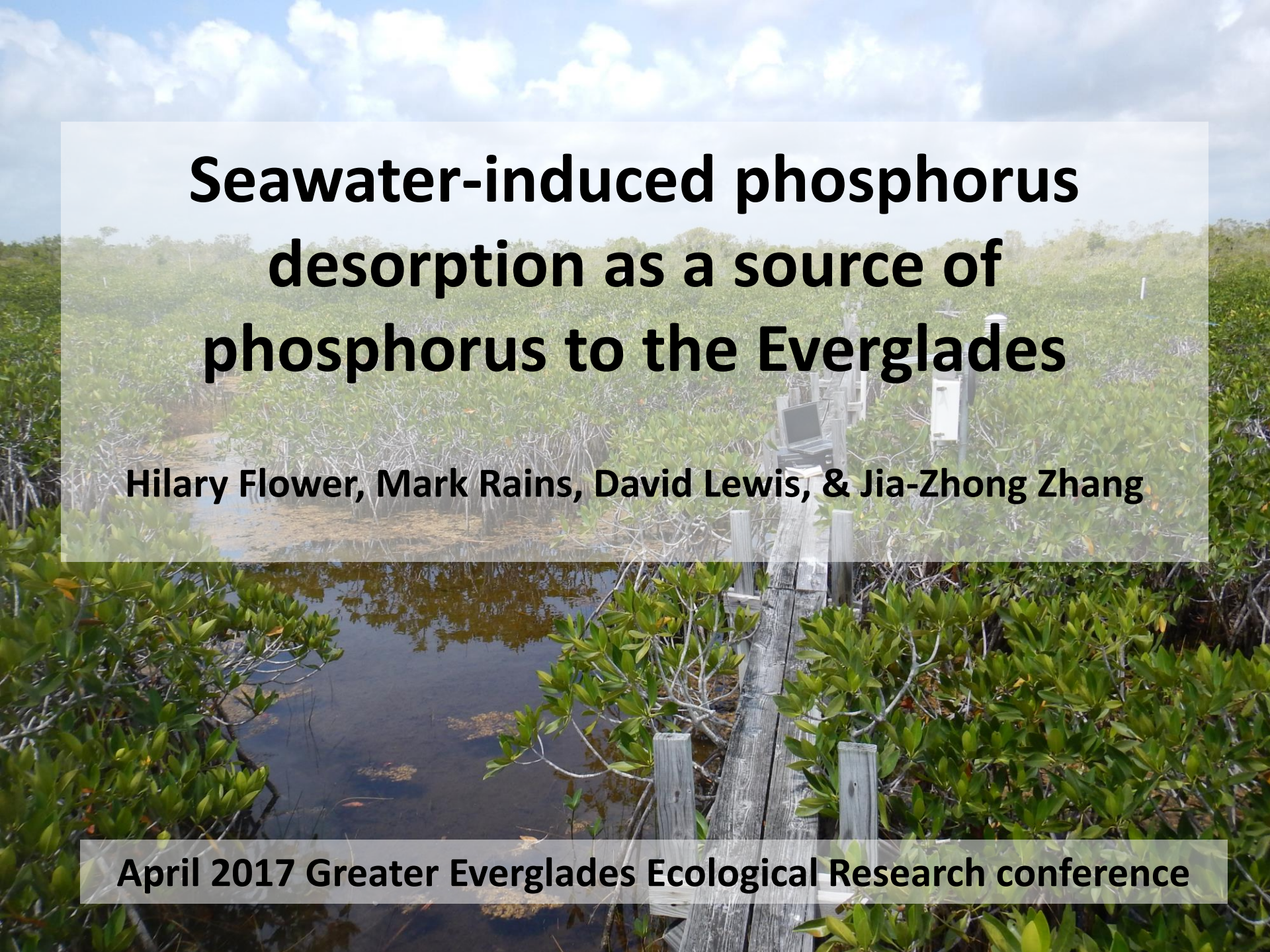
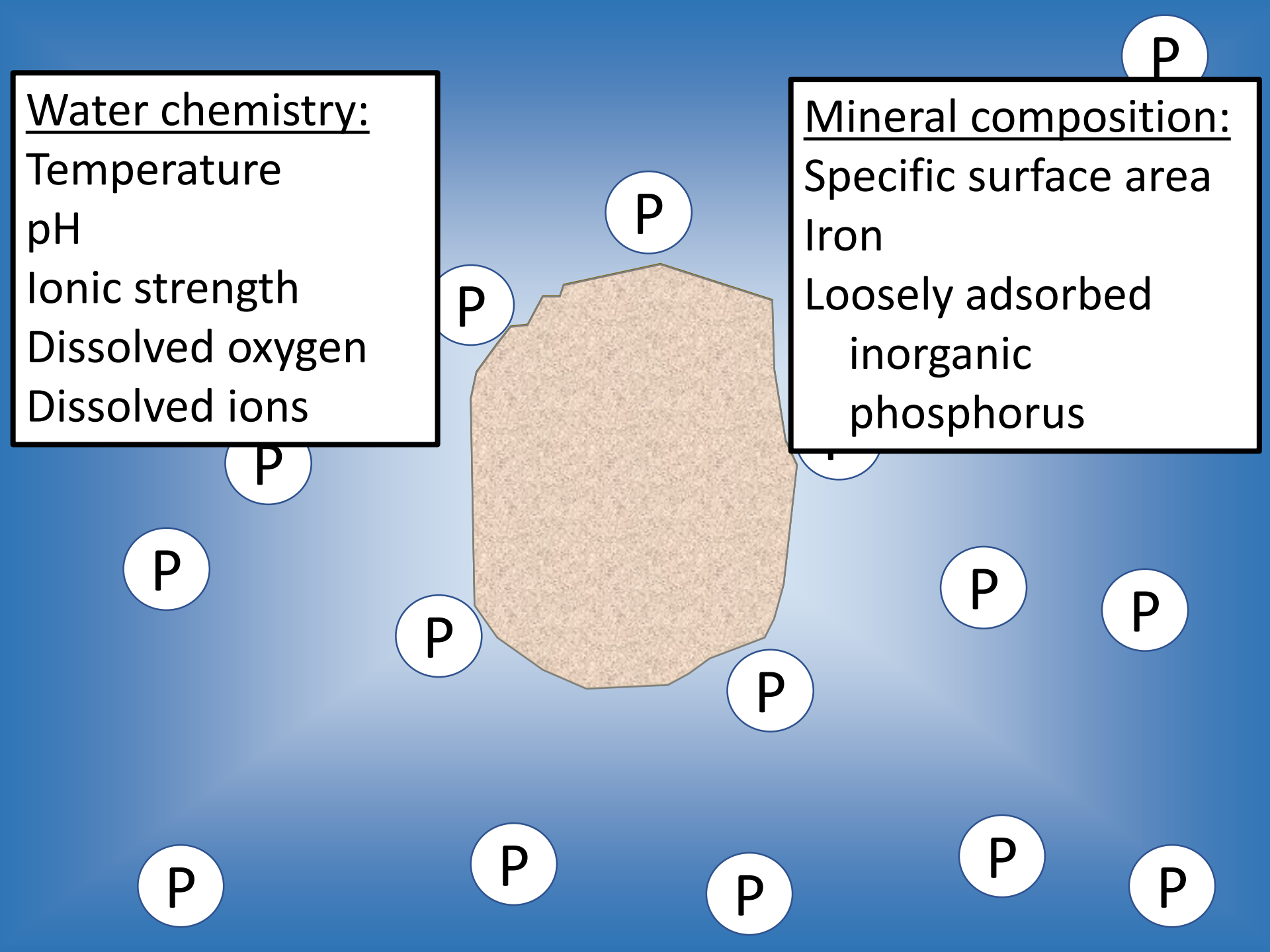


