



Florida Stormwater Association
2020 Fall Seminar
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Impacts of Sediment on Water Quality: Reduction Techniques

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woodplc.com

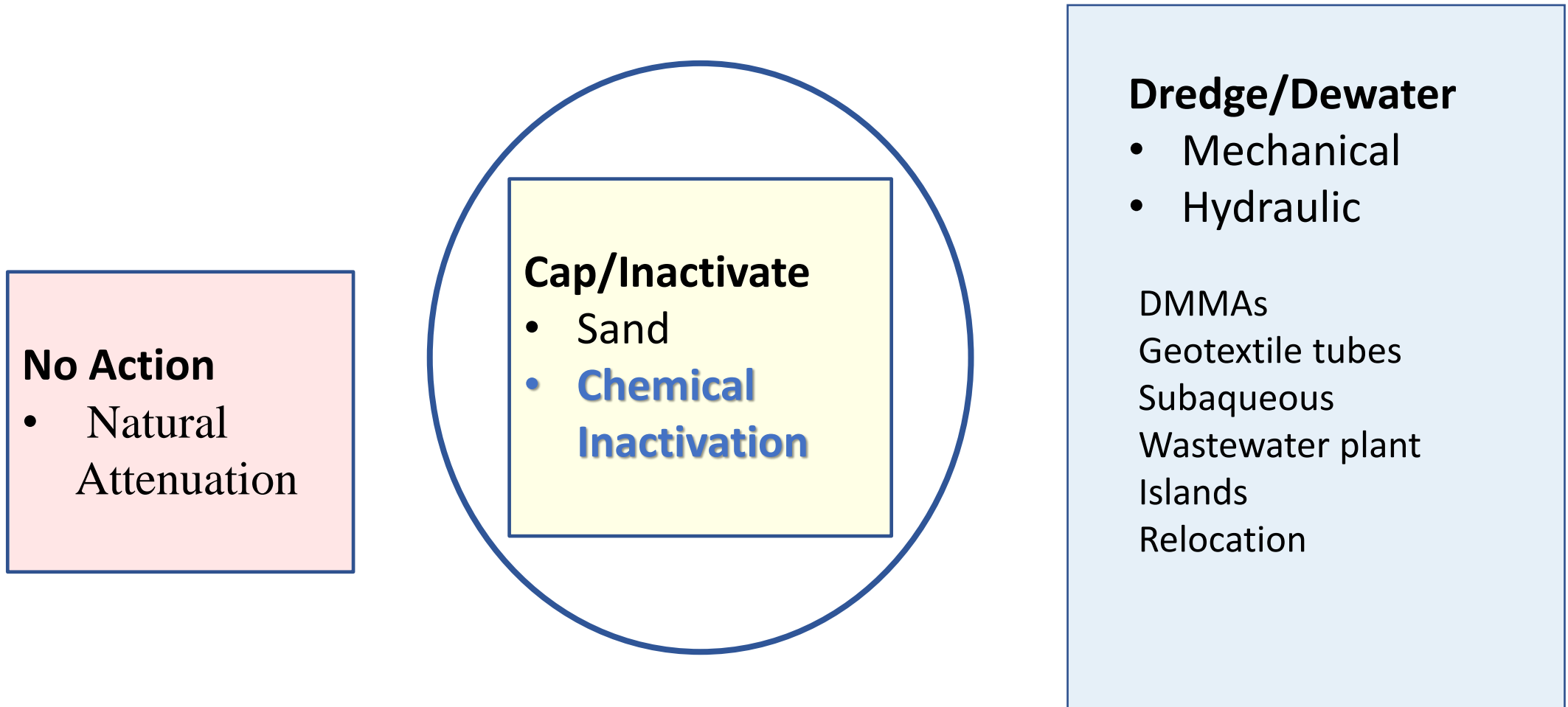


How does sediment quality impact water quality?

- Resuspension
- Diffusion
 - Release nutrients and other pollutants to water column
 - Source or sink for pollutants – Internal cycling

