A Condition Assessment of Nearshore Fish Habitat in the Great Lakes Fish Habitat Partnership

IAGLR 2017

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GLAHF

Great Lakes Aquatic Habitat Framework

GLAHF

Great Lakes Aquatic Habitat Framework

Collaborative, Integrative, Bi-national Project

Funded by:

Great Lakes Fishery Trust

Erb Family Foundation

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GREAT LAKES BASIN
Fish Habitat Partnership

International Joint Commission · Commission Mixte Internationale

U.S. Fish & Wildlife Service

NOAA

Department of Natural Resources DNR Michigan

University of Windsor

USGS
science for a changing world

The Nature Conservancy

United States Environmental Protection Agency
Mid-Continent Ecology Division

Michigan State University

Michigan Tech Research Institute

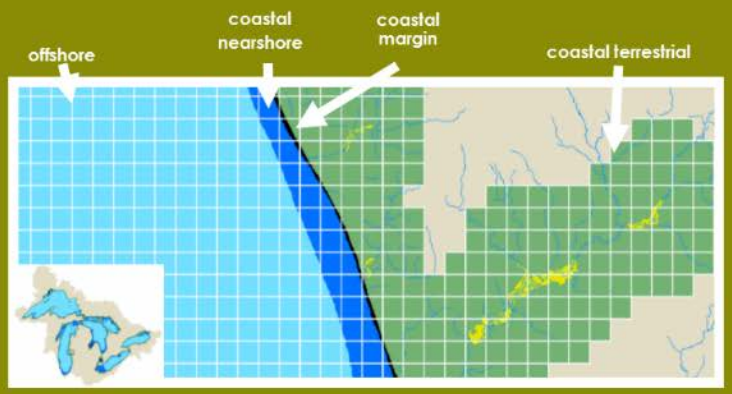
University of Toronto

Natural Resources Research Institute
University of Minnesota Duluth
Driven to Discover

Natural Resources and Environment
University of Michigan

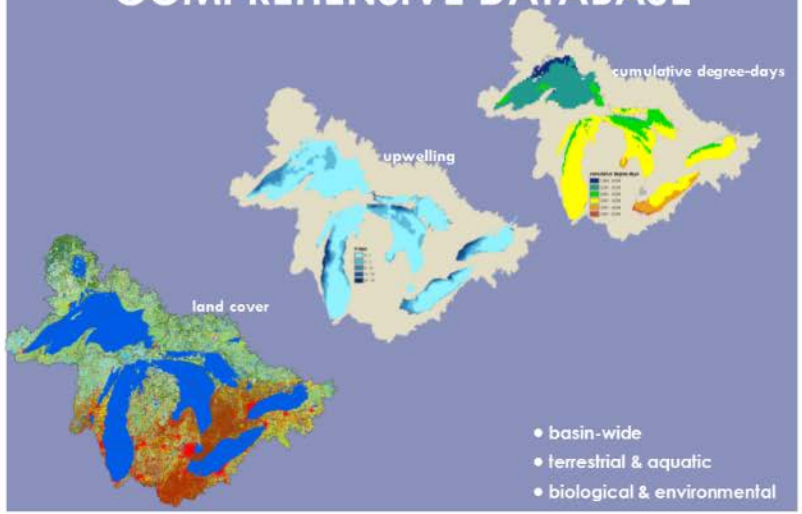
Great Lakes Aquatic Habitat Framework

BASIN-WIDE FRAMEWORK



- captures ecological zones of the Great Lakes
- links terrestrial & aquatic systems
- enables multiscale synthesis

COMPREHENSIVE DATABASE

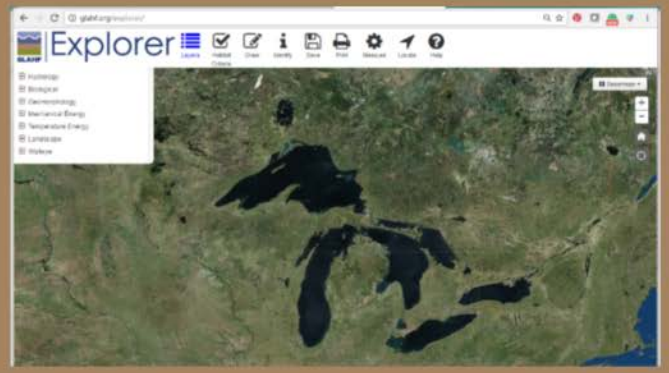


- basin-wide
- terrestrial & aquatic
- biological & environmental

HABITAT CLASSIFICATION

- identifies ecological types
- coastal, nearshore & open water classes
- hierarchical & scalable

DECISION SUPPORT TOOLS



- publicly available data sets
- web-based map viewer
- user-driven scenarios

FOR MORE INFORMATION
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Kevin Wehrly, wehrlyk@michigan.gov

