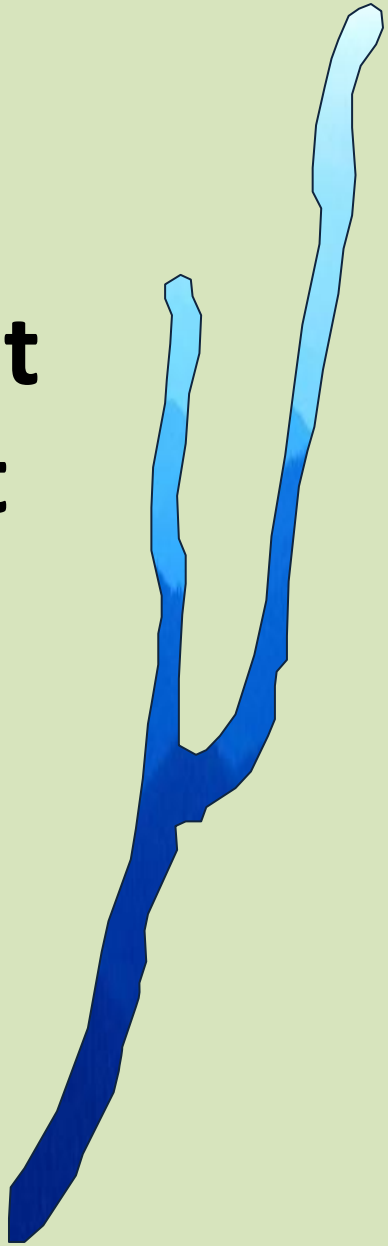
Keuka Lake History, Current State, and What We Don't Know

