Adsorption and desorption processes in shallow groundwater of mangrove ecotone, Taylor Slough

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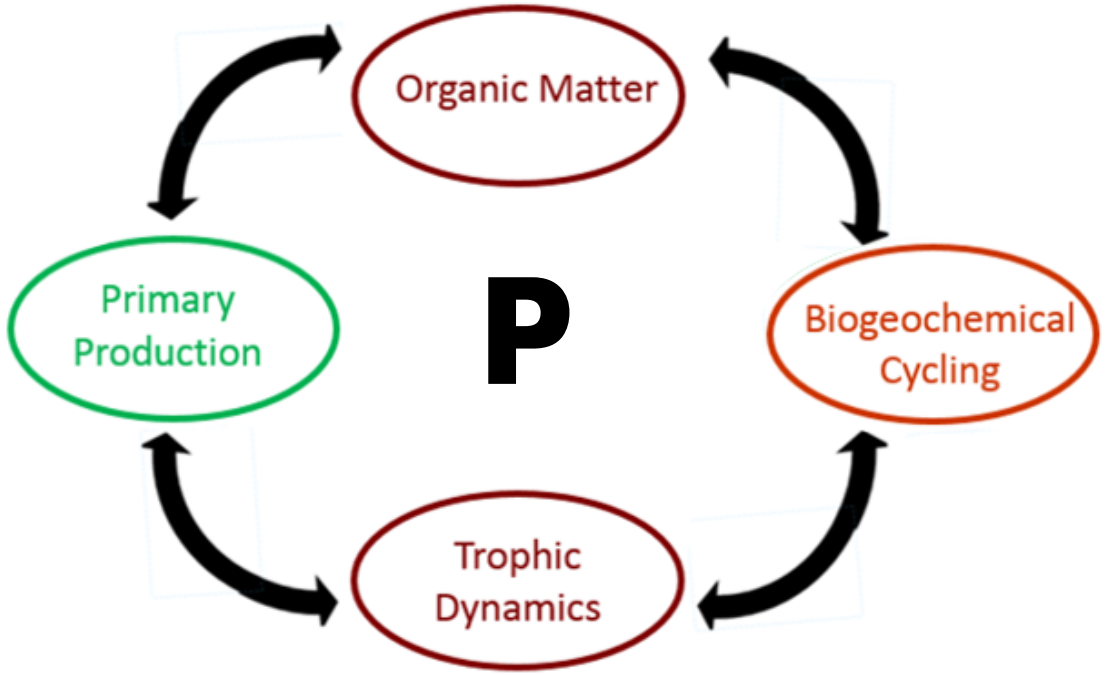
Fresh Water Supply

Everglades National Park

Marsh ↔ Ecotone ↔ Marine

Marine Supply



How does the balance of fresh and marine water supply affect soluble reactive phosphorus (P) availability?

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Everglades National Park

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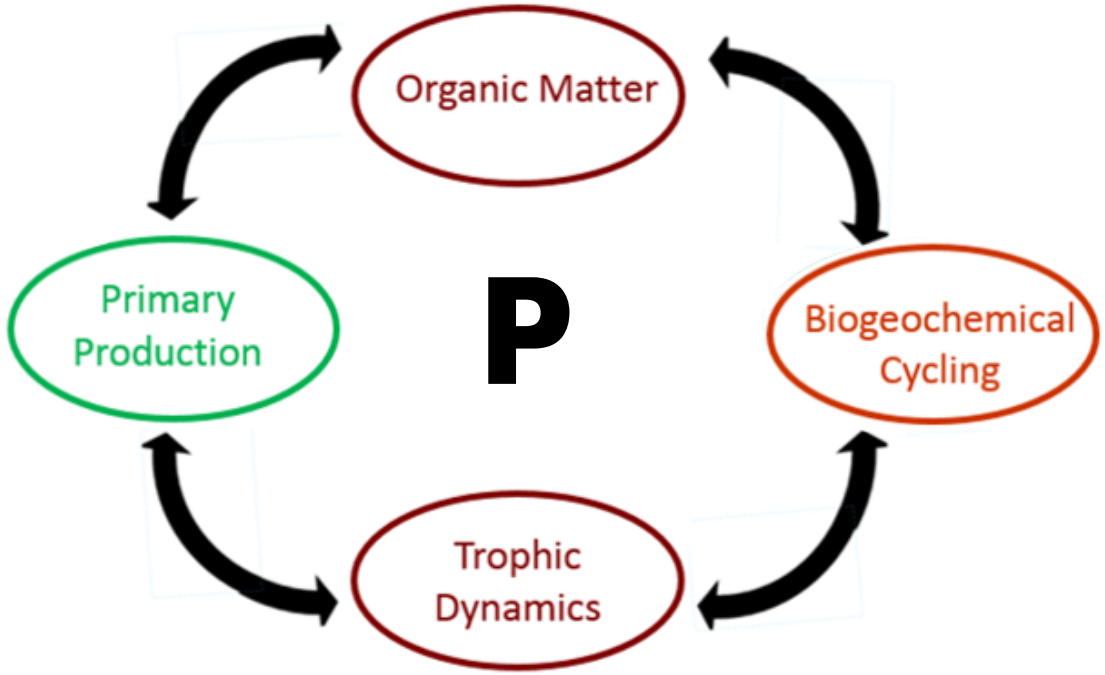
Marine Supply



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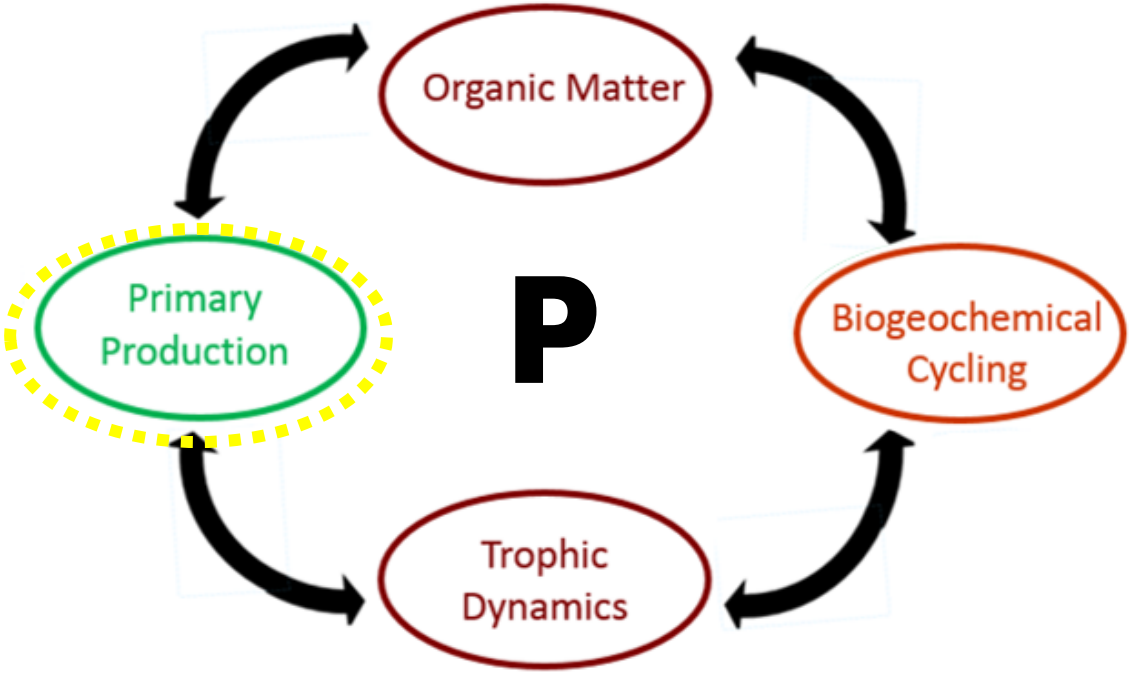

