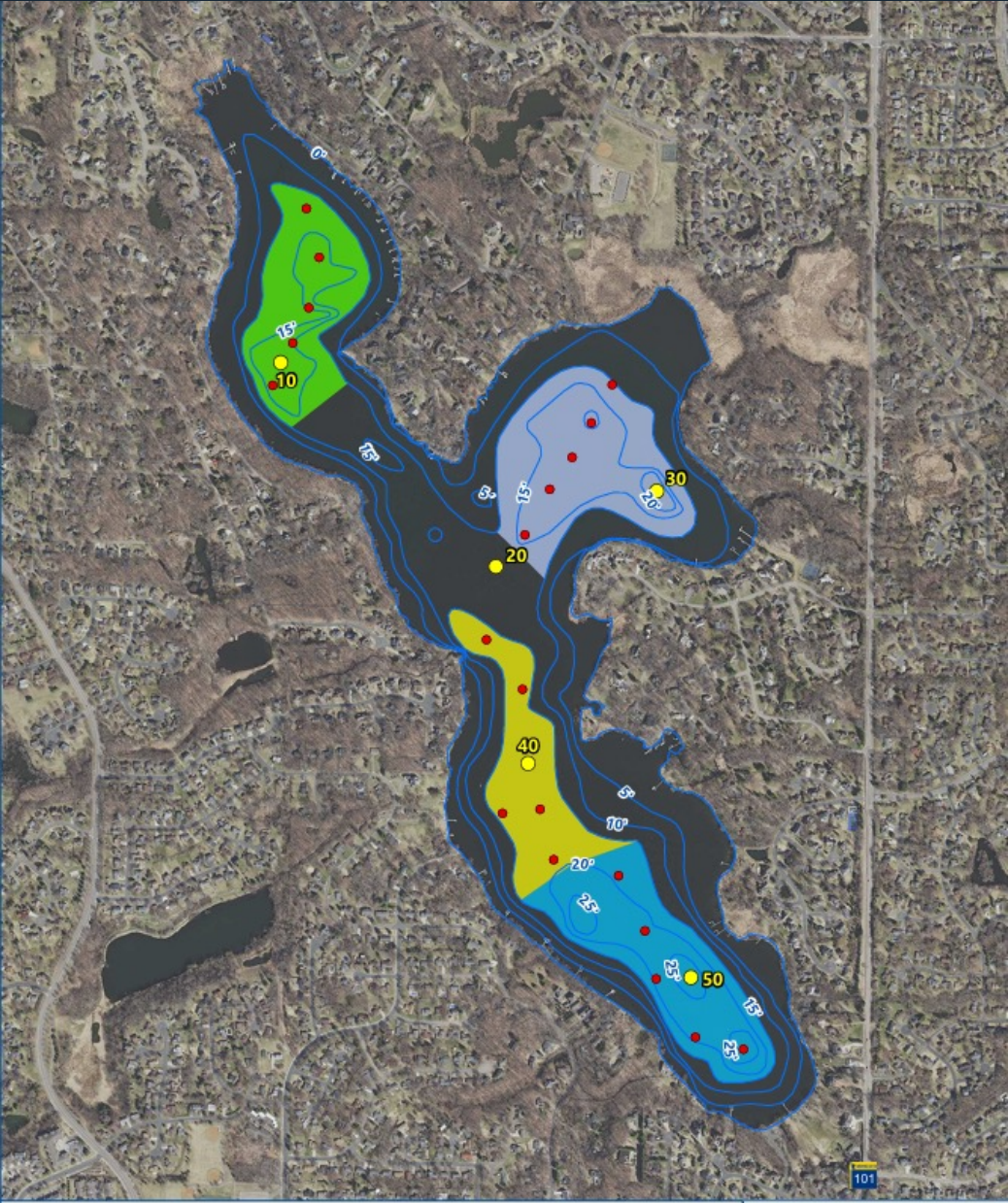


Lotus Lake Wake Boat Impact On Alum Treatment



Joe Bischoff & Kate Lucas

5/20/2026



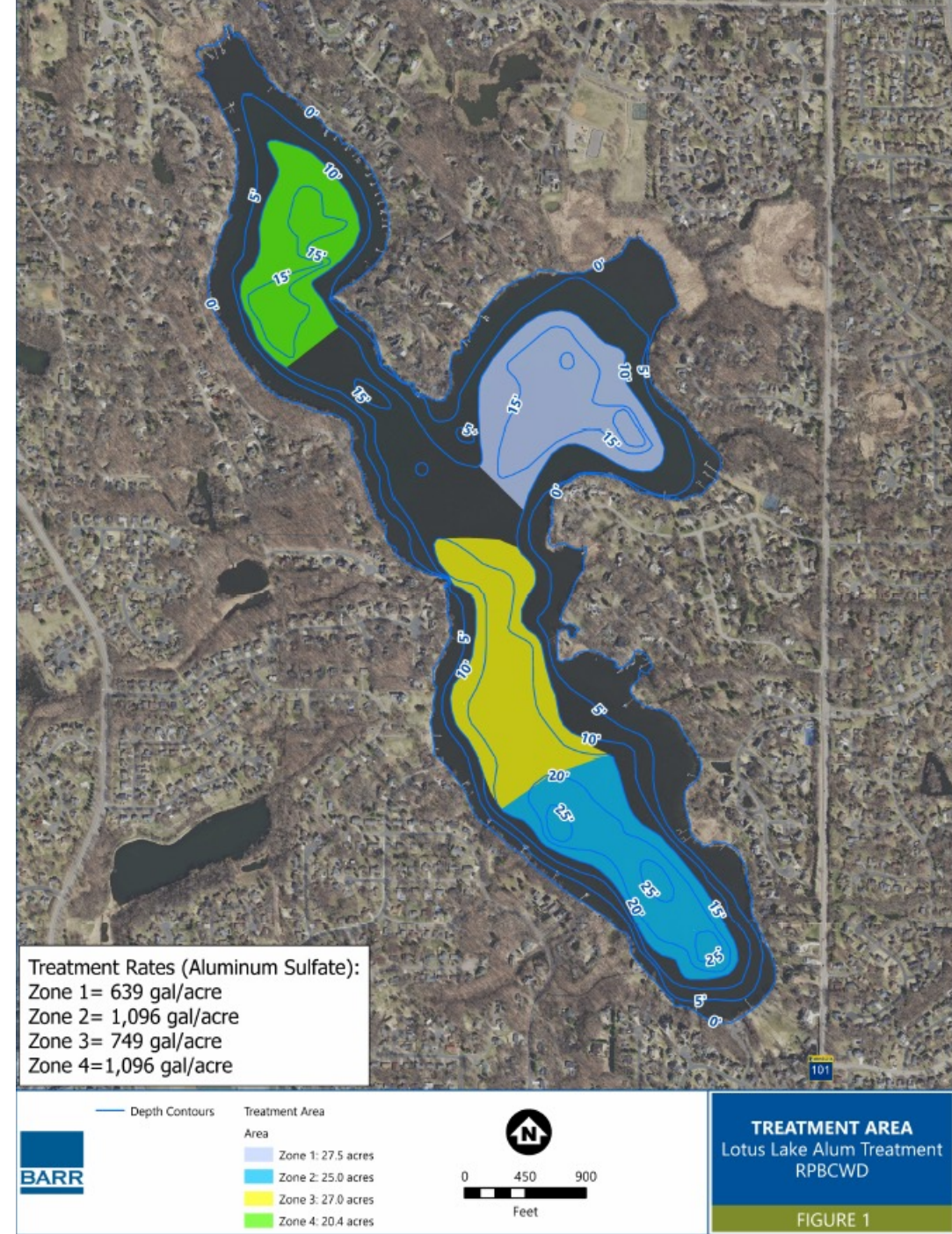
	<ul style="list-style-type: none">Depth ContoursRelease Rate StationsTotal AI Sampling Points	<p>Treatment Area</p> <ul style="list-style-type: none">Zone 1: 27.5 acresZone 2a: 25.0 acresZone 2b: 16.9 acresZone 3: 20.4 acres	 	<p>2025 Sediment Coring Locations Lotus Lake RPBCWD</p>
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FIGURE 4

