



## *Soil Health and Nutrient Strategies for Saginaw Bay*



# Indigenous Peoples of Lake Huron and Saginaw Bay



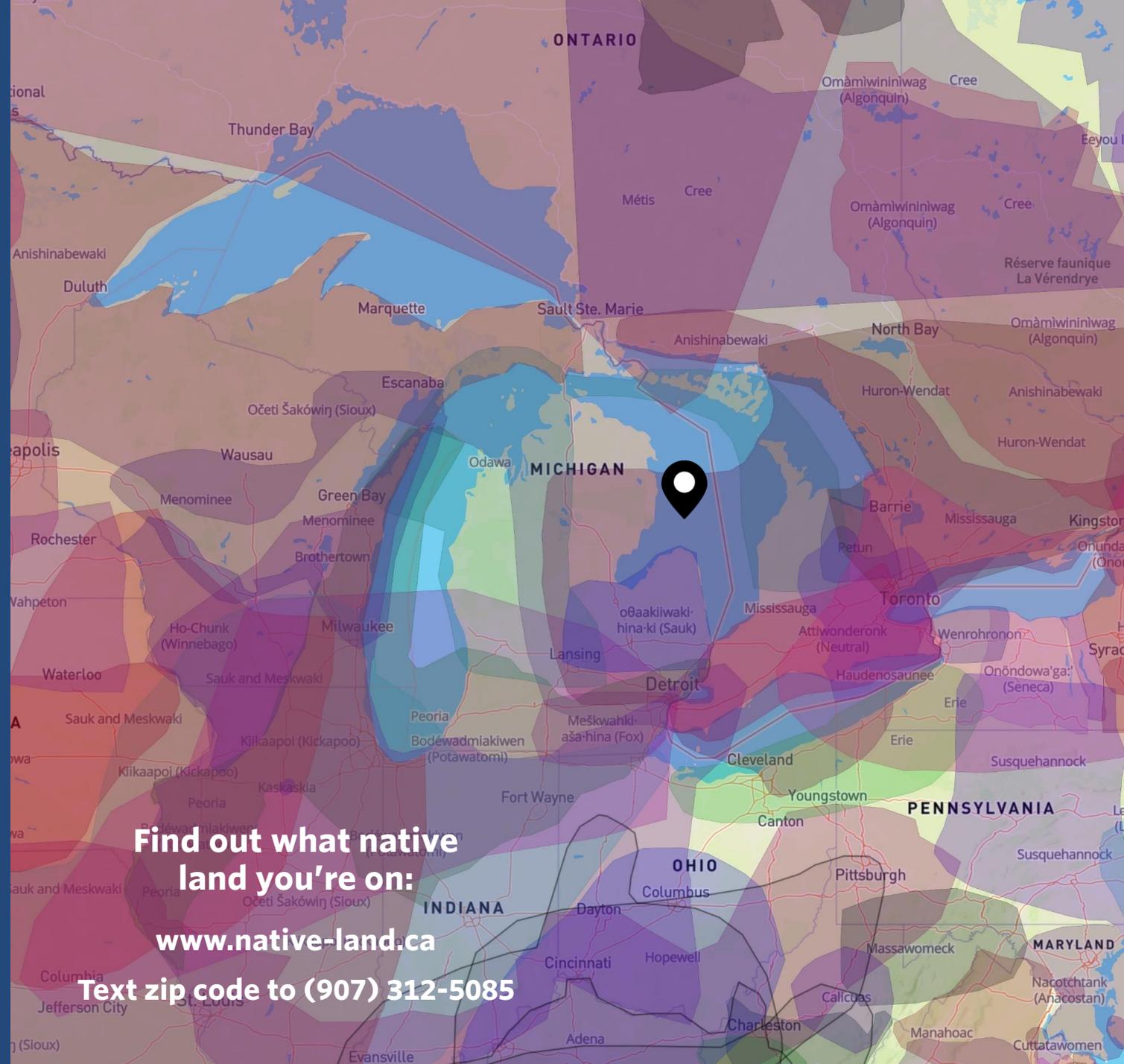
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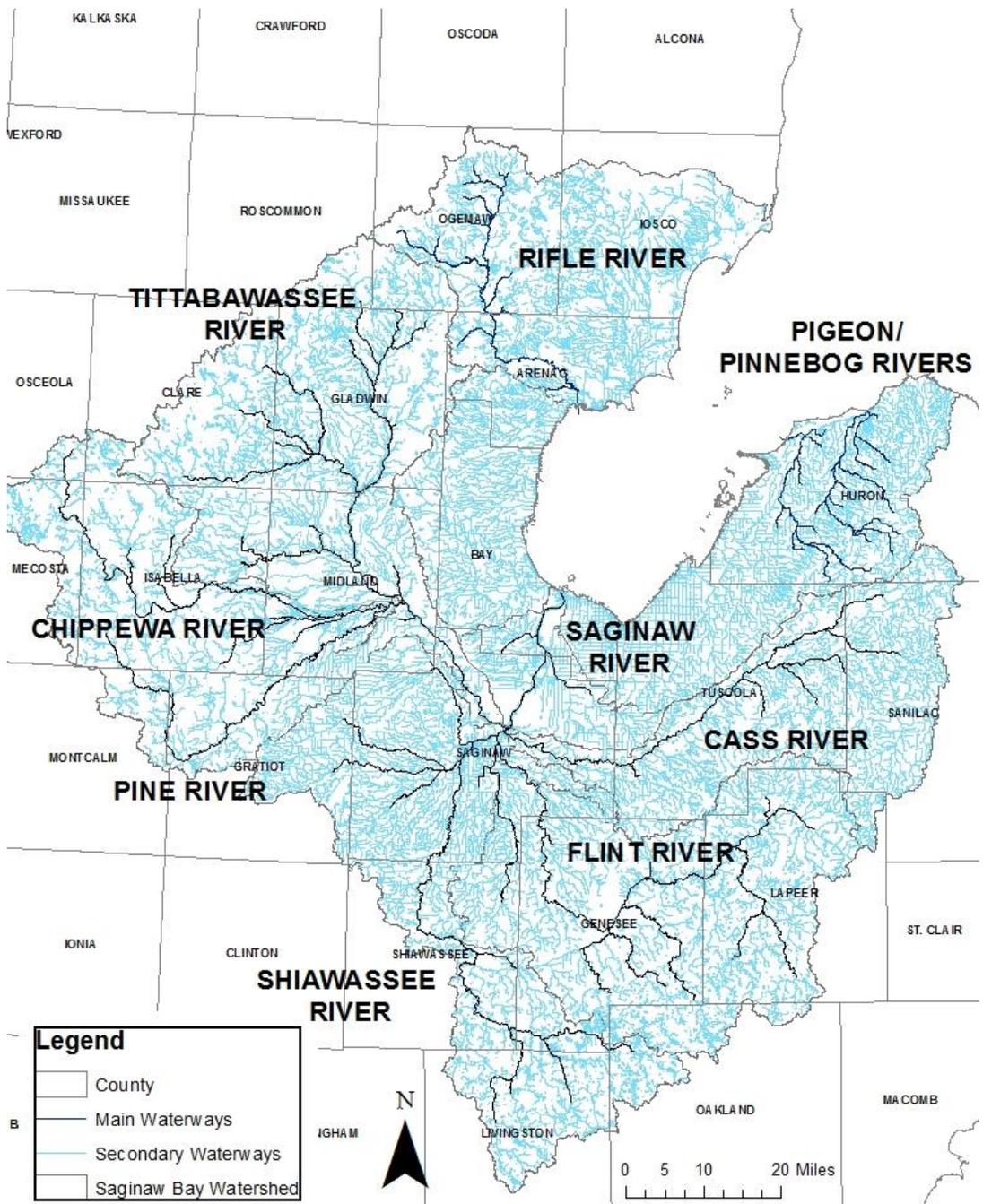
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# Topics