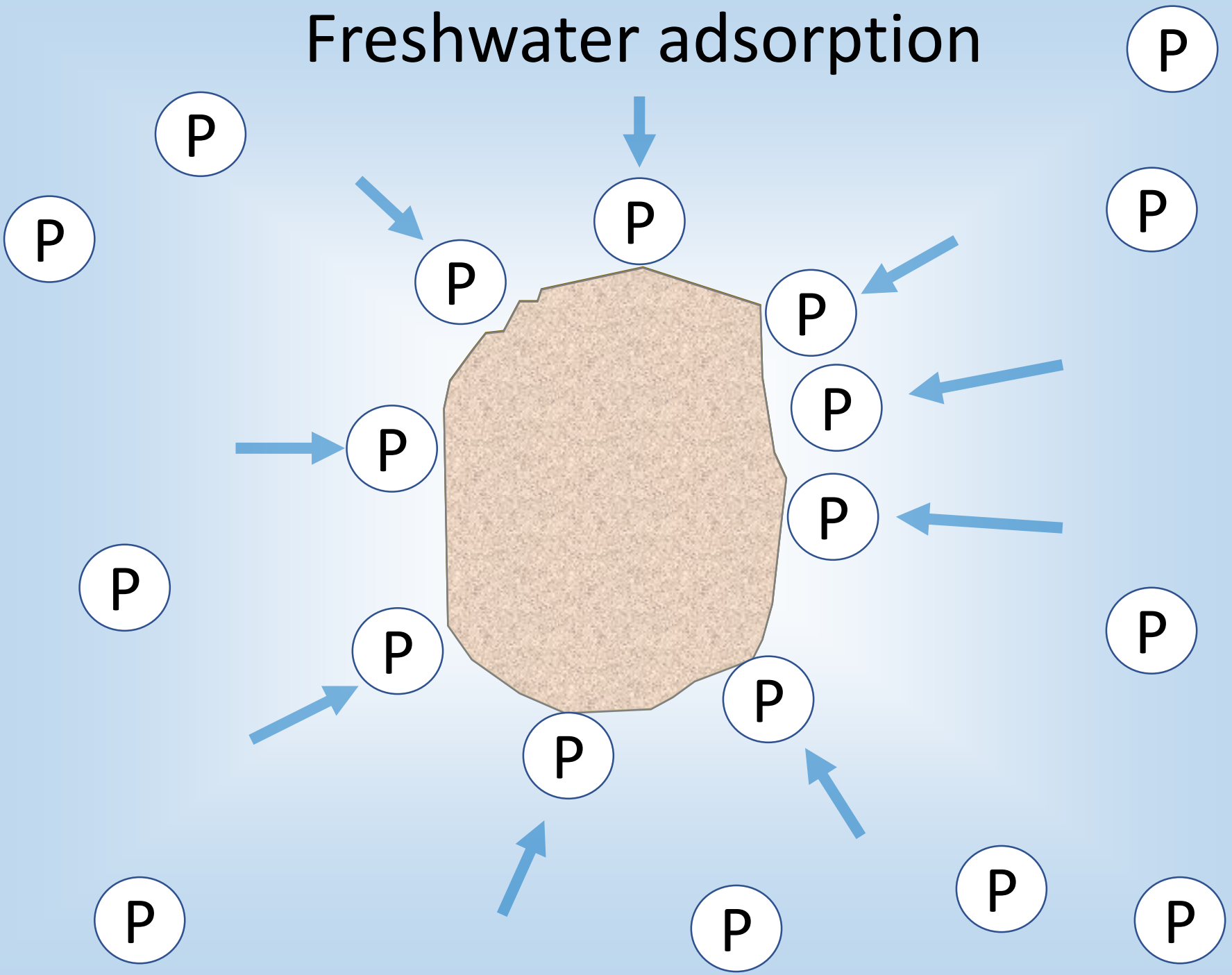
Seawater-induced phosphorus desorption as a source of phosphorus to the Everglades

Hilary Flower, Mark Rains, David Lewis, & Jia-Zhong Zhang

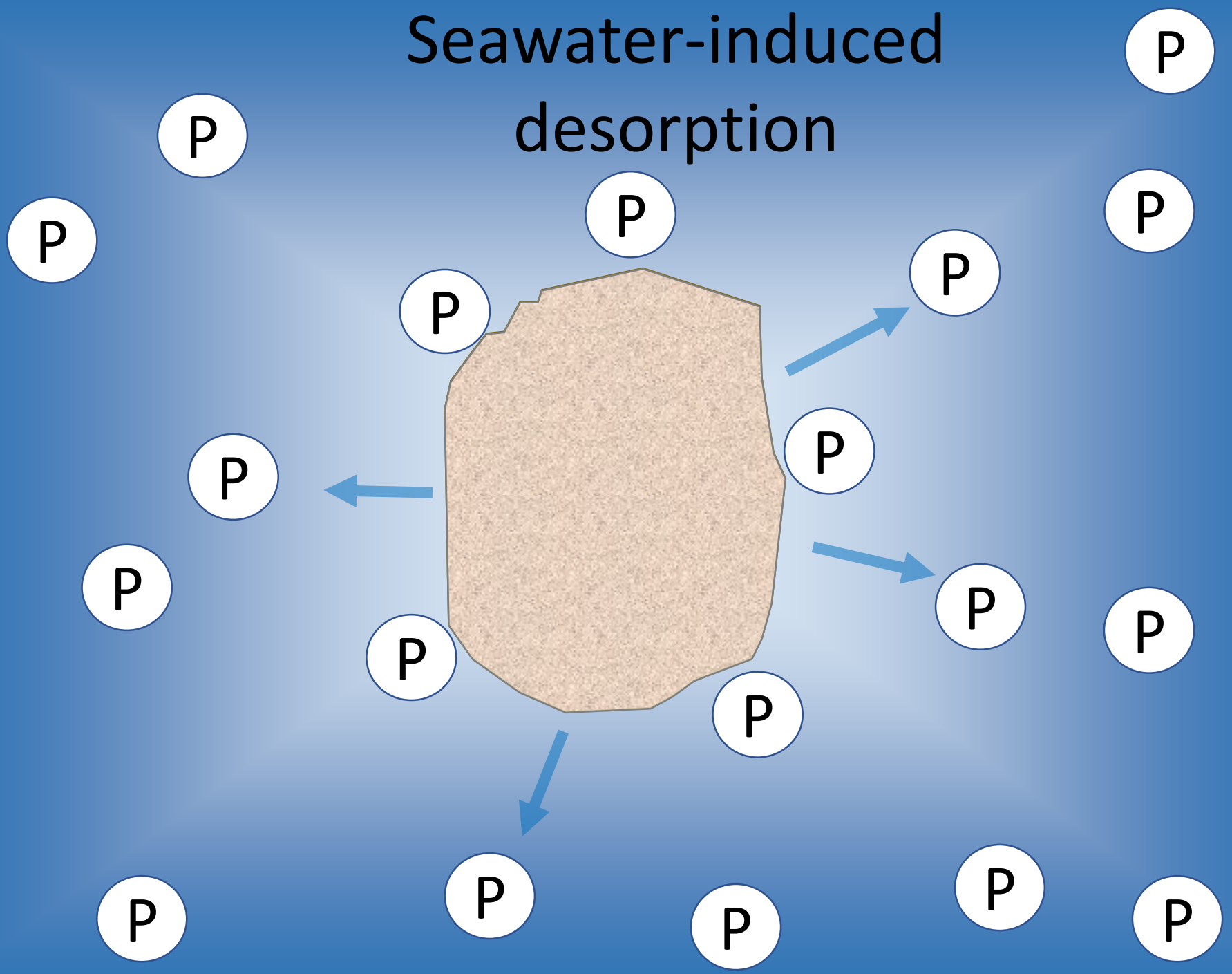
April 2017 Greater Everglades Ecological Research conference


Water chemistry:
Temperature
pH
Ionic strength
Dissolved oxygen
Dissolved ions
Mineral composition:
Specific surface area
Iron
Loosely adsorbed
inorganic
phosphorus
P

