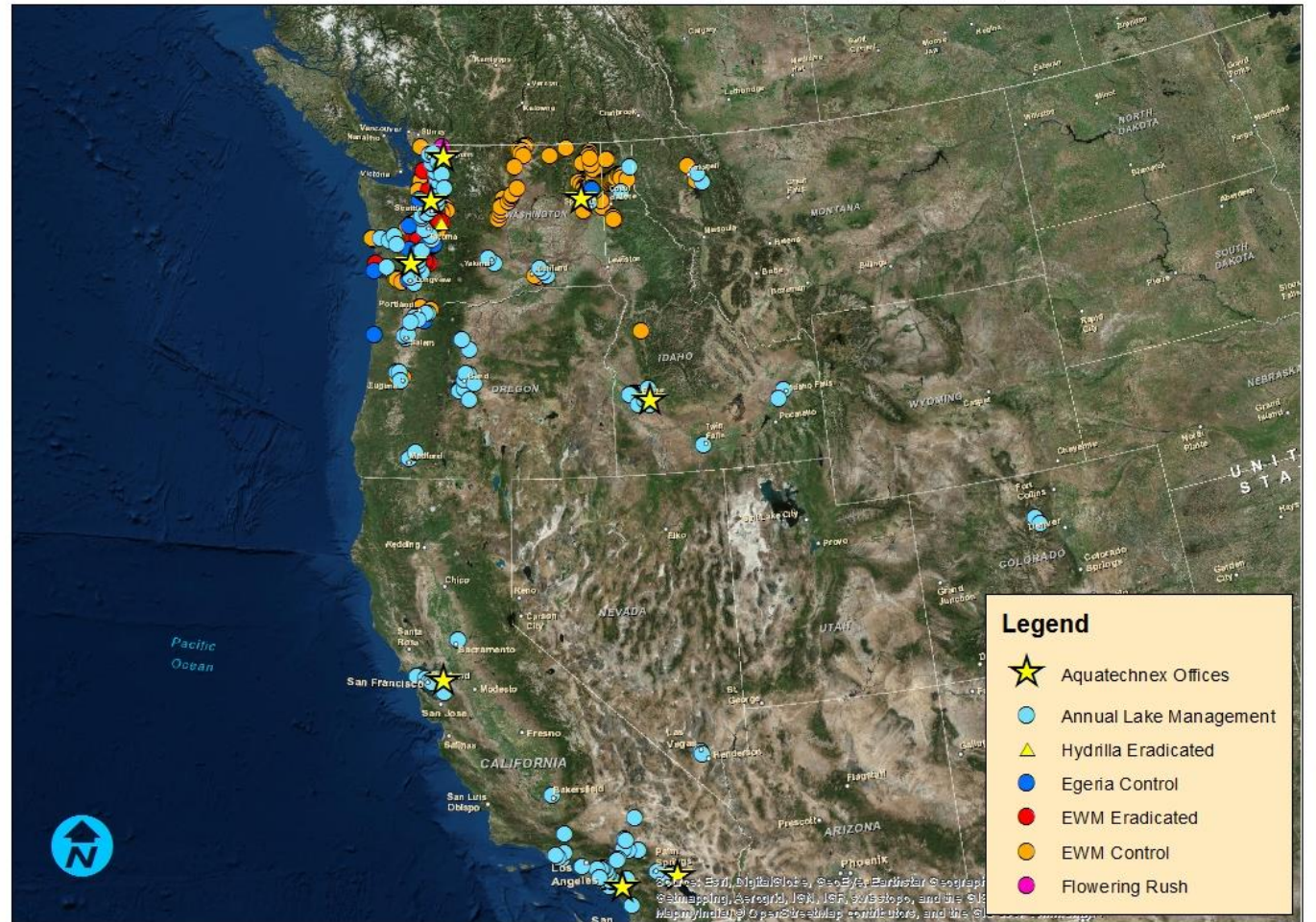




Spanaway Lake Aquatic Weed and Algae Management

Terry McNabb, CLM

Company Overview Over Four Decades of Lake Management Experience



Aquatechnex Major Lake Management and Invasive Aquatic Weed Projects

USAE APC Research Program/Aquatechnex Cooperation

- 1981-82 Sacramento Delta Water Hyacinth Planning
- 1983-84 Potomac River Hydrilla Control Demo Program
- 1988-1990 Pend Oreille River Dye Studies
- 1991-93 Columbia and PO River Triclopyr Studies
- 1989-1991 Okeechobee/Seminole/Kentucky Lake hyperspectral aerial imaging demo project
- 1995-96 Lake Minnetonka, MN Triclopyr Milfoil Study
- 2000-2009 Various Washington Studies
- 2010-2012 PO River Acoustic Doppler vs. Dye water exchange study
- 2013-2017 Flowering Rush Herbicide Trials
- 2018-2019 Bubble Curtain Study (video available, <https://www.youtube.com/watch?v=fDWChNwJMIM>)

