



*The Great Lakes: Advancing Knowledge
and Improvement*

**Aquatic Connectivity:
*Science to Shared Knowledge to
Strategic Action***

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Science Advisory Team

(Staff Support: Jon Beard, Mark Coscarelli)

- **Gary Dawson, Co-chair, Consumers Energy**
- **Tammy Newcomb, Co-chair, Michigan DNR**
- **Tom Gorenflo, Chippewa-Ottawa Resource Authority**
- **Erik Olsen, Grand Traverse Band of Ottawa and Chippewa Indians**
- **Julie Hinderer, National Wildlife Federation**
- **Matt Shackelford, DTE Energy**
- **Mark Holey, U.S. Fish and Wildlife Service**
- **Bill Taylor, Michigan State University**
- **Kyle Kruger, Michigan Department of Natural Resources**
- **Gary Towns, Michigan United Conservation Clubs**
- **Marty Holtgren, Little River Band of Ottawa Indians**
- **Kevin Donner, Little Traverse Bay Bands of Odawa Indians**





Great Lakes Fishery Trust

- **\$5.3 million investment to date to enhance aquatic connectivity and inform decision making**
- **Large and small-scale barrier removals, research, community planning, and GIS Platforms**
- **Habitat Information Initiative:**
 - **build a common classification framework for Great Lakes fisheries habitats**
 - **encourage use of this system throughout the basin**



