N:P uptake ratios to infer optimal conditions for HABS

Terri Jicha, Jicha.terri@epa.gov, 218-529-5153
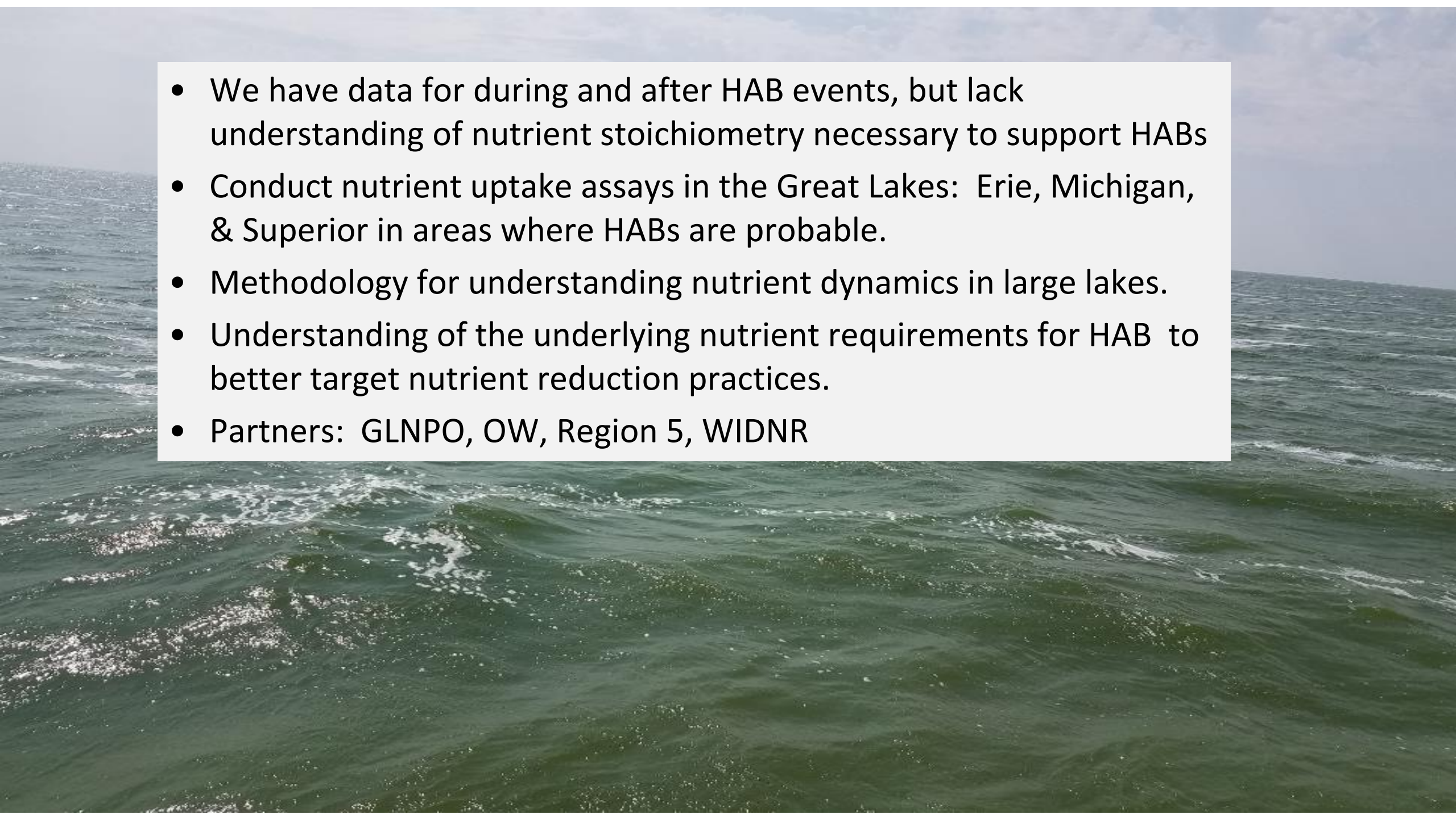
- We have data for during and after HAB events, but lack understanding of nutrient stoichiometry necessary to support HABs
- Conduct nutrient uptake assays in the Great Lakes: Erie, Michigan, & Superior in areas where HABs are probable.
- Methodology for understanding nutrient dynamics in large lakes.
- Understanding of the underlying nutrient requirements for HAB to better target nutrient reduction practices.
- Partners: GLNPO, OW, Region 5, WIDNR