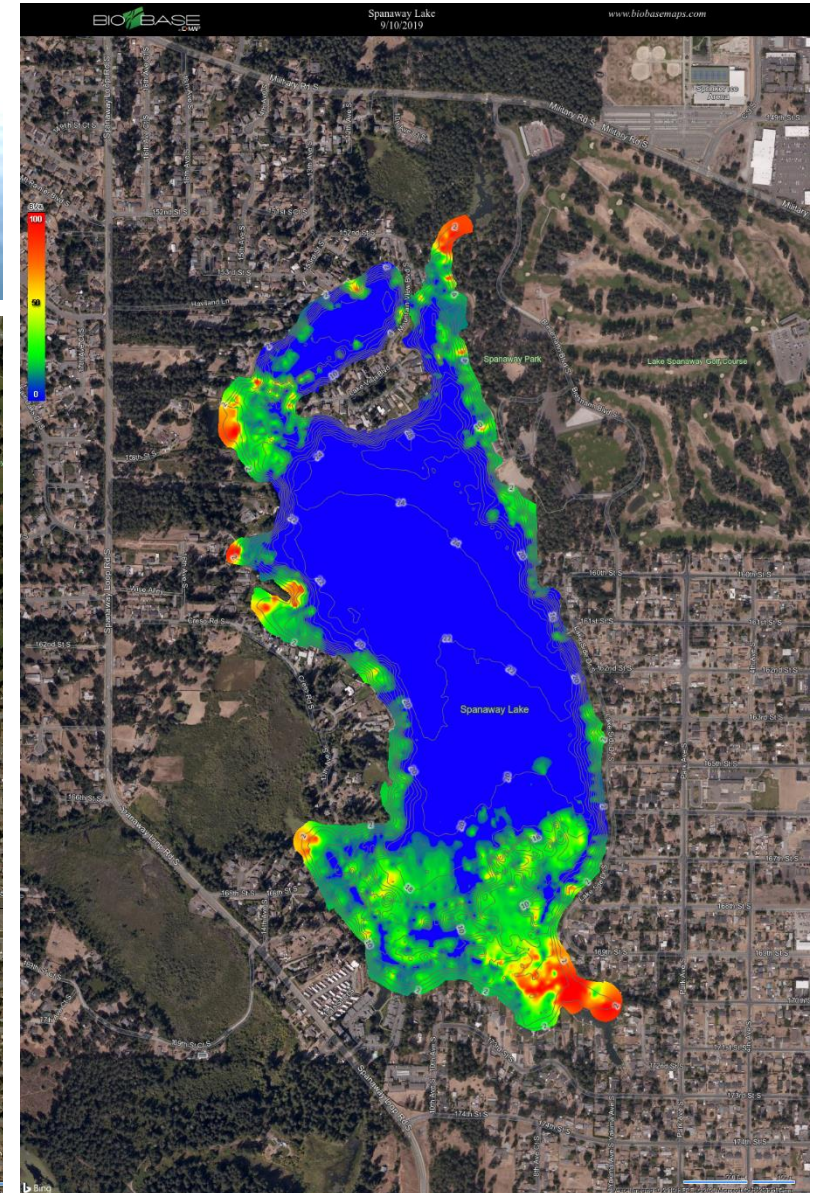
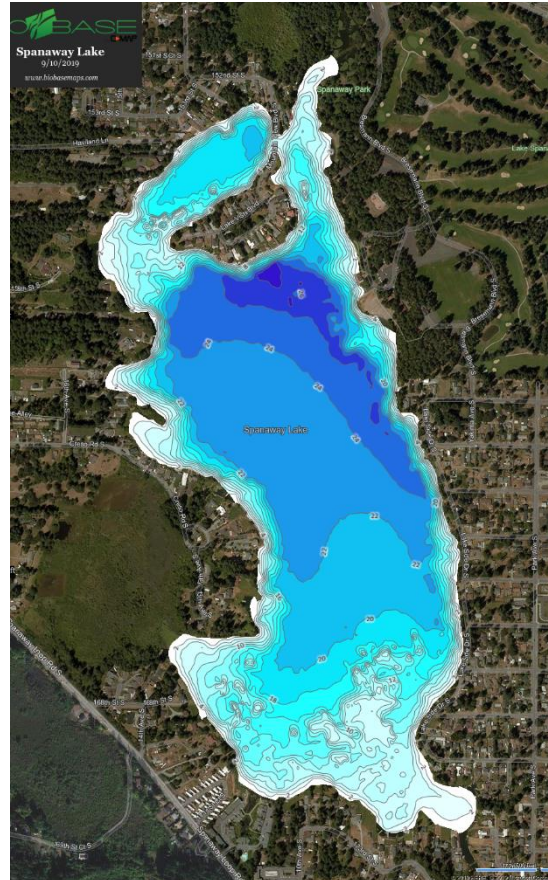