Aquatic Connectivity Defined

🐟 One part of watershed management

🐟 Connectivity

- Vertical
- Lateral
- Temporal
- Longitudinal

🐟 Dams and culverts



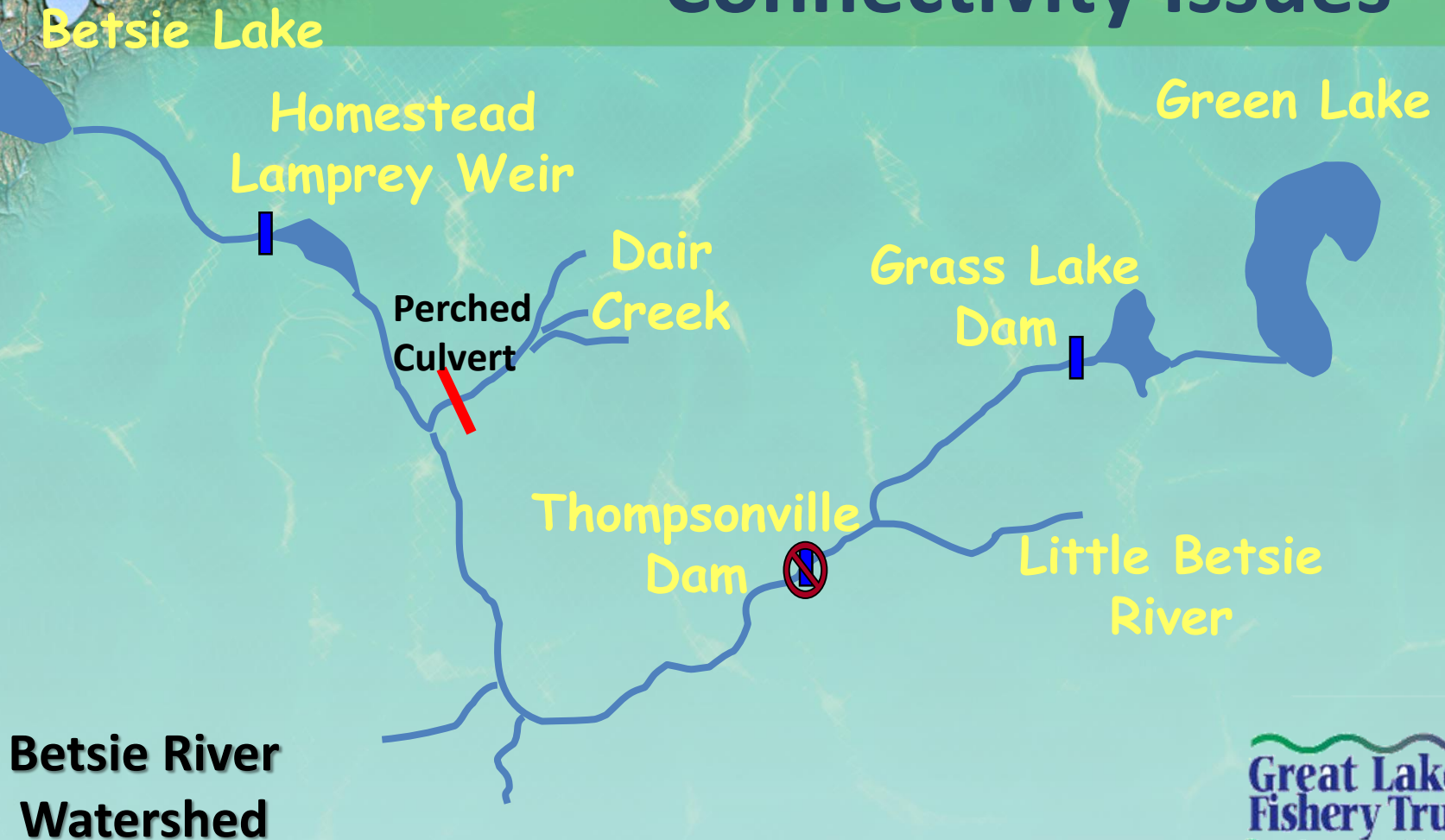


Issues Regarding Longitudinal Connectivity

