Fish habitat and accessing information about your lake

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What is habitat?

- The places where fish live
- Chemical, physical, and biological
- Required to survive, grow, and reproduce
Local effects
Watershed effects
Global effects
Changing shoreline land cover

• Decreased woody debris, emergent vegetation, and floating vegetation (Christensen et al. 1996; Radomski and Goeman 2001; Jennings et al. 2003)

• Removal of shoreline vegetation on 60% of properties in Michigan (Nohner, unpublished)

• Negative association between developed shorelines and:
  • Muskellunge spawning habitat (Nohner and Diana 2015)
  • Largemouth Bass and Yellow Perch (Sass et al. 2006)
  • Lake Trout, Lake Whitefish, Cisco (Clingerman et al. 2012)
  • Pike, Bluegill, Pumpkinseed (Radomski and Goeman 2001)
  • Fish diversity (Jennings et al. 1999)
Local effects – Shoreline development
Local effects – Boat docks
Local effects – Woody debris
Local effects – Shoreline armoring
Watershed effects

- Nutrients
- Sedimentation
- Connectivity
Land use and land cover change

- Watershed land cover change increases nutrient loading and eutrophication
- Greatest stressors in the 2010 Midwest Glacial Lakes Partnership Fish Habitat Assessment:
  - Land stewardship
  - Wetland cover
  - Pasture land cover
  - Grassland land cover
Watershed effects

[Map showing trophic state and total phosphorus distribution]

- Trophic state:
  - Oligotrophic
  - Mesotrophic
  - Eutrophic
  - Hypereutrophic

- Total phosphorus:
  - Low
  - Medium
  - High
Watershed effects
Watershed effects
Watershed effects

National Inventory of Dams
Climate change – Houghton Lake

PRISM modeled surface air temperatures
Climate change

- Warming water temperatures
- Longer growing seasons
- Shorter ice coverage
- Changes in water levels and precipitation
- Changes in dissolved oxygen
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Global effects

Hansen et al. 2016
Global effects – invasive species

• Non-native and whose introduction causes harm

• Modify ecosystem function
Zebra Mussel Invasion

• Anthropogenic vectors
  • Boat hulls, trailers, bilge water
  • Bait and bait buckets
  • Equipment used on the water

• Natural vectors
  • Rivers
  • Flooding
  • Waterfowl
Zebra Mussel Invasion

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2000 Zebra Mussel occurrence

USGS 2015
Zebra Mussel Invasion

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USGS 2015
Invasive Zebra Mussels

• Decrease chlorophyll $\alpha$, phytoplankton, and zooplankton by 50% (Higgins and Vander Zanden 2010)

• Decrease condition and growth of age-0 fishes (Nienhuis et al. 2014)

• Changes fish assemblages (Nienhuis et al. 2014)
Invasive aquatic plants

• Limit fish abundance and growth
  • Increased hypoxia
  • Inferior food quality
  • Decreased habitat availability

• Costly mitigation
  • Harvesting
  • Herbicides
  • Biological controls
Mitigating, adapting, and improving

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Lake information sources

- Michigan Lake Water Clarity Viewer
- MiCorps
- MISIN
- DNR Status and Trends Lake Habitat Viewer
- Midwest Glacial Lakes Partnership
Michigan Lake Water Clarity Viewer

MiCorps Data Exchange

One of the key components of the MiCorps program is the MiCorps Data Exchange (MDE) platform, which provides online access to volunteer monitoring data through a searchable database. This system fulfills a critical role by allowing volunteers to gather and exchange reliable and meaningful water quality data for water resources management and protection programs at the state and local level.

Prior to 2015, the MDE was comprised of monitoring data collected by MiCorps member organizations and others who have completed the necessary trainings with MiCorps staff. To submit data to the MDE, monitors must demonstrate their capacity and willingness to adhere to specific MiCorps quality assurance and operating procedure criteria.
The Midwest Invasive Species Information Network (MISIN) is a regional effort to develop and provide an early detection and rapid response (EDRR) resource for invasive species.

The goal of this regional resource is to assist both experts and citizen scientists in the detection and identification of invasive species in support of the successful management of invasive species.

This effort is being led by researchers with the Michigan State University Department of Entomology Laboratory for Applied Spatial Ecology and Technical Services in conjunction with a growing consortium of Supporting Partners.
• Collect chemical, physical, and biological indicator data
• Partnership between DNR / DEQ
• ~430 lakes complete from 2002 – Present
• ~30 lakes per year
• [2002 – 2007 Report](#)
Status and Trends Lake Habitat Viewer

Status and Trends Inland Lake Habitat Viewer

▲ Introduction ▲
Midwest Glacial Lakes Partnership

March 14, 2013

The importance of fish habitat

New Public Service Announcement focuses on Midwest Fish Habitat Partnerships and links to a new website to get further information on fish habitats and fish habitat projects!
MGLP assessment data

- **Fish**
  - 3,050 **Bluegill** lakes
  - 2,449 **Walleye** lakes
  - 3,092 **Northern Pike** lakes
  - 561 **Coldwater fish** lakes
    - Lake Trout
    - Cisco
    - Lake Whitefish
    - Burbot

- **Predictor variables:**
  - Degree Days
  - Log Lake Area
  - Average Surface Temperature
  - Base-flow Index
  - Runoff
  - Elevation of Catchment
  - Log Catchment Area

midwestglacials.org
MGLP assessment approach

Species Data

Distribution Models

GIS Data

Habitat Suitability

Vulnerability
- Land Cover change
- Climate change

Conservation Planning
MGLP assessment application

• Fish models to determine species present
• Watershed and shoreline land cover development
• Metrics of climate change resilience
Summary

• Aquatic habitat affected by processes at multiple scales
• Context, then action!
• Public data sources available
  • Michigan Lake Water Clarity Viewer
  • MiCorps
  • MISIN
  • DNR Status and Trends Lake Habitat Viewer
  • Midwest Glacial Lakes Partnership

midwestglaciallakes.org
Summary

Michigan Lake Water Clarity Interactive Map Viewer
Status and Trends Inland Lake Habitat Viewer
Conservation Guidelines for Michigan Lakes and Associated Natural Resources
Michigan Natural Shoreline Partnership
Michigan Inland Lakes Partnership
Michigan Shoreland Stewards Program
Midwest Glacial Lakes Partnership
Michigan State University Extension

Contact:
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midwestglaciallakes.org
References

- Minnesota Department of Natural Resources. 2013. Fish habitat plan: A strategic guidance document. Minnesota Department of Natural Resources Section of Fisheries. St. Paul, Minnesota.
- Whelan, G. To Infinity and Beyond: The National Fish Habitat Assessment Strategy. Oral Presentation at the National Fish Habitat Board Meeting, October 19, 2011, Albuquerque, New Mexico.