MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

National Lake Assessment: Michigan Lake Shorelines

Gary Kohlhepp

September 14, 2023

Michigan Wetlands Conference

EPA National Lake Assessment

- National Aquatic Resource Survey
- Report on the condition of the nation's lakes
- 5-year rotation
- NLA: 4 surveys 2007-2022

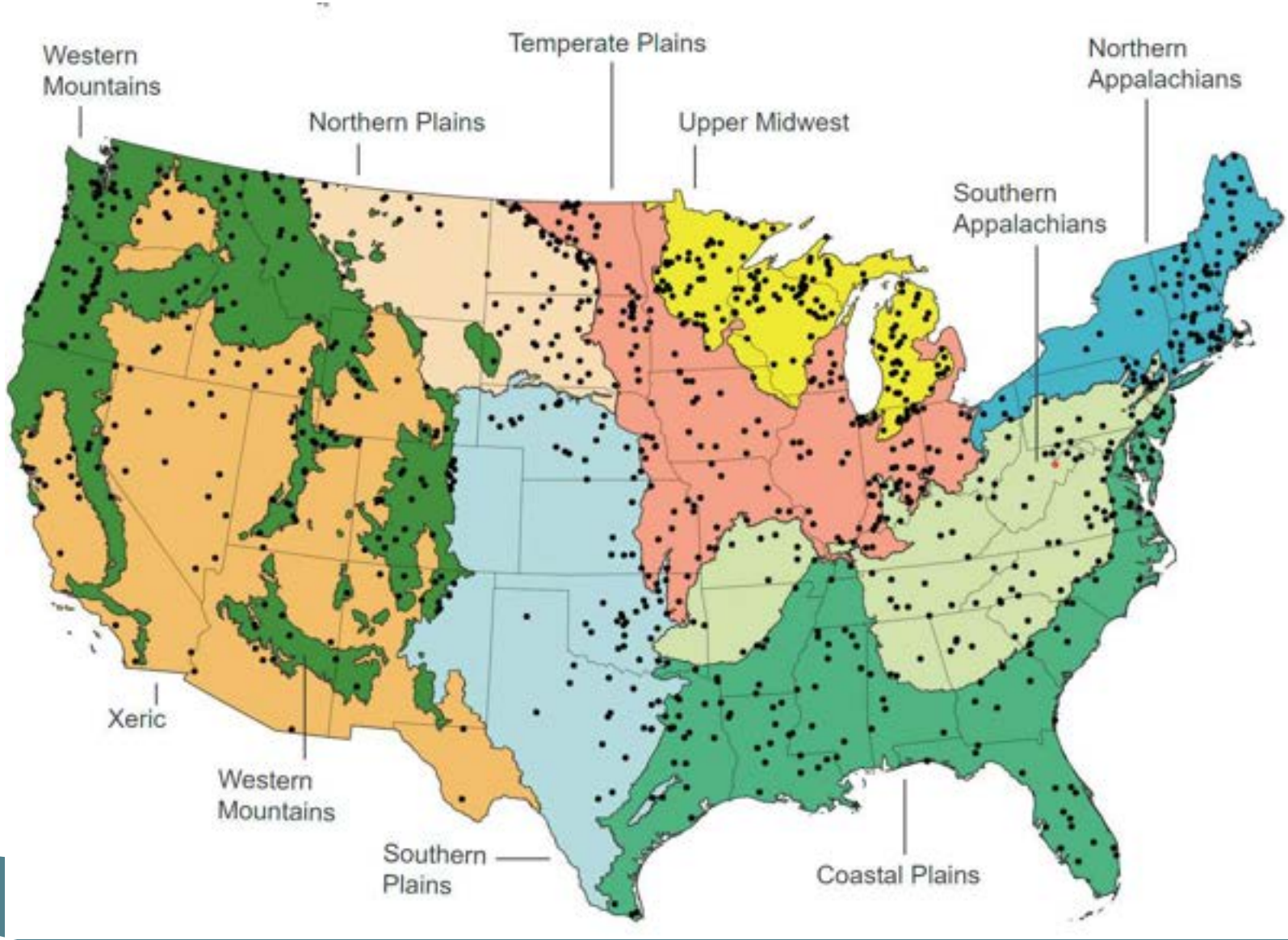
National Lake Assessment: Questions

- What are the current biological, chemical, physical, and recreational condition of lakes?
- Is the proportion of lakes in the poor condition changing?
- Which environmental stressors are most strongly associated with degraded biological condition in lakes?

National Lake Assessment: Lakes

- ~ 1000 lakes sampled per survey
- >1 hectare & 1 meter depth
- Exclude: Great Lakes, water treatment ponds, tidal impacted lakes
- Random selection: characterize subset populations (location, size)

