

Impacts of Multiple Stressors on Water Quality in Saginaw Bay

Juli Dyble, Gary Fahnenstiel, Tom Nalepa, Hank Vanderploeg
NOAA Great Lakes Environmental Research Lab

Scott Peacor, Dianna Dziekan, Kim Peters
Michigan State University

Steve Francoeur
Eastern Michigan University

Donna Kashian
Wayne State University

Jim Bredin, Bruce Walker
Michigan DEQ

Joe Depinto
LimnoTech

Peter Lavrentyev
University of Akron

Dave Millie
Florida Institute of Oceanography

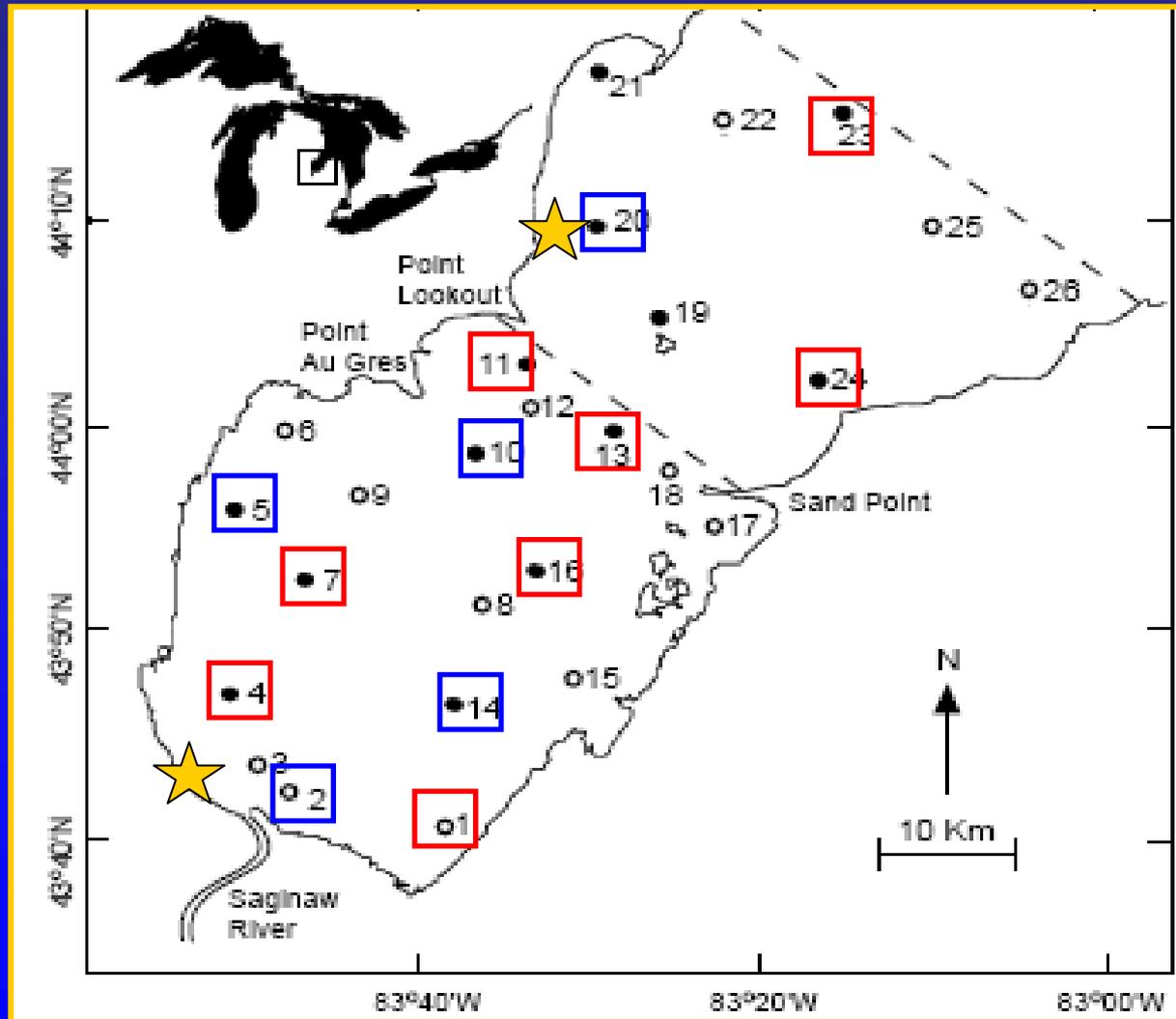
Outline

- ❖ What have we done?
 - ◆ Water quality monitoring
 - ◆ HABs
 - ◆ Benthic algae
 - ◆ Beach muck
- ❖ What have we learned?
- ❖ Plans for 2010
- ❖ Questions for discussion

WQ monitoring

- ❖ Monthly sampling May – Oct 2009
 - ◆ 13 stations (10 inner, 3 outer bay)
 - ◆ 5 master, 8 basic
 - ◆ Physical: CTD (incl. DO, PAR), secchi
 - ◆ Nutrients: total P, SRP, TDP, particulate CN, DOC, NO₃, NH₄, SiO₂, Cl, TSS, VSS
 - ◆ Phytoplankton: chl *a*, cell counts, HPLC pigments
- ❖ Water utility intakes (Bay City, Midland)
 - ◆ Microcystin
 - ◆ Taste and odor (MIB and geosmin)

