

GLAHF-DSS: Assessing Information Needs and Developing Tools for Great Lakes Ecosystem Management

Water Center Annual Meeting – July 21, 2015

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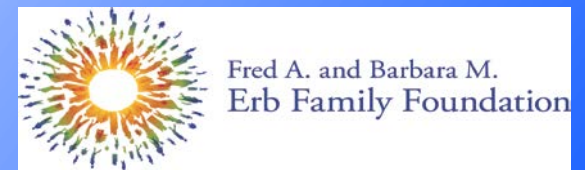
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Project overview

Goal: To develop a web-based Decision Support Tool to aid managers and planners in using spatial data decision making about management and restoration of Great Lakes aquatic resources

Research Questions:

1) Social

- How can *design thinking methods* be used to produce ecosystem management tools with greater *usability and usefulness*?
- Which aspects of the tool design process (participant diversity, creativity, social learning, etc.) relate to these tool outcomes?

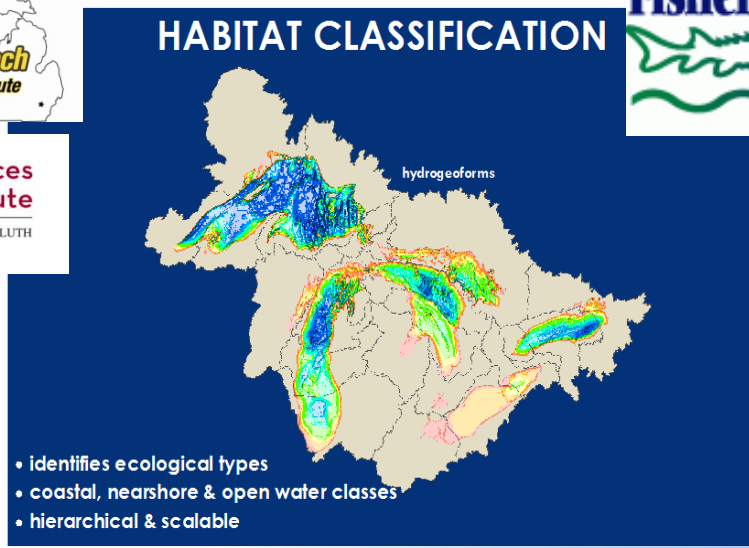
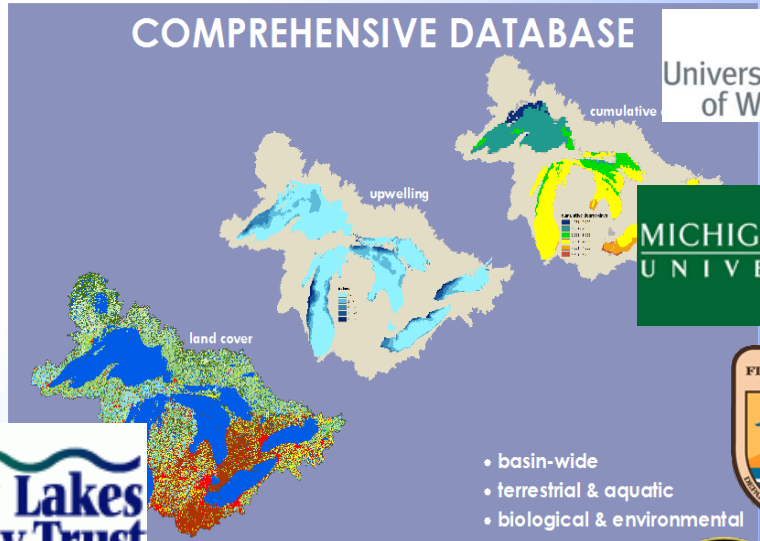
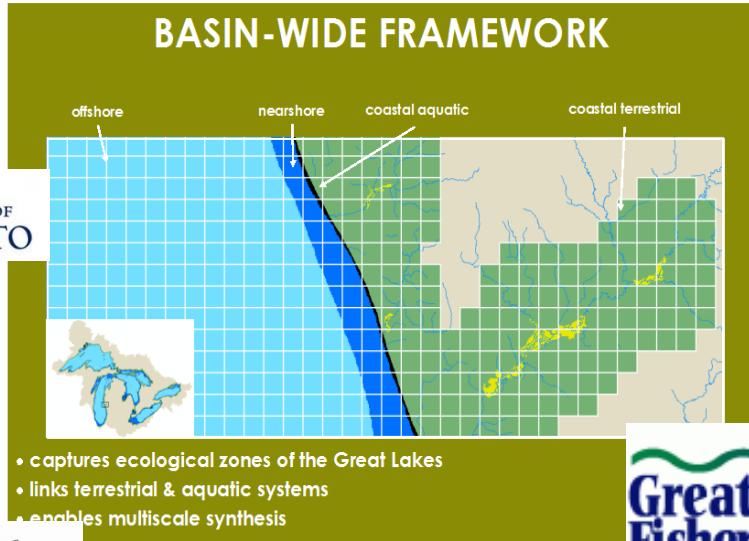
2) Technical

