

The National Coastal Condition Assessment Western Lake Michigan and Southern Lake Superior



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Terra MODIS image of Wisconsin. Space Science and Engineering
Center (SSEC) at the University of Wisconsin-Madison

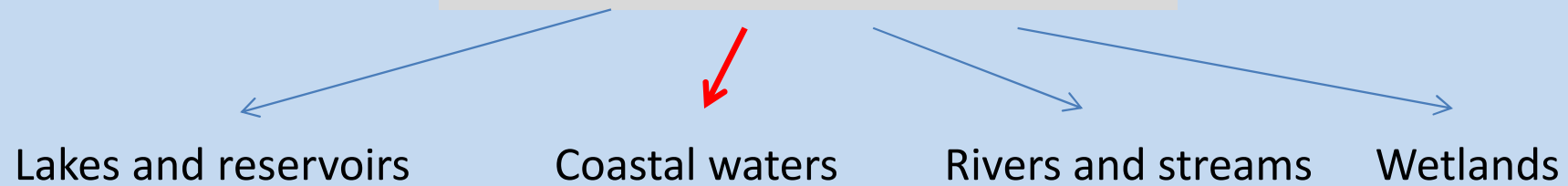
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...with additional information on the WDNR nearshore survey

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National Aquatic Resource Surveys



Great Lakes

Marine

Lake Ontario

Lake Superior

Lake Michigan

Lake Erie

Lake Huron

Western Shore L. Michigan and portion of Southern L. Superior

The primary goal of the NCCA

To assess the condition of the nation's coastal waters via an unbiased, statistically-representative approach by addressing two key questions about the quality of the Nation's coastal waters:

- What percent of the Nation's coastal waters are in good, fair, and poor condition for key indicators of water quality, ecological health, and recreation?
- What is the relative importance of key stressors such as nutrients and contaminated sediments?

Other key objectives:

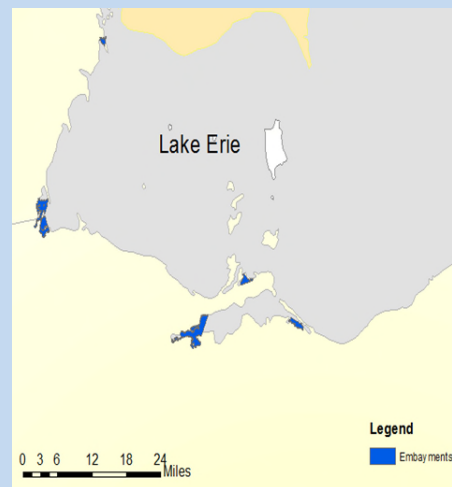
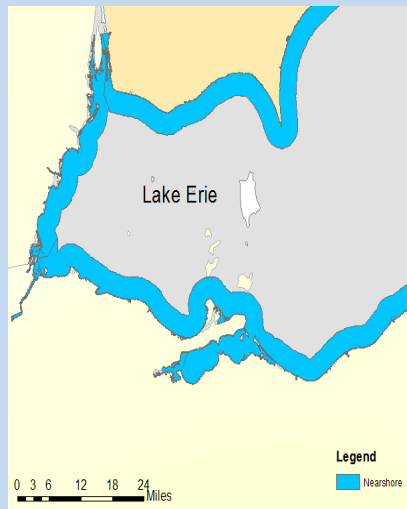
- Evaluate changes in condition from previous studies
- Help build state and tribal capacity for monitoring and assessment, and promote collaboration

Assessment is directed and sponsored by US EPA



WDNR Photo

- 1,104 sites in estuarine and Great Lakes nearshore waters
- 35,400 square miles of U.S. coastal waters.
- Same methods at all sites to ensure that results would be nationally comparable.



In the Great Lakes.....

- Sample size of 45 sites in Near Shore zone for each Great Lake
- Sample sizes were allocated proportional to shoreline length by state within each Great Lake.
- Embayment study added 150 sites into the Great Lakes assessment.

Coastal Condition Indicators

Water Quality Indicator:

- Water Clarity – Secchi, PAR
- DO, Temp, pH
- Chlorophyll α
- Nutrients (DIN, DIP, TP, TN)



Benthic Indicator:

- Oligochaete Trophic Index

Sediment Quality Indicator:

- Toxicity (10-day amphipod survival)
- Contaminants (PAHs, PCBs, Metals, Pesticides)
- TOC
- Grain Size

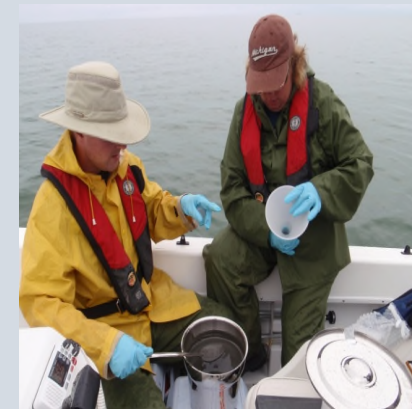


Fish Tissue Indicator:

- Whole-Fish Contaminant Burden – same as Sed chem

Human Health Indicator:

- Fillet – Fish Contaminant Burden (Great Lakes Only)
- Fish Plug for Mercury (new to 2015)
- Enterococci
- Microcystin/ Algal Toxins (new to 2015)
- Phytoplankton and Underwater Footage (Great Lakes Only)



2010 and 2015 Great Lakes Enhancements

- Embayment Study
- Phytoplankton Study
- Underwater Camera study
- Human Health Fish Tissue Study
- National Park Service Study (2010 only)
- Lake Erie Subbasin study (2015)
- Connecting Channels Study (2015)



The WDNR was responsible for surveying 20 of the 225 total NCCA Great Lake sites. There were 13 sites in Lake Michigan and 7 sites in Lake Superior



Wisconsin DNR Nearshore Survey

Objectives

- What is the spatial and temporal variation in nearshore nutrient concentrations?
- What are the long-term trends in nearshore nutrient concentrations?
- What is the density and distribution of *Cladophora* along Wisconsin's Lake Michigan coastline?
- Support of ongoing and new nutrient and ecosystem research



WDNR Nearshore Survey Summary

Garden Penn.

