

Consequences of River Reconnection on Water Quality in Barataria Bay, LA

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Coast & Environment

[illegible]

Map of the Mississippi River showing project design flow rates in cubic feet per second (CFS) for September 1958. The map includes major cities, tributaries, and floodways.

Flow Rates (CFS):

- Ohio River:** 2,250,000
- Tennessee River:** 490,000
- Arkansas River:** 1,000,000
- White River:** 20,000
- St. Francis R:** 80,000
- Mississippi River (Main Stem):**
 - Below Cairo: 2,410,000
 - Below New Madrid: 2,890,000
 - Below Memphis: 2,710,000
 - Below Greenville: 2,720,000
 - Below Vicksburg: 2,100,000
 - Below Natchez: 1,500,000
 - Below Morgan City: 1,250,000
- Local Tributaries:**
 - Arkansas City: 540,000
 - Helena: 550,000
 - Old R: 620,000
 - St. Falaya Dwy: 350,000
 - Atch R: 1,200,000
 - Yazoo River: 25,000
 - Local (near Vicksburg): 55,000
 - Bonnet Carré Sp: 250,000
- Floodways:**
 - New Madrid Floodway: 550,000
 - Morganza Floodway: 600,000
 - Bonnet Carré Sp: 250,000

Other Labels: CAIRO, NEW MADRID, PADUCAH, MEMPHIS, GREENVILLE, VICKSBURG, NATCHEZ, RED RIVER LDG, BATON ROUGE, NEW ORLEANS, LAKE CHARTRA, GULF OF MEXICO.

NOTE: DECREASE IN STREAM FLOW OCCASIONED BY CHANNEL VALLEY STORAGE.

PROJECT DESIGN 58-AEN
CUBIC FEET PER SECOND
SEPT 1958

Infrastructural



Land 1932 Coastal Sustainability Studio



Land 2010 Coastal Sustainability Studio

Flood Years – A lost Opportunity ?

Land Gain

Land Loss

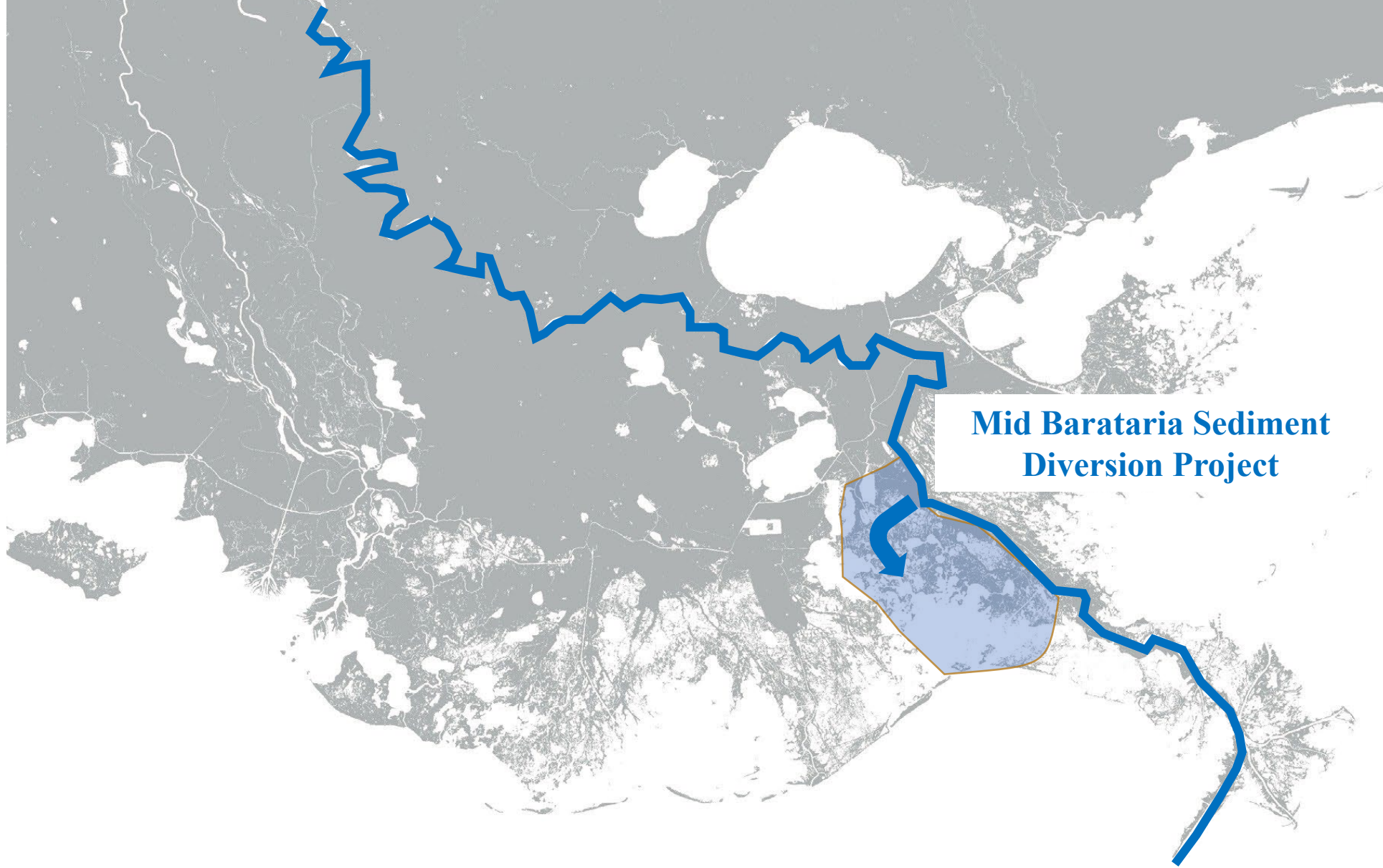
Land Loss

Useful for
Building the coast

Useless for
Building the
coast



River Reconnection
A Possible Fix ?