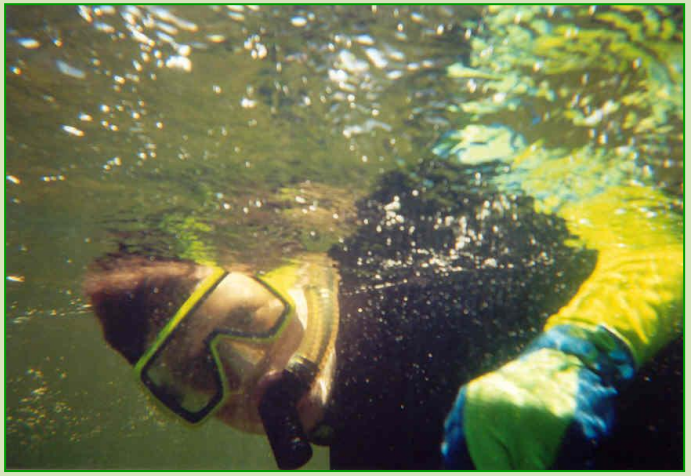
Tim Sellers, PhD



August 2018

Tim Sellers, PhD

KLA Science/Water Quality Advisor



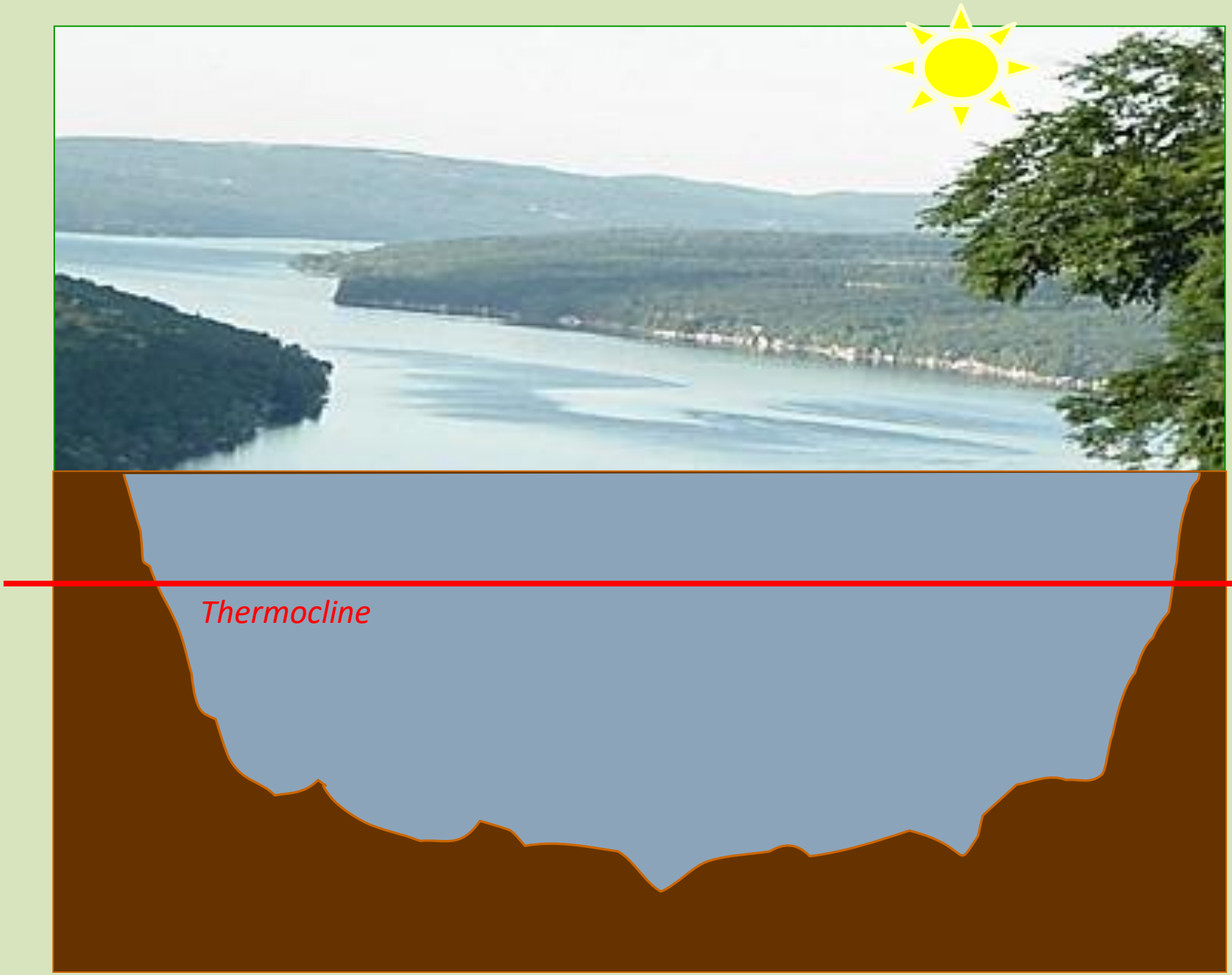
Training

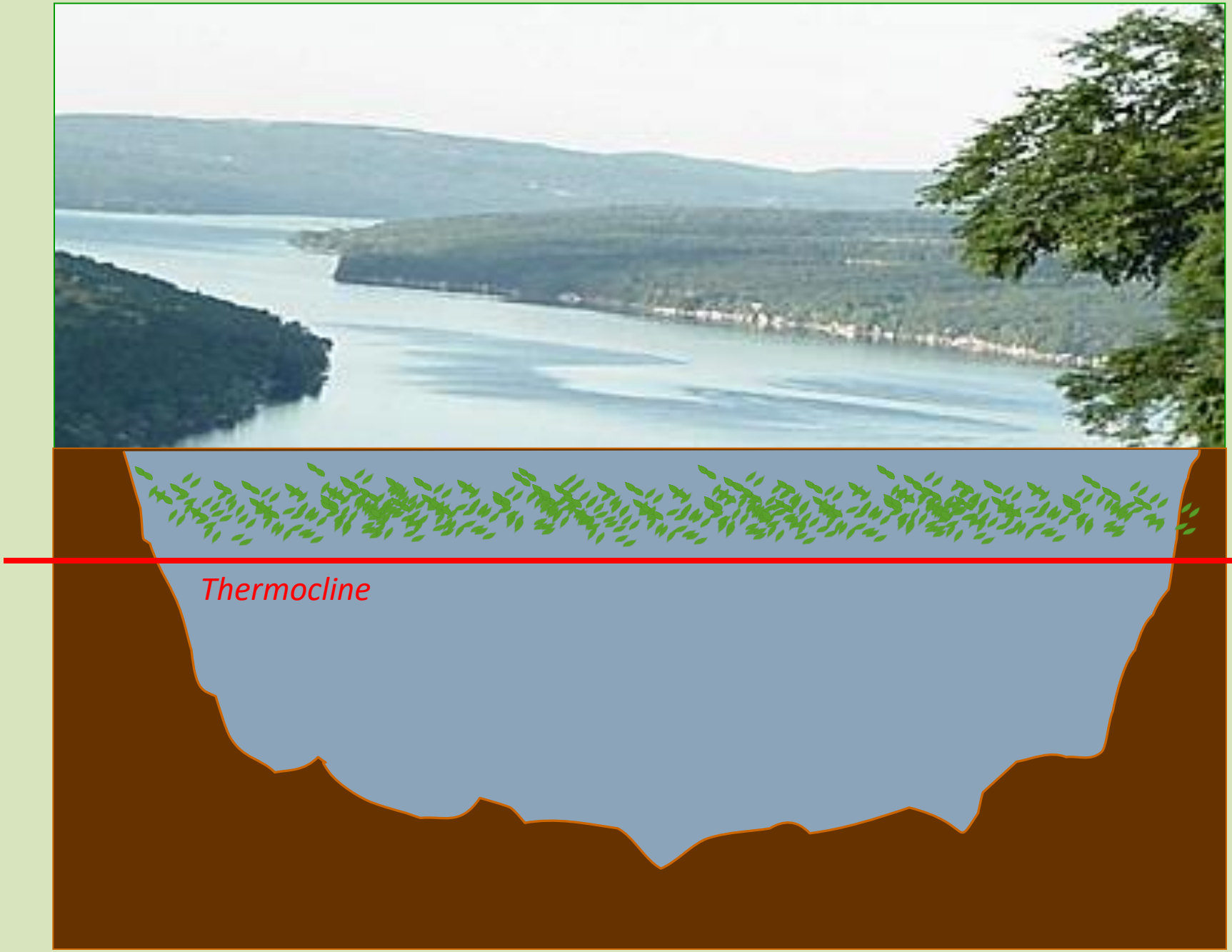
Limnologist / Aquatic Biologist
Research lakes, rivers, oceans

Keuka College

Director, Center for Aquatic Research
Professor of Biology and Env. Sci.

Associate Provost for Academic Innovation


Thermocline


Thermocline

Lake samples

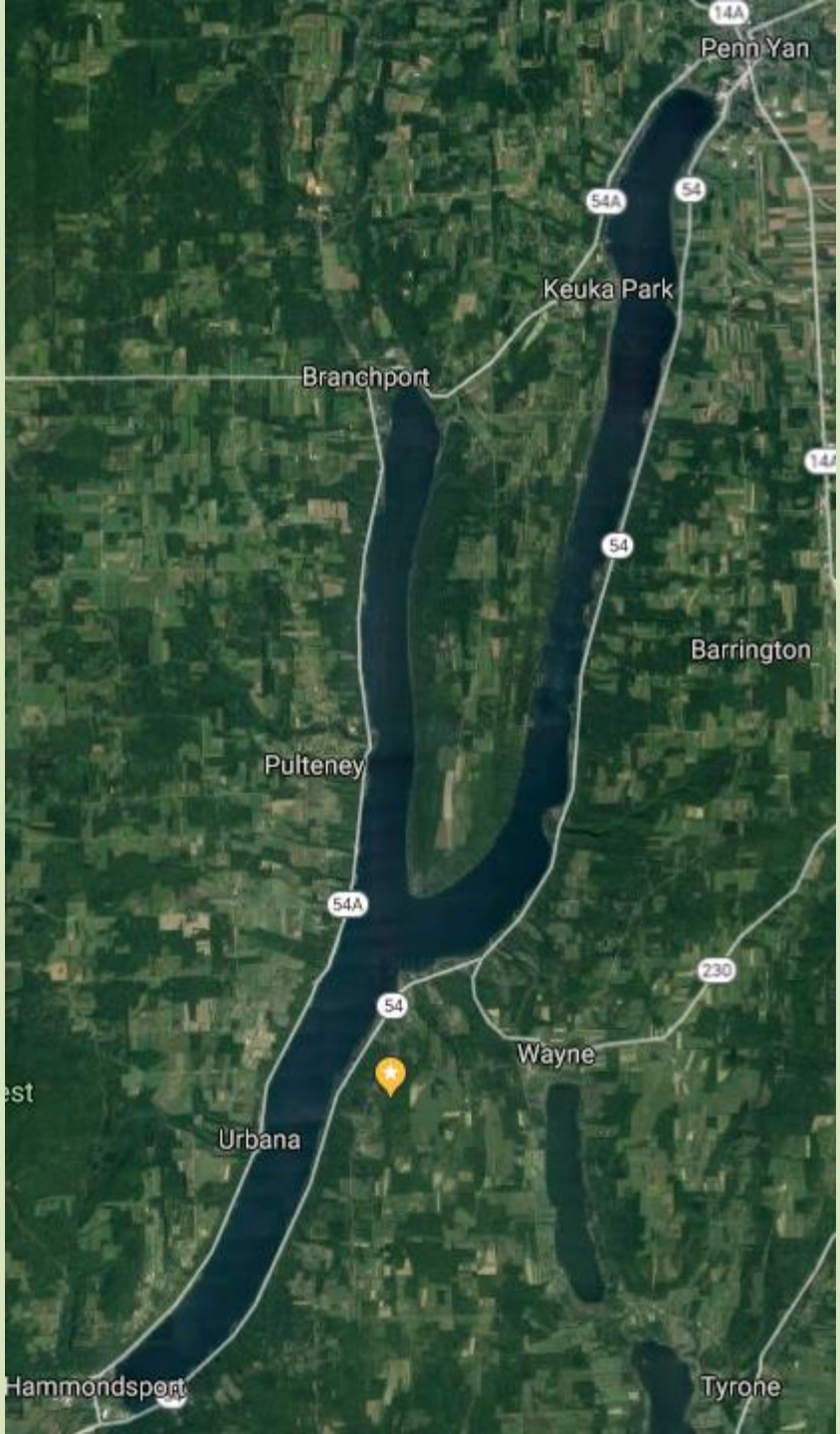
- Whole lake, 1 day
- Monthly, 5 – 8 times/year
- 25+ years