COLLABORATORS

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Wang et al., 2015 JGLR

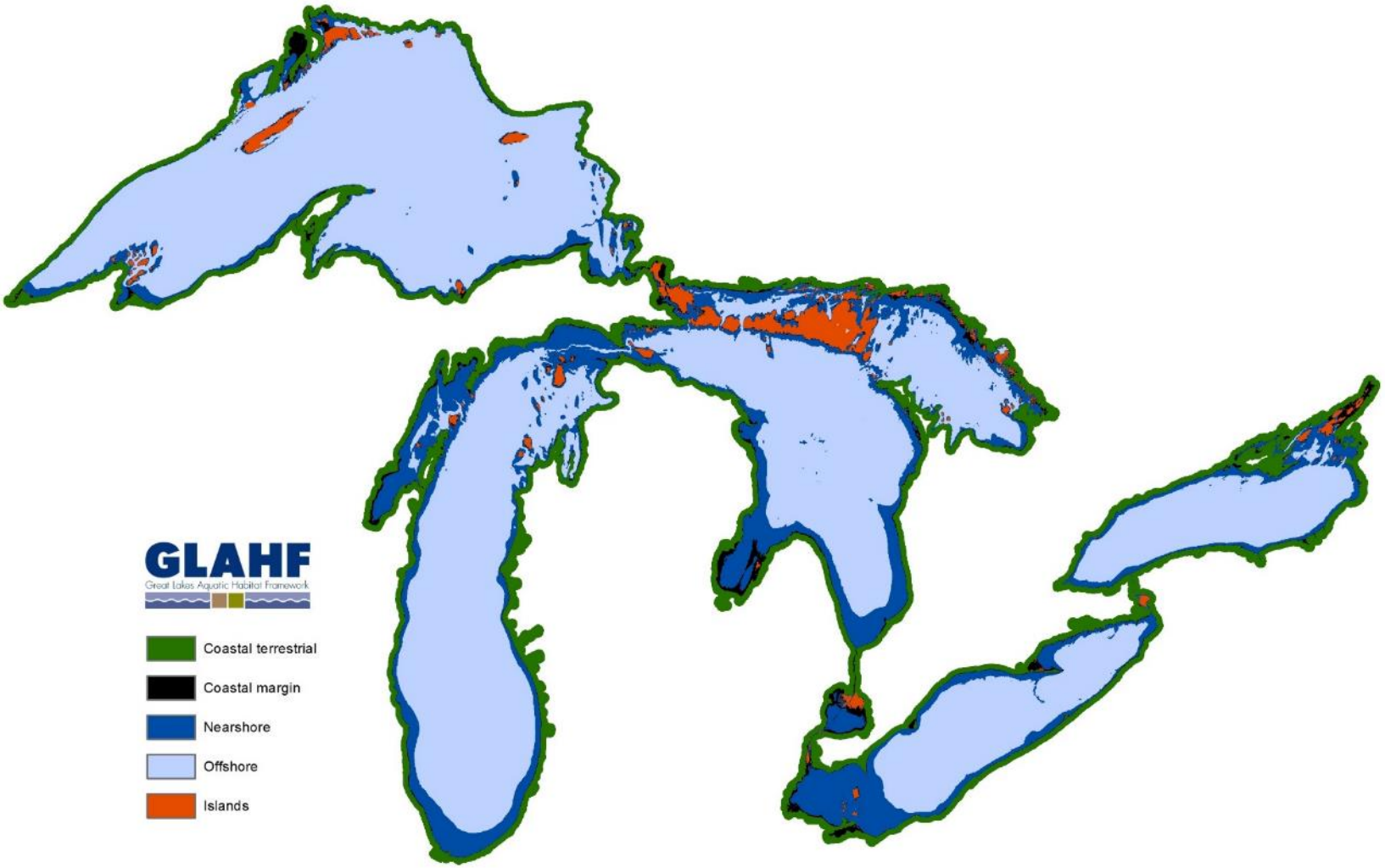
Nearshore Fish Habitat Assessment

Goal:

Identify fish habitat potential

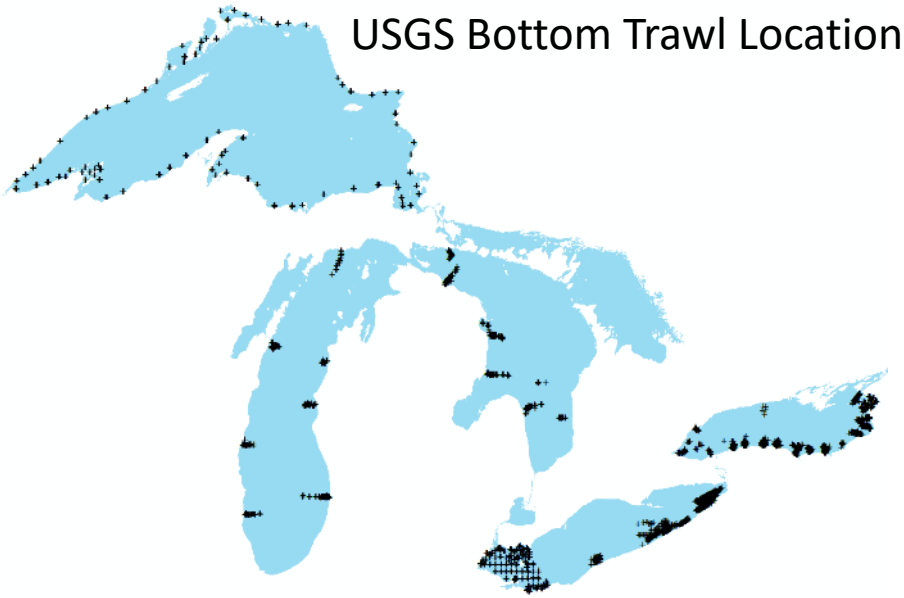
Assess condition

Prioritize actions and funding

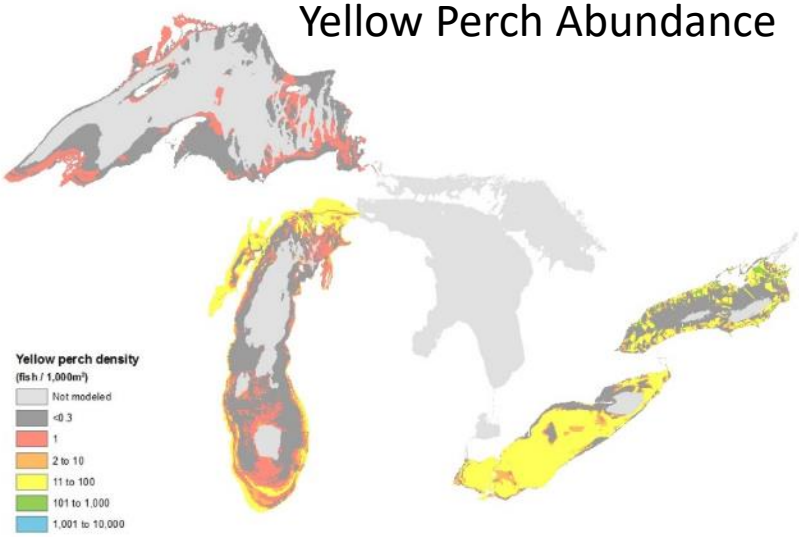

GLAHF
Great Lakes Aquatic Habitat Framework
Coastal terrestrial
Coastal margin
Nearshore
Offshore
Islands