Sturgeon
Bay

Kewaunee

Manitowoc

Sheboygan

Milwaukee

Kenosha

Sampling

- 16 sites
- Mid-summer
- 10 m contour
- Profiles

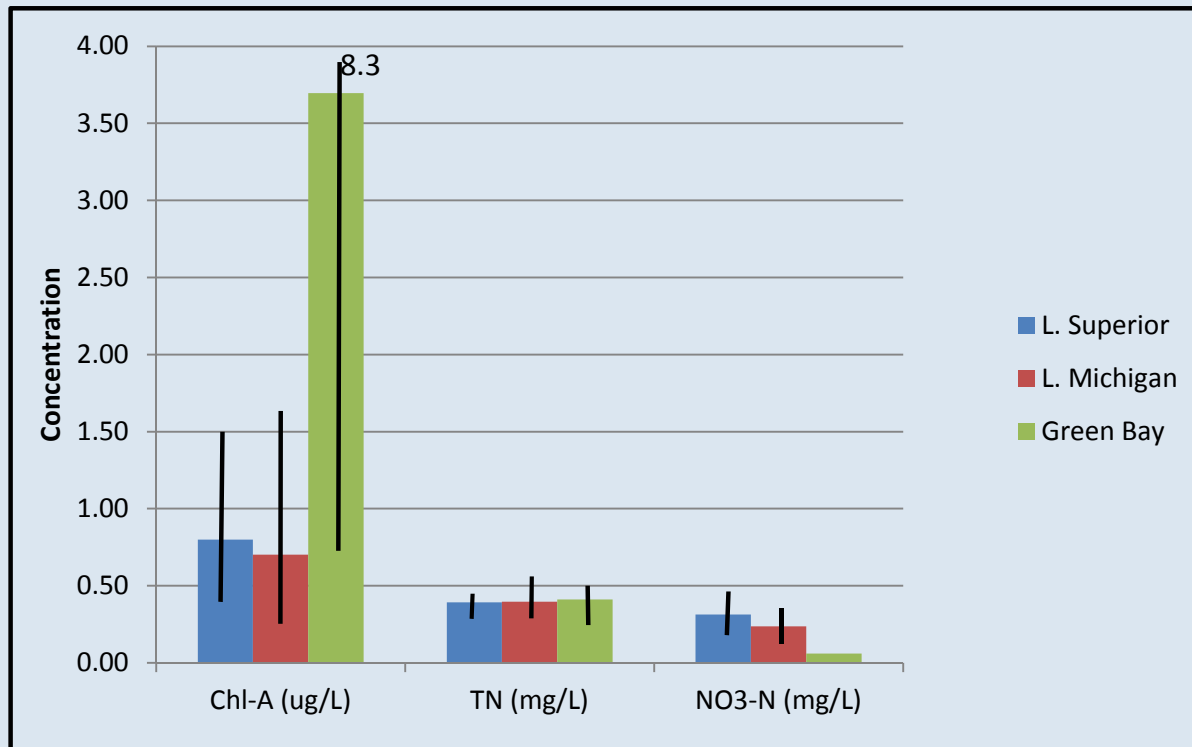
Chemistry

- Total Kjeldahl N
- Ammonia
- Nitrate
- Cl
- Dis. Si
- Total suspended solids
- Total P
- Total dissolved P
- Dissolved reactive P

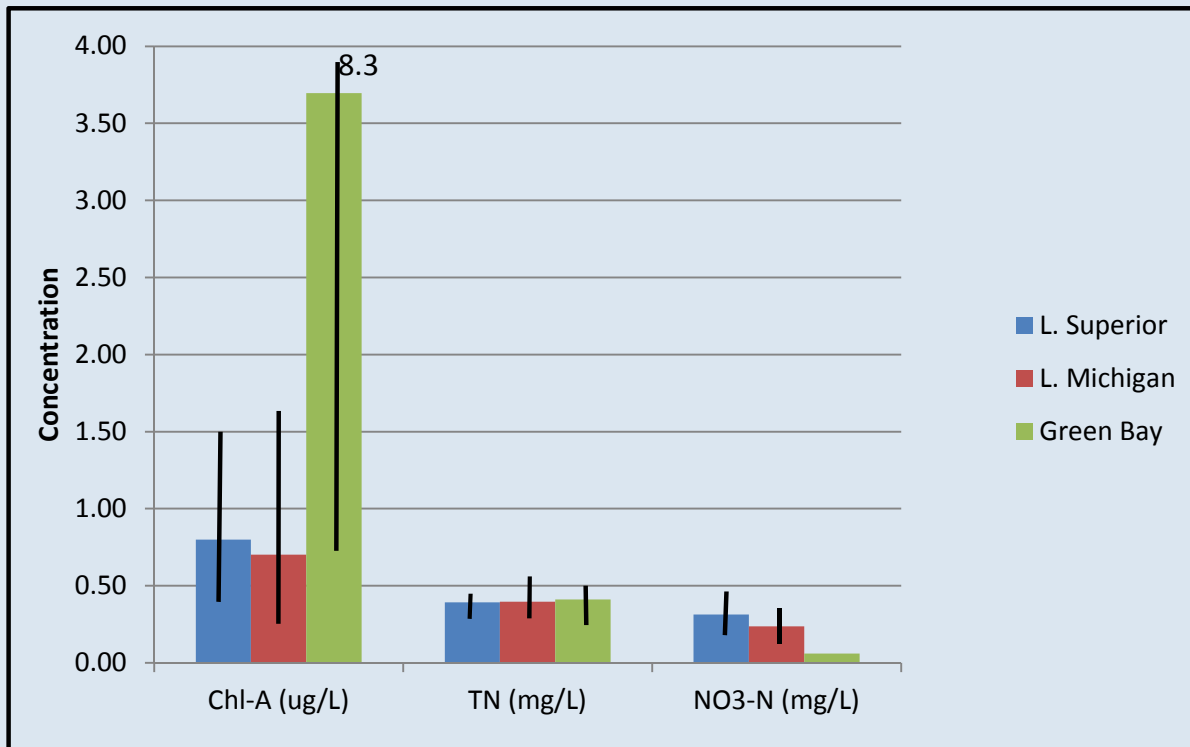
Cladophora Distribution and Characteristics