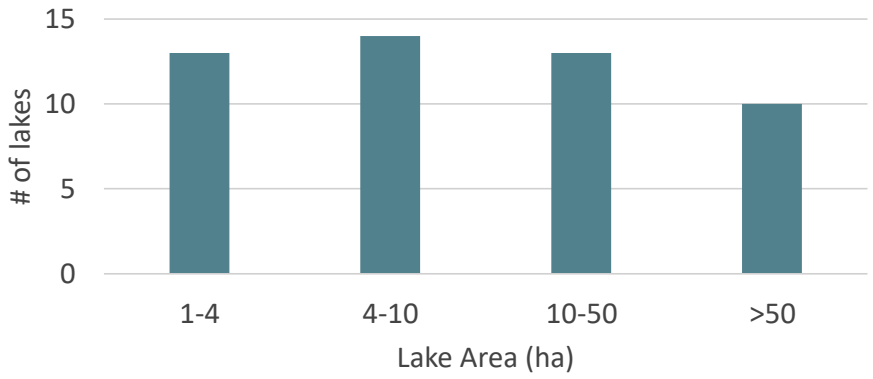
2017 NLA Sites and Ecoregions



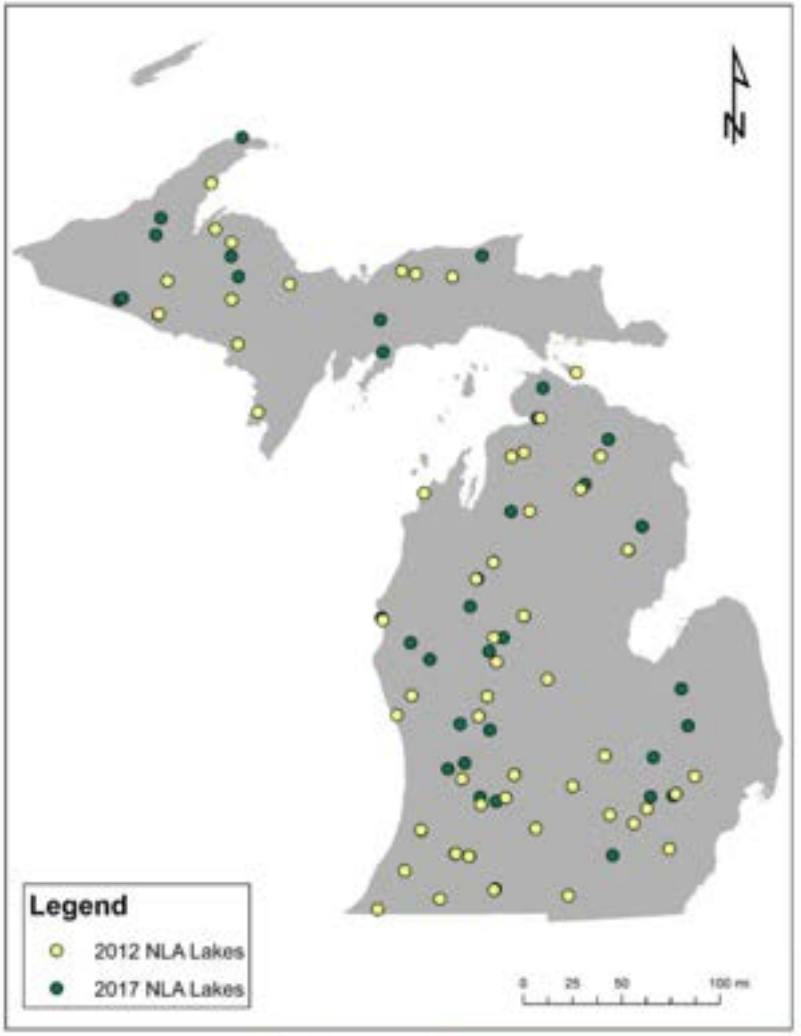
2017 NLA Indicators

Chemical	Trophic State	Biological	Physical	Recreational
•Dissolved oxygen •Nitrogen •Phosphorus •Atrazine	•Trophic State	•Benthic macroinvertebrates •Chlorophyll a •Zooplankton	•Drawdown •Human disturbance •Lakeshore habitat •Physical habitat complexity •Shallow water habitat	•Algal toxins •Cyanobacteria •Enterococci

2017 Michigan NLA Lakes



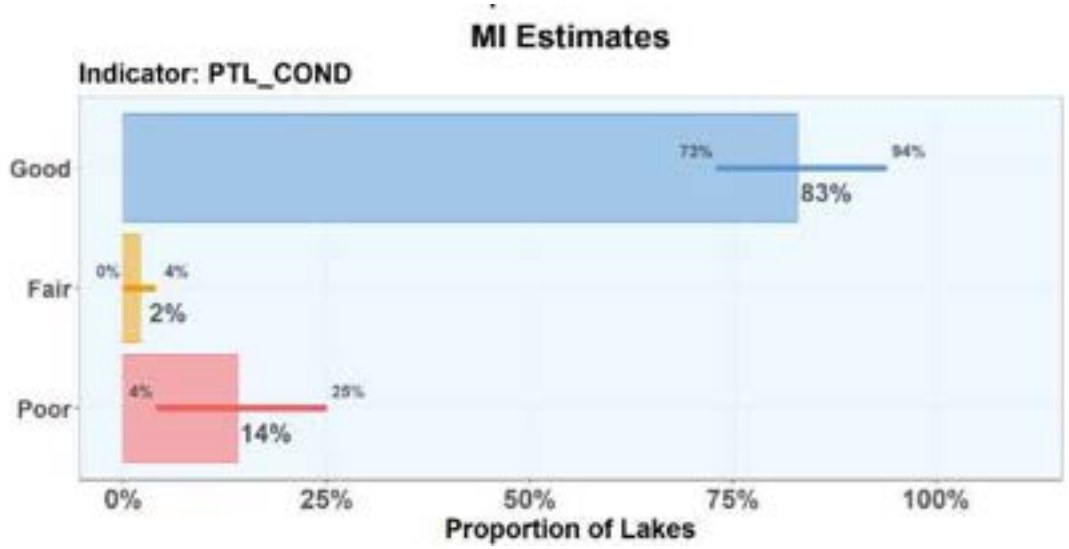
Lake	County	Area (ha)
Lake Mitchell	Wexford	1061
Crooked Lake	Emmet	969
Pere Marquette Lake	Mason	242
Palmer Lake	St. Joseph	198
West Lake	Kalamazoo	133
Saddle Lake	Van Buren	110
Au Sable Lake	Ogemaw	107

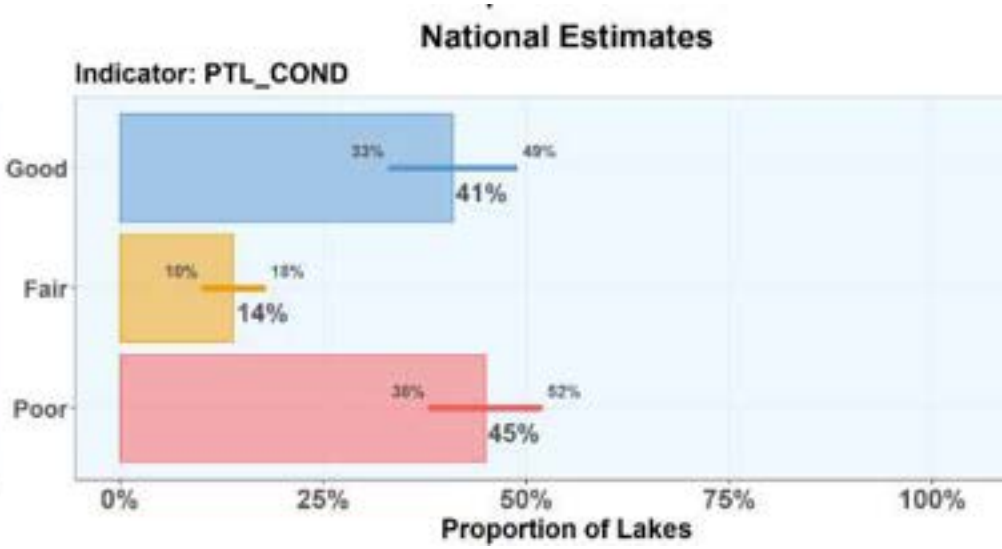


2017 MI NLA Results

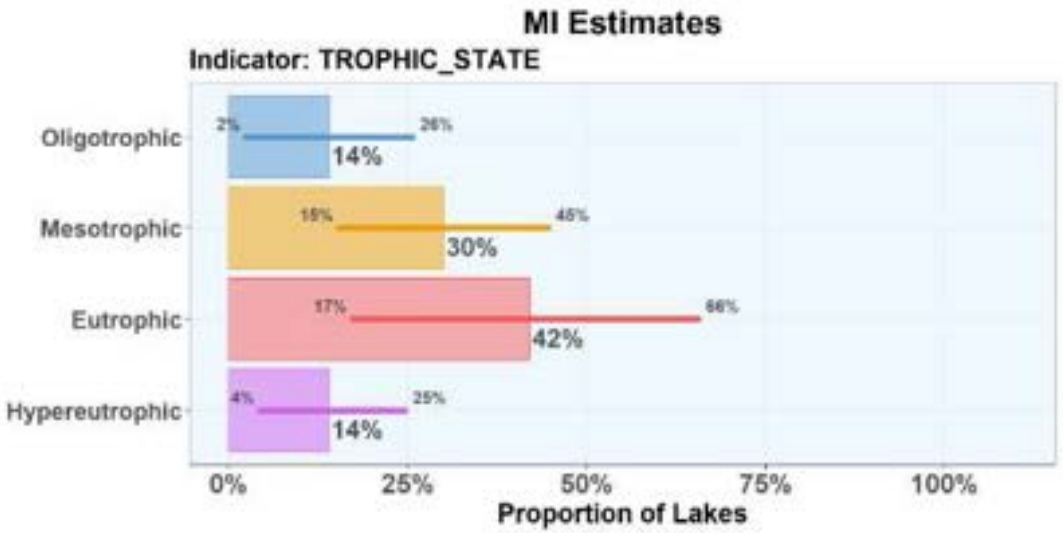
- EPA uses reference site data to classify data into Good, Fair, or Poor condition categories.
  - Good > 75% reference
  - Fair 75-95% ref
  - Poor < 95% reference
- 2017 Results: 2017 MI vs national condition estimates and MI conditions from 2007, 2012, and 2017
- Phosphorus, Trophic State, Shoreline