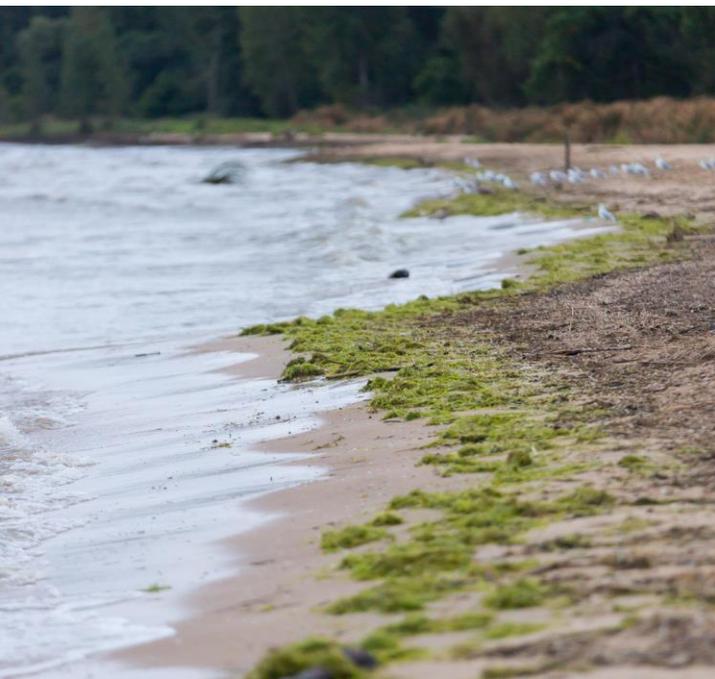
- Overview of Saginaw Bay and TNC's Soil Health and Nutrient Strategy
- The Saginaw Bay Monitoring Consortium





# Saginaw Bay Watershed

- Largest watershed in Michigan
  - 8,700 square miles
  - ~ 7,000 miles of rivers and streams
- ½ is farmland = 2.2 million acres
  - Corn
  - Soybeans
  - Wheat
  - Drybeans
  - Sugar Beets
  - Potatoes
  - Cucumbers (pickles)
- Important for MI's \$13 billion ag economy
- Migrating birds on the Mississippi Flyway
- Expansive fish spawning habitat & important fishery