Spanaway Scope of Work

- Map aquatic vegetation in the lake, develop thoughts on treatment
- Update phosphorus reduction plan, sample and analyze
- Develop treatment options and plans for aquatic plant management and mitigating phosphorus blooms through in lake phosphorus sequestering technologies
- File Notice of Intent and obtain permit coverage for same.

Hydro- acoustic mapping work





Result of aquatic plant mapping work

- Submerged vegetation primarily native species, one invasive found
- Floating leaf plants primarily state listed noxious weed White Water Lily





Control options

- Individual
 - Bottom barriers
 - Cutters and rakes
- Lake wide
 - Bio-control
 - Mechanical
 - Herbicide
- Community input required for consensus

Hand tools





Grass Carp

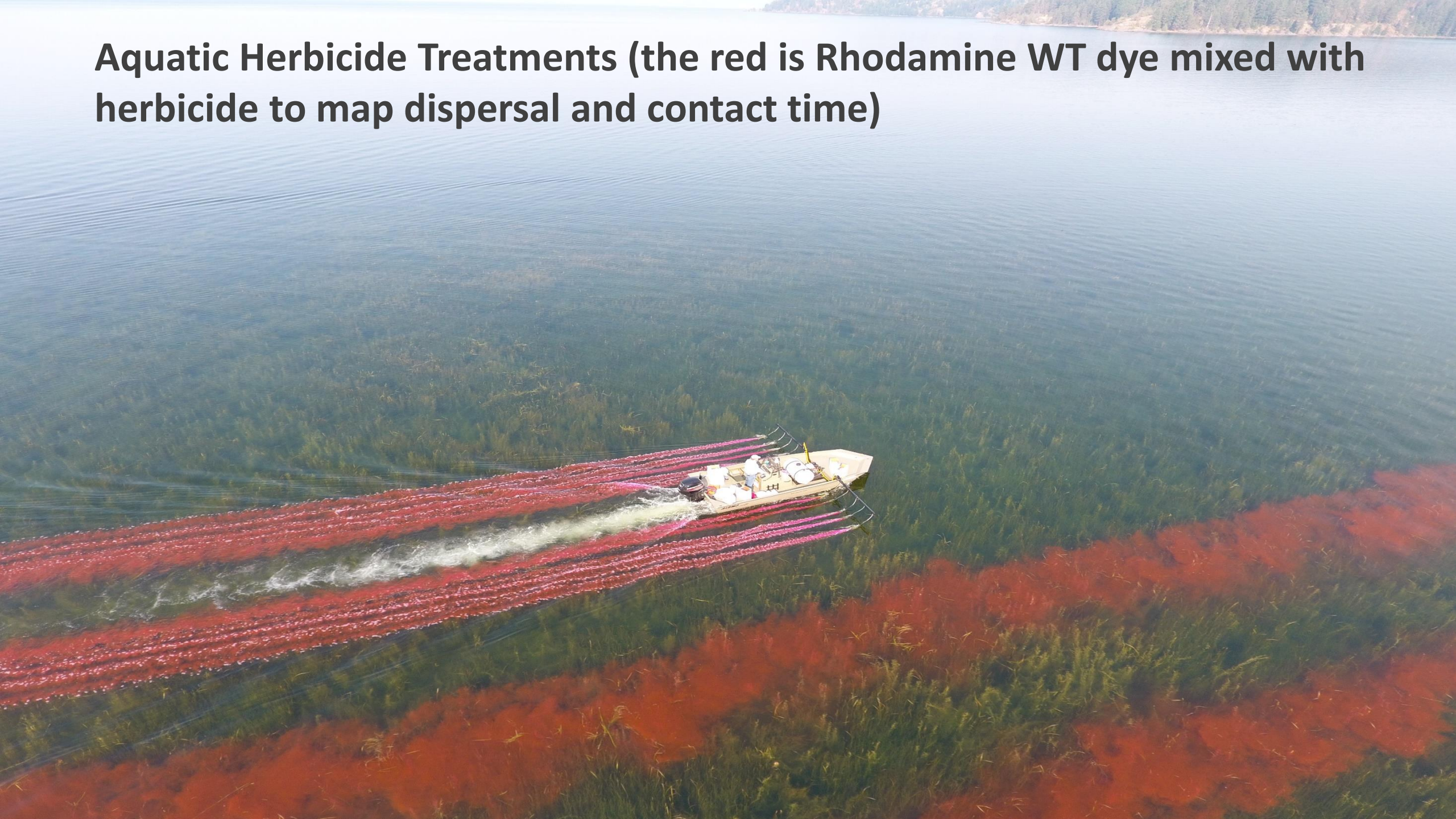
- Minnow family, native to Amur River in North China
- Consume submerged aquatic weeds
- Feeding preferences
- Stocking rate drives control
- Year classes, older fish don't eat as much, mortality needs to be accounted for
- Many states require permit, Washington State does not have one available for public lakes