- 10 m
- Substrate
- Density
- Dreissenid mussels

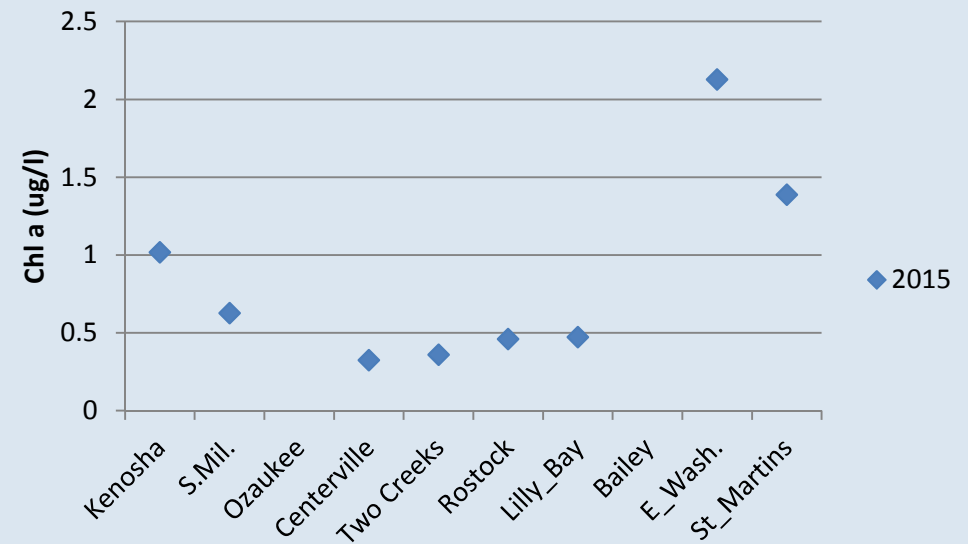
2015 NCCA Water Quality results



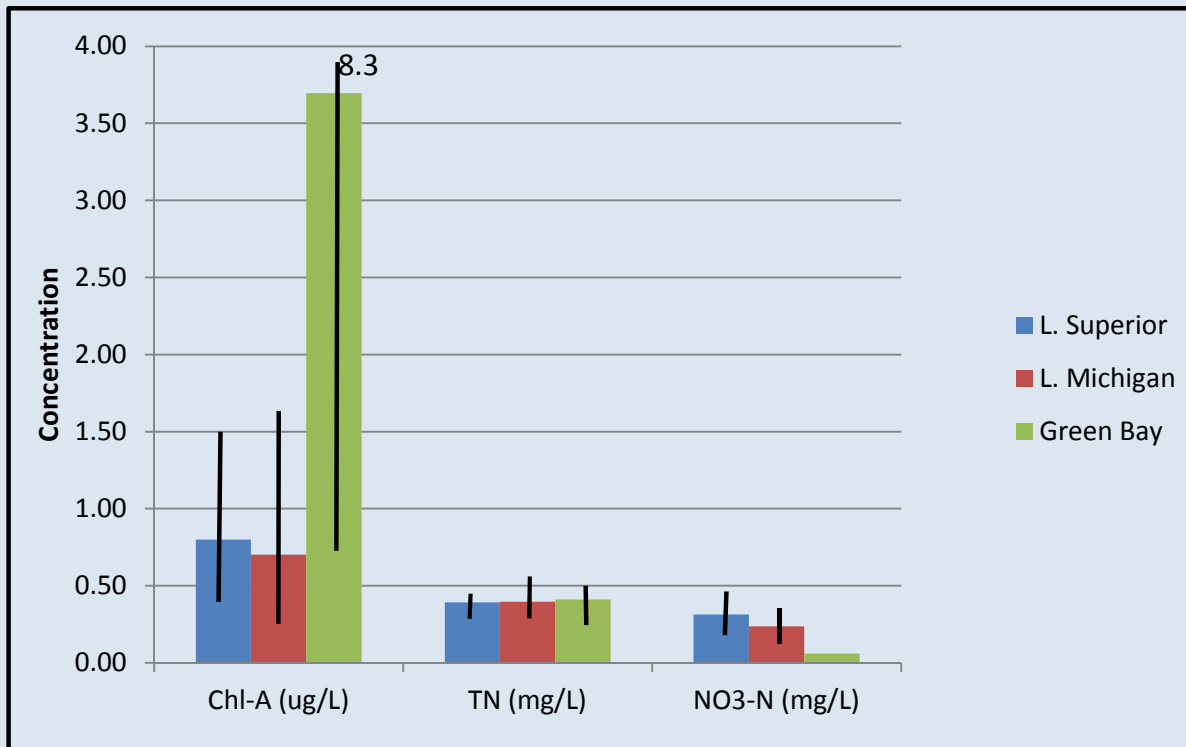
2015 NCCA Water Quality results



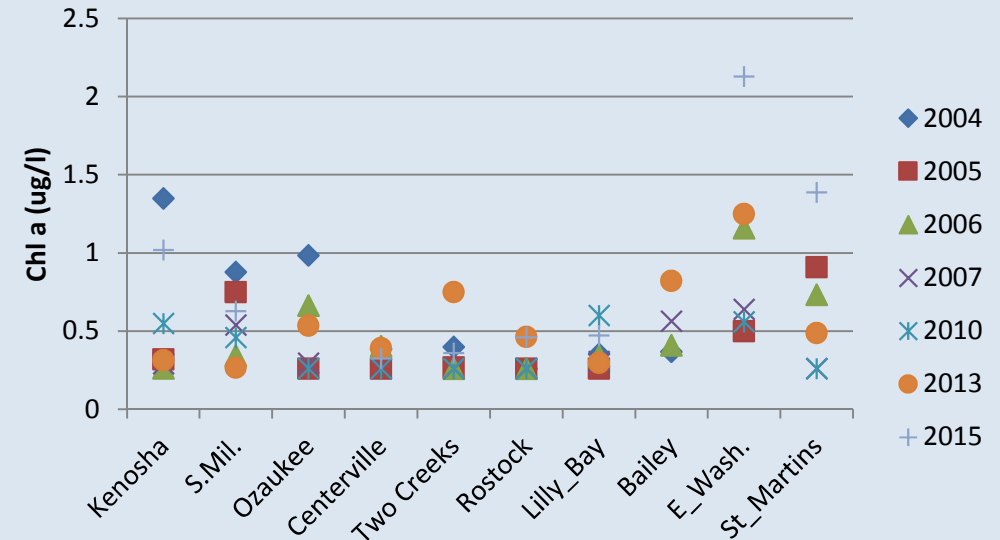
WDNR Nearshore Survey



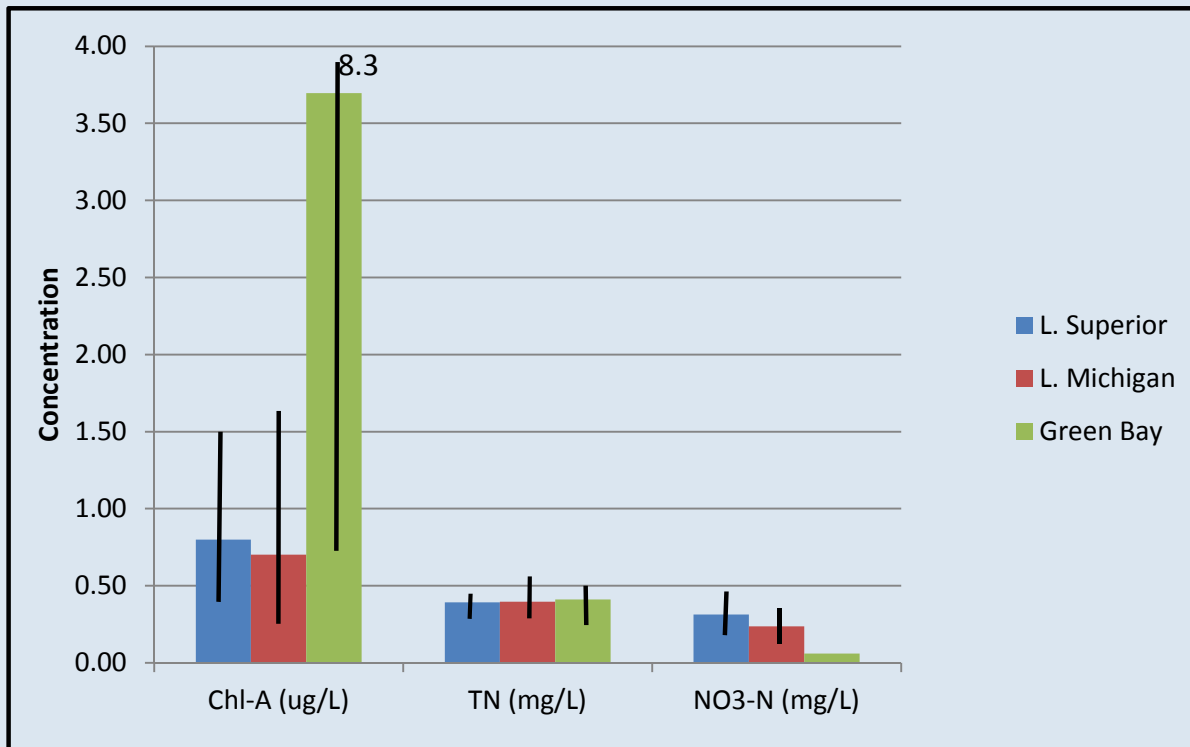
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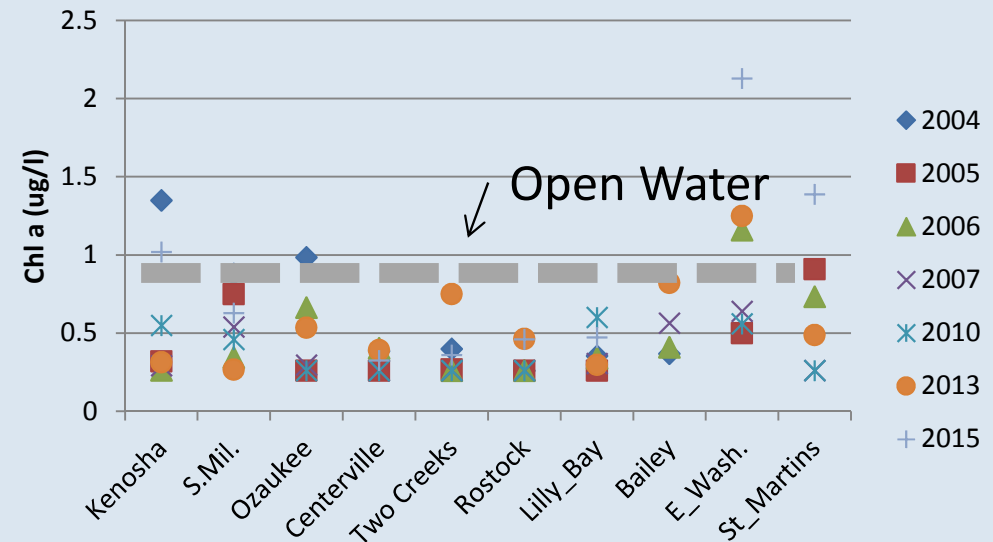
WDNR Nearshore Survey