- Multiple (16) sites
  - Even distribution
  - Near-shore, Open water
  - Shallow (~ 1m), Deep (~ 30m)

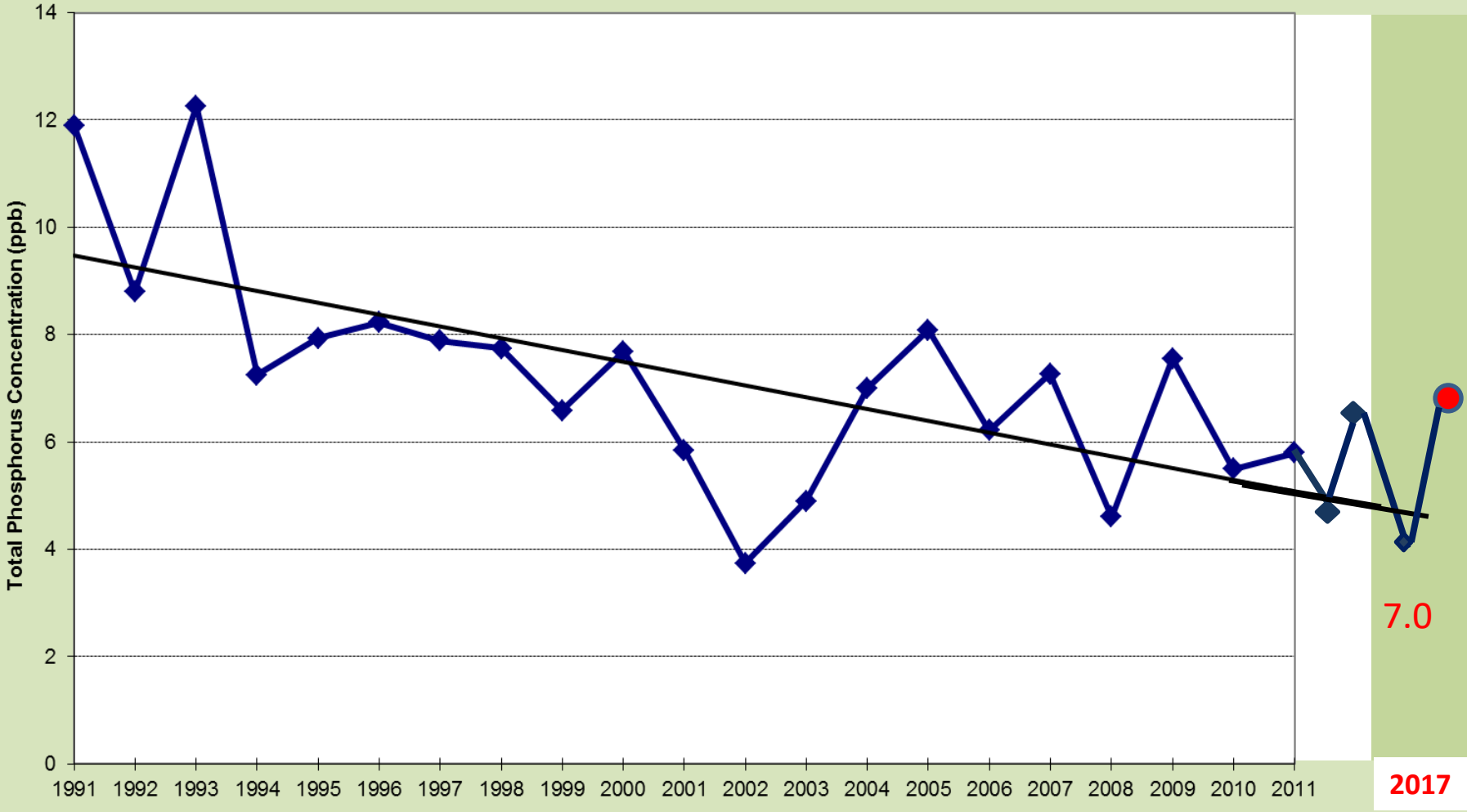
Well-mixed water in lake

No stream inputs, point sources

- Nutrients: TP, NO3
- “Algae”: Chl *a*, Secchi depths
- [pH, conductivity, temperature]



