

# **International Field Years on Lake Erie (IFYLE) Program**

**Stuart Ludsin, Stephen Brandt, Nathan Hawley,  
Brian Eadie & Margaret Lansing**

National Oceanic and Atmospheric Administration  
Great Lakes Environmental Research Lab  
Ann Arbor, Michigan

**Thomas Johengen**

Cooperative Institute for Limnology & Ecosystems Research  
University of Michigan  
Ann Arbor, Michigan

# Presentation Outline

- **Historical Foundation, Support & Coordination**
- **Research Objectives & Approach**
- **Field Program**
- **Timeline**

# **International Field Years on Lake Erie Program (Historical Foundation)**

- **Integrative, multidisciplinary, ecosystem-based research program**
- **Based on long-term planning by GLERL**
  - **“A Bold Step Forward: Ecosystem Forecasting, Integrated Observing Systems, and International Field Years for the Great Lakes” (Brandt 2003)**
  - **“Lake Erie Science Planning Workshop”, March 2004**
    - > 50 attendees (scientists, managers)
    - focus on anoxia/hypoxia, HABs, fish production
  - Previous Lake Erie activities
    - Millennium Network, EPA-GLNPO, Environ. Canada

# IFYLE Program (Major Support)

- **NOAA**
  - ~\$3M (ship support, buoy systems, personnel, cash)
    - 11 GLERL Investigators
  - R/V Laurentian and R/V Cyclops to Lake Erie
- **US EPA-Great Lakes National Programs Office**
  - \$450K cost match for ship time (R/V Lake Guardian)
- **National Sea Grant**
  - \$250K to support external (academic) investigators
  - Received 41 proposals for > \$1.2M (14 funded)
- **Environment Canada (NWRI)**
  - Moorings/buoys
  - Historical Data

# IFYLE Program (Other Support)

- **Ohio Sea Grant**
  - \$25K to support research
  - Research vessel, PI housing, website reporting
- **New York Sea Grant**
  - \$25K to support research
- **Pennsylvania Sea Grant**
  - \$7.5K to support research
- **Lake Erie Committee agencies (OH, MI, PA, NY, ON)**
  - Historical database access & vessel support

## **IFYLE Program (Coordination)**

- **Lake Erie Committee – Great Lakes Fishery Commission**
  - **Lake Erie Millennium Network**
  - **Lake Erie Lakewide Management Plan – IJC**
  - **International Council of Great Lakes Research Managers**
  - **Regional Working Group of Presidents Executive Order**
- **Representatives on Strategic Planning Team**

# IFYLE Program (Statistics)

- ~\$5M Direct Costs
- 5 Research Vessels
- 13 Moorings (NOAA and Environment Canada)
- 45 Scientific Investigators
- 18 Universities & Private Institutions
  - 33 Investigators (7 US states, Canada, Sweden, Italy)
- 10 federal, state, & provincial agencies
  - NOAA, EPA-GLNPO, USGS, Army Corps, Environ. Canada
  - 5 Lake Erie fishery management agencies
- > 130 ship days
- > 2,100 Person-Days at Sea

# Presentation Outline

- Historical Foundation, Support & Coordination
- **Research Objectives & Approach**
- Field Program
- Timeline



# IFYLE Program (Objectives)

## – Overarching Goal:

- Provide Lake Erie agencies with ecological understanding & forecasting tools  
→ allow for development of integrative ecosystem-based approaches to resource management