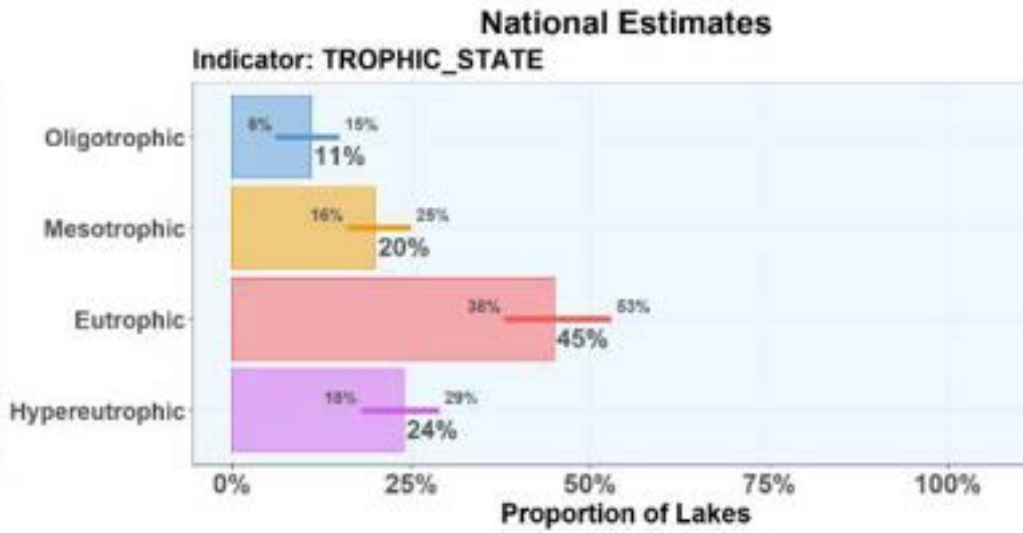
2017 Condition – Total Phosphorus





2017 Condition - Trophic State

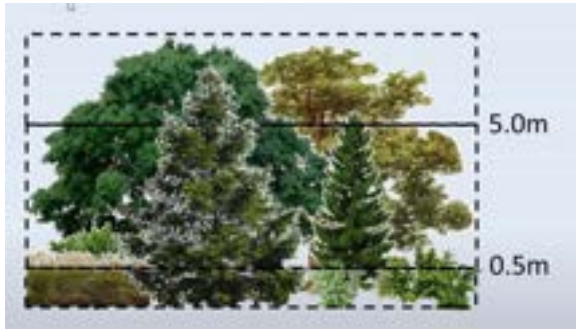




Oligotrophic	≤2	ug/L
Mesotrophic	>2 and ≤7	ug/L
Eutrophic	>7 and ≤30	ug/L
Hypereutrophic	>30	ug/L

2017 NLA Riparian Indicators

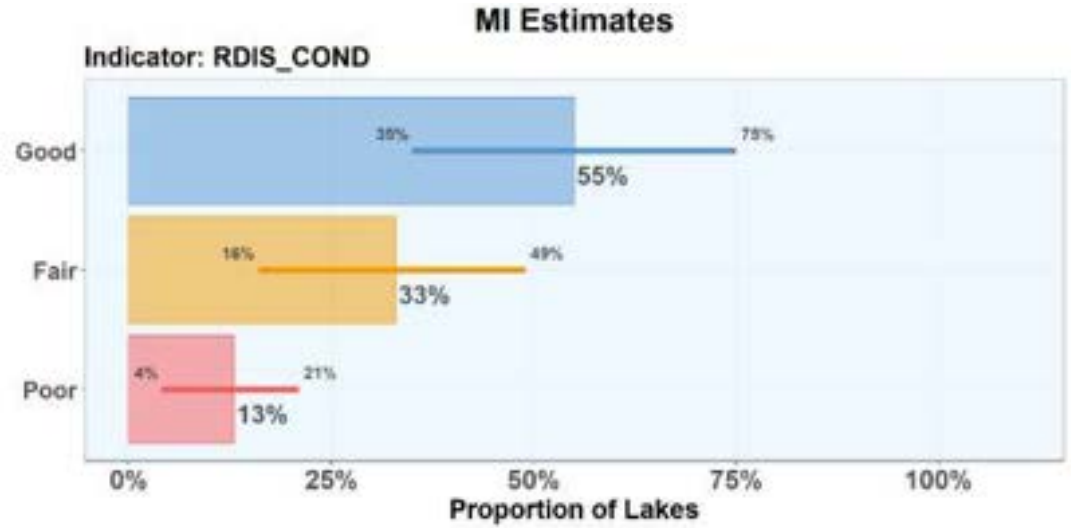
Lakeshore Disturbance	Riparian Vegetative Cover
Direct human alteration of the lakeshore Loss of vegetation structure and complexity Modifications to substrate types	• Understory (<0.5m) • Mid-story (0.5-5m) • Overstory trees (>5m) Best condition: vegetation cover is high in all layers