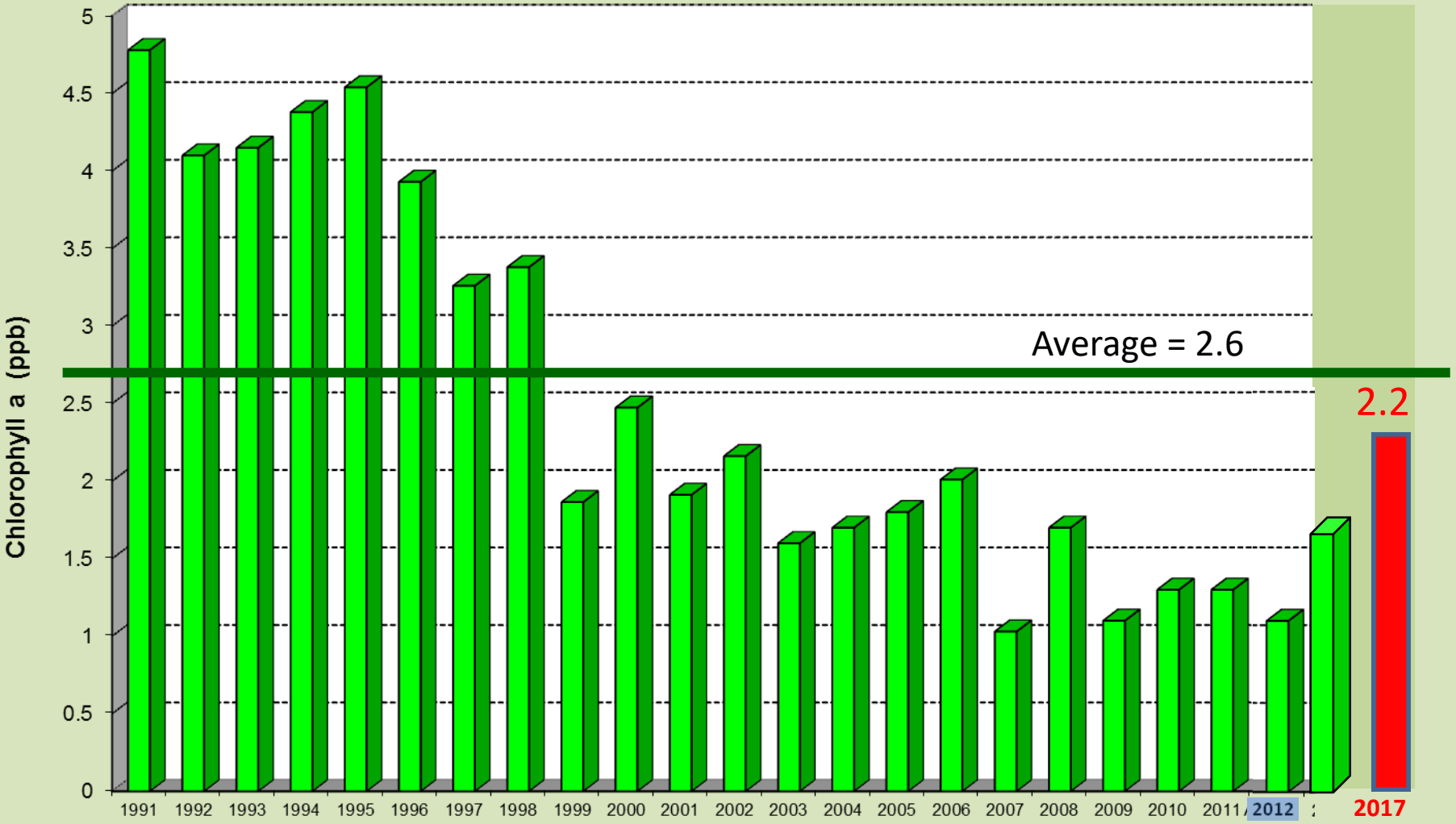
Keuka Lake Phosphorus Trends



Keuka Lake Secchi Disk Data

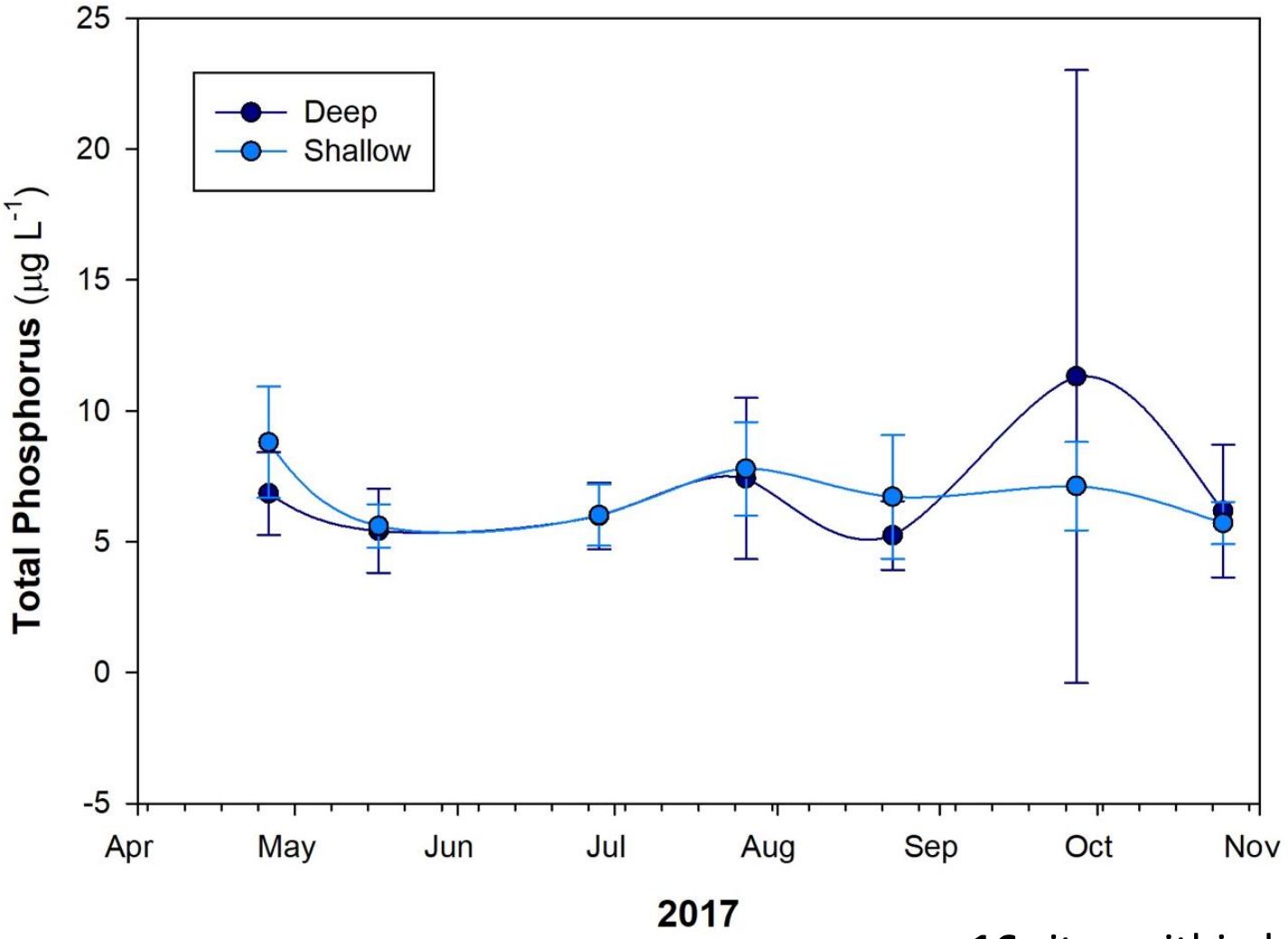
SD
Trendline
$R^2 = 0.3117$
Depth in Meters
Date
9.1
2017

Keuka Lake Chlorophyll *a* (= algae)