Pursue Connectivity

- Biotic diversity
- Migratory fishes
- Recreation
- Aesthetics
- Sustainability
- Improve habitat

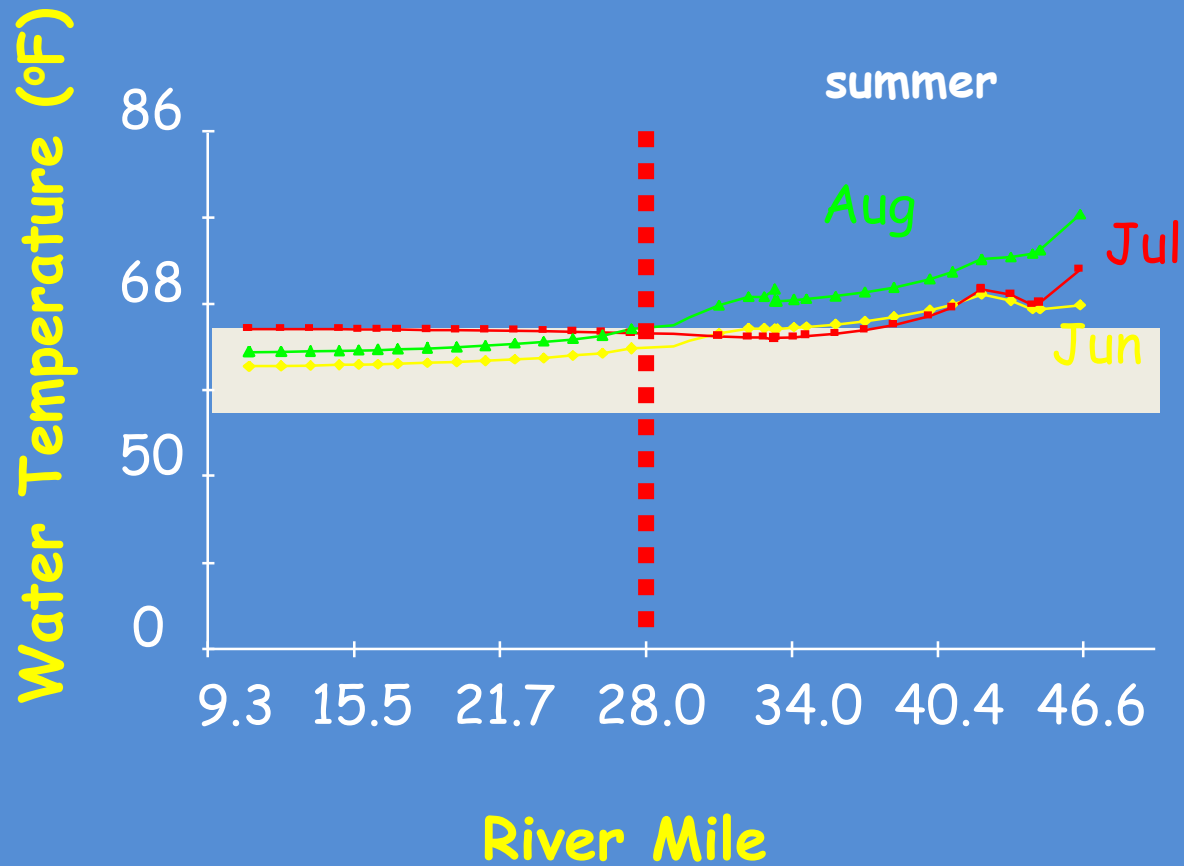
Longitudinal & Temporal Connectivity Issues