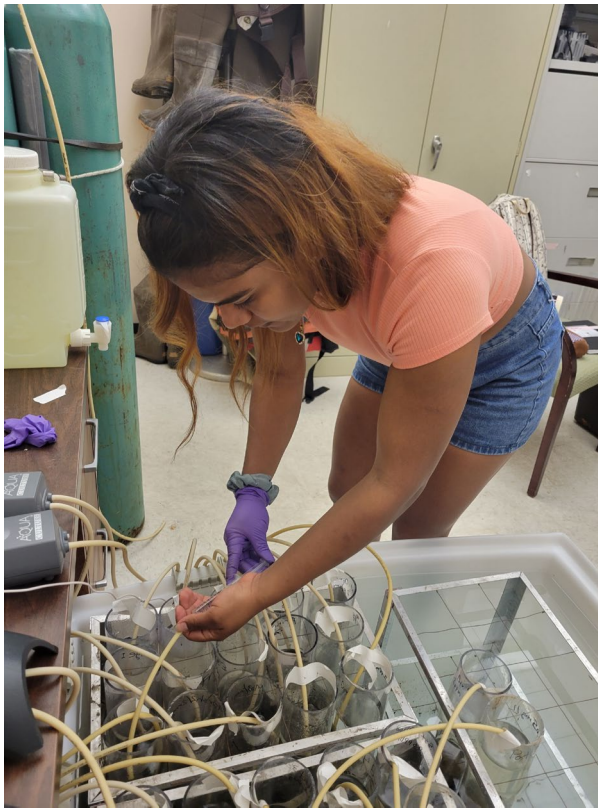
**Mid Barataria Sediment
Diversion Project**



Nutrient ??? Associated with Sediment Diversions

Denitrification Rates with River Sediment?

Mercedes Pinzon



Sample Collection

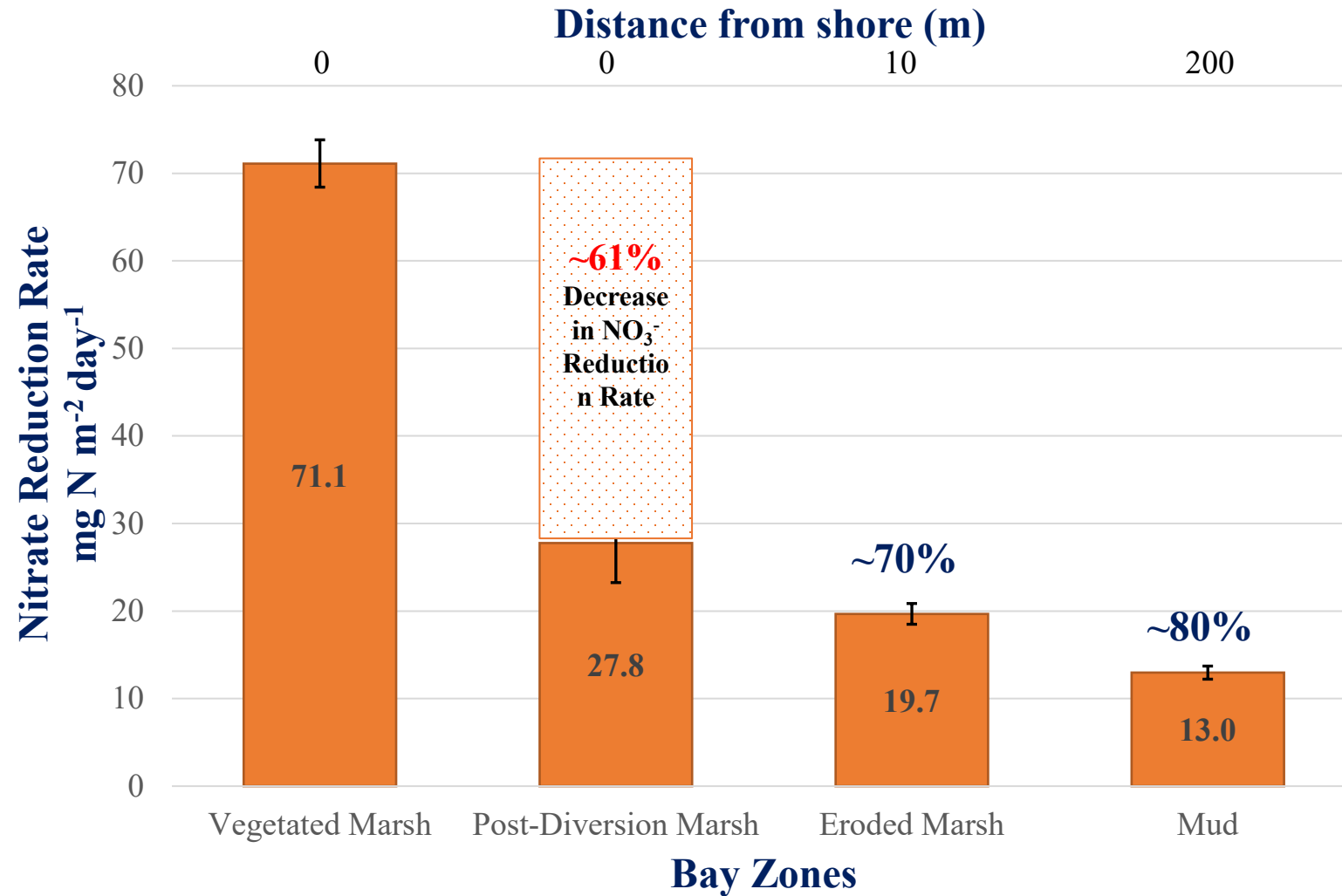


The diversion will deliver substantial NO_3^- to the basin

- **How NO_3^- reduction rates will change over time as mineral river sediment covers organic marsh soil?**