Total **Phosphorus**

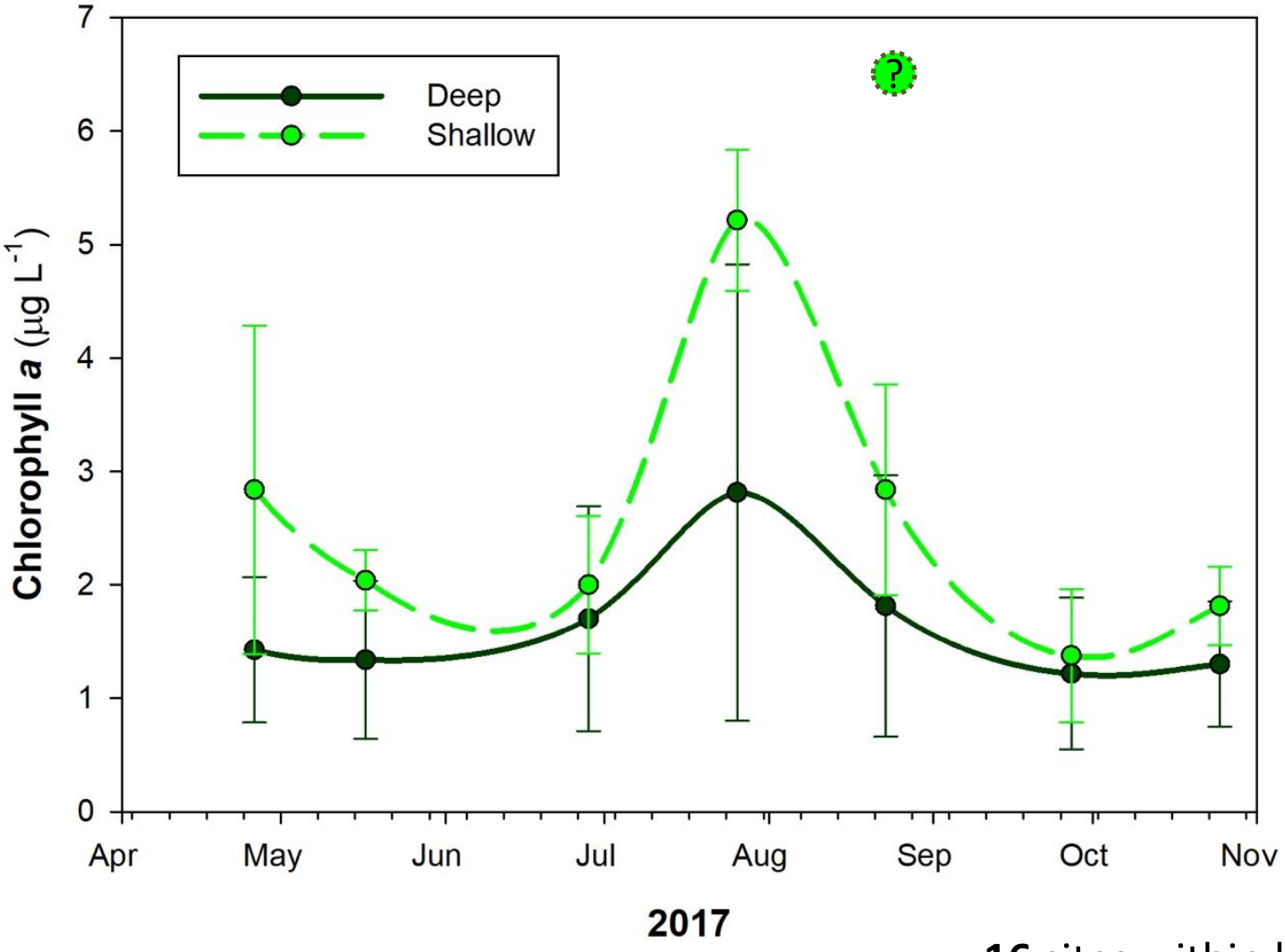
"Fertilizes" algae – good *and* bad



16 sites within lake

Chlorophyll *a*

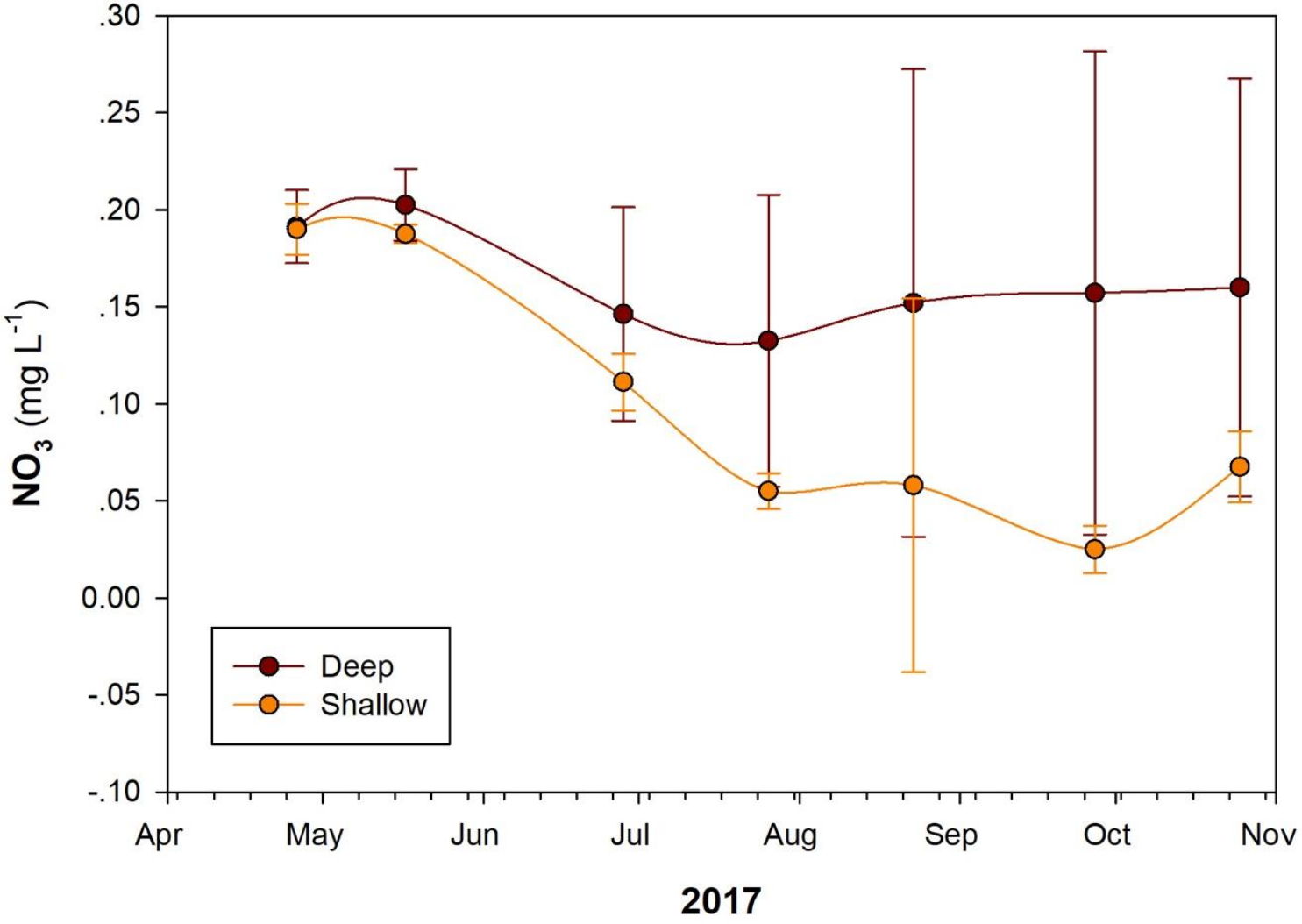
All **algae** – both good *and* bad



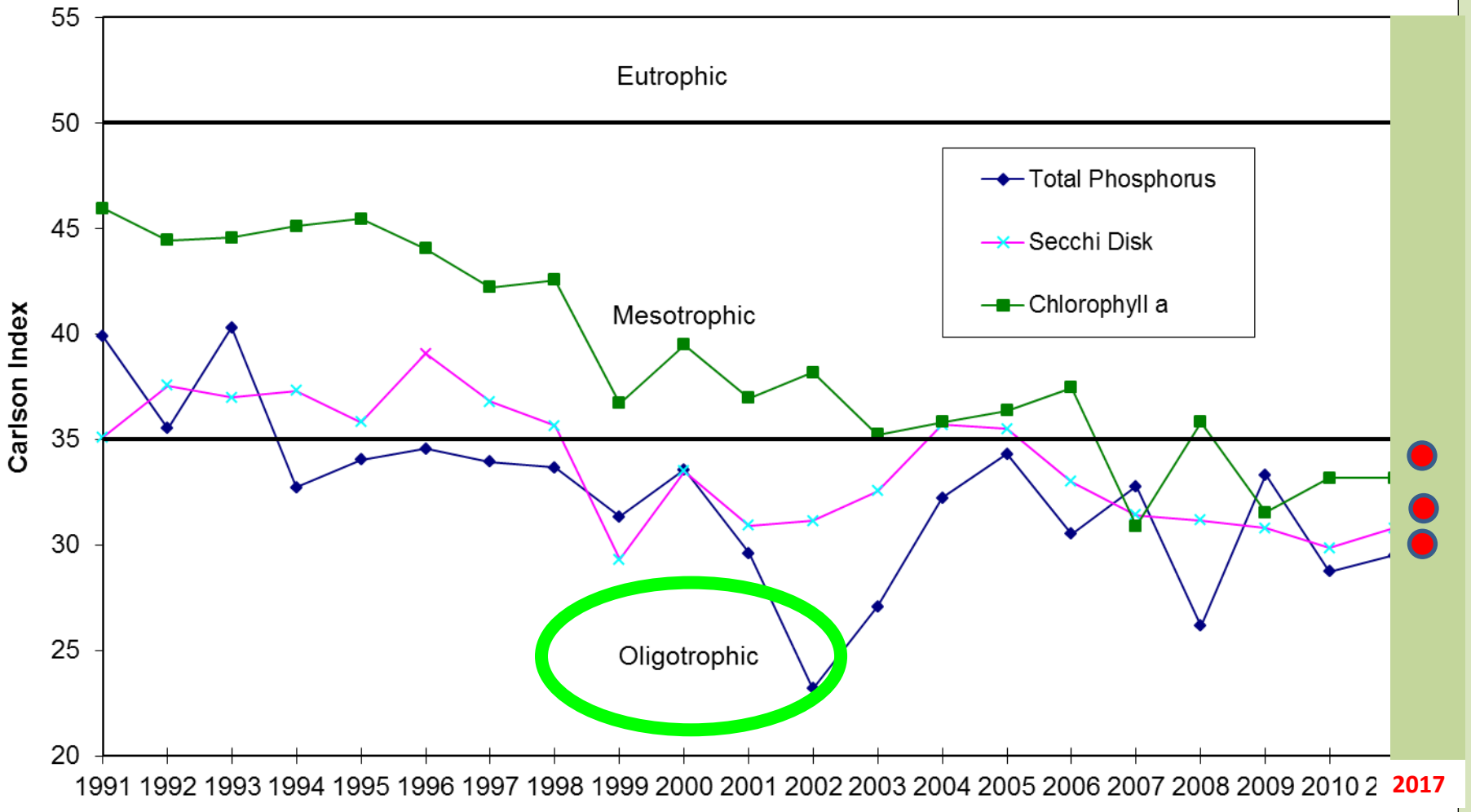
16 sites within lake

Nitrate

"Fertilizes" algae – good *and* bad



Keuka Lake Trophic Status



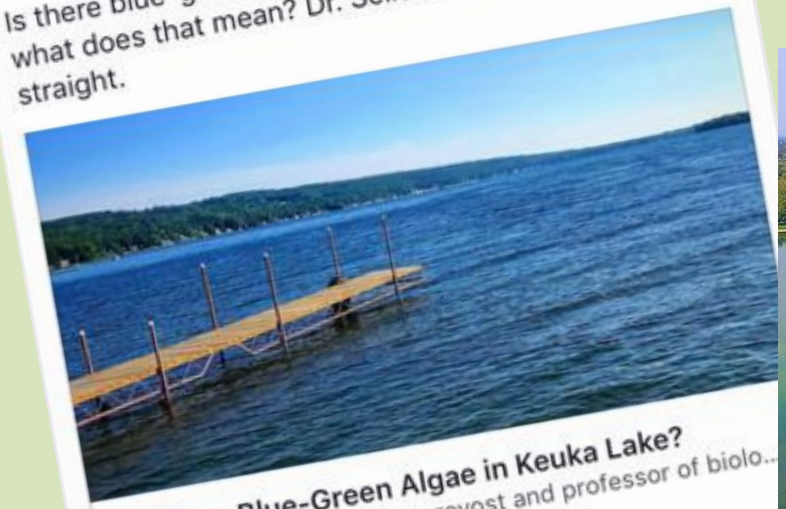
Mail ●○○○○ LTE 12:37 77%

Search

Keuka College

1 hr

Is there blue-green algae in the lake? And if there is, what does that mean? Dr. Sellers sets the record straight.



Is There Blue-Green Algae in Keuka Lake?

