

LAKE ROBERTS HYDROLOGICAL AND NUTRIENT SOURCE ASSESSMENT

Mitchell Katz, Ph.D.

Water Sciences, Orange County EPD



LAKE ROBERTS ASSESSMENT

- Background
- Scope of Work
- Results
- Conclusions
- Recommendations for Future Assessments



BACKGROUND

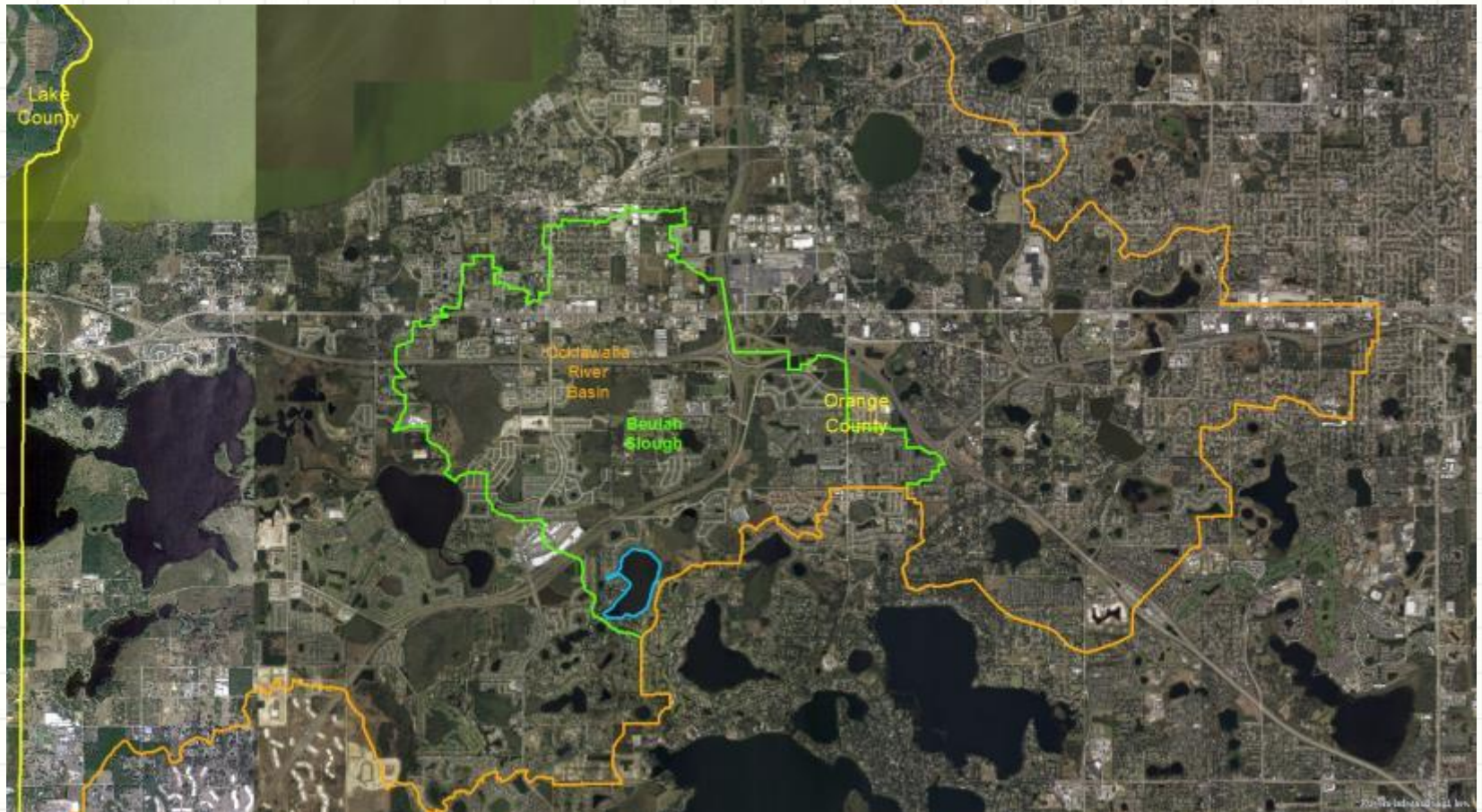


Lake Roberts – WBID 2872A

- Verified impaired for nutrients (TSI) in 2010.
- Located in the Ocklawaha River Basin next to the Upper Kissimmee River Basin.
- $\pm$ 108 Ac with distinct north and south lobes.
- Mean Depth 10 feet, Maximum Depth 20 feet.
- Connected to Lake Reaves through an intermediary tussock.
- Highly Colored Lake (AGM $\approx$ 50 PCU).
- Significant history of blue-green algae blooms.