Figure 1: Samples sites for Lake Erie Lower Food Web/primary production surveys. Selected sites will be sampled for nutrient uptake assays.

- ✳ Nutrient uptake assay (NUA) sites
- ✳ NUA-HABs/ Hypoxia transects (OSU)

- ◆ Primary Production + ORD Nutrients + Cornell Zooplankton (Rosette + 2 Nets)
- ◆ NOAA Hypoxia + Primary Production + ORD Nutrients + Cornell Zooplankton (Rosette + 2 Nets + 1 Ponar)
- ◆ NOAA Hypoxia + Cornell Zooplankton (Rosette + 2 Nets + 1 Ponar)
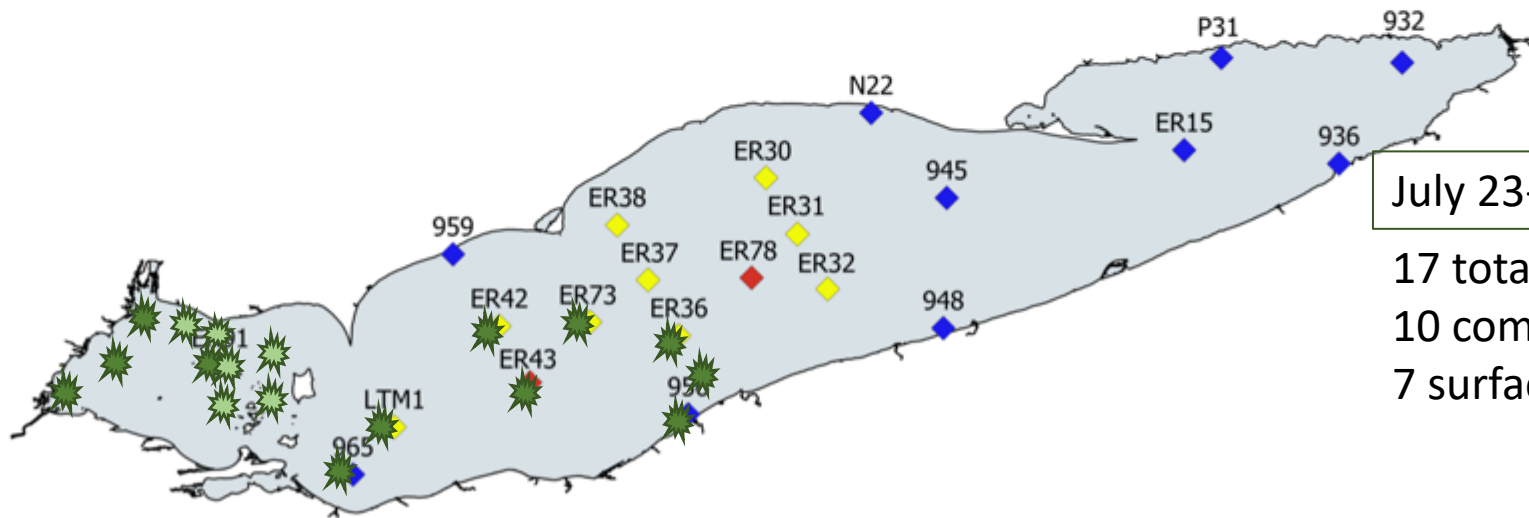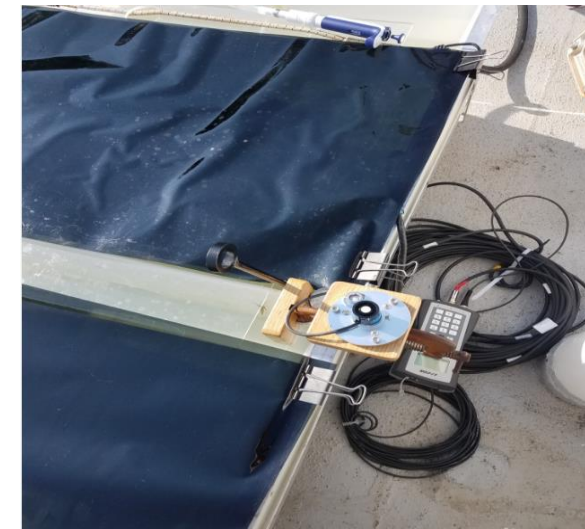
July 23- 30, 2019