NO₃ Reduction Rate for cores spiked with 2 mg N L⁻¹

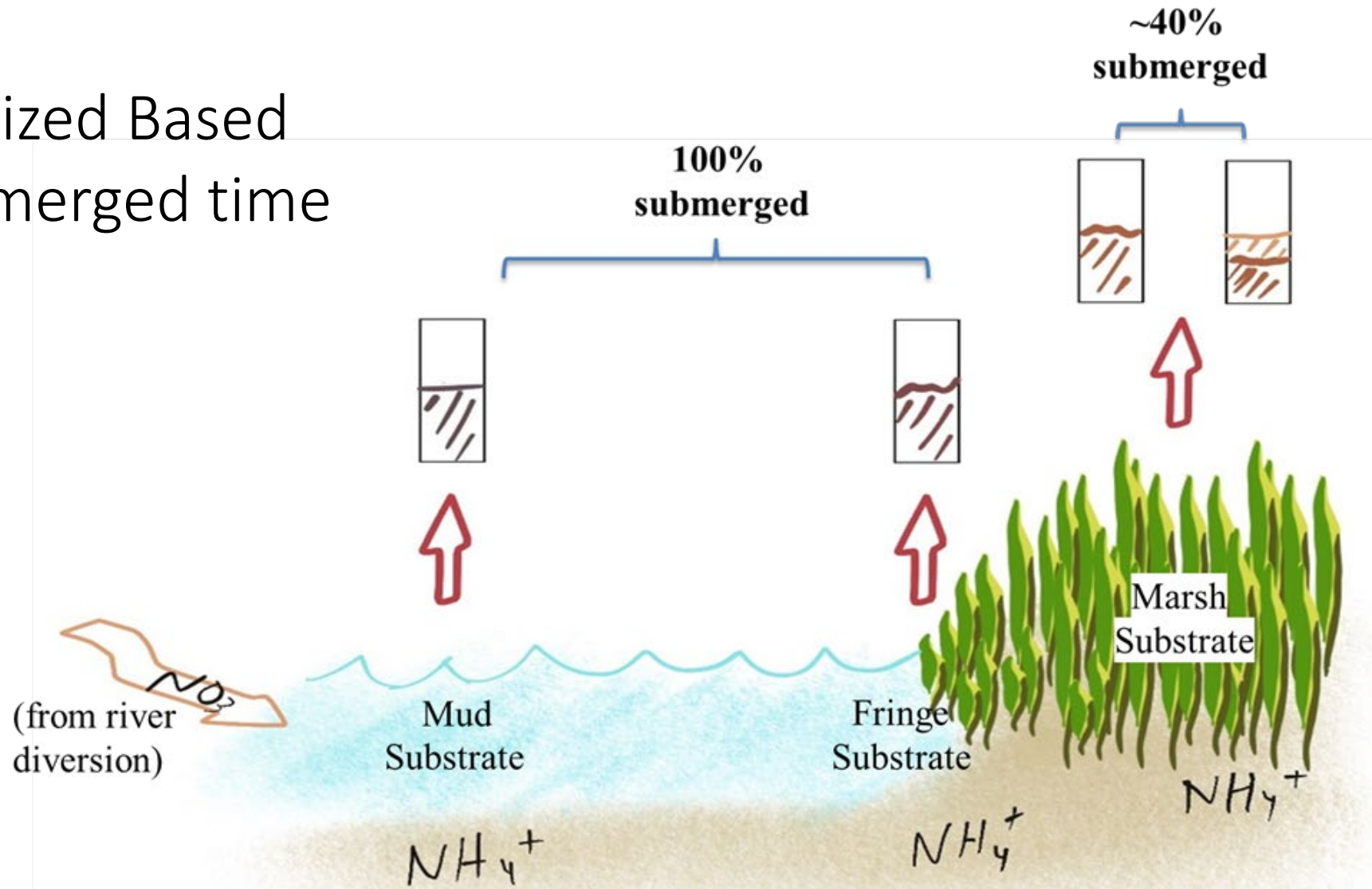


Conclusions

- Marsh initially will perform well
- Marsh Denitrification Rates may decline over time
- Most Nitrate will be in the open channels and bays