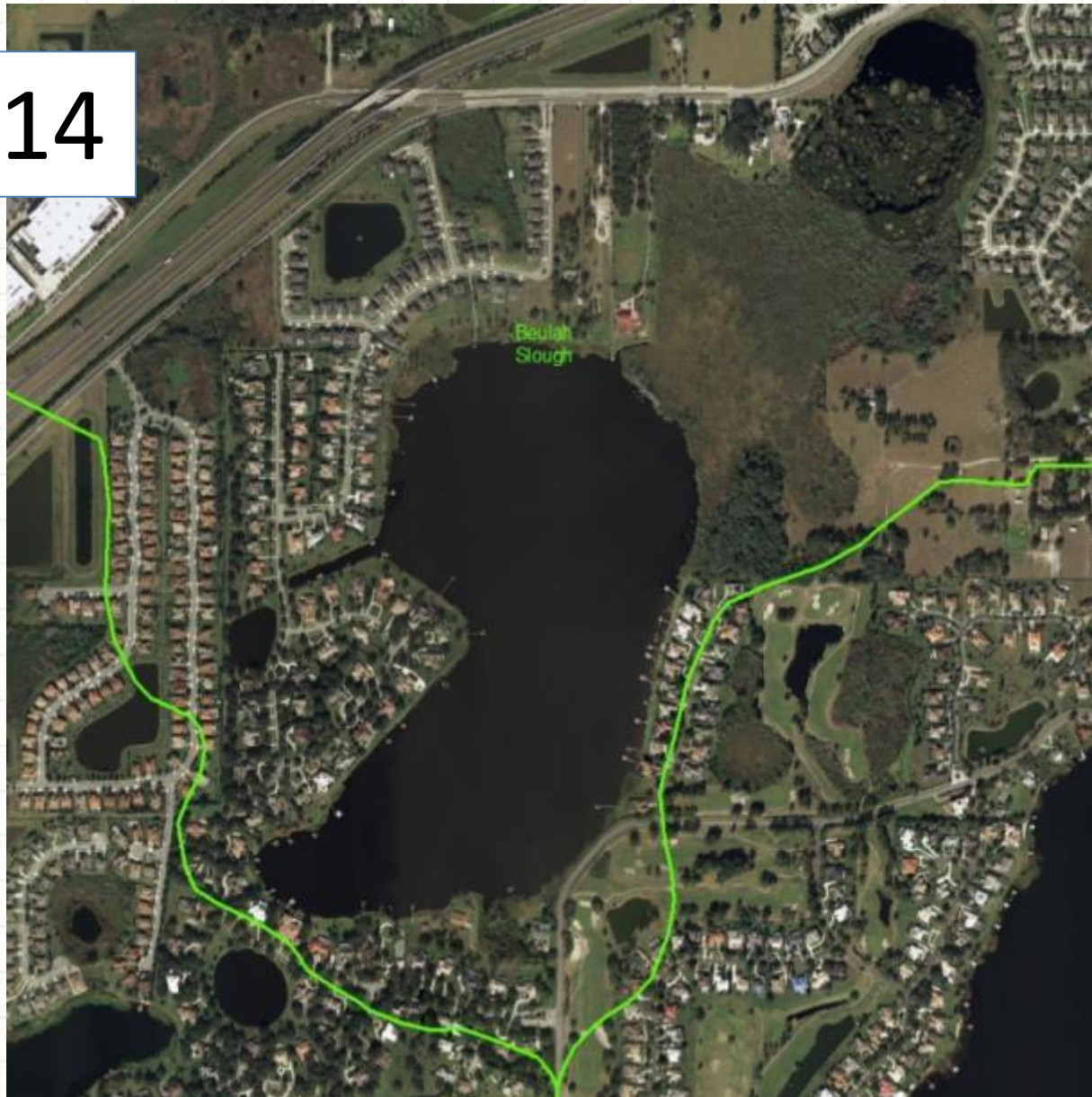
Upper Ocklawaha in Orange County



1969



2014



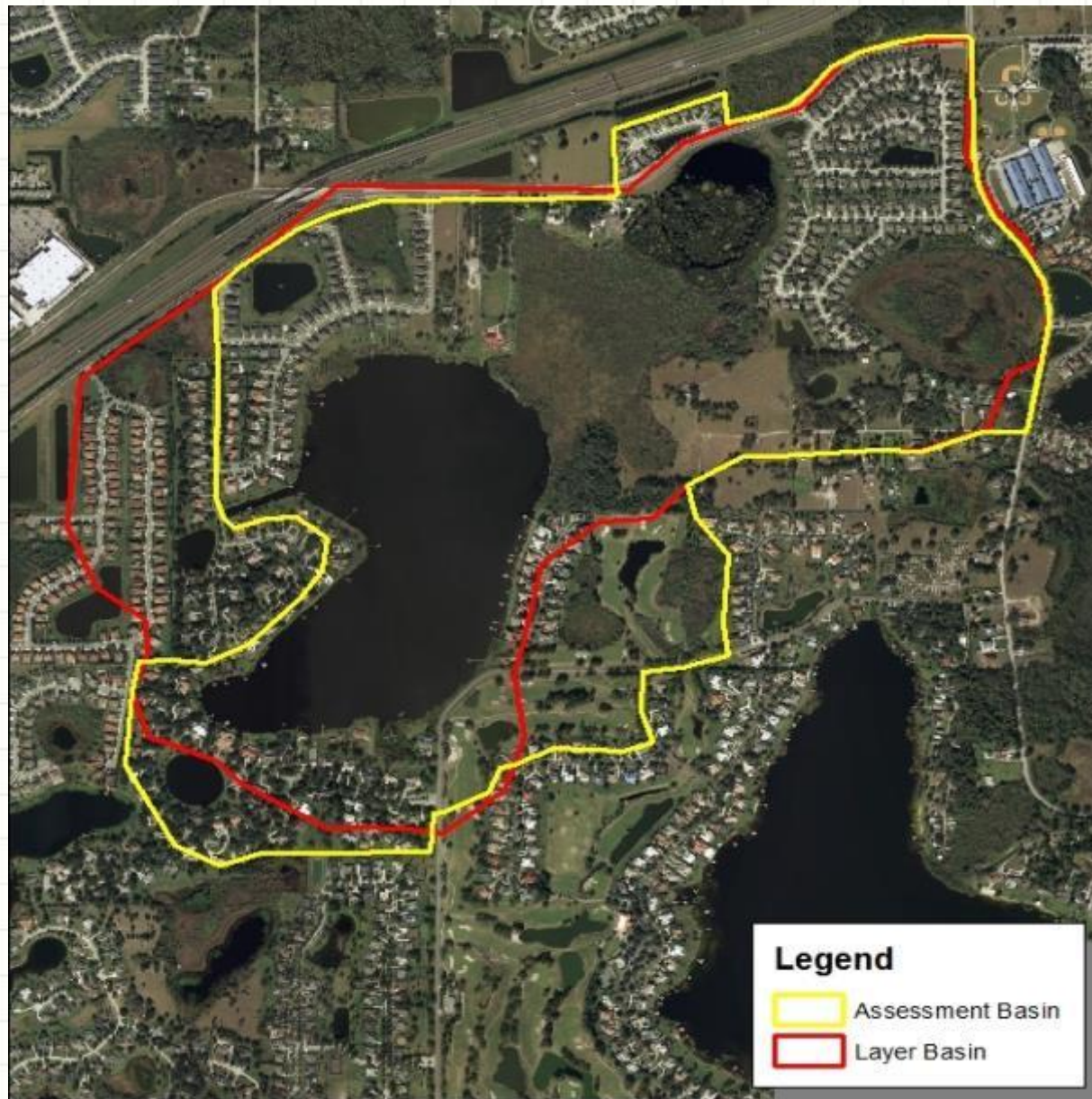
Bloom on South Shore



SCOPE OF WORK



Drainage Basin Comparison



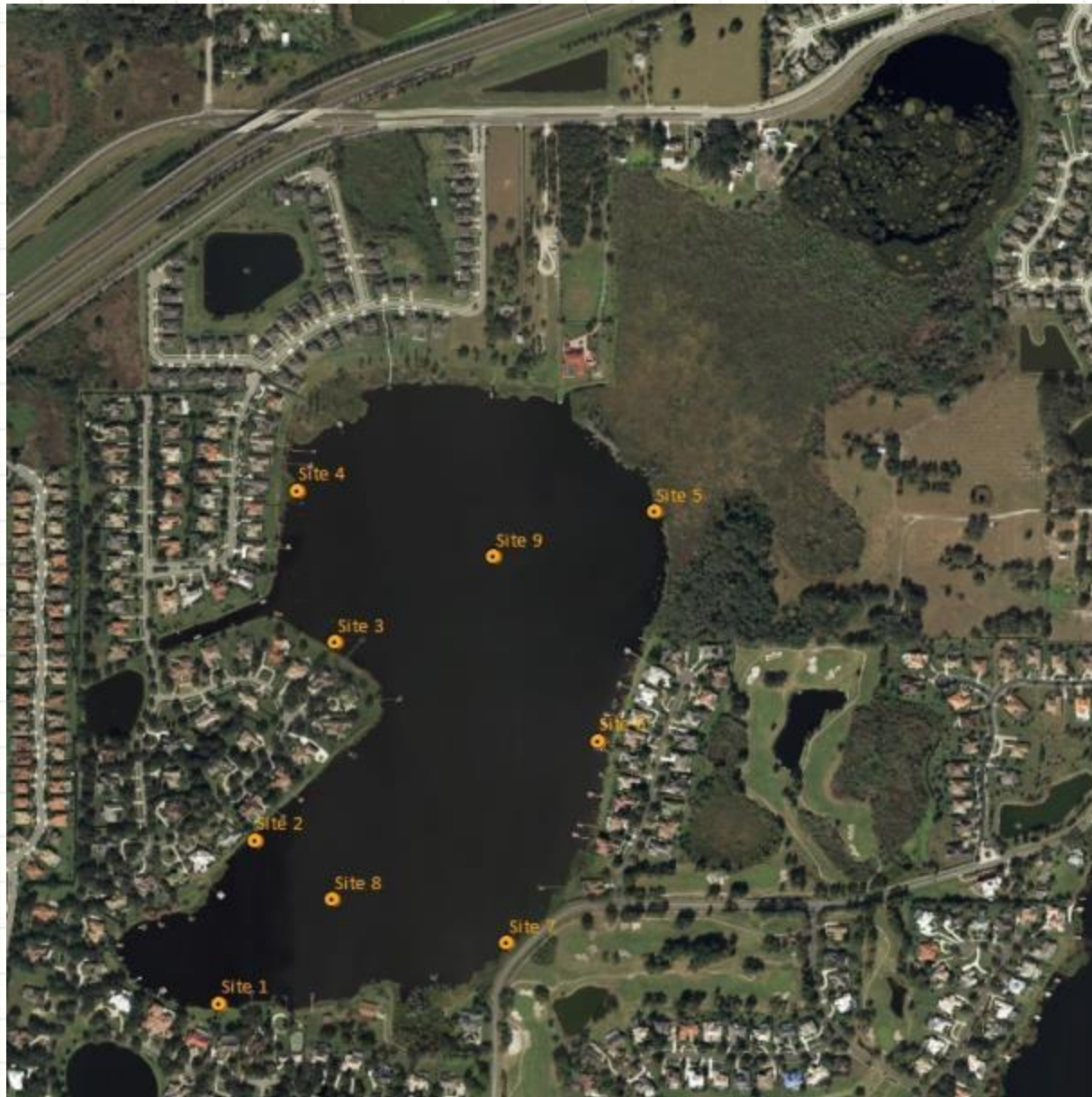