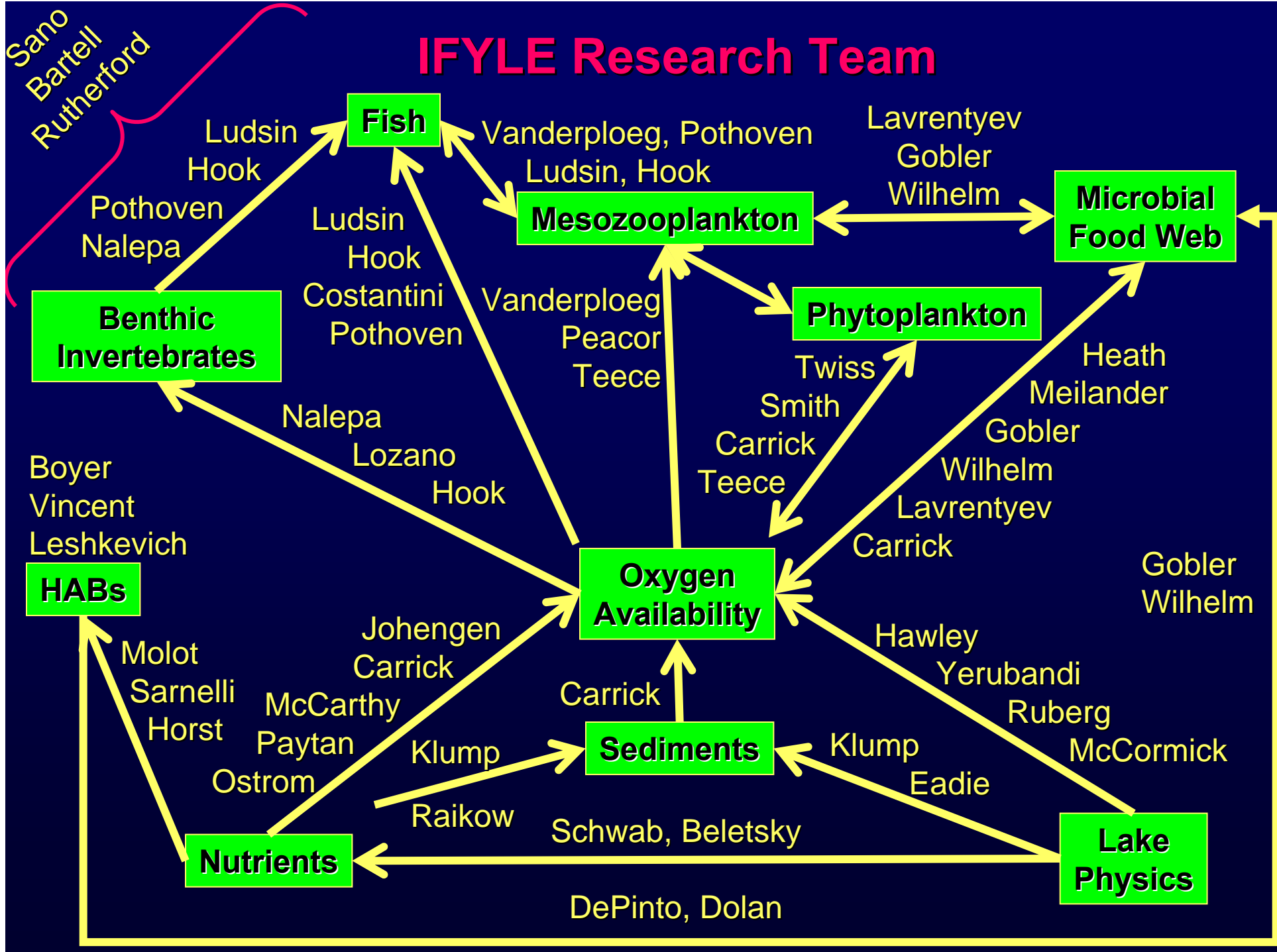
## – Primary Research Goals:

- Develop tools to forecast the timing, extent & magnitude of hypoxia in central Lake Erie
- Quantify the ecological impacts (e.g., fish production) of hypoxia & develop tools to forecast them
- Explore the causes of HABs formation in Lake Erie & provide understanding/tools to forecast their formation