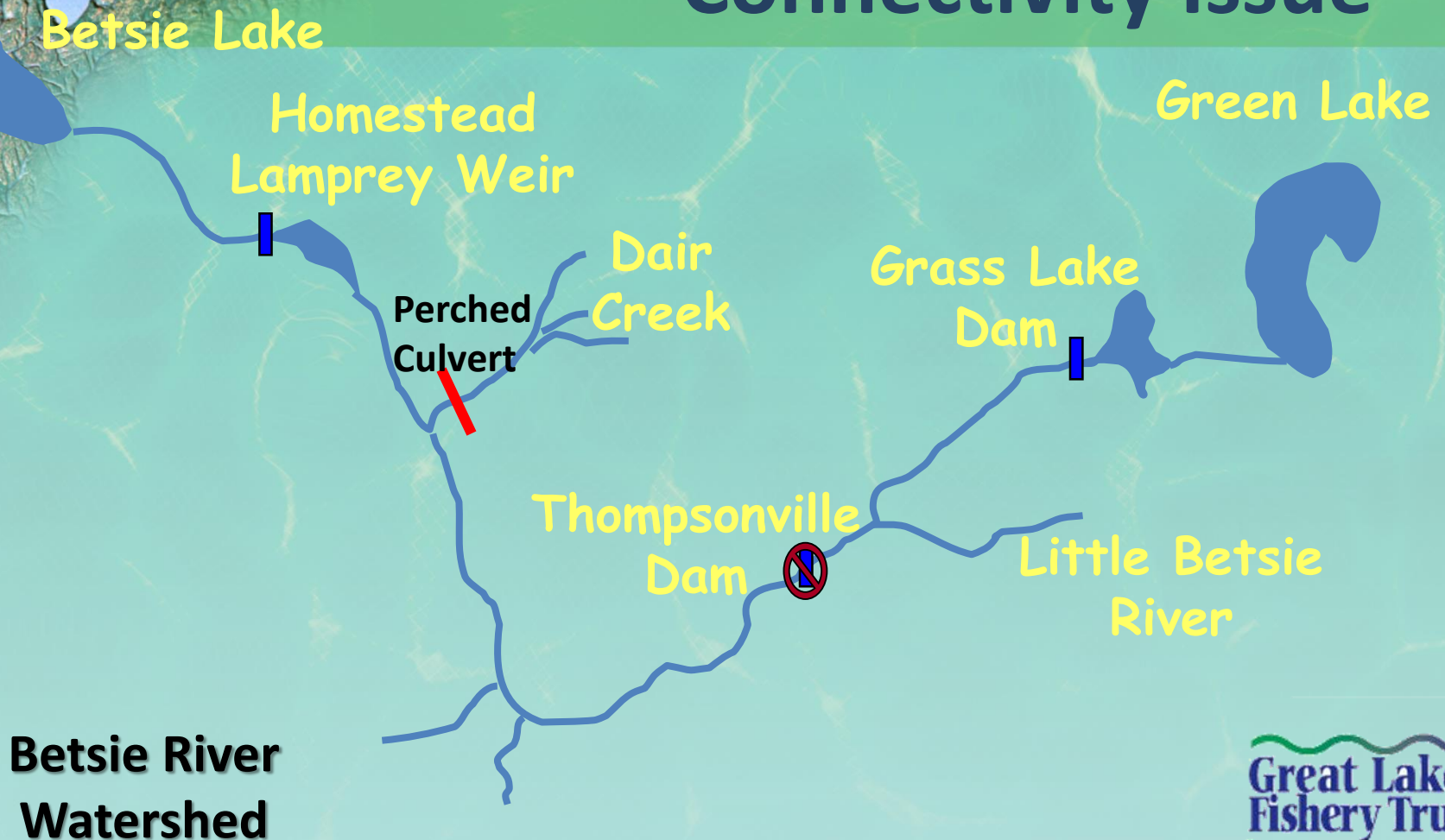
Lamprey Weir




Mean Daily Water Temperature in the Betsie River



Longitudinal & Temporal Connectivity Issue





Beyond the “Natural” Platitudes

“Watershed management direction is complicated by competing interests and goals, gaps in scientific knowledge, and constraints on time and resources.”

Anderson et al. 2003





Issues Regarding Longitudinal Connectivity

Pursue Connectivity

- Biotic diversity
- Migratory fishes
- Recreation
- Aesthetics
- Sustainability
- Improve habitat

Retain Barriers

- Biotic diversity
- Invasive Species
- Recreation
- Hydropower
- Flow management
- Aesthetics

Invasive Species: Asian Carp

Silver Carp

1997



Sources: U.S. Department of the Interior, U.S. Geological Survey,
U.S. Fish and Wildlife Service
THE HUFFINGTON POST

