

Significance of Groundwater Discharge to Coastlines

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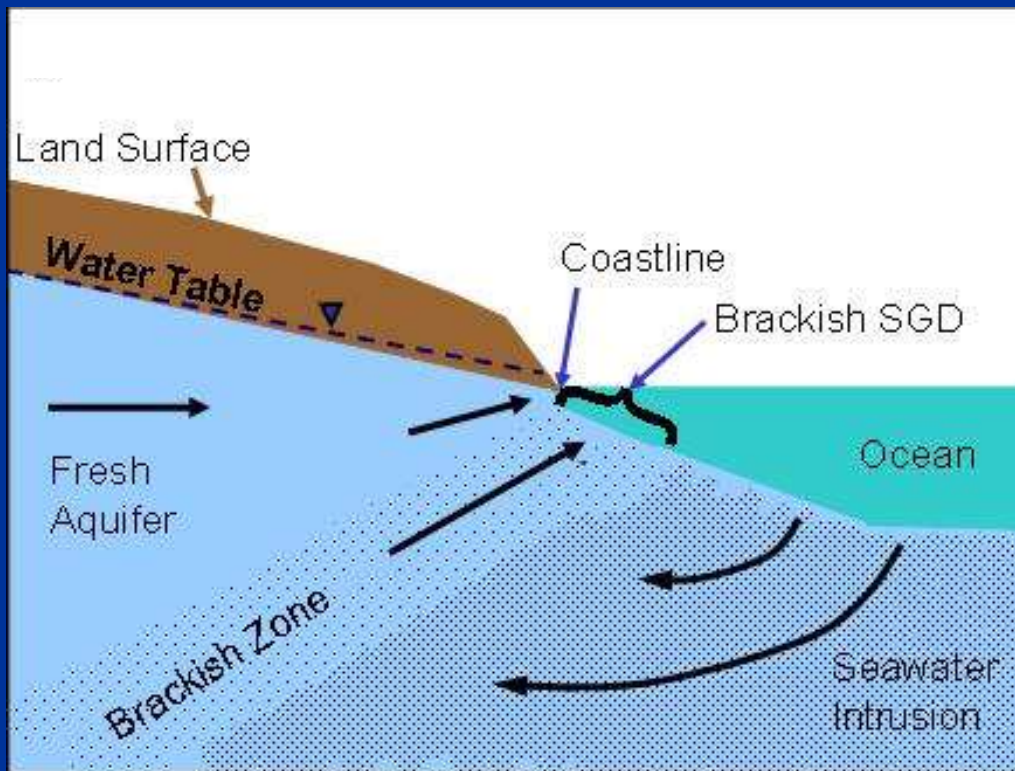
April 19, 2017



Florida Coastal Everglades
Long Term Ecological Research



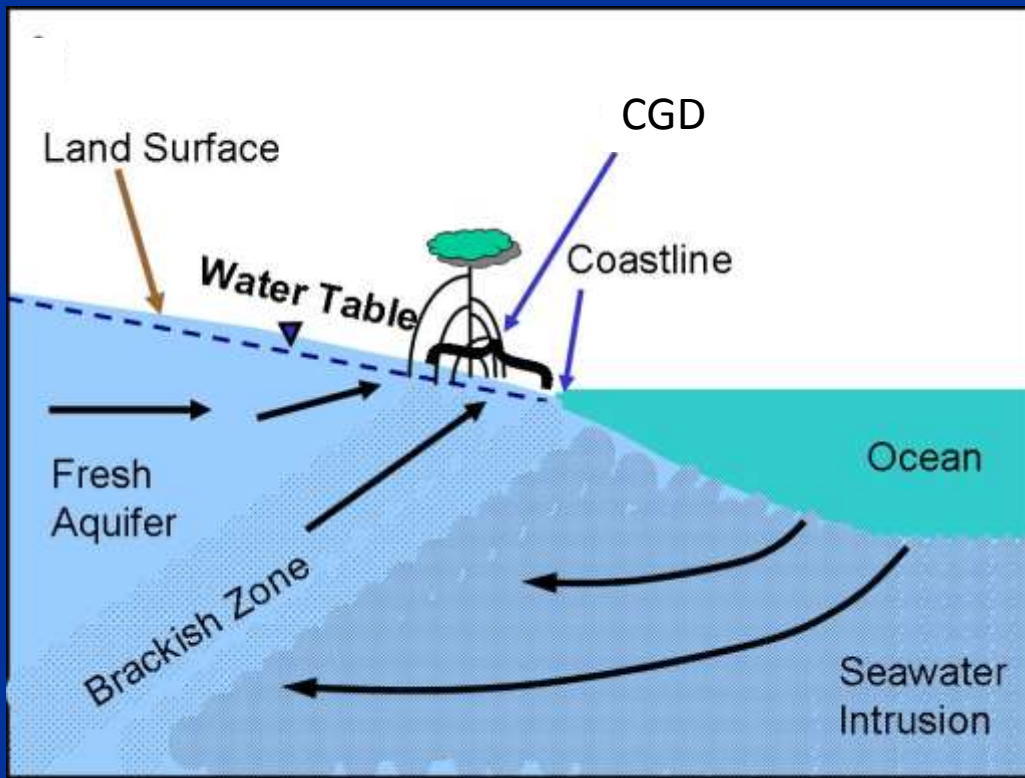
Submarine Groundwater Discharge (SGD)



Transfer of:

- Fresh and brackish Water
- Nutrients

Coastal Groundwater Discharge (CGD)