Aquatic Weed Harvesting

- Purchase or contract
- Operations on the water and on shore
- Production depends on plants present, distance on the water and disposal



Aquatic Herbicide Treatments (the red is Rhodamine WT dye mixed with herbicide to map dispersal and contact time)



Application techniques




Herbicides

- Pondweeds
 - Aquathol K, contact herbicide
 - Diquat contact herbicide
- White Water Lily
 - Rodeo with Surfactant
- Permit required; same permit used for Phosphorus Mitigation
- Costs
 - Permit fee
 - Notices
 - \$500-750.00 per treated acre





HAB Harmful Algae Blooms



Phosphorus drives HAB blooms

- Cyanobacteria have competitive advantage in eutrophic lake systems
- Total P averages 33.9 ug/l
- Free Reactive P 5 ug/l
- Trophic scale for lakes, 24-96 ug/l is considered Eutrophic

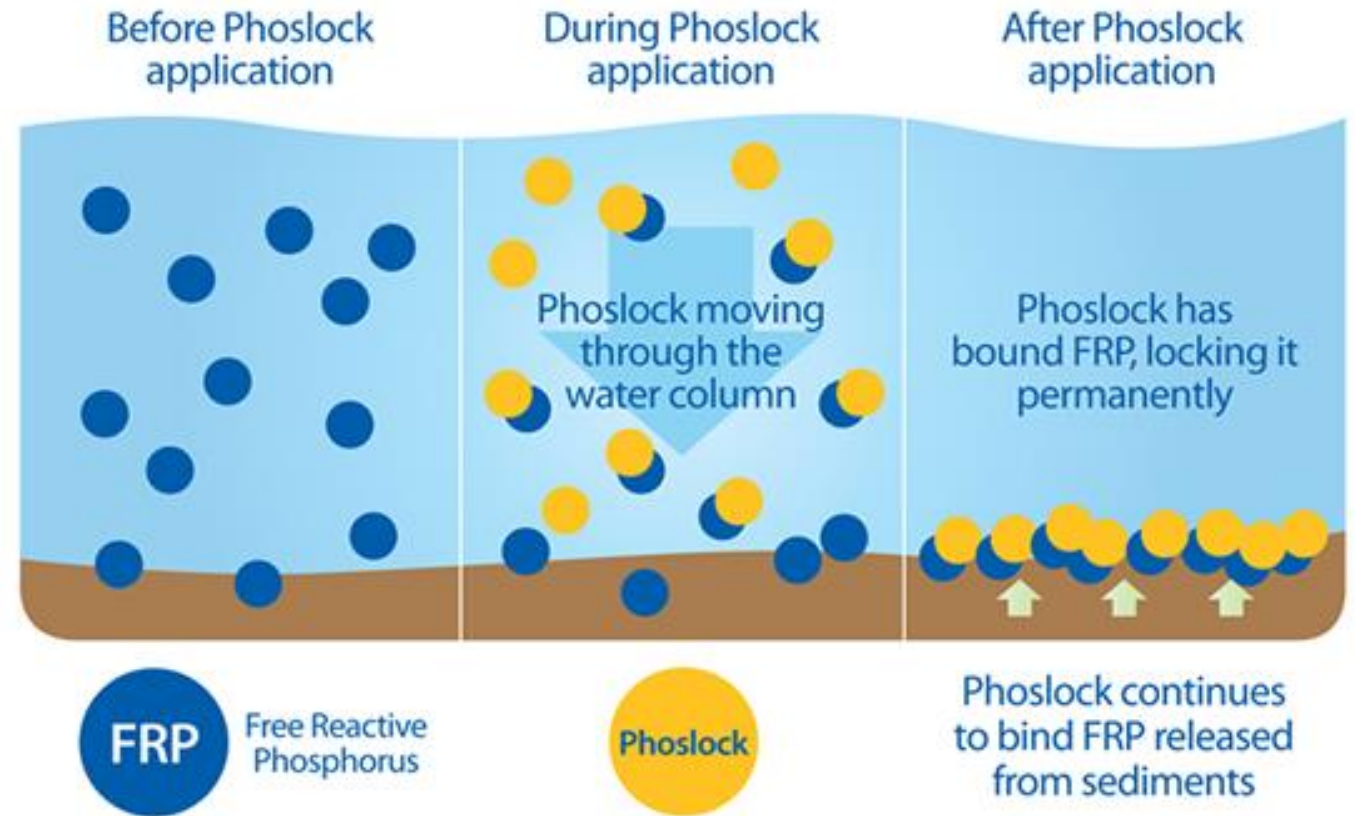
Nutrient Inactivation



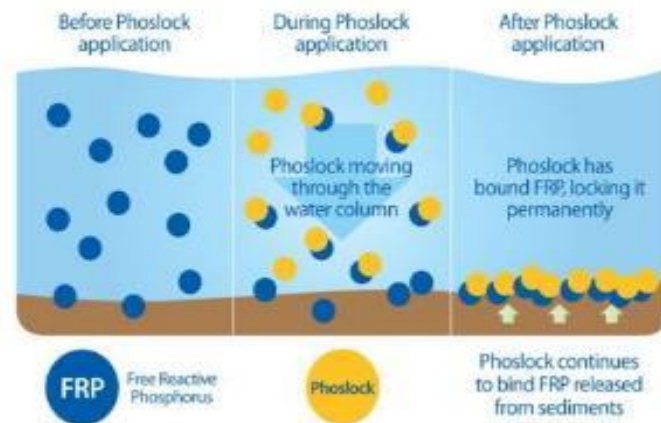


Aluminum Sulfate

Phoslock

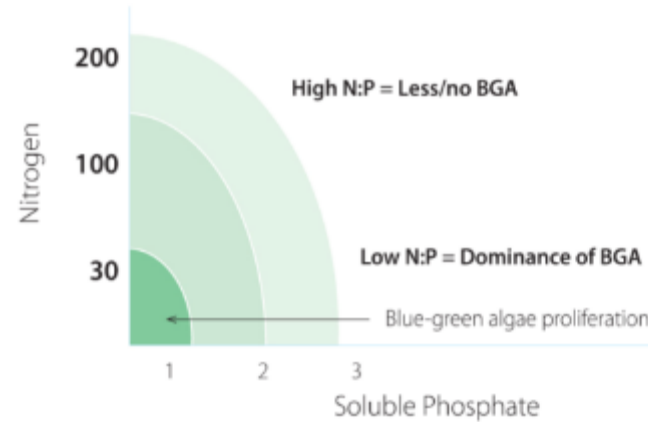


