

**NCER 2013  
CHICAGO, IL  
JULY 29-AUGUST 1, 2013**

# **Targeting and Incentivizing Environmentally Beneficial Conservation Practices in Great Lakes Agricultural Watersheds**

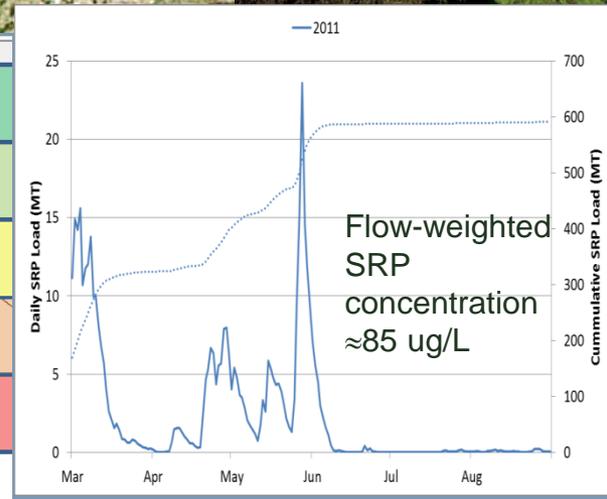
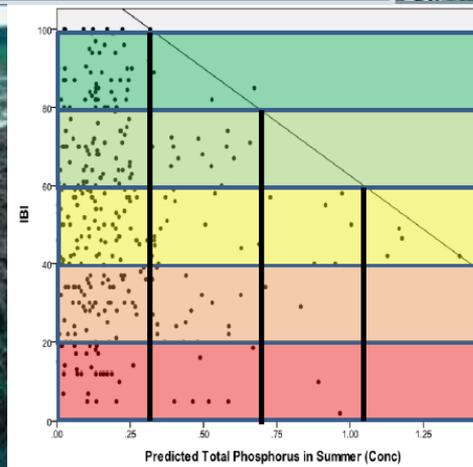
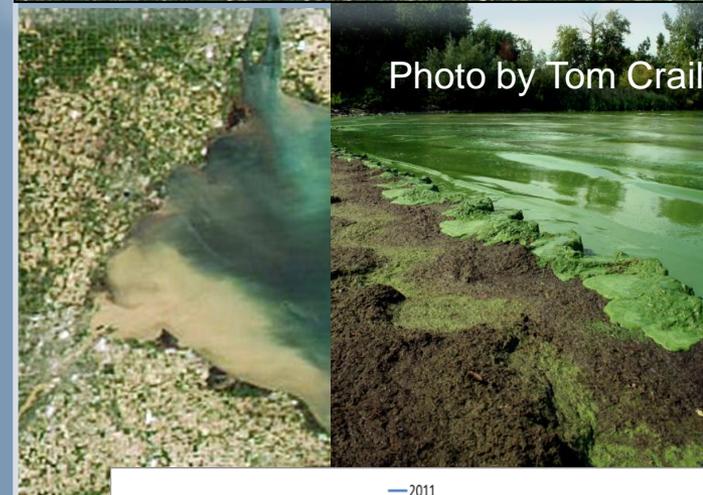
**Project: Great Lakes Watershed Ecological Sustainability Strategy**