Dr. Tim Sellers, associate provost and professor of biolo...

keuka.edu

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Express

dansvilleonline.com

Update: Indian Pines and Red Jacket swimming areas reopen after algae concerns

By Gwen Chamberlain

The Chronicle-Express

Posted Aug 8, 2017 at 12:52 PM

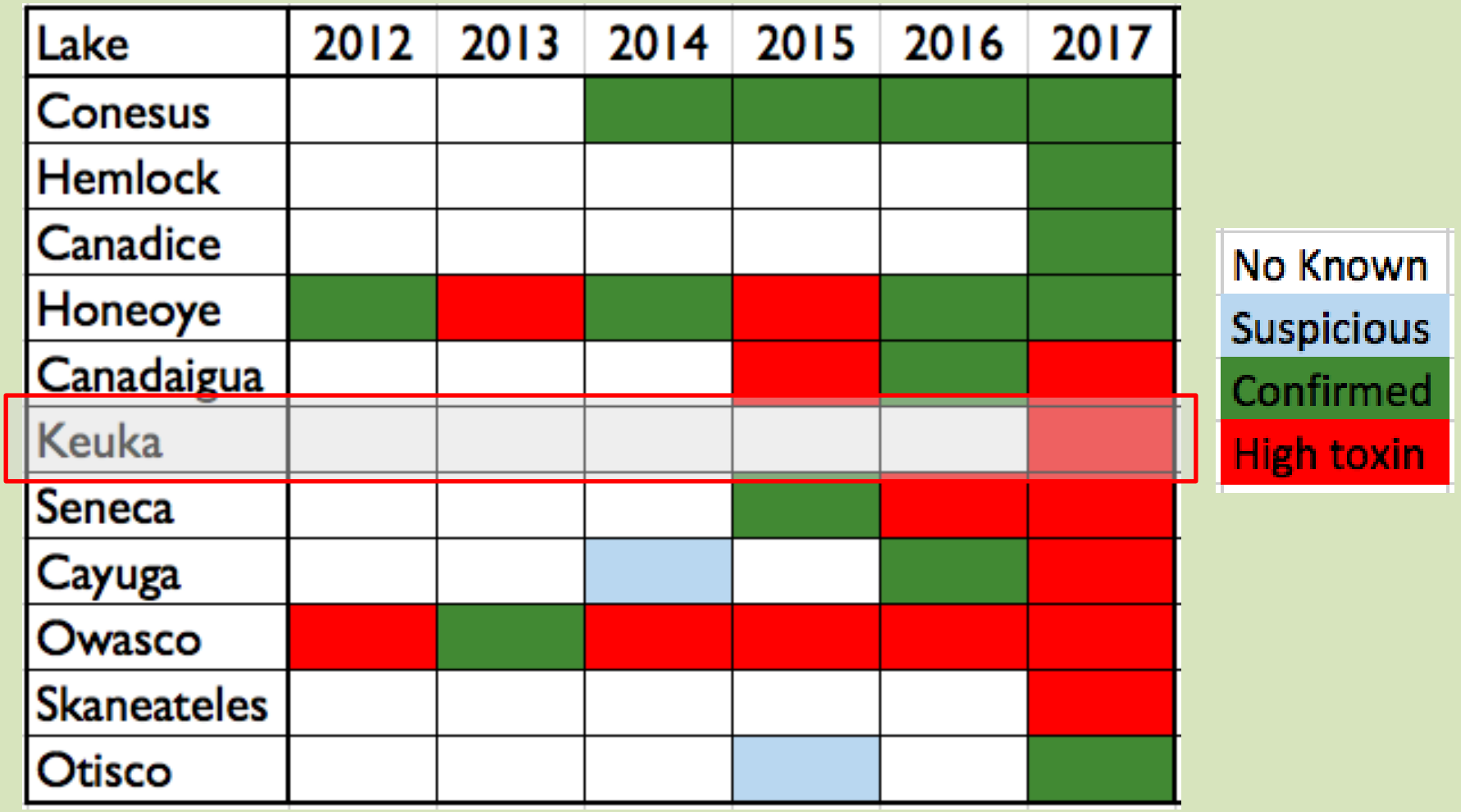
UPDATE: The swimming areas at Red Jacket and Indian Pines Parks in Penn Yan are reopening today (Aug. 9) at 11 a.m. Officials at Keuka Lake State Park are still awaiting test results to determine when that area will reopen.