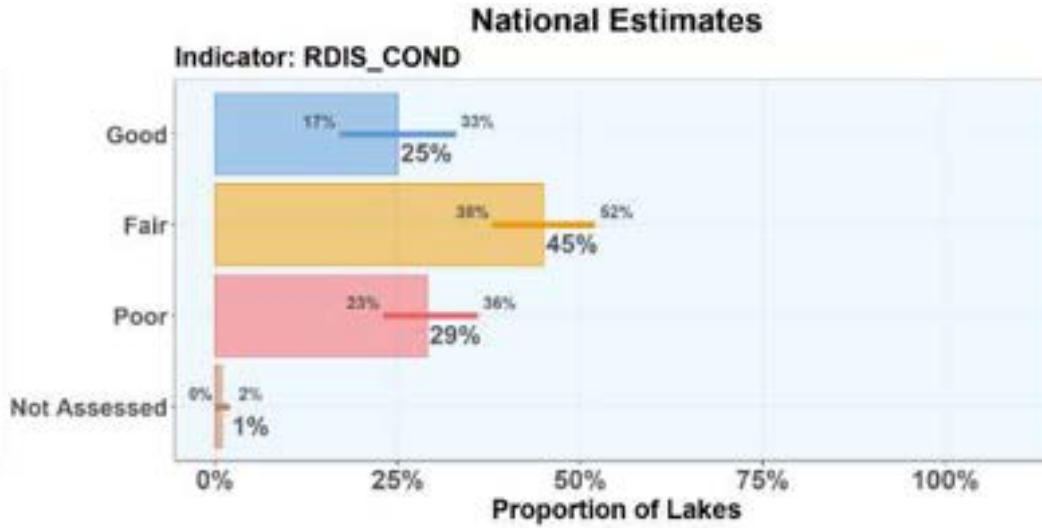


Shoreline Construction

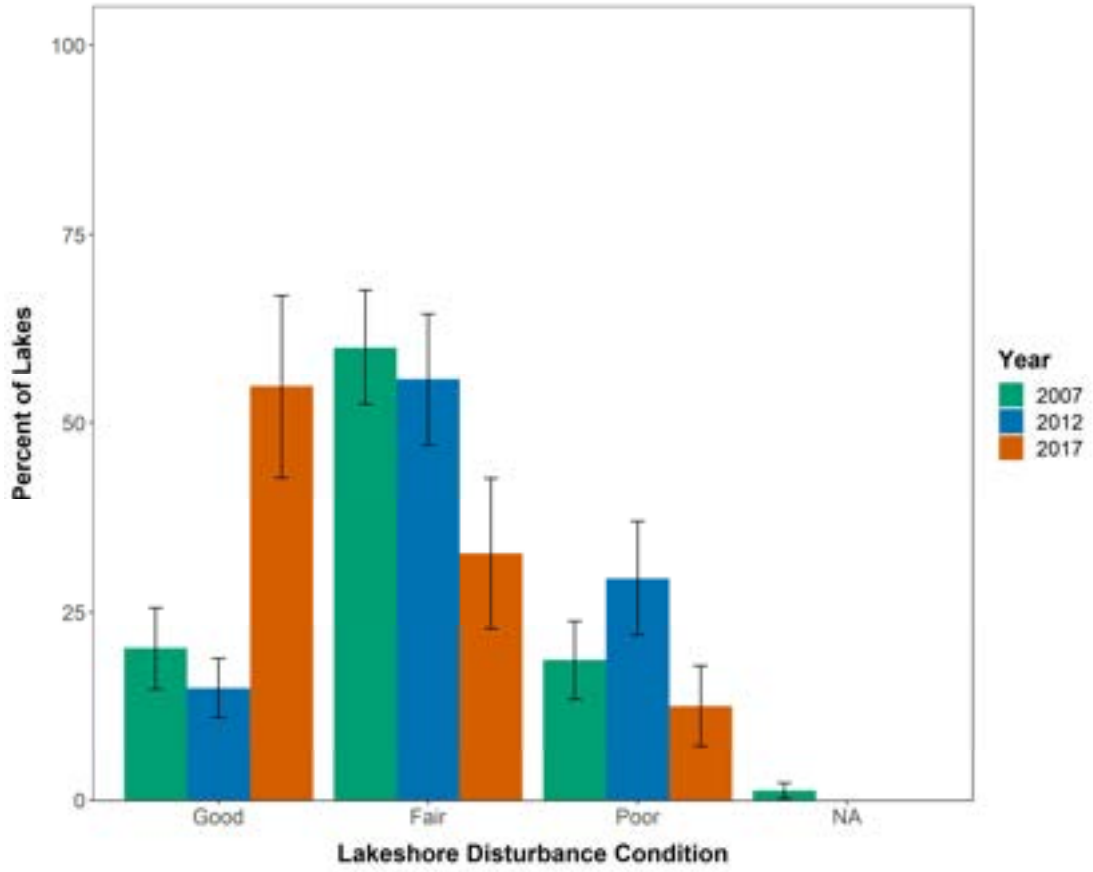
Hardened Shoreline

2017 Lakeshore Conditions- Lakeshore Disturbance

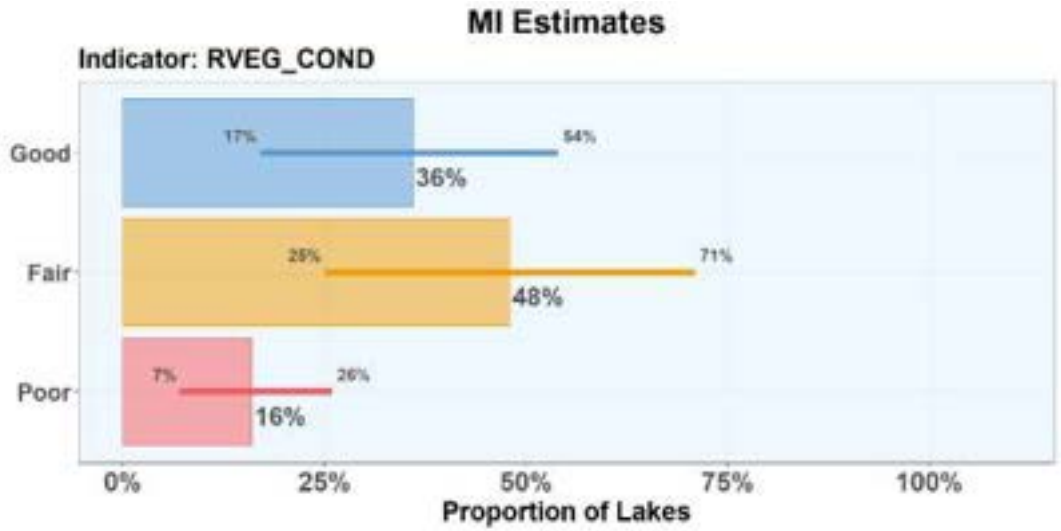