# Problems in the Bay and Watershed

## Altered hydrology

- 1,930 miles of ditches

## Historical changes

- Lumbering & late 19<sup>th</sup> century fires
- Forests gave way to tilled fields

## Impacts from sediment & nutrients

- Degraded stream fish and invertebrate communities
- Loss of reef spawning habitat
- Excessive algal growth (HABs and Muck) → nearshore
- Invasive species → zebra & quagga mussels
- Lake Huron offshore → nutrients decreasing

## Saginaw River and Bay

- Designated by EPA as an ***Area of Concern***
  - Originally 12 of 14 BUIs
- Inner Bay designated as Impaired by MI EGLE in 2022

## HABs and Impairment

*“The **repeated, persistent, and extensive cyanobacteria blooms** impacting the inner portion of Saginaw Bay, as evidenced by both NOAA satellite imagery as well as EGLE’s recent shoreline monitoring data have been determined to be excessive/nuisance conditions leading to ecological imbalance”*

From: *Water Quality and Pollution Control in Michigan 2022: Sections 303(d), 205(b), and 314 Integrated Report* – MI Department of Environment, Great Lakes, and Energy 2022

<https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/WRD/SWAS/2022-Integrated-Report.pdf?rev=0a6b006c0cc44bcd936c75d5608659ed&hash=03A5B2B0F3379B07D369F289BA32C483>

## Saginaw Bay nutrient impairment designation

Sarah Fronczak, Erica Rogers and Monica Jean, Michigan State University Extension - March 31, 2022

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Saginaw Bay in Lake Huron is on a proposed list of impaired waters due to nuisance algae blooms.



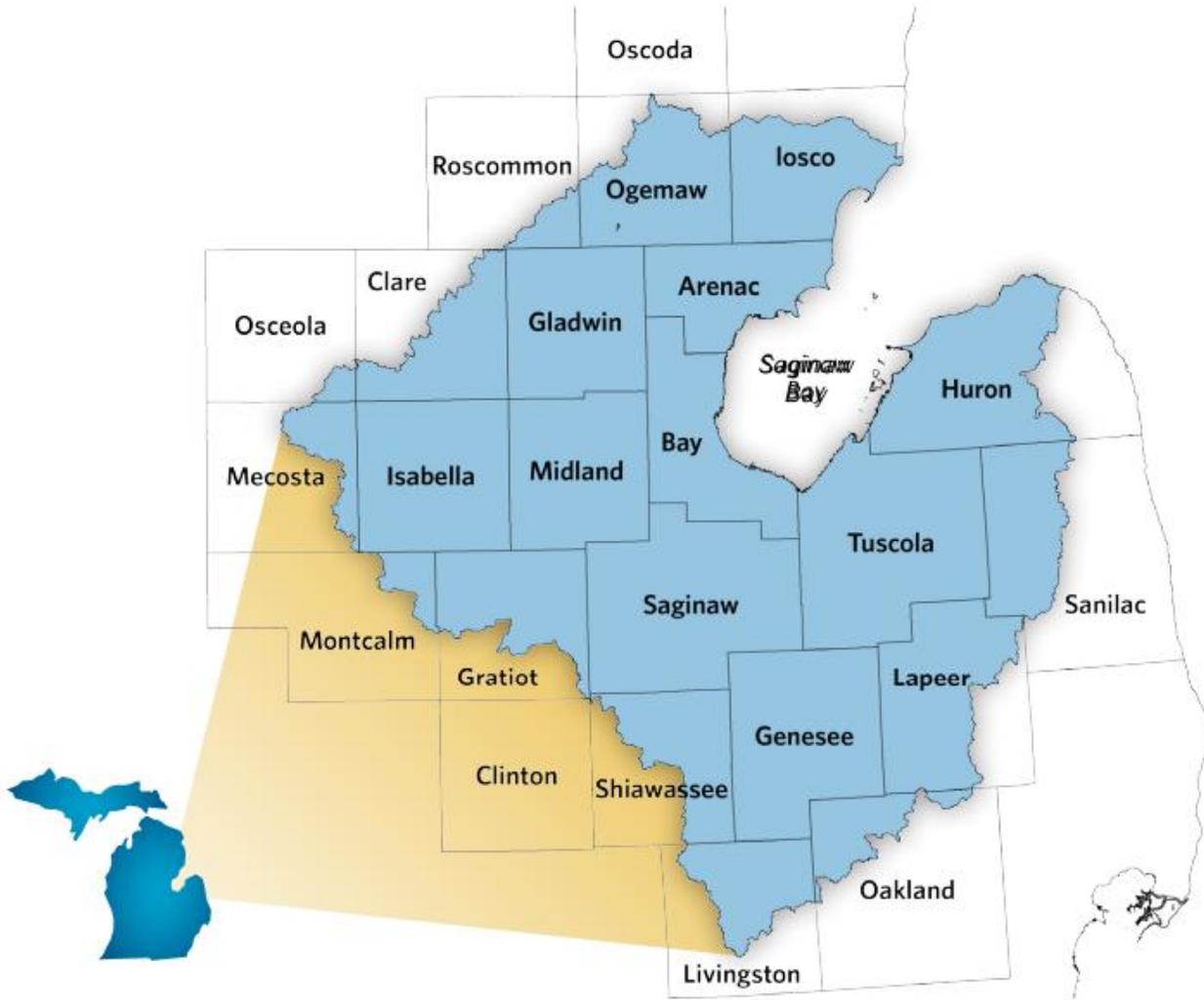
<https://www.canr.msu.edu/news/saginaw-bay-nutrient-impairment-designation-2022>

# Soil Health & Nutrients in the Saginaw Valley

TNC's Soil Health & Nutrient program:

- Connects farmers with research, technical resources, peer networks, program offerings and direct technical assistance
- Supports farmers in the decision-making process toward choosing conservation practices for their farm.