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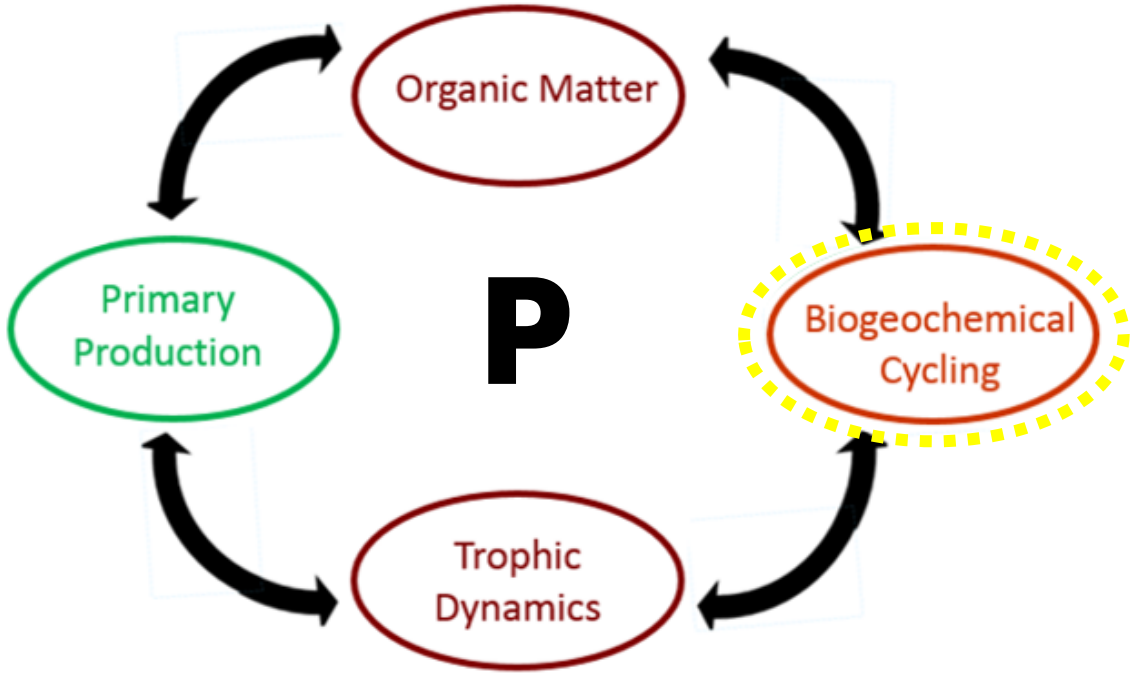
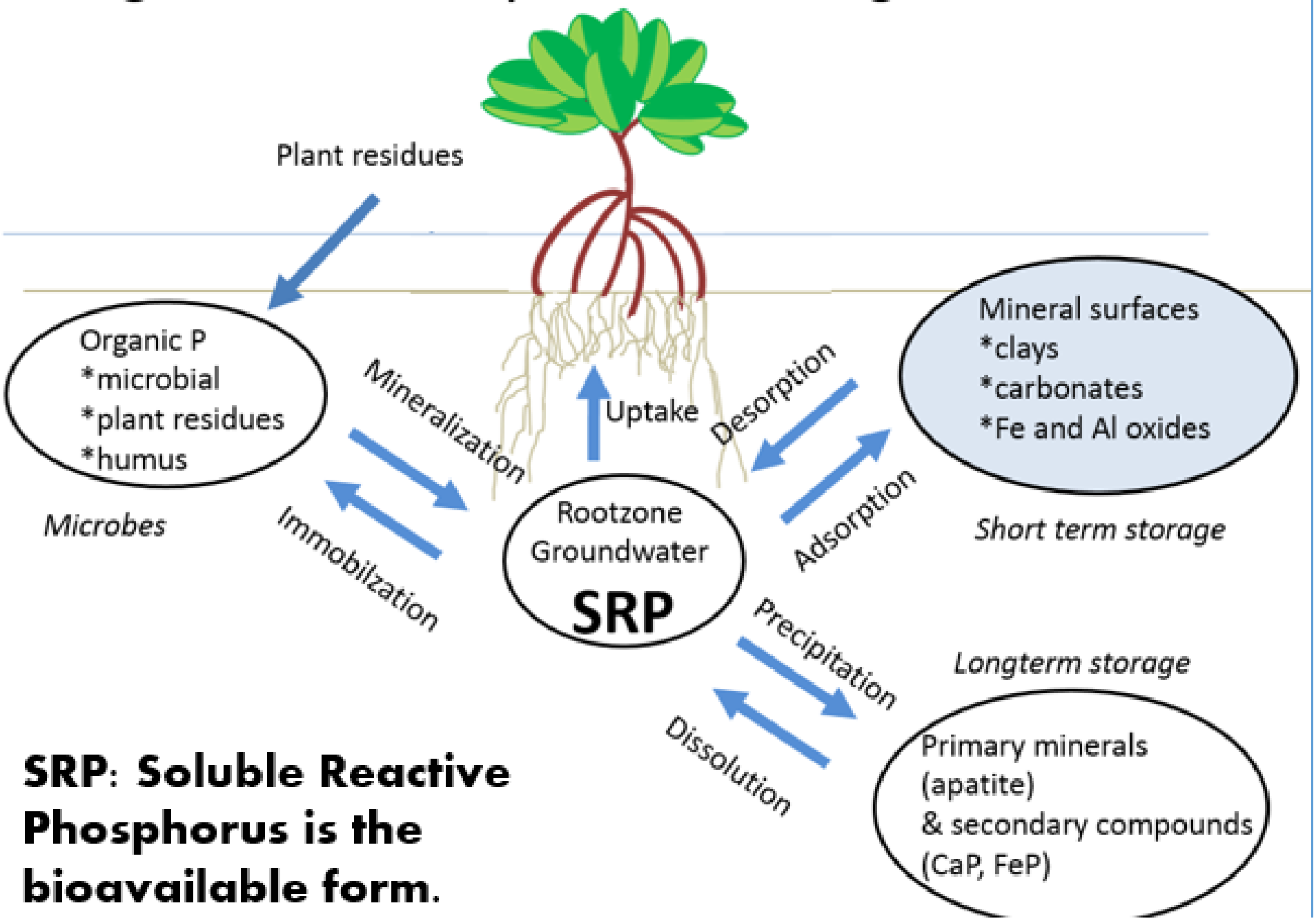
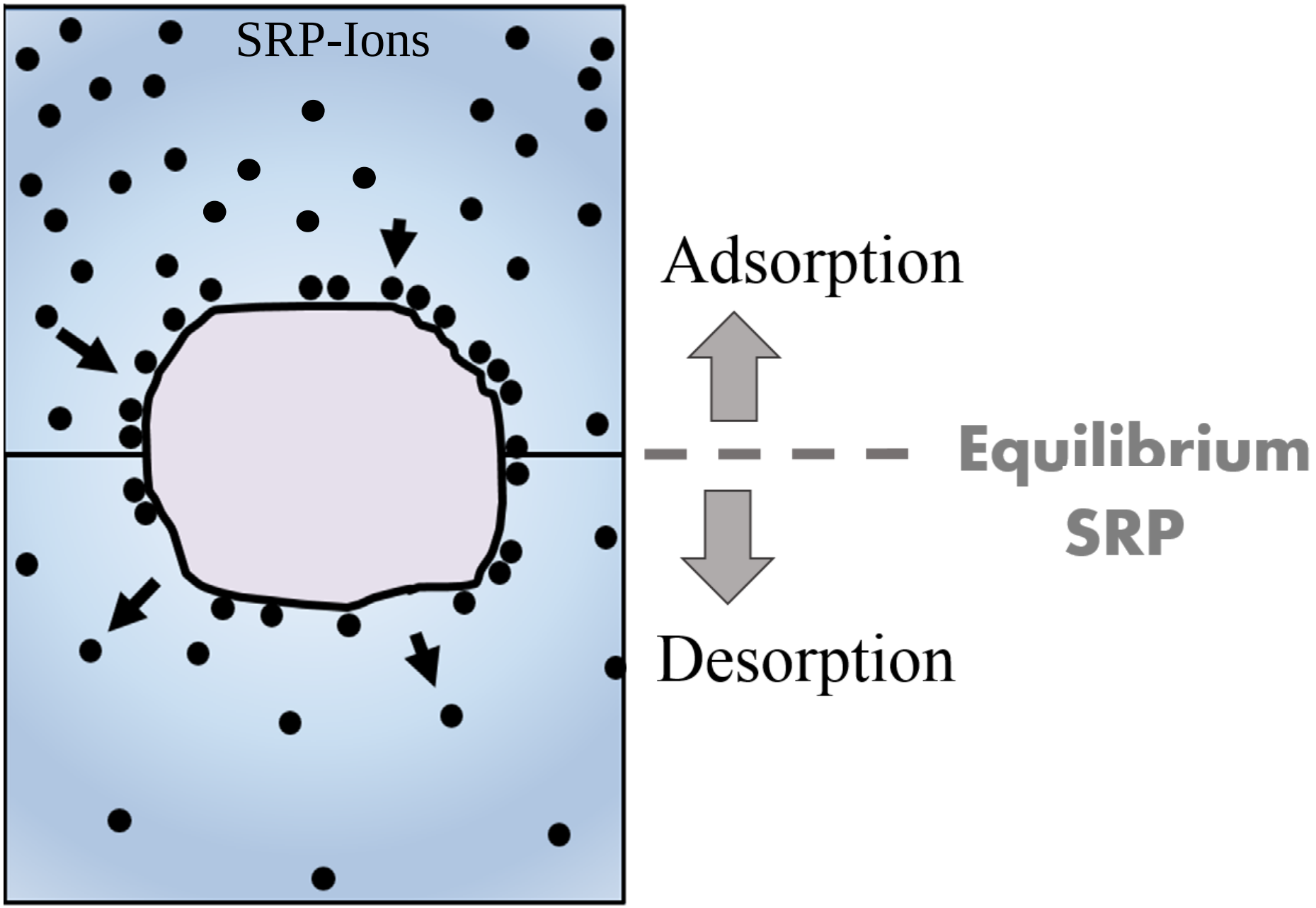