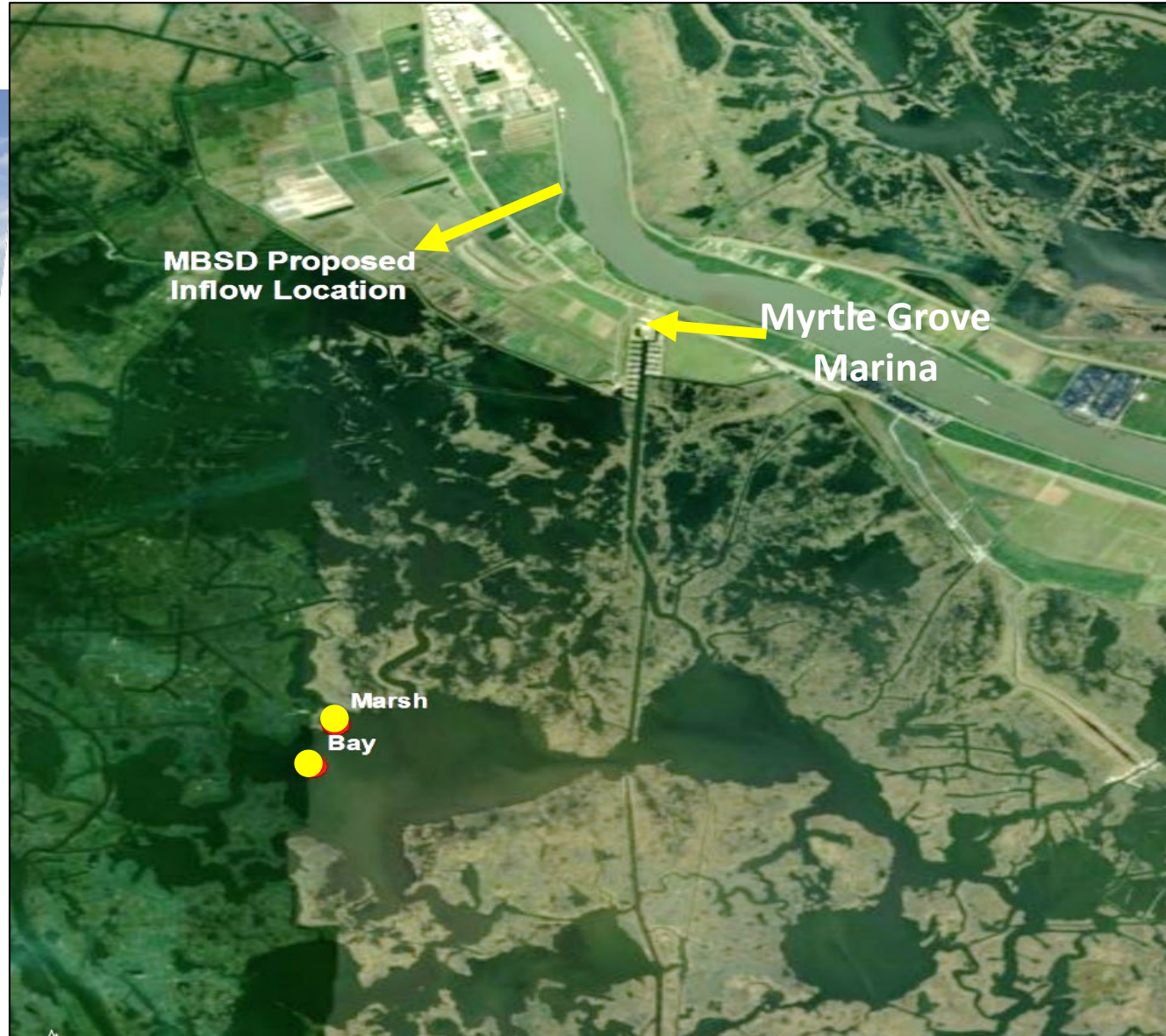
Conclusions

Normalized Based
on submerged time

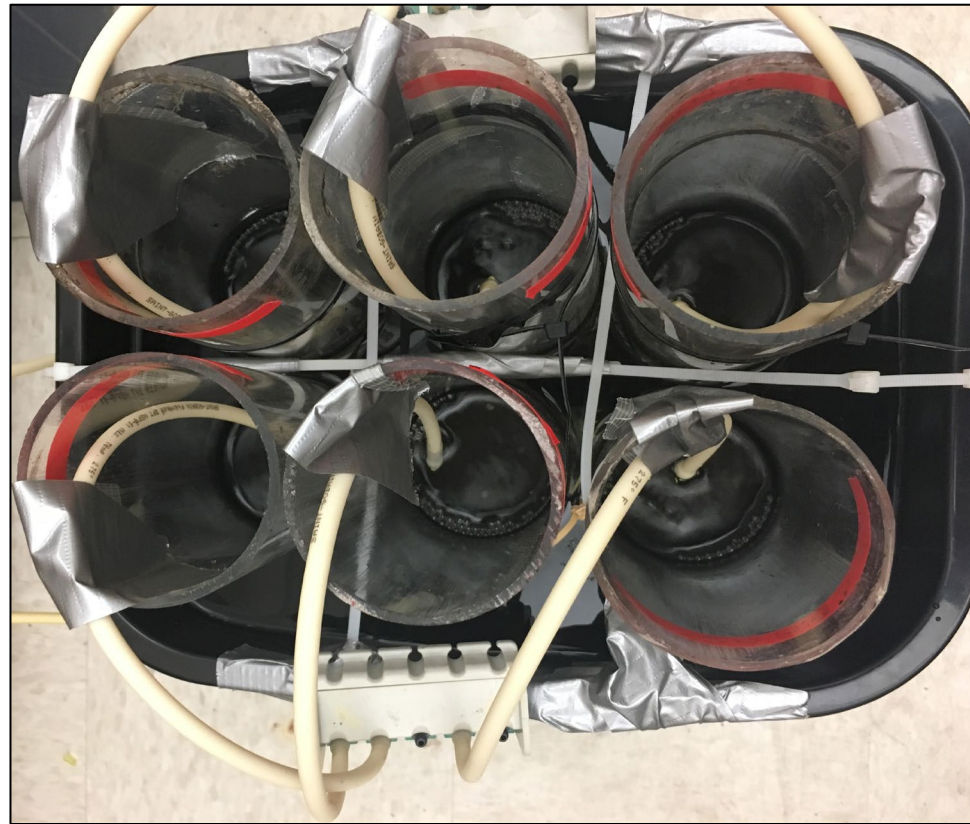


What Happens to Denitrification with Cold River Water ?