Freshwater adsorption



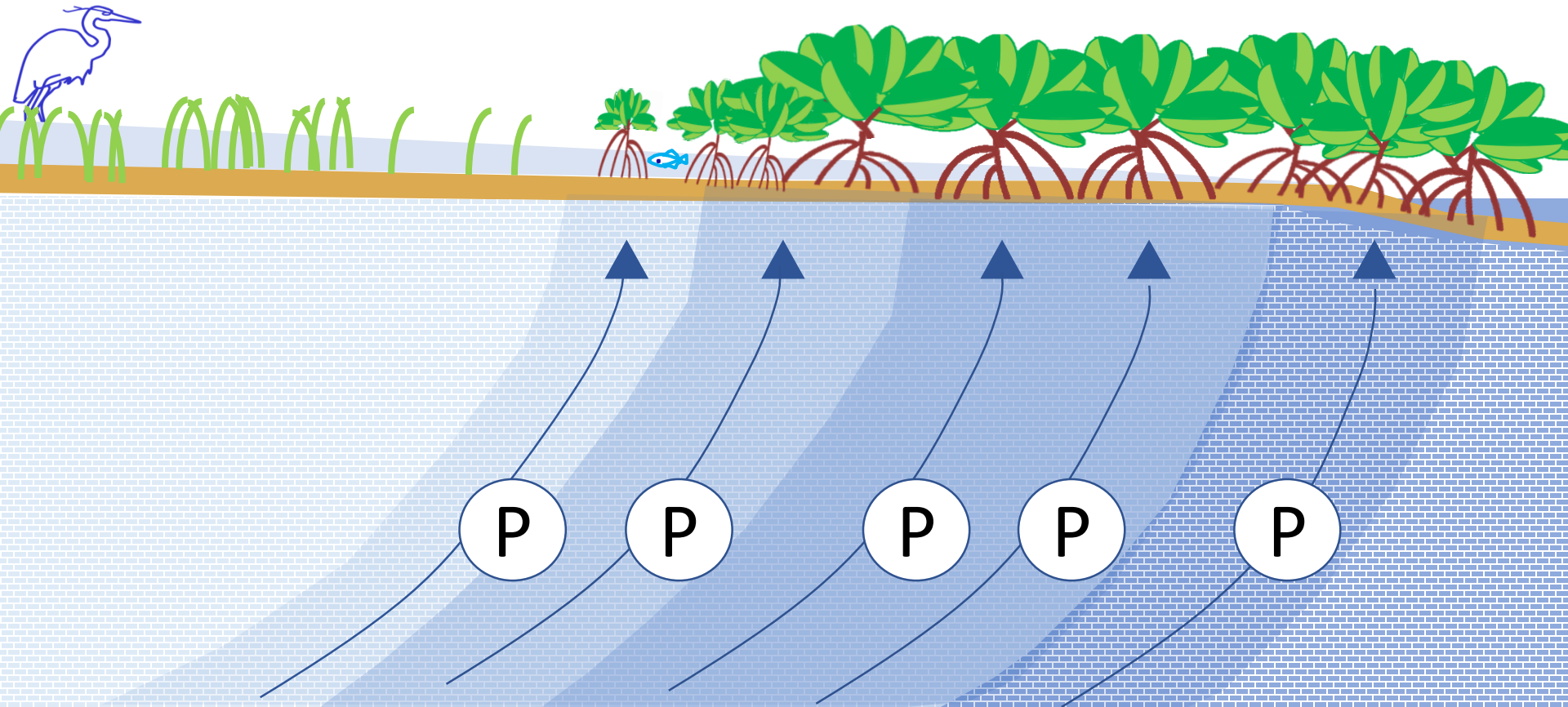
Seawater-induced desorption



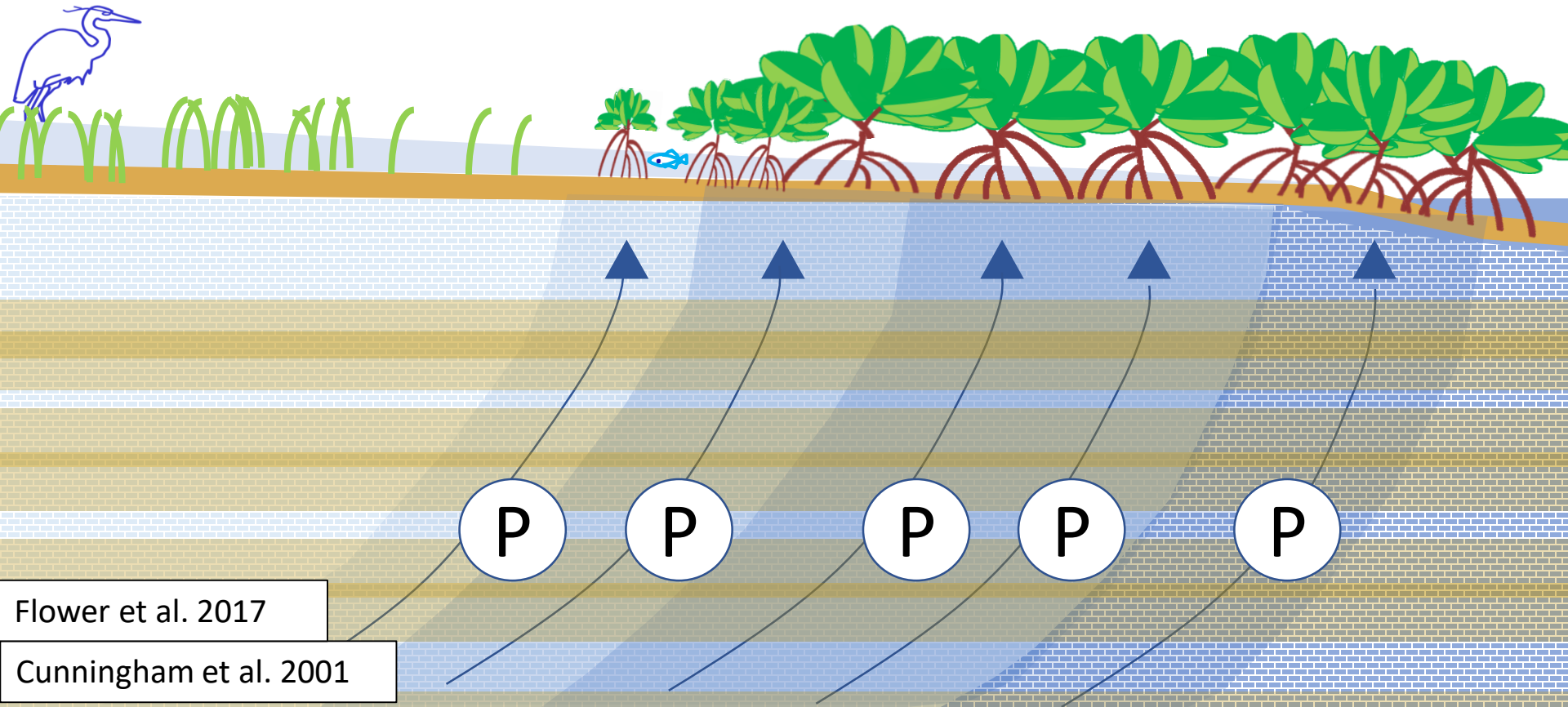
Hypothesis:

The **magnitude** of increased phosphorus concentration from seawater-induced desorption

Would **vary** by stratigraphic layer

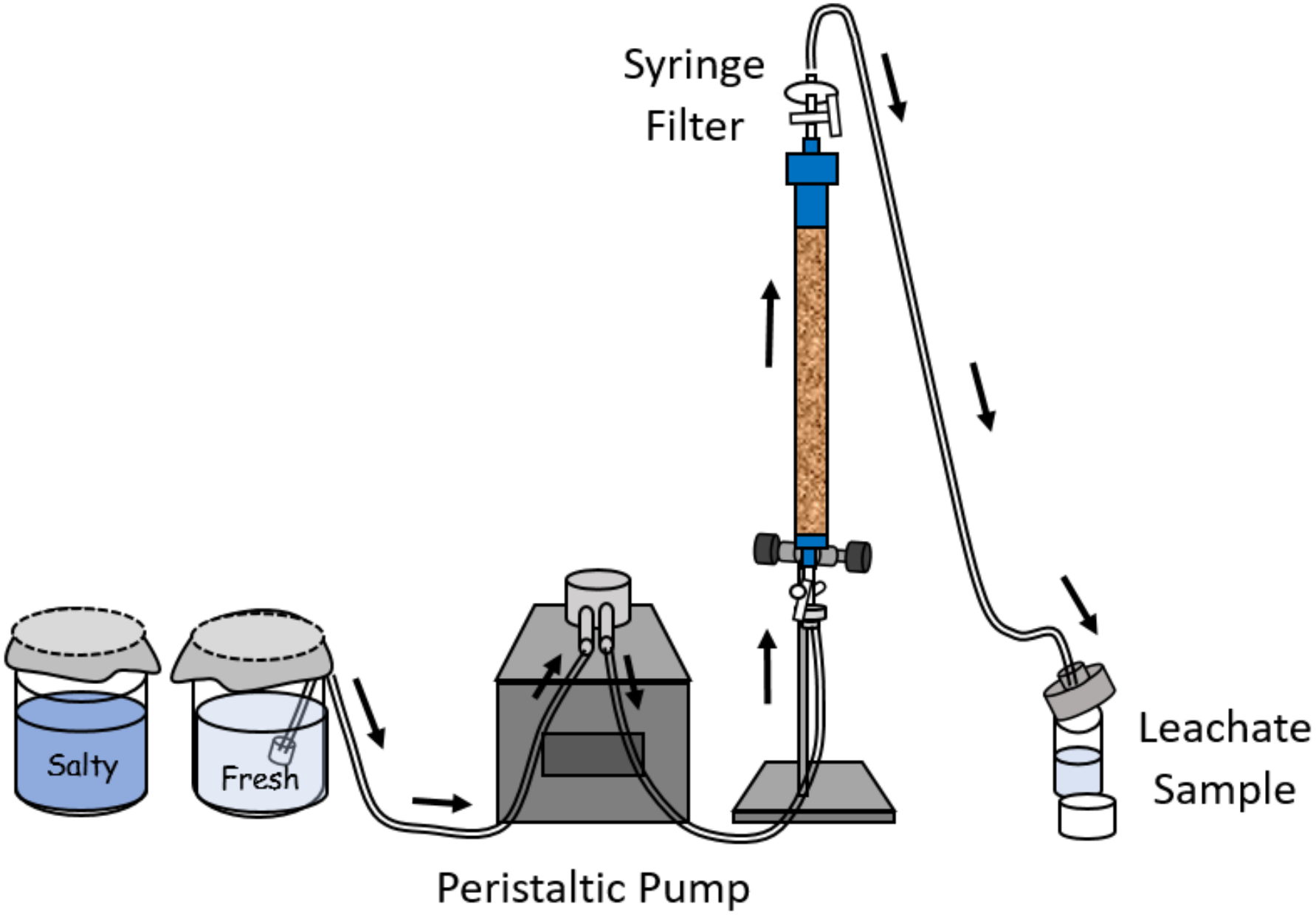


Rock layer phosphorus content	Effect on phosphorus concentration of the ambient water
High	Substantial (eg. exceeding EPA limit)
Low	Not detectable