Condition Assessment Approach

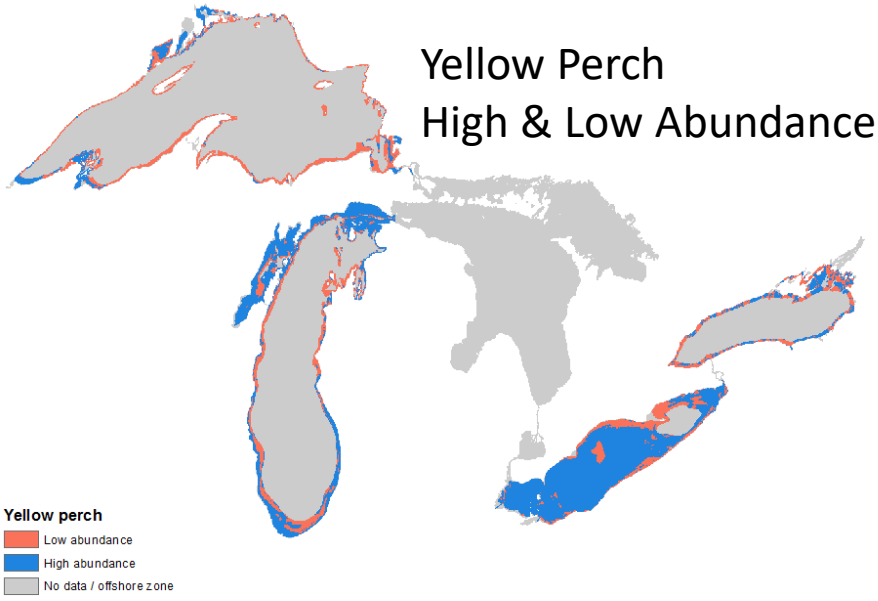
USGS Bottom Trawl Locations



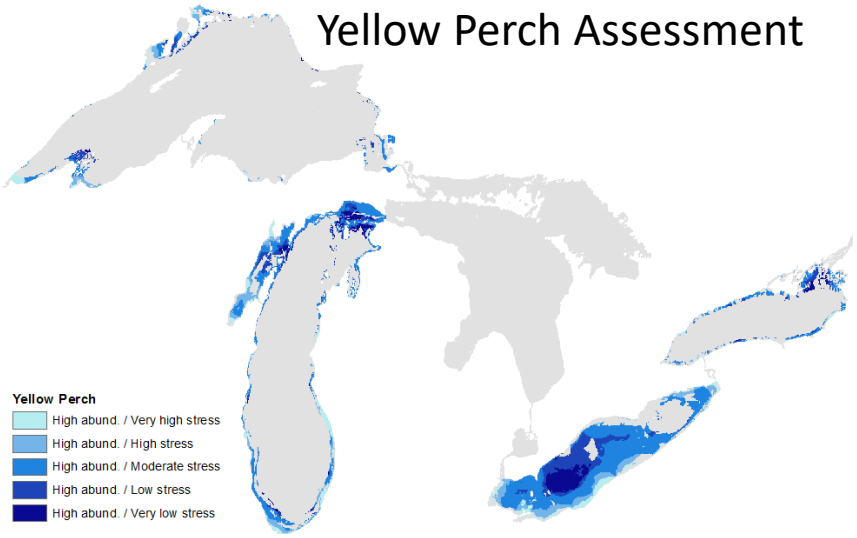
Yellow Perch Abundance



Yellow Perch
High & Low Abundance



Yellow Perch Assessment



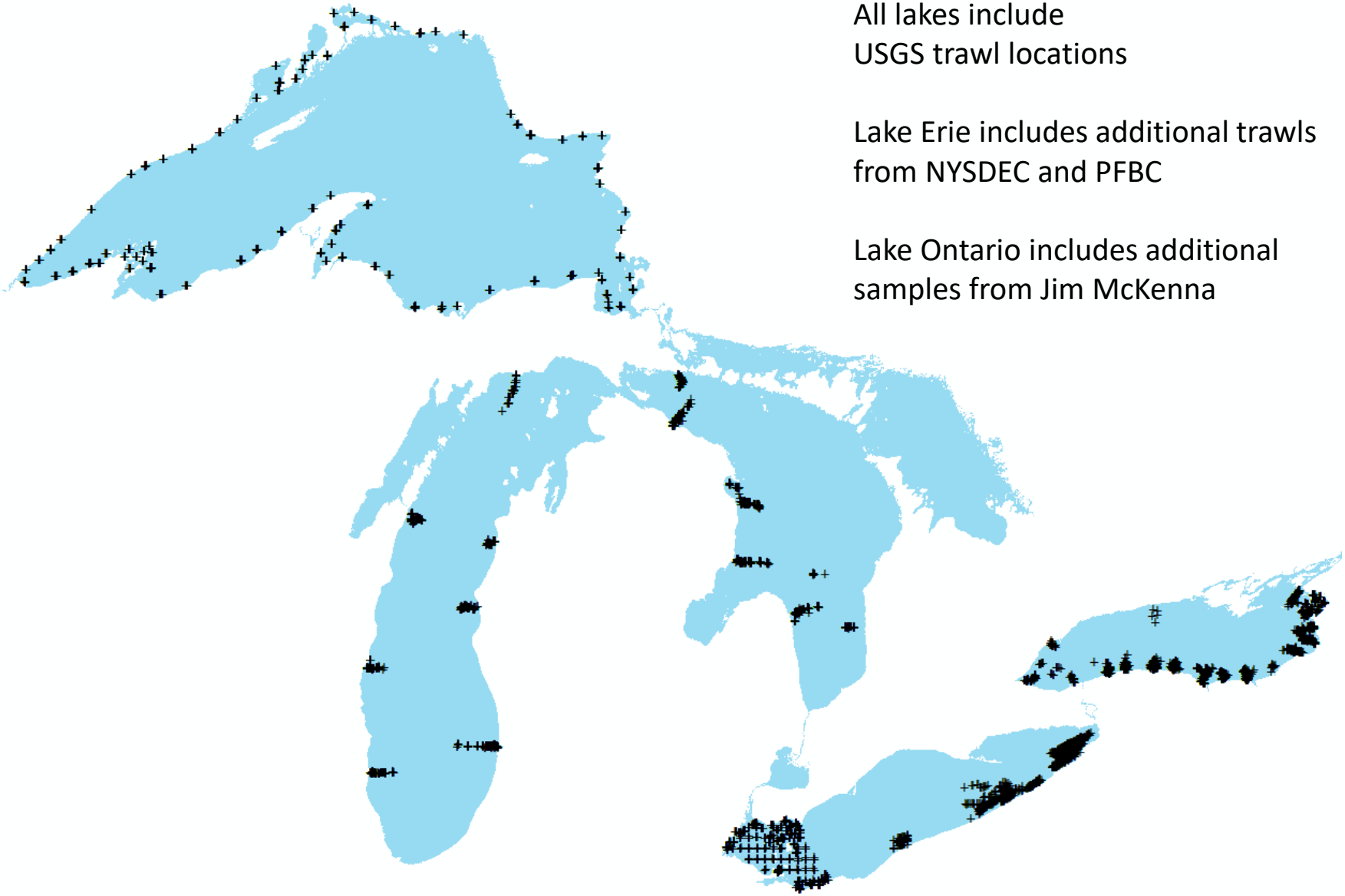
General Approach:

- Developed Neural Network models predicting bottom trawl fish abundance class from habitat variables (e.g. depth, temperature, mechanical energy, shoreline, substrate, connectivity to other habitats, etc.)
- Models species-specific and lake-based
- Models used to predict abundance by species within a lake; lake maps combined for a basin-wide display
- Habitat suitability based on species abundance

Data and model summary:

	Erie	Huron	Michigan	Ontario	Superior
Fish data source(s)	NYSDEC, PFBC, USGS	USGS	USGS	USGS, McKenna	USGS
Temporal extent of trawl dataset in nearshore models	2000-2015	1973-1991 & 1994-2008	1996-2014	1978-2013	2000-2014
Minimum, Maximum Trawl Depth (m)	1, 36	9,110	5, 132	5, 175	14, 140
No. spp. modeled	28	11	20	33	25