Silver Carp

2014

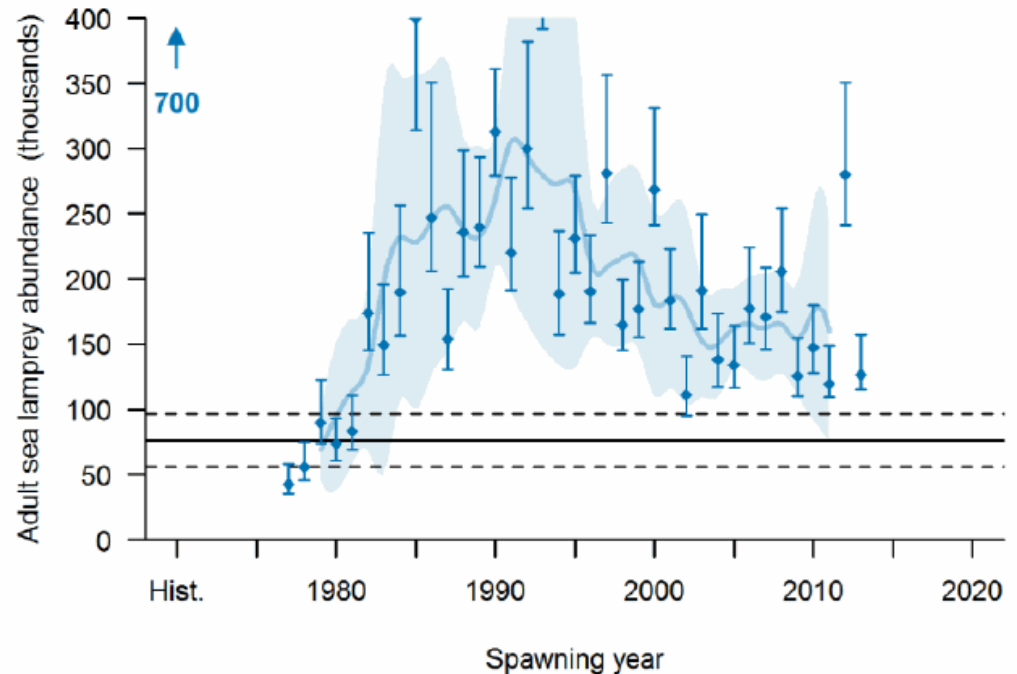


Invasive Species: Sea Lamprey



STATUS OF SEA LAMPREY CONTROL IN LAKE HURON

Sea Lamprey Abundance:



(Source: Great Lakes
Fishery Commission)



What is the priority?

“People with limited time often consider only a small subset of crucial criteria, eliminating alternatives that fail to achieve satisfactory results on each, rather than gathering all the information about the alternatives.”

(Anderson et al. 2003)

