Understanding the Key Issues Affecting Lake Erie

Dr. Jeffrey M. Reutter, Director
Ohio Sea Grant and Stone Laboratory
The Ohio State University

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Today’s Talk

- Great Lakes and Lake Erie 101
- Background on 6 key issues causing huge changes in Lake Erie.
  - Climate Change/Lake Levels/Severe Storms
  - Sedimentation/Water Clarity/Dredging
  - Nutrients and Phosphorus
  - HABs—Harmful Algal Blooms
  - Dead Zone
  - AIS—Aquatic Invasive Species
Profile of the Great Lakes

- Lake Michigan: 925 ft
- Lake Huron: 752 ft
- Lake Erie (shallowest)
- Lake Ontario: 804 ft
- St. Lawrence River
Lake Erie Cross Section

Lake Erie Basins

Prime area for anoxia to occur

Central Basin

Western Basin

Eastern Basin

Depth in feet:
thermocline forms somewhere between 45' - 55'
Great Lakes Basin Land Use 1985

Percent of Basin

L. Superior | L. Michigan | L. Huron | L. Erie | L. Ontario

Forest | Agriculture | Residential | Other

| L. Superior | 91 | 5 | 3 | 3 | 5
| L. Michigan | 44 | 9 | 6 | 10 | 5
| L. Huron | 68 | 27 | 1 | 7 | 4
| L. Erie | 21 | 67 | 1 | 7 | 4
| L. Ontario | 49 | 39 | 4 | 5 | 4
TRIBUTARY LOADING OF SUSPENDED SEDIMENTS INTO THE GREAT LAKES

SUSPENDED SEDIMENT LOADS, 1000 METRIC TONS PER YEAR

Data from IJC, 1978 (PLUARG Final Report)
As a Result, Lake Erie Gets:

- More sediment
- More nutrients (fertilizers and sewage)
- More pesticides

The above 3 items are exacerbated by storms.

And is still biologically, the most productive of the Great Lakes.
Lake Erie Stats

- Drinking water for 11 million people
- Over 20 power plants
- 300 marinas in Ohio alone
- Walleye Capital of the World
- 40% of all Great Lakes charter boats
- $1 billion sport fishery
- Largest freshwater commercial fishery in the world
Historical Trends: The Lake Erie Ecosystem

- Getting worse annually to 1970
- Stable 1970-75
- Improving 1975-1990 or 1995
- 1995+ Getting worse
Sedimentation

- Reduced water quality
- Nutrients and contaminants attached to sediment particles
- Can trace Maumee River sediments from open lake disposal to Fairport
Nutrients and Phosphorus
Blue-green Algae Bloom
circa 1970, Lake Erie
“I heard Lake Erie is the place fish go to die.”

--Johnny Carson, 1976
Phosphorus Loading

- Limiting nutrient for plant growth
- 29,000 tons in 1969
- Hit 11,000 target by mid-80s
- Became Walleye Capital of the World
- Soluble form increasing since 1995
Dissolved Reactive Phosphorus

Source: P. Richards, Heidelberg College
Impacts of Increased Phosphorus Concentrations

- HABs
  - *Microcystis*
  - Microcystin levels 60 times WHO
  - *Cylindrospermopsis*
- Nuisance Algae Blooms
  - *Lyngbya*—Western Basin Attached
  - Cladophora—Whole Lake Attached
- Dead Zone
HABs
(Harmful Algal Blooms):
Western Basin Problem
Blue-green Algae Bloom circa 1970, Lake Erie
HAB Requirements

- Warm water (summer problem)
- High phosphorus levels
- Zebra/quagga mussels (remove competition)
HABs: Western Basin Problem But Contribute to Oxygen Demand in the Central Basin, i.e. the Dead Zone
Dead Zone: Central Basin Problem
The Dead Zone: Anoxic Hypolimnion
Central Basin with Thermocline
Wind Tilting Thermocline
Global warming and climate change are real and will make these problems worse!

- Warm water favors HABs
- Warm water increases oxygen depletion rates
- Lower water levels make it easier to resuspend and transport bottom sediments
- More severe storms will resuspend more sediment and increase erosion and sediment loading
- Lake levels will go down
AIS

- Over 180 species in Great Lakes
- 75% since Seaway opened
- Zebra and quagga mussels
- Phragmites and loosestrife
- Round gobies
- Next?
- How do we close the door?
Zebra Mussel vs Quagga Mussel
Because Lake Erie is the southernmost, shallowest, warmest, and most nutrient-enriched of the Great Lakes, it is likely that AIS will always present the greatest problem, and have the greatest impact, in Lake Erie.
1974—Before Zebra Mussels
1994—After Zebra Mussels
For more information

- Ohio Sea Grant and Stone Lab
- Ohio State Univ.
- 1314 Kinnear Rd.
- Col, Oh 43212
- 614-292-8949
- Reutter.1@osu.edu
- www.ohioseagrant.osu.edu/

- Stone Laboratory
- Ohio State Univ.
- Box 119
- Put-in-Bay, O 43456
- 614-247-6500