Bathymetry and Muck Depths



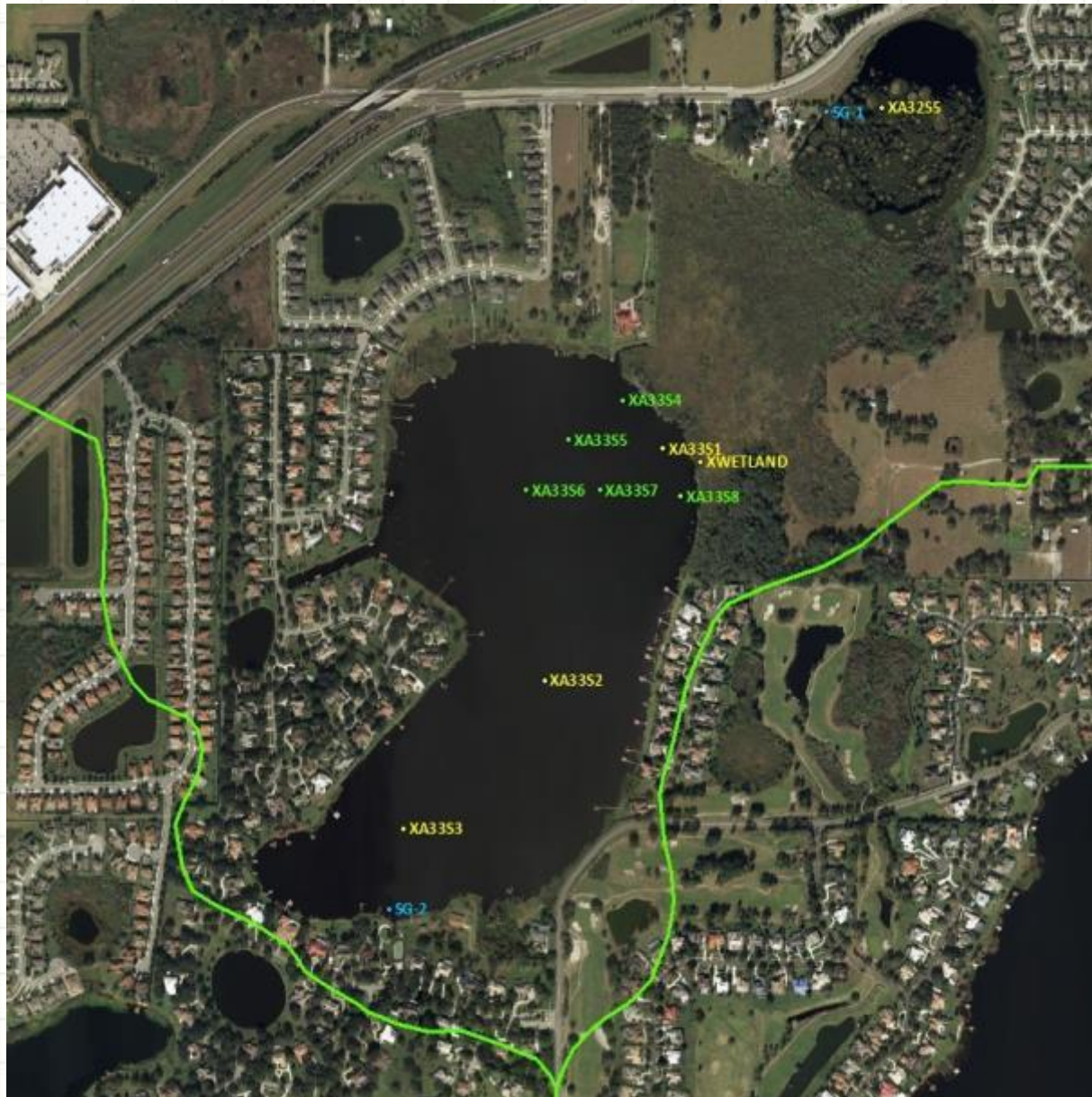
Sediment Mapping and Collection



Seepage Meter Locations



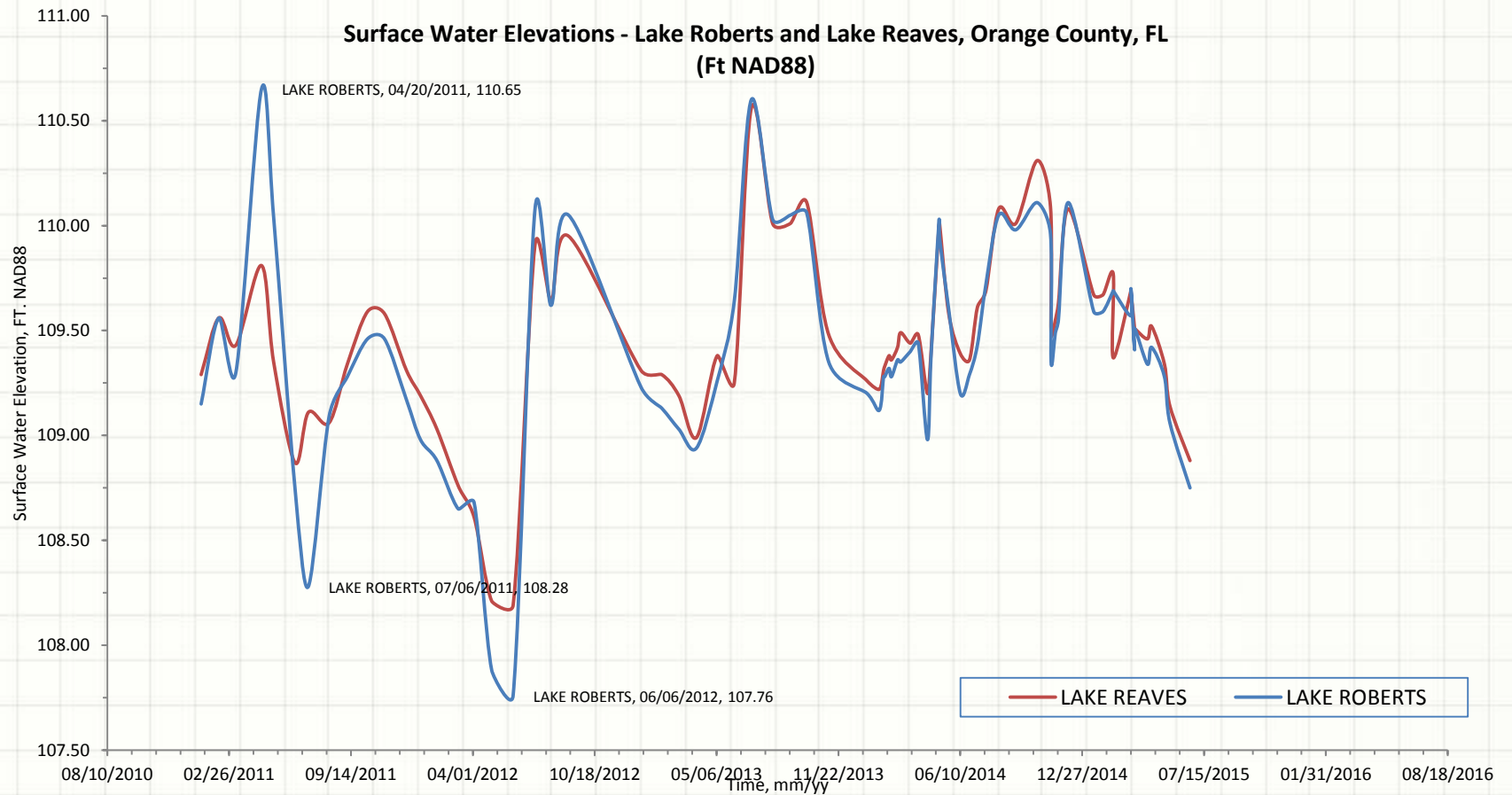
Surface Water Sample Locations



RESULTS

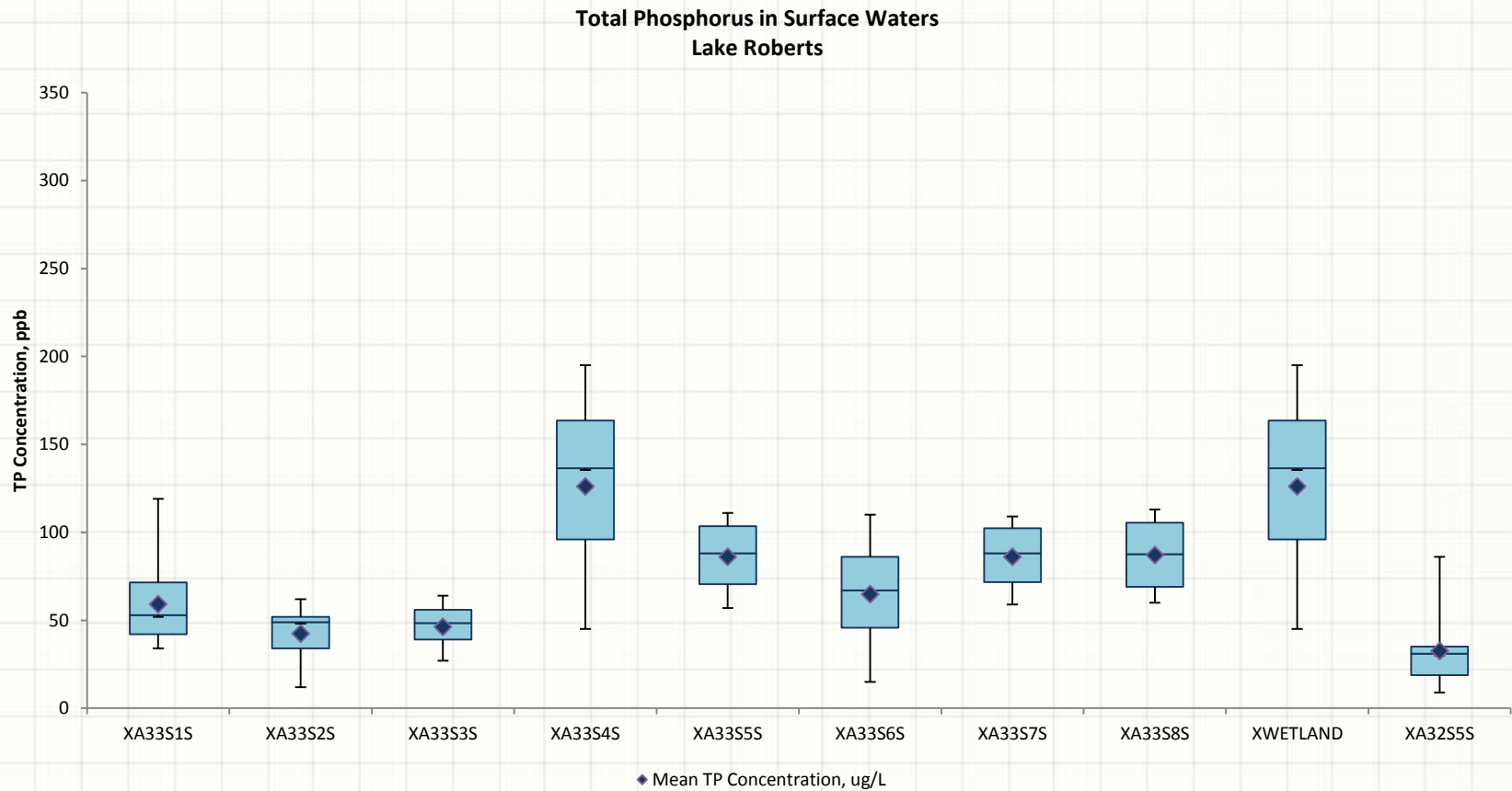