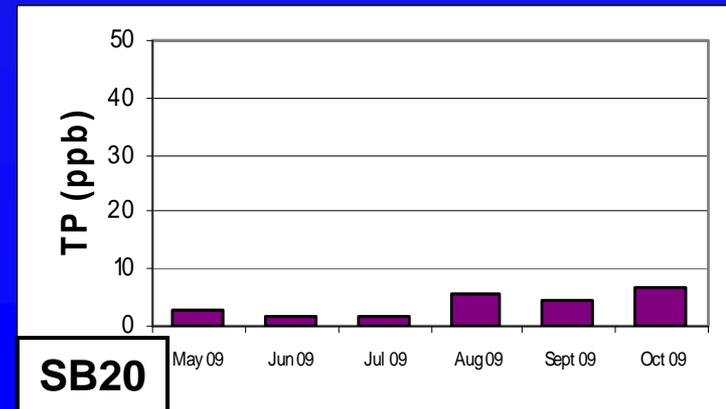
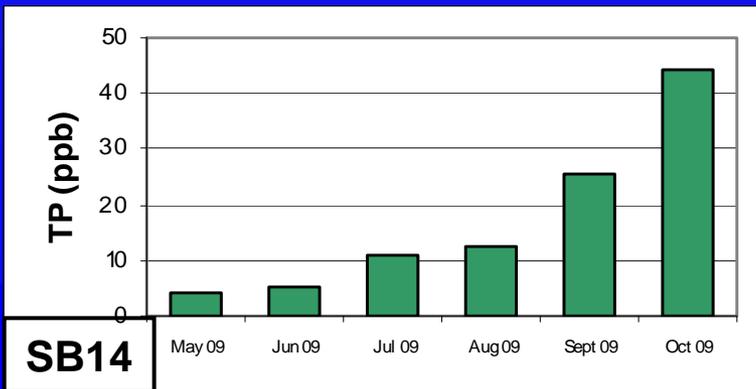
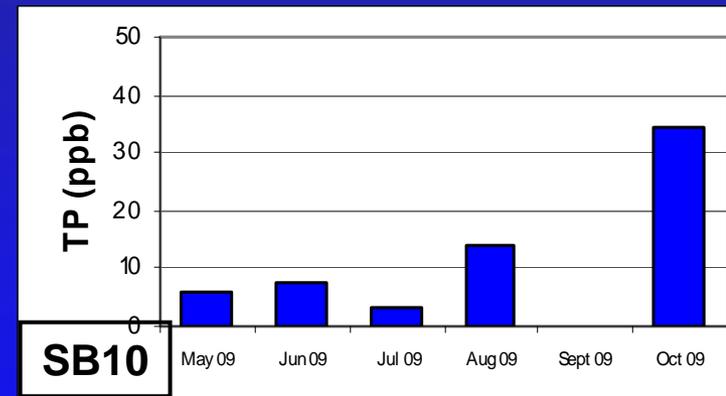
