restoration or enhancement of rivermouth, nearshore, and coastal habitats. Thus, even if fishery management agencies had the authority to manipulate nearshore and coastal habitats, limited information is available to provide guidance as to how best to enhance or restore those habitats. Science-based information and guidance is a key outreach strategy of the HTG to promote sound restoration projects and practices in riverine, coastal, and nearshore environments.

The HTG is implementing the following research strategies to address these needs:

There is a continuing need to identify habitat knowledge gaps and research needs.

- Development of techniques and methods to restore fish habitat in riverine, coastal, and nearshore environments through implementation of small pilot projects and associated monitoring work to validate project results.
- Encourage continued regional mapping and assessment of nearshore and coastal habitat areas (promote the use of new technologies such as sidescan sonar, multibeam, and underwater video technologies).
- Encourage continued sampling of fish communities in shallow-water coastal and nearshore habitats.
- Build linkages between coastal processes, hydrology, and habitat structure to promote sustainable habitat enhancement/restoration projects.

There is a need to identify opportunities and develop guidance materials to promote and implement nearshore habitat enhancement and restoration projects:

- Identify potential opportunities to influence the design and function of proposed shoreline projects through early collaboration with the USACE, U.S. EPA, Port Authorities, County Planning agencies, Municipalities, Townships, Engineering firms, Contractors, NGOs, and Coastal Property Owners.
- Develop guidance materials to support and implement nearshore and coastal habitat restoration through existing State and Local regulatory processes in collaboration with Federal, State, and Local agencies.

– Develop an outreach and education program to actively distribute guidance materials and information about the Lake Erie Environmental Objectives to other agencies/programs for inclusion in ongoing and proposed projects
– Support increased monitoring of nearshore areas adjacent to restoration/enhancement sites to document how improvements in nearshore habitats have benefited nearshore fish communities, including the development of performance indicators that can be used to quantify fisheries benefits.

Implementation
The Ohio Department of Natural Resources Office of Coastal Management, working collaboratively with the Ohio Division of Wildlife and the University of Toledo, is currently funding initiatives designed to address several of the research and implementation needs described above. The research strategies described in this task, Charge 4, support and contribute directly to achieving the goals and objectives of the new task assigned to the HTG, Charge 5 - *Develop and maintain a list of key functional habitats and priority management areas that would support LaMP and LEC Environmental objectives,* (Section 6).

Section 6. Develop Key Functional Habitats and Priority Management Areas in support of the Environmental Objectives

C. Castiglione, J. Tyson, E. Weimer, S.D. Mackey

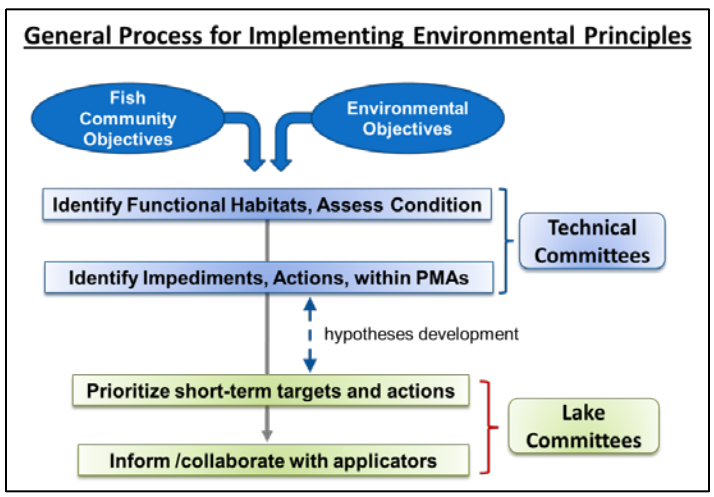


Figure 6-1. Flowchart describing the decision making process for implementing the Environmental Principles

The purpose of the Environmental Principles is to provide consistent guidance for the protection and improvement of aquatic habitat in support of a sustainable fishery within the Great Lakes. In October 2014, the Council of Lake Committees adopted a draft set of principles to assist decision makers in taking action on identified priorities that will protect or improve habitats for sustainable fisheries in the Great Lakes Basin. Additionally, decision makers should understand the priorities of fisheries managers for implementation through regulations, policies, practices, and projects at appropriate spatial scales (e.g., specific locations up to lakewide application). Implementation will also be affected by the interests/priorities of other groups, such as land-use, water quality, and wildlife managers. Where possible, alignment of actions across decision makers could benefit all through the efficient use of resources, evaluation of collaboration and potential trade-offs, establishment of partnerships, and communication of short term/long term priorities. Opportunities to align lake-specific priorities among various decision makers exist through binational initiatives, such as the Lake Erie Lake Partnership of the Great Lakes Water Quality Agreement and the new

Great Lakes Regional Aquatic Habitat Connectivity Collaborative, as well as within and among the various federal, provincial, and state government agencies in each Great Lake.