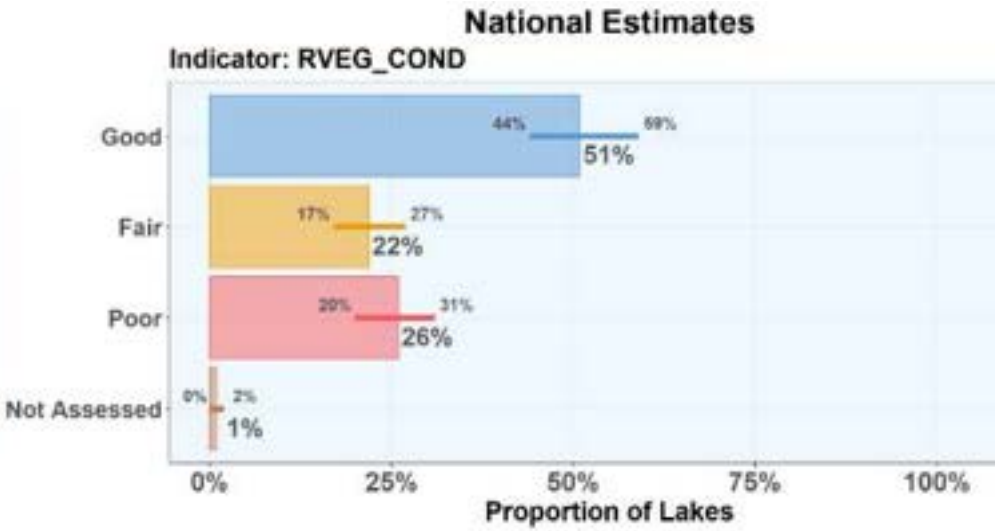


MI Lakeshore Conditions- Lakeshore Disturbance

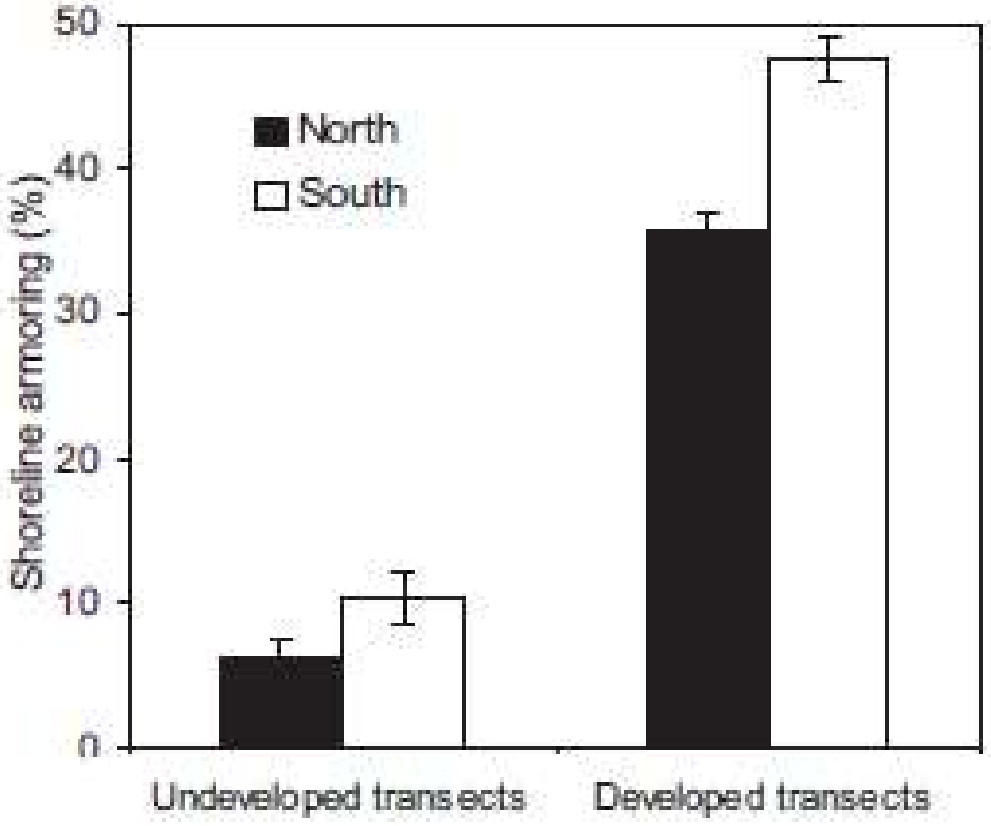


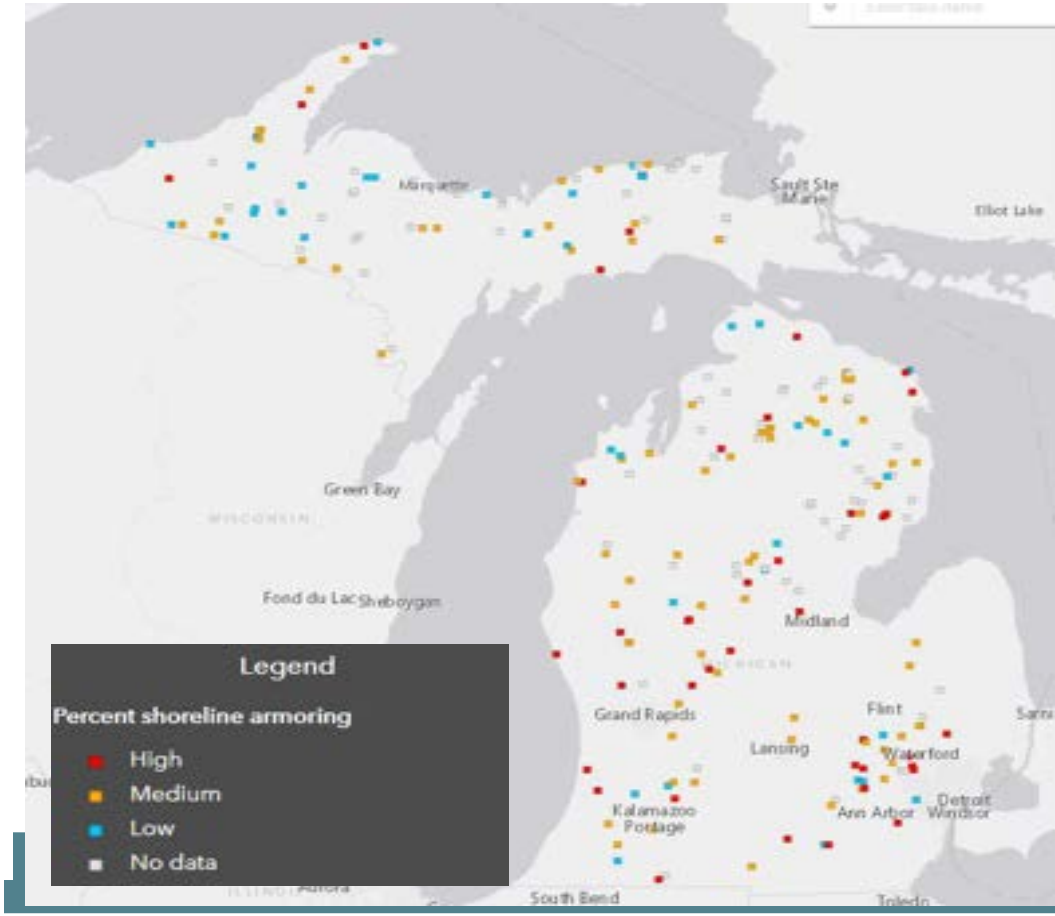
2017 Lakeshore Conditions-Riparian Vegetation