Visit [SoilSavings.com](https://www.soilsavings.com) to learn more!



# Practice goal

*Best practices on **50%** of farmland  
in the Saginaw Bay watershed*



# Project Highlights

## Accessing Subsidized Strip-tillage Equipment Trial (ASSET)

- 5-year effort to demonstrate success with strip tillage in sugar beets

## Sustainable Options: Wheat

- Partnership with Star of the West Milling Co. to demonstrate incentive models with creation of a new "sustainably grown" specialty market

## Dairy: Feed in Focus

- Working with dairy farmers to reduce greenhouses gasses & improve soil health

## Farmer-led Watershed Groups

- Local leaders sharing successes & lessons learned

## Saginaw Bay Monitoring Consortium

- Developing a coordinated monitoring framework



# The Saginaw Bay Monitoring Consortium (SBMC)

Coordinating Team members and affiliations

Gust Annis  
Douglas Pearsall  
Rebecca McNitt  
Autumn McGowan



Jennifer Bailey  
Troy Techlin



Sherry Martin  
Lisa Fogarty



John Bratton



Bretton Joldersma  
Jennifer Tewkesbury



Abigail Eaton  
Joseph Kelpinski



Craig Stow



David Karpovich  
Rebecca Bowen



# Key Questions:

- What is the condition of the Bay and its tributary streams?
- Has progress been made toward restoration?
- Has the interim phosphorus loading target\* been met and is it appropriate?
- What is the status of the AOC's Eutrophication BUI?
- What are appropriate restoration criteria for the Eutrophication BUI?

\*440 metric tonnes per year, 2012  
*Great Lakes Water Quality Agreement*



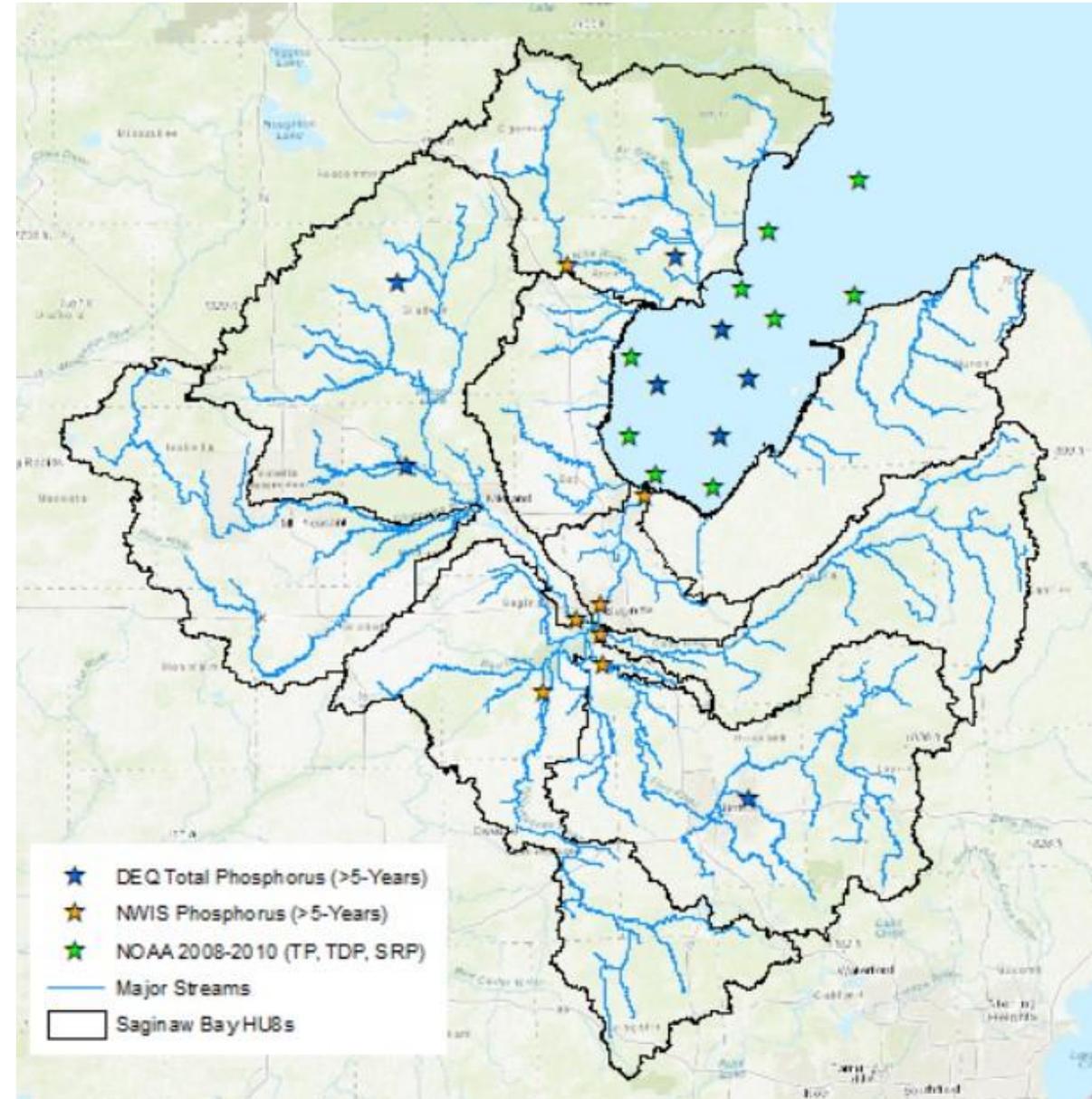
To answer our questions, we need additional data