- How best to process and present complex spatial data for web-based databases and tools?

Great Lakes Aquatic Habitat Framework GLAHF Project Context



Mid-Continent Ecology Division



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Wang et al.,
2015 JGLR

Social Context: Spatial information for Ecosystem Management

Spatial information is needed for ecosystem-based management and planning in the Great Lakes

- Requires **multiple types of information** (e.g., Slocombe, 1993)
- Info. needed at **suitable spatial scales for management** (e.g, Evans and Klinger, 2008)
- **Accessible to all stakeholders** (e.g., Kartez and Casto, 2008)
- Support **querying & analysis** for investigation

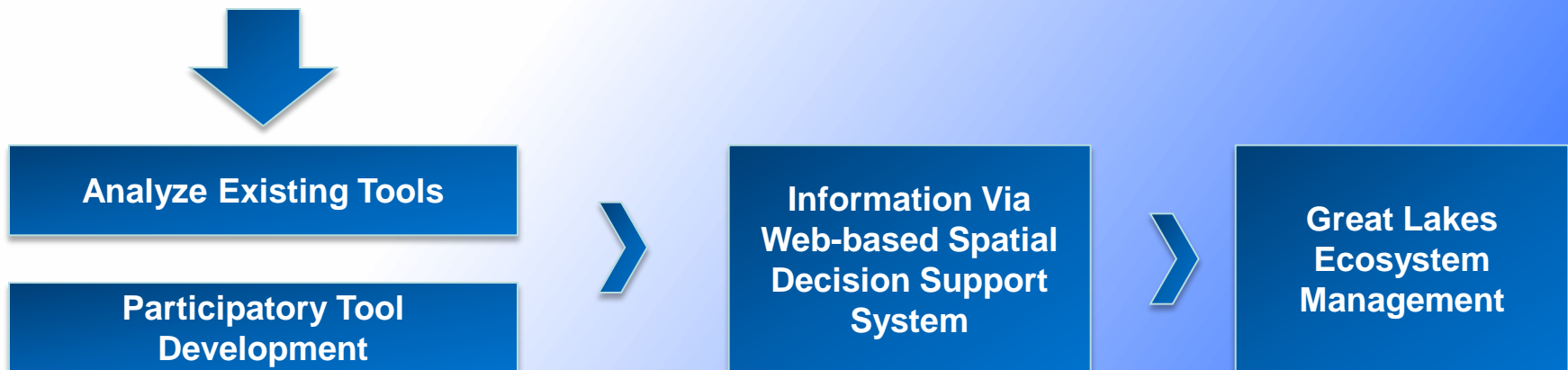


Social Context: Spatial information for Ecosystem Management

Closing the Gap Between Tools and Policy: Literature and Our Method

- SDSS are often **not used** by practitioners because there is a gap between developers and practitioners (Uran and Janssen, 2003; Shim et al. 2002)
- EM tools are not developed with sufficient **user engagement, training and documentation**, and **sustainable funding** (Curtice et al., 2012)
- Our project adopts **design thinking methods** to avoid these problems