The Lake Erie Committee has charged the Habitat Task Group with determining specific priorities for protecting and improving fish habitats in the Lake Erie basin following the guidance provided within the CLC's "Environmental Principles for Sustainable Fisheries". The premise of the CLC approach is that sustainable fisheries can occur across the basin if

> ***functional habitats are protected or improved*** *in each lake through a*
> ***systematic, adaptive, cumulative, and collaborative approach*** *that accommodates*
> ***fishery value*** *in decisions to*
> ***act on manageable anthropogenic stresses****.*

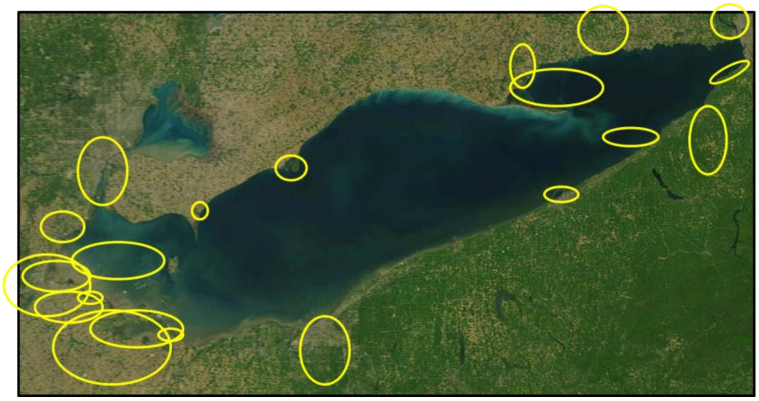


Figure 6-2. Hypothetical example of Functional Habits located in Lake Erie

Implicit in this approach is an emphasis on protecting or improving (restoring or enhancing) functionality to habitats that support fish production (e.g., spawning and nursery areas) and is generally focusing on earlier life-history stages. The CLC prioritizes three types of management actions as Protection, Restoration, Enhancement.

- Protection: guarding against threats to habitats that are already in functional condition,
- Restoration: addressing threats/stresses thereby improving functionality to an unimpaired condition
- Enhancement: addressing threats/stresses thereby improving functionality to a less impaired condition.

Whether protecting or improving (restoring or enhancing), the focus is always on addressing manageable (as opposed to unmanageable) sources of threats or existing stresses on habitat functionality. Accordingly, the goal for a habitat improvement action (e.g., attaining "unimpaired" or "less impaired" functionality) is not to attain a "pristine" condition but to a state that supports an attainable level of fish production.

This approach also addresses uncertainty in establishing habitat protection and improvement priorities. While the Fish Community Goals and Objectives identify key fish species of interest, the LEC recognizes that there are knowledge gaps about the specific habitat requirements (and/or impediments) of species and stocks to determine priorities. Using the best available information and the extensive knowledge of the HTG and partners, the development of an adaptive application approach will form a working hypothesis to establish actions and expected outcomes. The LEC wants to expand the knowledge of what is needed, identify the expected results, establish short-term priorities, and learn as we implement these strategies. Identification of gaps in understanding that result from exercising the approach can be used to guide research priorities of the agencies.

A key concept of the Environmental Principles is that sustainable fish production to achieve FCGOs requires a diversity of functional habitats. A functional habitat is a system of connected habitats needed to support desired fish production. They are dynamic in nature because of the ever changing processes like hydrology and energy cycling acting upon the habitat. Inherent variation in these features within defined functional habitat systems is an essential attribute for fish production from those systems. These functional habitats have to incorporate multiple species/stocks along with different life histories and life stages but similar life support requirements. The development of these habitats also must address current and emerging ecosystem issues (water level fluctuations, nutrient inputs, climate change, stocking and prey base dynamics, changes in food web structure, etc.) by

- Identify critical habitats and their attributes (ex. wetland size, integrity, diversity)
- Where possible be quantifiable (provide desirable end-points)
- Address habitat impairment issues identified in the FCGOs
- Promote and maintain biodiversity (genes, populations, communities and landscapes)

Using the functional habitats as a guideline, the HTG has been tasked to identify Priority Management Areas (PMAs) that will focus short-term efforts with the greatest impact for protecting, restoring, and enhancing the functionality of the habitat.