Bottom Trawl Fish Data: Sampling Locations



All lakes include
USGS trawl locations

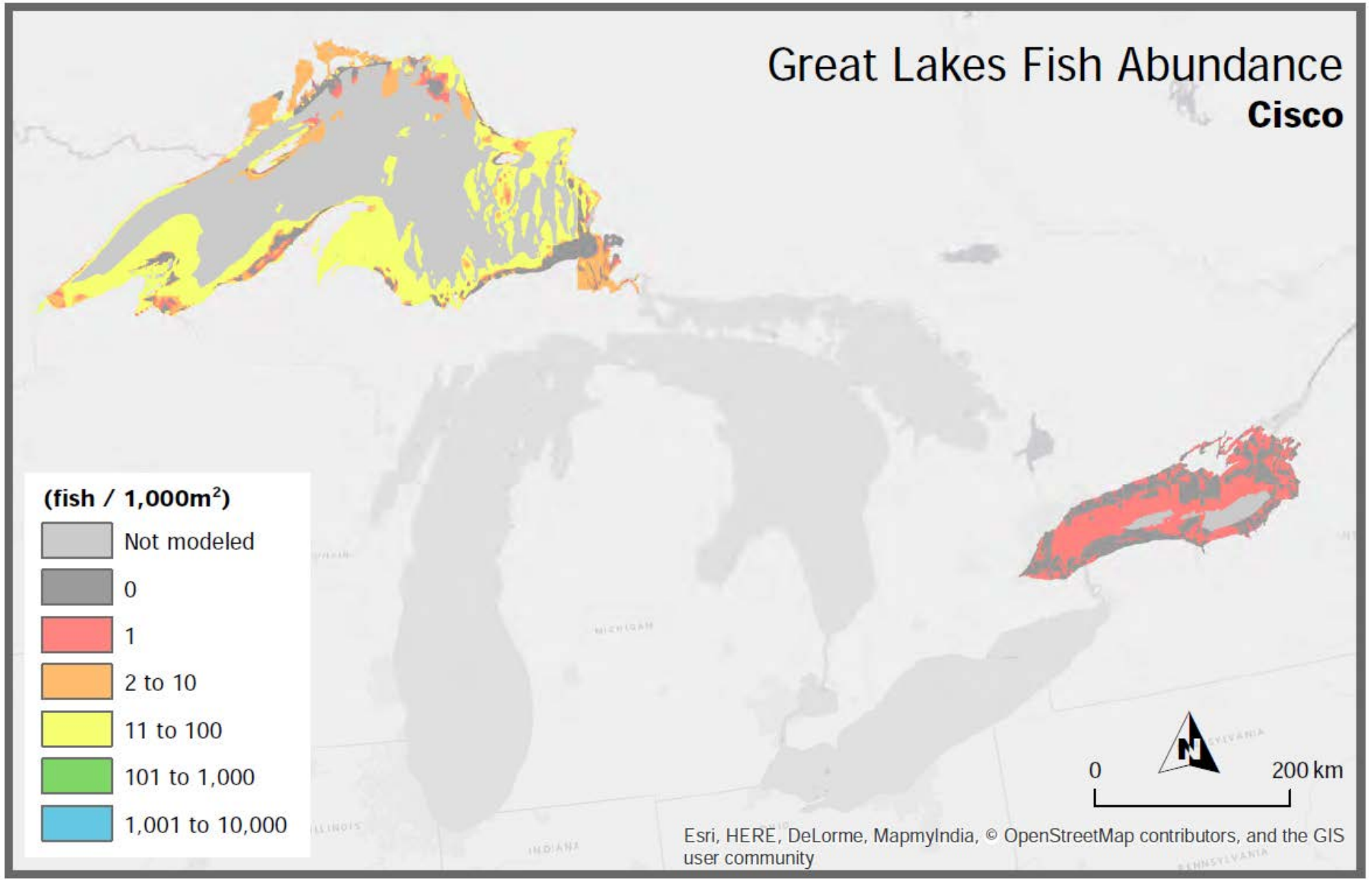
Lake Erie includes additional trawls from NYSDEC and PFBC

Lake Ontario includes additional samples from Jim McKenna

Nearshore Fish Habitat Modeling most influential habitat variables

	ER	HU	MI	ON	SU
Depth	✓	✓✓	✓✓		✓
Temperature	✓	✓	✓✓✓✓		✓✓
Mechanical Energy	✓✓	✓			✓
Substrate				✓	
Rivers and Coastal Wetlands	✓✓✓	✓✓		✓✓	✓✓
Shoreline characteristics				✓✓	