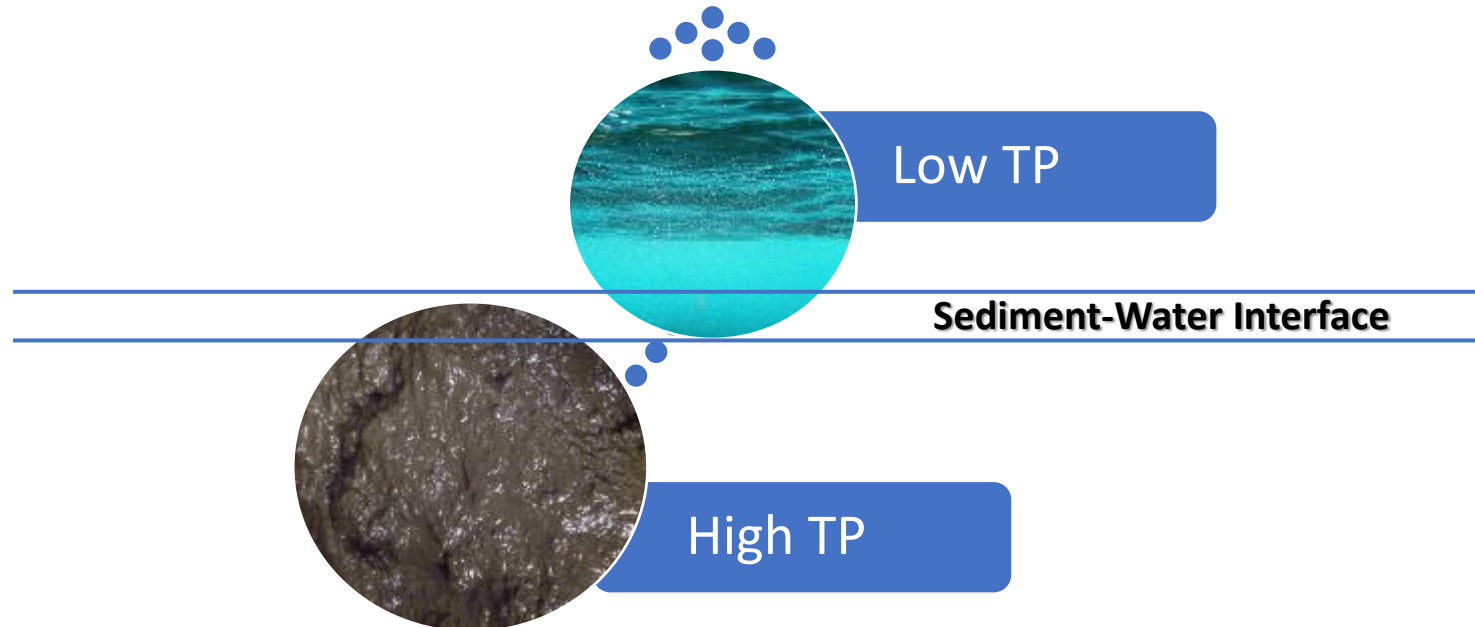


Approach to Sediment Management



Water Quality Degradation – Sediment Quality

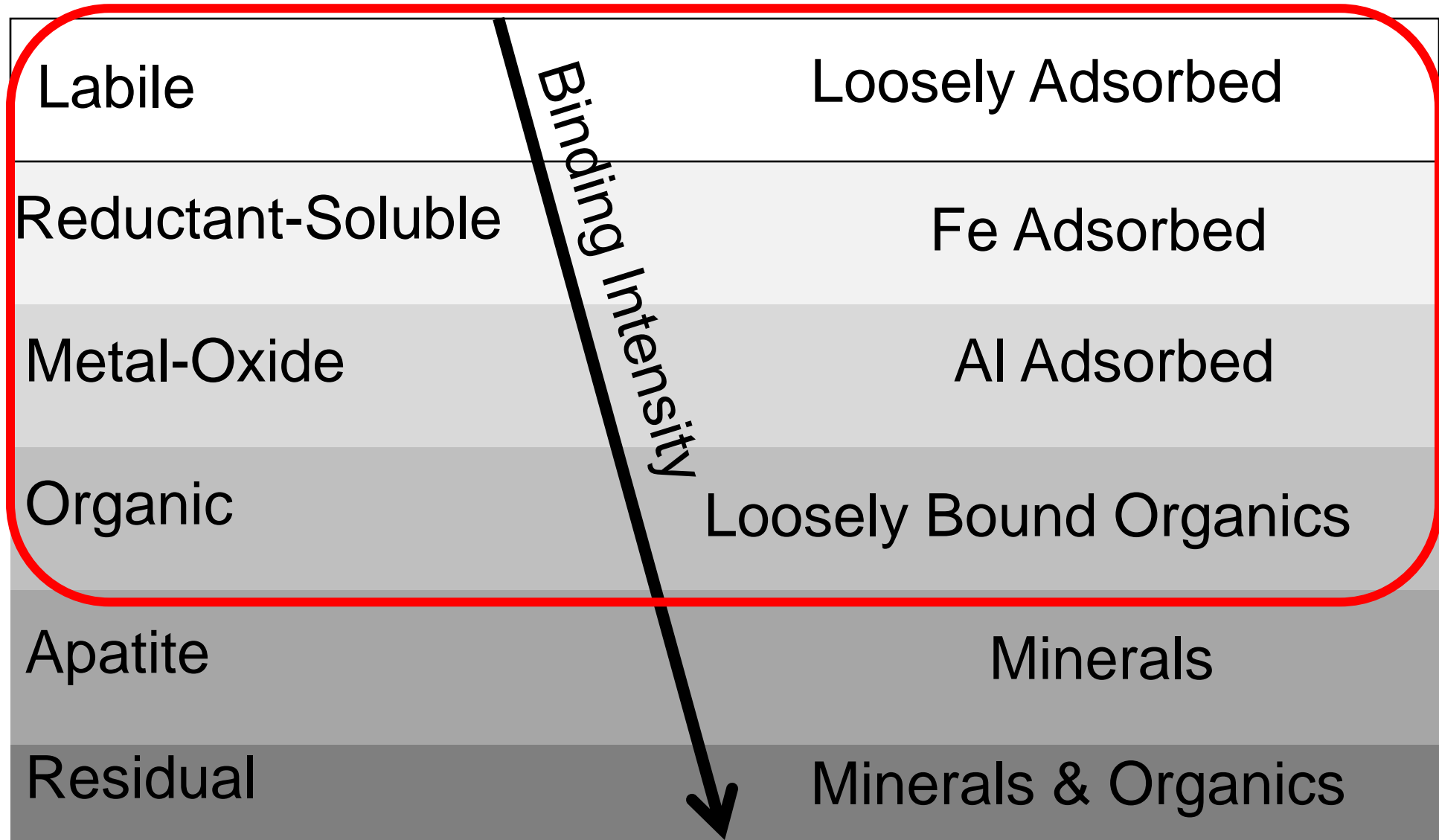
- Internal nutrient release from sediment = **FLUX**
- Flux rates driven by concentration gradient
 - Transfer of dissolved nutrients from sediment (high concentration) to water column (low concentration)