Water Quality Restoration with Phoslock



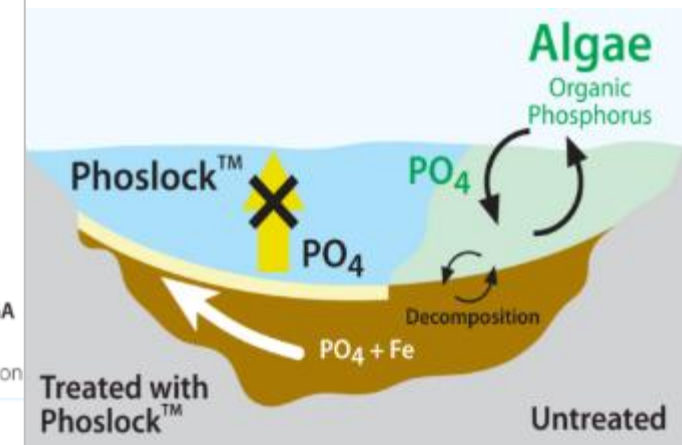
1) Immediate Impact

- Rapid P binding
- As Phoslock moves through the water column it adsorbs P at different depths in the water body



2) Short- term Impact

- Reduction in P
- As P becomes the limiting nutrient the N:P ratio increases
- Resulting in more balanced water quality conditions



3) Longer- term Impact

- Phoslock remains active at the bottom of a water body
- Adsorbs P released from sediments
- Adsorbs P from new inflow water, as settles to bottom



OC parks **Laguna Niguel**
Regional Park

Improving Water Quality in Laguna Niguel Lake

Project Overview
OC Parks is implementing a project to address phosphorus levels in Laguna Niguel Lake.

Laguna Niguel Lake has high levels of phosphorus that can lead to water quality issues, harmful blue-green algae (i.e., cyanobacteria blooms) and create an ecological imbalance.

San Diego Regional Water Quality Control Board has issued NPDES permit necessary to move forward with the Laguna Niguel Lake restoration efforts.