Fish Modeling Results for 53 Species


Great Lakes Fish Abundance
Cisco
(fish / 1,000m²)
Not modeled
0
1
2 to 10
11 to 100
101 to 1,000
1,001 to 10,000
N
0
200 km
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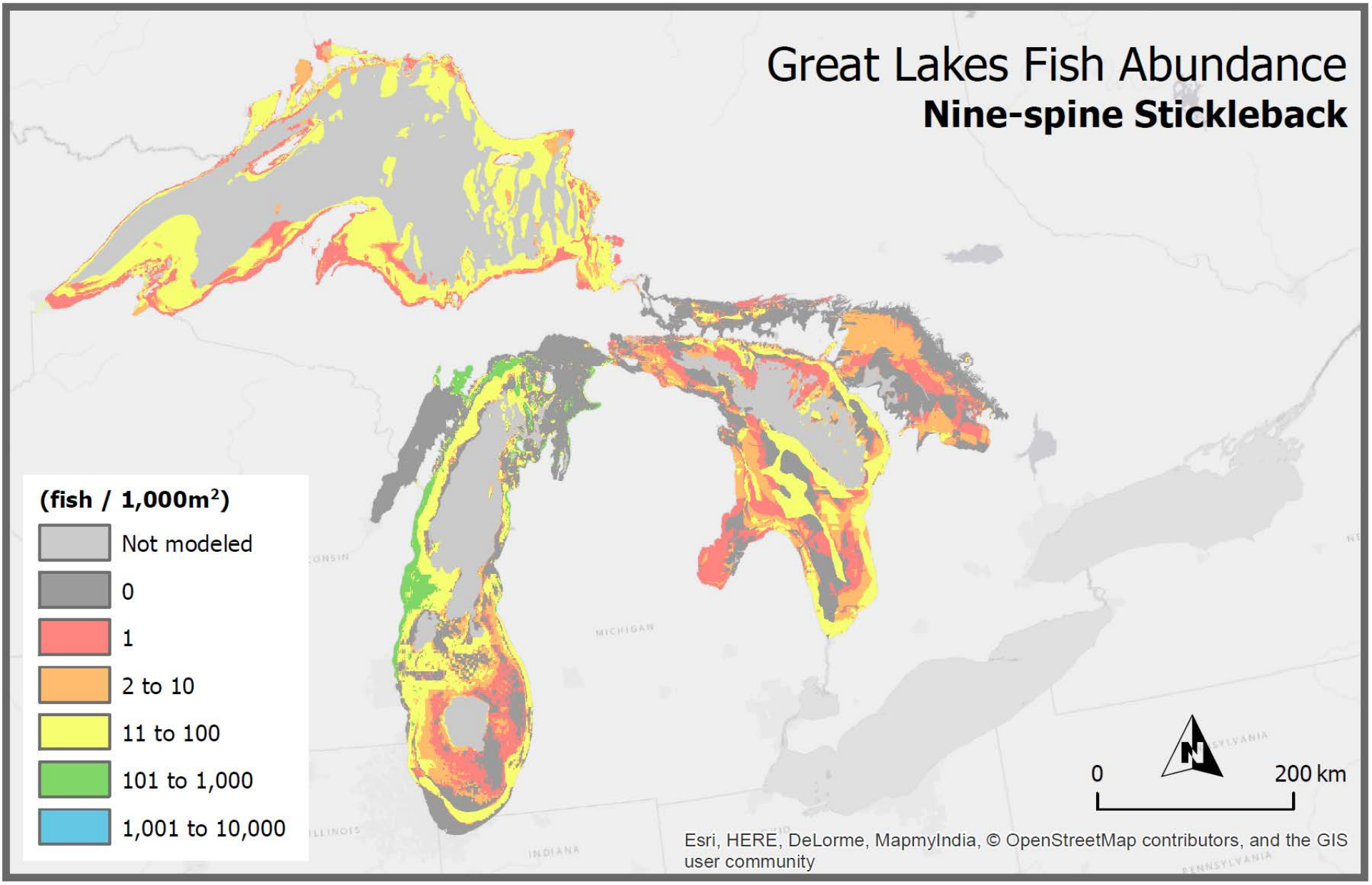
Great Lakes Fish Abundance
Nine-spine Stickleback
(fish / 1,000m²)
Not modeled
0
1
2 to 10
11 to 100
101 to 1,000
1,001 to 10,000