Sediment Phosphorus Fractionation

Nuisance algae prefer biologically available phosphorus - BAP

MUCK
HIGH BAP



SAND
LOW BAP



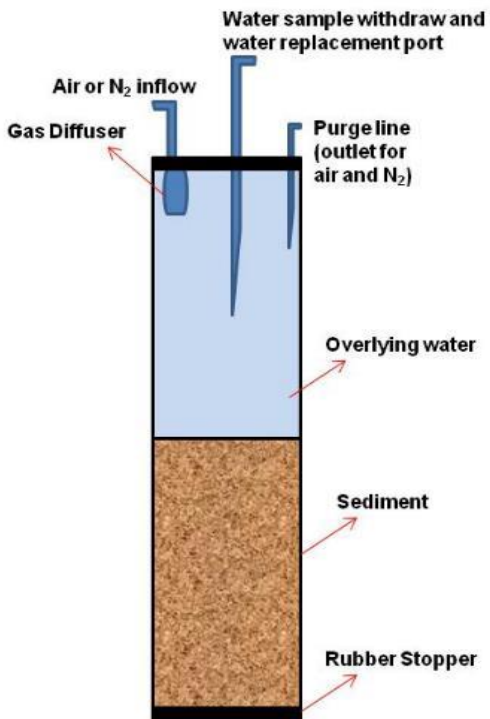
Assessing Sediment Treatment Alternatives

- Wood Flux Field and Lab SOP (approved by FDEP) to measure site-specific flux and internal nutrient loads
- Evaluate effectiveness of various treatment alternatives
 - Physical or chemical cap
 - Reduction of flux rate
- Conduct cost-efficiency analysis for treatment alternatives



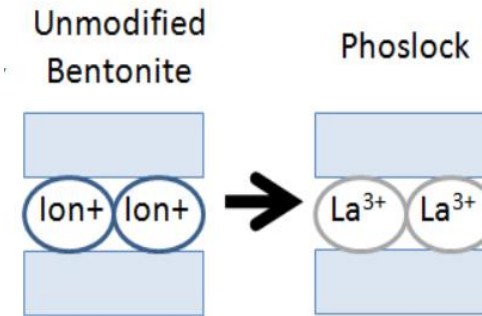
Data Needed for Dosing

- Field Collection
 - *In-situ* water quality profile and SRP/TP data
 - Muck thickness
- Laboratory Analyses
 - Intact sediment cores
 - Sediment physical and chemical content
 - **P Fractionation (Sequential extractions) BAP**
 - Flux lab incubations