Surface Water Flow



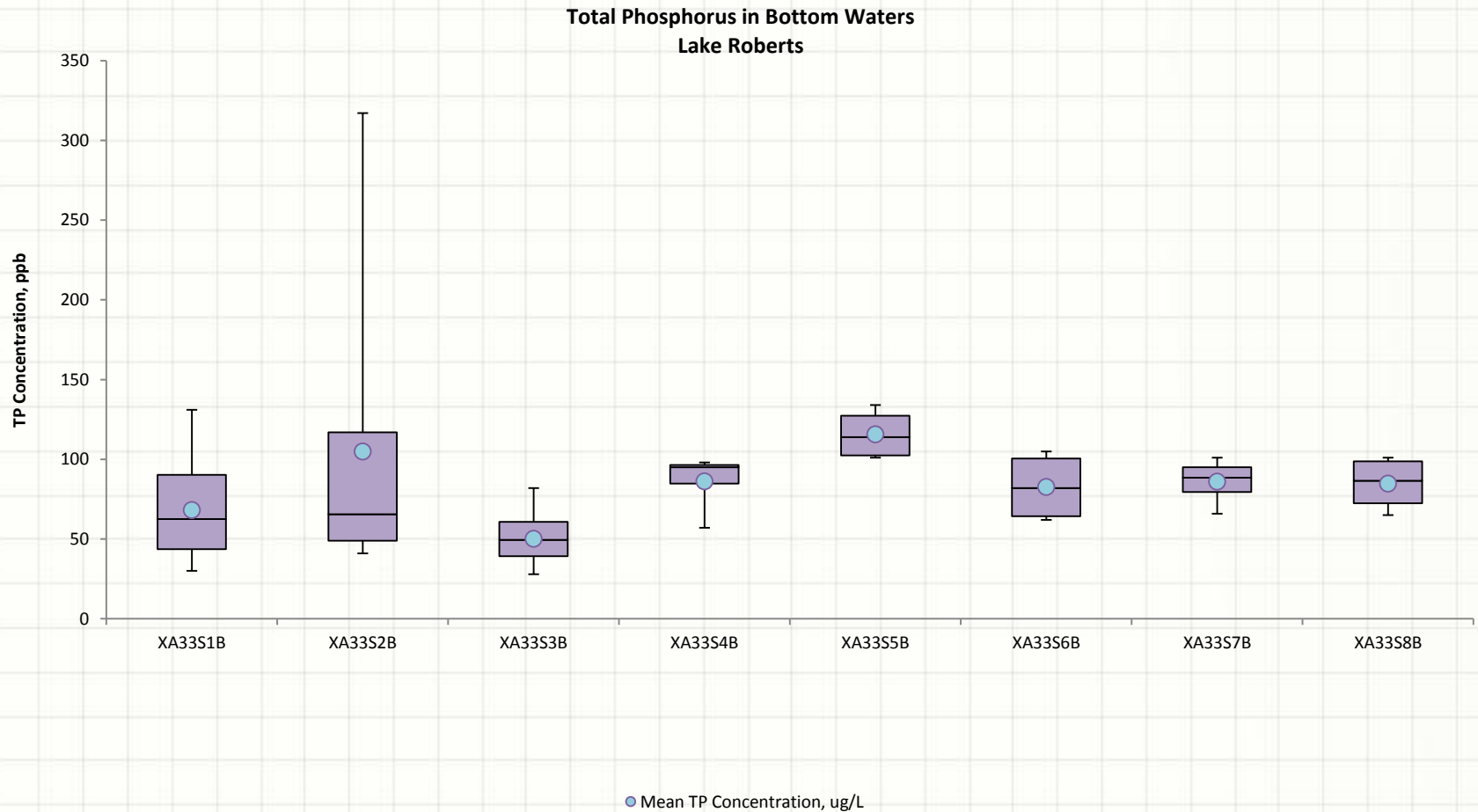
Upper Column WQ – TP, $\mu\text{g/L}$

(September 2013 - June 2015)



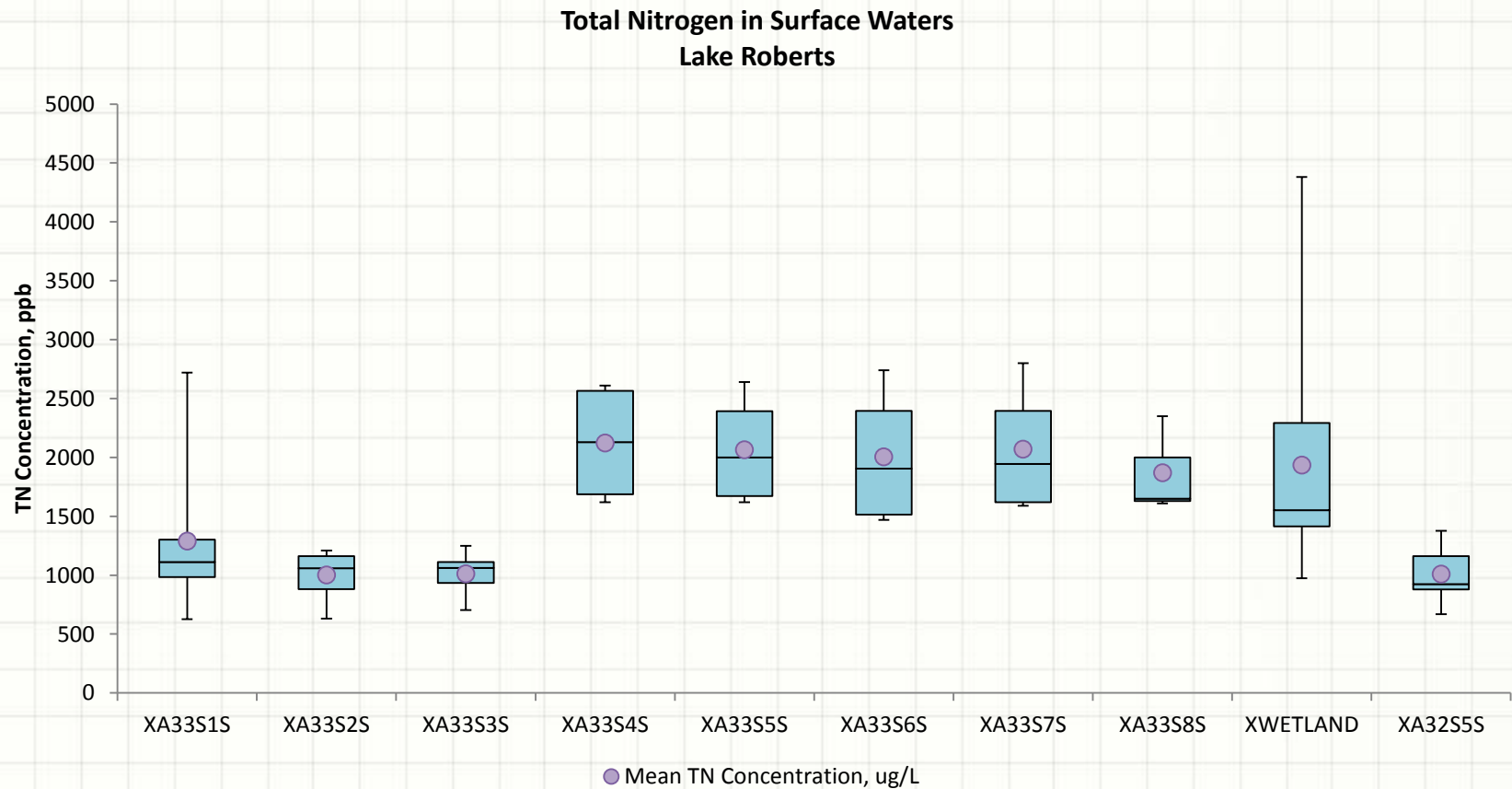
Lower Column WQ – TP, $\mu\text{g/L}$

(September 2013 - June 2015)