- In the right locations and frequency
- Collected over several years
- Co-located with active stream gages
- Uniformity of sampling and analysis protocols

**Map with data >5 Years →**

- About 11 tributary sites
- Even fewer at gage sites
- Even fewer with same protocols/methods
- Even fewer in 'idealized' locations

Limited data



## 10 Saginaw Bay (open water) sites

- Sampled/measured by NOAA GLERL

## 18 tributary sampling locations

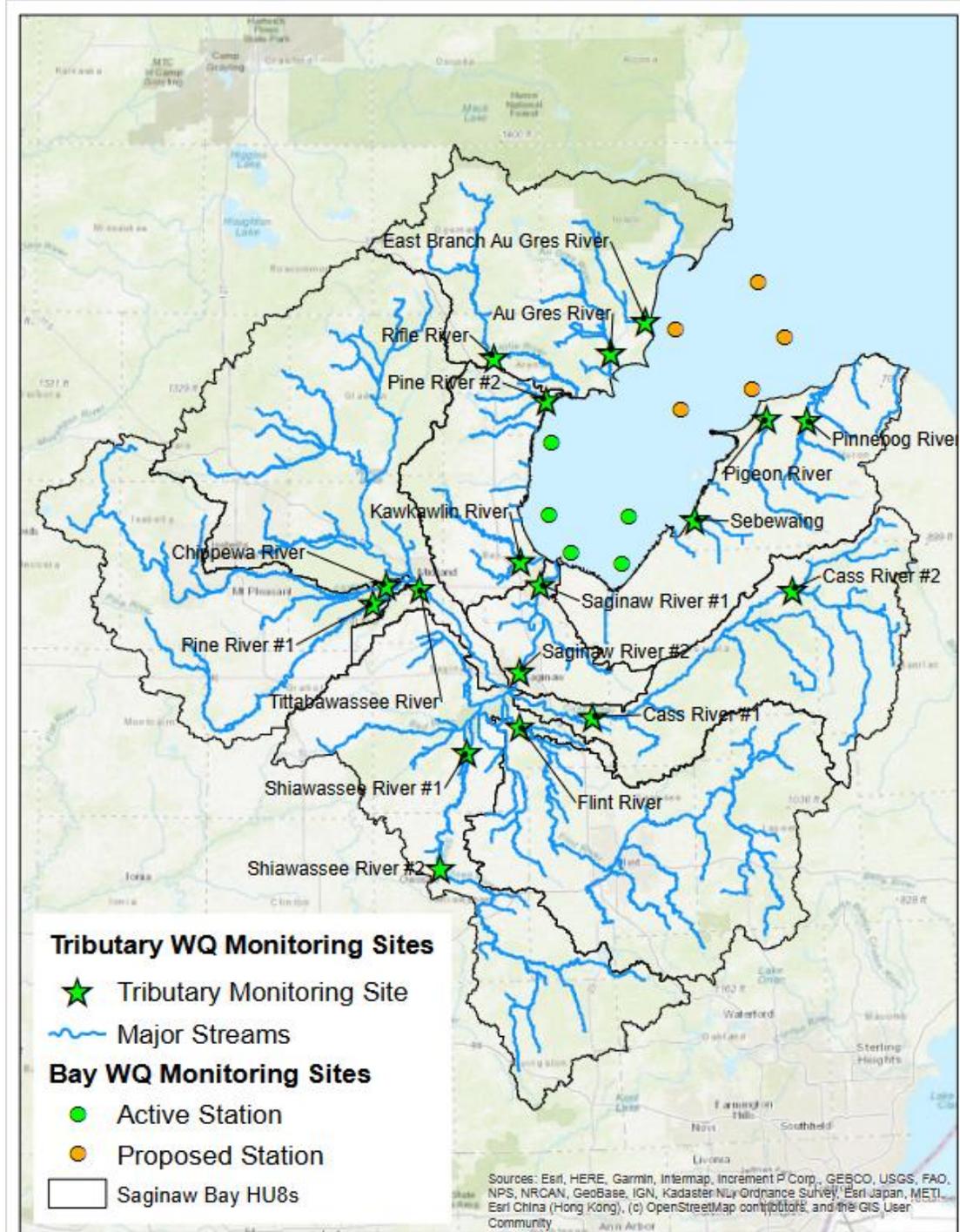
- 6 with existing USGS gages
- 12 new or upgraded gages
- 10 in Saginaw R watershed
- 8 in coastal watersheds