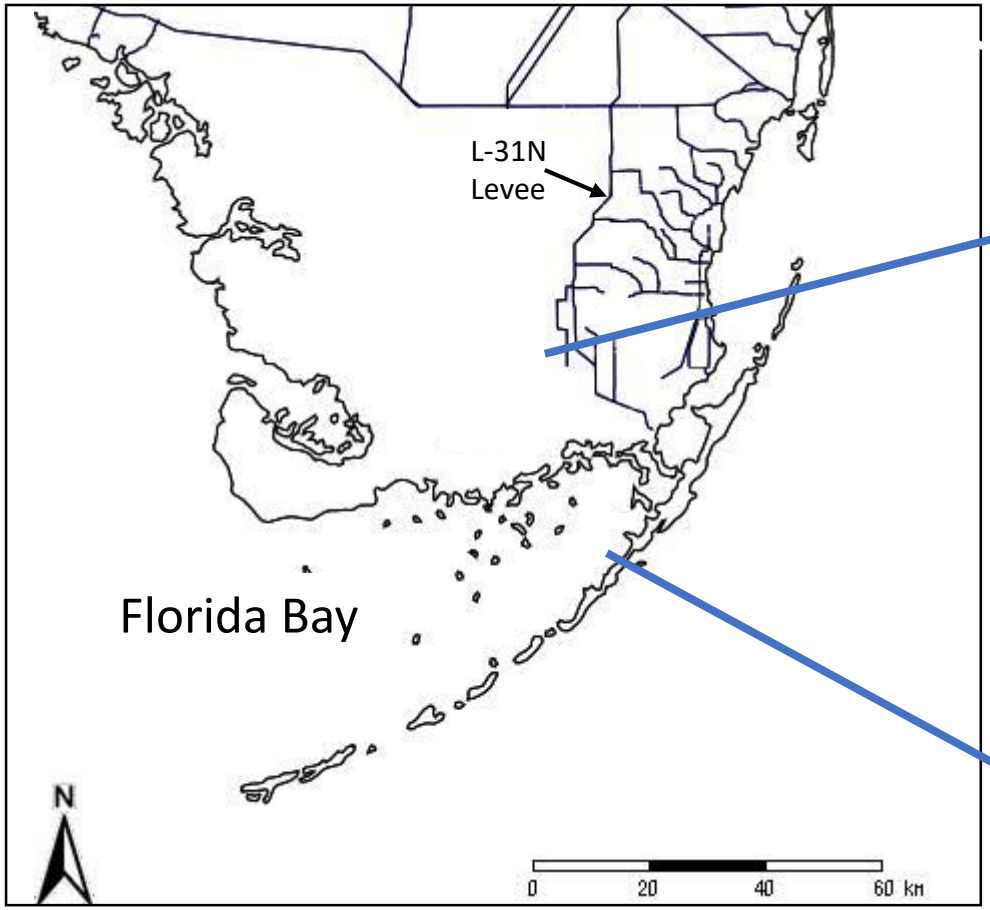


Flower et al. 2017

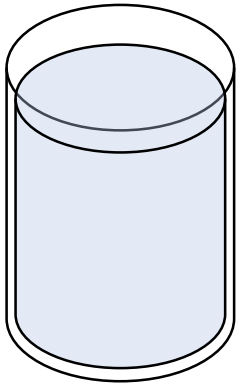
Cunningham et al. 2001



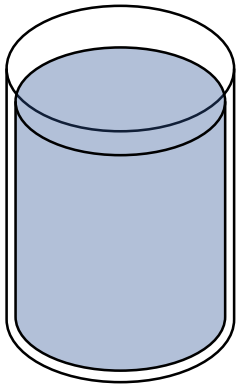
Suzumura et al., 2000



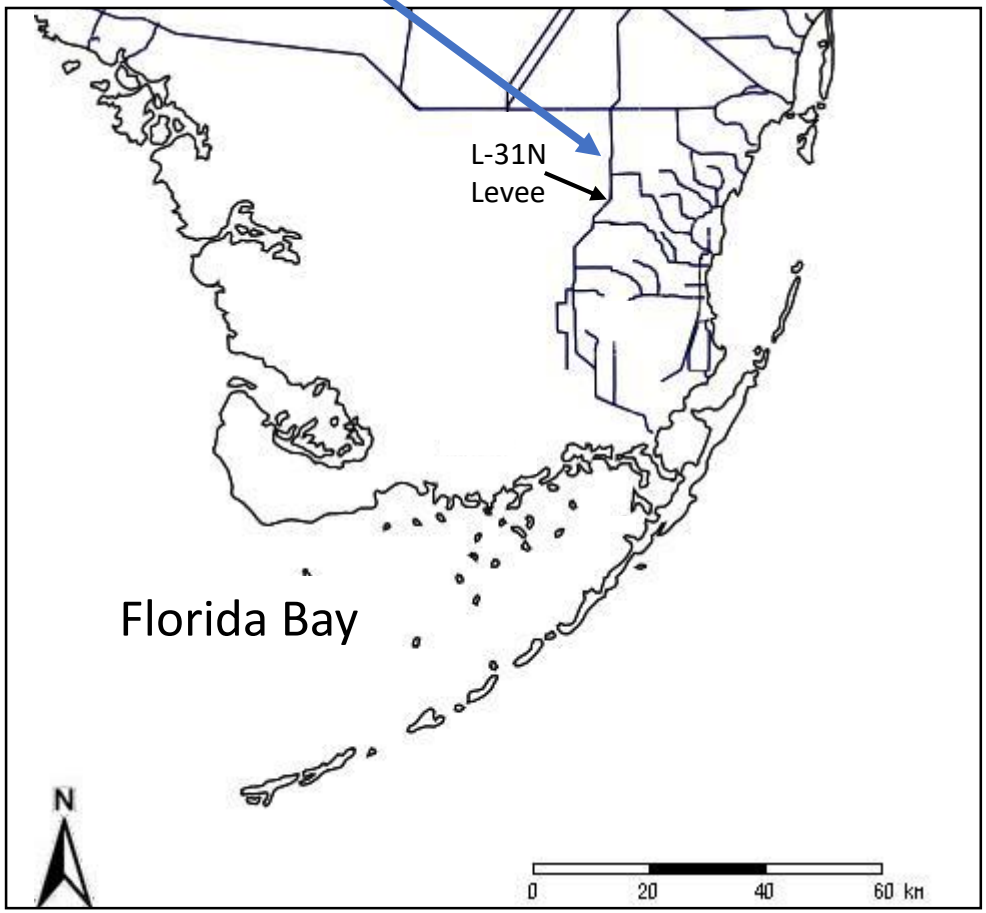
Fresh groundwater



Saltwater



