GLNPO Monitoring Program on Lake Erie

Nutrients, Dissolved Oxygen, Biology, Contaminants in Fish, Air Deposition of Contaminants

Monitoring Program

Limnology Program

Biological Monitoring Program
GLNPO’s Base Monitoring Programs

Spring and Summer Surveys in all Five Great Lakes
- 73 stations sampled for nutrients, plankton and conservative ions
- 46 stations sampled for benthos

Surveys for Dissolved Oxygen in Lake Erie
Fish Contaminants
Atmospheric Deposition
Concentration of Phosphorus in the Open Waters of the Great Lakes

Phosphorus Concentrations
How Much Oxygen in the Water Do Aquatic Creatures Need?

Oxygen, mg/liter

- 6 – 15 O.K.
- 4 – 6 Stressed
- 2 – 4 Choking
- 1 – 2 Dying
- 0 – 1 Dead

Dissolved Oxygen Concentration
Lake Erie Central Basin Hypolimnion

- 2006
- 2004
- 2003
- 2001
- 1997
- 1993
Dissolved Oxygen Depletion Rates should be expressed as mg/l/mo. The blackened areas represent the maximum observed extent of dissolved oxygen concentrations less than, or equal to, 1 mg/l in late summer.

<table>
<thead>
<tr>
<th>Year</th>
<th>Lake Erie Central Basin</th>
<th>Dissolved Oxygen Concentrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>3.35 mg/l</td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td>3.75 mg/l</td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>3.48 mg/l</td>
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<tr>
<td>1988</td>
<td>2.76 mg/l</td>
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<tr>
<td>1991</td>
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<td>1992</td>
<td>3.33 mg/l</td>
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<td>1999</td>
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<td>2000</td>
<td>3.02 mg/l</td>
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<td>2001</td>
<td>3.21 mg/l</td>
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<td>2002</td>
<td>3.61 mg/l</td>
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Lake Erie Central Basin
Dissolved Oxygen Concentrations


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<tr>
<th>Year</th>
<th>Early June</th>
<th>Late June</th>
<th>Mid-July</th>
<th>Early Aug.</th>
<th>Late Aug.</th>
<th>Mid-Sept.</th>
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<td>&gt; 6 mg/l</td>
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<td>1993</td>
<td>4-6 mg/l</td>
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<td>1997</td>
<td>2-4 mg/l</td>
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<td>1-2 mg/l</td>
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<td>0-1 mg/l</td>
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Hypolimnion Thickness, meters

Temperature, Celsius

Standard Temperature

Average Thickness

YEAR

0 1 2 3 4 5 6 7 8 9

Hypolimnion Thickness, meters

mg O2/L/Mo

YEAR


OXYGEN DEPLETION RATE
LAKE ERIE CENTRAL BASIN

Depletion Rate
Approx. Target
Trend 1970-1989
Trend 1990-2006
Hexagenia

Diporeia and Zebra Mussels

Populations declining

Populations are drastically declining
Botulism

• Beginning in 1999, botulism outbreaks have caused fish and bird kills along the shores of Lake Erie.
• Thousands of waterfowl on Lake Erie were killed by botulism in each of the years from 1999-2003.
• The number of outbreaks in Lake Erie seem to be decreasing over the past 4 years.

Cladophora

• Recent increase in Cladophora in Lake Erie.
• Could be caused by an increase in:
  – Nutrient inputs
  – Water clarity
  – Water temperature
  – or, by changing lake levels
“You’re glumping the pond
where the Humming-Fish hummed.
No more can they hum, for their gills are all gummed.
So I’m sending them off. Oh, their future is dreary.
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 up in Lake Erie.”

from THE LORAX, by Dr. Seuss
Random House, New York, 1971
Eastern Lake Erie Spring Total Phosphorus

Eastern Lake Erie Spring Dissolved Reactive SiO2

Central Lake Spring Total Phosphorus

Central Lake Spring Dissolved Reactive SiO2