## Tributary monitoring objectives

- Capture major sub-watersheds of the Saginaw River:
- Represent smaller, coastal tributaries with substantial ag land in the western and eastern parts of the watershed.
- Inform where pollutants in run-off are an issue and how they affect the bay, i.e., calculate sediment and nutrient loadings

## Site Selection Criteria

- Land use
- Proximity to Saginaw Bay
- Flow conditions
- Site conditions and year-round physical accessibility
- Local importance
- USGS Gage Status



# Priority Water Quality Parameters

	Stream	Bay
Stressor	Total Phosphorus (TP) Dissolved Reactive Phosphorus (DRP) Nitrate ( $\text{NO}_3^-$ ) Nitrite ( $\text{NO}_2^-$ ) Ammonium ( $\text{NH}_4^+$ ) Discharge (for loading) Total Suspended Solids (TSS)* E. coli*	Total Phosphorus (TP) Dissolved Reactive Phosphorus (DRP) Nitrate ( $\text{NO}_3^-$ ) Nitrite ( $\text{NO}_2^-$ ) Ammonium ( $\text{NH}_4^+$ ) Total Suspended Solids (TSS)* E. coli*
Response	Stream health (macroinvertebrate IBI) Turbidity Dissolved oxygen (DO)	Harmful Algal Blooms Chlorophyll Dissolved oxygen (DO) Turbidity (secchi) Muck Beach closures

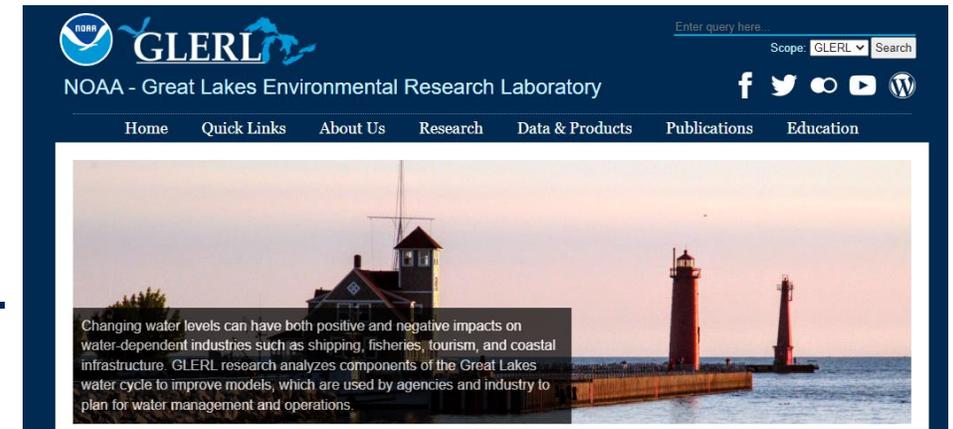
\*These parameters are important to some stakeholders but not budgeted for the initial phase of implementation. They may be added later.

The next three slides were contributed by Craig Stow, NOAA GLERL

# Saginaw Bay Water Quality Data

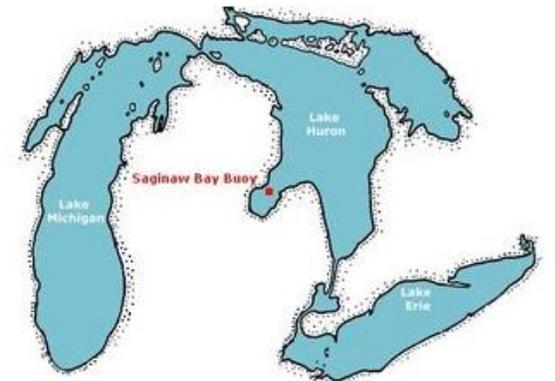
NOAA Great Lakes Environmental Research Laboratory (GLERL) has historical data back to 1991.

- Since 2014 monitoring has been at 4-5 inner bay sites, approximately biweekly
- Buoy in “deep-hole” transmits real-time sensor-based data including temperature and dissolved oxygen concentration
- In 2023 additional Great Lakes Restoration Initiative (GLRI) funding will support enhanced monitoring and a second buoy in the outer bay