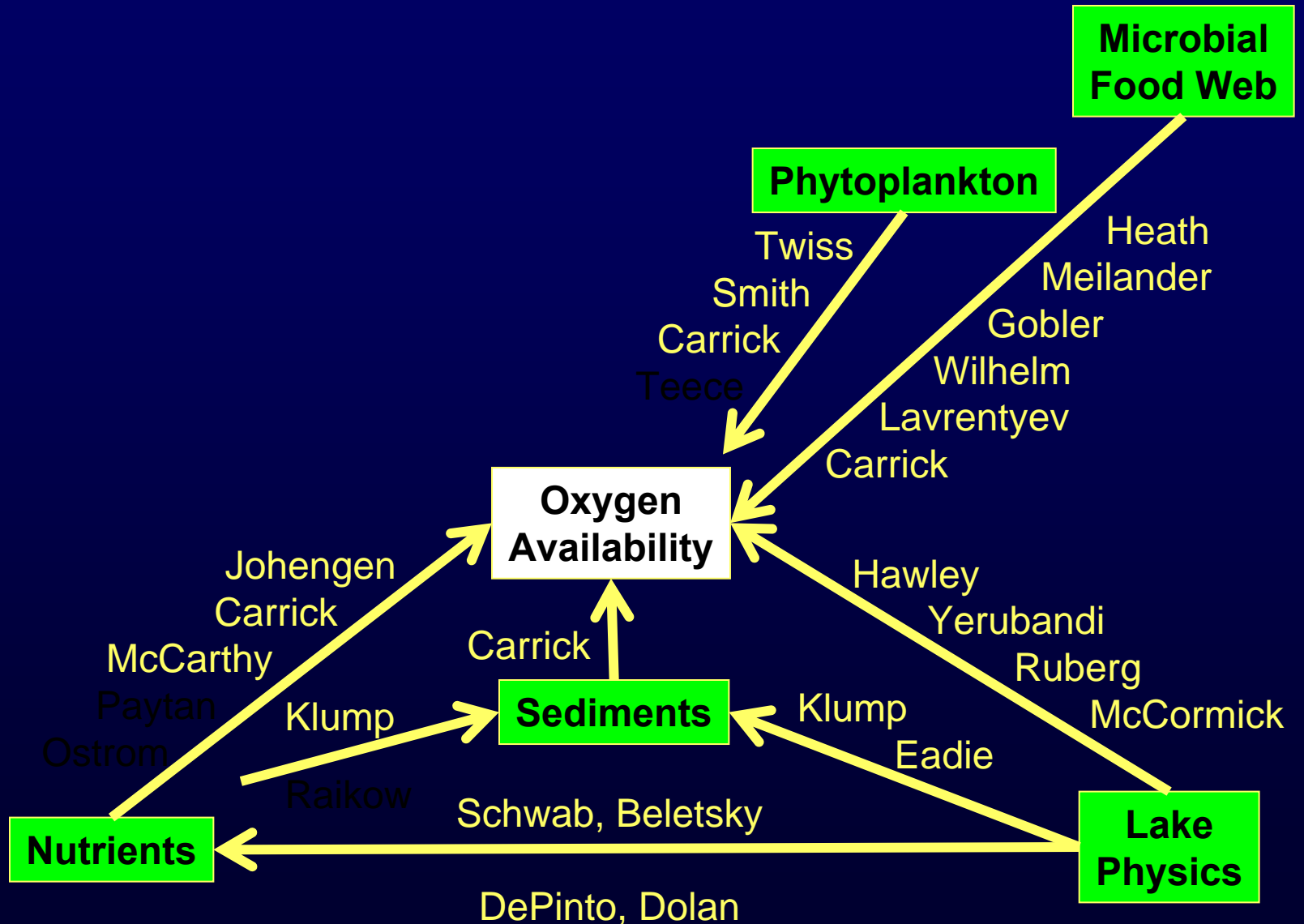
# IFYLE Program (Research Approach)

- Although somewhat exploratory & descriptive...
  - Most investigators are testing one or more hypotheses
  - Each research effort is contributing a novel piece of information/data that will help achieve one or more of our 3 primary research goals