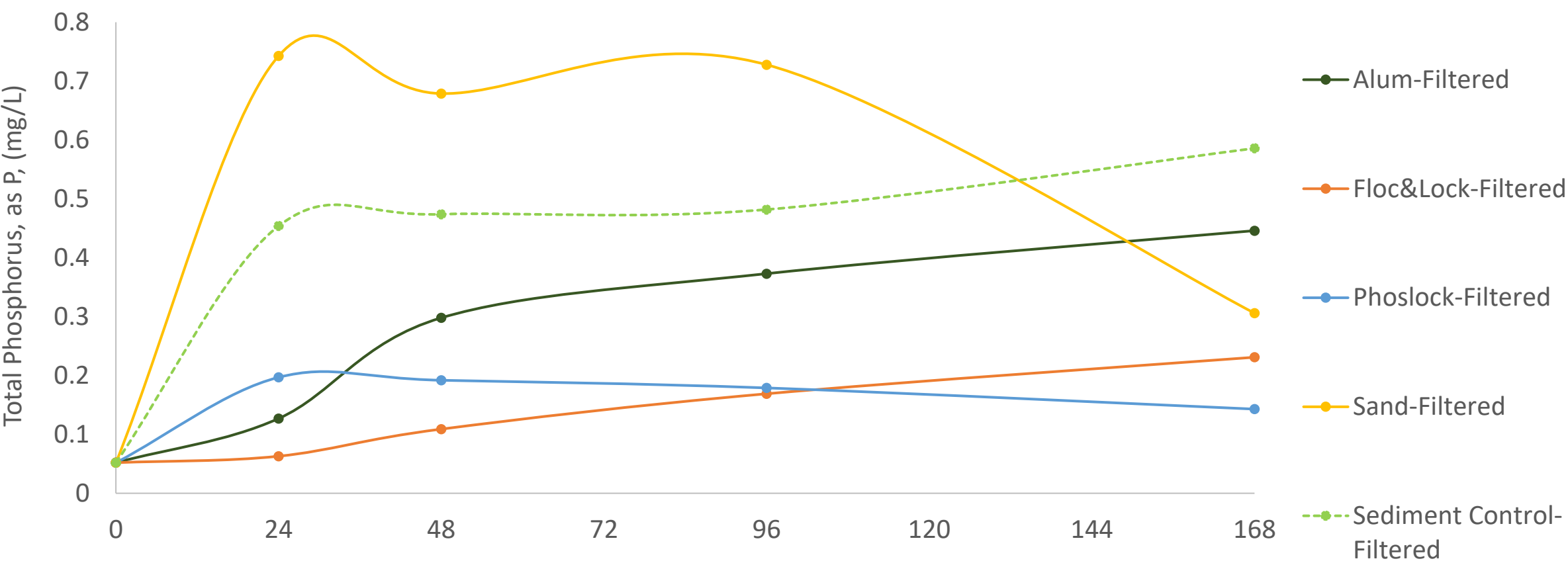


Sediment capping/treatment alternatives

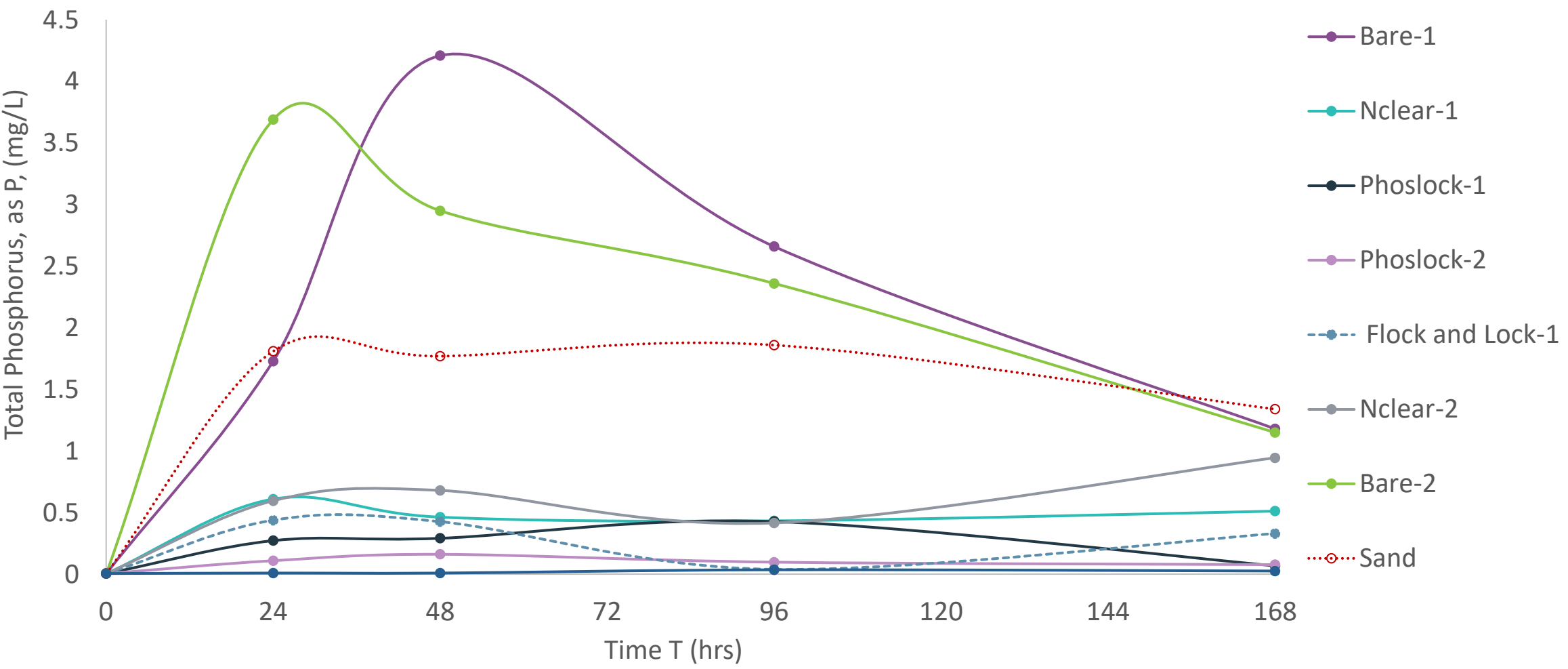
- Phoslock[®]
- Alum
- "Floc&Lock" (Phoslock[®] and Alum)
- NClear TPX
- Clean sand
- Purple Sulfur Bacteria
- Oxygenation
- Organic soil / muck