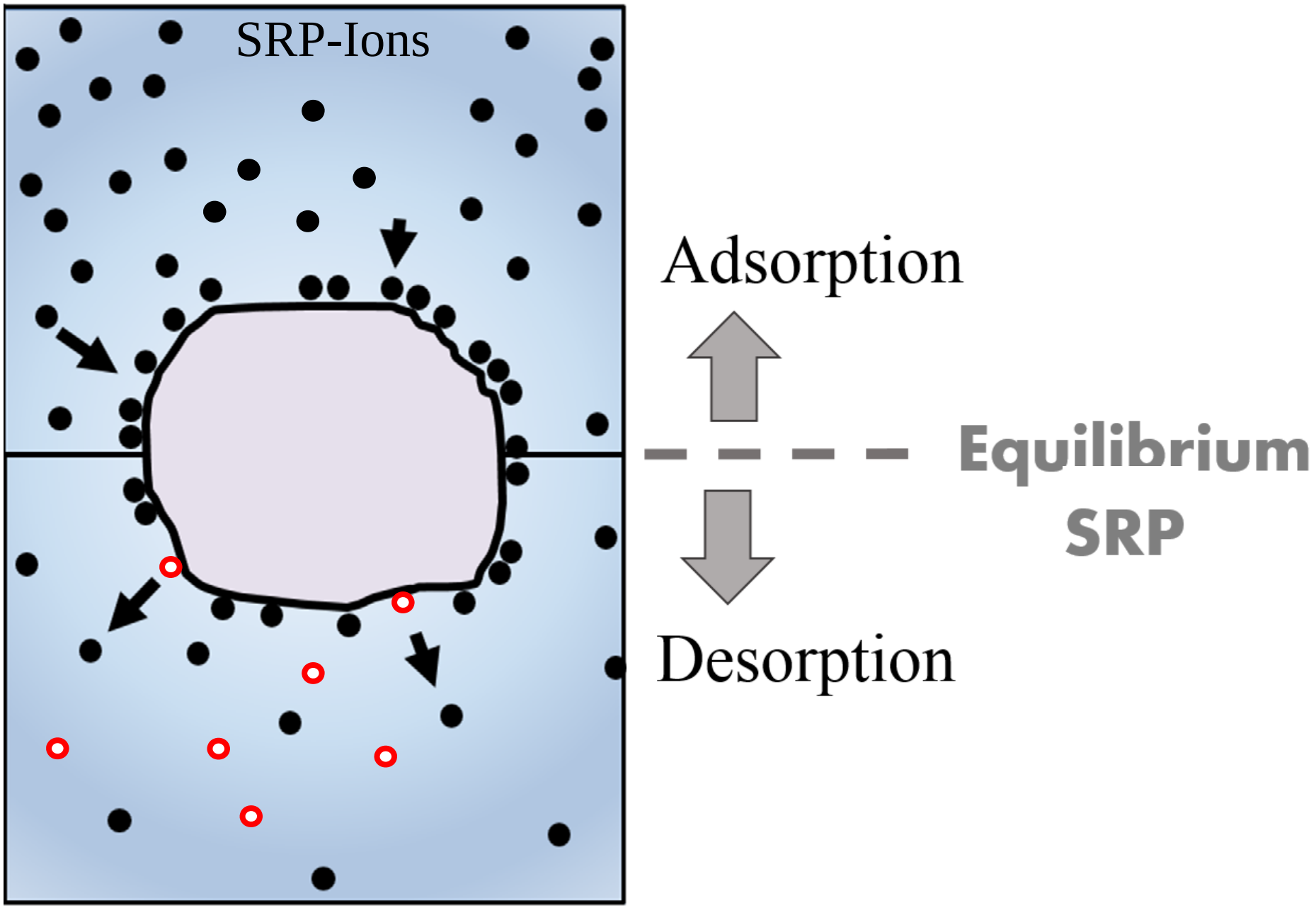
How does the balance of fresh and marine water supply affect soluble reactive phosphorus (SRP) availability?