**Primary Funding: Great Lakes Protection Fund**

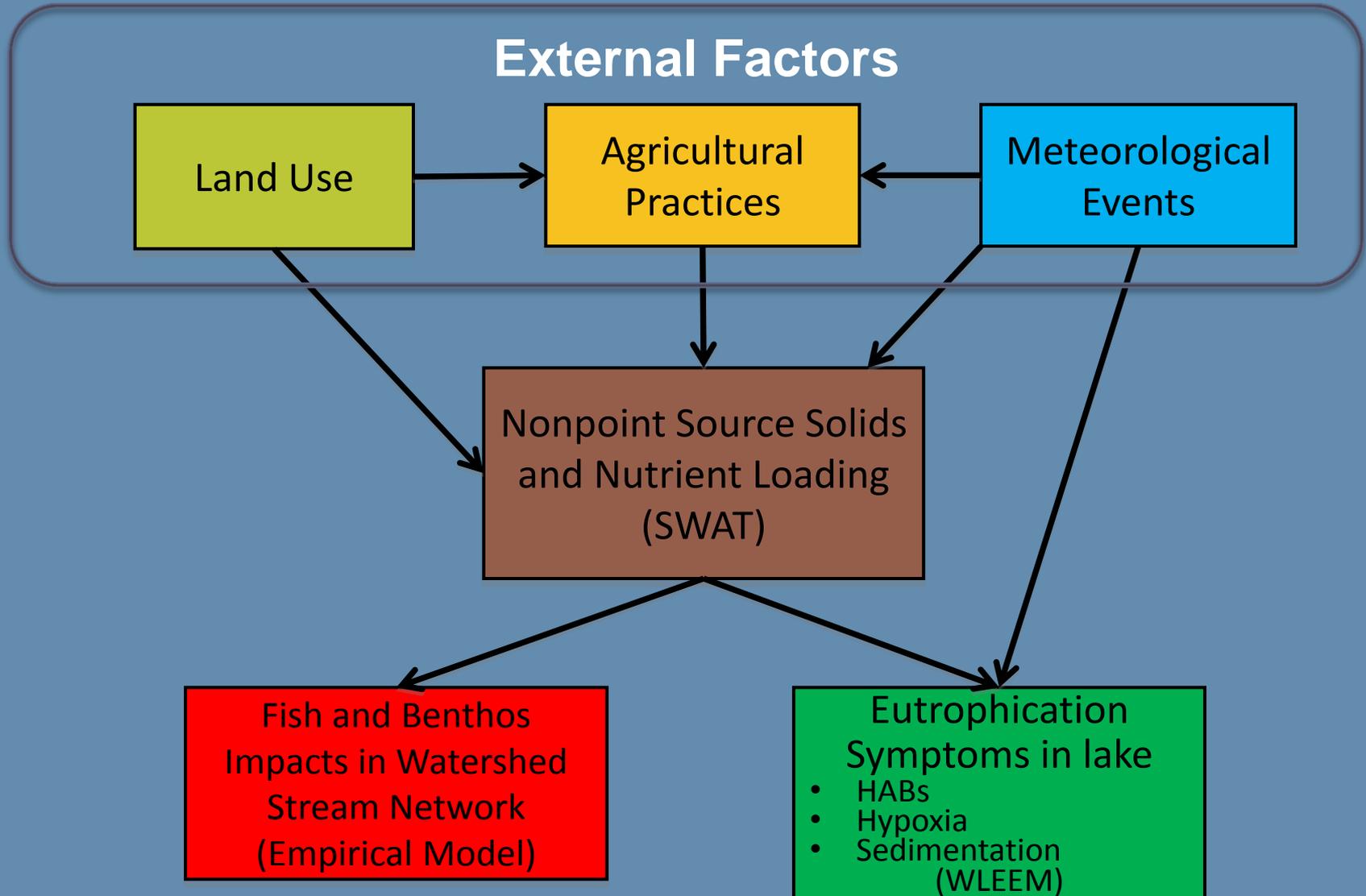
**Leveraged Funding from other Projects: USACE-Buffalo District,  
USDA-NRCS Great Lakes CEAP program**

# The Problem

- Excess sediment and bioavailable phosphorus loads from agricultural nonpoint source areas
- Environmental Impacts:
  - Excess sedimentation in harbors and navigation channels
  - Detrimental impacts on fish and benthic communities in watershed stream network
  - Blooms of harmful and nuisance algae (e.g., *Microcystis*, *Lyngbya*, *Cladophora*)
  - Eutrophication symptoms such as hypoxia
- Impacts seen in Great Lakes embayments and basins – Lake Erie (Western Basin, Central Basin), Green Bay, Saginaw Bay, nearshore areas in Lake Michigan, Lake Huron, Lake Ontario)



# The Cause-Effect Analysis



# The Solution: Transactions ↔ Ecological Endpoints

## Transactions

### Candidate Transactions

- Reverse auction
- Certification

### Final Evaluation of Transactions

- Type
- Location(s)
- Funding

\*Relative ecological benefits

\*Bid ranking (\$/lb algal reduction)

### Improved Management Practices

- Type of practice(s)
- Affected land area

Changes to crops, tillage, drainage, etc.