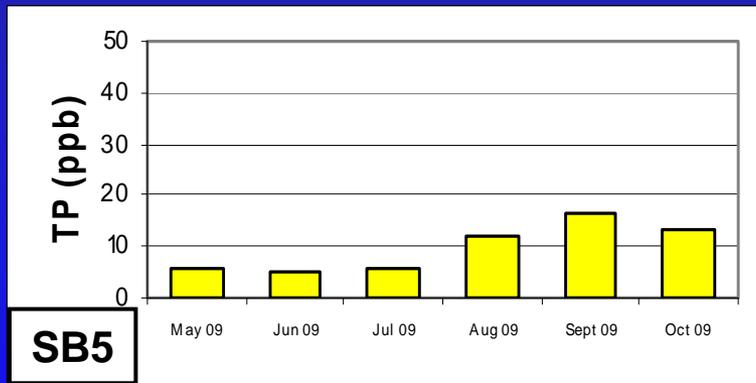
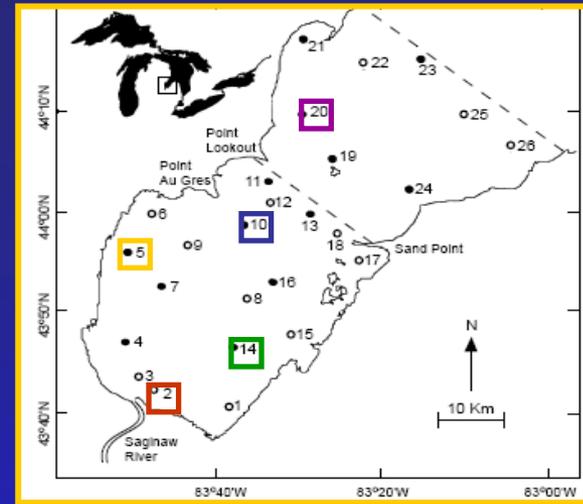
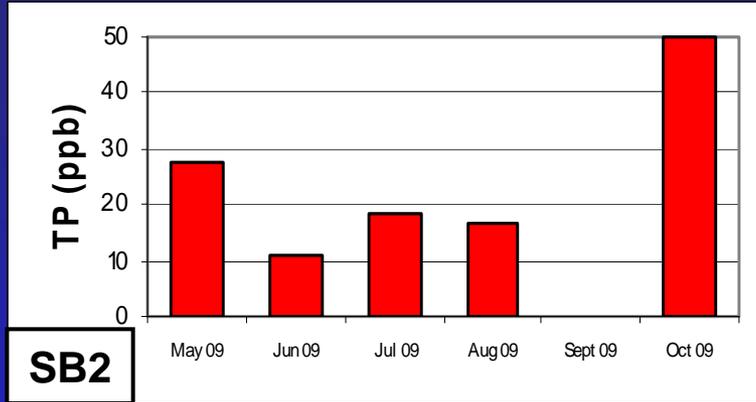
Sampling stations



