U.S. EPA Great Lakes National Program Office (GLNPO) - Open Lake Monitoring Program and CSMI

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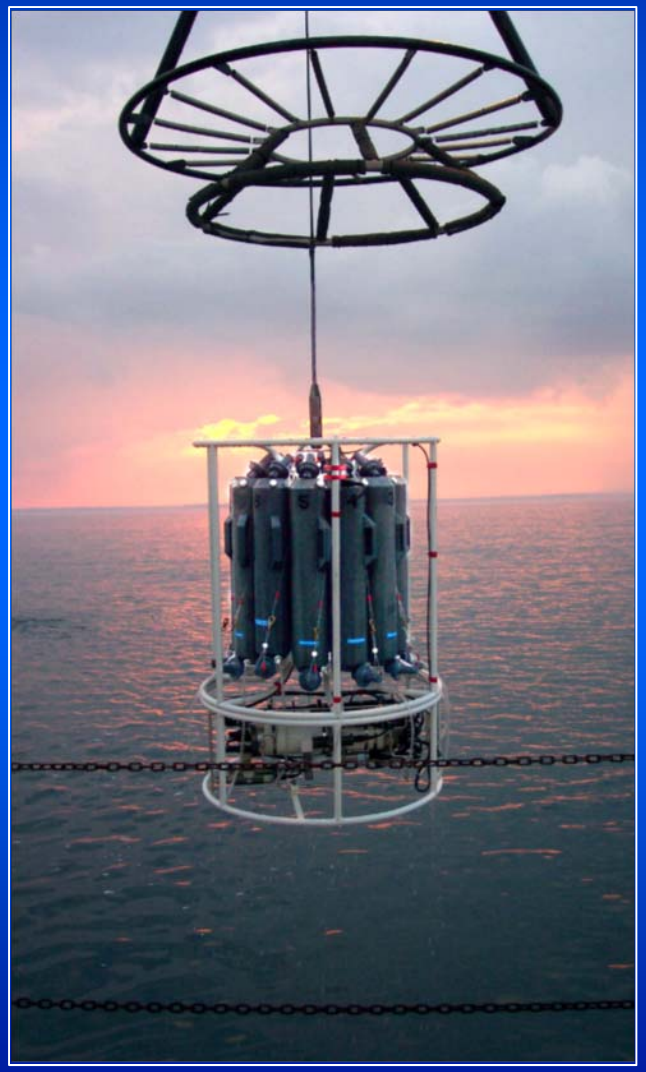
R/V Lake Guardian Specifications

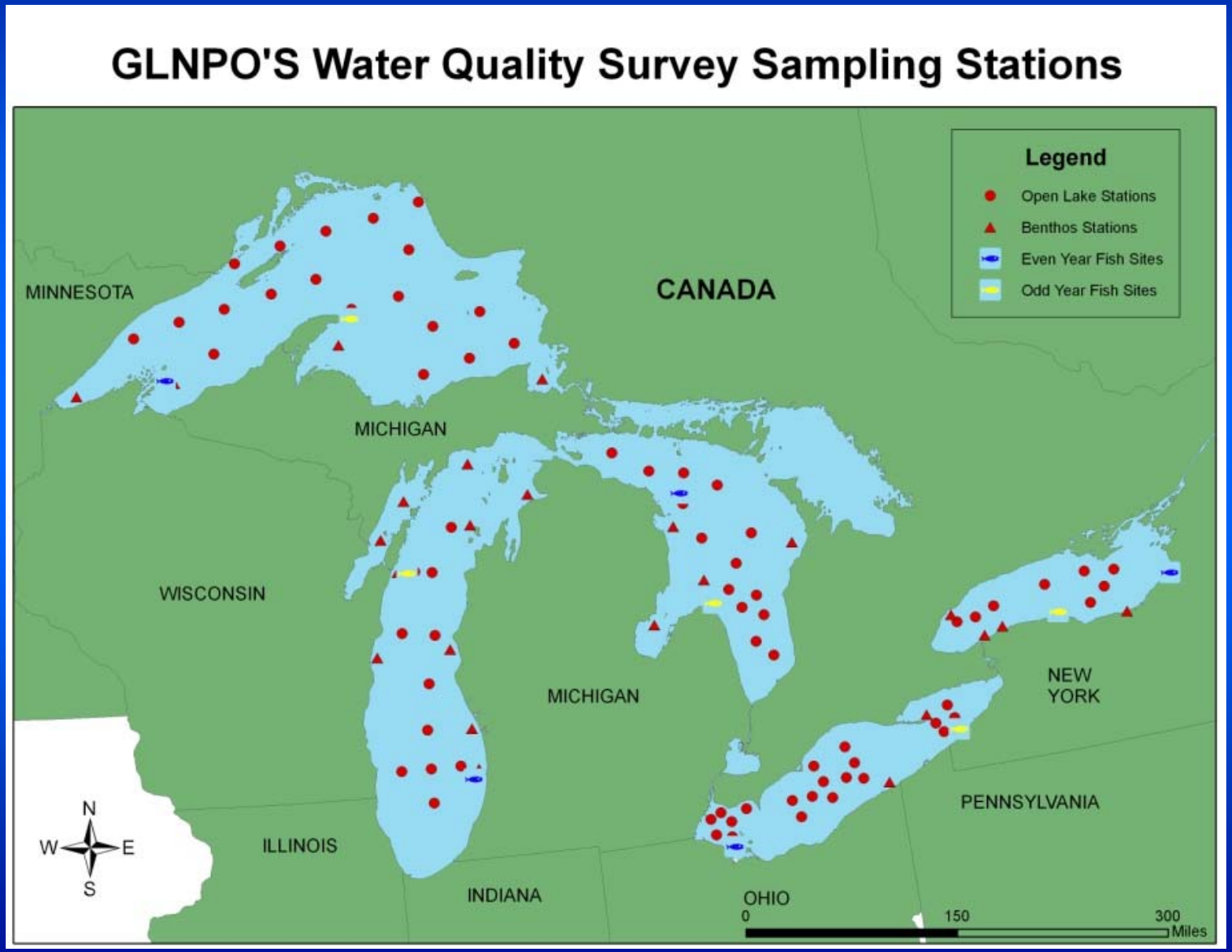
- 180 feet long
- 11 knot cruising speed
- Bunks for 27 scientists & 13 crew members
- 3 laboratories
- Sampling gear