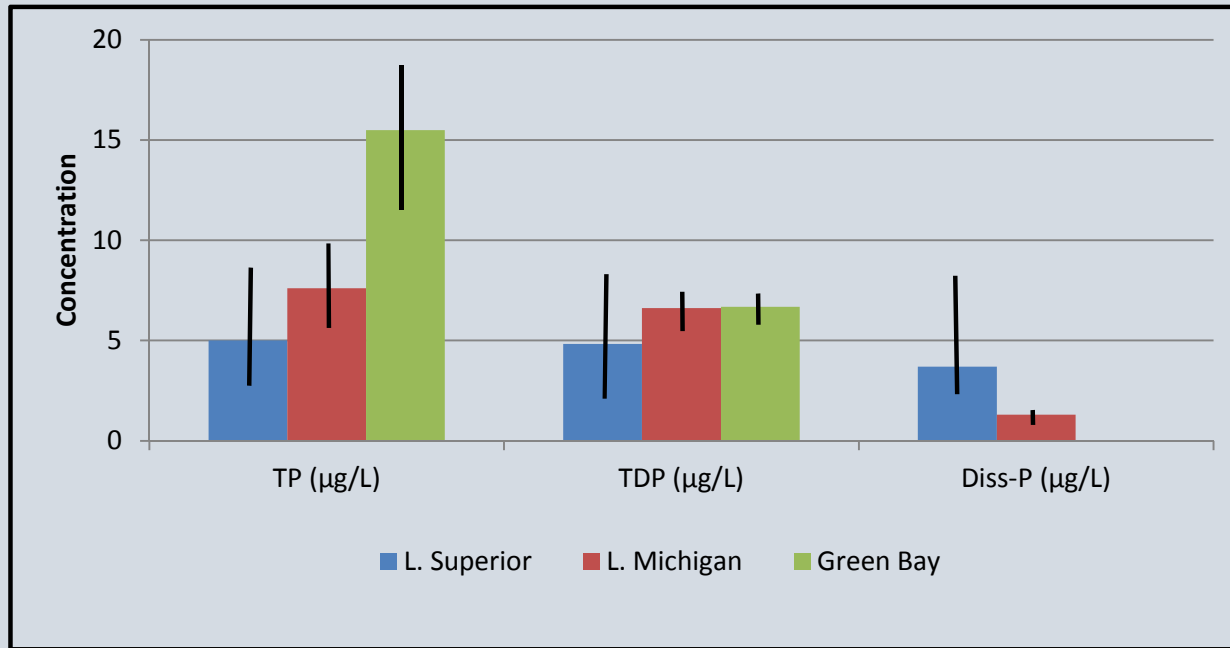
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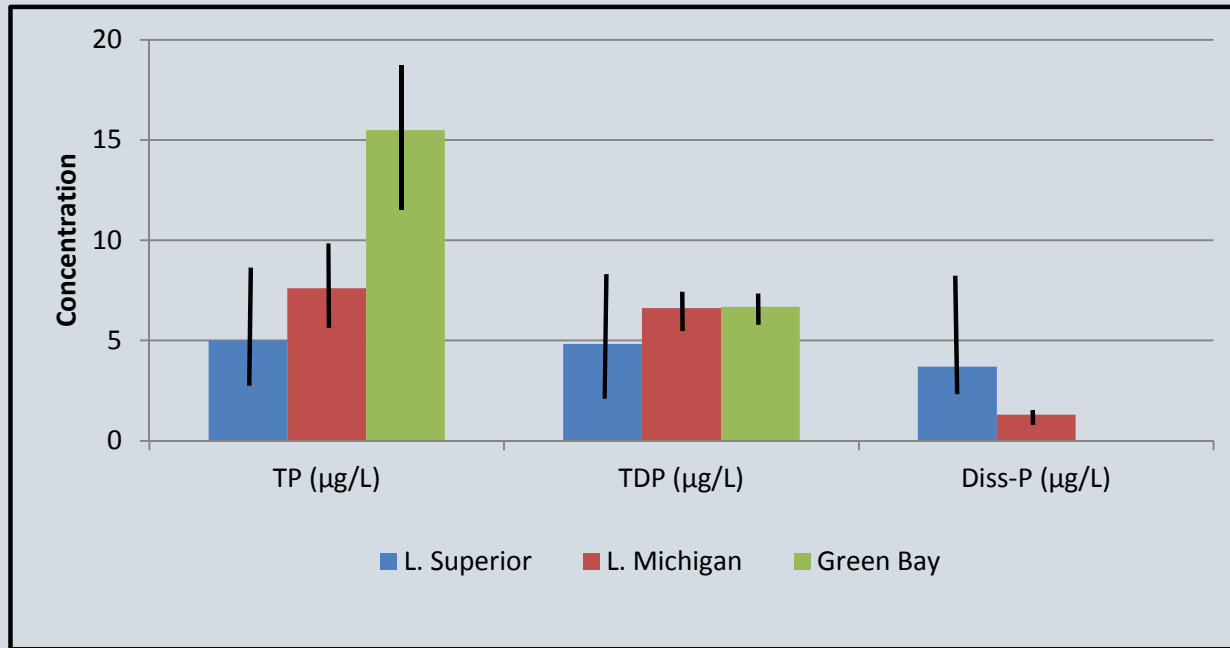
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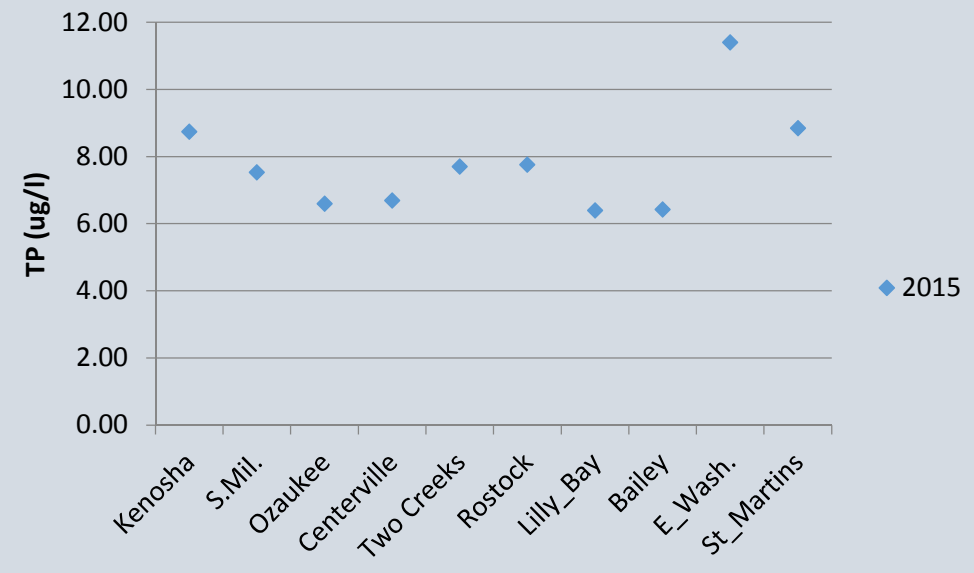