Biogeochemical P cycle in the Mangrove Root Zone

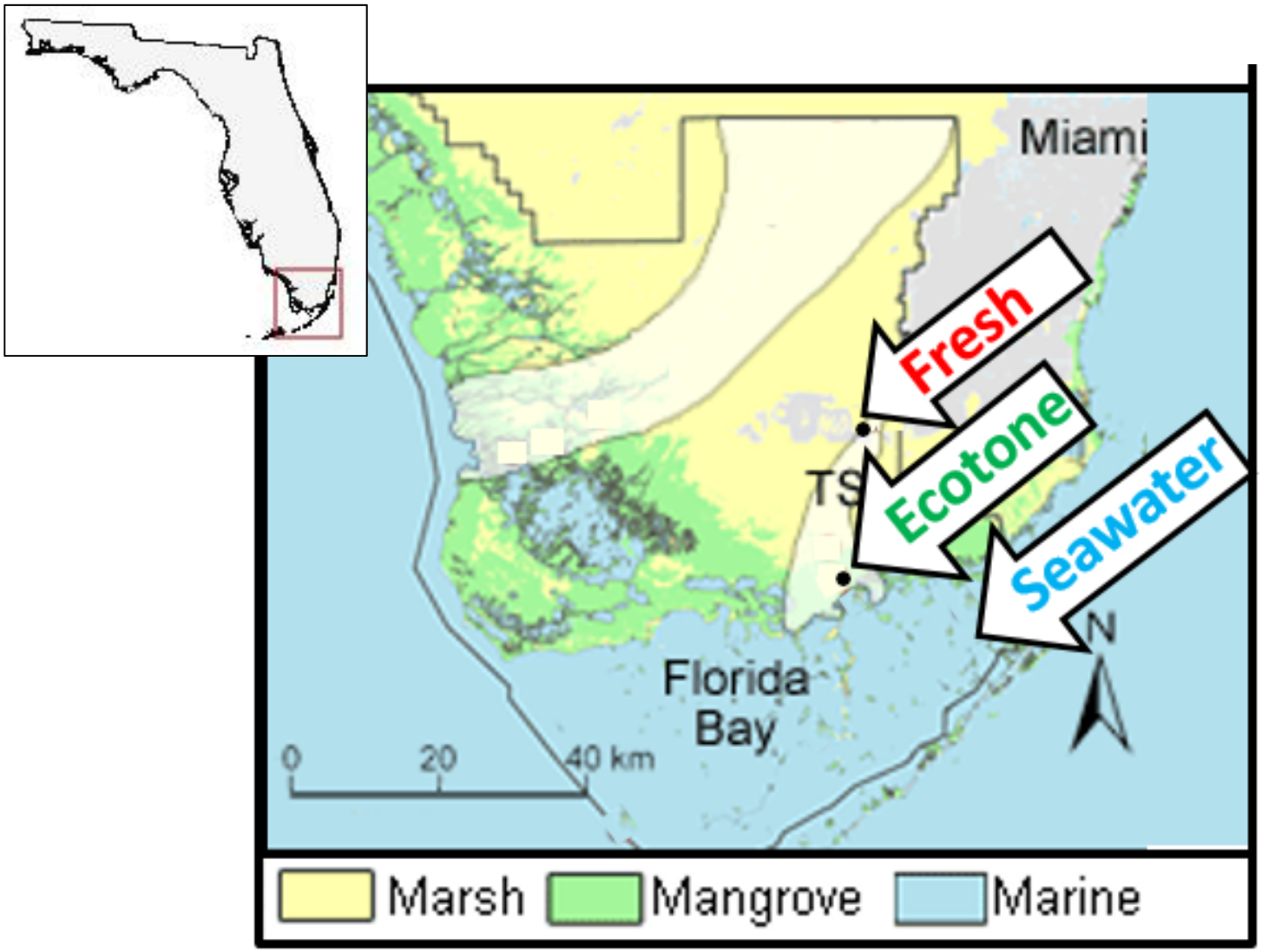


SRP: Soluble Reactive Phosphorus is the bioavailable form.


SRP-Ions
Adsorption
Equilibrium
SRP
Desorption


SRP-Ions
Adsorption
Equilibrium
SRP
Desorption

Taylor Slough Field Waters



Taylor Slough Field Waters

	pH	Salinity, psu	SO_4^{2-}, µM	HCO_3^- Alkalinity µM
Fresh	7.3	0	0	4
Ecotone	6.7	16	11	17
Seawater	8.2	31	28	3

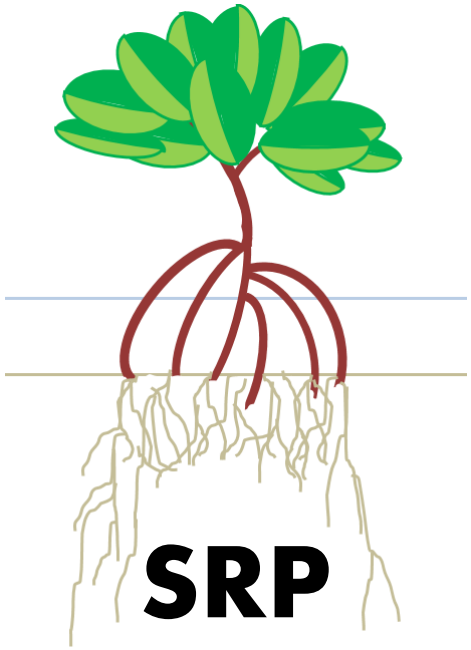
How do sediment P sorption reactions in the three endmember water types

Fresh Groundwater

Ecotone Groundwater

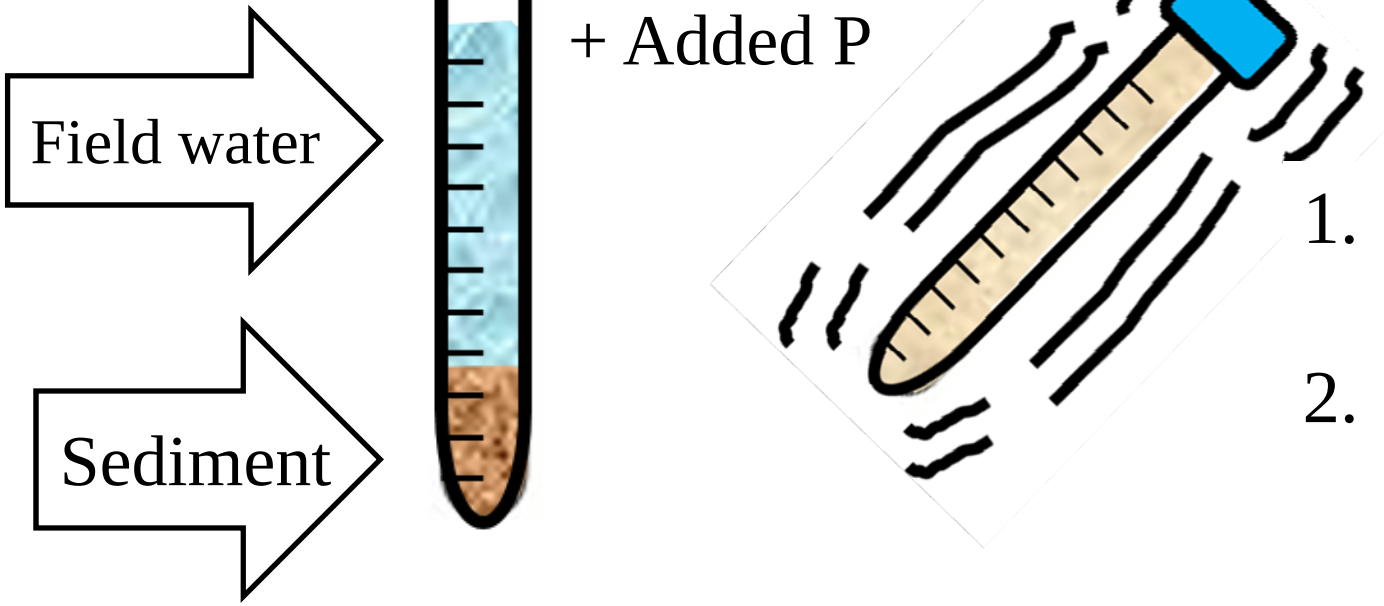
Florida Bay Seawater

affect SRP availability in the mangrove root zone?