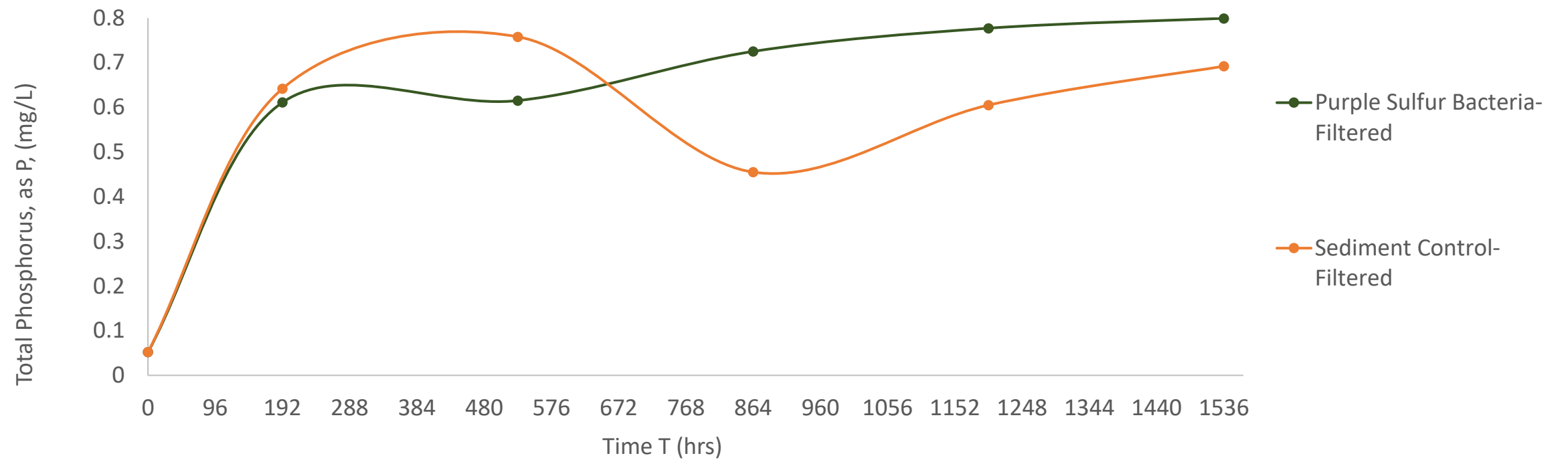
Alternatives Analysis Results



Alternatives Analysis Results

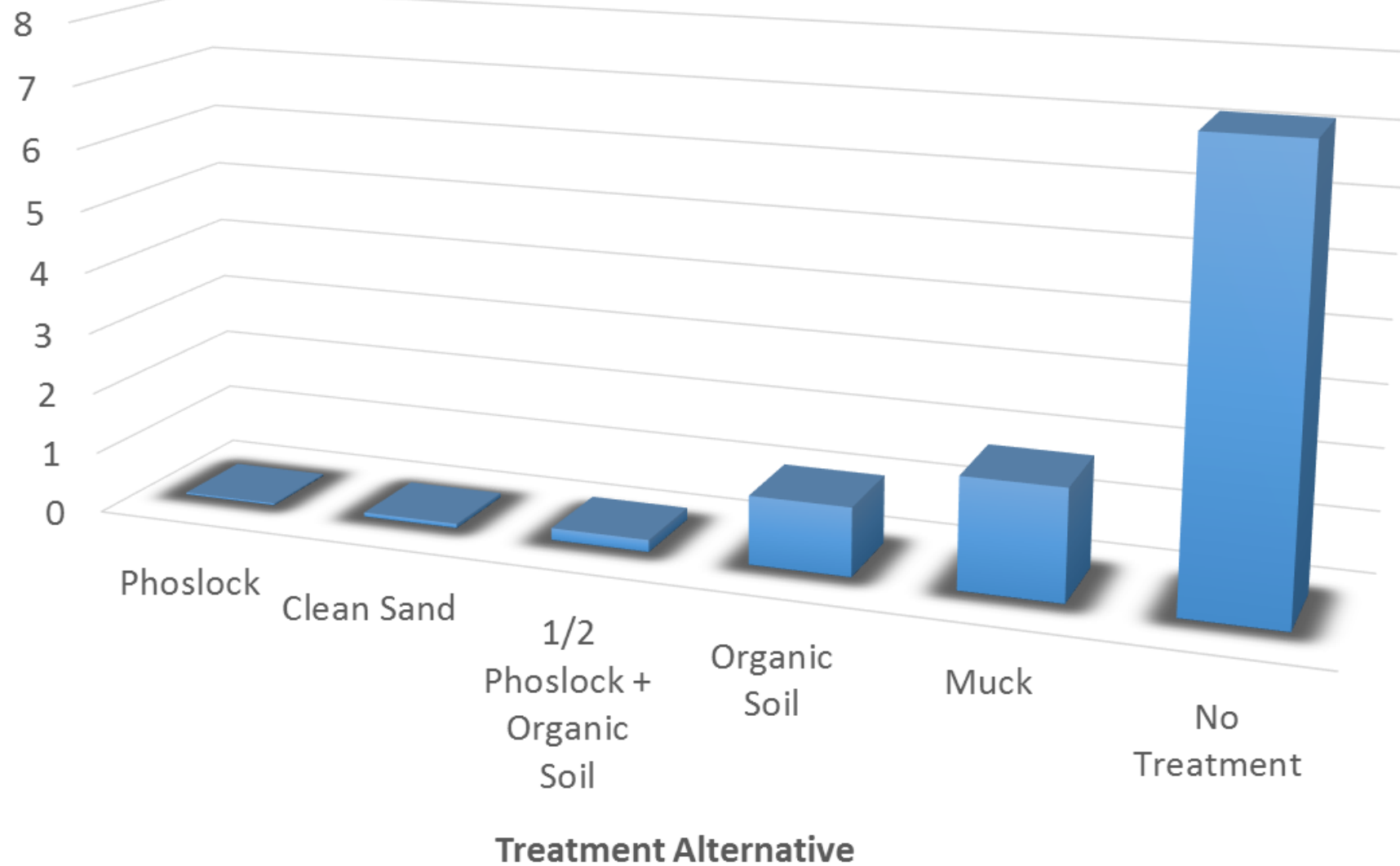