Review of existing tools to assess needs, utility and functionalities for Great Lakes management issues, relevant GIS software applications



GLAHF DST Participatory Tool development

Interactive User engagement: participatory workshops, iterative beta testing, outreach meetings – design thinking methods to make tools and products most useful by involving users in developing tools

User engagement workshops-brainstorming big ideas



July - Toledo, Ohio

Lake Erie Habitat Task Group

Fish habitat focus



October – Burlington, Ontario

Canadian agencies, NGOs, Cons Authorities

GLWQA focus

GLAHF DST Participatory Tool development

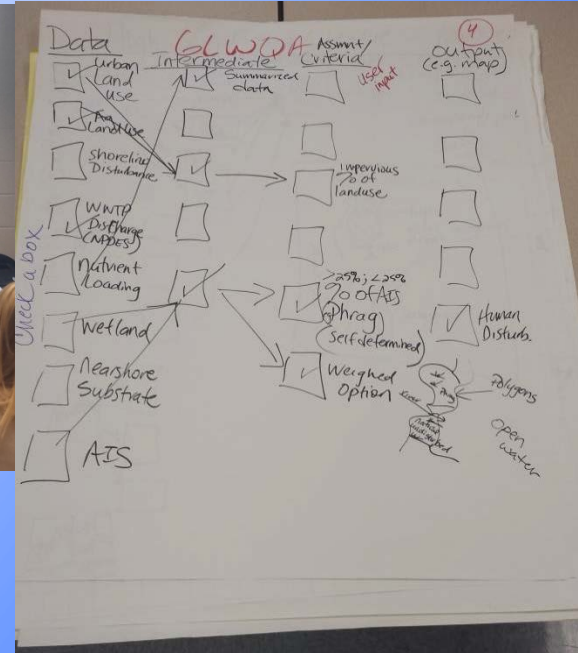
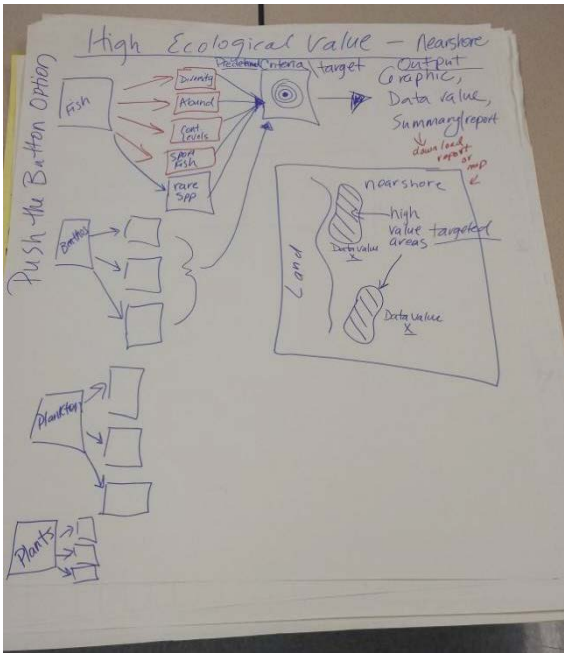
User Engagement Workshops

1) Discussion/voting to identify final tool focal areas: Six tool ideas narrowed to...

- Aquatic Habitat Suitability
- Coastal Management & Planning

2) Interactive methods to identify key tool functionalities and data

- Wireframe design approach
 - Functionalities
 - Data needed



Wireframe design: Great Lakes Aquatic Habitat Explorer - Habitat Suitability

Great Lakes Aquatic Habitat Explorer

http://ifr.snre.umich.edu/ahviewer/

Radio Button

Great Lakes Aquatic Habitat Explorer

a project of the Great Lakes Aquatic Habitat Framework (GLAHF)

Habitat Map | Habitat Information | Query | Help & Support

Habitat Characteristics and Criteria

Select one or more option for each criteria and click "search" to view a map of areas in the Great Lakes which meet these criteria. Click on the factor name to read more about it.