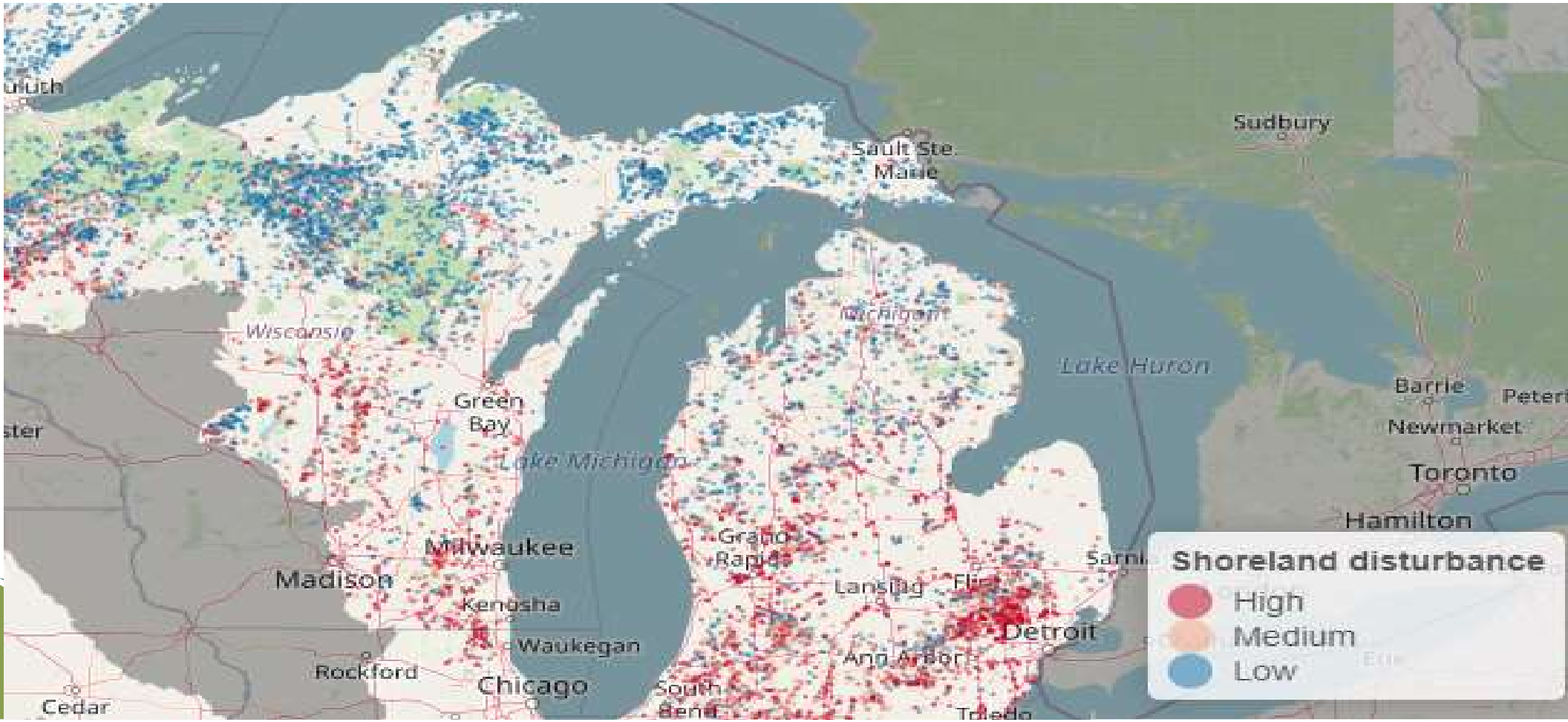


Shoreline armoring





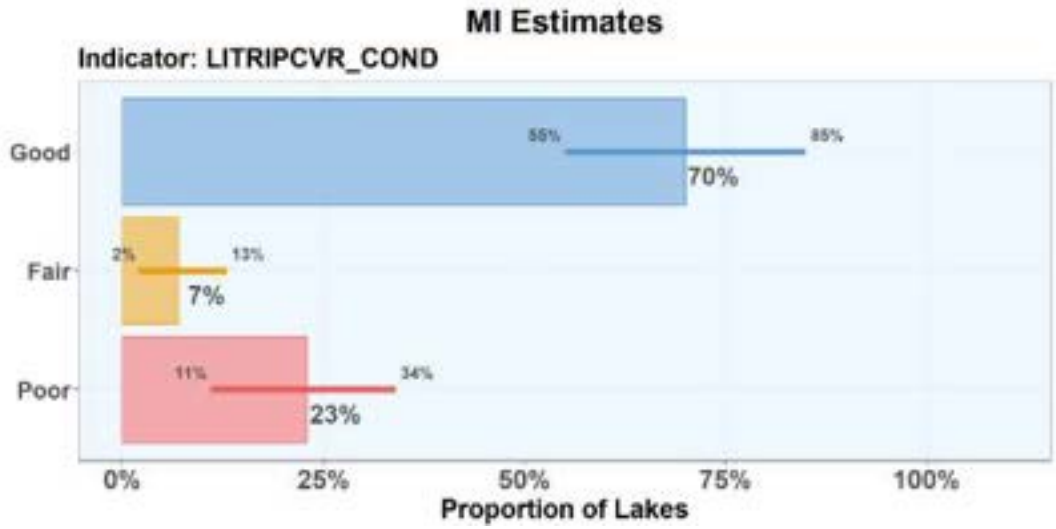
Shoreline development statewide

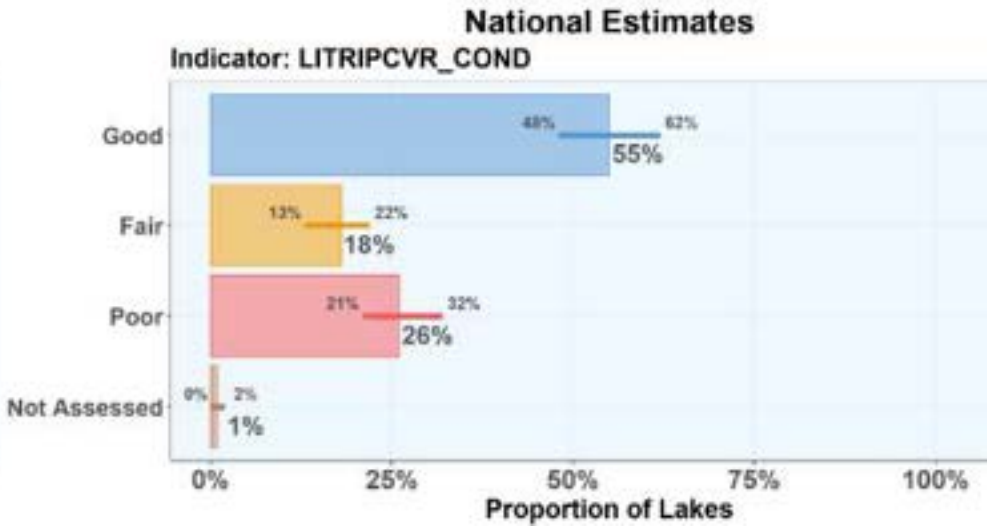


2017 NLA Littoral Indicators

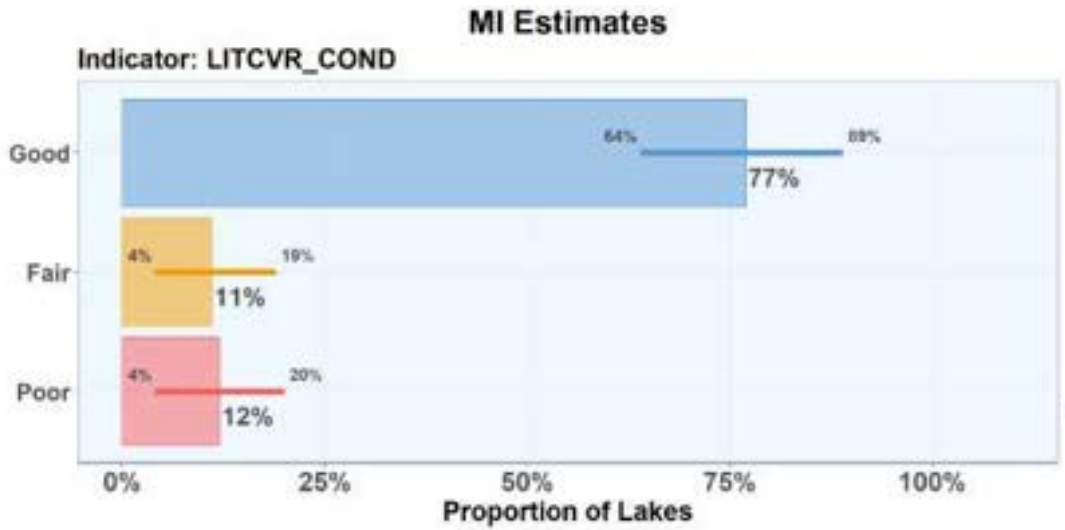
Shallow Water Habitat	Lake Habitat Complexity
Measures living and non-living features such as: • overhanging vegetation • aquatic plants • large woody snags • brush • boulders • rock ledges Variable shallow water habitat typically support more aquatic life	Combines riparian vegetation cover and shallow water habitat indicators to estimate the amount and variety of all cover types at the water's edge (land and water) High complexity creates more ecological niches for macroinvertebrates and fish

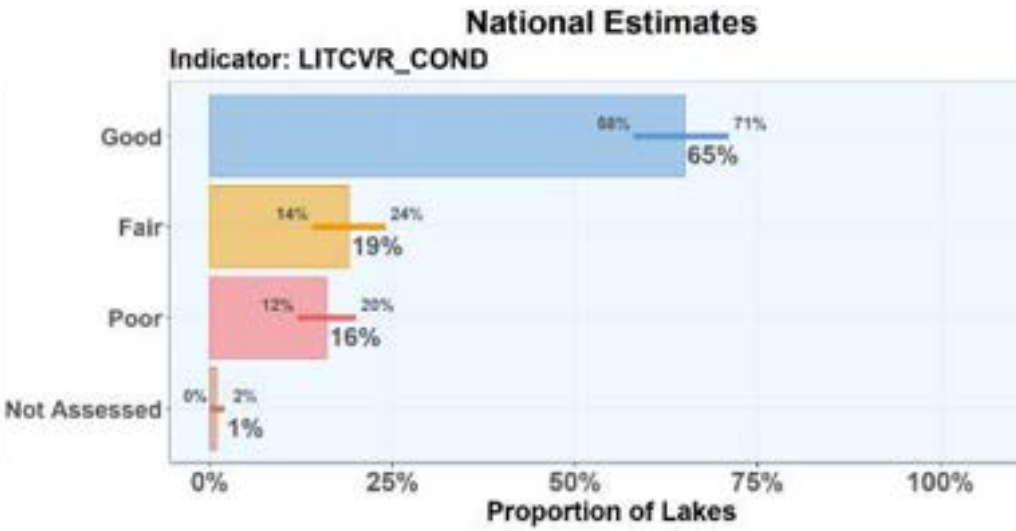
2017 Littoral Conditions- Lake Habitat Complexity