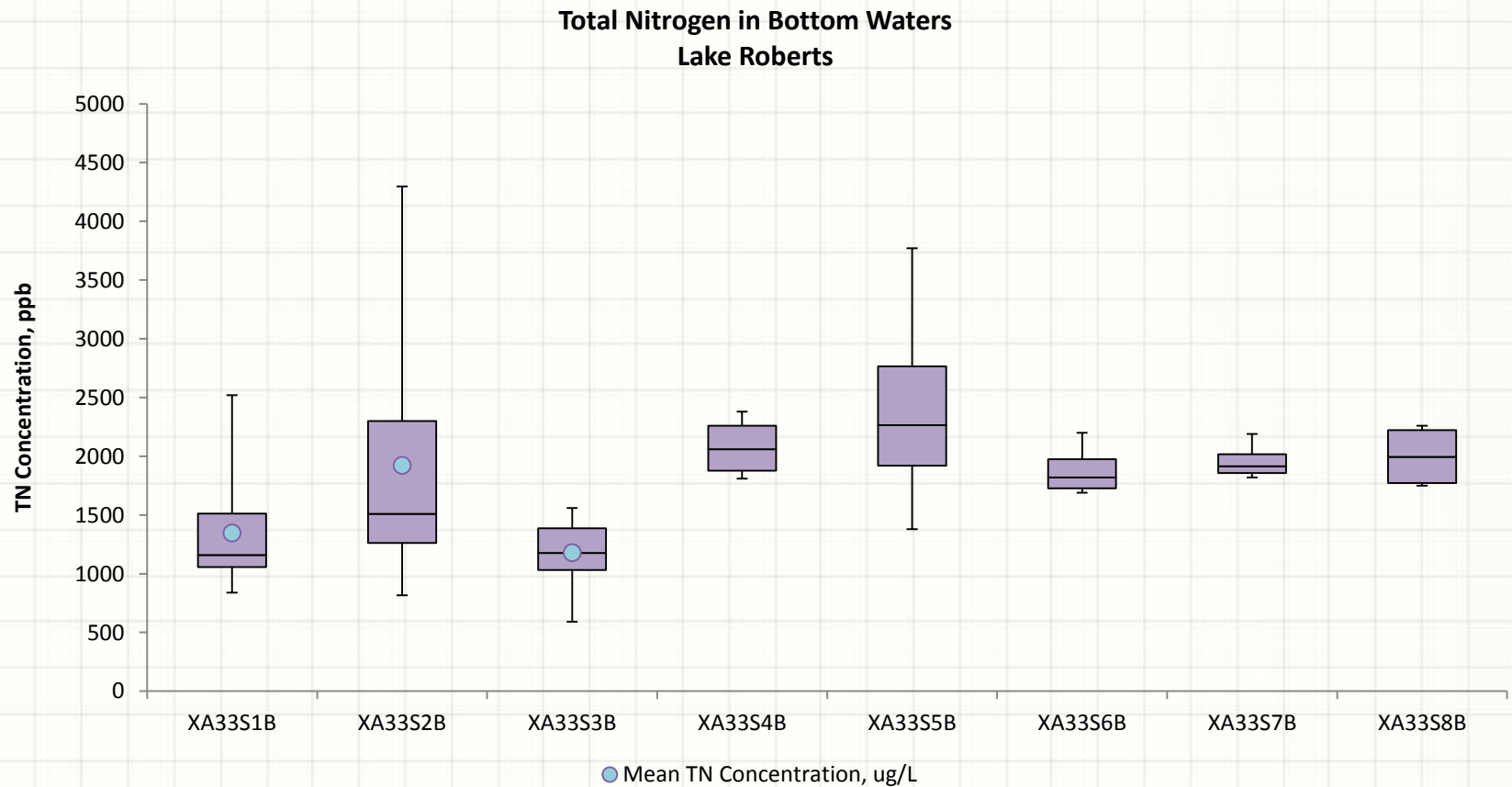
Upper Column WQ – TN, $\mu\text{g/L}$

(September 2013 - June 2015)