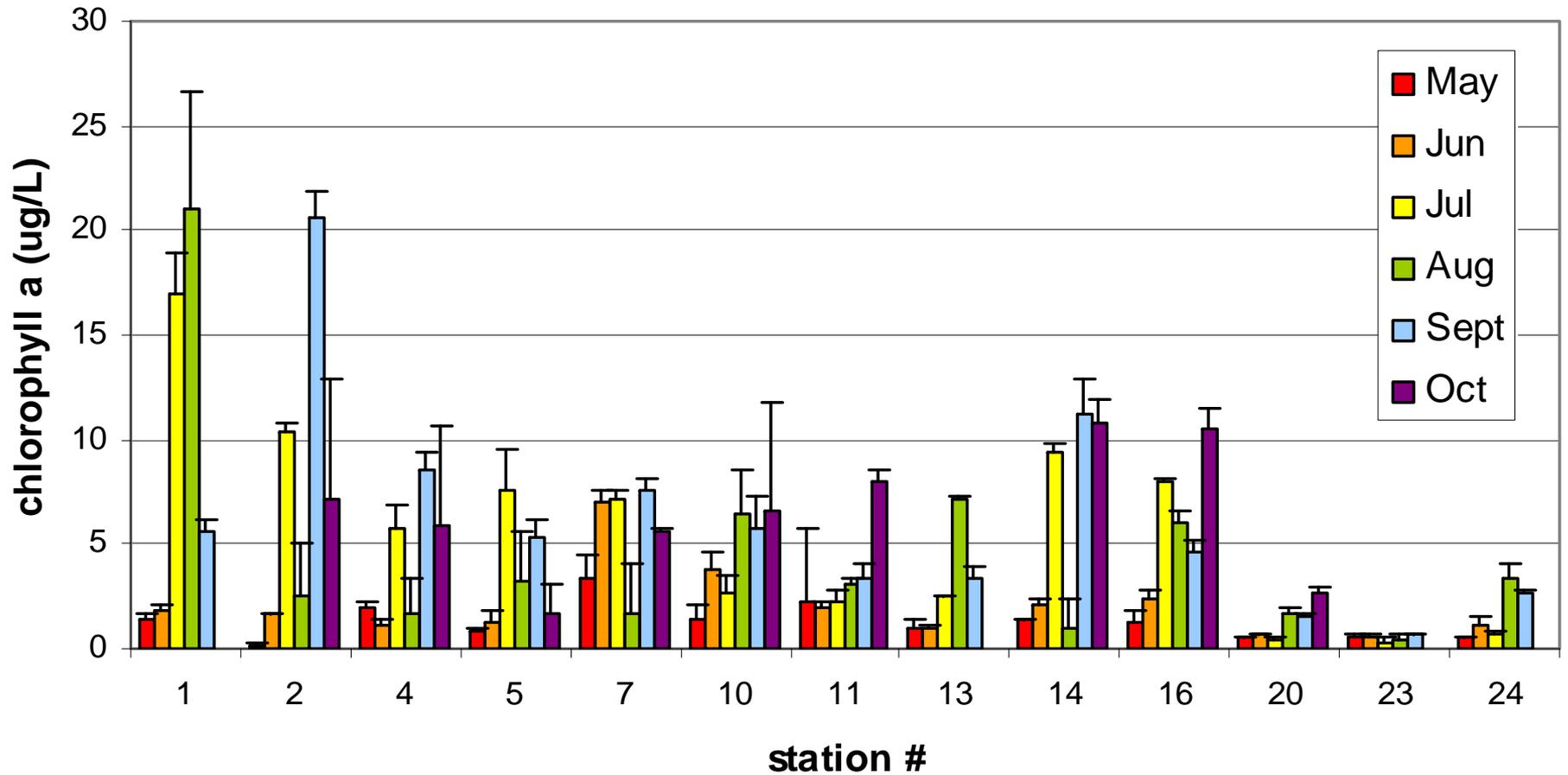
Blue: Master (5)
Red: Basic (8)

 Water utility intakes

TP (ppb) 2009



Chlorophyll a 2009



Status of sample processing

❖ Monitoring

- ◆ CTD - finished
- ◆ Chl *a* – finished
- ◆ HPLC, cell counts – not started
- ◆ Nutrients – in process

❖ HABs

- ◆ microcystin – not started
- ◆ MIB/geosmin – in process

Plans for 2010

❖ Monitoring

- ◆ 3 times – every 2 months
- ◆ All 13 stations (basic and master)
- ◆ Sample water intakes for microcystin

What have we learned?

❖ Monitoring

- ◆ *Microcystis* is back – large bloom in late Aug, early Sept

Questions for discussion

- ❖ Should we monitor every month to keep up dataset?
- ❖ What are some ways to test whether beach muck is a localized, seasonal issue (algae growing in nearby areas coming onshore that summer) vs. a bay wide repository?
- ❖ Is there a relationship between cooler, cloudier summer with high water levels and relatively low muck and benthic algal biomass?