## Realtime Coastal Observation Network (ReCON) Station

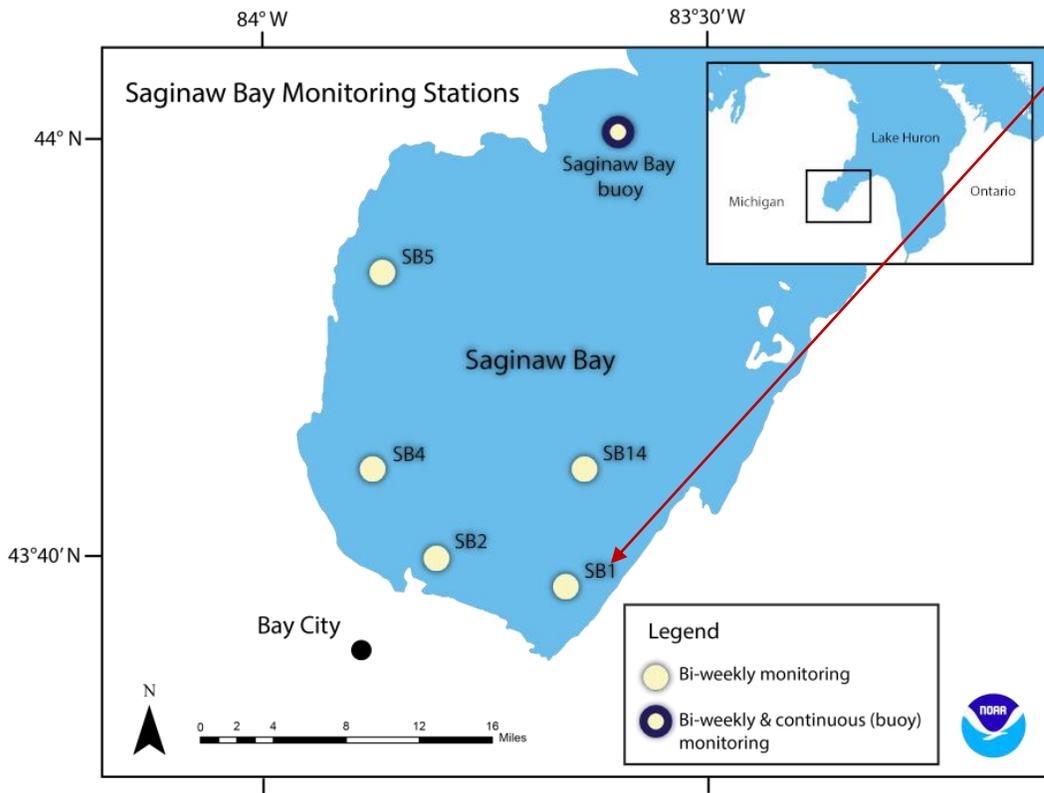
**Saginaw Bay Buoy** Location: 43° 59.0790' N, 83° 35.7858' W, Depth: 44 ft (13.5 m)



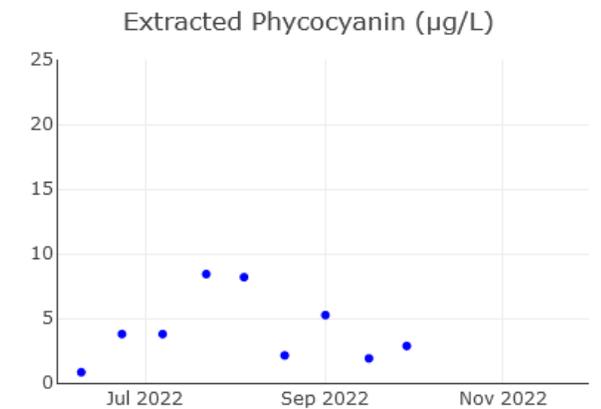
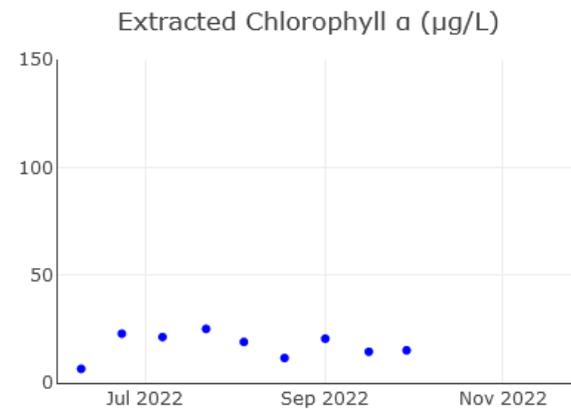
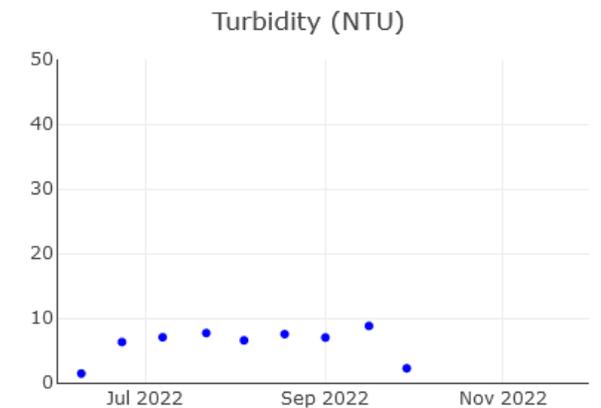
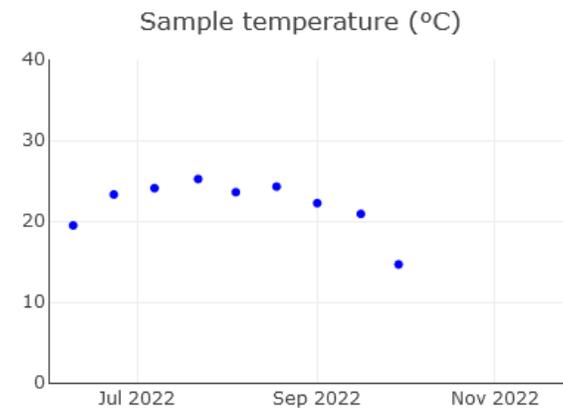
<https://www.glerl.noaa.gov/res/recon/station-sbb.html>