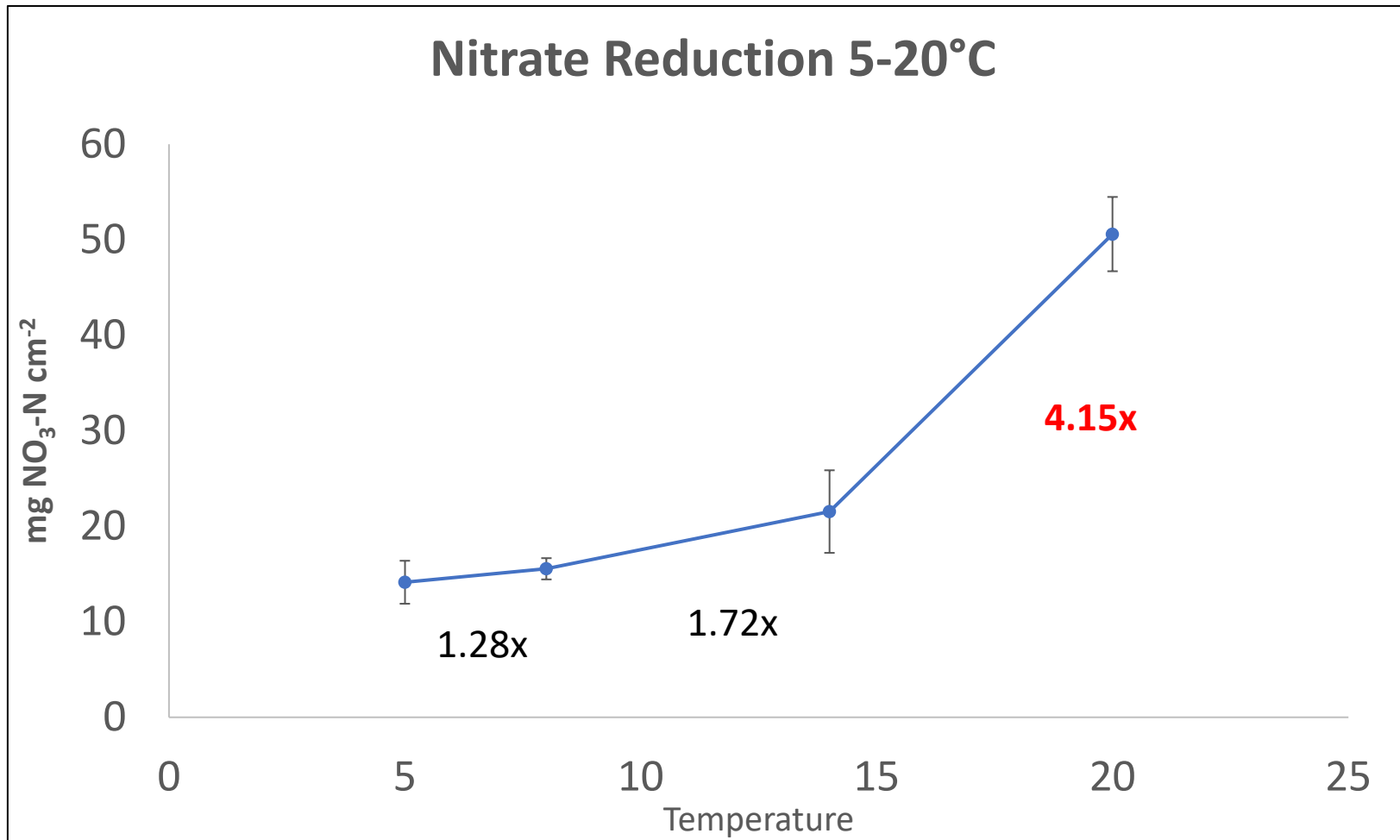
Katie Bowes



Triplicate Intact Cores at 4 temperatures 5, 8, 14, 20 C



Nitrate Reduction



Conclusion

- Timing of the Diversion is projected to be early in the year 5-10 C
- The spread of nitrate may stretch further into the basin



What about Phosphorus ?

385 Mt SRP ← SRP

900 Mt TP ← Fine
Particulates

Mississippi
River
Diversion
Input at
75,000 cfs
for 30 days

Peter Mates



Current Marsh Total Phosphorus

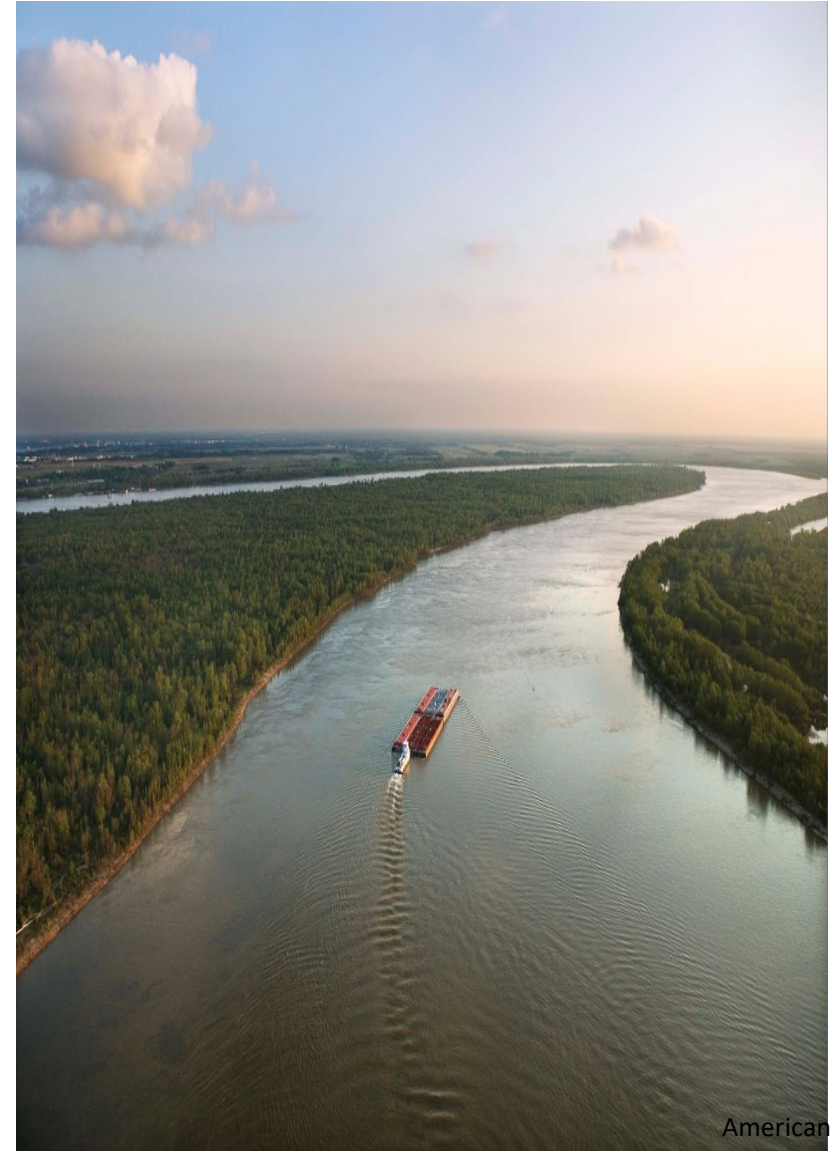
- Marsh has significantly greater TP
- Barataria marsh and open water soils are organic