# IFYLE Research Team

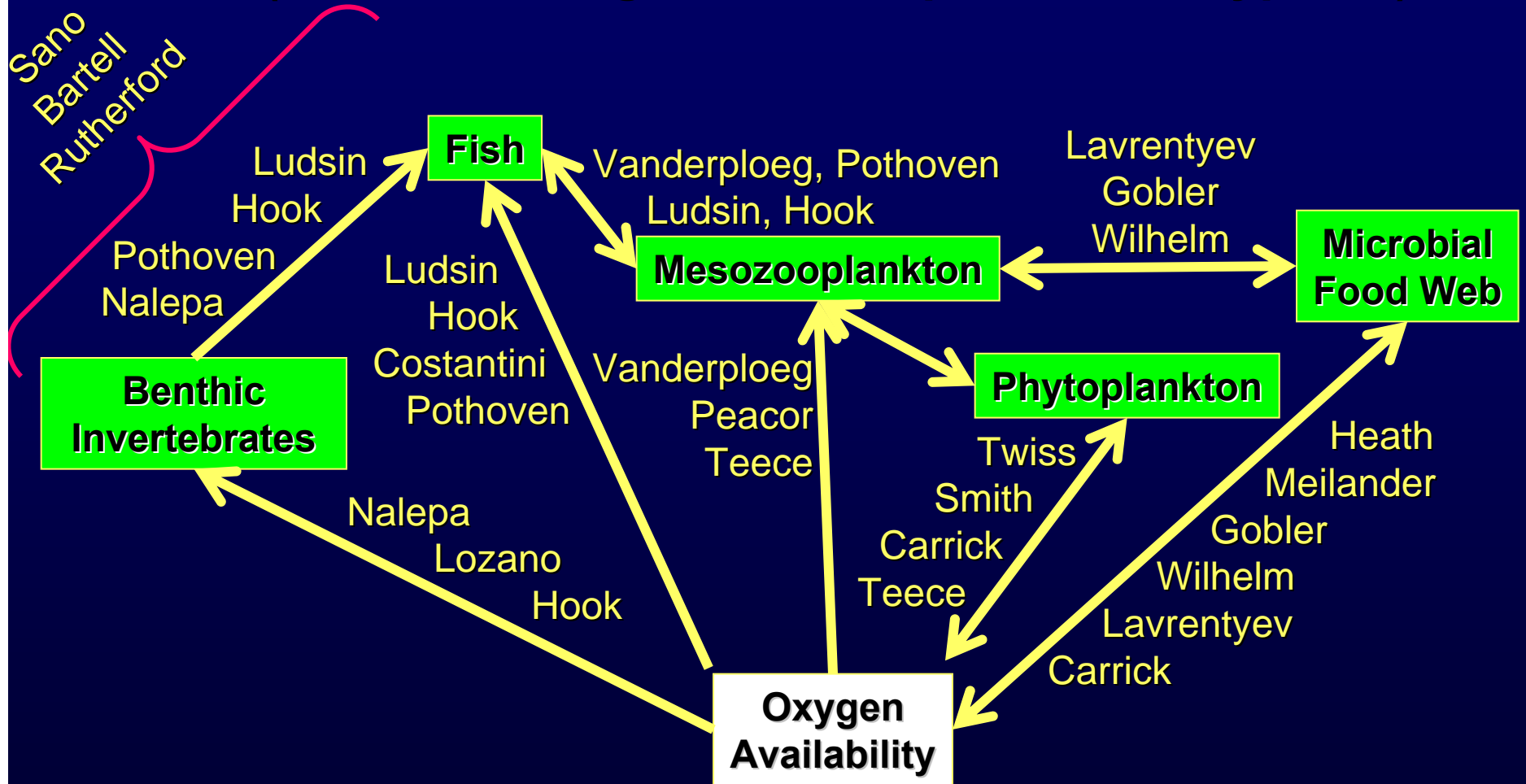


# IFYLE Research Team (Goal 1: Drivers of Hypoxia)



# IFYLE Research Team

(Goal 2: Ecological Consequences of Hypoxia)



# IFYLE Research Team (Goal 3: Drivers/effects of HABs)

Microbial  
Food Web

Boyer  
Vincent  
Leshkevich

HABs

Molot  
Sarnelli  
Horst

Nutrients

Gobler  
Wilhelm



# IFYLE Program (Research Approach)

- Use a variety of approaches
  - Field sampling
    - Traditional limnological, oceanographic & ecological methods
      - ZP nets, light:dark bottle expts., ponars, trawling, sediment traps, box coring
    - State-of-the-technologies
      - Optical plankton counter, fast repetition rate fluorometer, spectral fluorometer, flow cytometry, acoustics, real-time buoys, ADCPs
  - Laboratory Analysis
    - Phytoplankton, microbial & zooplankton production, community composition, algal toxin analysis, microbial-zooplankton grazing expts., fish diet & condition analyses, molecular genetics, RNA:DNA analysis, fatty acid analysis
  - Modeling
    - Hydrodynamics, Comprehensive Aquatic System Model (CASM), spatially-explicit bioenergetics-based growth-rate potential modeling