Cyanobacteria "Blue green algae"

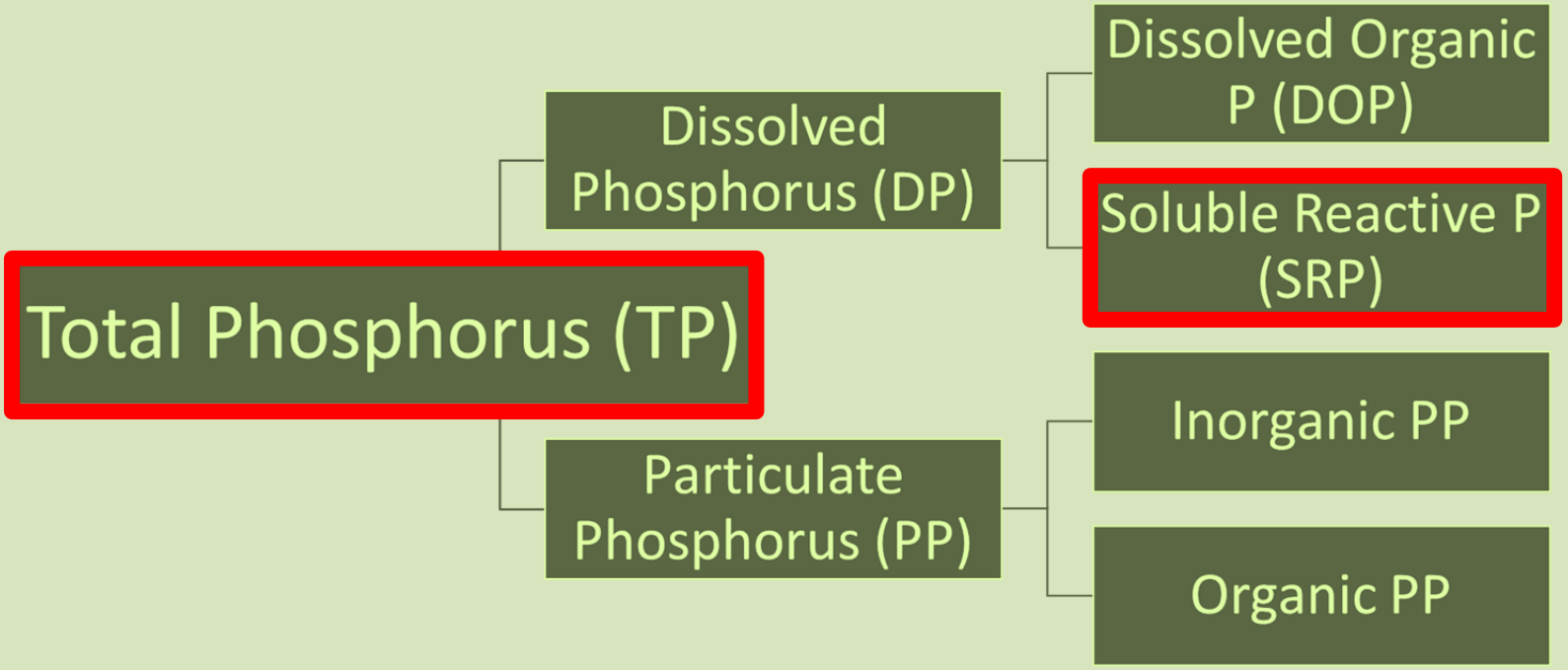
- Types of phytoplankton / algae
- Generally **surface** (not deep)
- Many species
  - Most **harmless**
  - *Some* produce **toxic chemicals**
  - → **H**armful **A**lgal **B**looms **(HABs)**