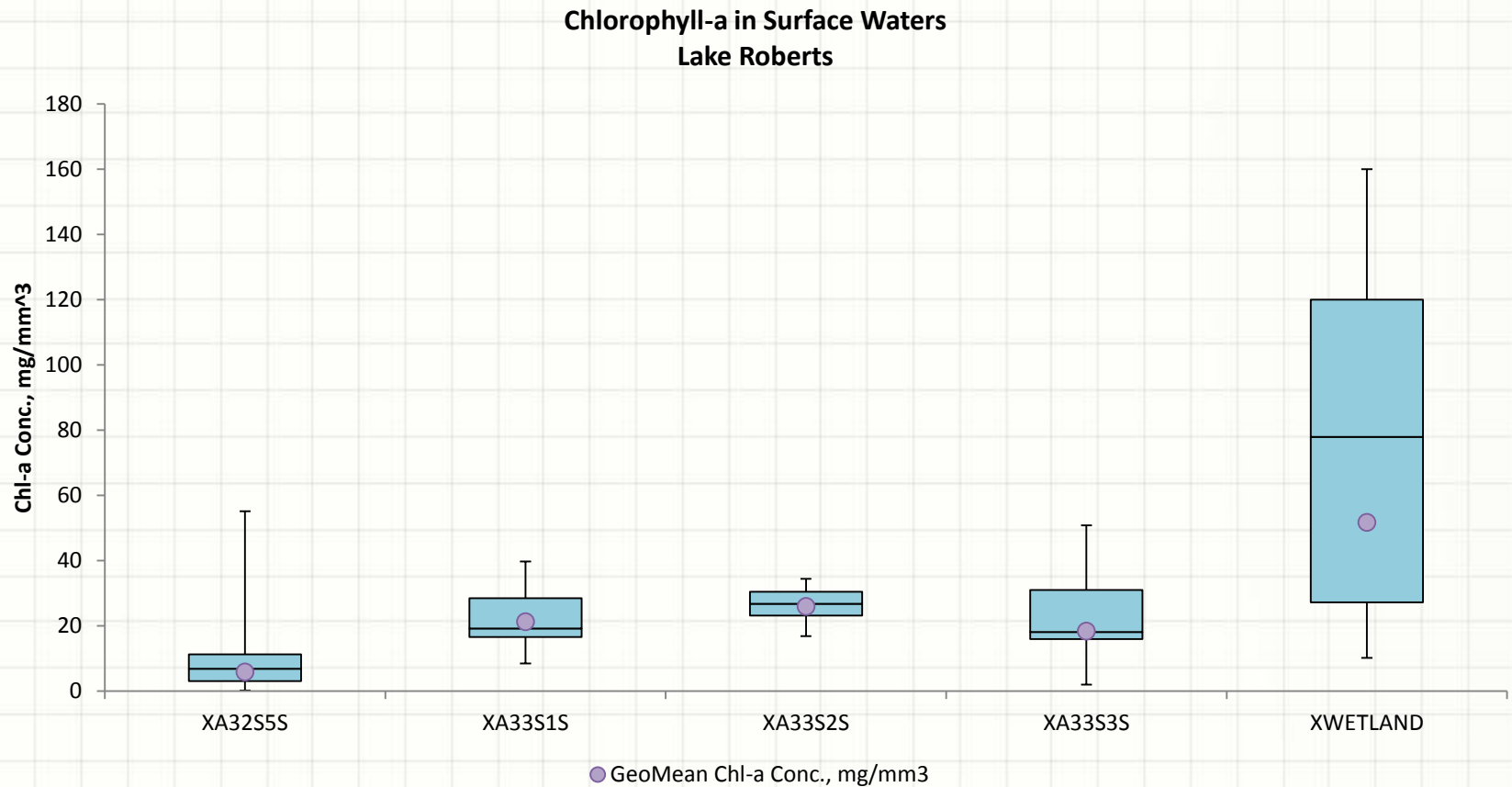


Lower Column WQ – TN, $\mu\text{g/L}$

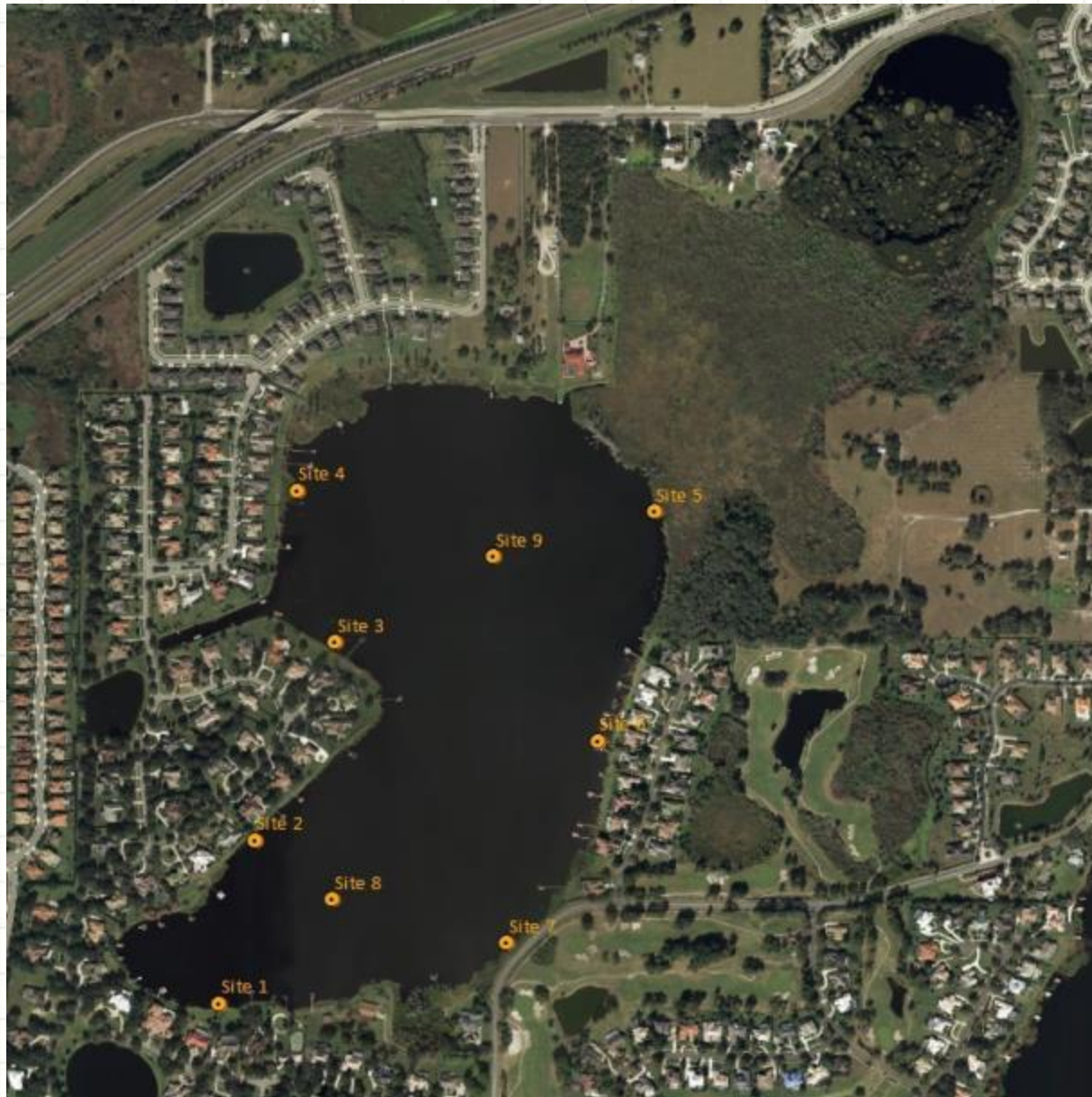
(September 2013 - June 2015)



Corrected Chl-a Concentrations in Surface Waters (mg/mm³)