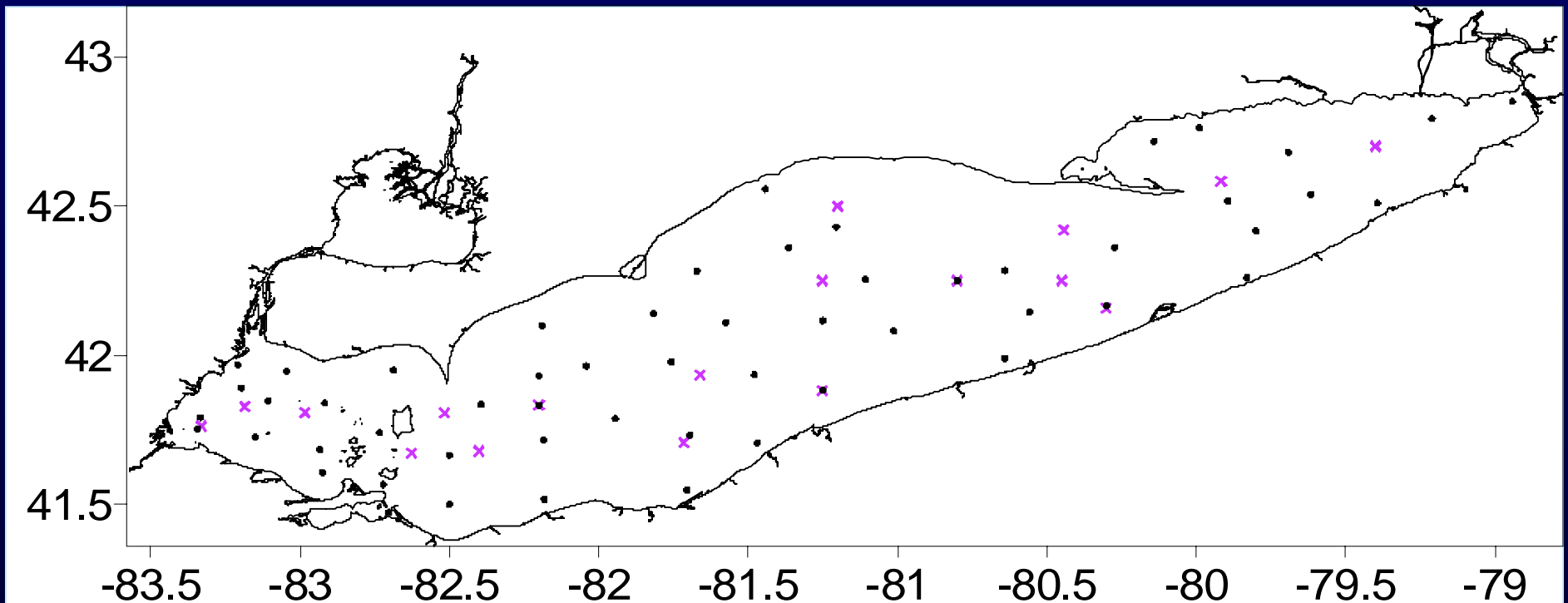
# Presentation Outline

- Historical Foundation, Support & Coordination
- Research Objectives & Approach
- **Field Program**
- Timeline



# IFYLE Field Program (Fixed Station)

- Monthly sampling during May through September
  - EPA-GLNPO: R/V Lake Guardian (180')
  - Focus: Hypoxia & HABs



Source: Don Coles

- Fixed-station sites (n=55)
- x Moorings/Buoys (n = 13)