Barataria	Marsh mg P/kg	Open Water mg P/kg
Total P	677 ± 183	503 ± 89.5
Total Inorganic P	197 ± 92.9 (30%)	209 ± 96.3 (41%)
Total Organic P	479 ± 149.4 (70%) ^a	296 ± 106 (59%) ^b

Barataria contains majority
organic P



Mississippi River contains majority
inorganic P

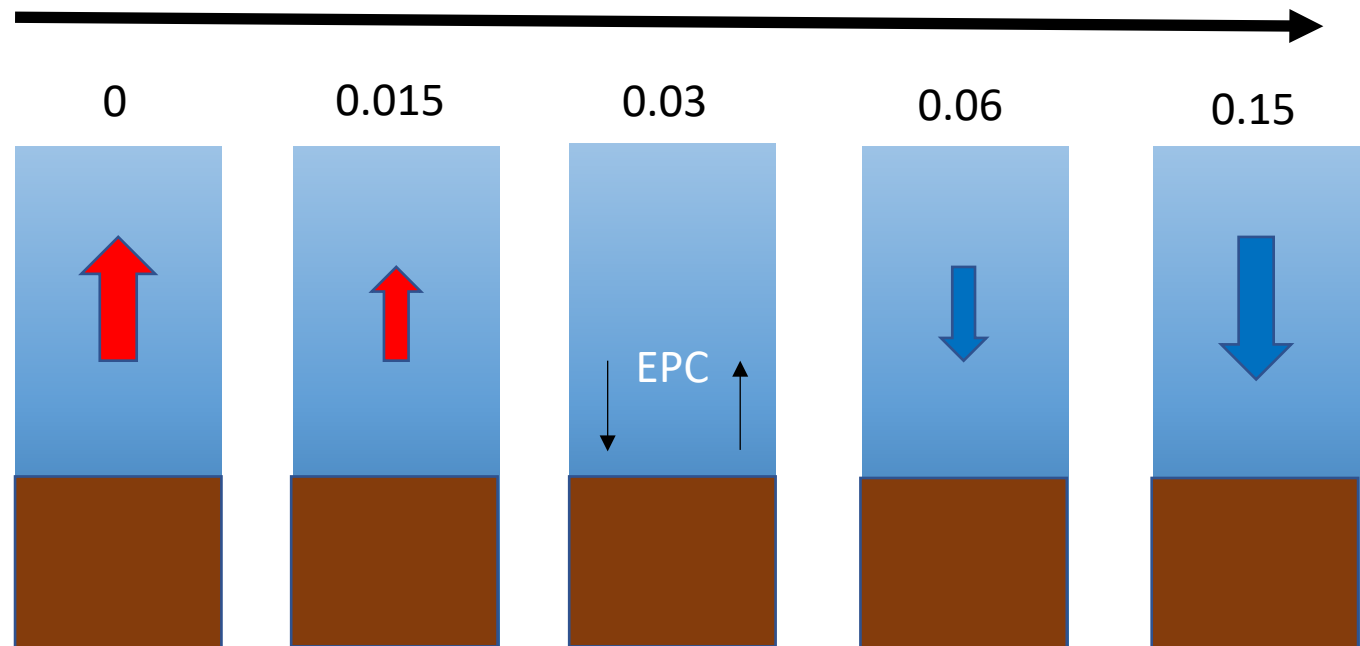


What Happens with River SRP ?