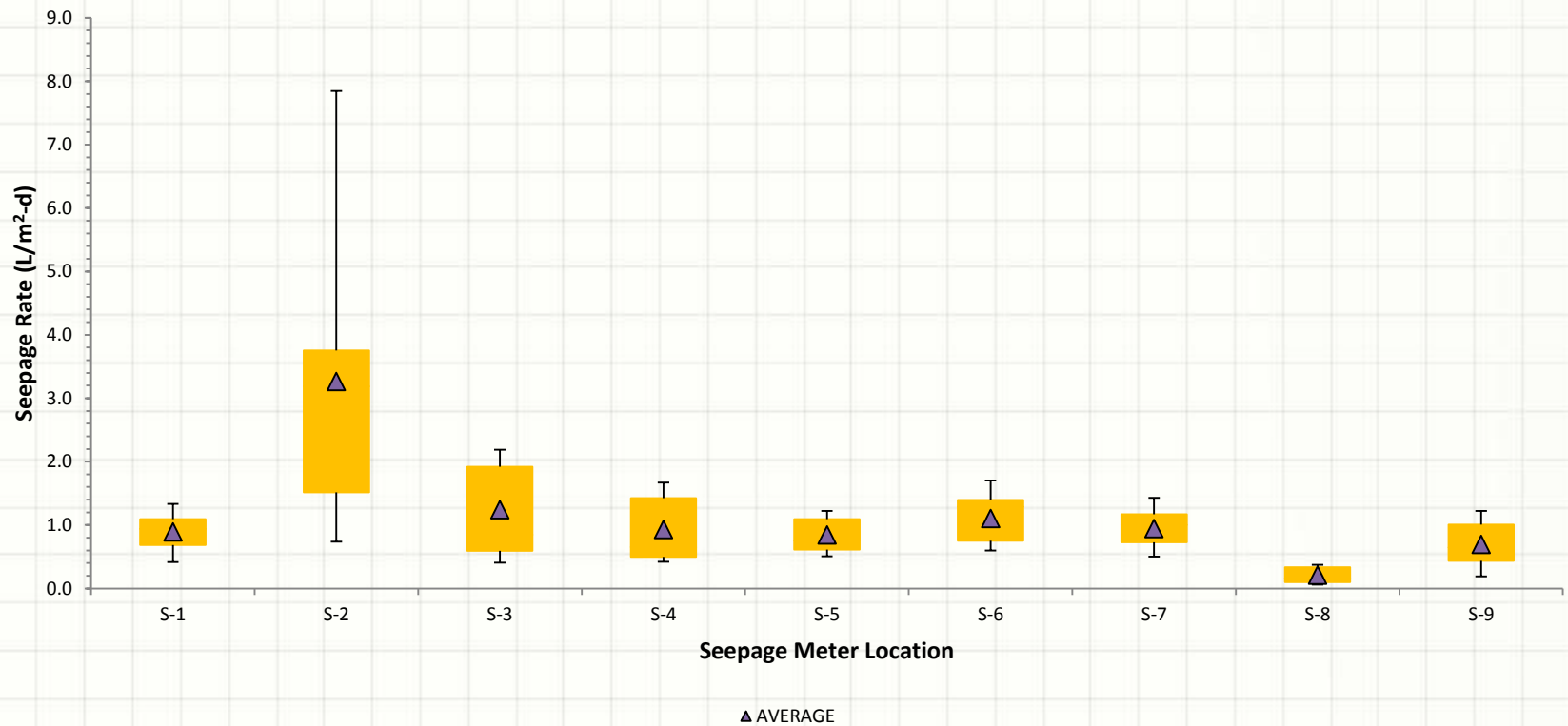


Seepage Meter Locations



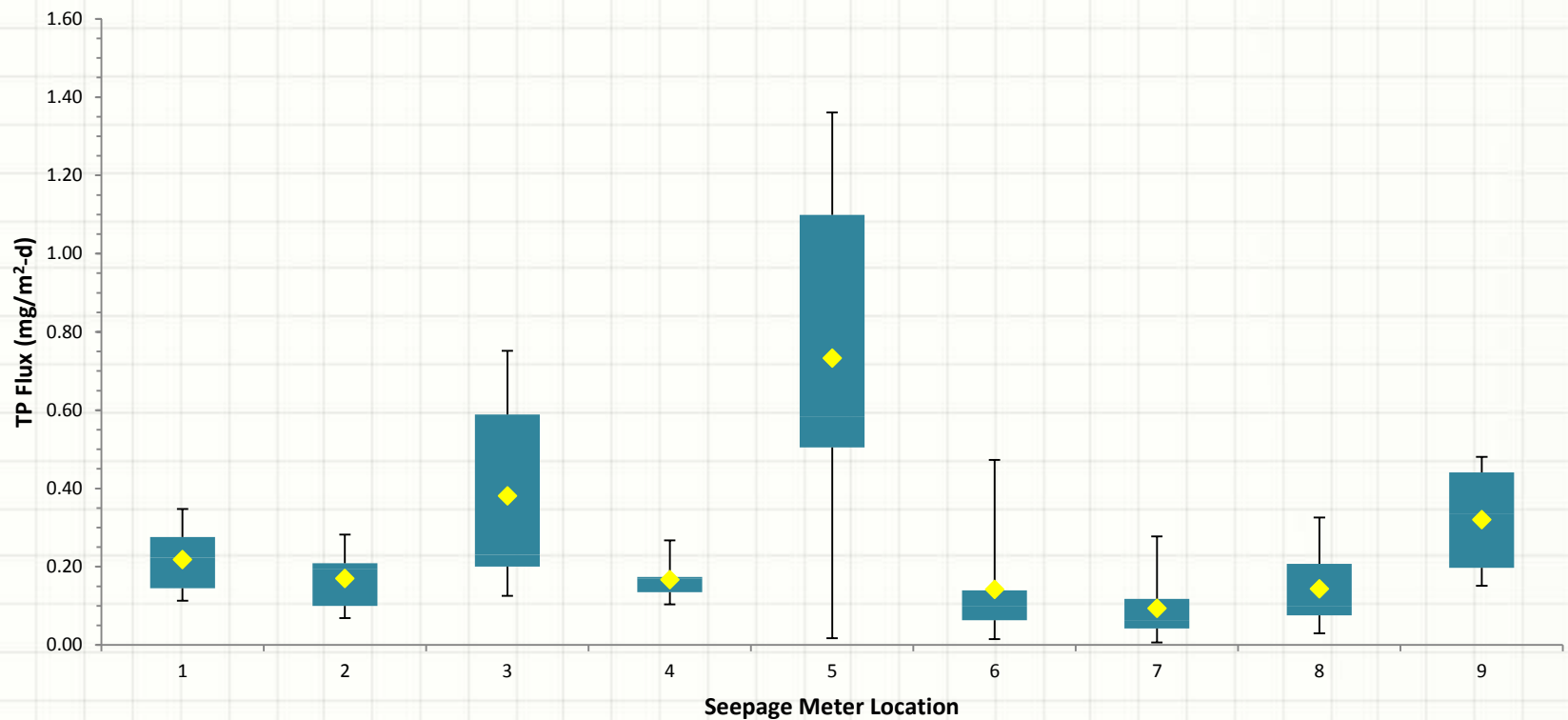
Seepage Rate Distributions (L/m²-d)

Seepage Rate Distributions
Lake Roberts, Orange County, FL



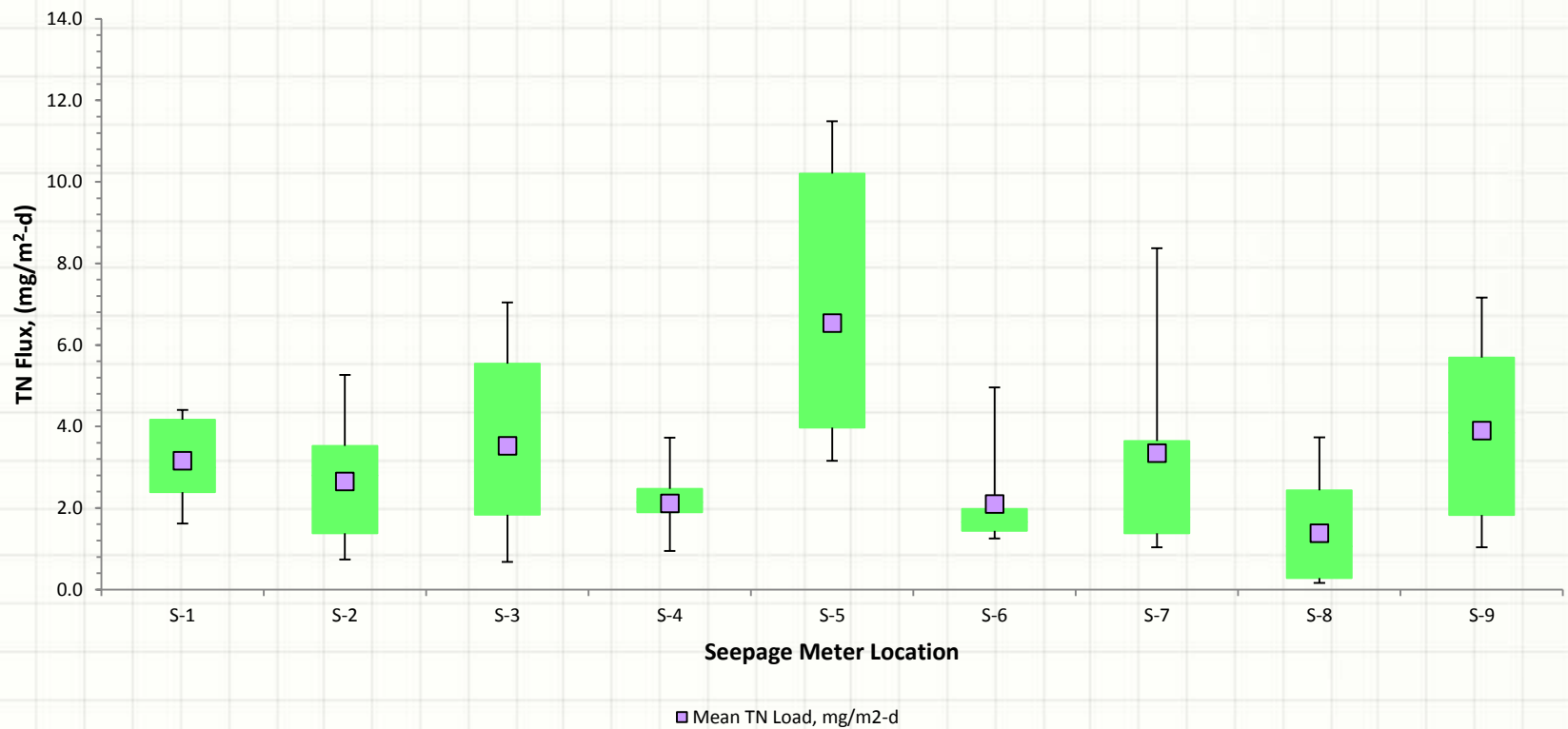
TP Flux ($\text{mg}/\text{m}^2\text{-d}$)

Total Phosphorus (TP) Flux
Lake Roberts, Orange County, FL

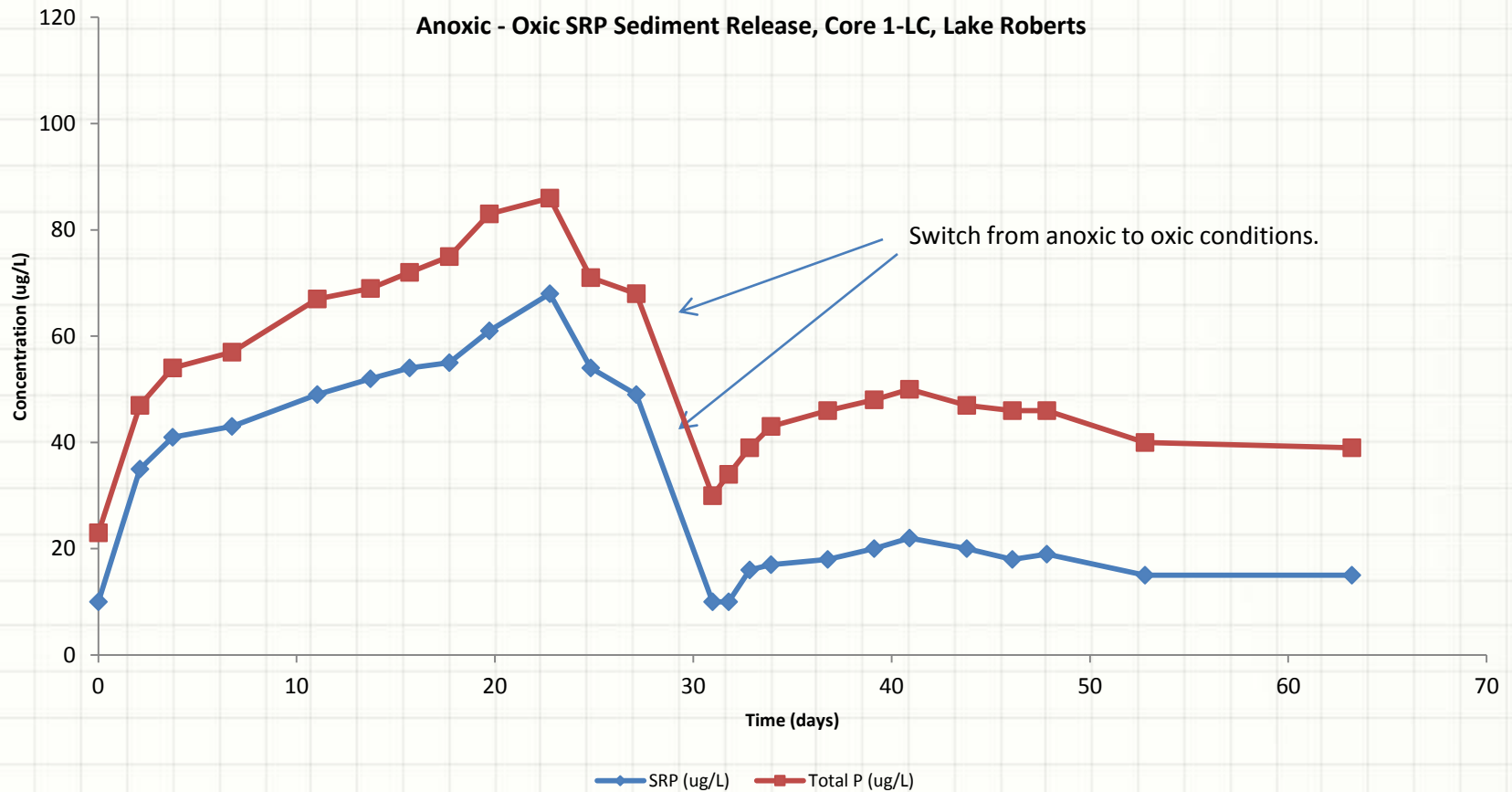


TN Flux (mg/m²-d)