G-3784 test corehole



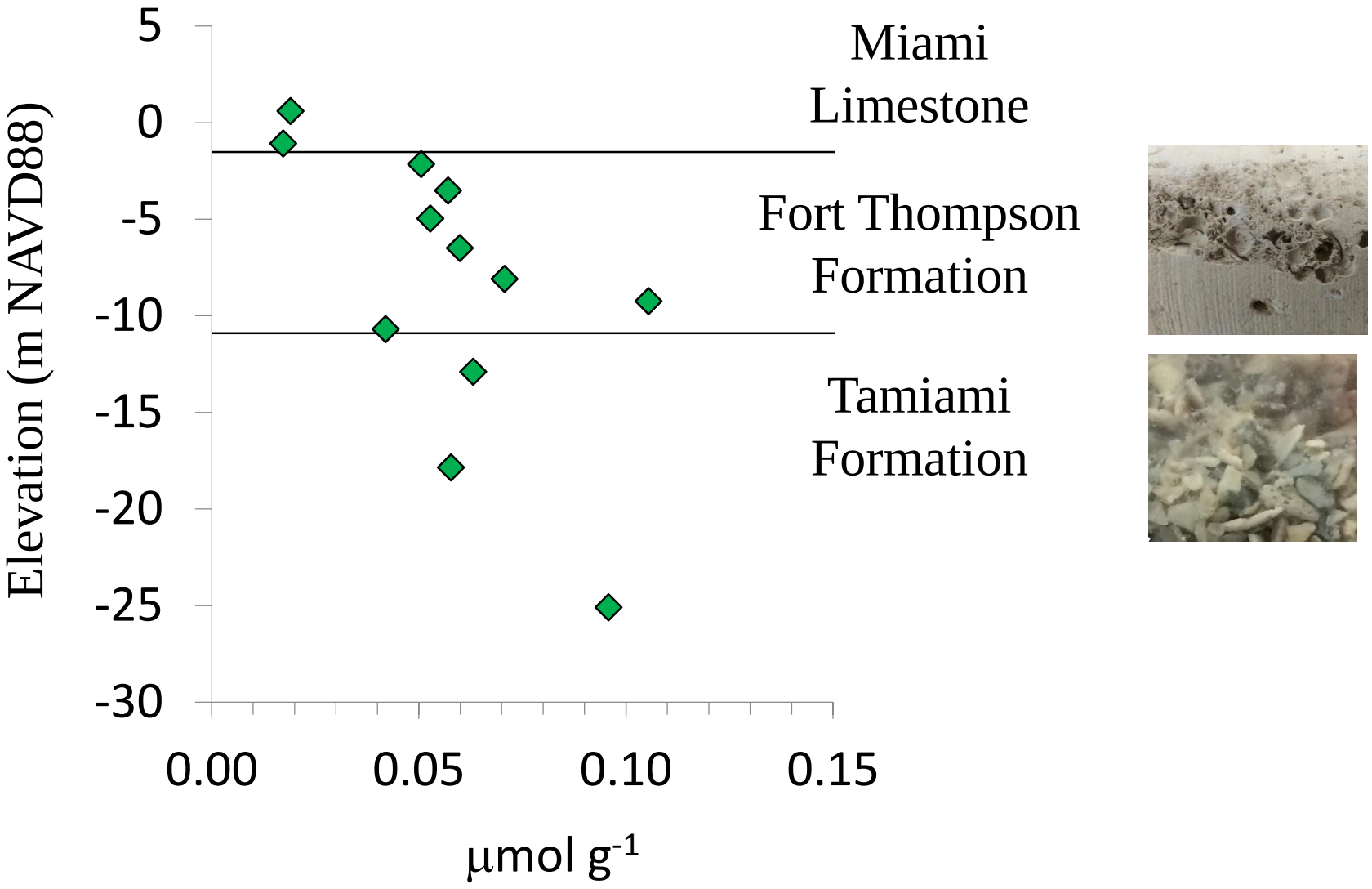
Miami Limestone

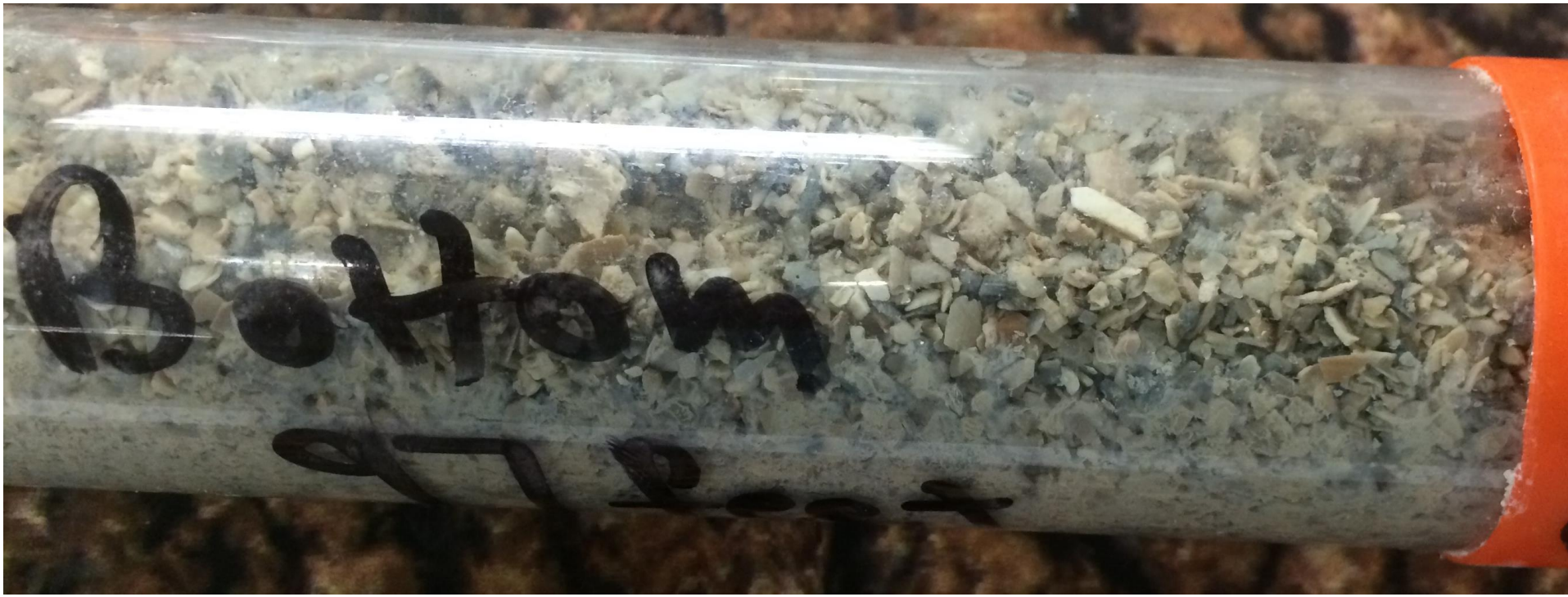
Fort Thompson Formation

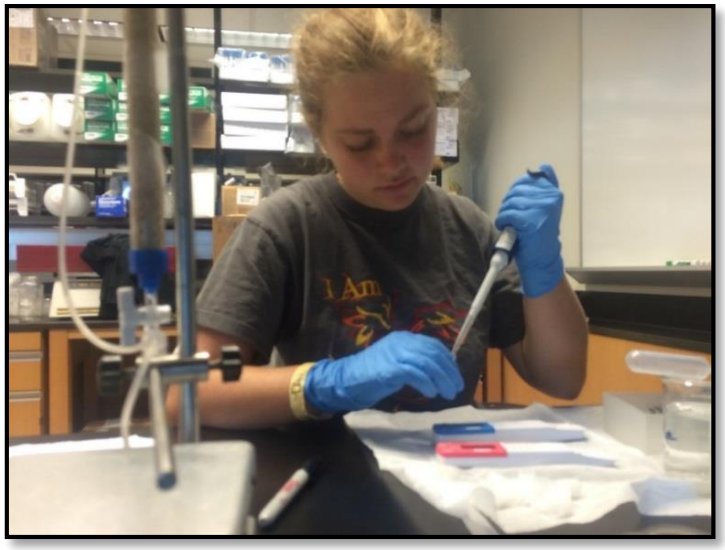
Tamiami Formation

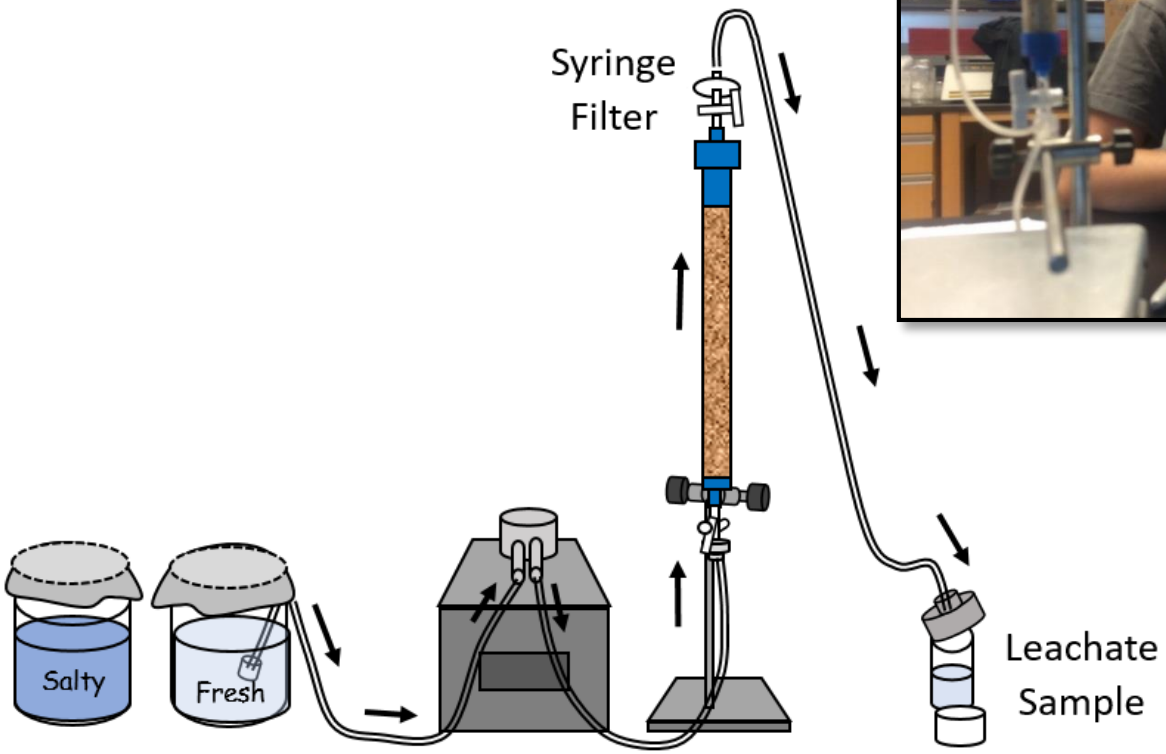