17 total stations
10 composited
7 surface and bottom

Collection:
- Samples were collected via the Rosette at 3 depths: 1M, Fmax, 2M from bottom
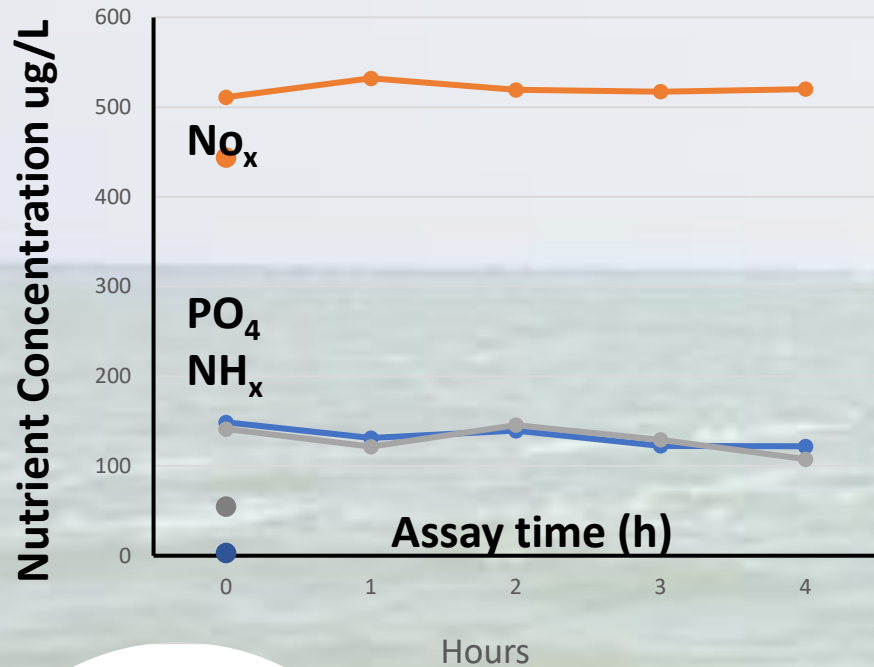- Composited by stratification