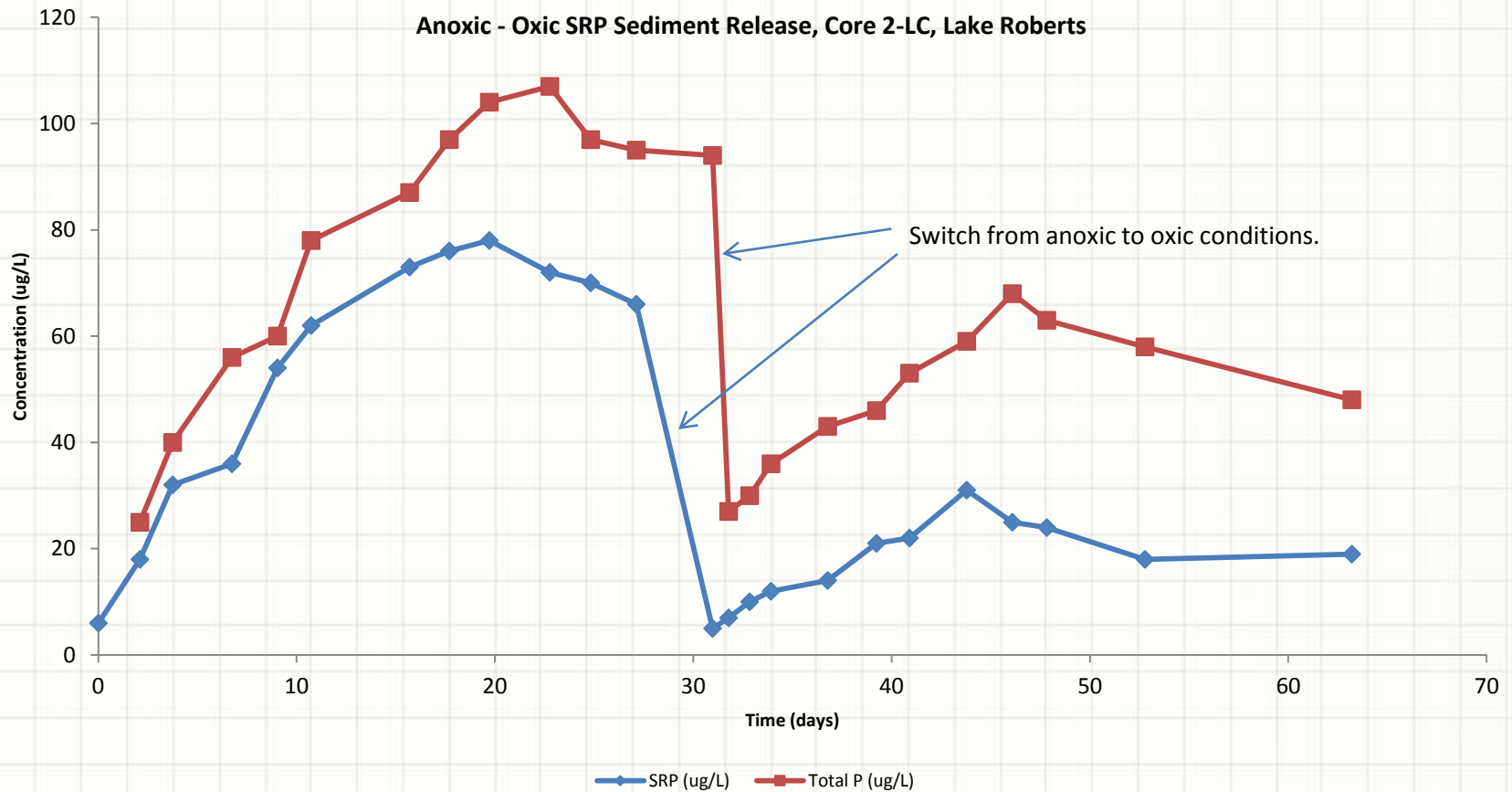
Total Nitrogen (TN) Flux
Lake Roberts, Orange County, FL



Internal Cycling – Core 1C (12 fbws)



Internal Cycling – Core 2C (18 fbws)



CONCLUSIONS



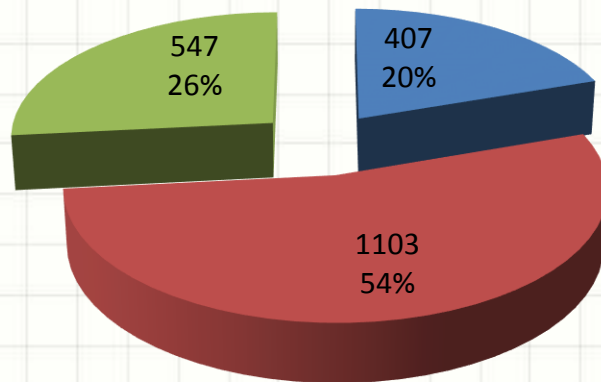
Lake Roberts Behaviors ...

- Mean residence time: 339 days.
- Storm water runoff greatest contributor to lake water quality.
- Storm water from Lake Reaves / Tussock contributes ~40% TP and ~50% TN run-off load to the surface water of Lake Roberts.
- Monitoring of the tussock resulted in EMCs of 0.113 mg/L and 1.55 mg/L for use in run-off calculations.
- Sediment release accounts for 41% of the net load to the surface water.



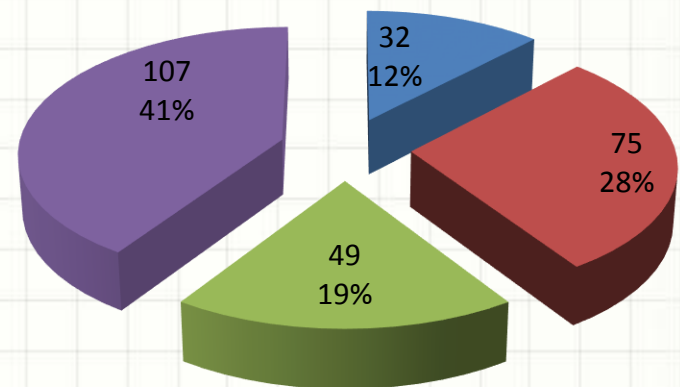
Net TN, TP Loading

Net TN (Kg/yr)



■ Bulk Precipitation ■ Stormwater Runoff
■ Groundwater Seepage ■ Internal Recycling

Net TP (Kg/yr)



■ Bulk Precipitation ■ Stormwater Runoff
■ Groundwater Seepage ■ Internal Recycling

Lake Roberts Behaviors ... (con't)

- Ground water TN, TP fluxes greatest from tussock area.
- Approximately 20% of the TN in near-shore seepage meters was nitrate.
- Actual seepage rates determined at the meters were approximately 1-2 orders of magnitude smaller than those derived for ARCNLET.



ASSESSMENT RECOMMENDATIONS



Assessment Recommendations

- Assess the System
 - Do as complete an assessment as possible.
 - Identify long-term and short-term trends.
- Characterize the Sources
 - Identify the major and minor sources.
 - Include new / potential sources.
- Develop BMPs
 - Include a wide range of BMPs.
 - Include metrics (e.g., removal efficiencies, \$/lb, etc.)

Many Thanks....

- Xueqing Gao, Watershed Evaluation and TMDL Section, FDEP.
- Woo-Jun Kang, Watershed Evaluation and TMDL Section, FDEP.
- Kyeongsik Rhew, Watershed Evaluation and TMDL Section, FDEP.
- Julie Bortles, Liz Johnson, Lori Cuniff, Orange County Environmental Protection Division.
- Orange County Board of County Commissioners.

QUESTIONS?