On 28, the phosphorus mitigation plan will commence with application of the phosphorus locking technology Phoslock® continue throughout the week, concluding on May 3.

Water quality monitoring will occur prior to and after the Phoslock® applications to address permit requirements and assess the treatment to water quality over time.

Phoslock
Phoslock program was selected to specifically address phosphorus pollution in Laguna Niguel Lake.

Phoslock is a modified clay technology that specifically inactivates the available forms of phosphorus in the water column that are used from the bottom sediments of waterbodies.

Phoslock is not an algaecide.

Phoslock is certified for use in drinking water and poses negligible risk to the aquatic environment.

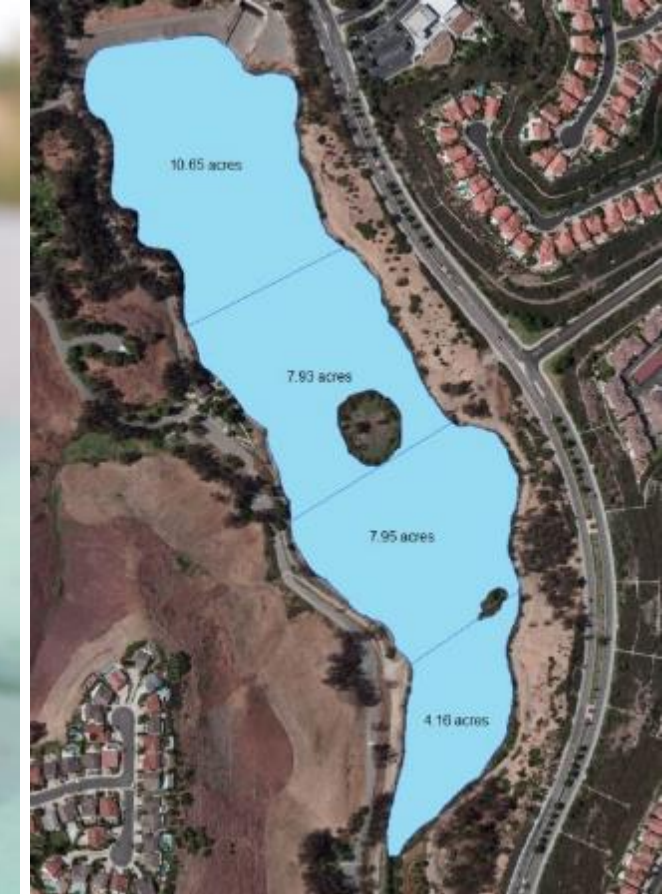
Phoslock has been successfully and safely applied to inactivate phosphorus in hundreds of ponds, lakes and reservoirs in over 20 states.

