Water Resources Division

Protect and Monitor

- 4 Great Lakes
- 3,300 miles of Great Lakes shoreline
- 11,000 inland lakes
- 36,000 river miles
- 6.5 million acres of wetlands
- 70,000 acres of critical dunes

For swimming, fishing, drinking, and aquatic ecosystems.

Michigan Nutrient Control

Phosphorus based

Great Lakes driven

Water Quality Standards

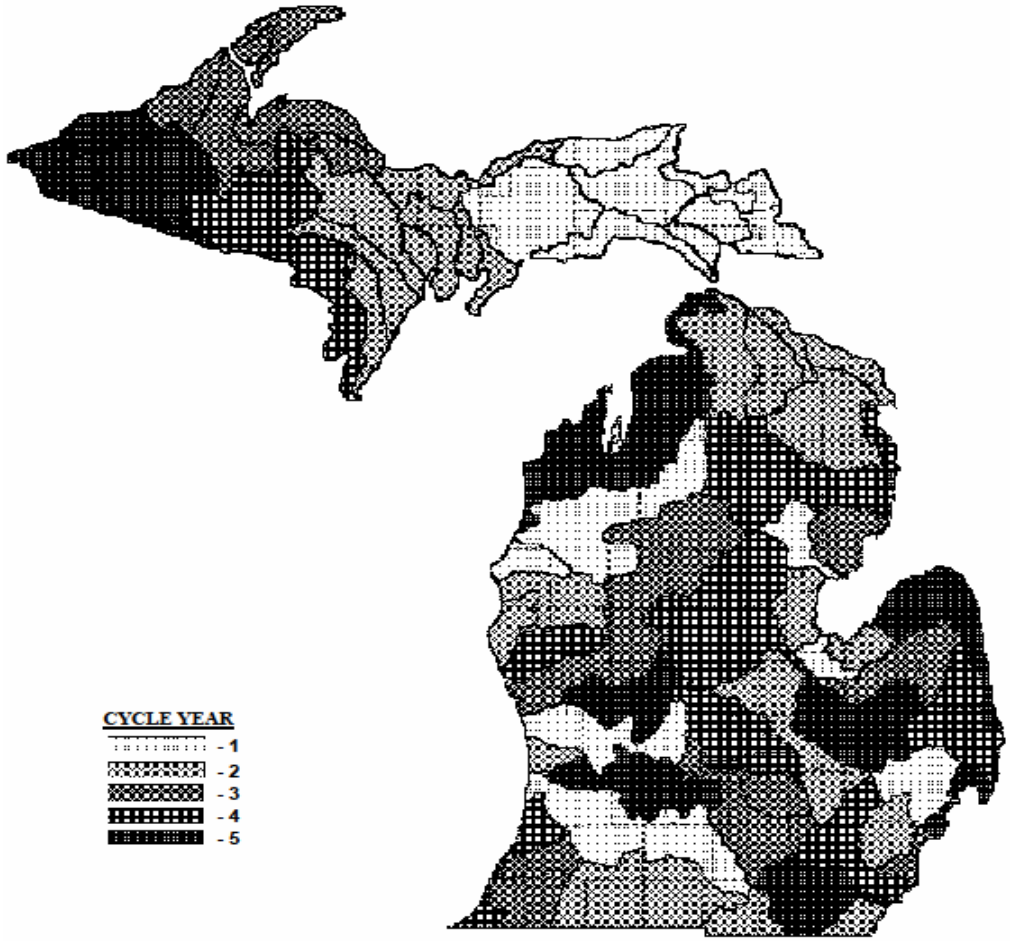
1.0 mg/L