Phosphorus Retention Isotherm

Phosphorus Added To Water Column – Range of P Concentrations mg/L

- Spike 5 Replicate Sediment Cores
- Plot Flux vs. Water Column P Concentration



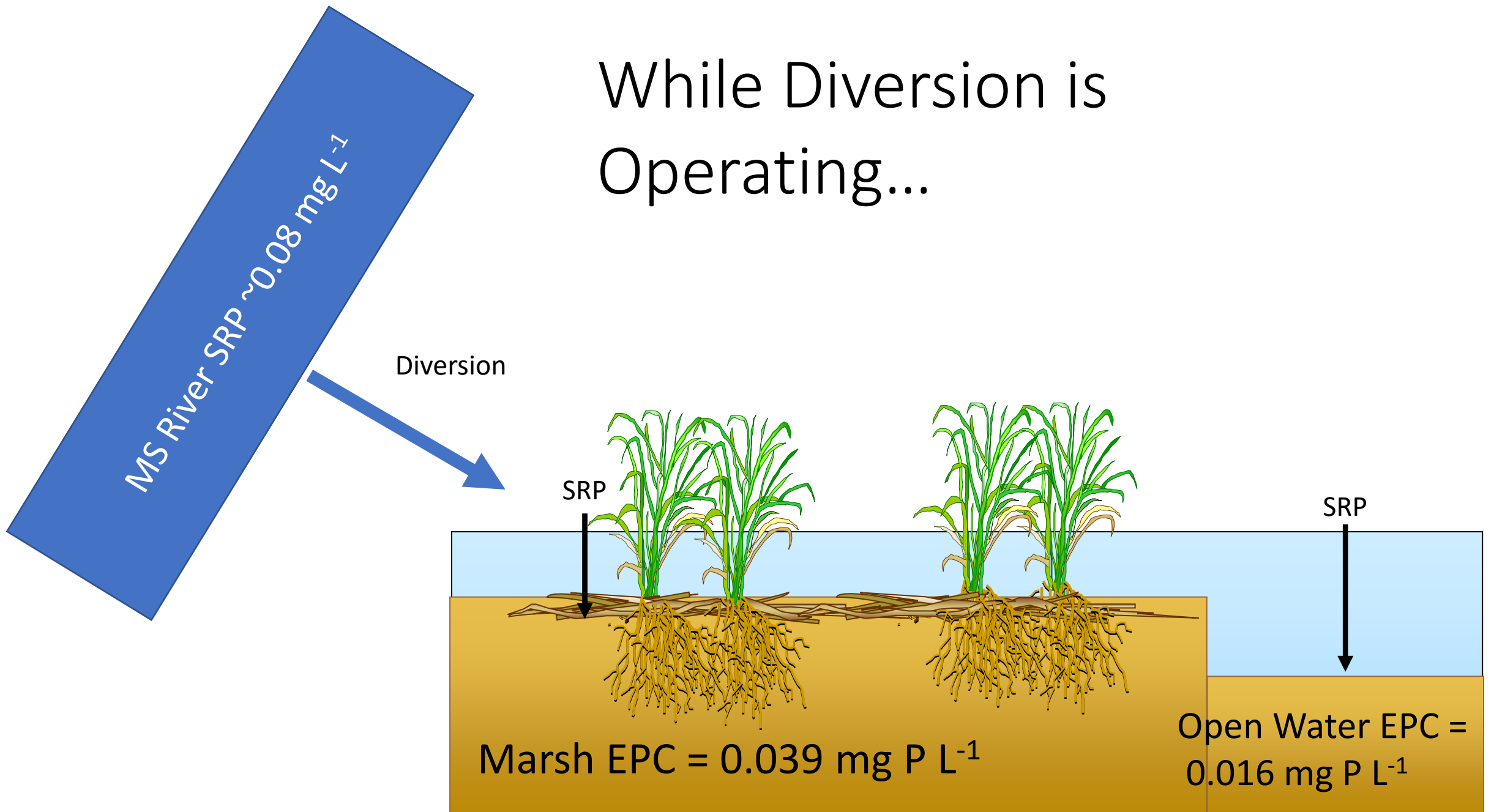
Intact core method

Equilibrium Phosphorus Concentration

Site	Mean EPC (mg P L ⁻¹)
Barataria Open Water	0.016 ± 0.008
Barataria Marsh	0.039 ± 0.015

River PO₄ Concentration = 0.080 mg P L⁻¹

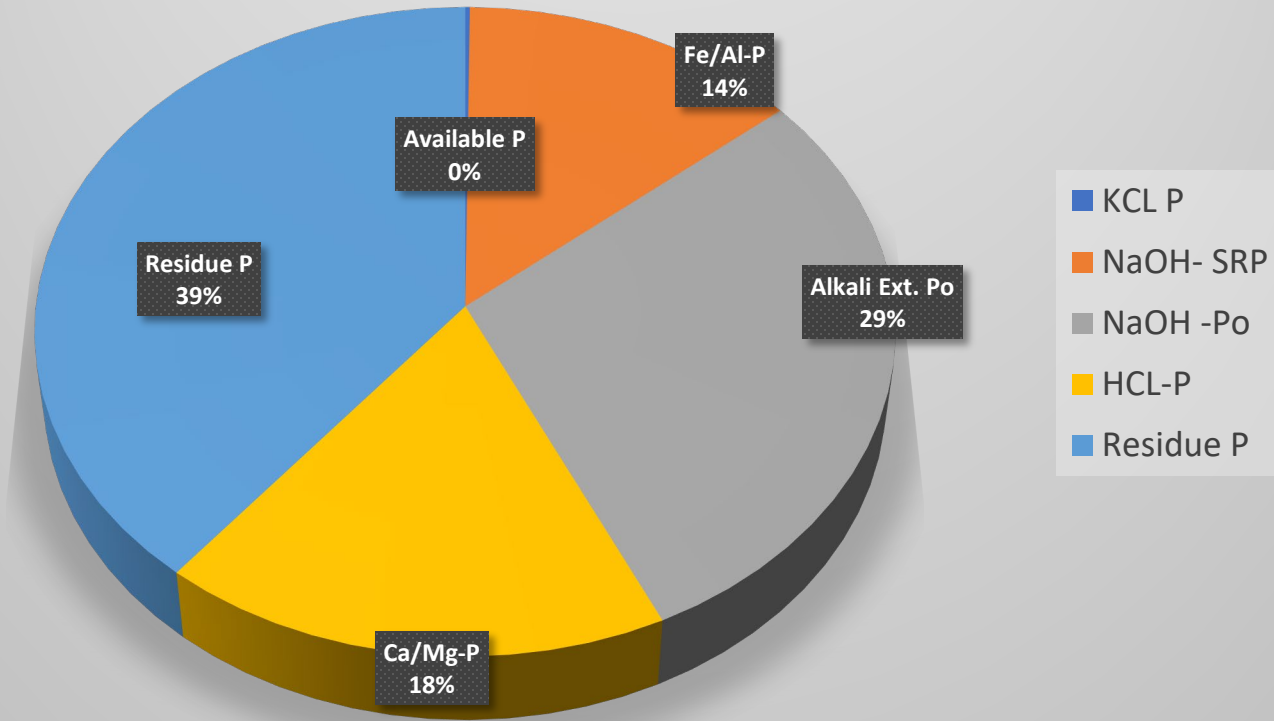
While Diversion is Operating...