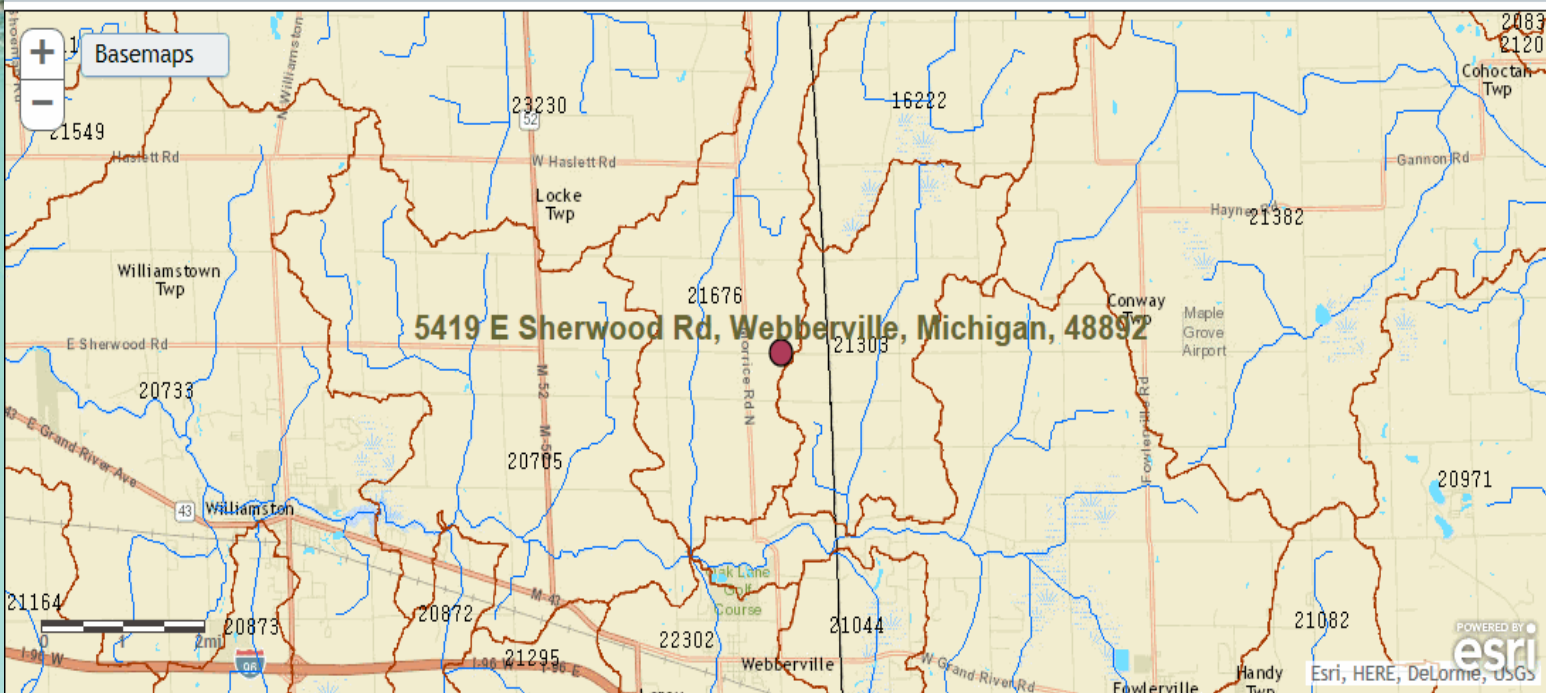




Decision Support Tools

- Easy to access & use
- Common baseline of understanding
- Allows alternatives to be explored
- Examples:
 - Water Withdrawal Assessment Tool
 - Lakebed Alteration Tool

Water Withdrawal Assessment Tool



Run the Tool

Legend

Map Layers

- Watersheds
- SWatersheds
- Lakes
- Streams
- County
- Sections

Find a Location

About the Tool

Water Withdrawal Assessment Tool



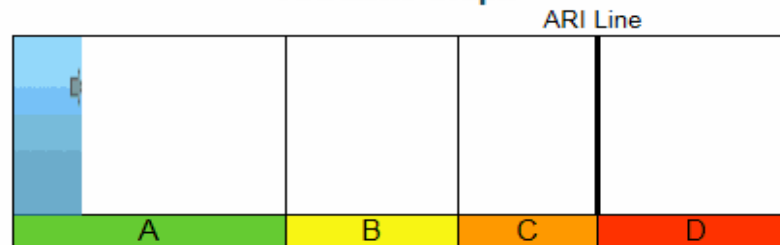
Michigan's Water Withdrawal Assessment Tool
Department of Environmental Quality



[Michigan.gov Home](#) | [WWAT Home](#) | [Map](#) | [Access Data](#) | [Contact Us](#)

Water withdrawal screening results

ARI Zone Graph



Result: Zone A

The proposed withdrawal has passed the screening process.

You must register below in order to begin using this withdrawal.

The graph above illustrates the estimated impact of the proposed withdrawal on the affected stream, and its potential for causing an adverse resource impact (ARI).

Results:

The proposed withdrawal has passed the screening process. The projected impact of the withdrawal lies within 'Zone A' and is not likely to cause an adverse resource impact.

Registration:

A large quantity withdrawal (LQW) with a capacity of 70 or more GPM must be registered before the withdrawal can begin. To register this withdrawal as you just entered it, use the button at the right.

[Register Now](#)

[Rerun](#)

[Administrator](#)

[View Report](#)

Lakebed Alteration Tool

Lakebed Alteration Decision Support Tool

Mapping the suitability of Great Lakes waters for lakebed-altering projects

Suitability Mapping

Data Overlays

Help

Suitability Mapping

Choose Data Sets Set Criteria View Results More

Click on the data sets you want to use to make your suitability map. On the 'Set Criteria' page, you'll be able to specify a suitability criterion based on each data set that you choose.

- Airports [\(info\)](#)
- Boating Access Sites [\(info\)](#)
- Bottom Type (from GLAHF project) [\(info\)](#)
- Bottomland Preserves [\(info\)](#)
- Commercial Fishing Areas [\(info\)](#)
- Critical Dunes [\(info\)](#)
- DEQ Environmental Areas [\(info\)](#)
- Dredging (Army Corps Projects) [\(info\)](#)
- Dredging (Confined disposal) [\(info\)](#)
- Dredging (NOAA charts) [\(info\)](#)
- Dredging Dumping Grounds (NOAA) [\(info\)](#)
- EPA Areas of Concern [\(info\)](#)

Welcome to the Lakebed Alteration Decision Support Tool.