2024 Application Design



- Expanded Treatment Area
 - Included shallow areas
- Concerns over wake boat impacts
 - Sediment disturbance
 - Reduce efficacy
 - Reduce longevity

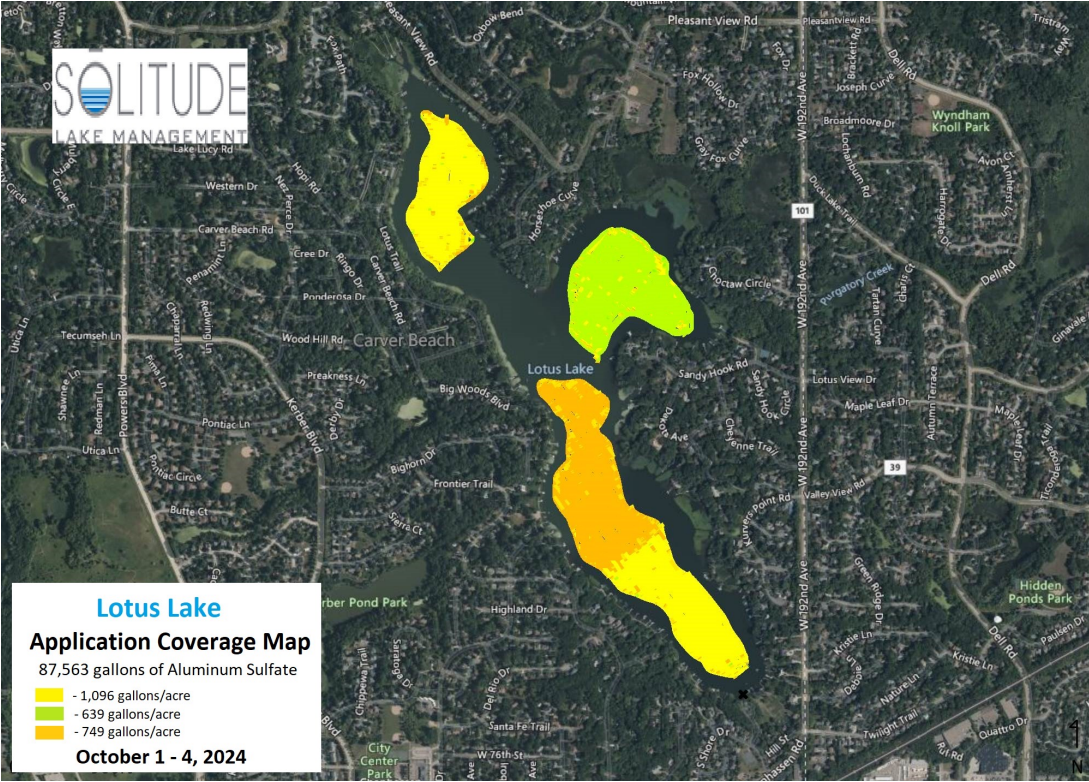
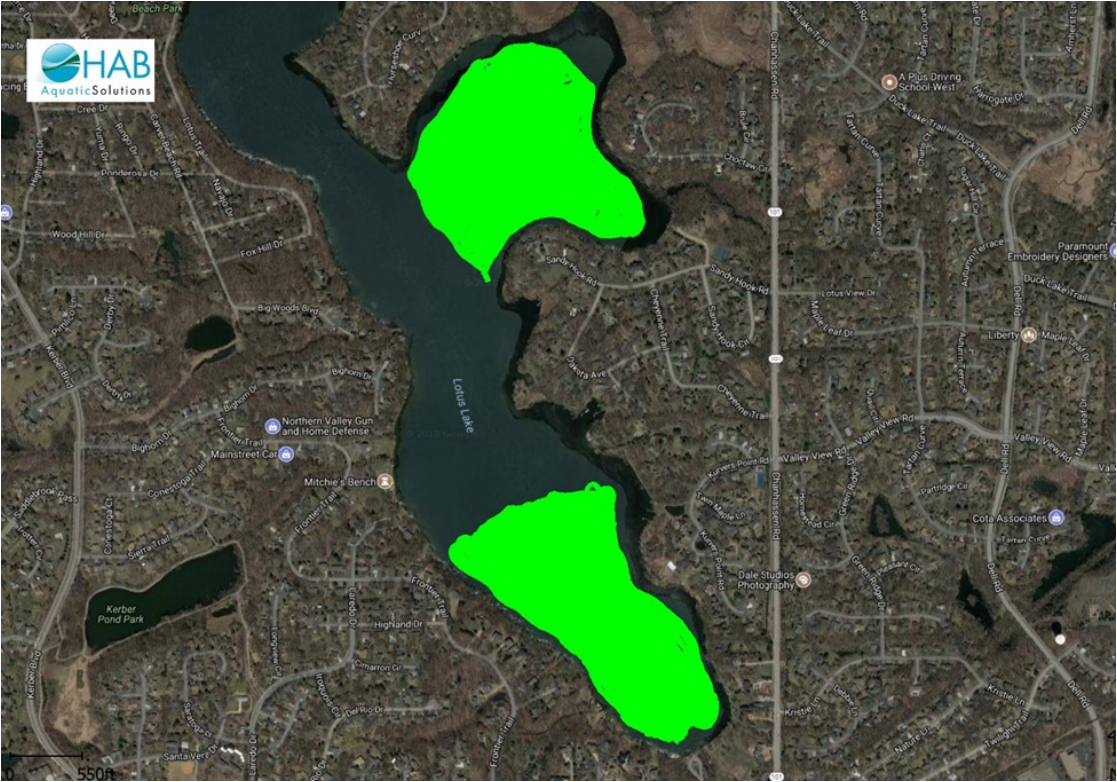


2024 Application



Scenario	Zone	Acres	2018 Application (g Al/m ²)	Proposed 2023 Application (g Al/m ²)	Proposed 2025 or later Application (g Al/m ²)	Total Required Application (g Al/m ²)
3	1	27.5	35	35		70
	2	25	111	60	--	171
	3	16.9	--	41	41	82
	4	20.4	--	60	60	120

Lotus Lake Alum Treatment and Wake Boat Assessment



Wake Boat Sediment Disturbance



- Recent SAFL study (2025) identifying sediment disturbance following a wake boat pass
 - Visual disturbance as deep as 14 feet
 - Estimated disturbance at 20 feet