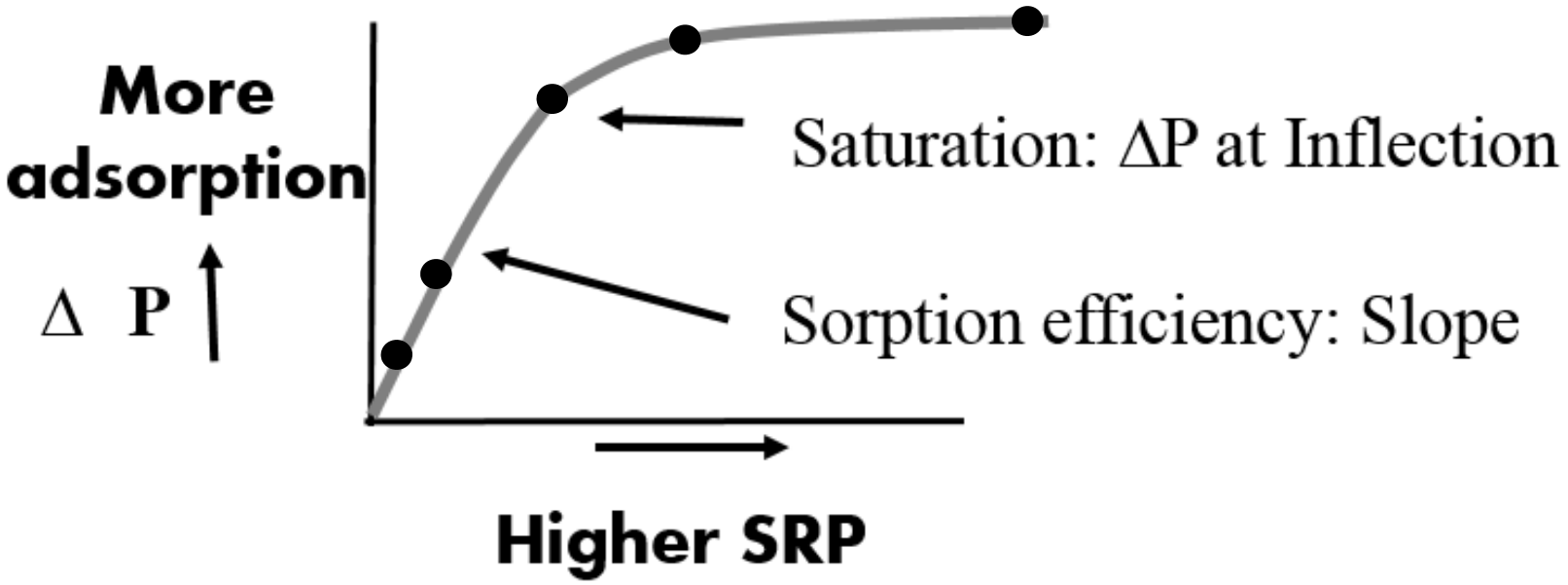
Taylor Slough Ecotone Sediment

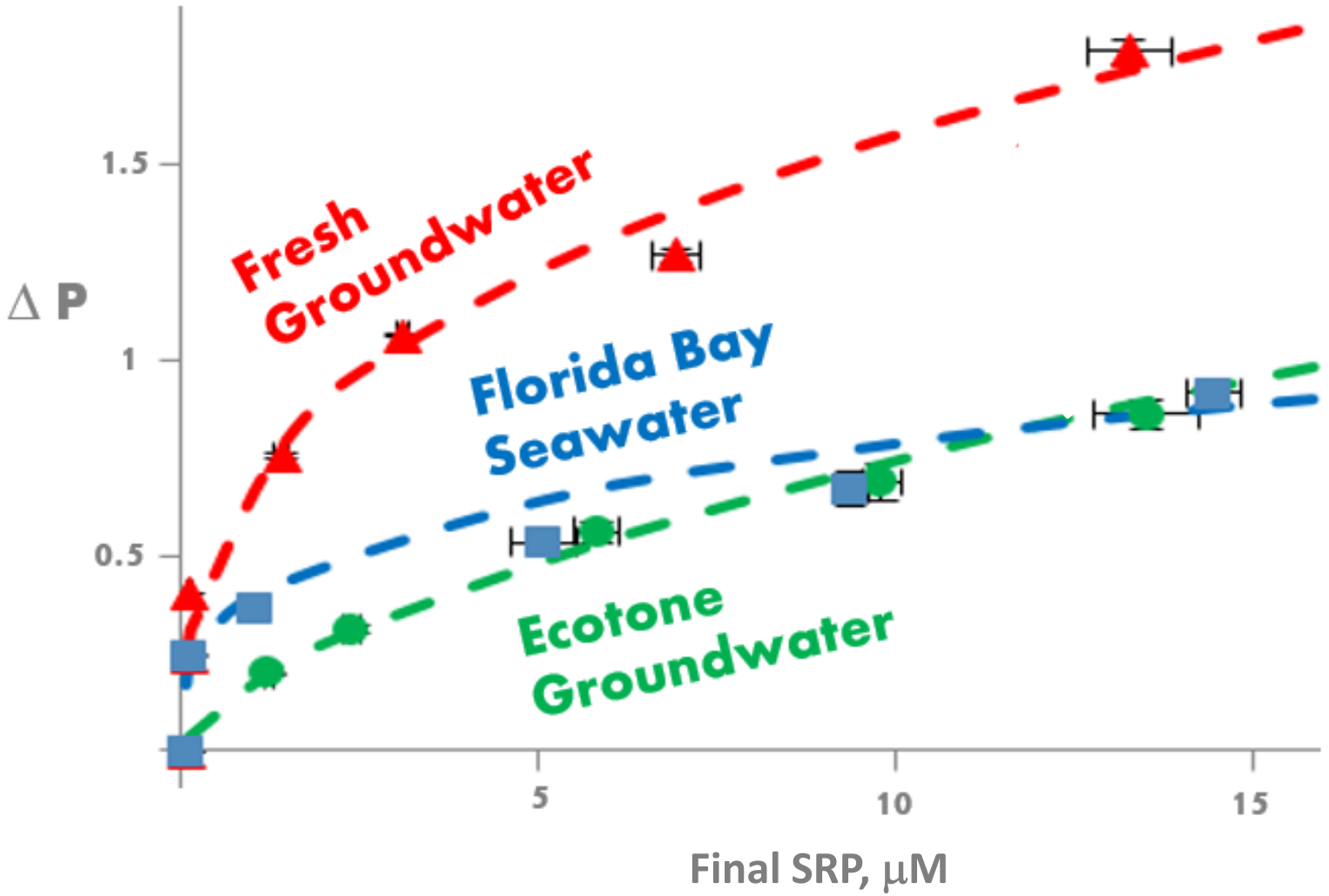
Sorption Experiments