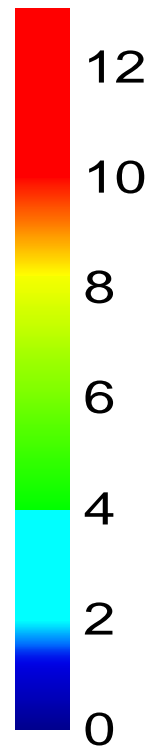
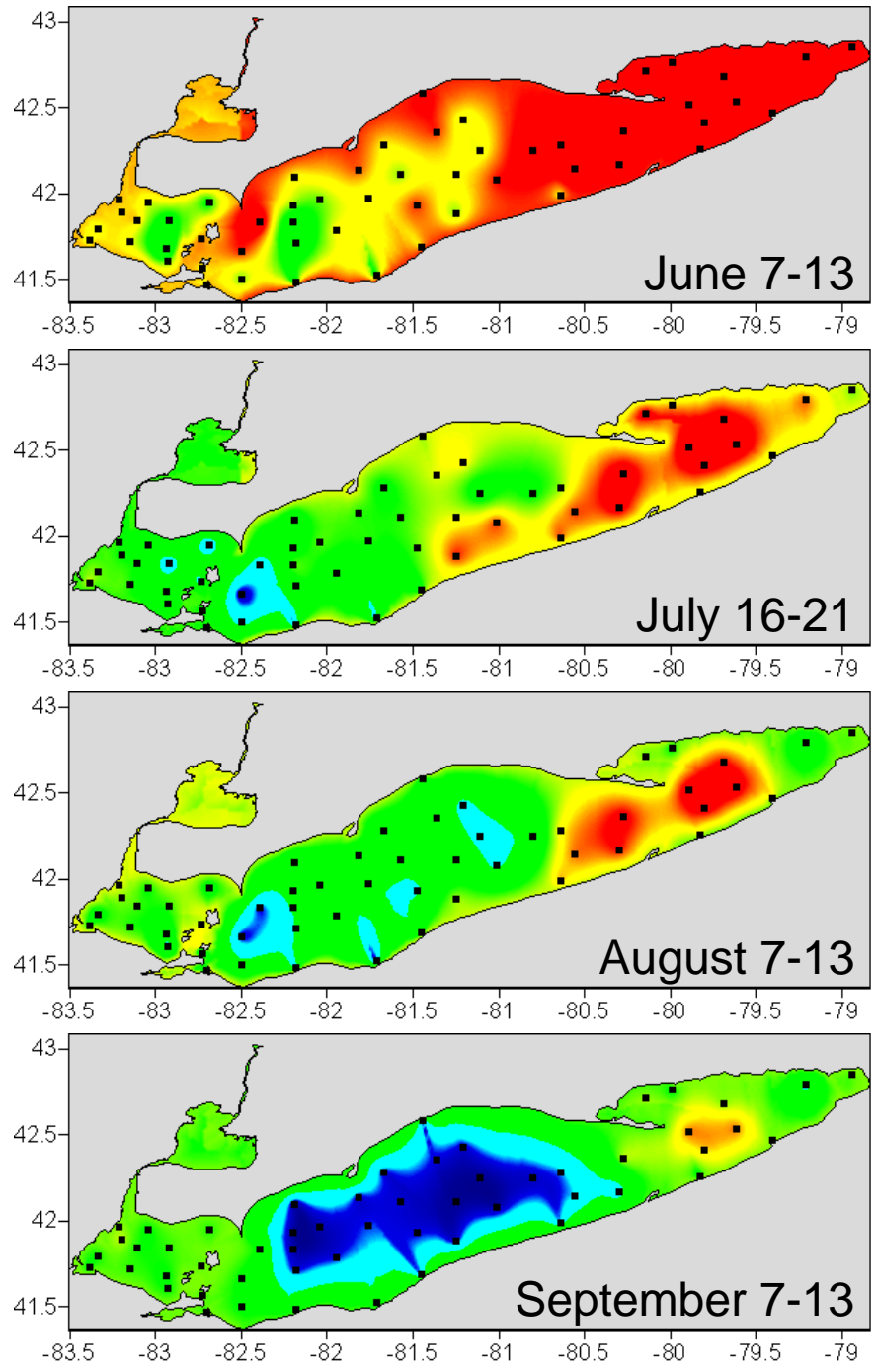
# IFYLE Field Program (Fixed Station)

## Typical collections at each site:

- CTD
- Pumping for toxin estimation
- Water samples for chl<sub>a</sub>, nutrients, phytoplankton, microbial food web, calibration of satellite imagery
- Ponar grabs for benthic invertebrates
- Zooplankton collections
- Fast repetition-rate fluorometer (FRRF)/fluoroprobe tows
- Hyperspectral light meter measurement
- Satlantic deployment