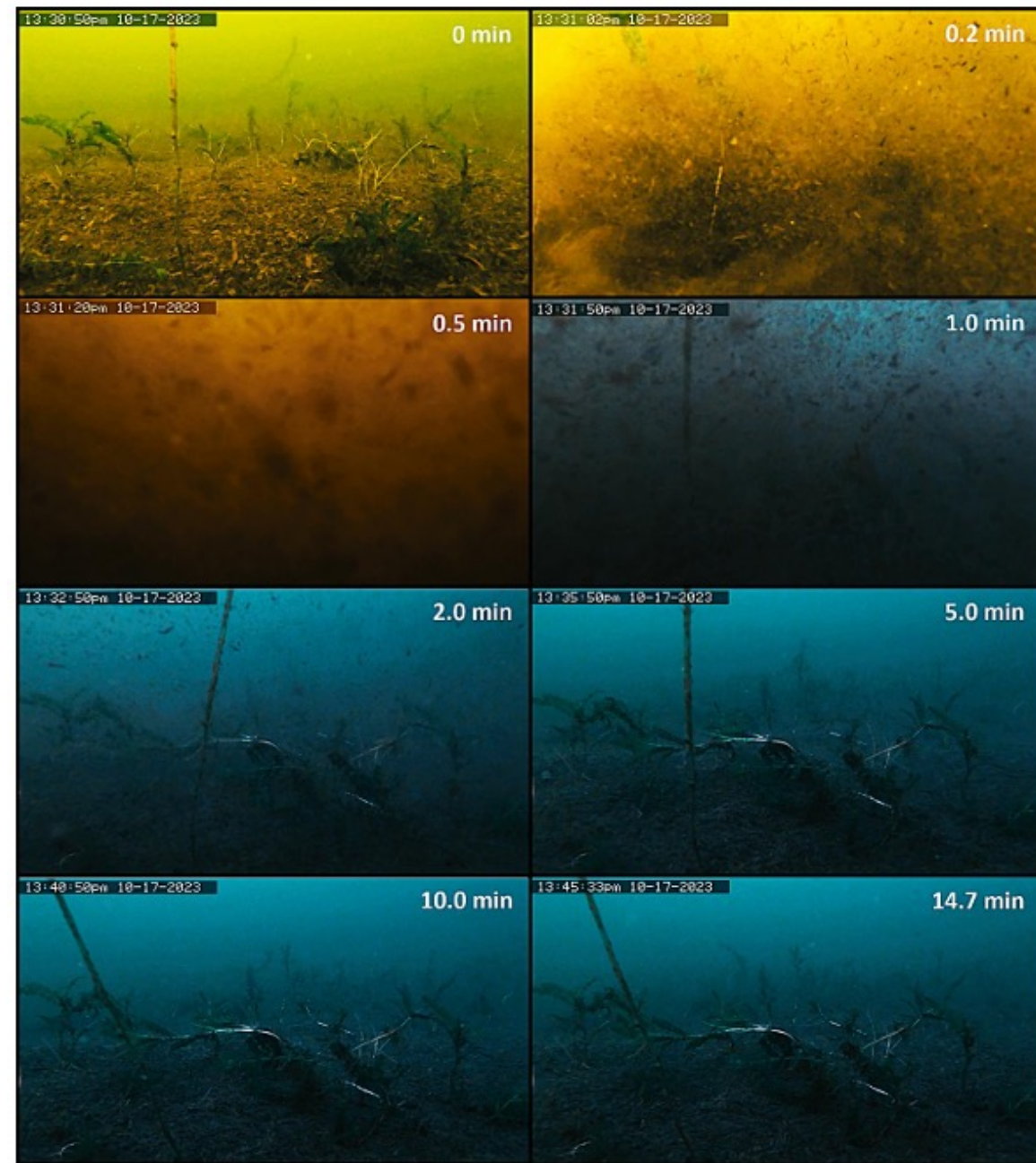
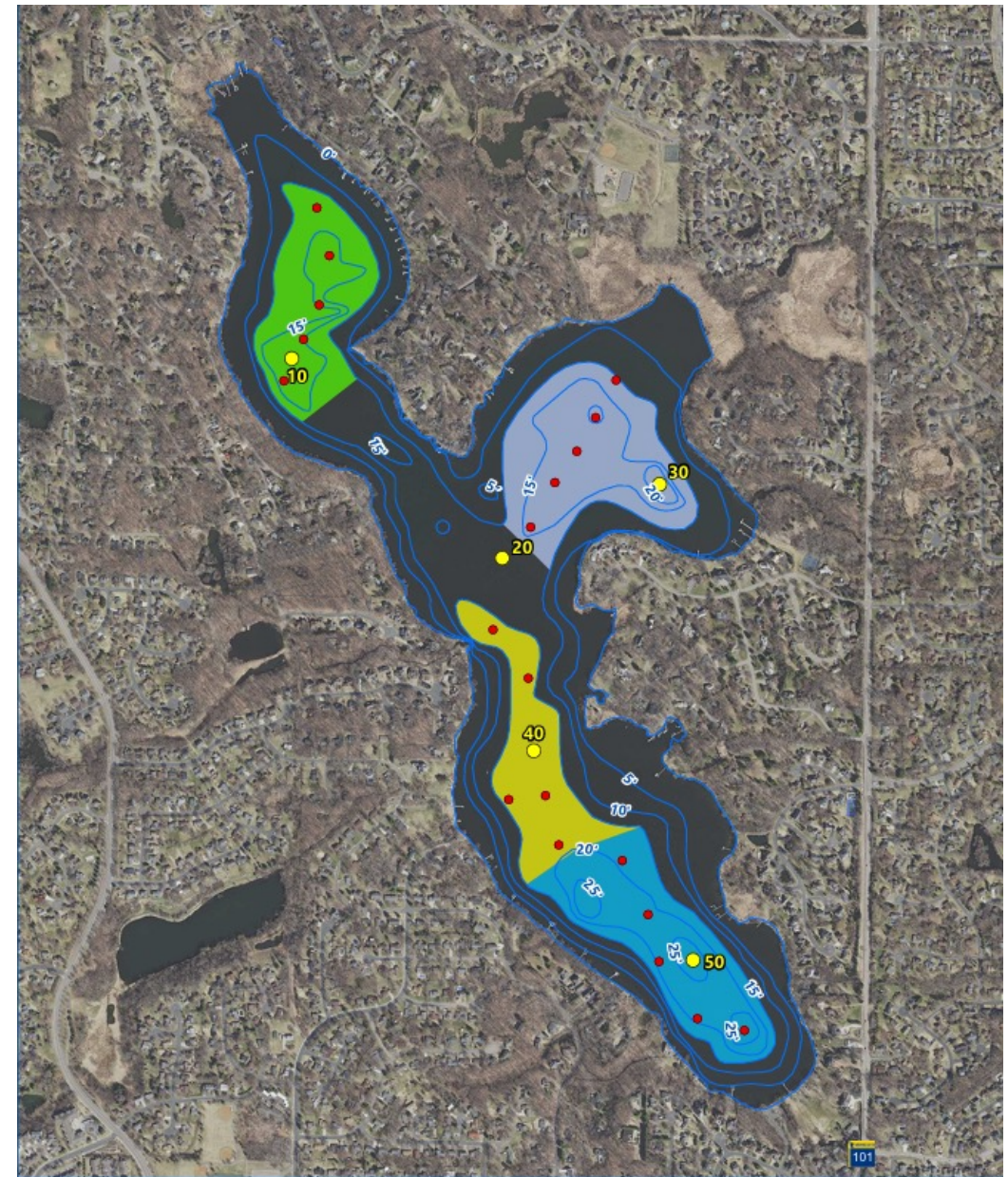
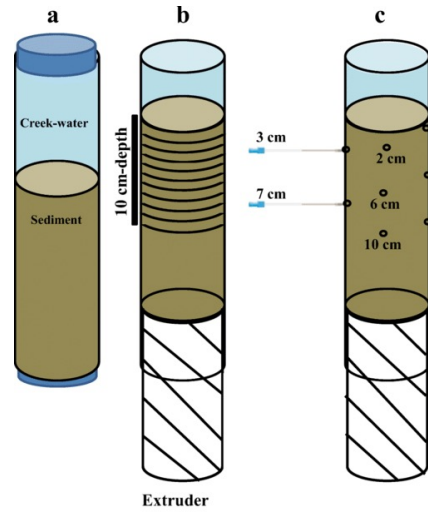