Limnology Program



- Lakes Michigan, Huron and Erie started in 1983
- Ontario began in 1986
- Lake Superior began in 1992

Open Lake Sampling Stations



GLNPO Open Lake Monitoring Program

Annual Monitoring Program - Surveys Biannually

- Spring - begins in late March/early April
- Summer - begins early August
- Approximately 1 Hour per Station

Typical Sequence:

Lakes Michigan, Huron, Erie, Ontario, Superior

Water Quality Metrics

Nutrients

- Total Phosphorus
- Total Dissolved Phosphorus
- Nitrite + Nitrate
- Soluble Reactive Silica
- Soluble Reactive P – select lakes

Water Quality Metrics, cont'd

Particulate C,N,P (Master Stations)

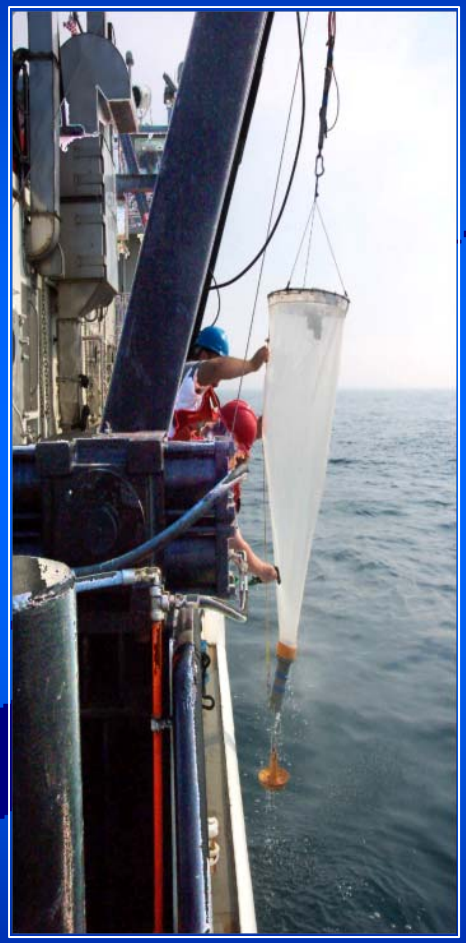
Conventionals

- pH, Alkalinity
- Specific Conductance
- Turbidity, hardness
- Dissolved Oxygen

Biological Monitoring

Currently Sample for:

- **Phytoplankton,**
- **Crustacean Zooplankton,**
- **Rotifers,**
- **Benthos**



Additional Capabilities and Equipment

Air Sampling

Box Corer

ROV

Epibenthic Sled

GLNPO's Nearshore Monitoring Program

- Nearshore monitoring challenge: limited availability of research vessels and resources to survey the extensive (>10,000 miles) shoreline
- Importance of nearshore surveys- nearshore waters are highly variable, high human interaction, can help inform federal/state/local monitoring programs and Great Lakes observing system