Bioassays:
- Conducted the following day between 10 am 2pm
- 5L biotainers
- Added nutrients to 100ppb above background
- under natural density film to mimic in situ light conditions.
- Tank flow through lake water to incubate at lake temperature
- Sampled hourly over 4 hours
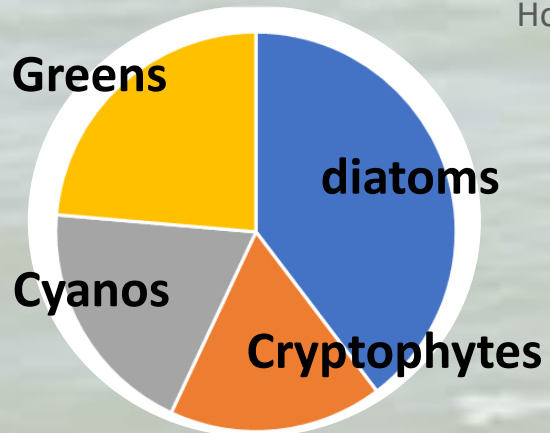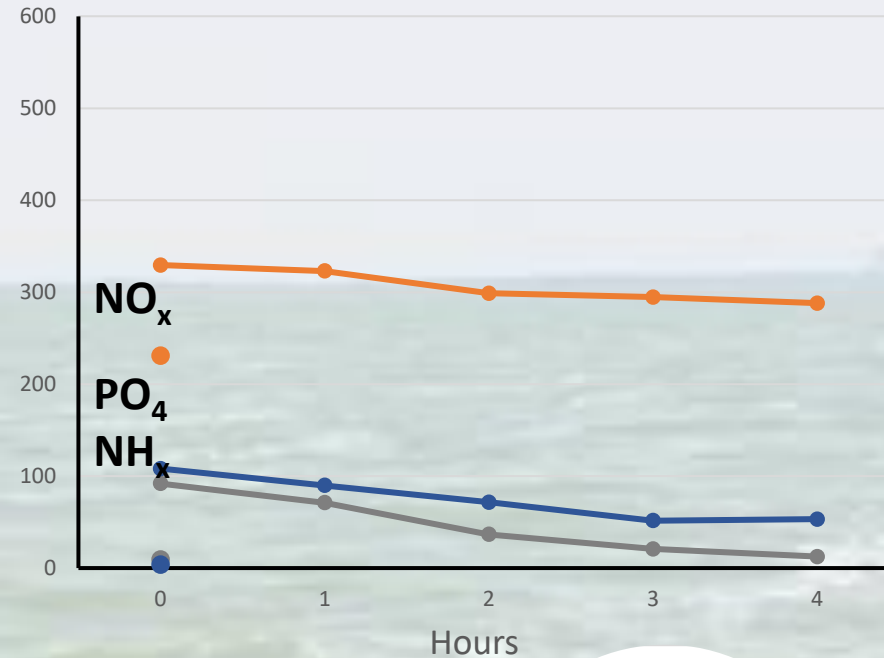- NH_4, NO_3, PO_4, Si, Fe, DOC, cations and anions