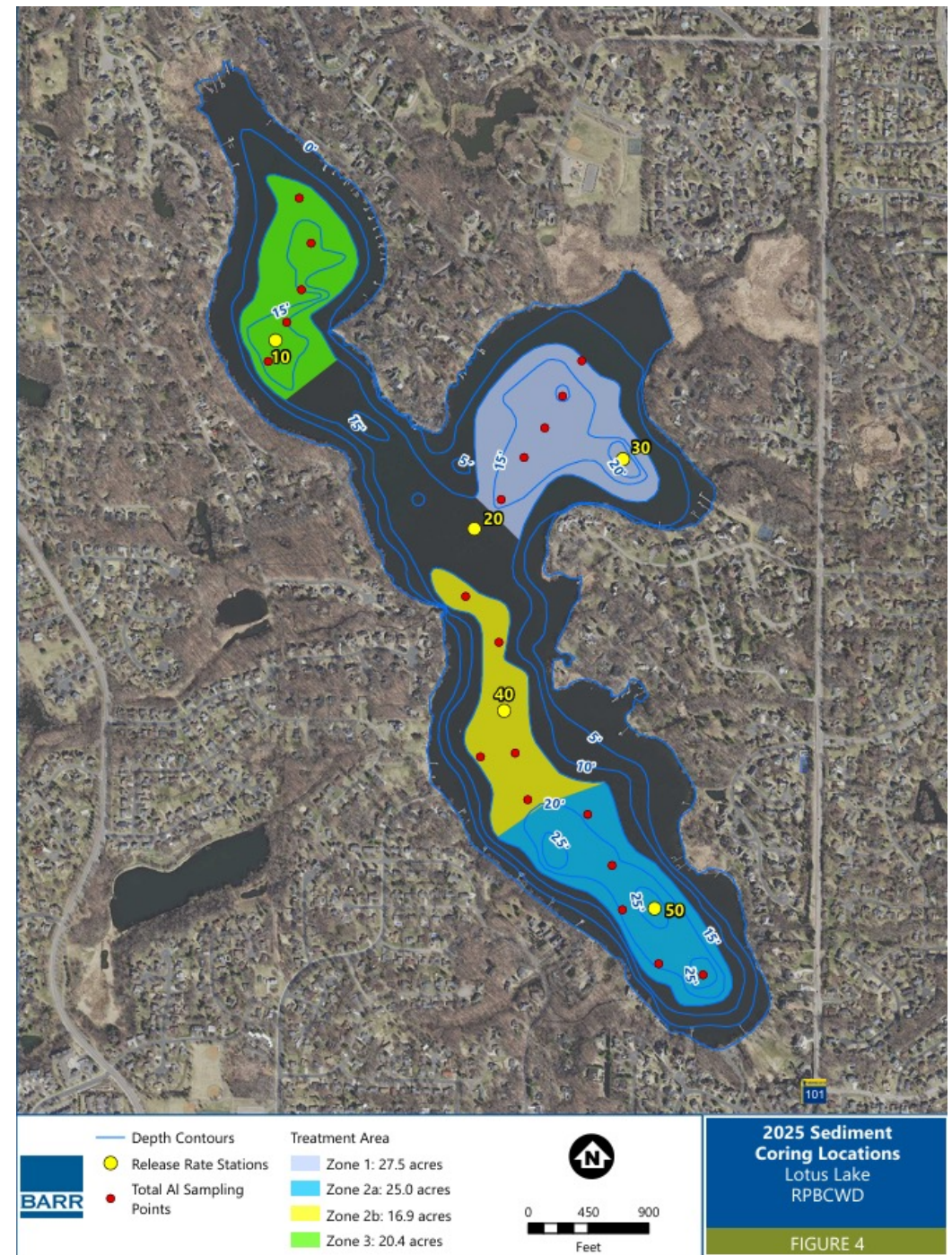
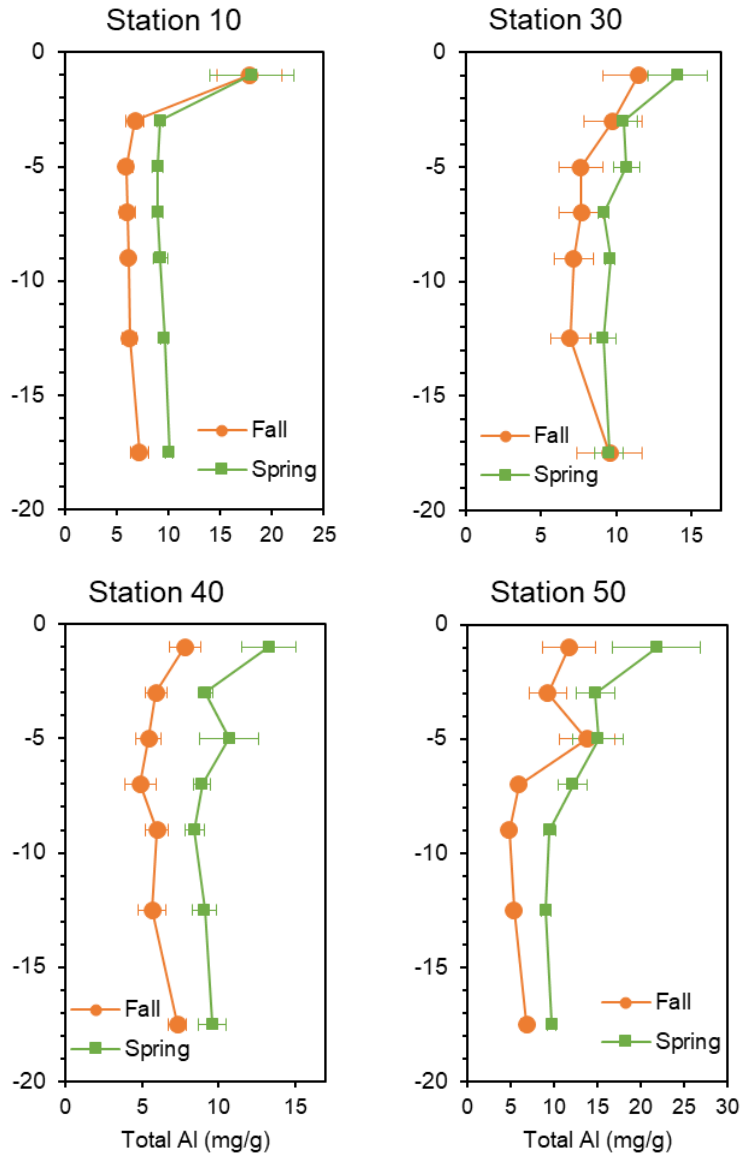
Figure 68. Screenshots taken from underwater video at 14 ft (ADCP) during pass 1 of semi-displacement mode (Condition 2) testing of the Malibu VLX Wakesetter.