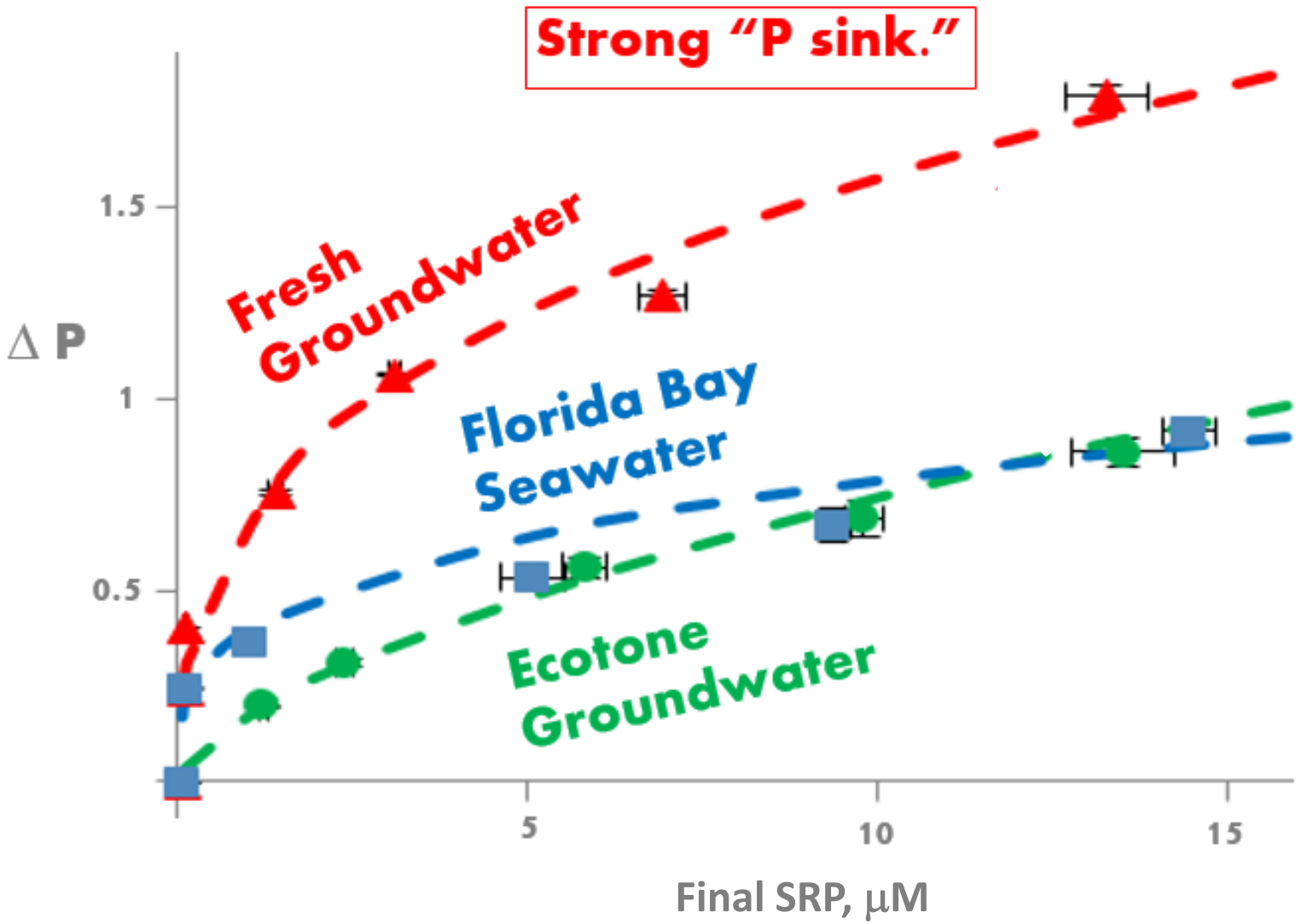


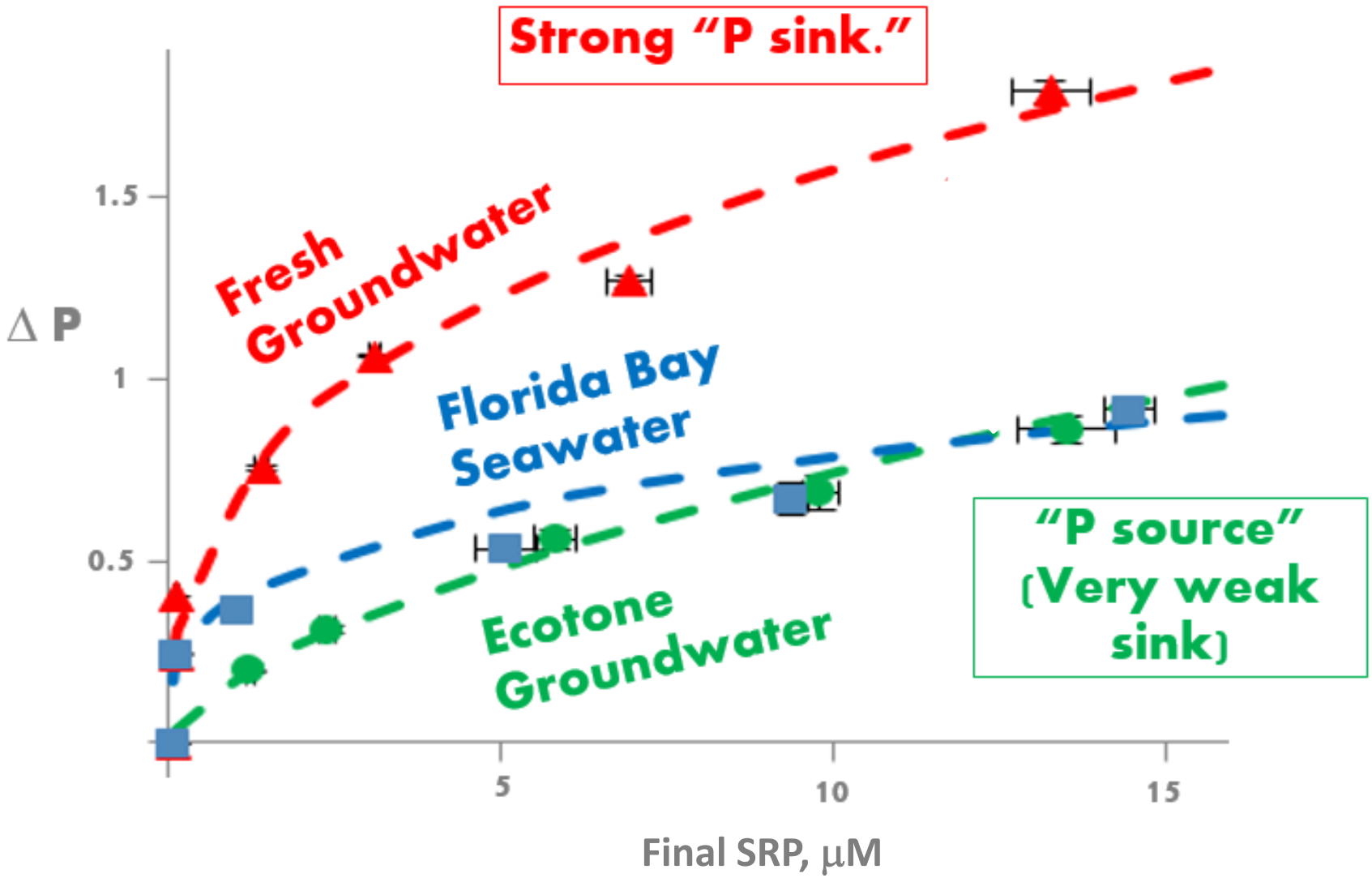
1. Shake 24 hours
2. Filter and analyze for P