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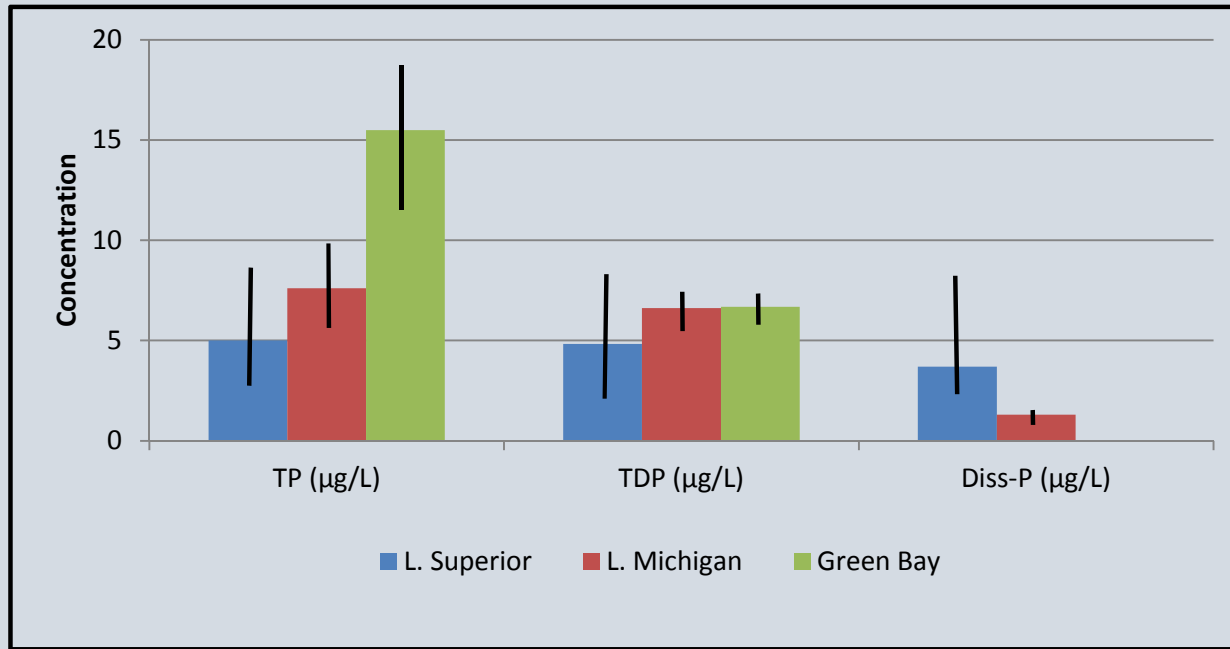
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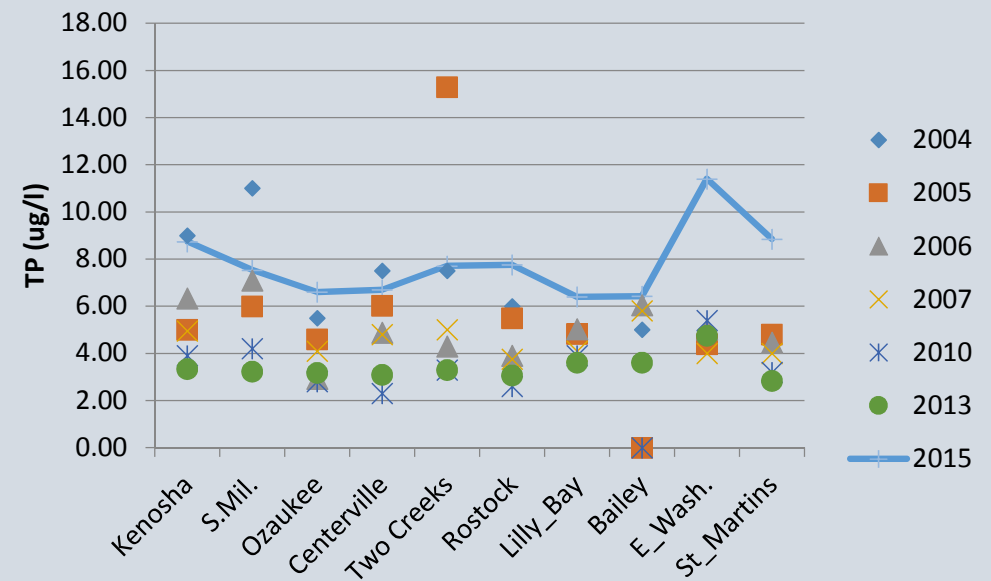
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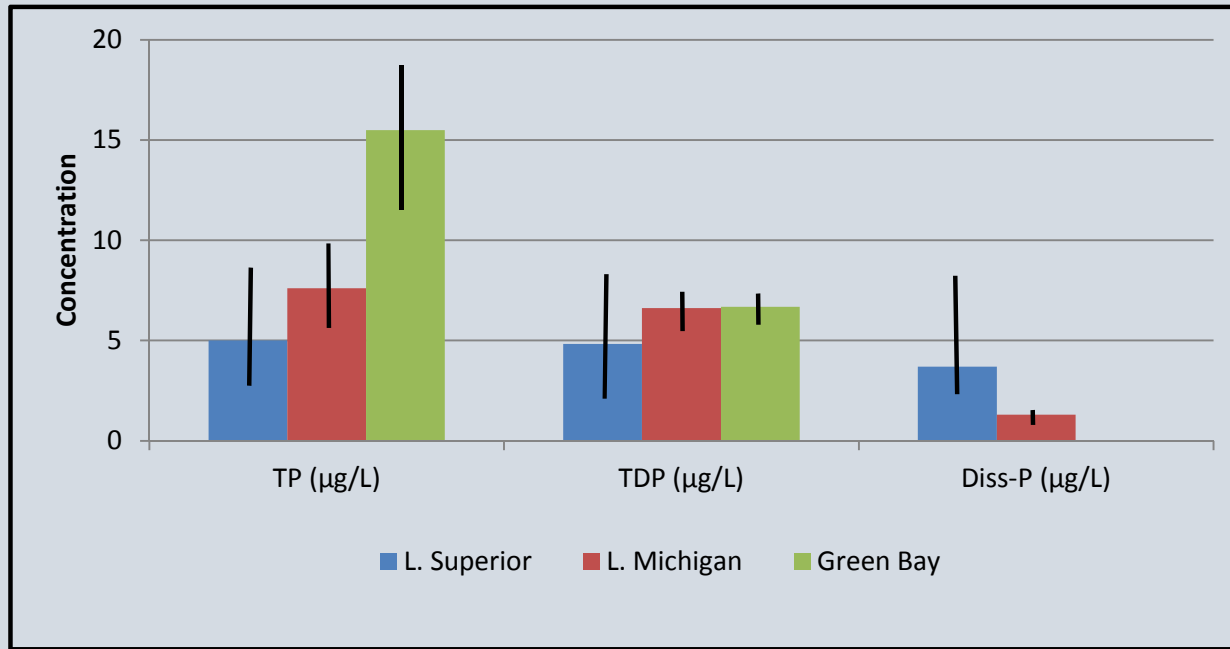