Experimental Design



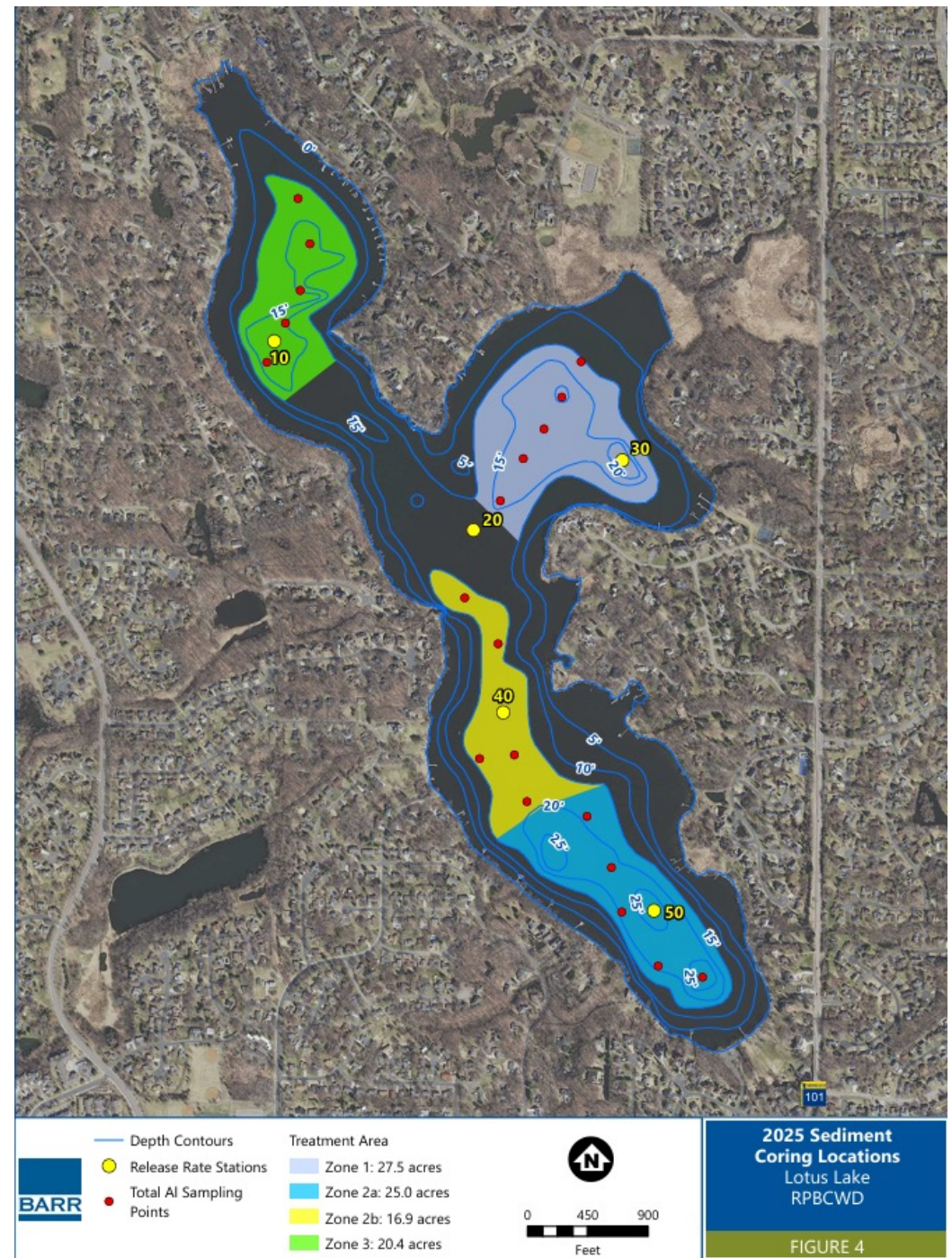
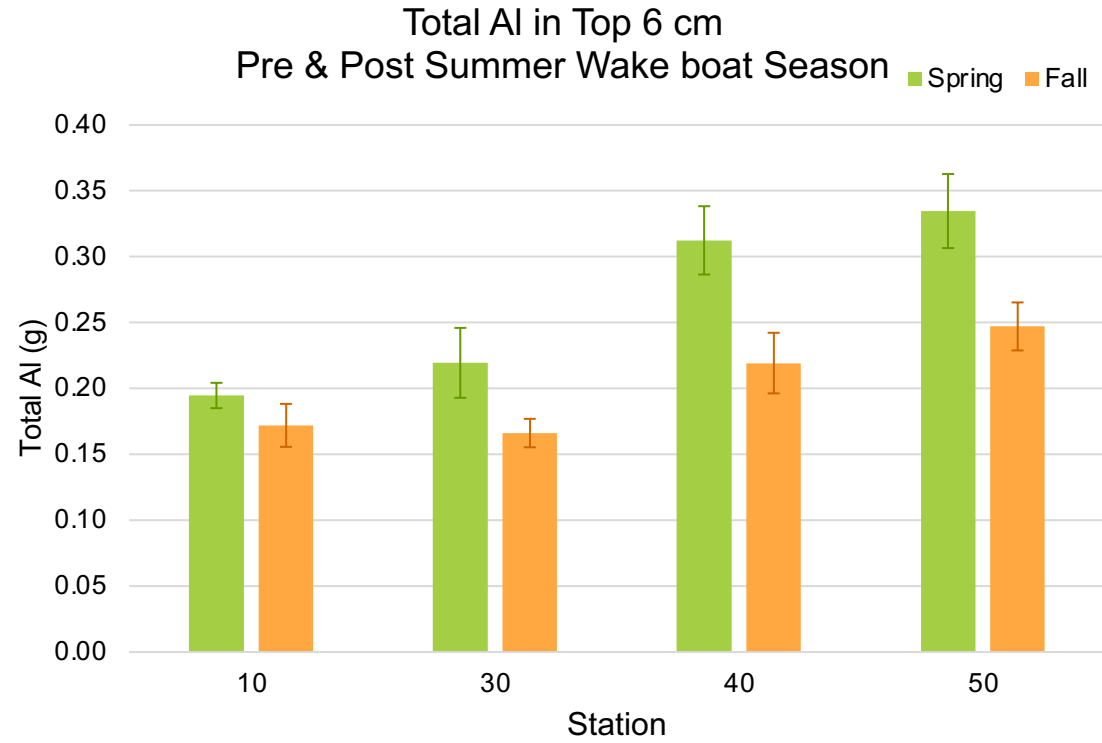
	— Depth Contours	Treatment Area	 	2025 Sediment Coring Locations Lotus Lake RPBCWD FIGURE 4
	● Release Rate Stations	■ Zone 1: 27.5 acres		
	● Total AI Sampling Points	■ Zone 2a: 25.0 acres		
		■ Zone 2b: 16.9 acres		
		■ Zone 3: 20.4 acres		