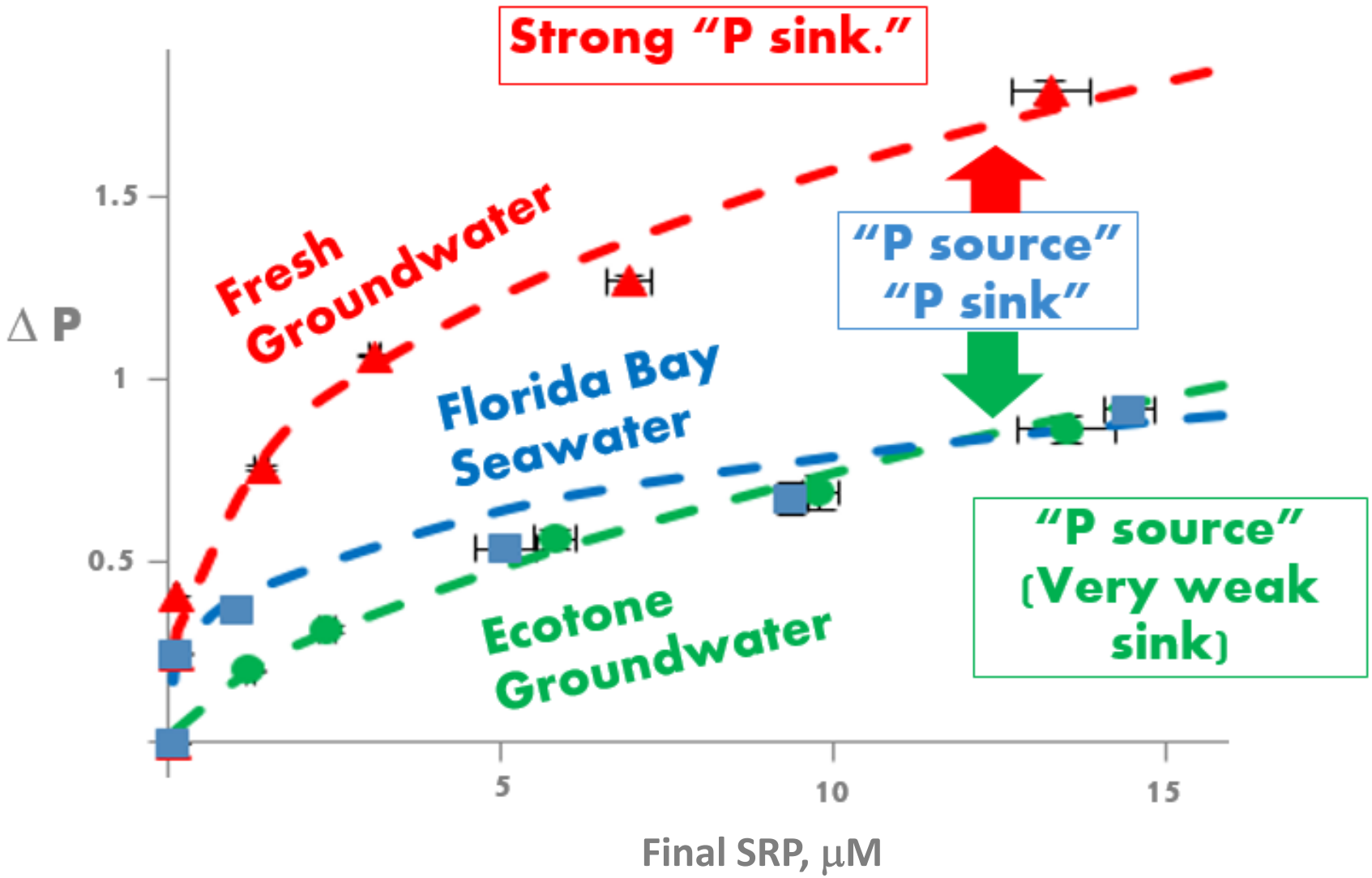
Δ P= Initial – Final


More adsorption
Δ P
Saturation: ΔP at Inflection
Sorption efficiency: Slope
Higher SRP


Fresh Groundwater
Florida Bay Seawater
Ecotone Groundwater
ΔP
1.5
1
0.5
5
10
15
Final SRP, μM


Strong "P sink."
Fresh Groundwater
Florida Bay Seawater
Ecotone Groundwater
ΔP
1.5
1
0.5
5
10
15
Final SRP, μM


Strong "P sink."
Fresh Groundwater
Florida Bay Seawater
Ecotone Groundwater
"P source" (Very weak sink)
Δ P
1.5
1
0.5
5
10
15
Final SRP, μM


Strong "P sink."
"P source"
"P sink"
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Fresh
Groundwater
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Δ P
1.5
1
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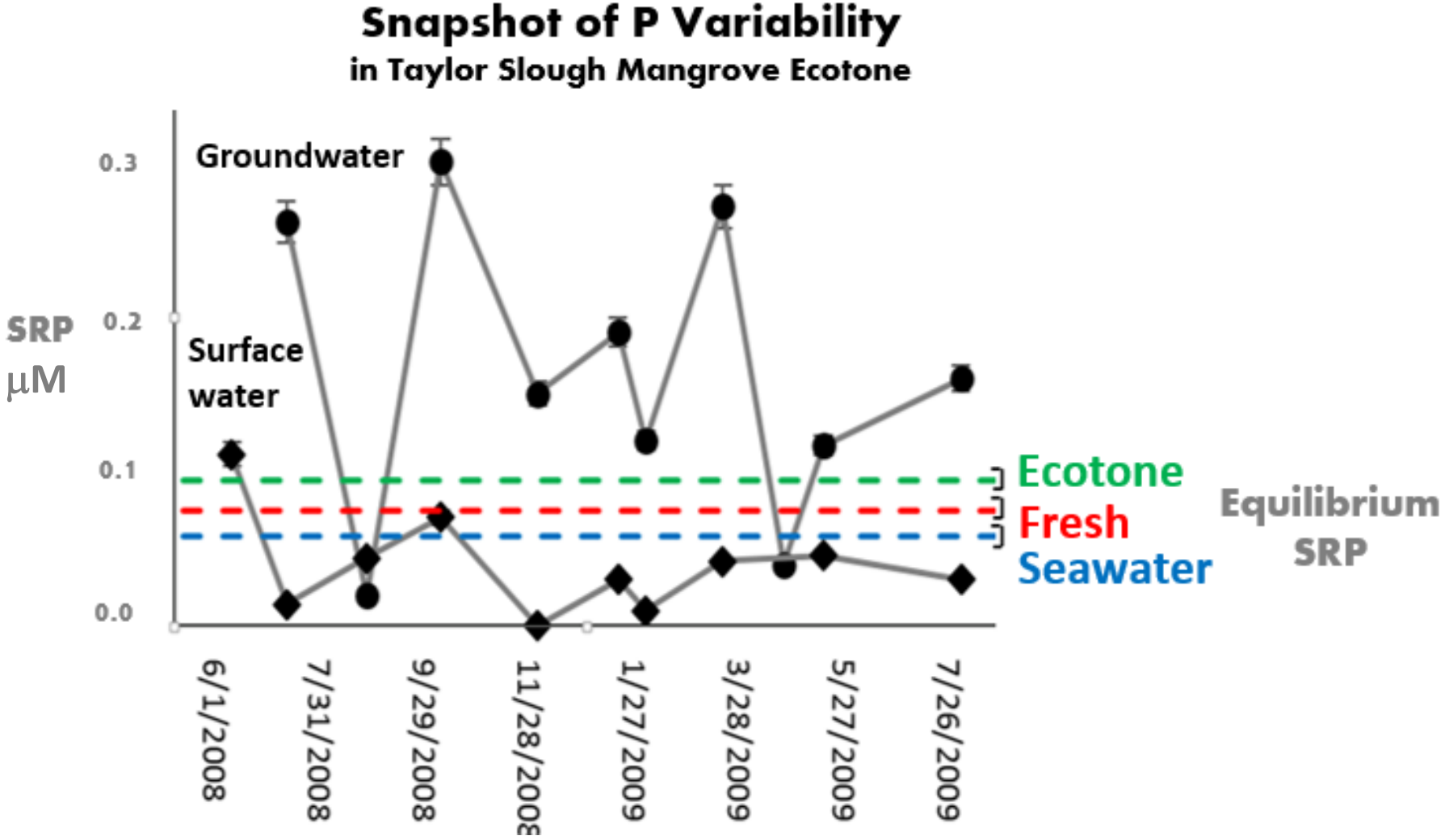
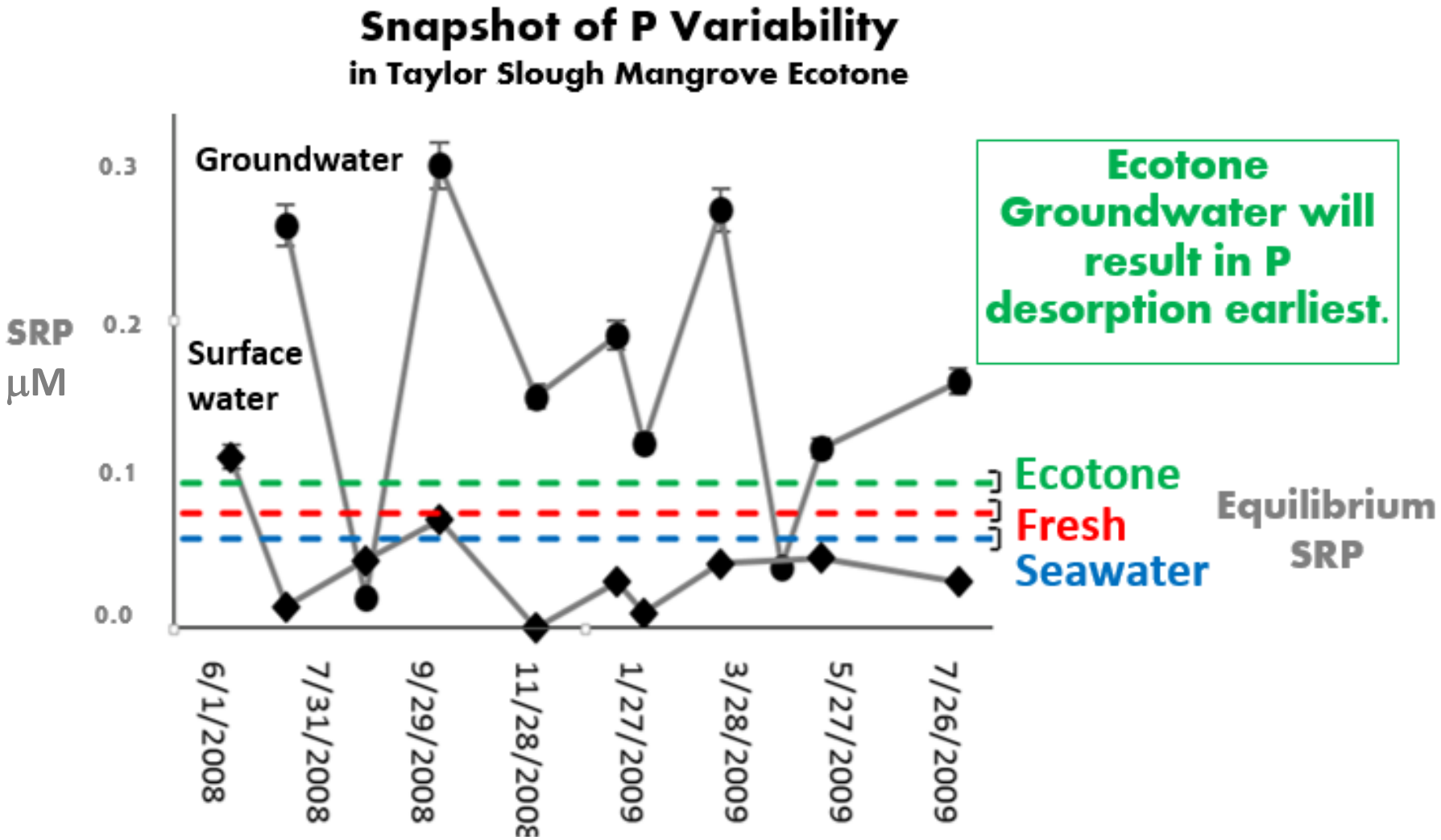
Final SRP, μM