Cunningham et al., 2004; Cunningham et al., 2006

Loosely Adsorbed Inorganic Phosphorus




Bottom

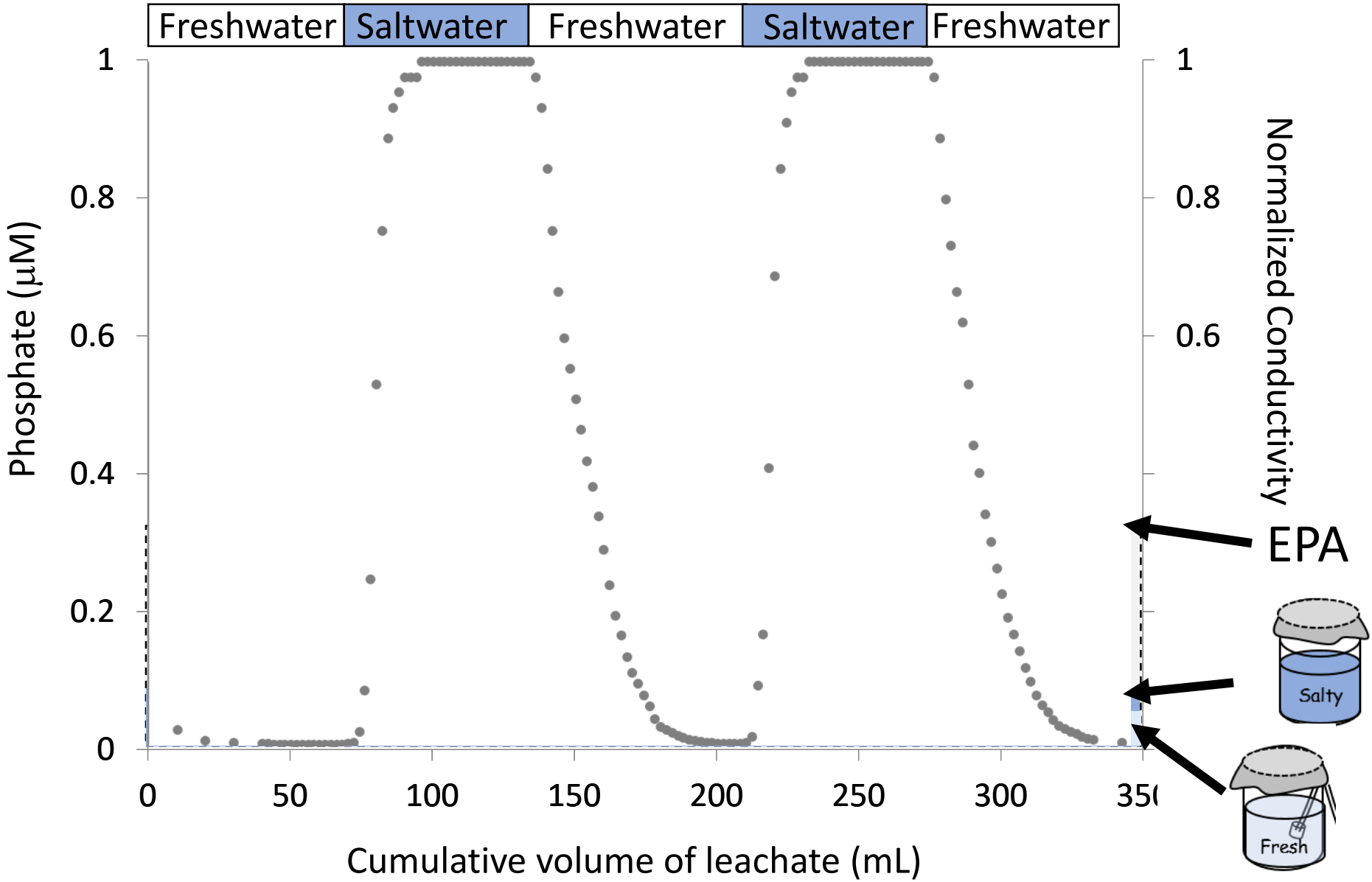




0 50 100 150 200 250 300 350

Cumulative volume through the column (ml)

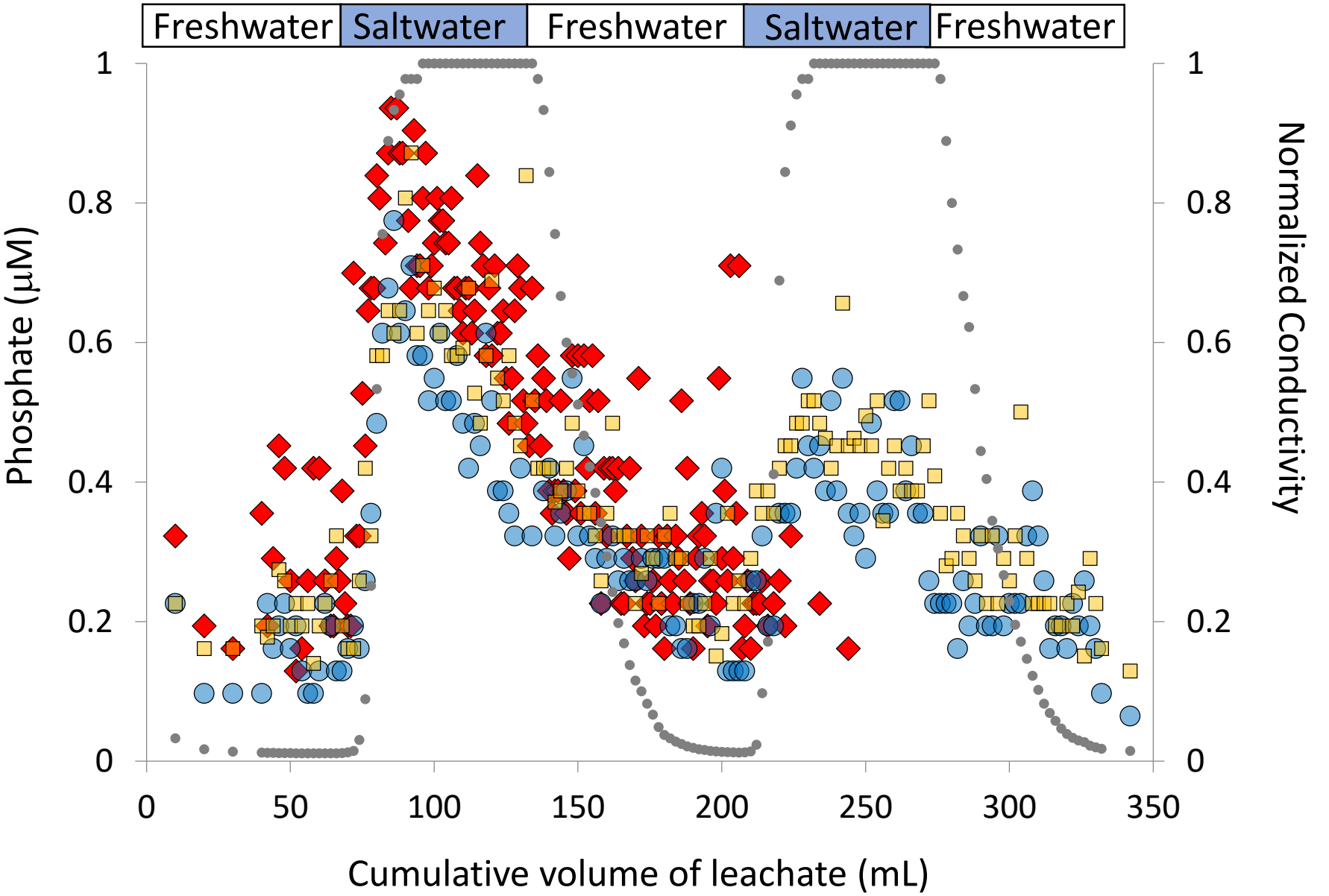
Passage of time (minutes)