Sediment Profile Comparison



2025 Sediment Coring Locations
 Lotus Lake
 RPBCWD
FIGURE 4

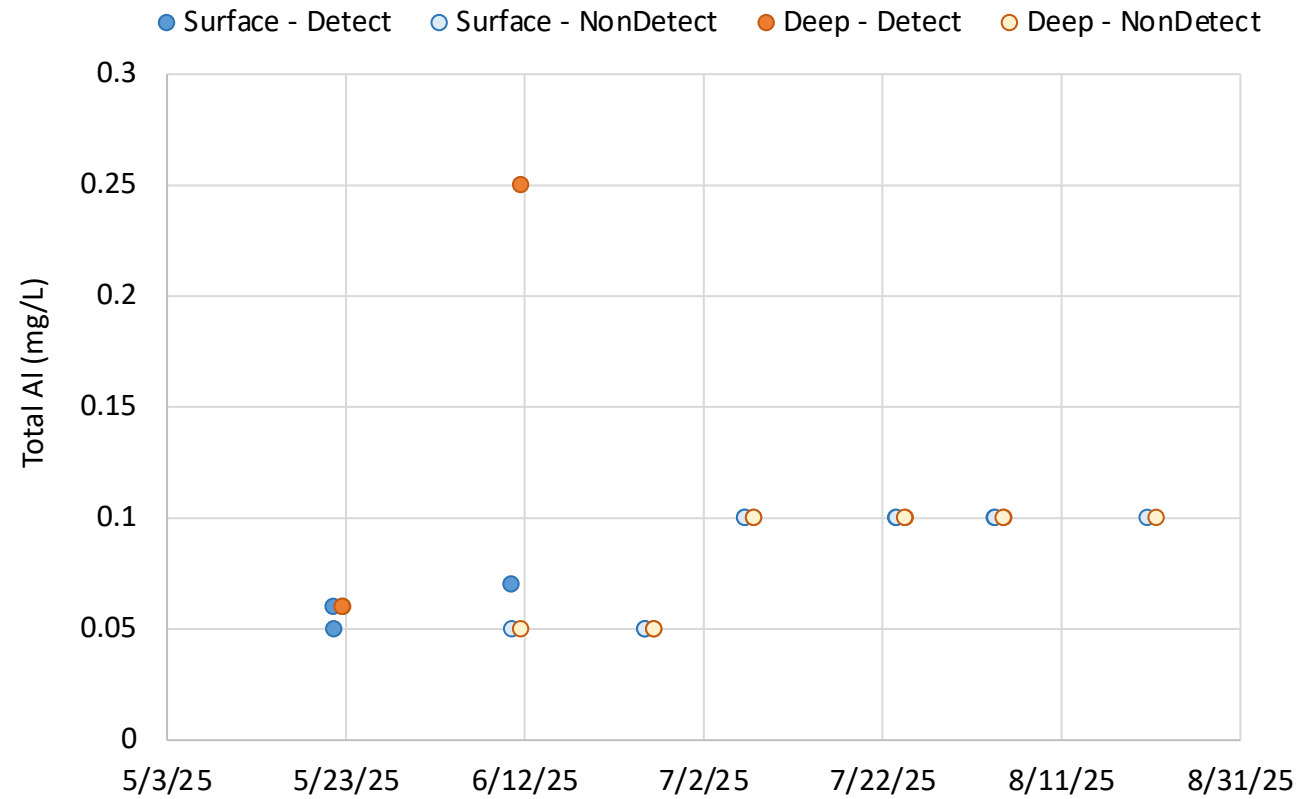
Total Mass Comparison



Water Column Aluminum Concentrations