MICHIGAN
INDIANA
0
200 km
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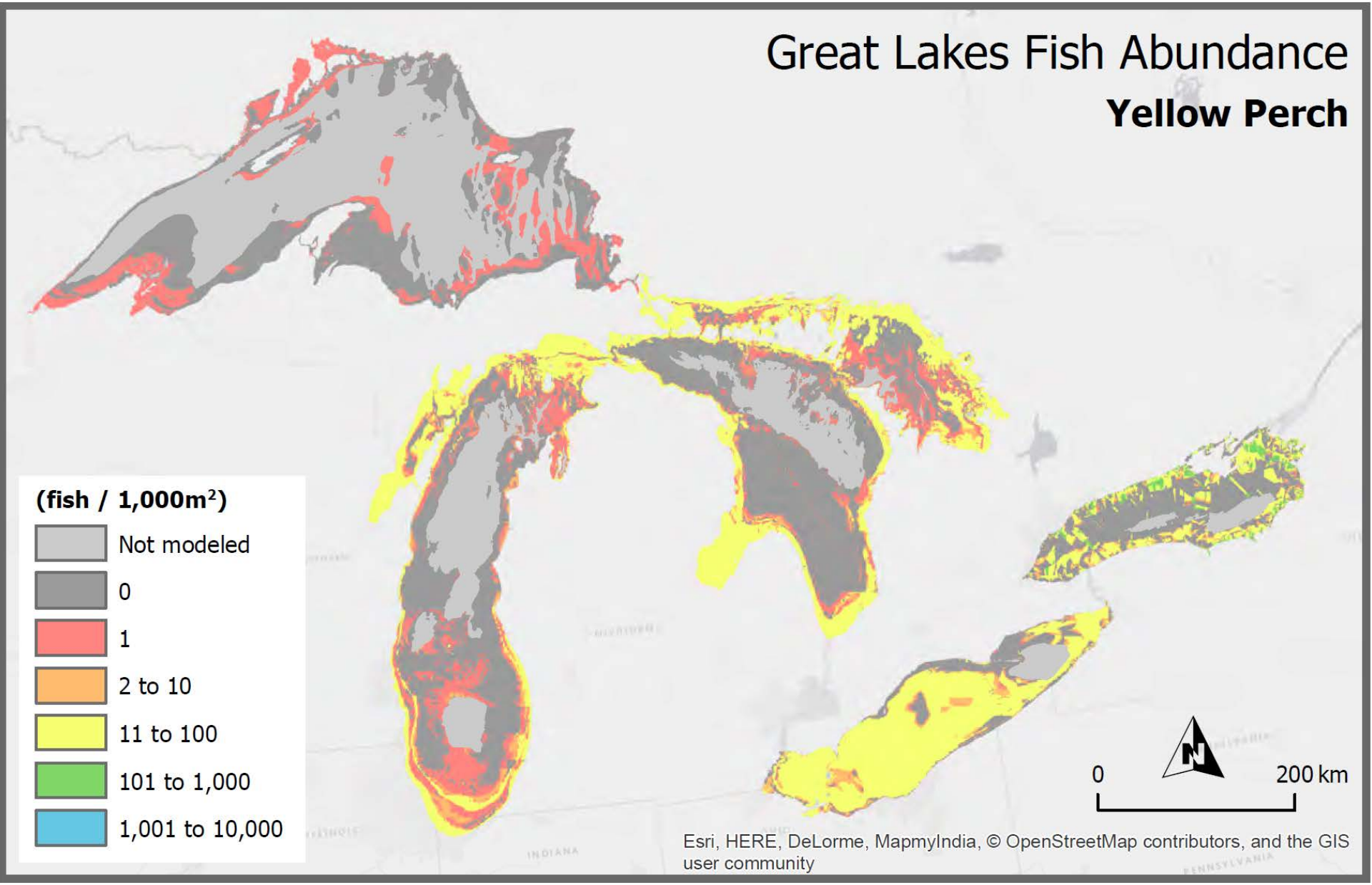
Great Lakes Fish Abundance
Yellow Perch
(fish / 1,000m²)
Not modeled
0
1
2 to 10
11 to 100
101 to 1,000
1,001 to 10,000
0
200 km
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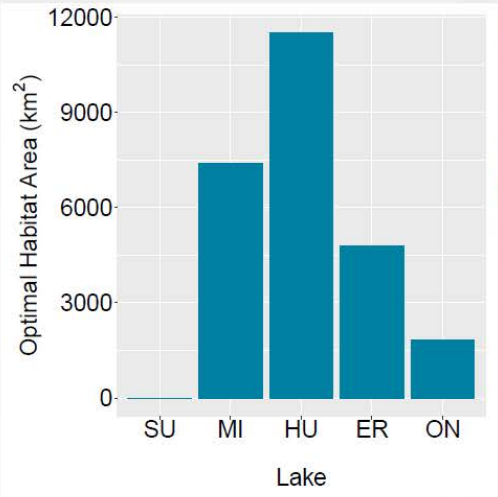
Great Lakes Nearshore Optimal Habitat