Barataria Bay Baseline Fractionation Results

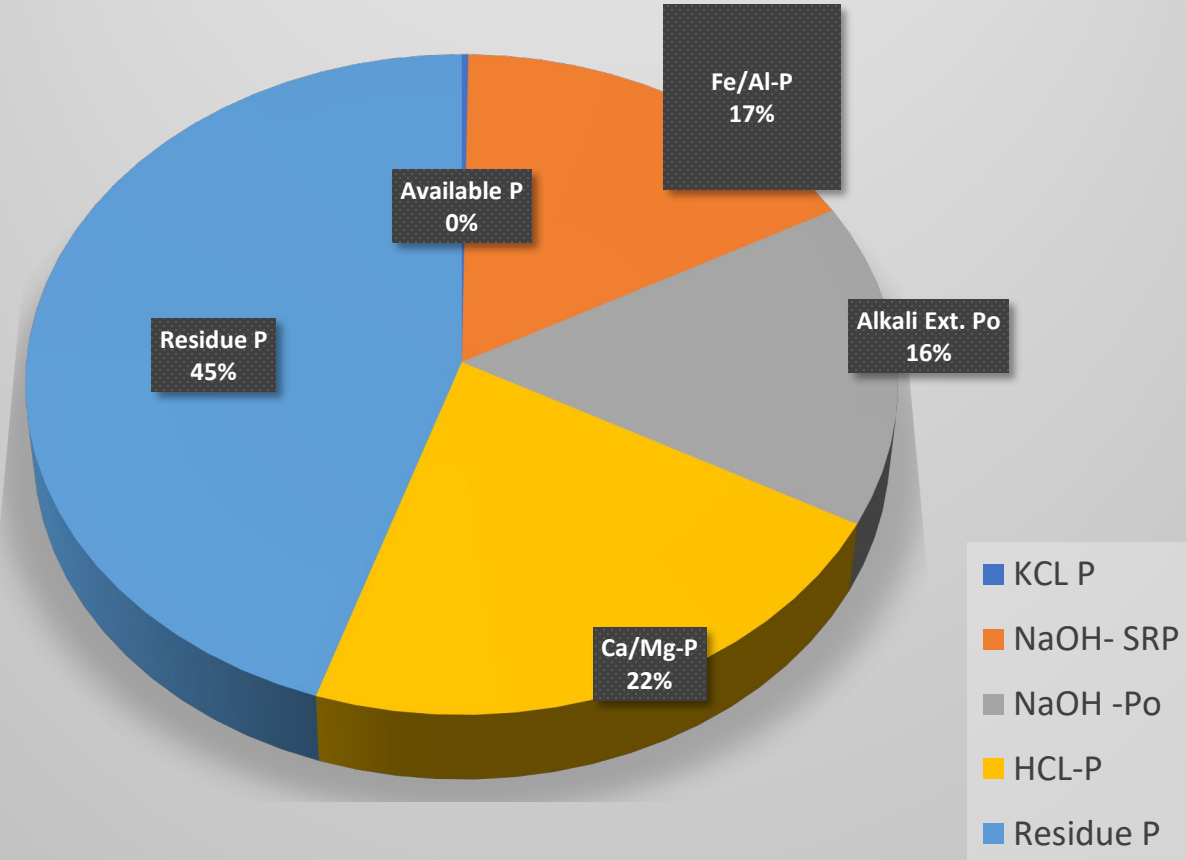
Marsh

TP = 677 ± 183 mg P kg⁻¹



Open Water

TP = 503 ± 90 mg P kg⁻¹

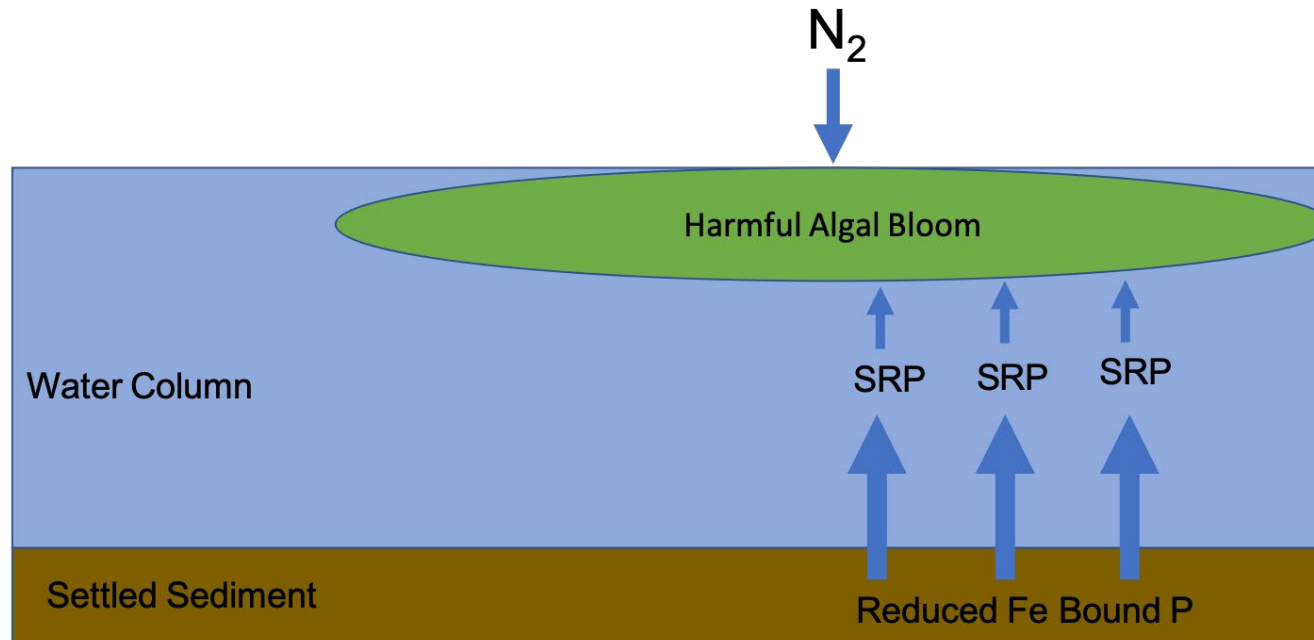


Mississippi River Sediment

- River sediment - 43% of P in Fe/Al-P (Sutula et al., 2004)
- Fe/Al-P implication for bioavailable P release
- Deposited Sediment will release P later

Conclusions

- Mississippi River will raise Total P
- River fine particulates contain elevated Fe/Al-P
- Fe/Al-P will decrease under reduced condition
- Harmful Algal Blooms
 - Dictated by presence of Microcystis and cyst abundance



Going forward, Monitoring will be critical to determine if conditions exist for HABs formation in Barataria Bay