### Watershed Models (SWAT)

*Model Linkage*

Flow, sediment, nutrient loading @ Waterville

### Western Lake Erie Ecosystem Model (WLEEM)

## Ecological Endpoints

Improved “Indices of Biological Integrity” (IBIs)  
(various locations in stream network)

Reduced Nutrient & Sediment Delivery  
(@ tributary mouths)

Reduced Algal Production and Sediment Problems in Western Lake Erie

- *Microcystis* blooms
- Sedimentation/turbidity

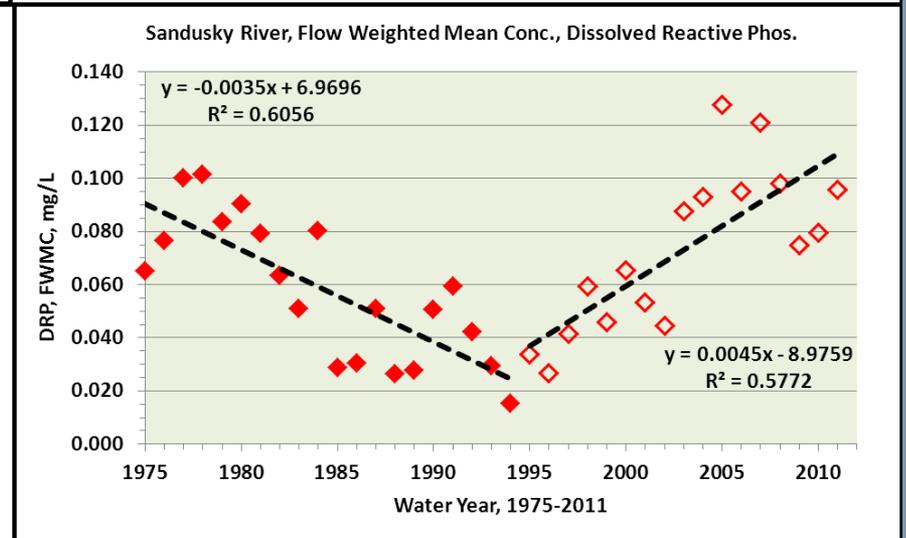
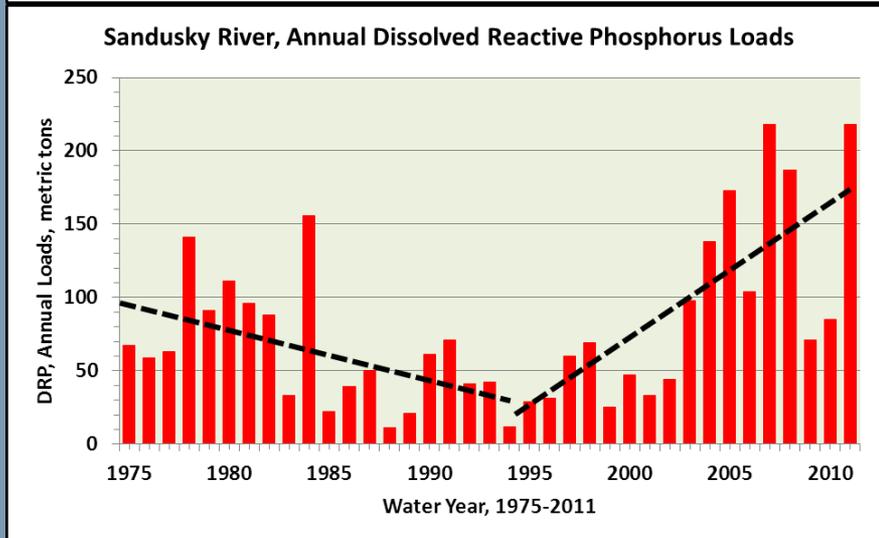
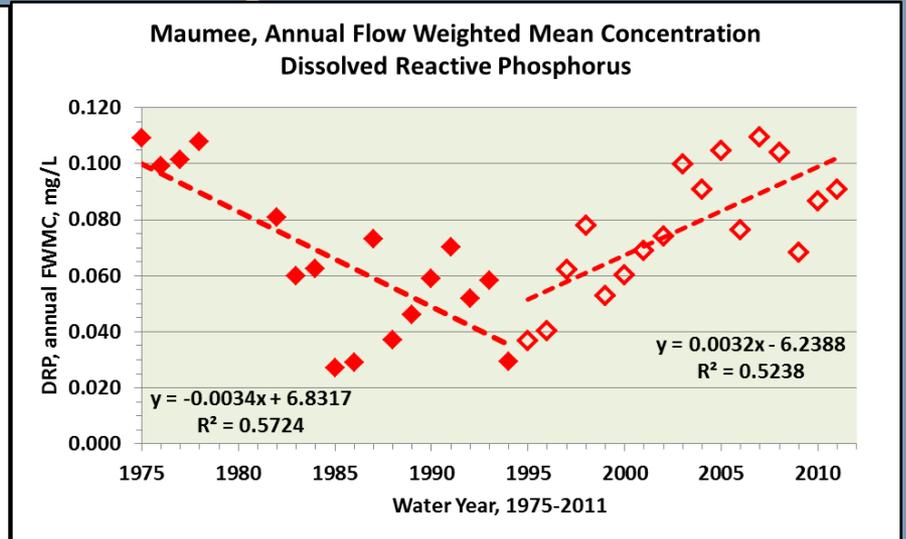
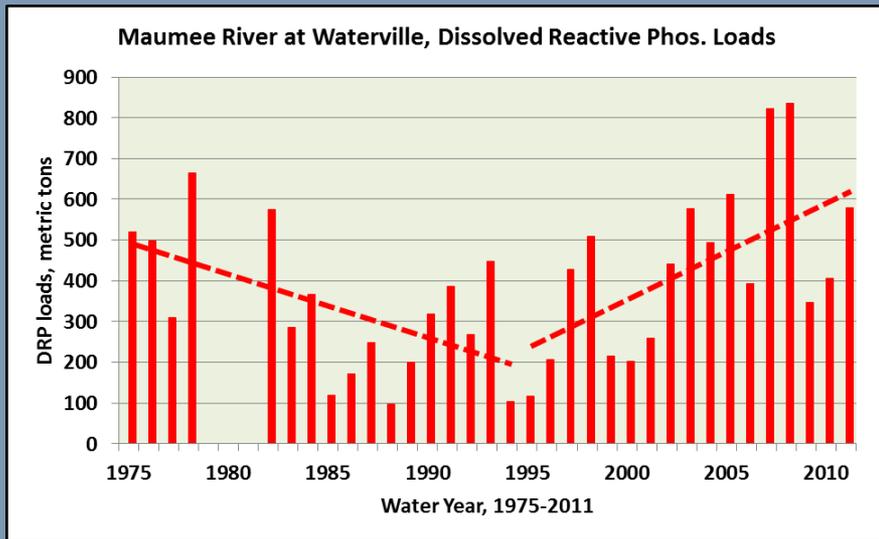
Flow, sediment, nutrient loading