# 2005

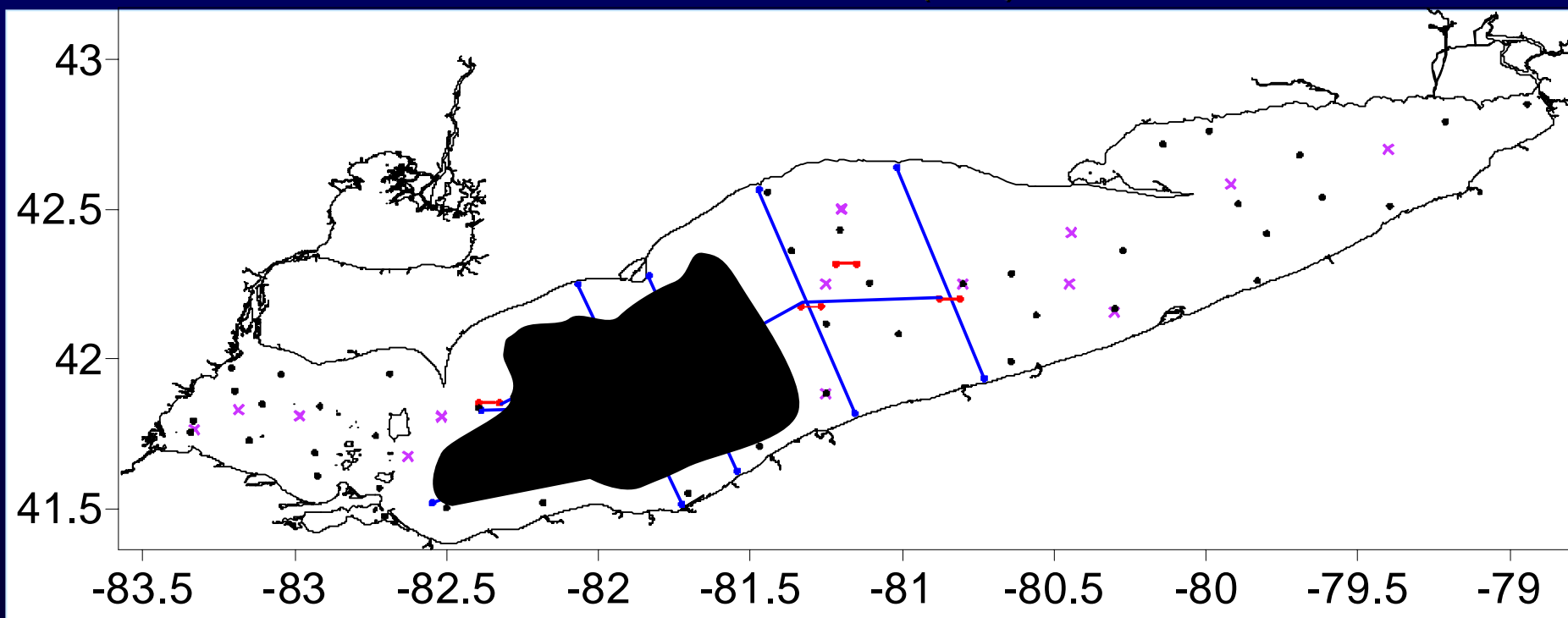


Dissolved  
Oxygen  
(mg/l)

Source: IFYLE Program

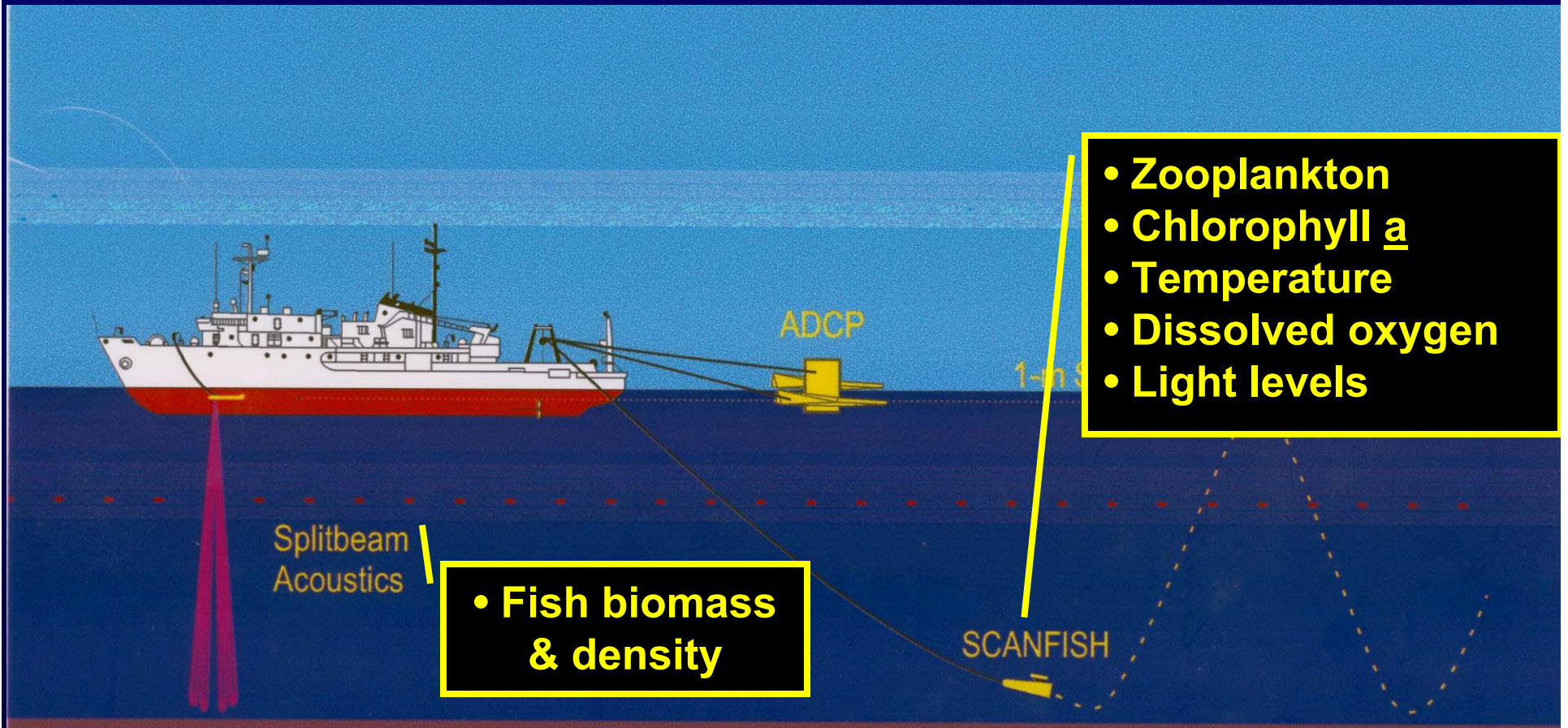
# IFYLE Field Program (Transect & Diel)