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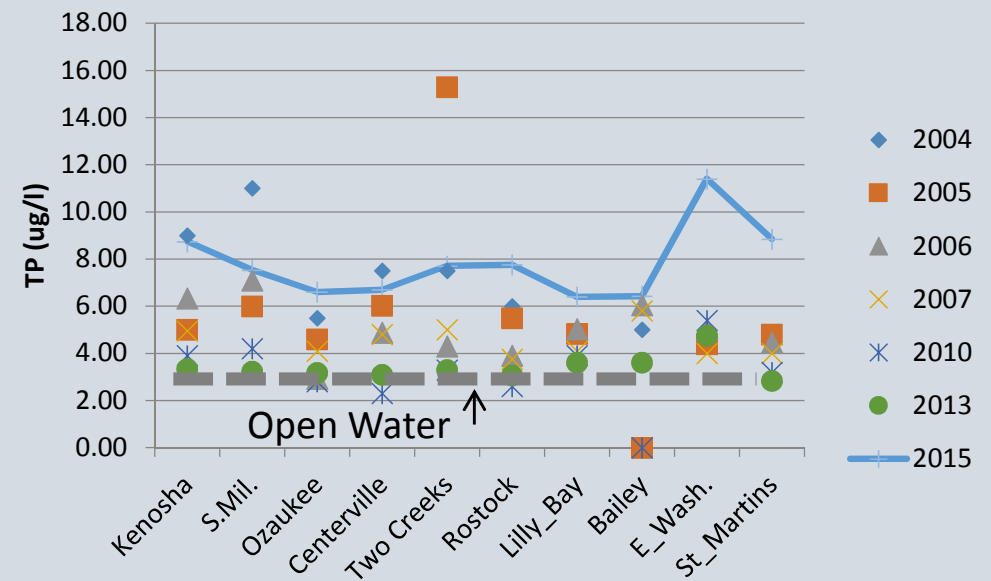
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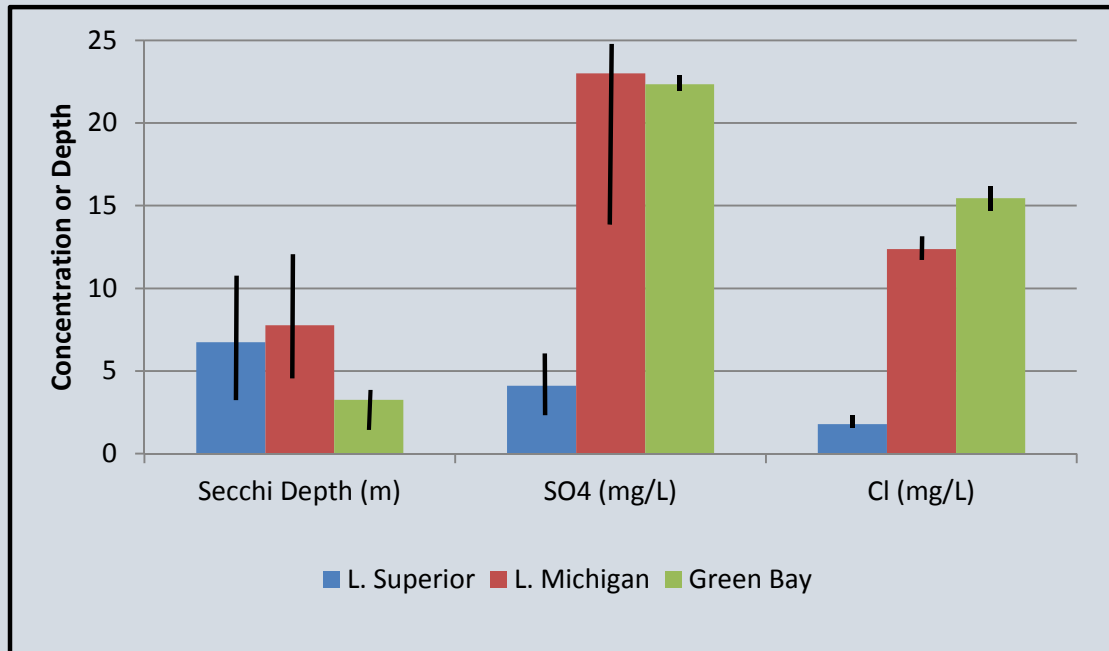
2015 NCCA Water Quality results