# Session 5 Talks

1. Dennis McGrath, The Nature Conservancy. SUSTAINING AQUATIC ECOSYSTEMS IN AGRICULTURAL WATERSHEDS
2. Amanda Flynn, et. al., LimnoTech. APPLICATION OF AN ENHANCED, FINE-SCALE SWAT MODEL TO TARGET LAND MANAGEMENT PRACTICES FOR MAXIMIZING POLLUTANT REDUCTION AND CONSERVATION BENEFITS
3. Leah Harris and Scott Swinton, Michigan State University. EVALUATING INCENTIVES FOR CROP FARMERS TO PROVIDE AQUATIC ECOSYSTEM BENEFITS
4. Carrie Vollmer-Sanders, The Nature Conservancy. GROUPS DON'T ACT, INDIVIDUALS DO: BUILDING A CERTIFICATION PROGRAM

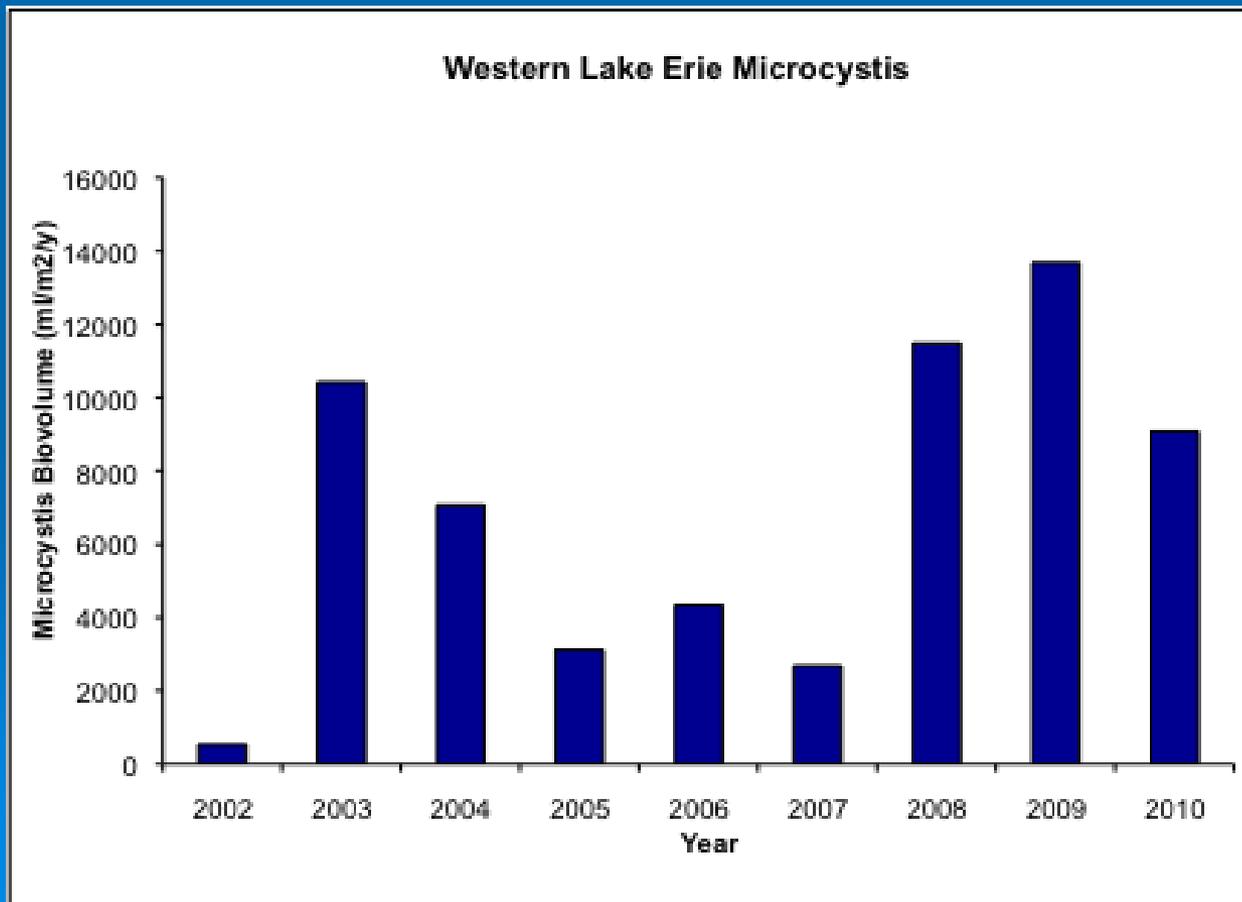
# Extra Slides

# Trends in annual loads and flow weighted mean concentrations of dissolved reactive phosphorus in the Maumee and Sandusky rivers



# Microcystis in Lake Erie Western Basin

- The *Microcystis-Anabaena* bloom of 2009 was the largest in recent years in our sampling region
- ...until 2011



2011

T. Bridgeman

# Lake Erie - One of the Most Important Lakes in the World

- Poster child for pollution problems in this country.
  - “Dead lake” image of 60s and 70s.
  - *“They’ll walk on their fins and get woefully weary in search of some water that isn’t so smeary. **I hear things are just as bad in Lake Erie.**”*
    - From *The Lorax*, Dr. Seuss (1971)
  - Best example of ecosystem recovery in world.
- But, most heavily utilized of any of the Great Lakes.
  - Shared by 4 states and 2 countries.
  - Drinking water for 11 million people
  - Over 20 power plants
  - 300 marinas in Ohio alone
  - Walleye Capital of the World – \$1.5 billion sport fishery
  - 40% of all Great Lakes charter boats
  - Ohio’s charter boat industry is largest in North America
  - The most valuable freshwater commercial fishery in the world
  - Coastal county tourism value is over \$10 billion

# Historical Trends: The Lake Erie Ecosystem

- 1970: Lake Erie declared “dead lake”
  - 1969—Cuyahoga River burns
  - Hypoxia in Central Basin
  - Major blue-green algal blooms