Alternatives Analysis Results

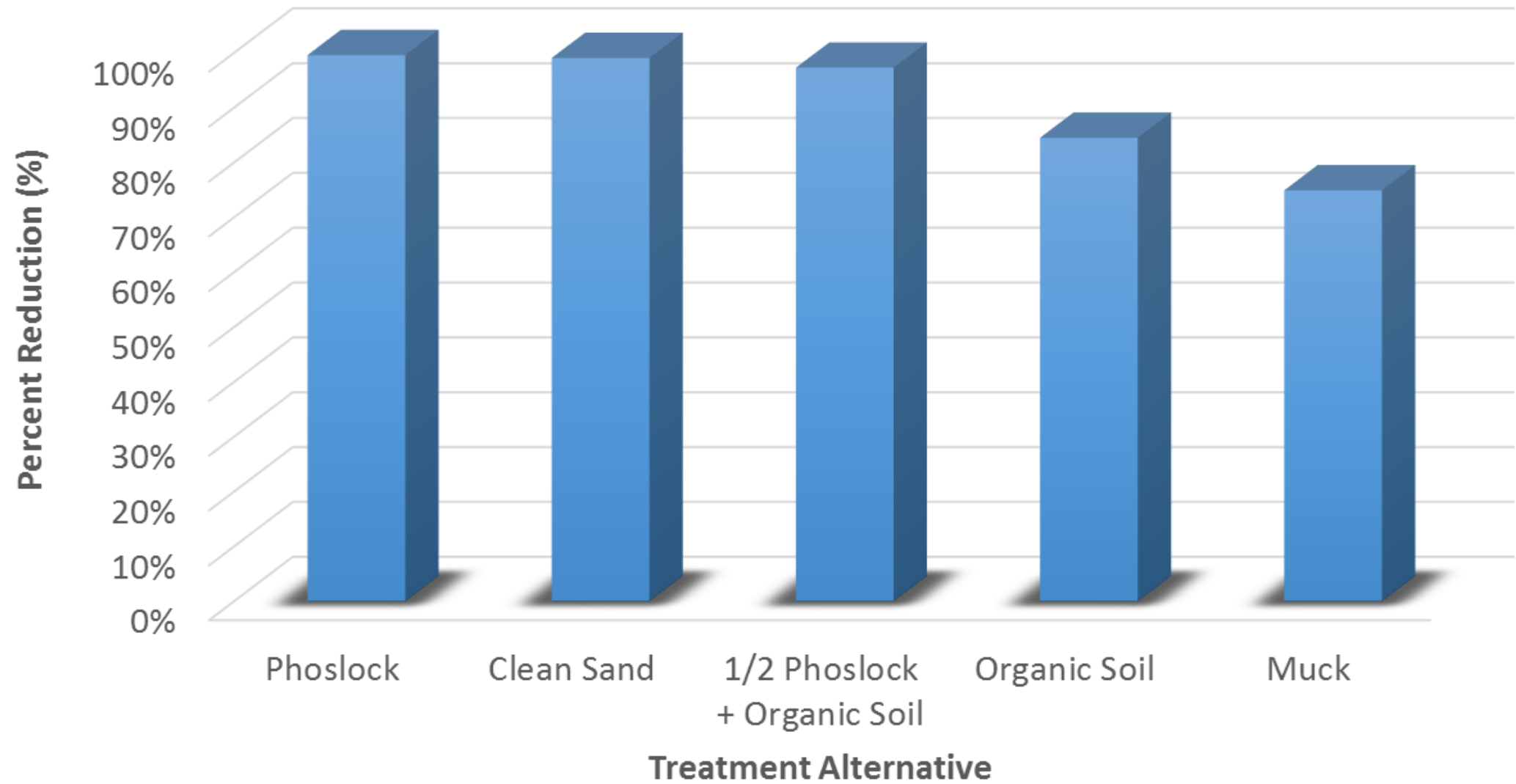


Orthophosphate Flux Rate (g/m²/yr)