With this tool, you can produce maps that show the suitability of Great Lakes waters for development projects (such as offshore wind farms, or other projects) based upon suitability criteria that you choose.

Financial assistance for this project was provided, in part, by the Michigan Coastal Management Program, Michigan Department of Environmental Quality (MDEQ), through a grant from the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce. Additional funding was provided by a grant from the U.S. Department of Energy.

This product includes color specifications and designs developed by Cynthia Brewer (<http://colorbrewer.org/>).

Built with the [ArcGIS Viewer for Flex](#) (c) Copyright 2011 Esri. All rights reserved.

Click to continue

Data Overlays

Primary Overlays

- Roads and Urban Areas
- Rivers
- Latitude / Longitude Grid

Land Overlays

- Airports [\(info\)](#)
- Ports [\(info\)](#)
- Federal Lands (e.g. National Parks) [\(info\)](#)

300 km
200 mi

POWERED BY
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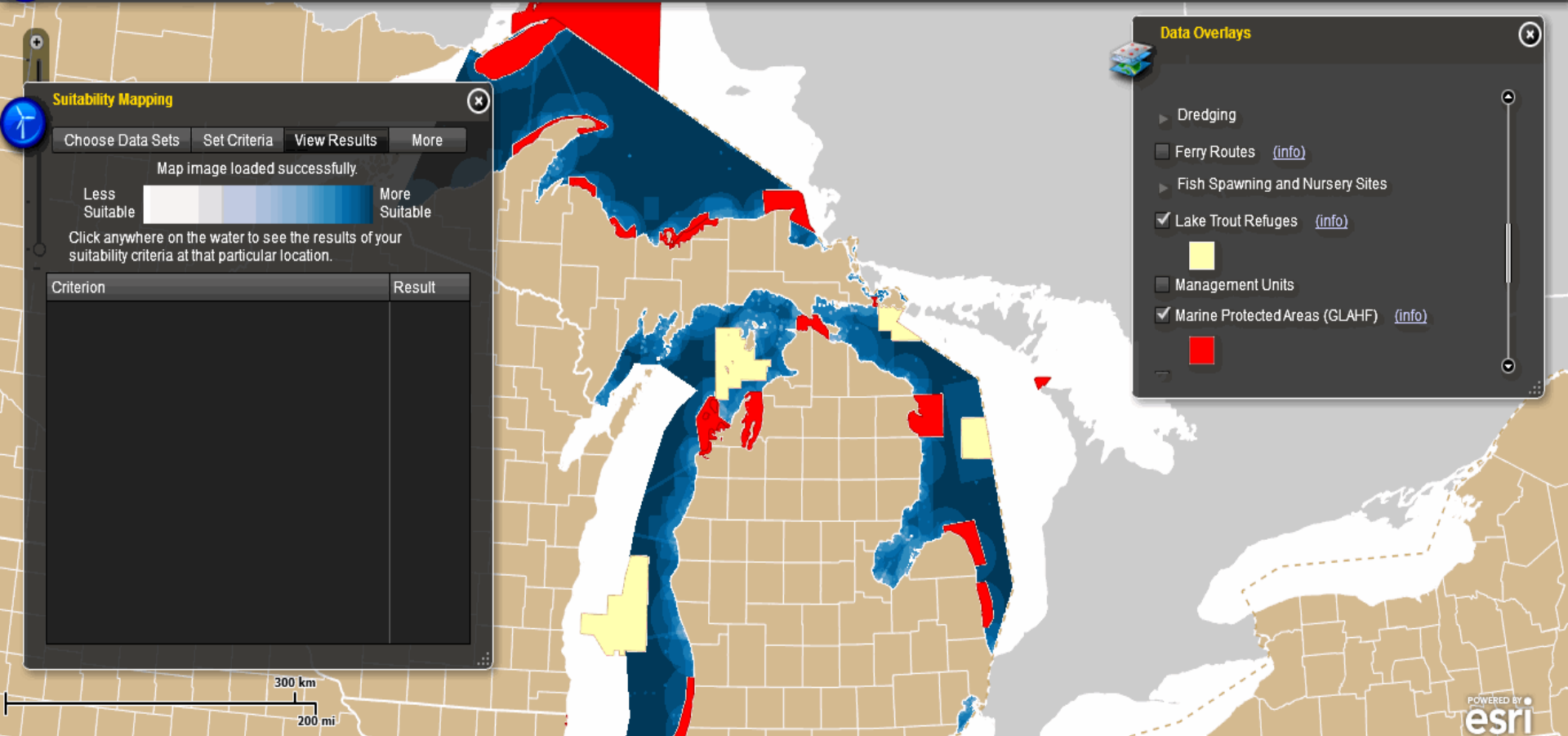
Lakebed Alteration Tool