■ 1970 – 1985: Enormous binational effort to

June 22, 1969

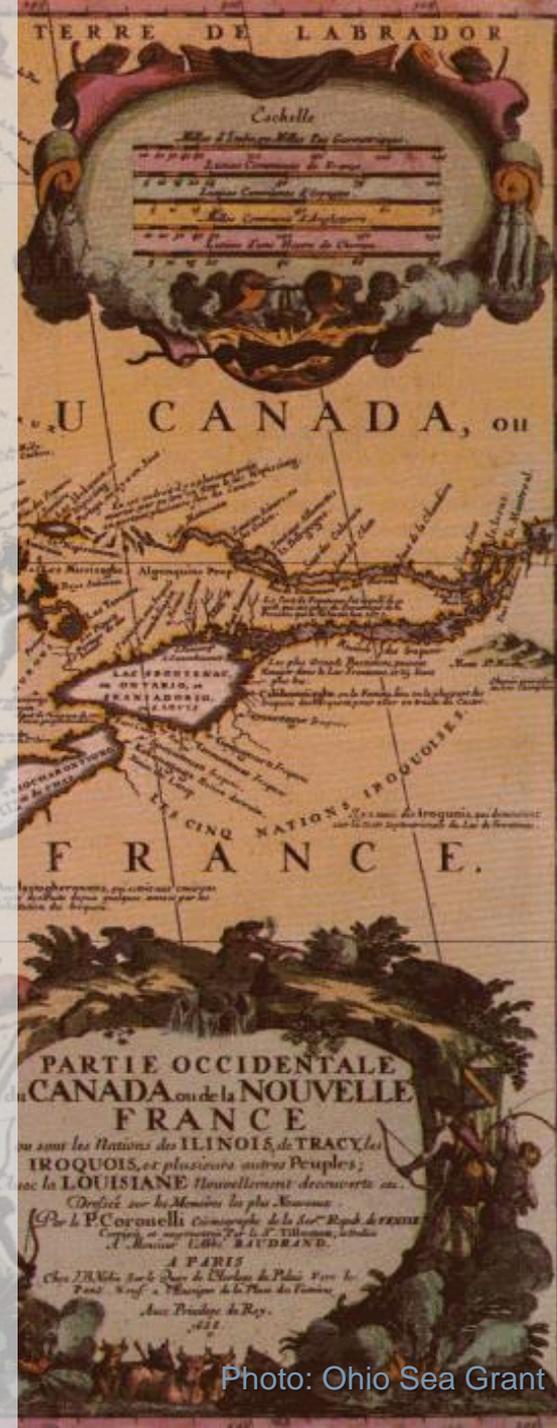
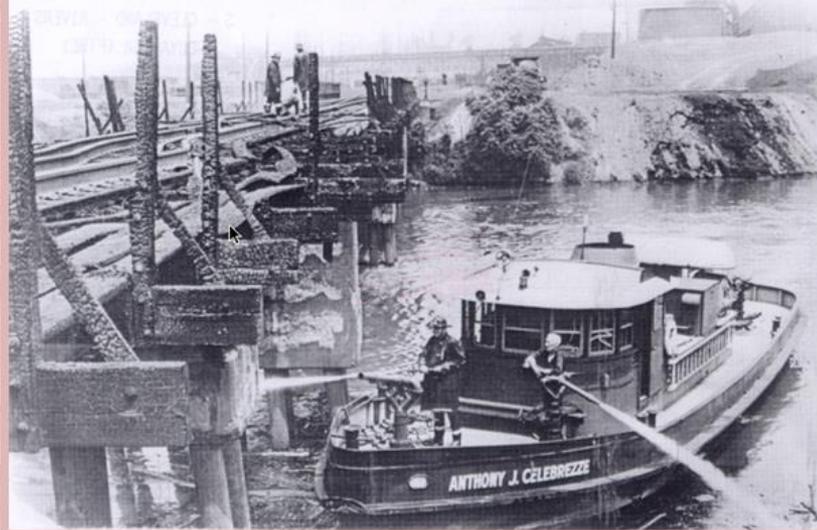


Photo: Ohio Sea Grant

# Serious Nuisance and Harmful Algal Blooms



# Annual Hypoxia