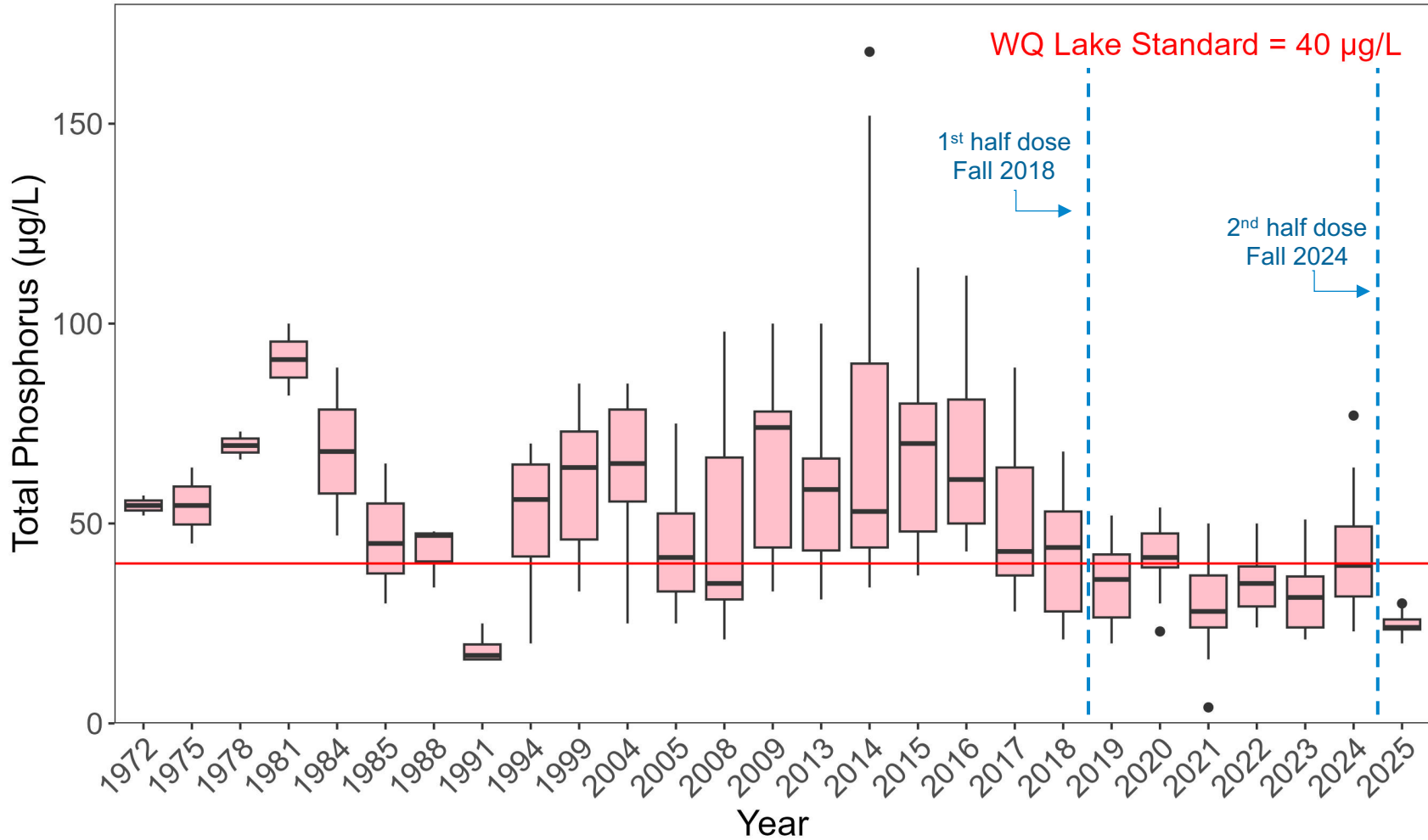
Lotus Lake Total Aluminum



Internal Loading Affects



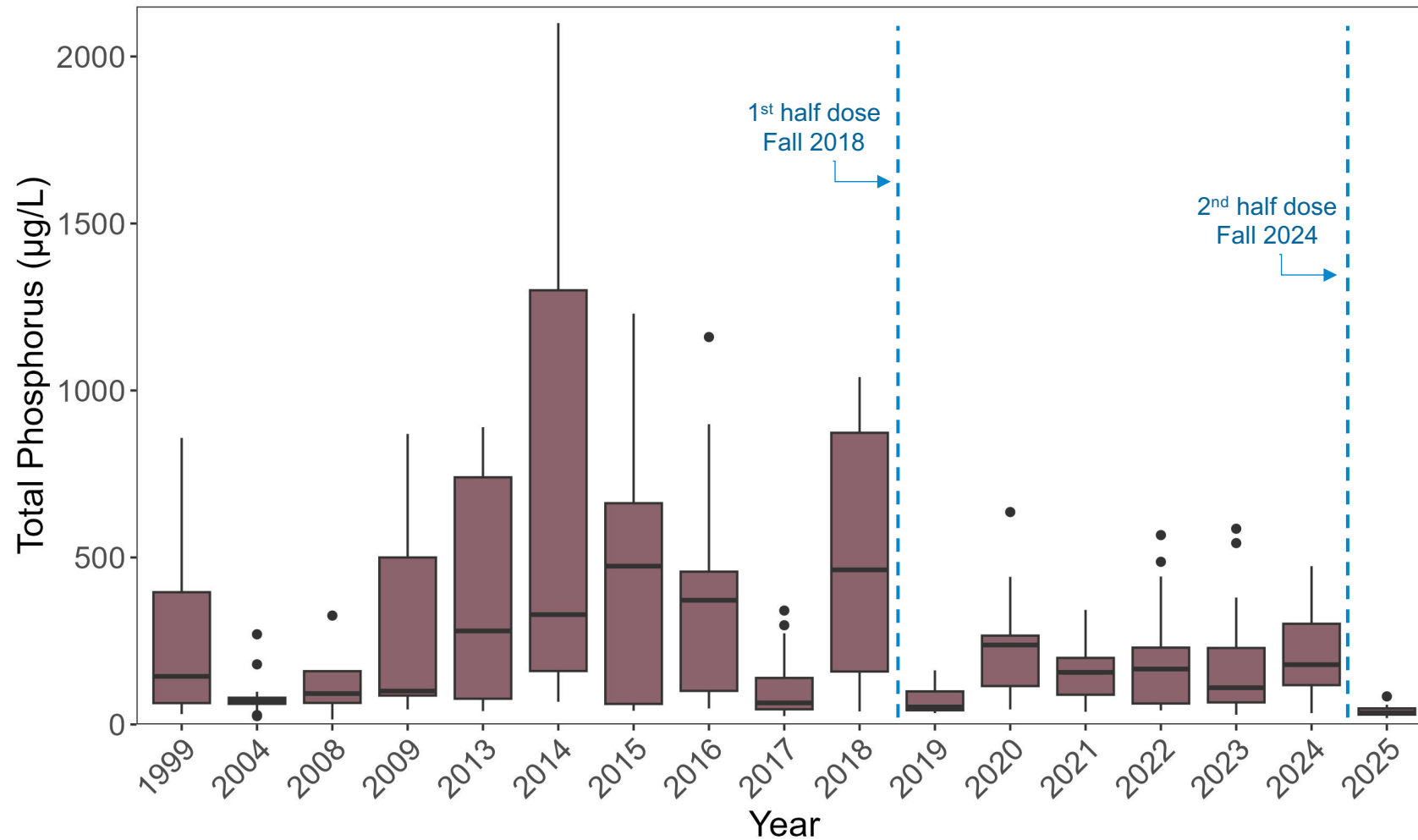
Lotus Lake Surface Total Phosphorus June through Sept, 1972-2025