TRIAXiS 3D Towed Undulating Vehicle Specifications

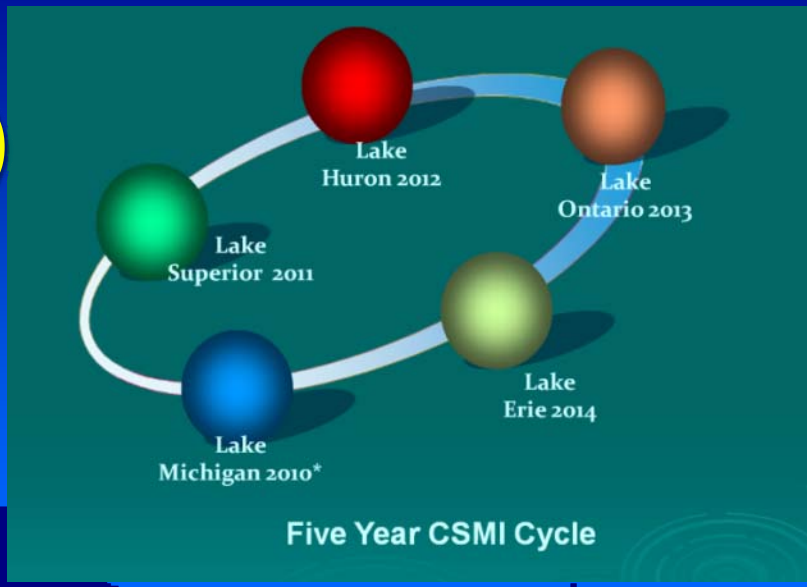
- Triaxus is a towed instrument platform that will house several sensors:
  - SeaBird CTD & D.O. probe
  - Active Fluorometer
  - Laser Optical Plankton Counter (LOPC)
  - Nitrate Analyzer
  - Side-Scan Sonar
  - Fluoroprobe
- Towed behind the R/V Lake Guardian commencing Spring 2009

Continuous Sampling Surveys

- Continuous Sampling through Seachest
  - Depth ~12 feet
  - Maximum Flow Rate ~ 60 liters/minute
  - Stainless Steel Piping
- In-line Filtration

- Seal Analytical AutoAnalyzer 3
  - Segmented Flow Analyzer
    - 5 cm Flow Cell
    - Dissolved Reactive Phosphorus
    - Nitrate-Nitrite Nitrogen
    - 10-15 minute Sampling Interval

Cooperative Science and Monitoring Initiative (CSMI)



5-Year Cycle

- 2013 Lake Ontario
- 2014 Lake Erie
- 2015 Lake Michigan

Sampling approximately monthly for 3-5 days each

Supporting:

- Federal, Academic Groups and Education
- GLNPO Contractors and Grantees
- Great Lakes Restoration Initiative (GLRI) Cooperators

Lake Erie

- Dissolved Oxygen Surveys
  - Central Basin
  - June through September
  - 2-3 Week Intervals
- Triaxus Nearshore Tows
  - 15 meter depth contour

Lake Erie

- Continuous Sampling Surveys
  - In conjunction with
    - Triaxus and DO Surveys
    - Open Lake Surveys
- CSMI, GLRI Related and other approved surveys
- May through July

For More Information:

http://epa.gov/greatlakes
'Monitoring and Indicators'