Nutrient uptake dynamics in Lake Erie (CSMI 2019)
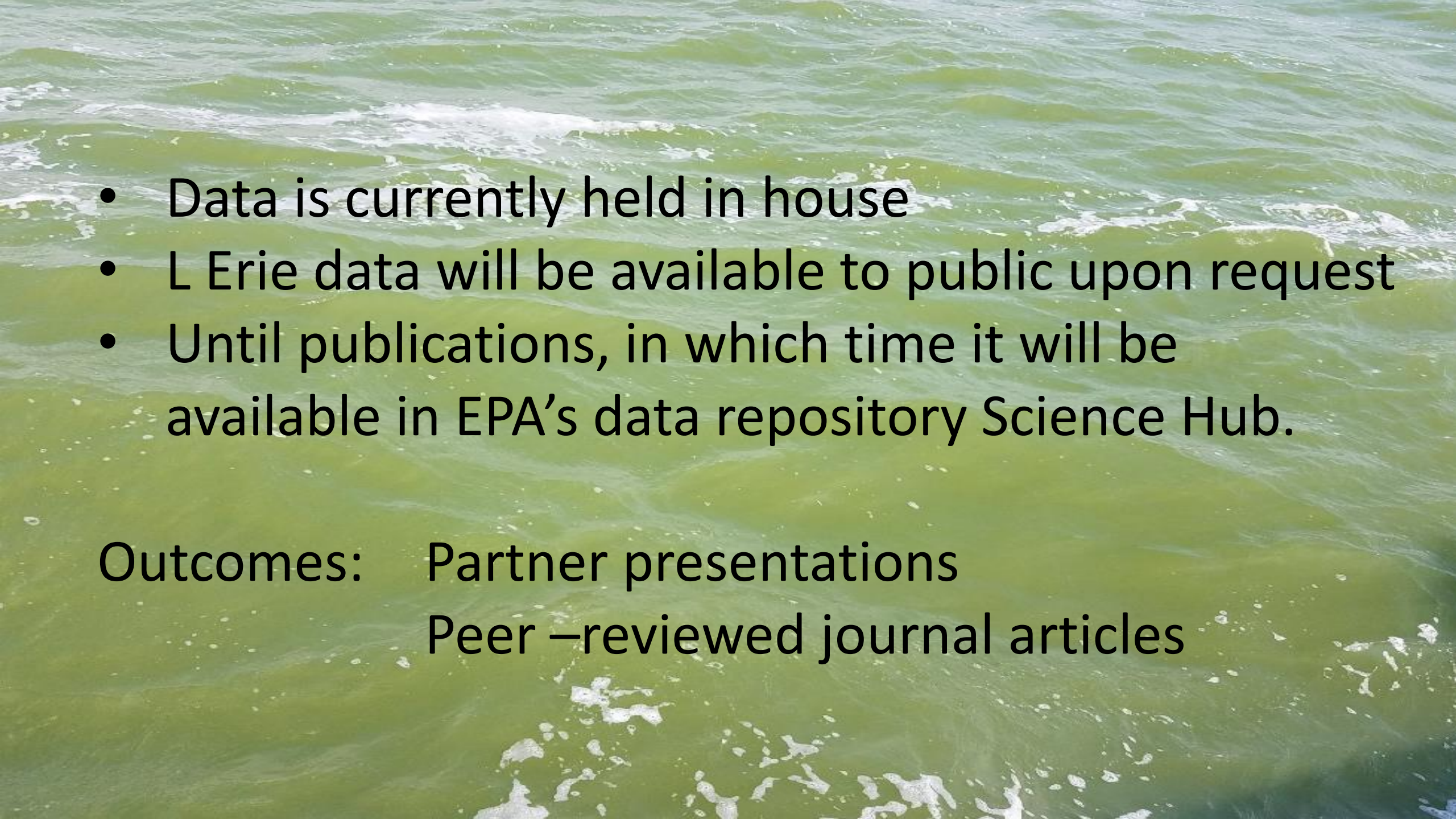

Low Chl a (2.6 ug/L)

Nutrient Concentration ug/L

No$_x$

PO$_4$
NH$_x$

Assay time (h)

Hours

High Chl a (40 ug/L)

NO$_x$

PO$_4$

NH$_x$

Hours

Greens
diatoms
Cyanos
Cryptophytes

Cryptophytes
Cyanos

Nutrient uptake assays show minimal nutrient uptake in low Chlorophyll a sites, while high Chlorophyll a sites show Ammonium and Phosphate as the preferred nutrients, possibly co-limiting.
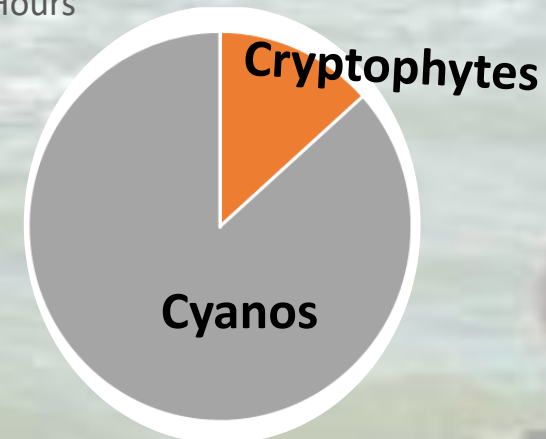
- Data is currently held in house
- L Erie data will be available to public upon request
- Until publications, in which time it will be available in EPA's data repository Science Hub.

Outcomes: Partner presentations
                 Peer –reviewed journal articles