- Monthly sampling during May through October
  - EPA-GLNPO: R/V Lake Guardian (180')
  - NOAA-GLERL: R/V Laurentian (80')



- Fixed-station sites
- x Moorings/Buoys
- Transect Lines (day/night)
- Diel Stations (24-hr sampling)

# IFYLE Field Program (Transect & Diel)



- Trawling & gillnetting (sp. composition, fish for diet analyses)
- Collection of macroinvertebrates & ZP (prey production)

# Presentation Outline

- Historical Foundation, Support & Coordination
- Research Objectives & Approach
- Field Program
- **Timeline**

# IFYLE Timeline

February 2005 :	Develop collaborations, find funding
March 2005:	Identify university partners
April 2005:	All P.I. meeting to finalize 2005 plans
May – October 2005:	Field season

# IFYLE Timeline

February 2005 :	Develop collaborations, find funding
March 2005:	Identify university partners
April 2005:	All P.I. meeting to finalize 2005 plans
May – October 2005:	Field season

**1-2 March 2006: All P.I. meeting to plan for 2006**

- IFYLE informal talks (6:15-7:45 PM tonight; 122 Biology)
- IFYLE-only session (1:00-5:00 PM tomorrow; 122 Biology)



# IFYLE Informal Session Schedule (Tonight in 122 Biology)

Presenter	Title	Time
Hawley	Time Series measurements in Lake Erie	6:15
Johengen	Spatial and temporal development of Lake Erie hypoxia and associated trophic conditions in 2005	6:30
Leshkevich	A New MODIS Algorithm for Retrieval of Chla, DOC, and Suspended Minerals for the Great Lakes	6:45
Horst	Phosphorus uptake physiology of toxic Microcystis and competing taxa along a nutrient gradient in Saginaw Bay (Lake Huron)	7:00
Vanderploeg	Dreissenid mussels and Microcystis in Lake Erie Western Basin; Zooplankton and hypoxia in Lake Erie Central Basin	7:15
Höök	Influence of Hypoxic Events on the Short-Term Growth of Organisms from Multiple Trophic Levels	7:30

# IFYLE Timeline

- |                          |  |
|--------------------------|--|
| February 2005 :          | Develop collaborations, find funding                       |
| March 2005:              | Identify university partners                               |
| April 2005:              | All P.I. meeting to finalize 2005 plans                    |
| May – October 2005:      | Field season   |
| <b>1-2 March 2006:</b>   | <b>All P.I. meeting to plan for 2006</b>                   |
|                          | - IFYLE informal talks (6:15-7:45 PM tonight; 122 Biology) |
|                          | - IFYLE-only session (1:00-4:30 PM tomorrow; 122 Biology)  |
| <b>Rest of 2006:</b>     | <b>Process/analyze data; refine H<sub>0</sub>'s</b>        |
| <b>Spring-Fall 2007:</b> | <b>More focused field season</b>                           |
| <b>2008:</b>             | <b>Process/analyze data; synthesize findings</b>           |

# IFYLE Sponsors



# IFYLE Informal Session Schedule (Tonight in 122 Biology)

Presenter	Title	Time
Hawley	Time Series measurements in Lake Erie	6:15
Johengen	Spatial and temporal development of Lake Erie hypoxia and associated trophic conditions in 2005	6:30
Leshkevich	A New MODIS Algorithm for Retrieval of Chla, DOC, and Suspended Minerals for the Great Lakes	6:45
Horst	Phosphorus uptake physiology of toxic Microcystis and competing taxa along a nutrient gradient in Saginaw Bay (Lake Huron)	7:00
Vanderploeg	Dreissenid mussels and Microcystis in Lake Erie Western Basin; Zooplankton and hypoxia in Lake Erie Central Basin	7:15
Höök	Influence of Hypoxic Events on the Short-Term Growth of Organisms from Multiple Trophic Levels	7:30