For more information on Phoslock, visit www.phoslock.com.

OC Parks and the lake management contractor, AquaTectra, will provide ongoing water quality monitoring throughout the project to assess performance of the project and comply with the NPDES permit requirements.

For more information about the Laguna Niguel Lake water quality restoration project, please contact Ben Corneisen, Technical SLC at (760) 272-6645, or email at ben@ocparks.com.

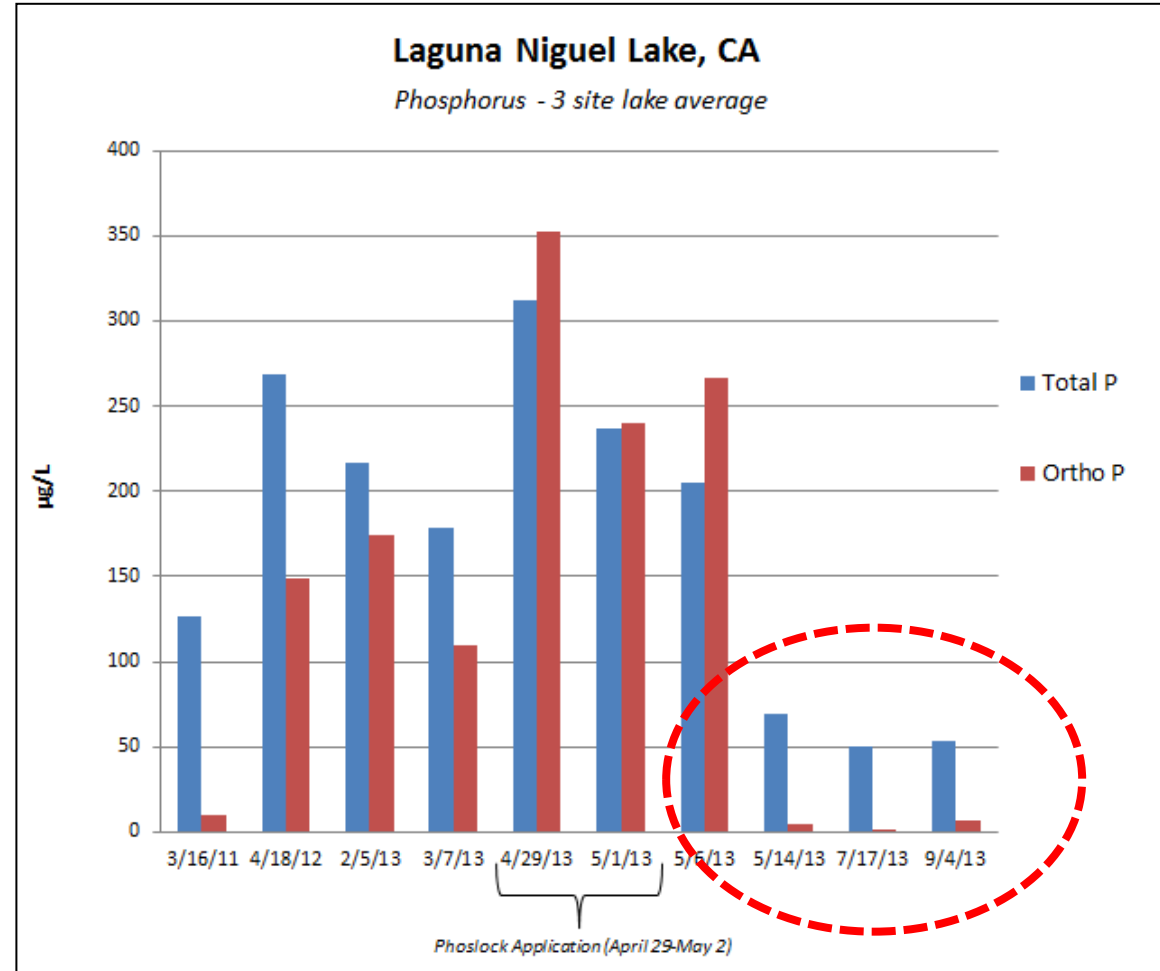


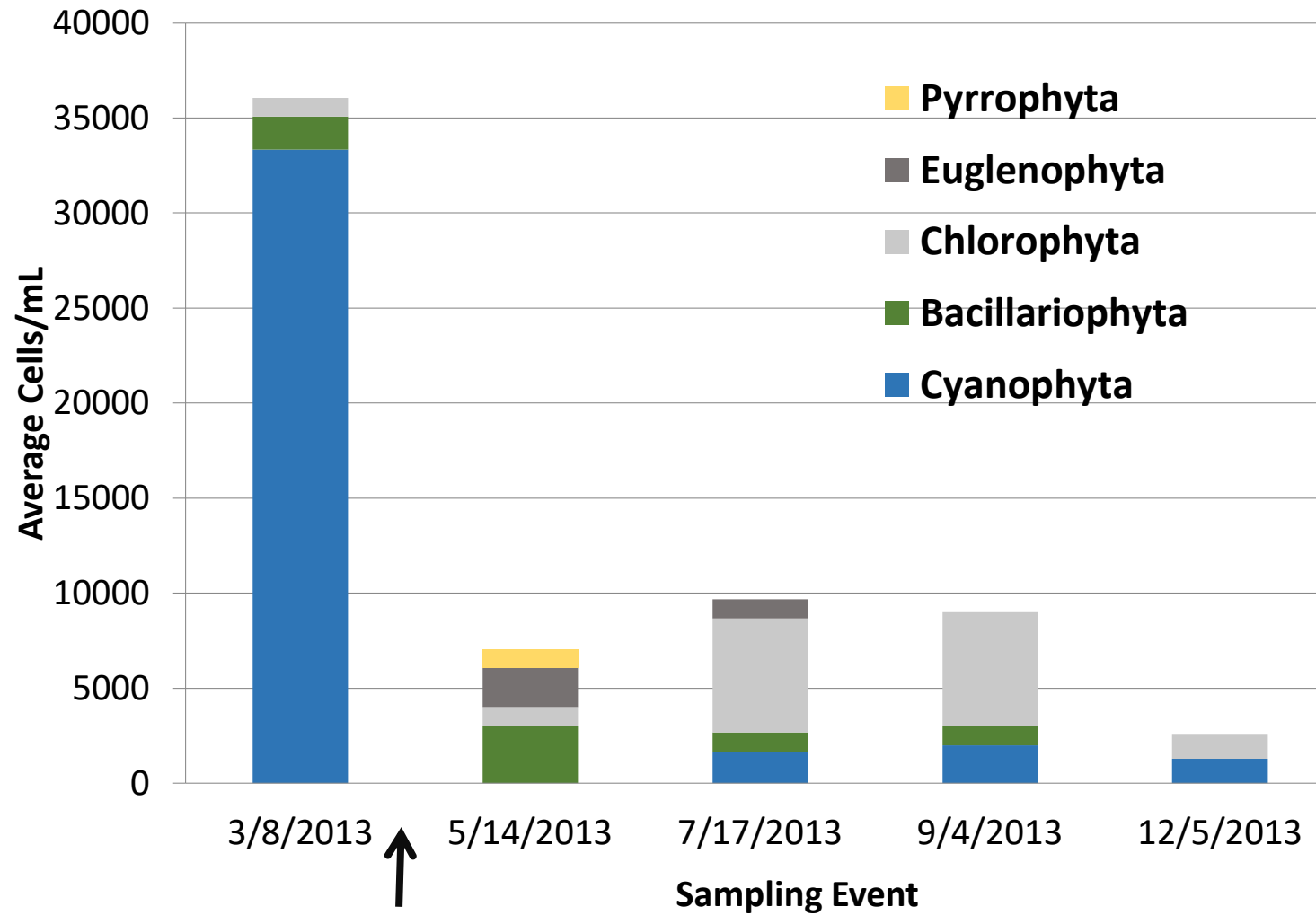
Phoslock Application – Laguna Niguel

Phosphorus Results

- Significant and sustain P reduction
- Average P levels since May 14th
 - TP 58 ug/L
 - FRP 4 ug/L



Algae Assemblage: Laguna Niguel





P Mitigation

- Alum and Buffer Costs Stripping \$150,000
- Phoslock Costs Stripping \$175,000
- Total Reset Costs either \$650,000

Drone Survey

- We operate two types of on the water drones
- This system used for documenting aquatic herbicide control, could replace point intercept or augment
- Aerial thermal drone survey Feb 3rd



Thanks

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- 360-201-2612