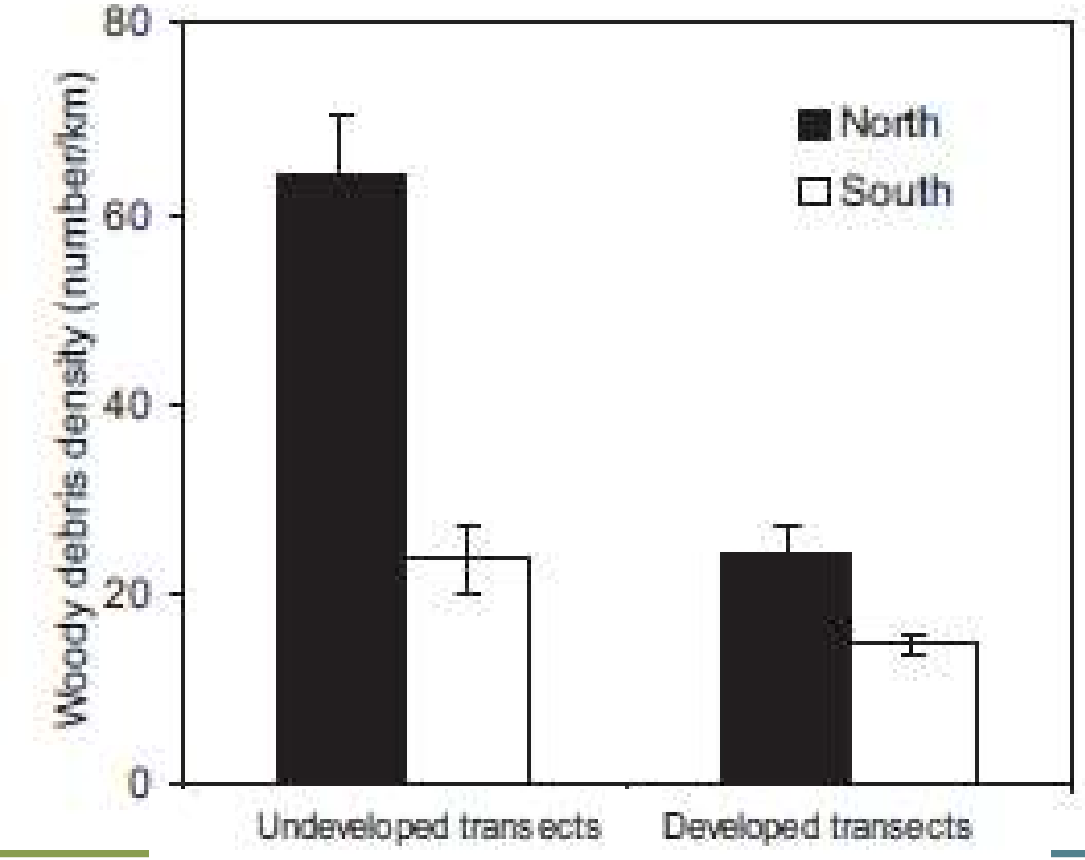


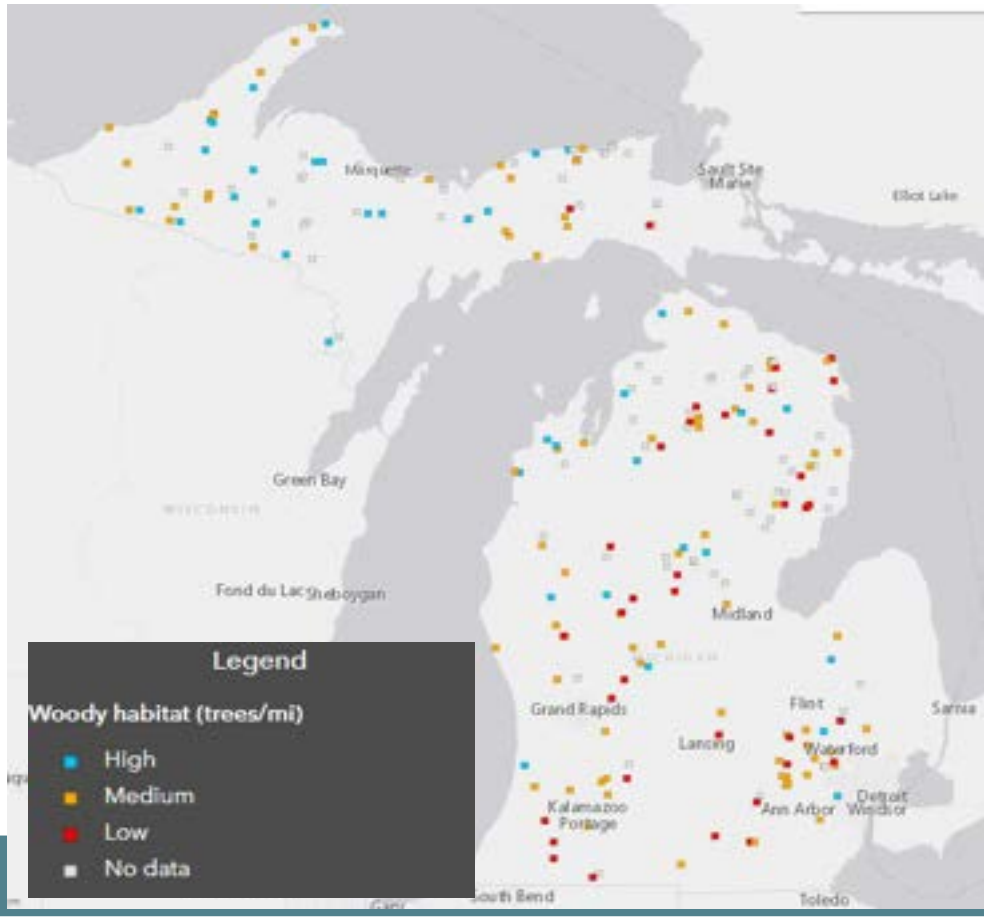
2017 Littoral Conditions-Shallow Water Habitat Condition