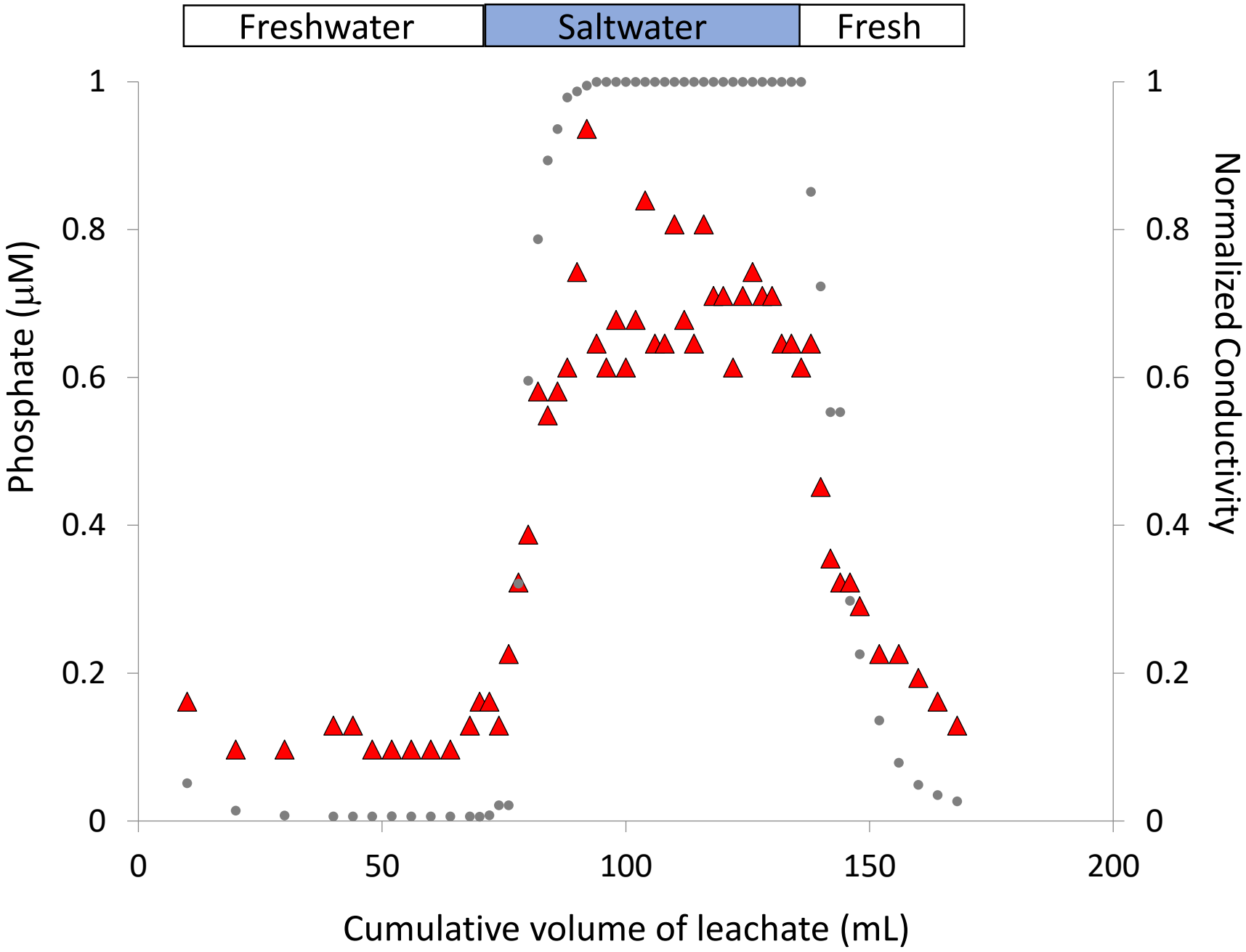


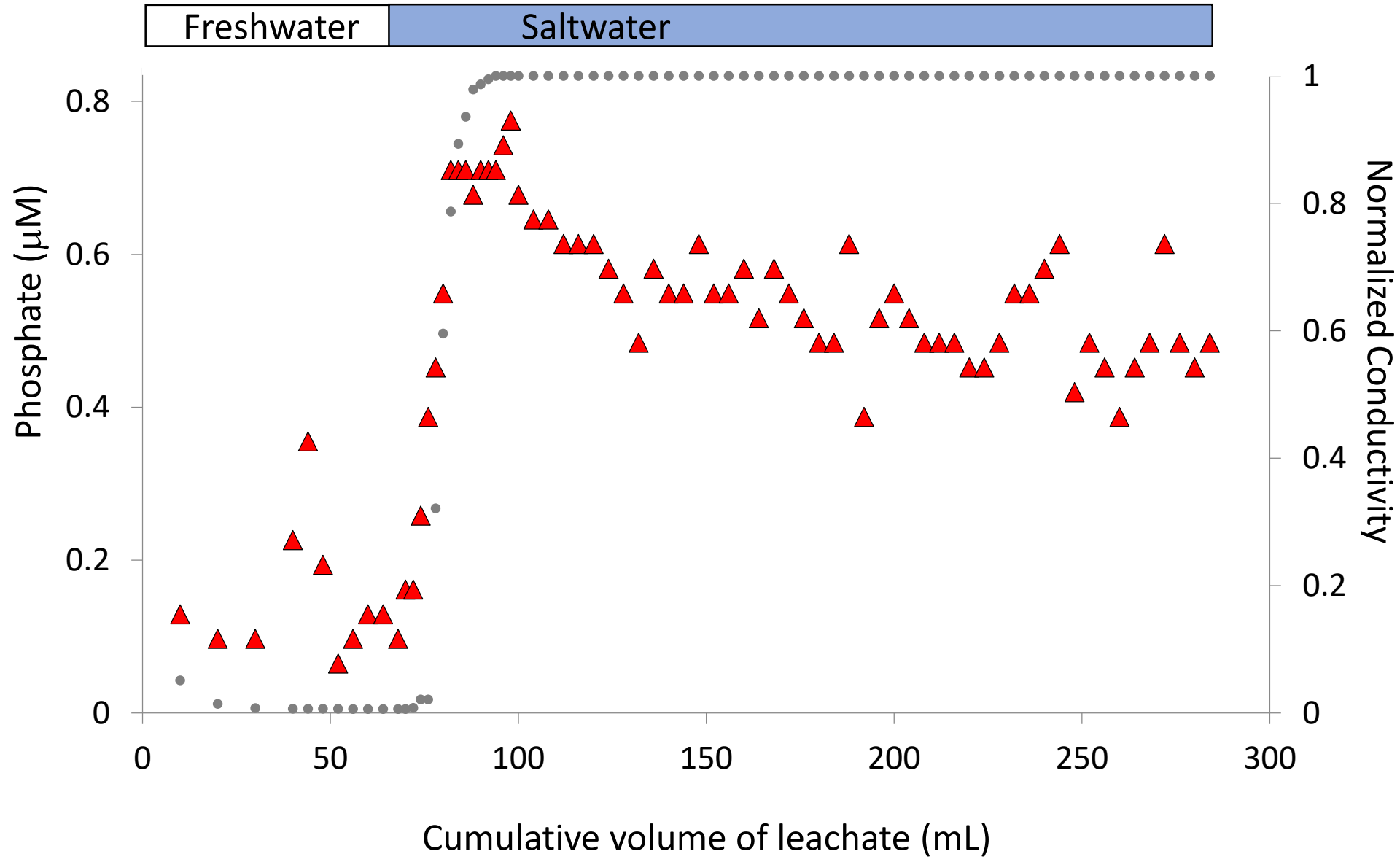
Flower et al. 2017

EPA: 0.322 µM total phosphorus

Saltwater: 0.076 µM phosphate
Freshwater: 0.050 µM phosphate

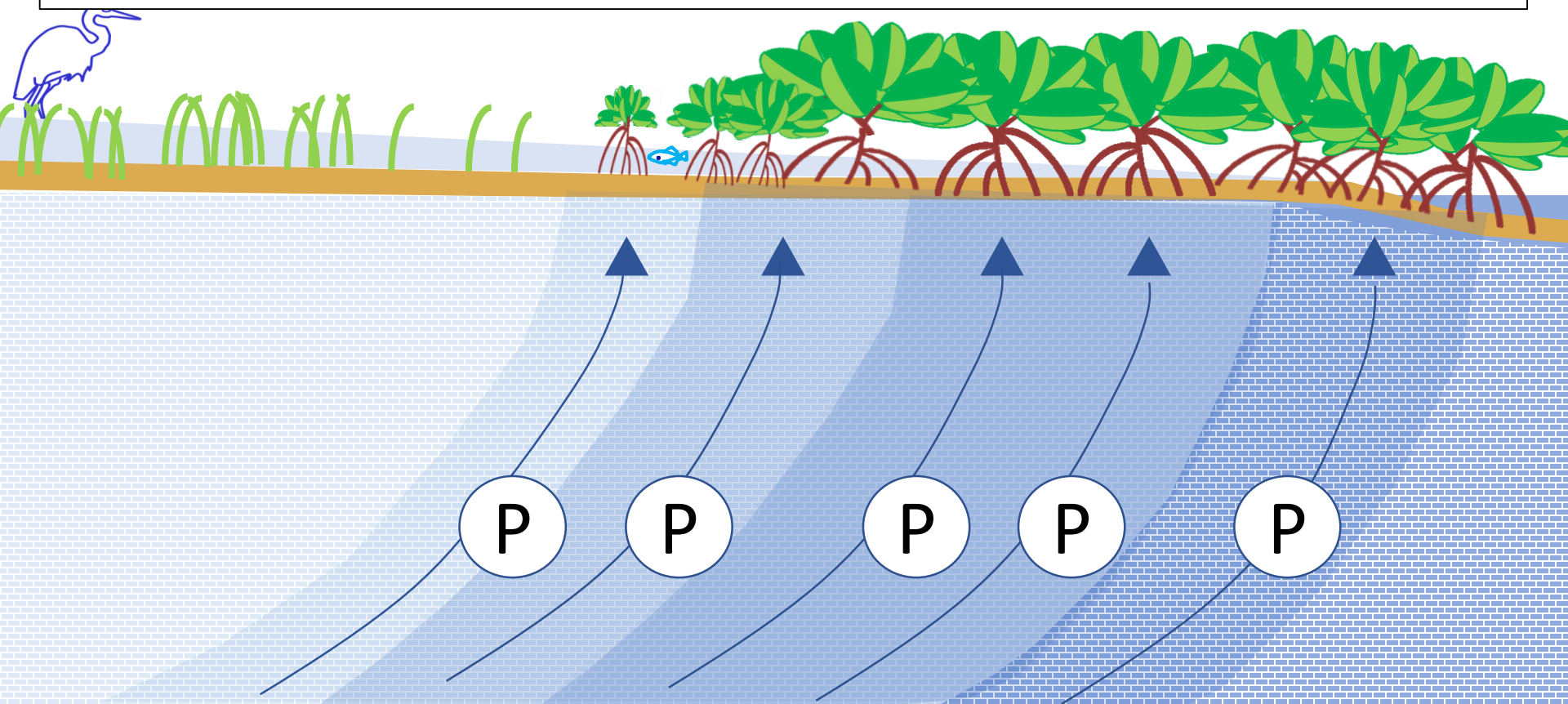

Freshwater
Saltwater
Freshwater
Saltwater
Freshwater
Phosphate (µM)
Normalized Conductivity
Cumulative volume of leachate (mL)
0
0.2
0.4
0.6
0.8
1
0
50
100
150
200
250
300
350


Freshwater
Saltwater
Fresh
Phosphate (µM)
Normalized Conductivity
Cumulative volume of leachate (mL)
0
0.2
0.4
0.6
0.8
1
0
50
100
150
200


Freshwater
Saltwater
Phosphate (µM)
0
0.2
0.4
0.6
0.8
Normalized Conductivity
0
0.2
0.4
0.6
0.8
1
0
50
100
150
200
250
300
Cumulative volume of leachate (mL)

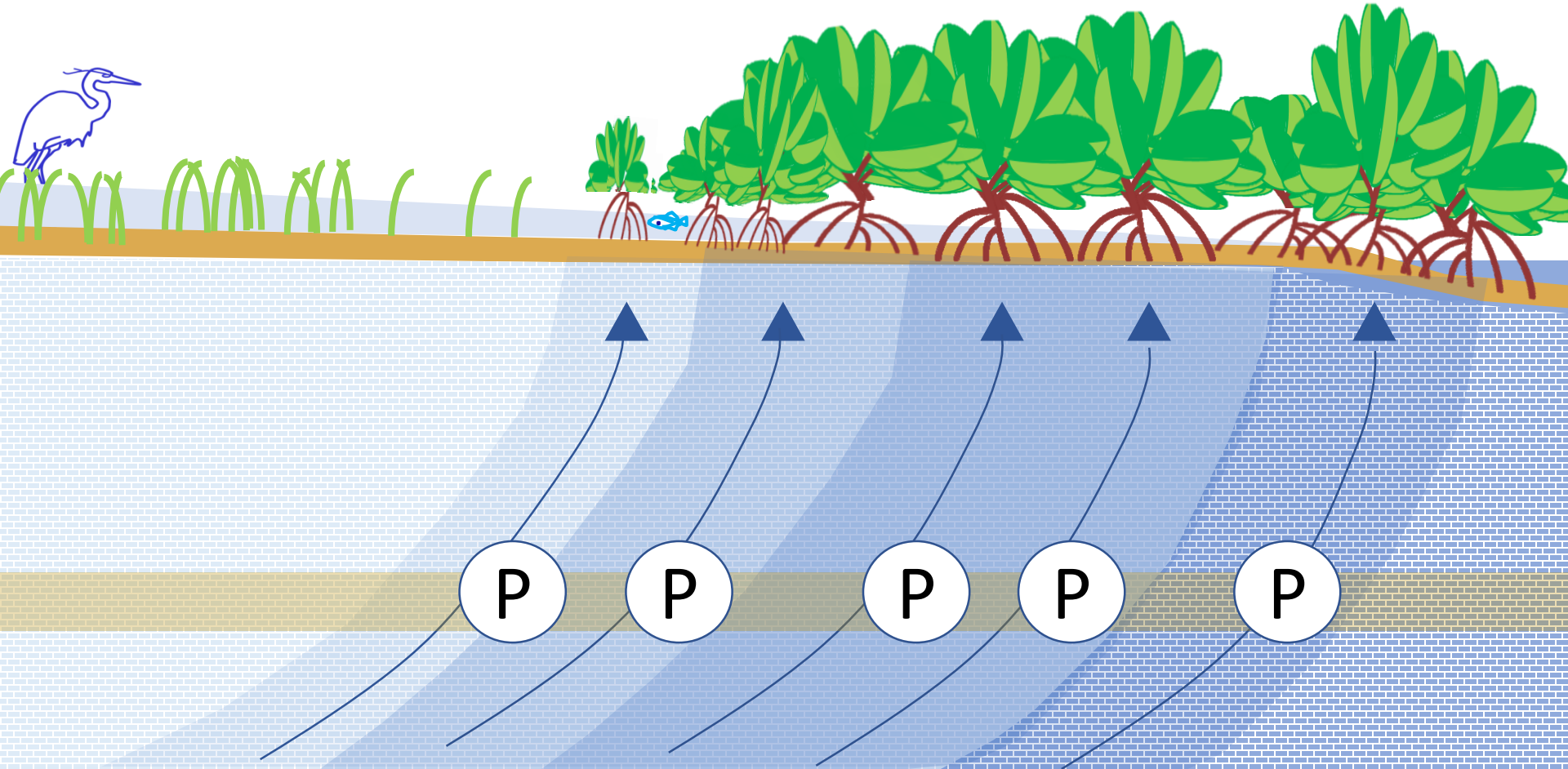
Conclusions:

1- An influx of saltwater to limestone from the Biscayne aquifer would be likely to trigger phosphorus desorption from mineral surfaces that is **intense, immediate, and sometimes sustained**



Conclusion:

2- Even rock layers with very low phosphorus content have the potential to raise groundwater phosphorus concentration enough to be ecologically significant



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USF

Dr. David Lewis

USF

Dr. Jia-Zhong Zhang

NOAA

NSF

FCE LTER

LTER

This project:

Flower, H., Rains, M., Lewis, D., Zhang, J.-Z., 2017. Rapid and Intense Phosphate Desorption Kinetics When Saltwater Intrudes into Carbonate Rock. *Estuaries and Coasts*, 1-13.

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