Saginaw Bay Harmful Algal Blooms: Nutrient Status

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with a lot of help from friends and colleagues
5 year study 2008-2013
NOAA Center for Sponsored Coastal Ocean Research

Also a study from 1991-1996
Water Quality History - context

1974 Report - many problems, minimal data

1978 Great Lakes Water Quality Agreement
- 440 metric ton/year Total Phosphorus target
- 15 µg/L total phosphorus
- 3.6 µg/L chlorophyll a
- 3.9 m secchi depth
- mesotrophic state
- goals in supporting documentation

early phosphorus reduction efforts – targeted point sources
mid-1980s success “declared” - emphasis shifted to toxic contaminants

2012 Great Lakes Water Quality Agreement
- charge to review/update existing targets (3 years for Lake Erie)
- 440 metric ton/year Total Phosphorus interim until updated
- 15 µg/L total phosphorus spring mean - western Lake Erie
- 5 µg/L total phosphorus spring mean - Lake Huron
Total Phosphorus and Chlorophyll

(a) Total Phosphorus (TP, ug/L) from 1968 to 2008

(b) Chlorophyll (Chla, ug/L) from 1968 to 2008
Microcystin
Microcystin vs Chlorophyll a

Saginaw Bay – Lake Erie

Courtesy of Dr. Freya Rowland
Summertime Oxygen Depletion
Annex 4 - Nutrients

Six Lake Ecosystem Objectives

1) minimize hypoxic zones
2) algal biomass below nuisance levels (*Cladophora*)
3) algal species consistent with healthy ecosystems nearshore
4) cyanobacteria at levels that do not pose toxin risk
5) oligotrophic state in open waters
6) mesotrophic conditions western, central Erie

Update Phosphorus Load Targets
(Do this for Lake Erie within 3 years - February 2016)
Summary

- TP load target not met as of 2011 – current status unclear
  need data (all tributaries)
- Original TP, chlorophyll a, secchi objectives not met
- Microcystin present
  moderate concentrations
- Evidence for periodic, short-term hypoxia
  important…?
- HABS concentrated around perimeter
  declining extent?
- Decisions pursuant to Annex 4 2012 GLWQA pending