Current year data can be viewed at: [https://www.glerl.noaa.gov/res/HABs\\_and\\_Hypoxia/sb-weekly-current/](https://www.glerl.noaa.gov/res/HABs_and_Hypoxia/sb-weekly-current/)

### Latest data for SB1 as of Thu Sep 29 2022



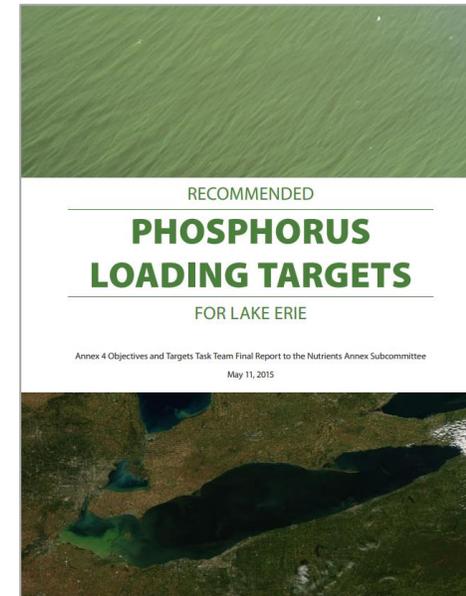
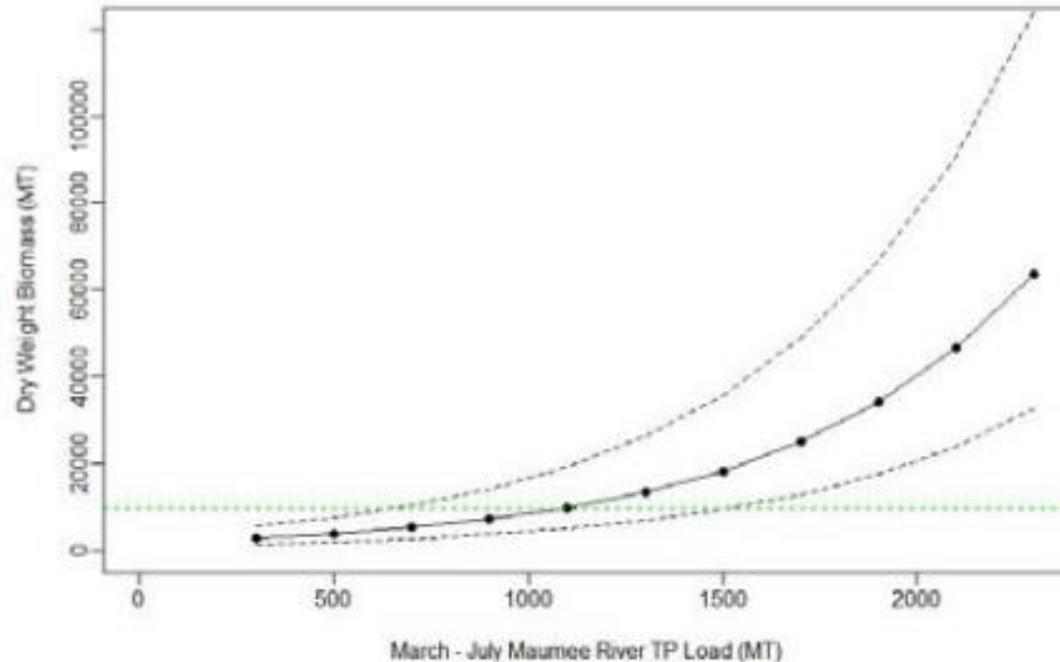
Sample temperature (°C)	14.62926
Turbidity (NTU)	2.22
Extracted Chlorophyll $\alpha$ ( $\mu\text{g/L}$ )	15.08
Extracted Phycocyanin ( $\mu\text{g/L}$ )	2.85
Particulate Microcystin ( $\mu\text{g/L}$ )	0.34
Dissolved Microcystin ( $\mu\text{g/L}$ )	Below Detection Limit



Historical data available at:  
<https://www.ncei.noaa.gov/>

# How will the new data be used?

- Determine the **nutrient and sediment loads** from tributaries to the bay
- Identify **priority sub-watersheds** for **soil and nutrient conservation**
- **Evaluate and update** the Saginaw Bay **annual phosphorus loading target**
- **Monitor progress** of Saginaw Bay restoration



Example model-generated “stressor-response curve” used to estimate updated Lake Erie phosphorus load target



# Thank You!



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