Hydrology
Watersheds (km²) 0-12 121-250 251-7,500 >7,500

Temperature/Energy
Vertical Temp. (deg.-days, C) <0 0-3,000 3,900+

Ice Cover Duration (days) <10 11-50 51-100 >100

Geomorphology
Depth (m) 0-3 3-5 5-15 15-30 15-30

Substrate (types) Fine Coarse Very Coarse

Shoreline Classification Artificial Natural High Slope Natural Low Slope

Shoreline Sinuosity 0-0.425 0.425-0.775 >0.775

Shoreline Hardening Yes No

Biological
Submerged Aquatic Veg. 0 <50% >50%

Mechanical
Circulation (m/s) 0-0.031 0.031 - 0.05 0.05-0.14 0.14+

Wave Height (m, mean) <0.276 0.276-0.439 0.439-0.764 0.764+

Wave Height (m, max) <3 3.0-3.6 >3.6

Upwelling (days per year) <10 11-50 51-100 >100

Legend

Layers

Existing Habitat Suitability Maps

Drawing Tool

Save Export Identify Measure Home

+
-

map here

Wireframe beta testing feedback

Habitat/Criteria

- How will habitat maps display? As layers on screen? As .PDFs?
- Can users pan/zoom in for finer grain details or specific area of interest?
- Ability to add/change/markup existing maps?

Functionalities

- More control: line/polygon color, fill type, point symbols, descriptions, font size/type
- Simple drawing and annotations
- Possibly save drawn symbols as a layer to be imported/exported?
- How will the Query functionality work with maps? Can the user generate a map? Will the map pop-up?
- How much can users “fine-tune” a query?
- Can users save a specific query to share with others?
- Export/download/print results (and guide on doing this)
- Symbols on buttons are unclear (which ones?) - focus on transparent UI

Data Needed

- Metadata page (users create new metadata for their own content?)(provide information about datasets to non-savvy users - what is a “fish statistical unit”?)
- Phragmites, Hypoxia index, thermocline depth, winter severity, river discharge