Lakebed Alteration Decision Support Tool
Mapping the suitability of Great Lakes waters for lakebed-altering projects

Suitability Mapping

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Suitability Mapping

Choose Data Sets | Set Criteria | View Results | More

Map image loaded successfully.

Less Suitable More Suitable

Click anywhere on the water to see the results of your suitability criteria at that particular location.

Criterion	Result

Data Overlays

- ▶ Dredging
- Ferry Routes [\(info\)](#)
- ▶ Fish Spawning and Nursery Sites
- Lake Trout Refuges [\(info\)](#)
- Management Units
- Marine Protected Areas (GLAHF) [\(info\)](#)

GLFT Workshop on Aquatic Connectivity

- Great Lakes Aquatic Habitat Framework
- Continued conflicts regarding barrier removal
- Continuing investment in connectivity





GLFT Workshop on Aquatic Connectivity

Workshop Goal

Identify types of decision-support tools that resource managers and practitioners need and would use to guide decisions on where to improve fish passage or remove a dam in the Great Lakes basin.





Workshop Findings

Types of information needed to develop and evaluate connectivity projects :

- **Project information**
- **Structural features**
- **Ecosystem dynamics**
- **Sociocultural factors**
- **Economic factors.**

Watershed Scale





Workshop Findings

Challenges :

- Accessing available and reliable data and information.
- Balancing management goals and evaluating potential tradeoffs among alternative management scenarios.
- Funding and managing complex connectivity projects.






Workshop Findings

Addressing the Challenges:

- Enhancing the availability of existing information
- Updating/completing relevant data bases
- Fill knowledge gaps
 - designing structures to allow for selective fish passage
 - completing watershed inventories
 - determining meaningful economic outcomes
 - Incorporating various types of information into stakeholder support processes





Evolutionary Problem Solving *(Brunner and Clark 1997)*

- Progressive improvement and adaptation
- Difficult problems can be tackled if interactions among the practitioners are explicitly structured
- Evolutionary problem solving does not require a firmly defined or internally consistent set of goals and objectives





Evolutionary Problem Solving *(Brunner and Clark 1997)*

Explicit Structure

- **Innovation** – a number of small independent projects intended to address a practical problem
- **Diffusion** – agreement on important variables to monitor and efficient, regular communication among practitioners
- **Adaptation** – selecting and adapting the most promising examples to new circumstances





Recommendations

1. Development of a desktop barrier removal decision support tool
2. Supporting modules include but are not limited to:
 - Development of a river spatial habitat quality index for key species
 - Development of an economic benefits framework
3. Comprehensive field inventories completed
4. Economic assessment comparing the lifespan and cost of properly and improperly placed road-stream crossing structures that would inform placement of design alternatives





GLFT Request for Proposals

- Up to \$800,000
- Dam removal & Habitat Information Initiative
- March 18, 2015, at 5:05 PM EST
- www.glft.org

Thank You!