Microcystis

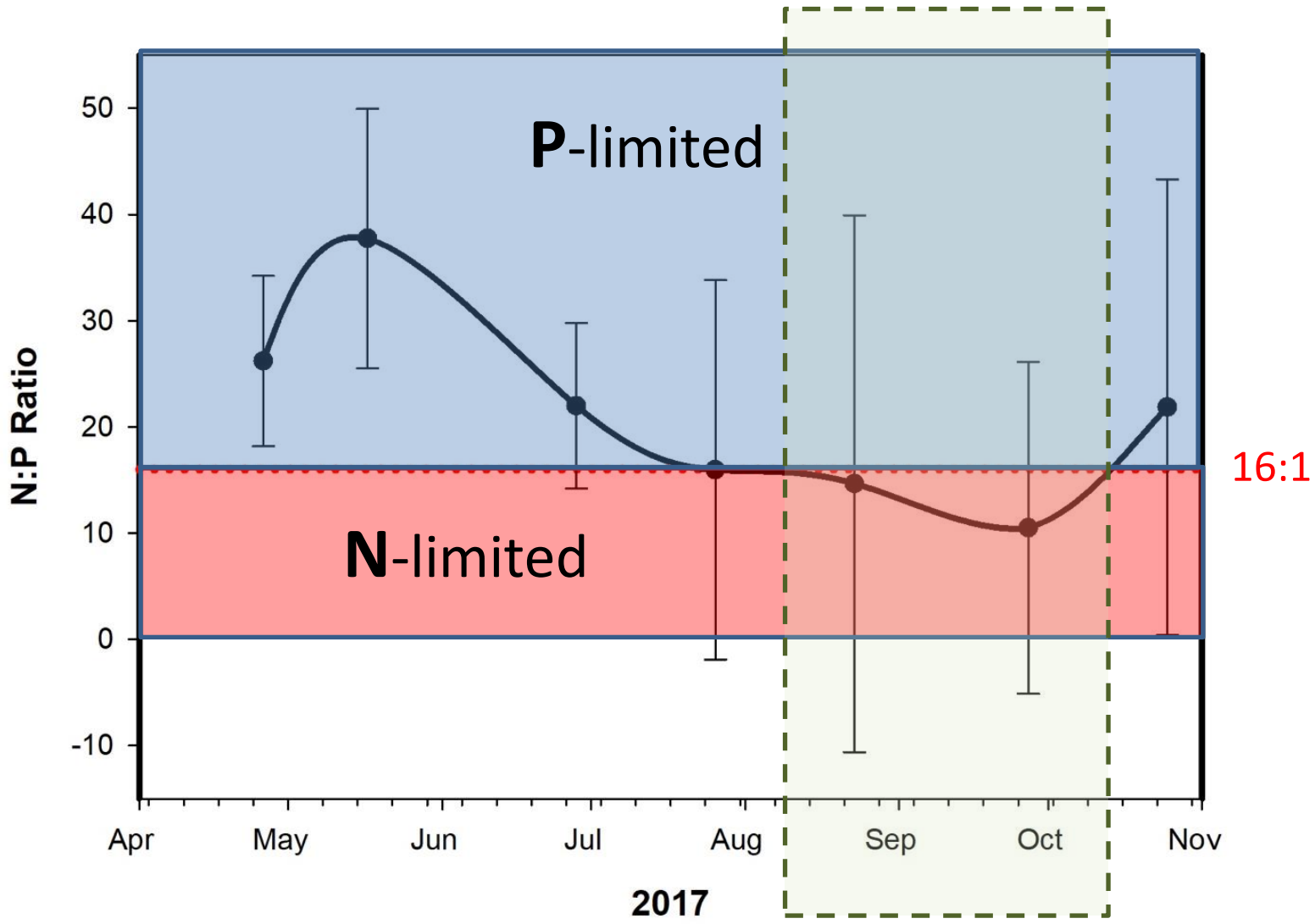
HABs in the Finger Lakes



Nutrients (P) are complicated…



Nitrogen to Phosphorus Ratios

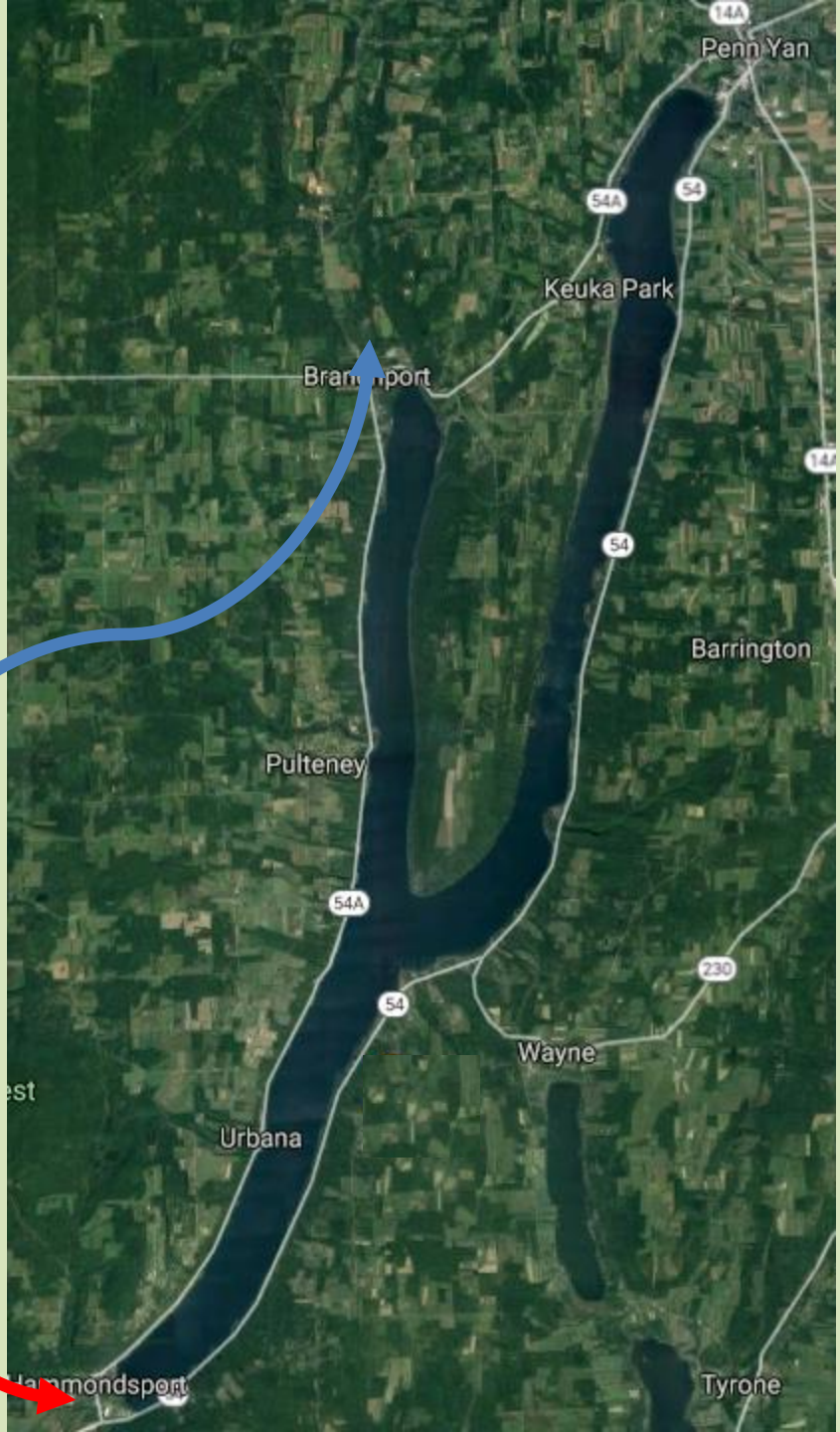


What We Know, What We Don't

- Keuka has *always* had **low** levels of "blue green algae"
- Typically low nutrients (N, P)
- 2017: All **11 Finger Lakes** had confirmed **HABs**, most with confirmed **toxins**
  - Keuka, Skaneateles…
- KLA Data
  - Great dataset of what is *already in* the lake
  - No real data of what is *coming in* to the lake (streams)
    - Nutrient types: SRP vs TP
    - Nutrient concentrations
    - Hydrologic flow
  - Citizen scientists?

PEERS Data. July 2018

Sample Location	Soluble Reactive Phosphorus‡‡ µg/L, 7/2/18, 2:35 PM (SRP)	Total Phosphorus‡ µg/L, 7/2/18 (TP)	Nitrate+Nitrite mg/L, 7/16/18 (NO_3)
Trip Blank	NS	<2.0	0.01
Eggleston	13.6	16.4	0.85
Sugar Creek Mouth	28.2	31.4	0.34
Sugar Creek Mid	18.9	40.9	0.26
Sugar Creek Mid dup	19.7*	40.1*	0.25
Sugar Creek Head	45.8	55.3	0.53
Cold Brook Mouth	26.9	45.4	0.71
Cold Brook Mid	38.4	40.1	1.35
Cold Brook Head	36.9	40.1	1.84
Wagner Glen	20.0	20.5	1.11



Potential **HAB** Drivers

- Increased **nutrient inputs** into lake
  - Agricultural, land use changes
  - "Point source" or targeted inputs
  - Intense weather events
- Nutrient **shifts**, location
  - N:P ratios, shallow/near-shore dynamics
- **Grazing** issues
  - Zebra/Quagga mussels: eat "good" algae, leave BG algae
  - *Research*: low nutrient lakes with zebra mussels show high HAB toxicities

→ The plot thickens (hopefully not the water)…

Think differently…