- Can user upload own layers?*

Great Lakes Aquatic Habitat Explorer: Data viewer



Viewer Query Results Metadata

Bathymetry

Bathymetry

High : 405.1
Low : 0.0025

Great Lakes Basin

Great Lakes basin boundary

Lake Basin Boundaries

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Land Cover

2000/2001 Landcover

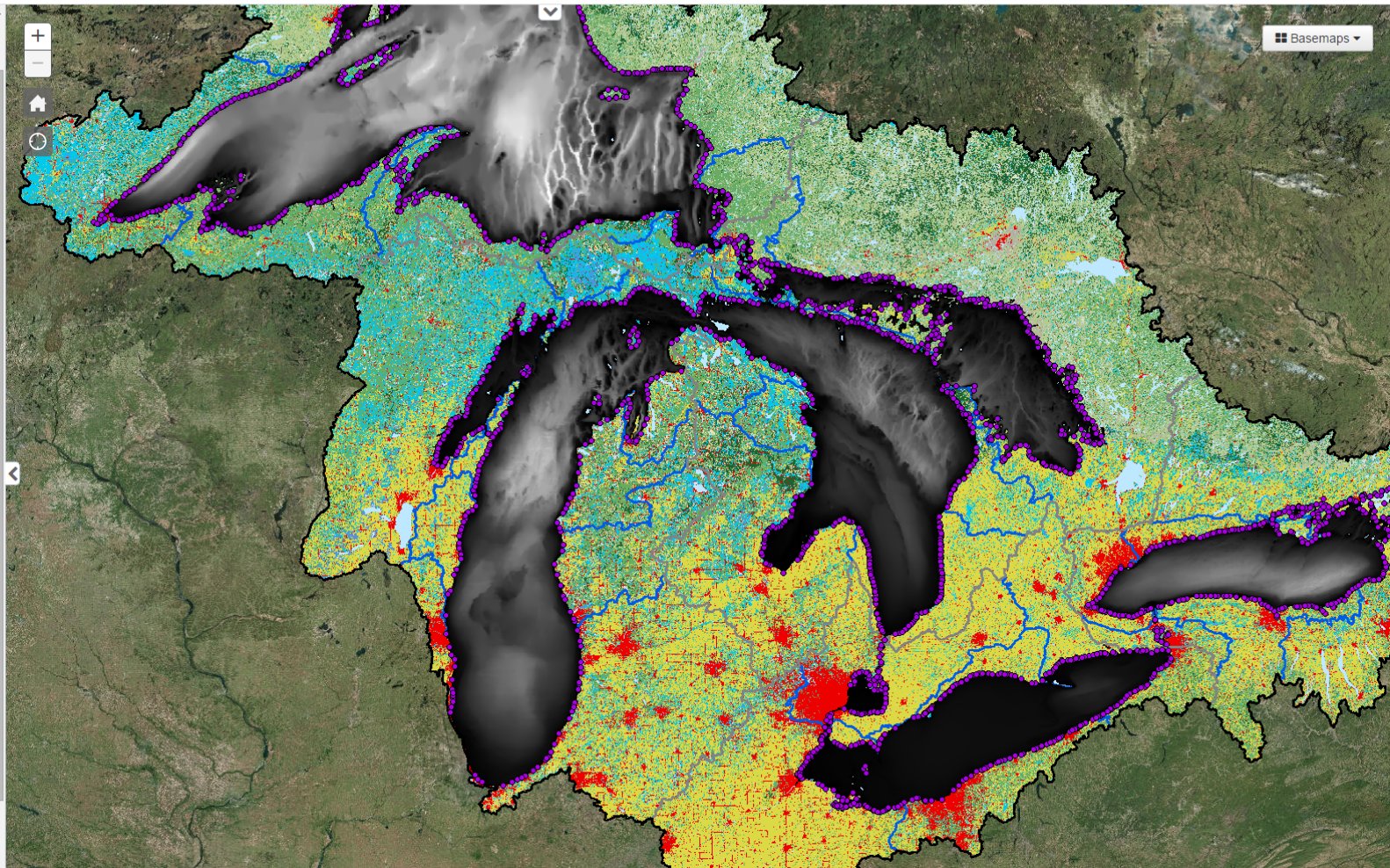
- Great Lakes
- Developed Land
- Agriculture
- Open Water
- Barren Land (Rock/Sand/Clay)
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Woody Wetlands
- Emergent Herbaceous Wetlands
- No Data