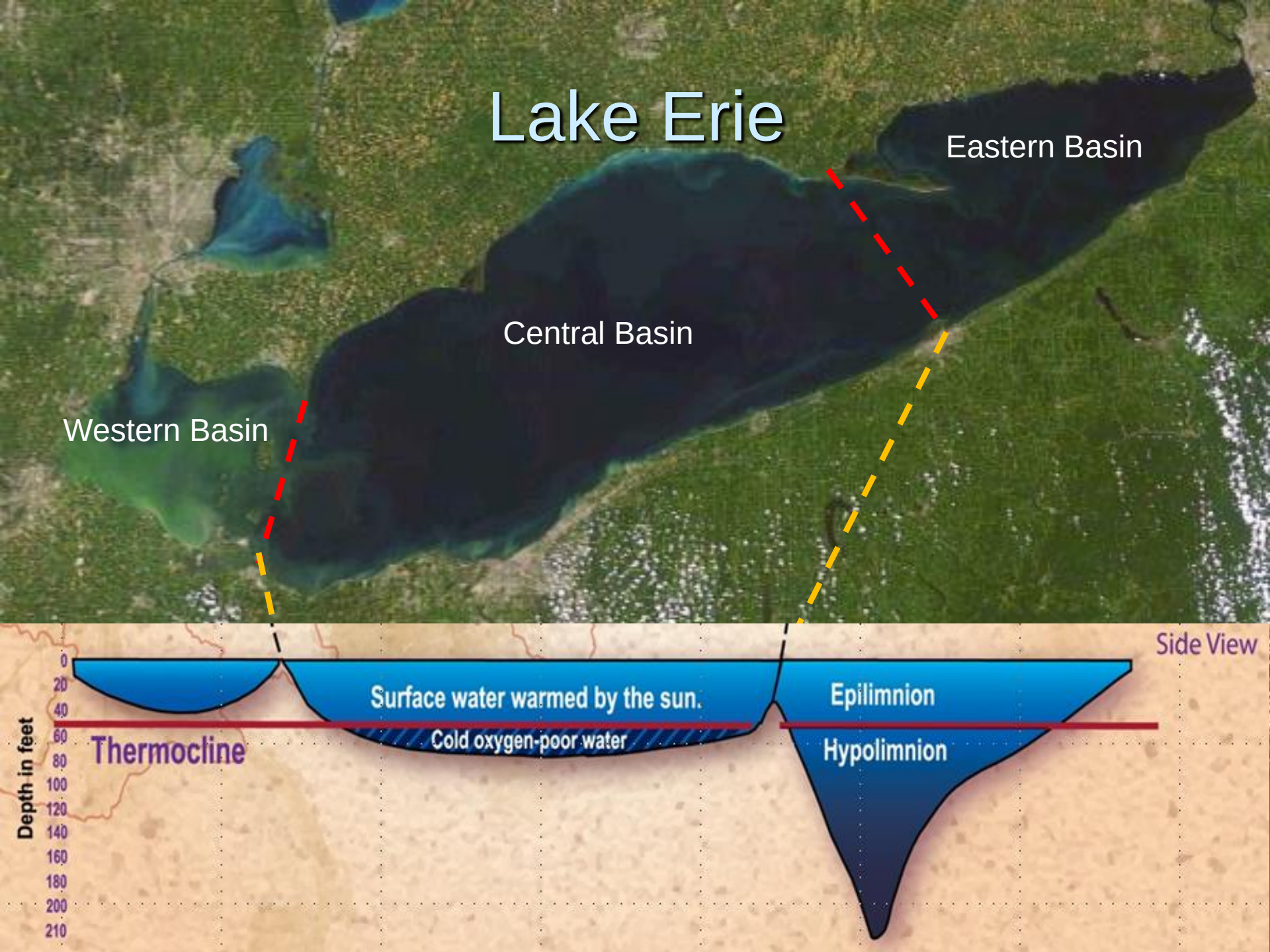
Narrative

NPDES Permit Limits

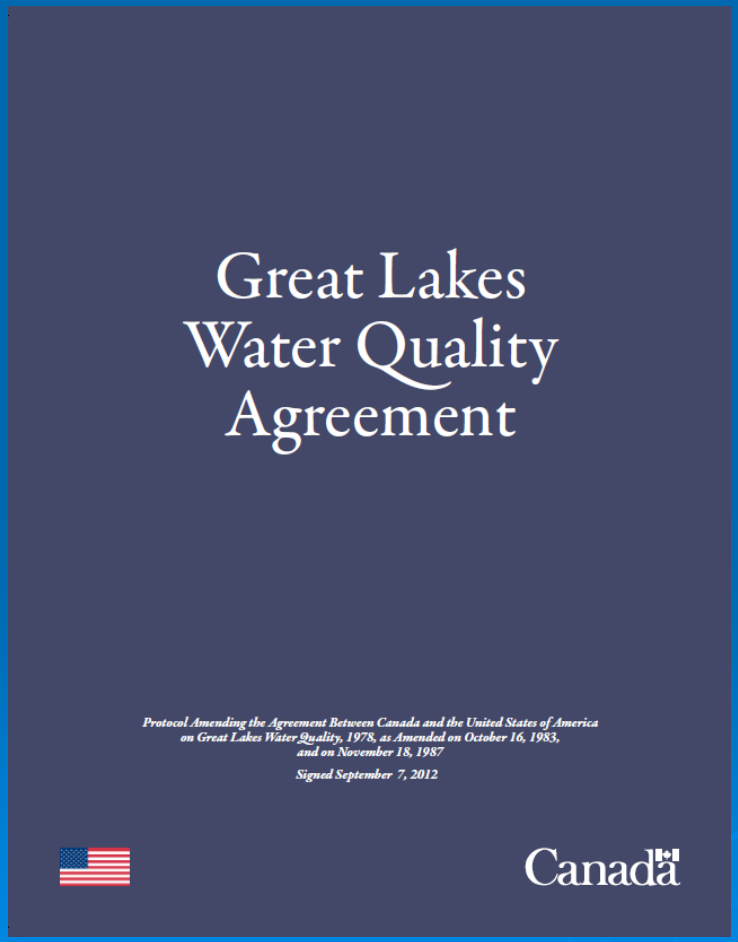
- 670 permits have some type of phosphorus control
- 350 permits contain numeric limits
- Watershed-based rotation

Watershed Evaluation Schedule




Lake Erie
Eastern Basin
Central Basin
Western Basin
Side View
Depth in feet
0
20
40
60
80
100
120
140
160
180
200
210
Surface water warmed by the sun.
Epilimnion
Thermocline
Cold oxygen-poor water
Hypolimnion

2012 GLWQA: Commitments to Develop New Phosphorus Targets & Action Plans



Charge to Annex 4 (Nutrients):

Starting with Lake Erie by 2016

- Determine phosphorus concentration objectives and loading targets for open waters and nearshore areas including embayments and tributaries.
- Determine loading allocation by country and identify priority watersheds for load reduction.