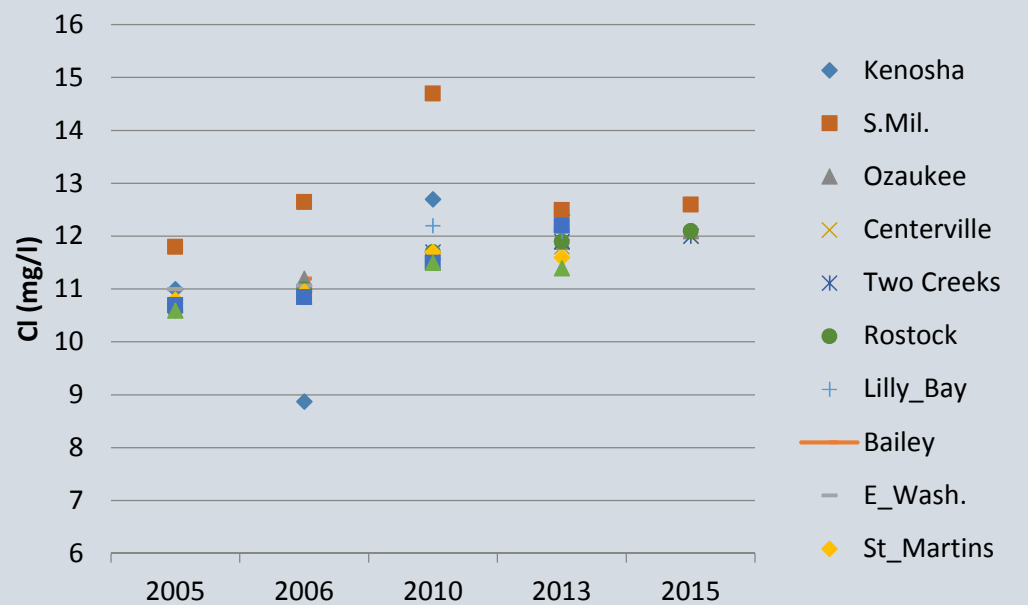
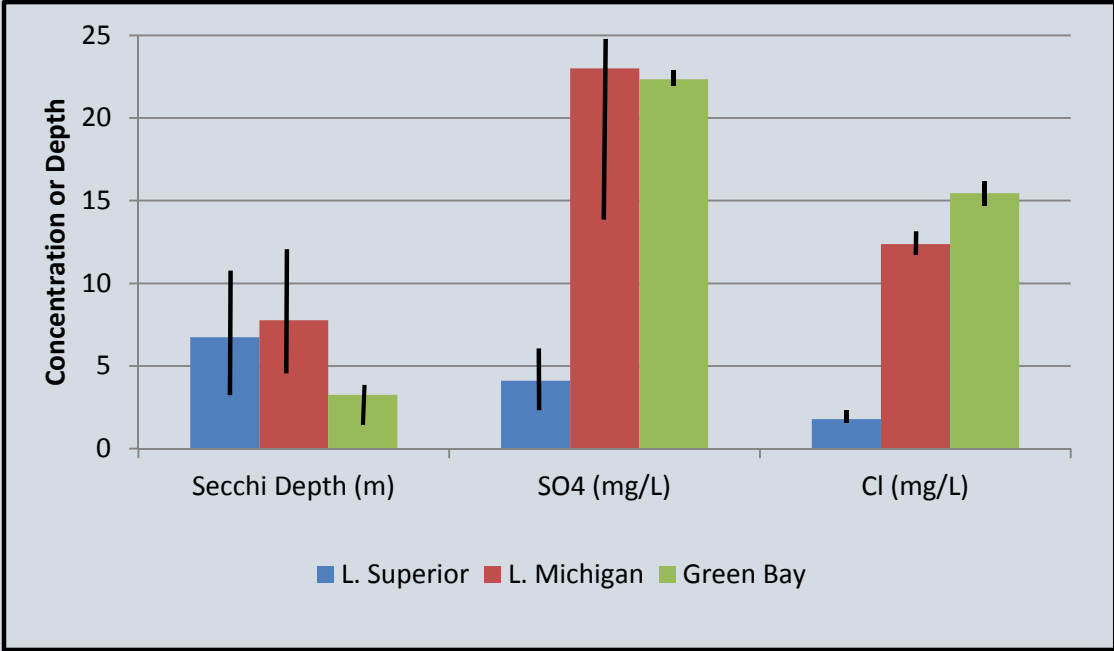
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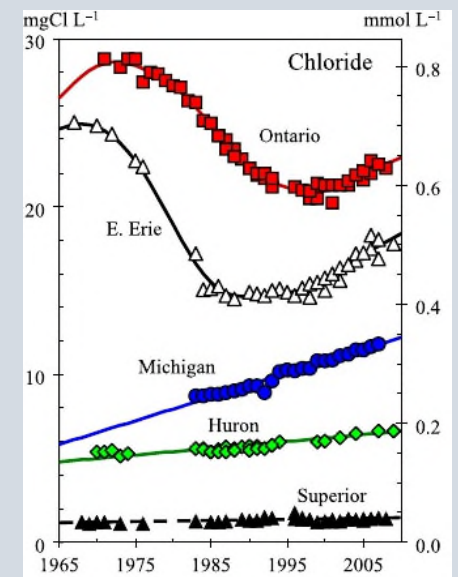
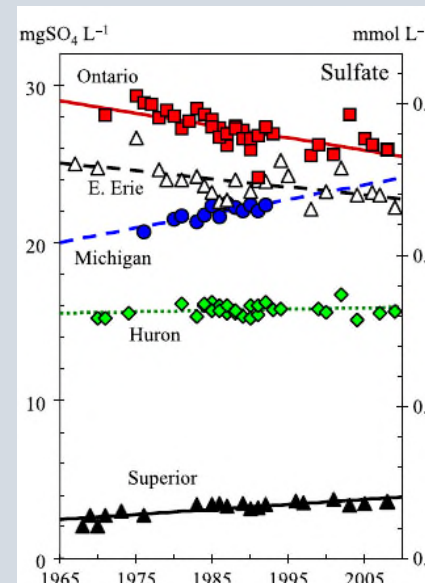
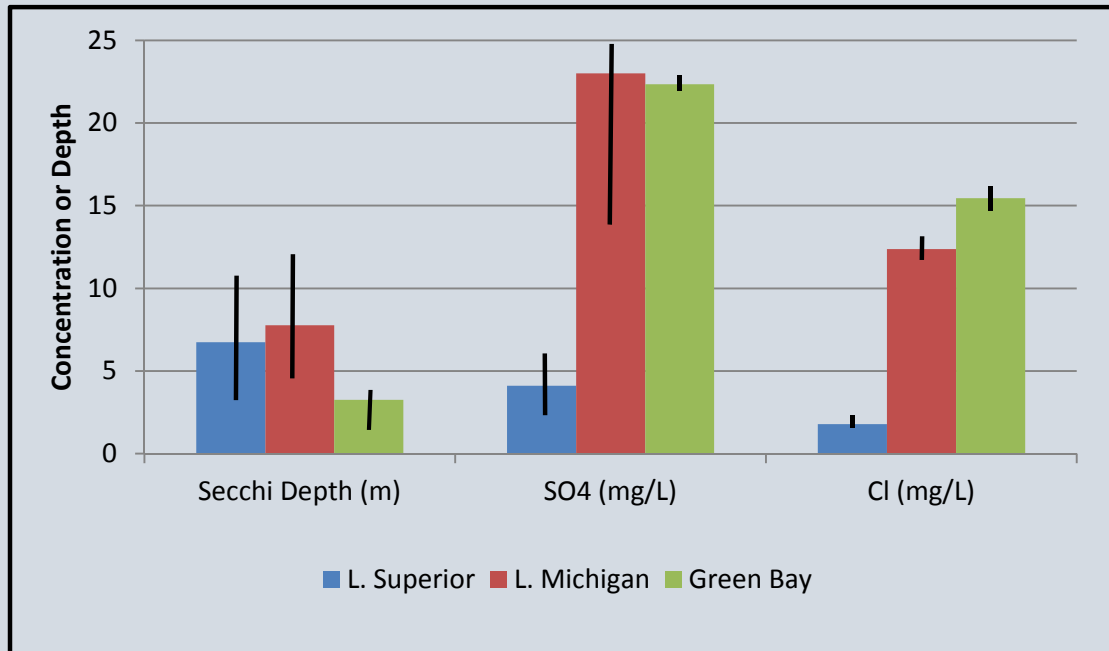
2015 NCCA Water Quality results