Sub-Basins

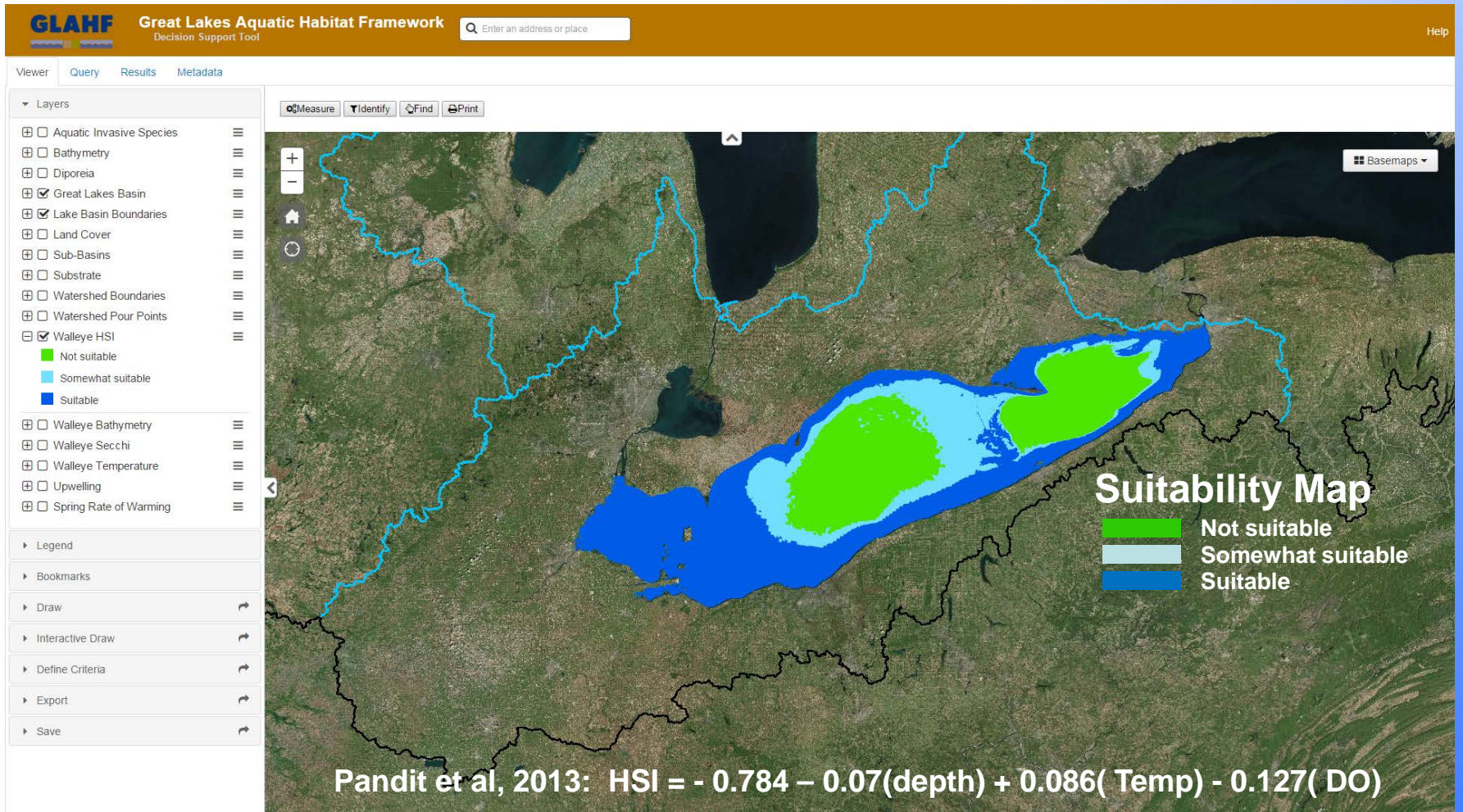
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Watershed Pour Points

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Great Lakes Aquatic Habitat Explorer: Habitat Suitability for Walleye in Lake Erie



Walleye habitat suitability query summary

Viewer Query Results Metadata

Walleye Suitability Search Display Results as: Table Figure

This query will display some information about Walleye Suitability.

Class	Area (sq. km)
Not suitable	8335.9
Somewhat suitable	4755.6
Suitable	4755.612641.1

Project Output/Outcomes

Completed

- Tool review document – provided to workshop participants and Water Center
- Two workshops for manager, policy makers and researchers with summary reports
- Selection and vetting of final tool focus and functionalities
 - First round of beta testing
- Iteratively developing tool(s)
- Presentations at meetings (IAGLR 2014 & 2015, Biodiversity Without Boundaries, American Fisheries Society 2015, Lake Technical Committees, NOAA-GLERL)

Next Steps

- Hands-on workshops to share draft tool(s)
- Final report & manuscript(s)
- Accessible web-based tool(s)



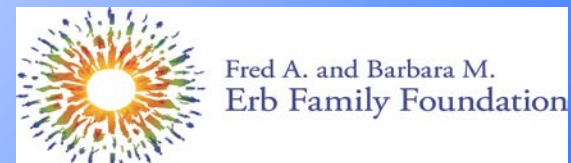
Thank You

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GLAHF funded by The Great Lakes Fishery Trust

Support: This work is supported by the University of Michigan Water Center, a center of the Graham Sustainability Institute. The Water Center is supported by funds from the Fred A. and Barbara M. Erb Family Foundation and the University of Michigan.



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