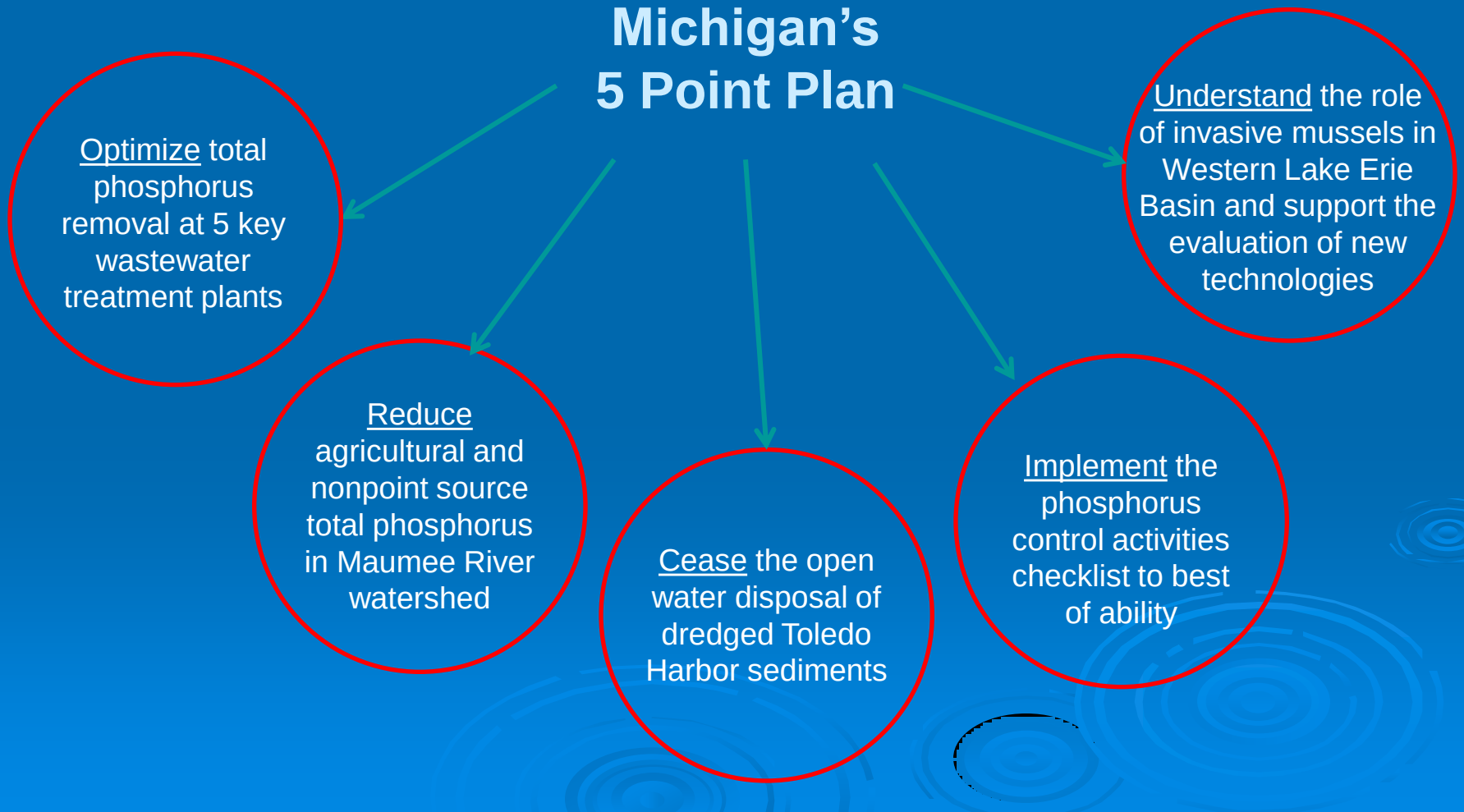
Starting with Lake Erie by 2018

- Assess effectiveness of programs to achieve the substance and lake ecosystem objectives.
- Develop domestic action plans and strategies to control nutrients.

Annex 4 Objectives for Lake Erie

1. Minimize the extent of hypoxia zones associated with excessive phosphorus loading, with emphasis on Lake Erie.
2. Maintain algal biomass below nuisance conditions.
3. Maintain algal species consistent with healthy ecosystems in nearshore waters.
4. Maintain cyanobacteria biomass at levels that do not produce toxin concentrations that pose a threat to human or ecosystem health.
5. Maintain mesotrophic conditions in the open waters of the Western Lake Erie Basin.