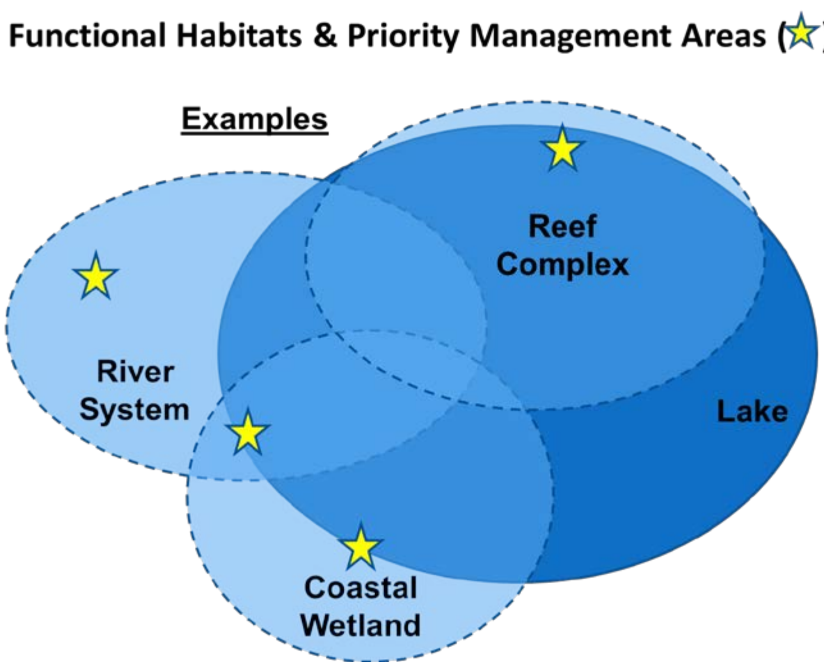


Figure 6-3. Example of functional habitats (blue ovals) with overlapping functions and Priority Management Areas (yellow stars) selected based on compilation of factors

The initial exercise for the HTG members was to identify specific species populations, areas of importance, and information about the individual habitat components (ex. Spawning habitat availability, temperature, mortality from predation, food availability). An initial worksheet (Figure 6-4) was created to collect information based on life history/function, the impairment status of the population with certainty measurements, the impediments acting upon the habitat component, and the actions needed to improve the function. This information will be compiled and identify areas of overlap based on geographic location, multiple species, certainty of the information, and effectiveness of actions with a completion by summer 2016. Priority criteria are being developed by the LEC to classify short-term, 5-year priority actions/distributions that can be incorporated into project selection and design. This information, along with information from Charge 4 (Section 5), will be incorporated to create a guidance document for identification of Priority Management Areas and habitat protection, restoration, and enhancement strategies to accomplish the Fish Community Goals and Objectives.

Egg Stage	**Sufficient Spawning Habitat**
Status	Highly Impaired
Certainty	High
Impediment	restricted fish access/lack of downstream transport
Source	Ballville Dam
Action	Remove the Ballville Dam
Certainty action will address impediment	High
Time to response in impediment	0-5 years
Comments	removal expected by 2017

Figure 6-4. Example section of Priority Management Area worksheet. Information was entered for the Egg Stage life history focusing on the spawning habitat component. Status, Impediments, and Actions were entered along with a certainty description for that information.

Section 7. Protocol for Use of Habitat Task Group Data and Reports

- The Habitat Task Group (HTG) has used standardized methods, equipment, and protocol in generating and analyzing data; however, the data are based on surveys that have limitations due to gear, depth, time and weather constraints that vary from year to year. Any results or conclusions must be treated with respect to these limitations. Caution should be exercised by outside researchers not familiar with each agency's collection and analysis methods to avoid misinterpretation.

- The HTG strongly encourages outside researchers to contact and involve the HTG in the use of any specific data contained in this report. Coordination with the HTG can only enhance the final output or publication and benefit all parties involved.

- Any data intended for publication should be reviewed by the HTG and written permission received from the agency responsible for the data collection.

Section 8. Acknowledgements

The HTG would like to acknowledge and thank the many contributors to the work presented in this report. As this report is mostly an overview of projects underway in the Lake Erie basin, it is impossible to identify every project and every individual involved. If you are involved in a habitat-related project in the Lake Erie basin and would like your work to be represented in the project table, please contact a member of the Habitat Task Group.