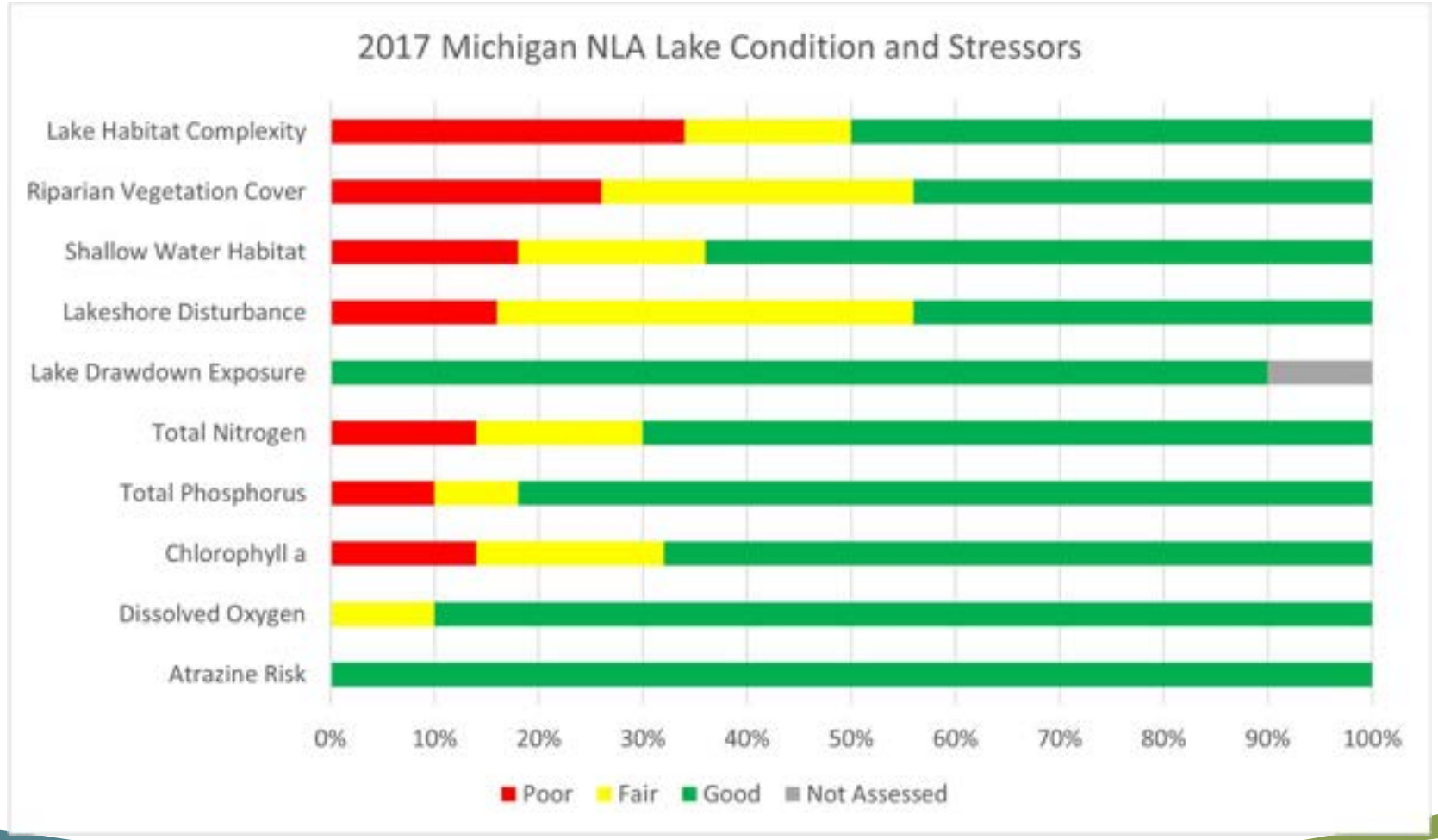




Woody habitat






2017 Michigan NLA Lake Condition and Stressors
Lake Habitat Complexity
Riparian Vegetation Cover
Shallow Water Habitat
Lakeshore Disturbance
Lake Drawdown Exposure
Total Nitrogen
Total Phosphorus
Chlorophyll a
Dissolved Oxygen
Atrazine Risk
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Poor
Fair
Good
Not Assessed

Extremes (all poor or all good)

2 lakes all “Poor”

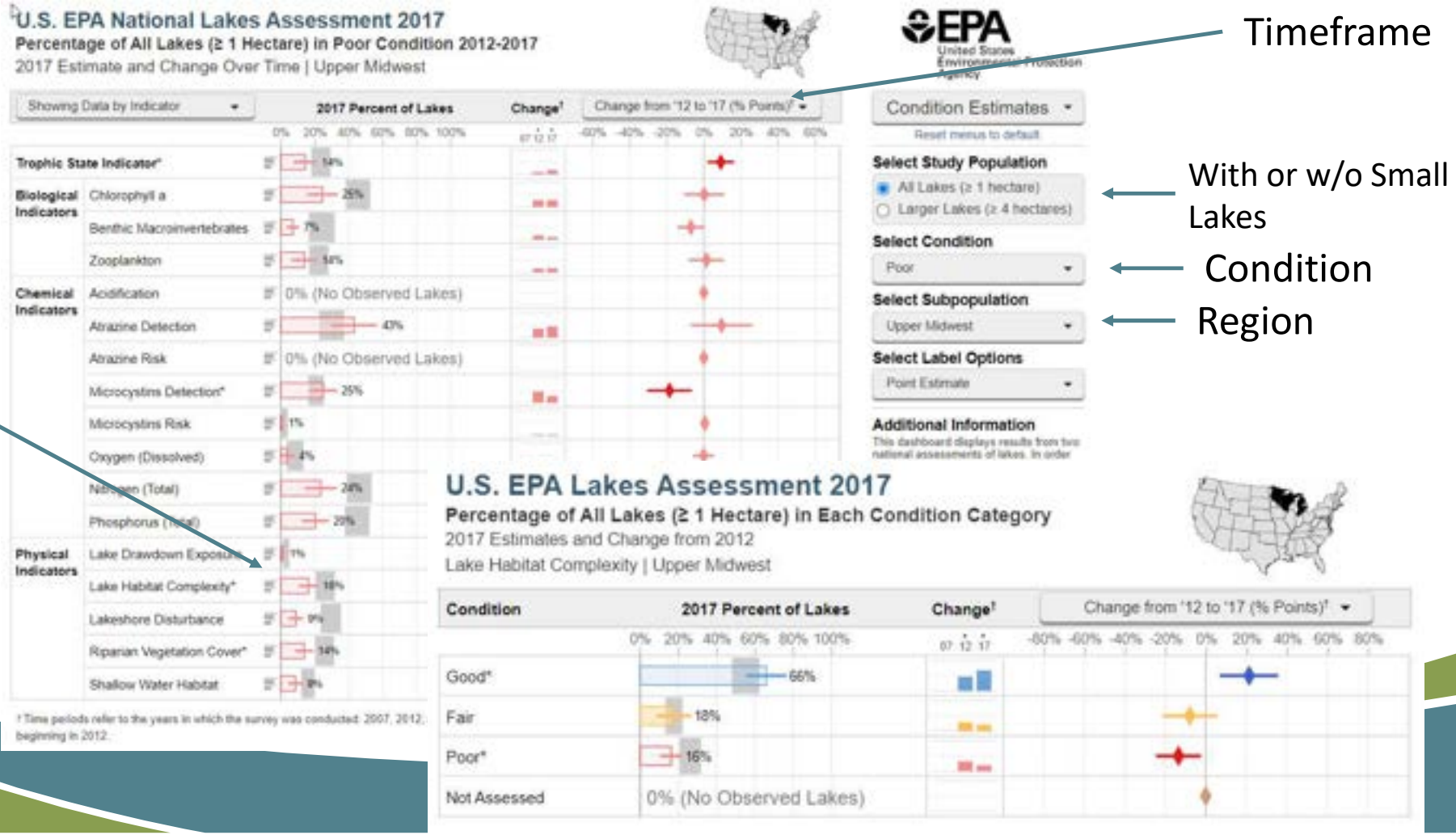
9 lakes all “Good”

Most Lakes NOT all poor or all good

Fair, Fair, Fair, Poor

Fair, Fair, Good, Poor

Data Dashboard https://nationallakesassessment.epa.gov/



Timeframe

With or w/o Small Lakes

Condition

Region

Extra Graphs

https://www.epa.gov/national-aquatic-resource-surveys/nla

How Does Your Lake Compare to Other U.S. Lakes?

You reported that your lake in Michigan (MI) had an observed value of 24.0 µg/L for Total Phosphorus in 2022. The graphs below show how your lake ranks at the state, regional and national levels compared to representative data collected by the U.S. National Lakes Assessment in 2017. For Total Phosphorus, a lower percentile ranking is generally preferable.

In MI, your lake is in the 83rd percentile.*

In Region 5, your lake is in the 44th percentile.*

Nationally, your lake is in the 34th percentile.*

*IMPORTANT: These population estimates are based on a weighted analysis of lake data from the U.S. EPA's 2017 U.S. National Lakes Assessment (NLA). Total Phosphorus was measured once at an open water location from May to October 2017. Sampled lakes were selected using a statistically representative approach that balances lake size with their distribution across the continental U.S. Results shown are weighted based on those factors. Percentiles are rounded to the nearest whole number. Estimated max. margin of error for MI percentile

Michigan Department of
Environment, Great Lakes, and Energy

Gary Kohlhepp
kohlheppg@michigan.gov