2015 NCCA Water Quality results



2015 NCCA Water Quality results



From Chapra et al. 2012

2015 NCCA Water Quality results

Water Body	Chl-A (ug/L)	TN (mg/L)	NH ₃ -N (mg/L)	NO ₃ -N (mg/L)	TP (µg/L)	TDP (µg/L)	Diss-P (µg/L)
L. Superior	0.80	0.392	< 0.015	0.314	5.0	4.8	3.7
L. Michigan	0.70	0.396	< 0.015	0.238	7.6	6.6	1.3
Green Bay	3.70	1.168	0.017	0.061	15.5	6.7	< 1.7

Water Body	Diss-Si (mg/L)	SO4 (mg/L)	Cl (mg/L)	Microcystin (µg/L)	Secchi Depth (m)	Mean EC (Below 0.5 m)
L. Superior	2.24	4.1	1.8	<0.1	6.7	0.534
L. Michigan	3.76	23.0	12.4	<0.1	7.8	0.369
Green Bay	2.03	22.4	15.5	0.24	3.3	0.815

Thresholds used to calculate water quality condition at Great Lakes sites

Lake	Surface TP (ug P/L)		Surface Chla (ug/L)		Secchi Depth (m)	
	TH1	TH2	TH1	TH2	TH1	TH2
L. Mich.	7	10	1.8	2.6	5.3	6.7
L. Superior	5	10	1.3	2.6	5.3	8

2015 NCCA Water Quality results

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Good Fair Poor

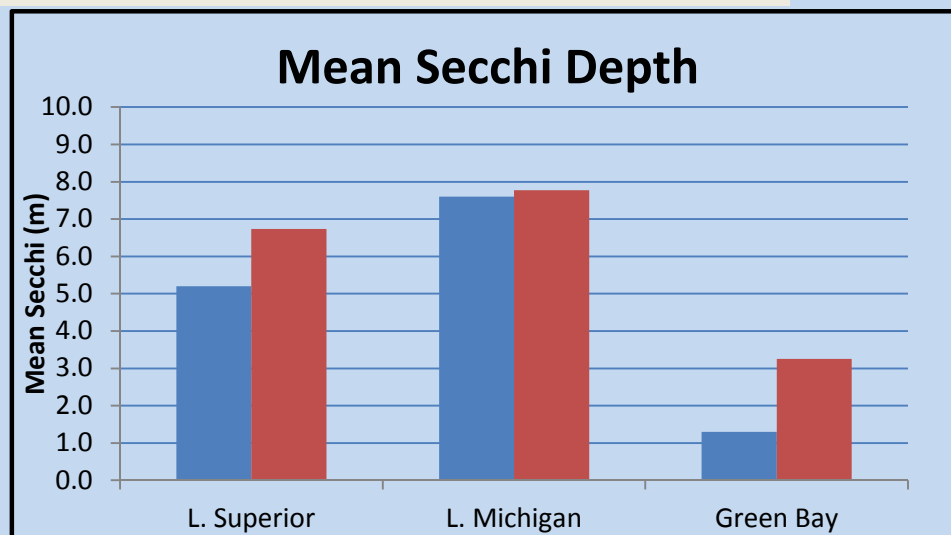
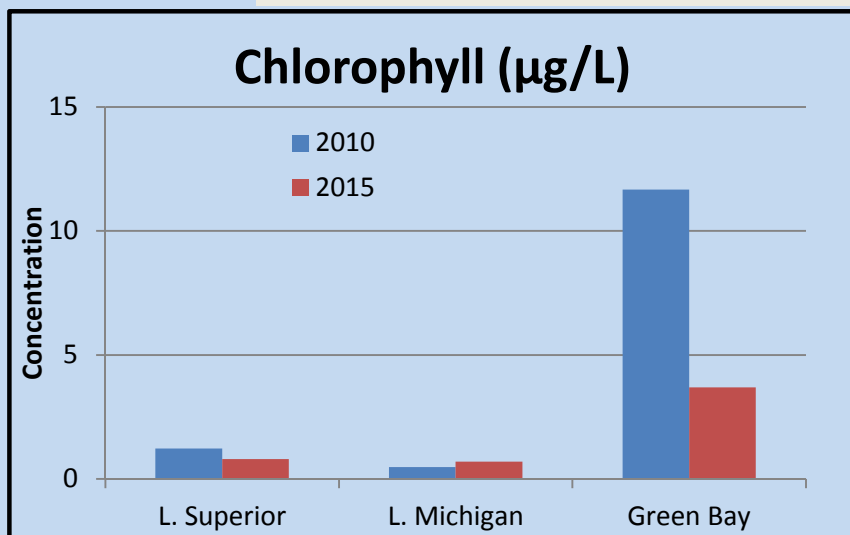
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L. Superior	5	10	1.3	2.6	5.3	8



Port Washington, WI Photo Credit: Maason Morrisson Morris

Comparison of 2010 and 2015 results



Mean	Chl-a (ug/L)		TN (mg/L)		TP ($\mu\text{g/L}$)		Mean Secchi (m)	
	2010	2015	2010	2015	2010	2015	2010	2015
L. Superior	1.23	0.799	0.440	0.392	3.5	5.0	5.2	6.7
L. Michigan	0.48	0.702	0.402	0.396	3.6	7.6	7.6	7.8
Green Bay	11.66	3.697	0.699	1.168	40.7	15.5	1.3	3.3