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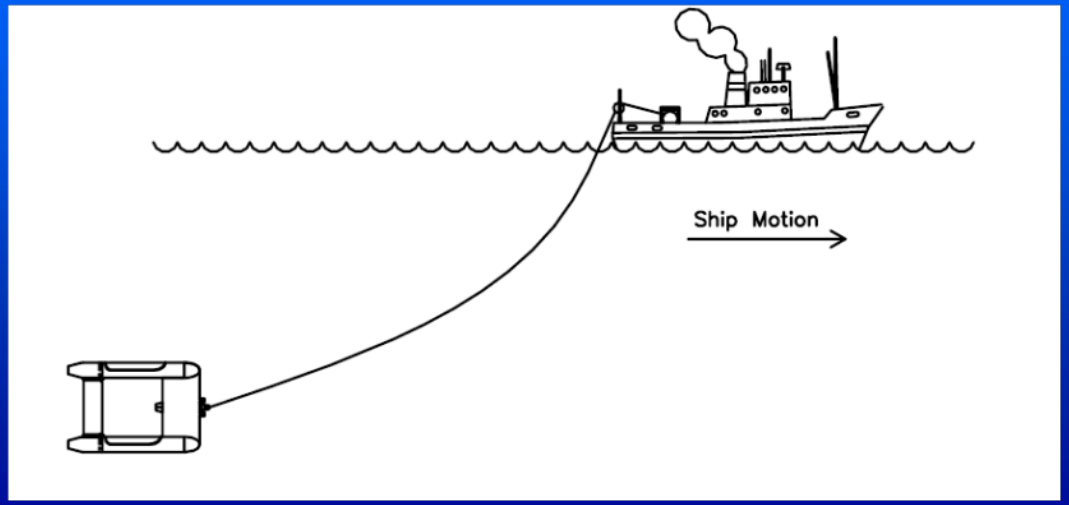
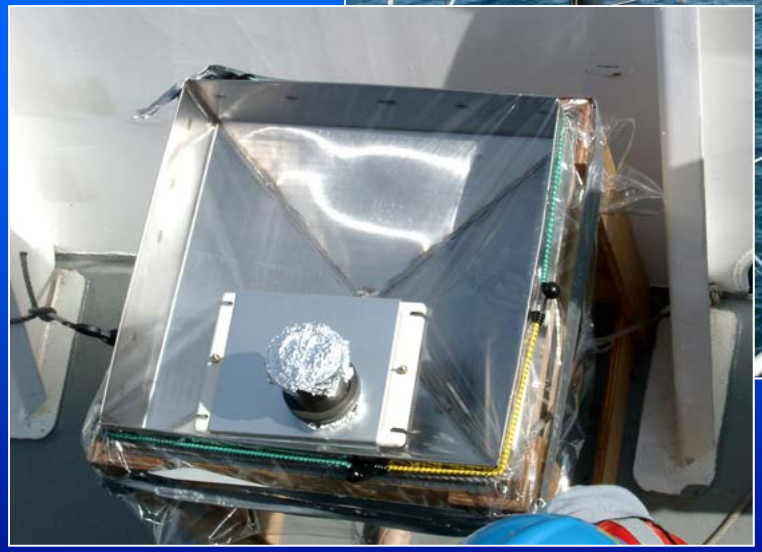
TRIAXUS 3D Towed Undulating Vehicle



Air Samplers

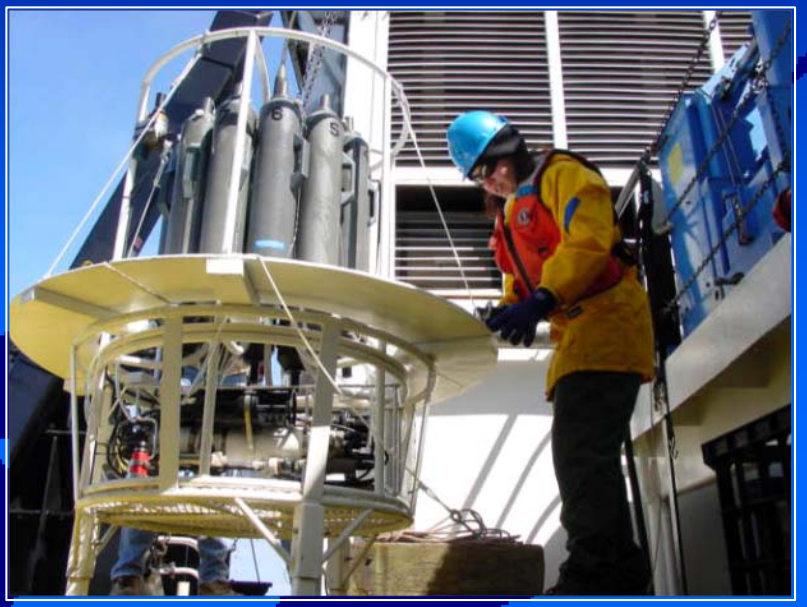


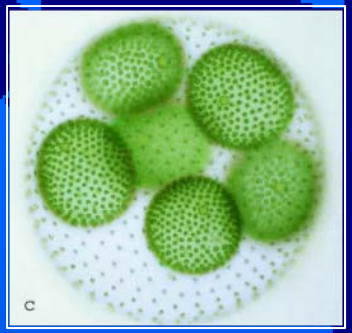
Remote Operating Vehicle (ROV)

Sampling Equipment

More Sampling Equipment

Rosette & SeaBird





Plankton Nets

zooplankton

Sediment Cores & Grabs

Box core

Ponar grab

Epibenthic Sled

Diporeia

Mysis

Great Lakes Spring Total and Dissolved Phosphorus Trends, 1983-2008 (USEPA-GLNPO)