Yellow Perch



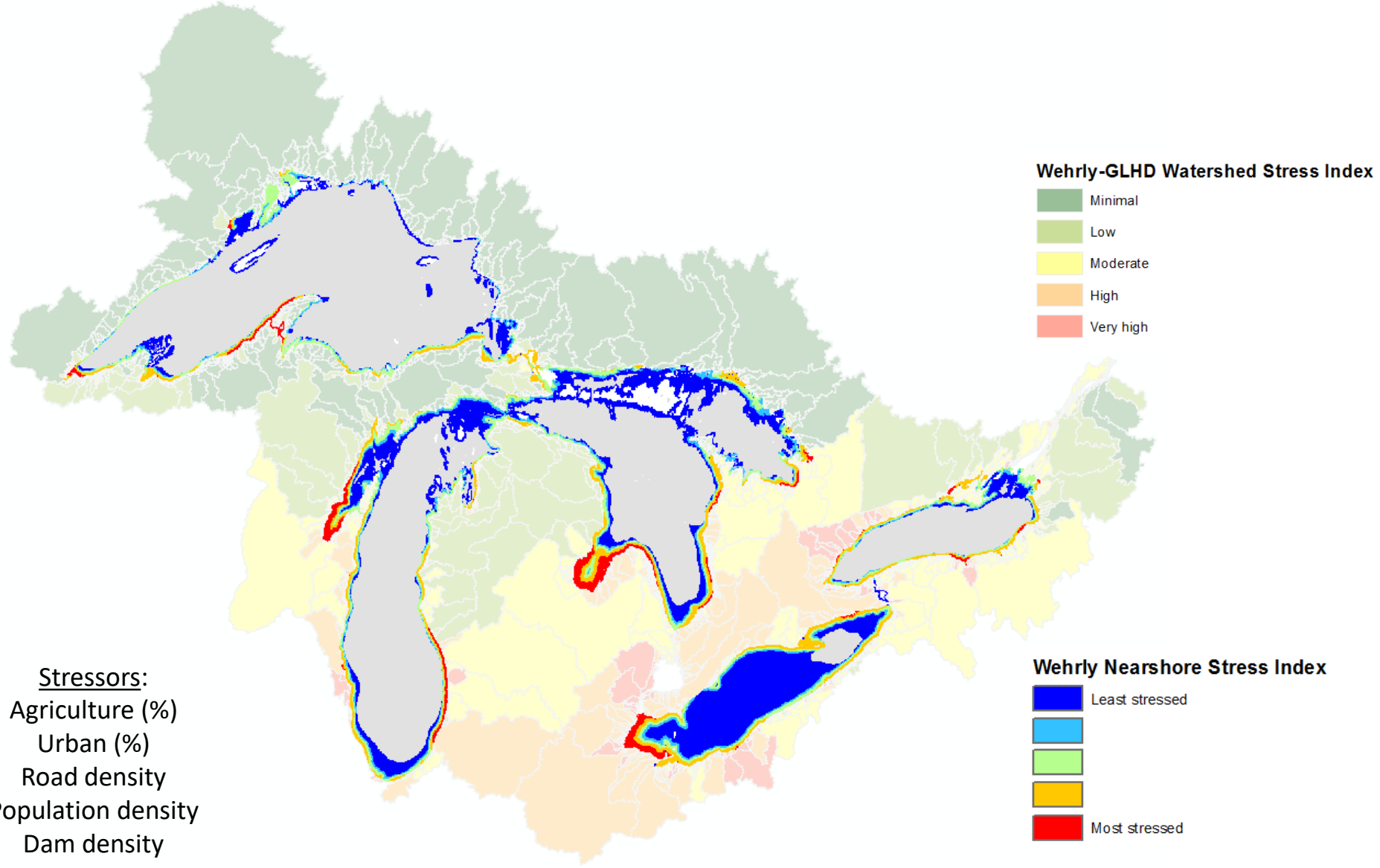
Optimal nearshore habitat

Coastal margin

0 200 km

Wehrly et al. (2012) Tributary Stress Index

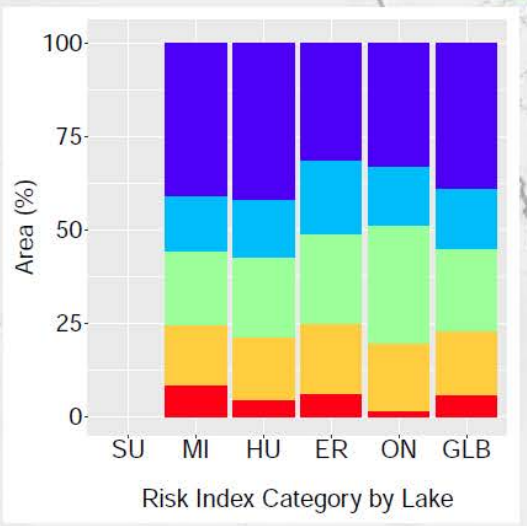
- dissipated into coastal & nearshore areas from river mouth or coastal interfluve



Stressors:
Agriculture (%)
Urban (%)
Road density
Population density
Dam density

Great Lakes Nearshore Assessment

Yellow Perch Optimal Habitat + Wehrly et al Landscape Risk Index



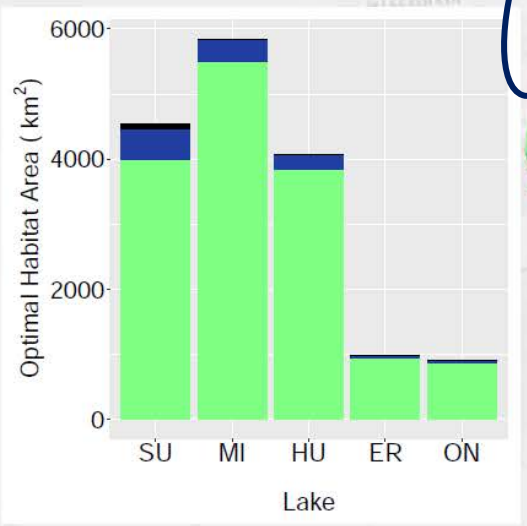
Risk Index Categories

- Very low
- Low
- Moderate
- High
- Very high
- Coastal margin

0 200 km

Great Lakes Nearshore Optimal Habitat

Species Composite

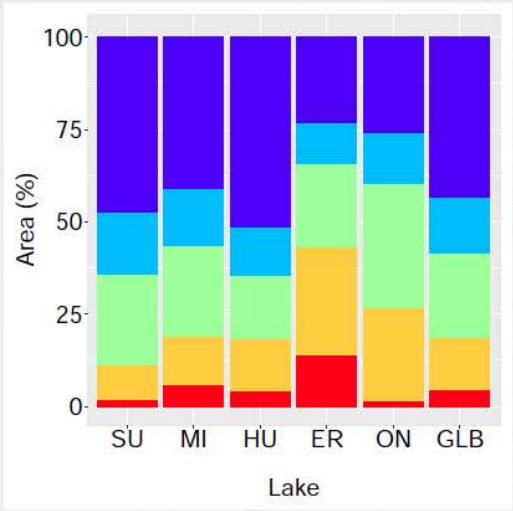


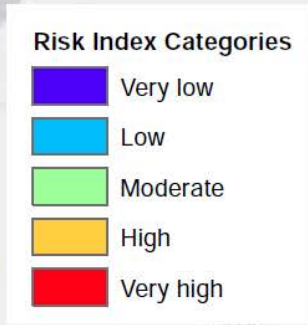
0 200 km

% spp. present
<50%
50-75%
75-90%
>90%

Great Lakes Nearshore Assessment

Species Composite Optimal Habitat + Wehrly et al Landscape Risk Index





0 200 km

GLAHF

ASSESSMENT

a coastal & nearshore assessment of the Great Lakes

The GLAHF spatial framework and classification is supporting a coastal and nearshore condition assessment of fish habitat in the Great Lakes Basin.

This project was funded by the Great Lakes Fishery Trust and the Great Lakes Basin Fish Habitat Partnership. If you have questions, please contact Catherine Riseng (criseng@umich.edu).

ABOUT GLAHF

Great Lakes Aquatic Habitat Framework is a comprehensive spatial framework, database, and classification for Great Lakes ecological data

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