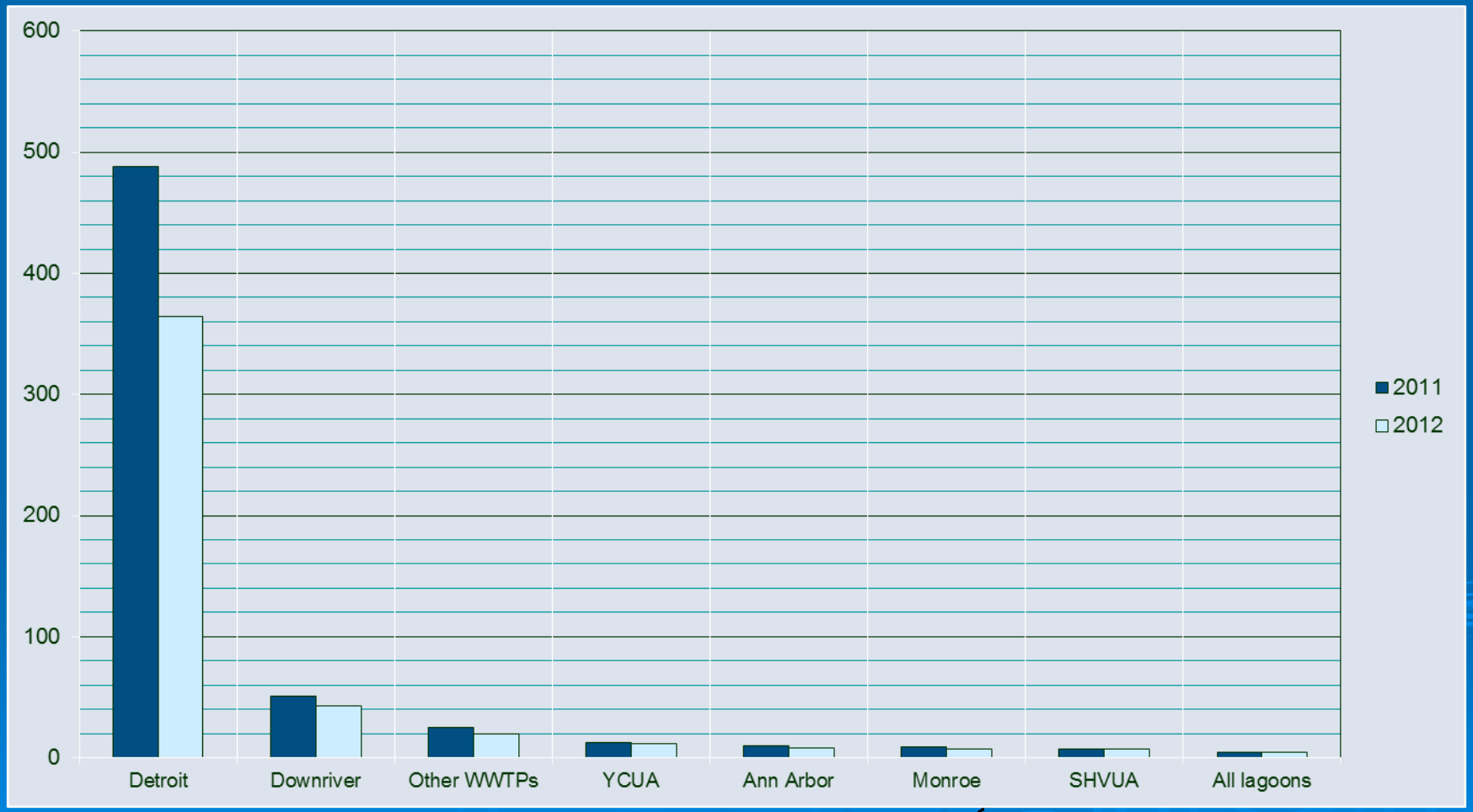
Michigan's 5 Point Plan to Correct Harmful Algal Blooms in the Western Lake Erie Basin



1. Optimize total phosphorus removal at 5 key wastewater treatment plants.

Detroit, Downriver, and YCUA WWTPs in MI;
Fort Wayne WWTP in IN; and Toledo WWTP in OH

Summary of Point Source Loads (MT)



Detroit WWTP
Total Phosphorus Load Sources

	2011	% Total	2012	% Total
Secondary Treated	756590	70	751110	94
Primary Treated (WWTP/CSO facilities)	275780	26	48250	6
Untreated CSO	42090	4	2240	0
Total	1074460	100	801600	100

4. Implement the phosphorus control activities checklist to best of ability.

- Water pollution control programs:
  - Limiting municipal and industrial discharges to a total phosphorus limit of 1 mg/l
  - Combined sewer overflow correction programs
  - Sanitary sewer overflow correction programs
  - Municipal storm water and construction storm water programs
  - Concentrated animal feeding operation permitting and regulation
  - Eliminating phosphorus in detergents and turf grass fertilizers

Invasive Mussels

- Promote harmful algal blooms:
  - Filter feeding and excretion stimulate nutrient releases into water column
  - Selectively feeding on phytoplankton
  - Reject blue-greens

Photo credit: Paul Skawinski, Golden Sands RC&D Council

Zequanox

- Biopesticide:
  - Dead cells of a common soil bacterium
  - Causes mortality of zebra and quagga mussels
  - Destroys the inner gut lining of invasive mussels
- Not harmful to other aquatic organisms and does not have lasting impacts on water quality
- Previous open water trials in Illinois and Minnesota

2014 Lake Erie Zequanox Pilot

Feasible in Lake Erie?

Things to consider -

- Depth
- Substrate
- Location of actual mussels
- Wave action

- La Plaisance Bay
- November 2014
- 800 m^2 Treatment Plot

Partners: Marrone Bio Innovations, PLM Lake and Land Management, and USGS


• Application technique = successful
• Concentrations not maintained

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