Orthophosphate Flux Rate

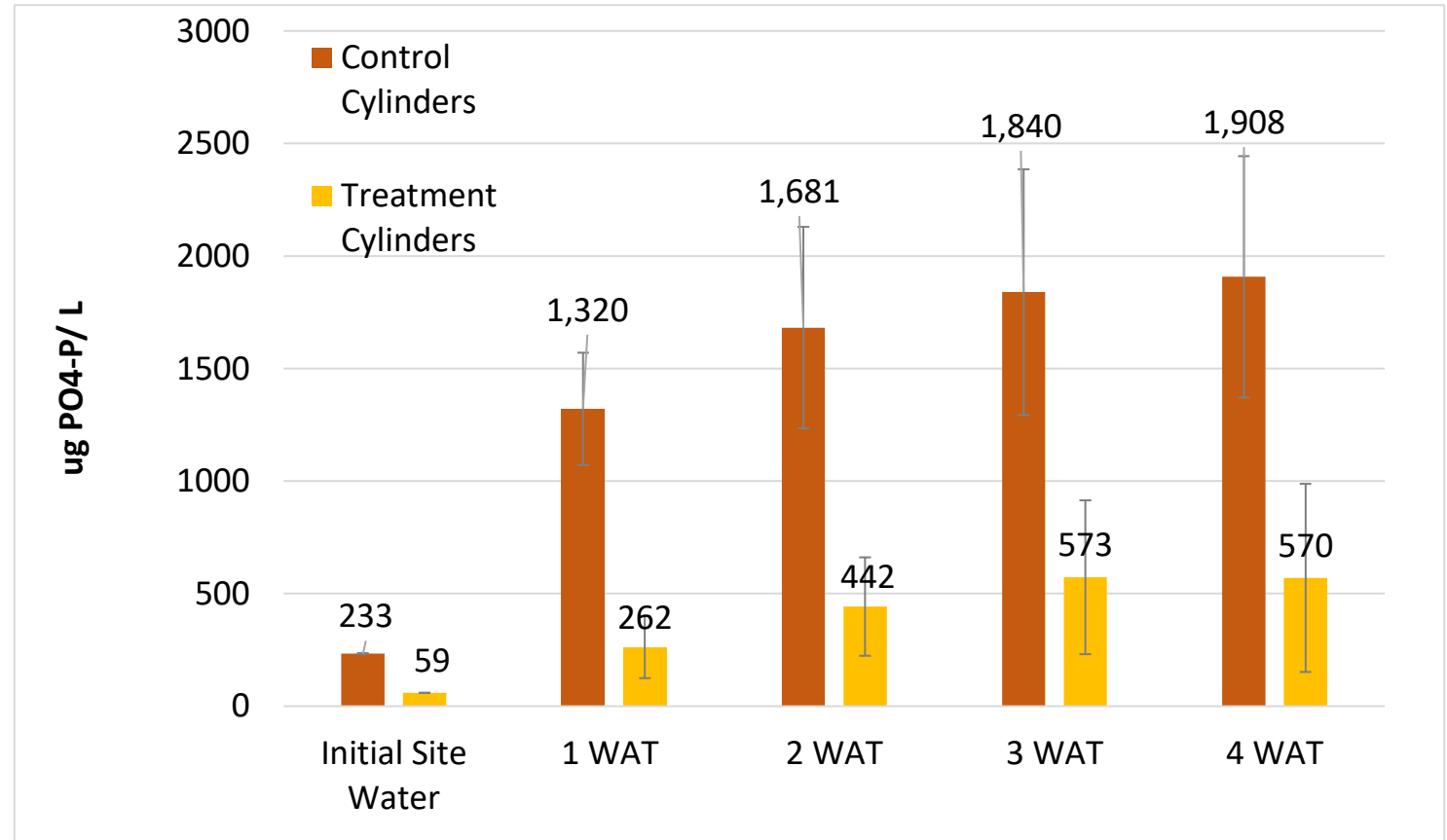


Percent Reduction of Orthophosphate Flux Rate



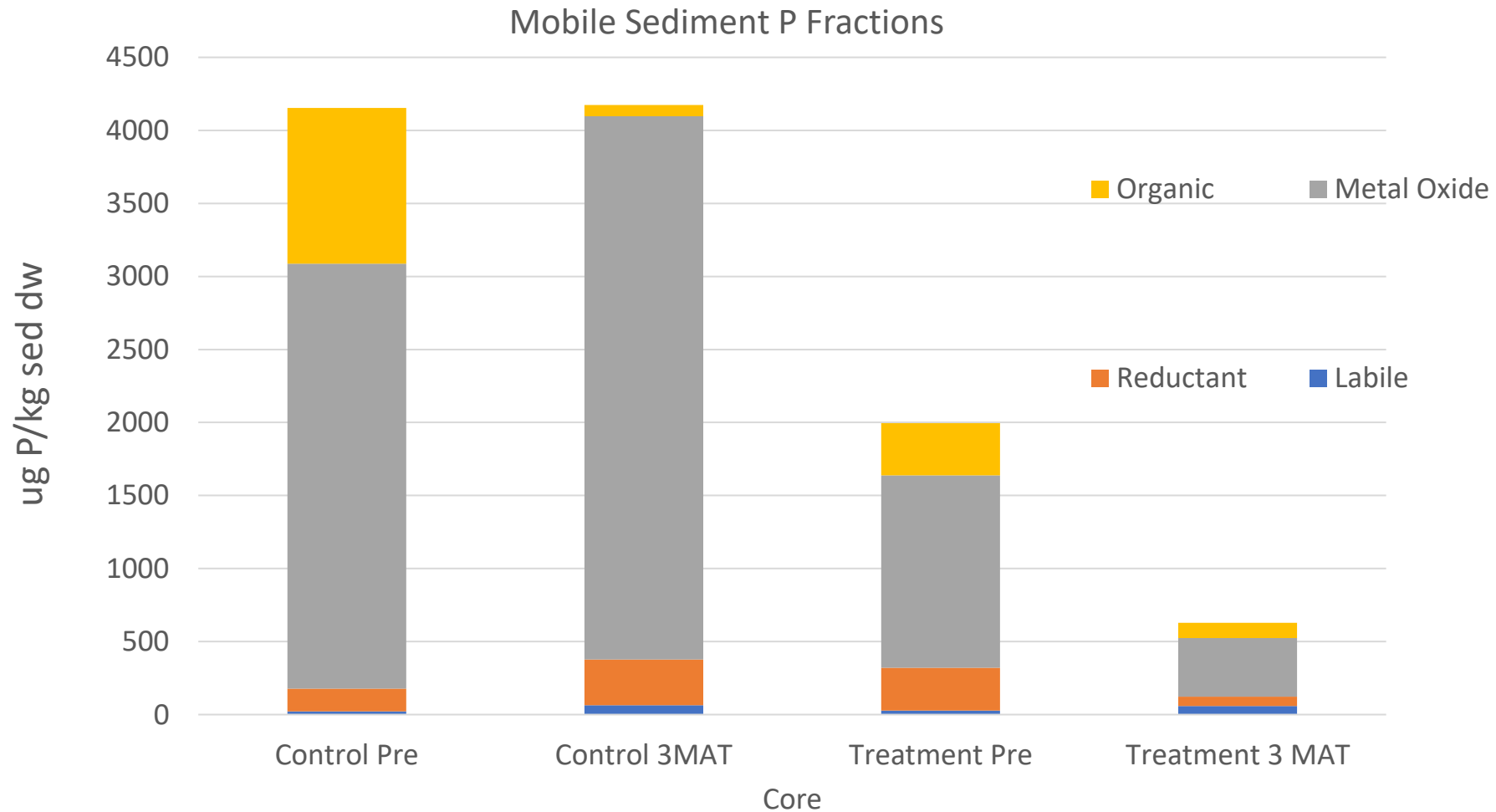
Treatment Alternatives Analysis – Pilot Study

Phoslock as Treatment Alternative



Treatment Alternatives Analysis – Pilot Study

Phoslock as Treatment Alternative



Comparison of Treatment Performance and Cost Efficiency

- Greatest load removal by:
 - Dredging, sand and Phoslock for TP
 - Dredging and sand for TN

Alternative	Estimated Average Performance Efficiency (% Removal)		Estimated Average Load Reduction (lbs/yr)		Estimated Implementation Cost (\$)	Estimated Cost/lb TP Removed (\$/lb)	Source for Cost Information
	TN	TP	TN	TP			
Sand	35%	59%	1,793.10	1,270.80	\$700,346.18	\$551.11	Literature derived (Amec Foster Wheeler 2016): \$23,345/ac capped, assume 1 ft cap over 30 ac
<u>Phoslock</u>	-63%	86%	-3220.6	1,194.00	\$450,000.00	\$376.88	Literature derived (Amec Foster Wheeler 2016): \$15,000/ac treated, assume 30 ac treated
Floc & Lock	-73%	53%	-3655.8	724.9	\$362,450.00	\$500.00	Literature derived (Amec Foster Wheeler 2016): \$500/lb treated, assume 724.9 lbs TP treated
Alum	11%	44%	548.4	567.2	\$180,000.00	\$317.35	Literature derived (ERD 2016): \$6,000/ac treated, assume 30 ac treated
Dredging	100%	100%	5,031.80	1,378.80	\$1,428,000.00	\$1,035.68	Based on previous dredging design costs derived for Lake Bonnet Feasibility Study: \$42/cy removed for 34,000 cy removed
Oxygenation/Aeration	15%	15%	754.8	206.8	\$45,000.00	\$217.58	Provided by aeration vendor: \$1200/ac treated, assume 30 ac treated



Summary

- Many techniques and alternatives out there, use caution and test them before ramping up
- Evaluate based on the biogeochemical based binding capacities of the product
- Collect the right data to optimize assessments and applications
- Tailor sediment management design plans with treatment alternatives analysis results





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The background of the slide features several large, overlapping circles in various shades of purple and magenta. One large white circle in the lower right quadrant contains the text 'Questions?'.

Questions?