Snapshot of P Variability
in Taylor Slough Mangrove Ecotone
SRP
µM
0.3
0.2
0.1
0.0
Groundwater
Surface
water
Ecotone
Fresh
Seawater
Equilibrium
SRP
6/1/2008
7/31/2008
9/29/2008
11/28/2008
1/27/2009
3/28/2009
5/27/2009
7/26/2009


Snapshot of P Variability
in Taylor Slough Mangrove Ecotone
SRP
µM
0.3
0.2
0.1
0.0
Groundwater
Surface
water
Ecotone
Groundwater will
result in P
desorption earliest.
Ecotone
Fresh
Seawater
Equilibrium
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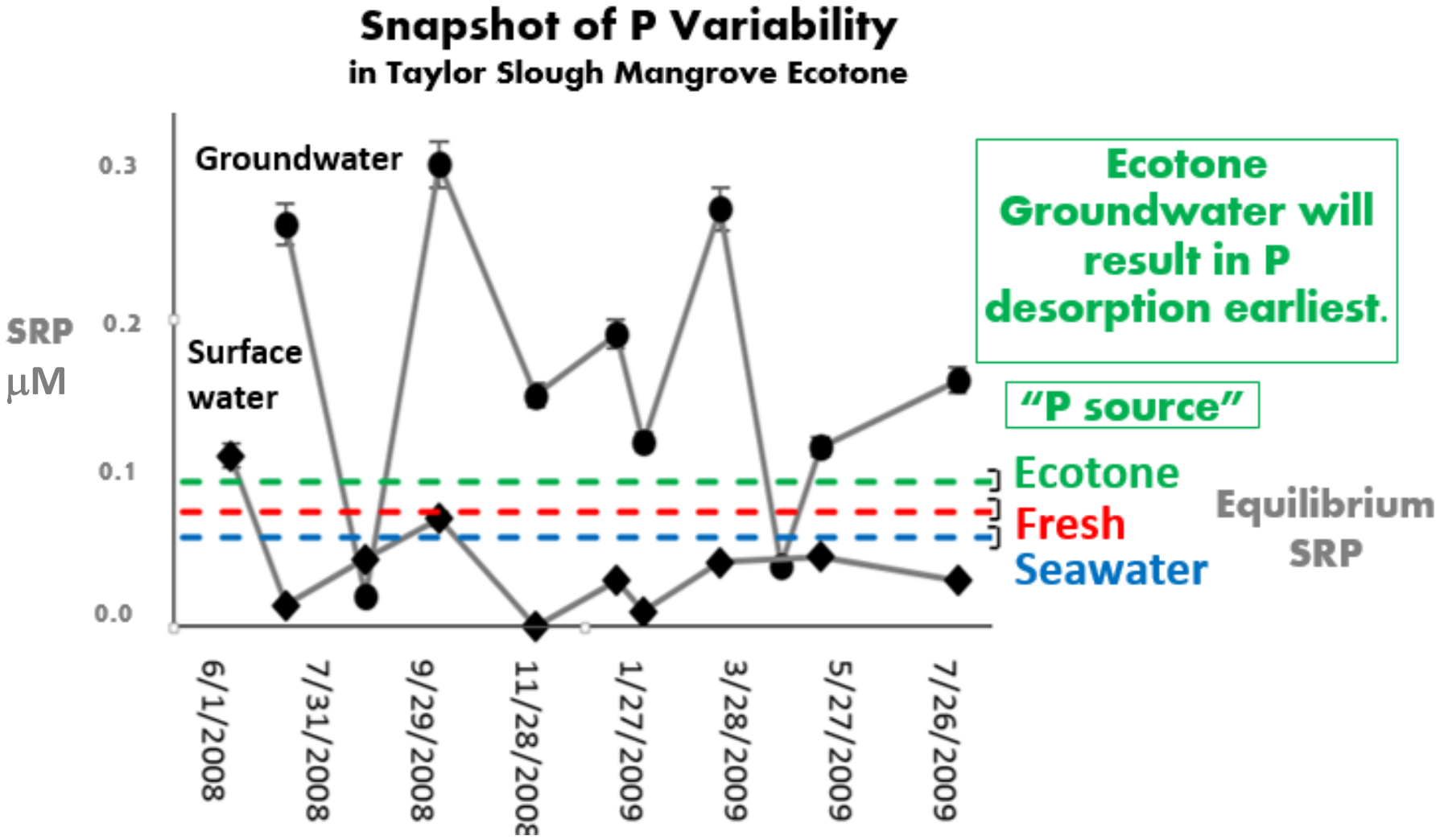
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SRP
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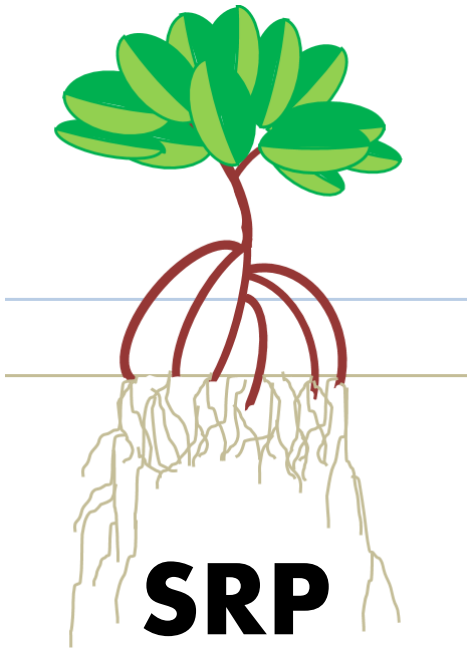
7/26/2009
Ecotone
Groundwater will
result in P
desorption earliest.
"P source"
Ecotone
Fresh
Seawater
Equilibrium
SRP

Conclusion:

Sediment P sorption reactions in the mangrove root zone cause SRP availability to change depending on water type:



Ecotone Groundwater » **Florida Bay Seawater** » **Fresh Groundwater**

Acknowledgements

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