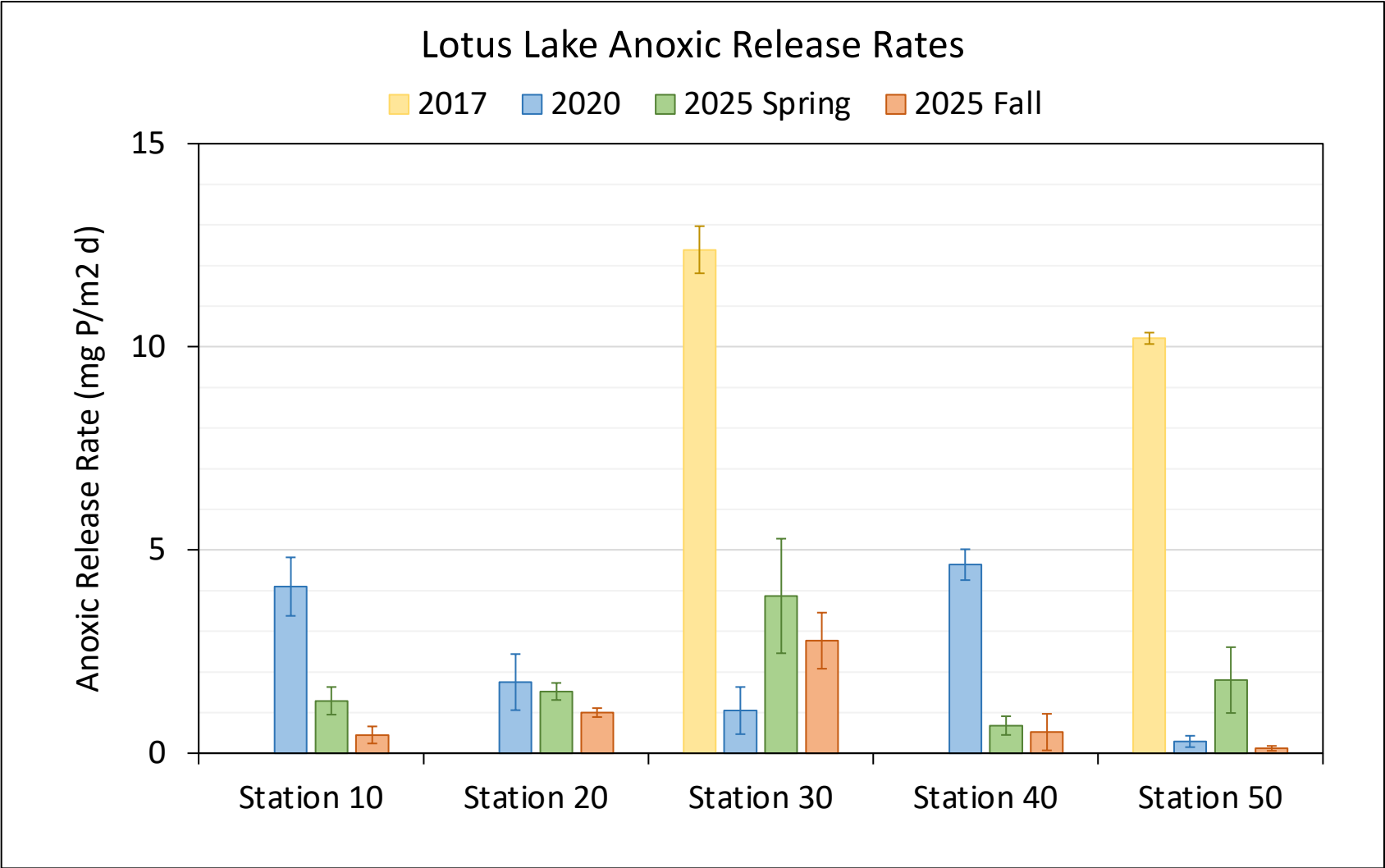
Internal Loading Affects



Lotus Lake Hypolimnetic Total Phosphorus
June through Sept, 1999-2025



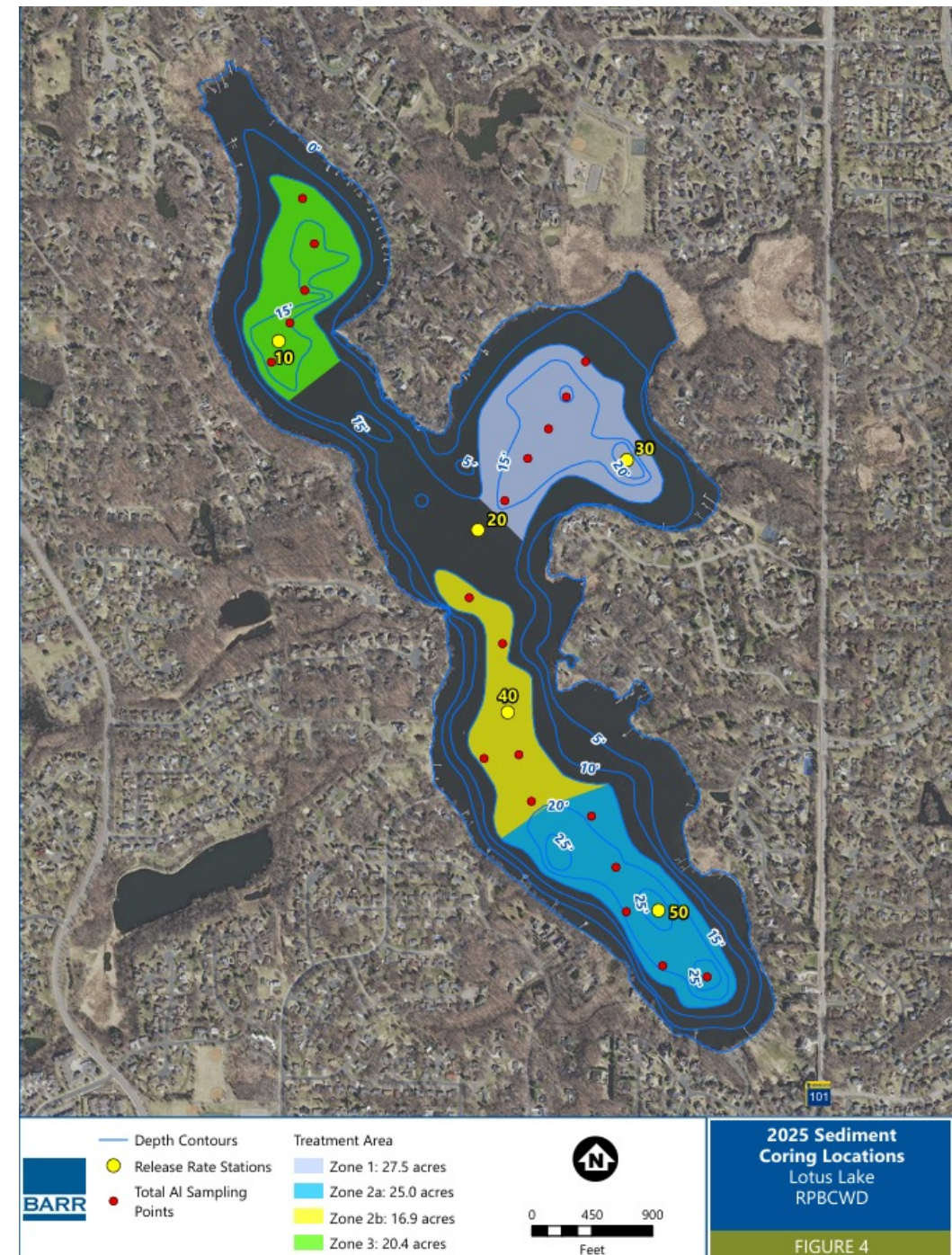
Internal Loading Affects



Wakeboat Impact?



- **Sediment disturbance?** Confirmed
- **Impacting internal P loading?** Unconfirmed
- **Next steps:**
 - Statistically analyze difference between seasons and zones
 - Continue coring to understand long term impact
 - SAFL research project to determine depth of sediment disturbance?



2027 LCCMR Proposal (2027-106)

Title: Impact of recreational boating on alum treated lakes

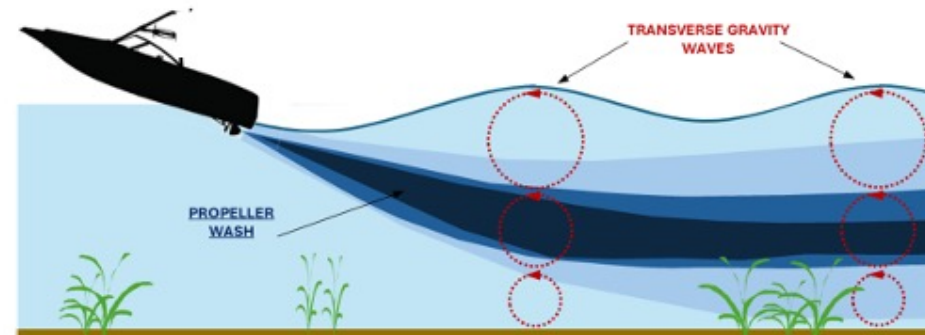
Team: Jeffrey Marr, Poornima Natarajan, Bill Herb, Jess Kozarek, Andy Riesgraf, Joe Bischoff, Kate Lucas

Funding request: \$475,000



Project Motivation:

- **Alum treatments are expensive** and use public dollars (\$100,000-\$500,000 per lake).
- Lake managers are concerned that **wakesurfing and other boating activities undermine the alum treatment and reduce longevity of protection.**
- **Lack of published research** and emerging need for research on the impacts of boating on alum treatments.
- **Leverage local facilities and experience (UMN-SAFL & Barr Engineering).**



What we will deliver:

- New knowledge on how alum creates phosphorus barriers at the lakebed.
- New measurements on the wave energy and velocities that disrupt alum-treated lakebed sediments.
- Published guidelines/recommendations for lake managers on ***How to optimize alum treatment performance in the presence of boating.***