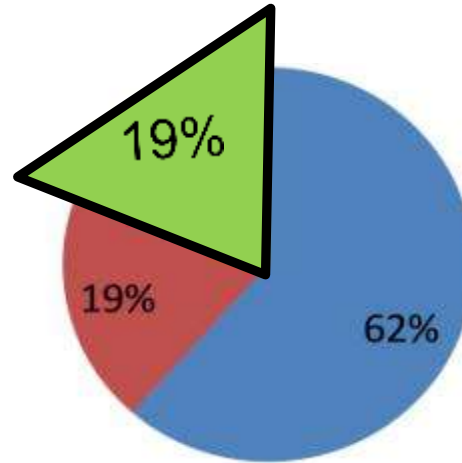


Transfer of:

- Brackish Water
- Nutrients
- Landward of coastline

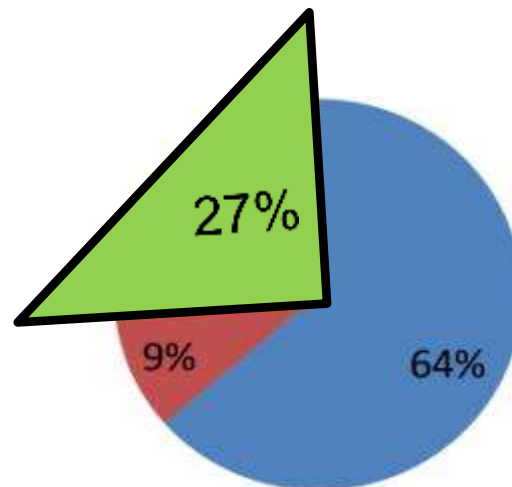
Groundwater Discharge

Shark



(Saha et al., 2012)

Taylor

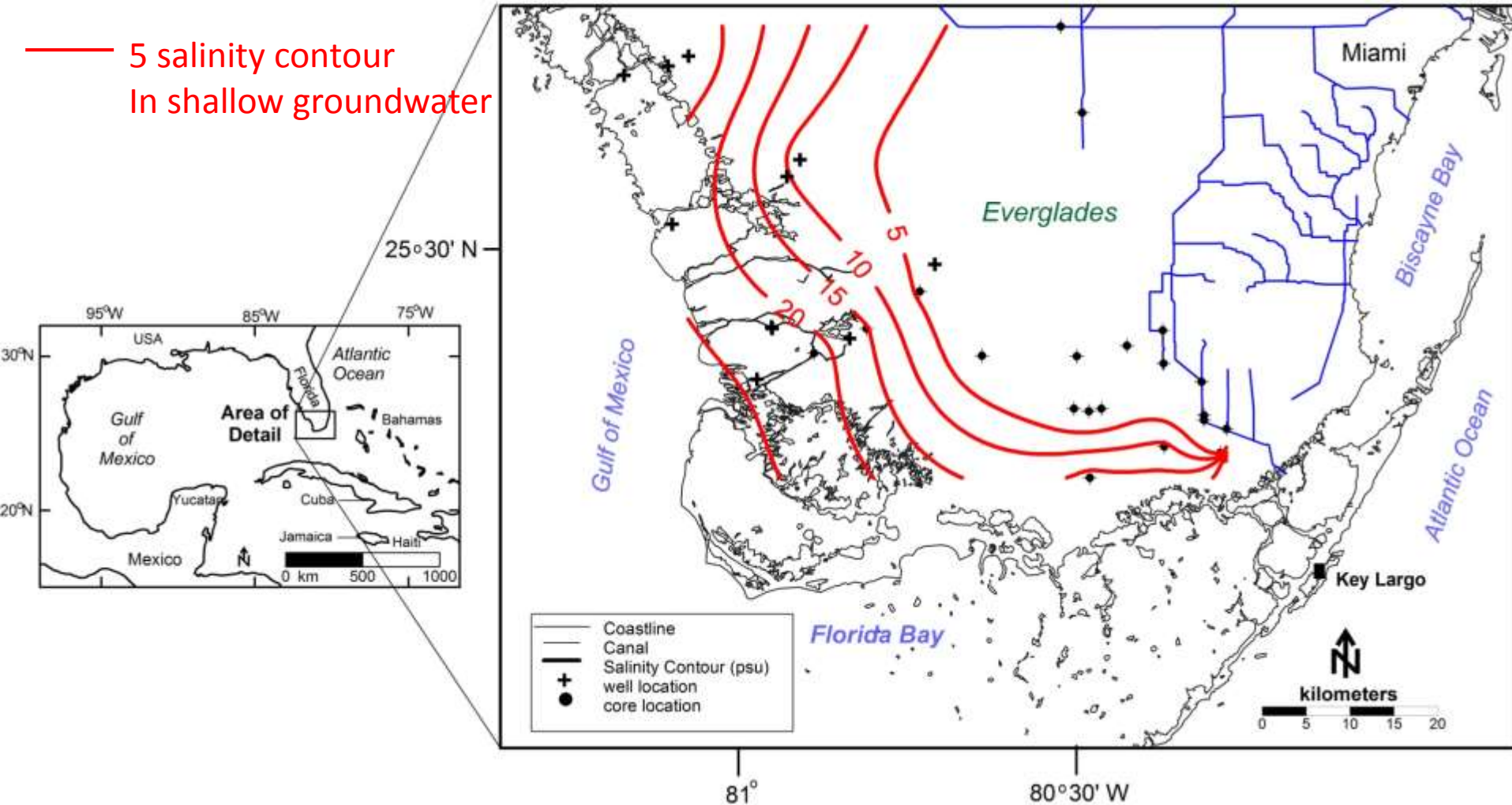


(Zapata et al., 2012;
Sandoval et al., 2016)

■ Rain ■ Qin ■ GWD

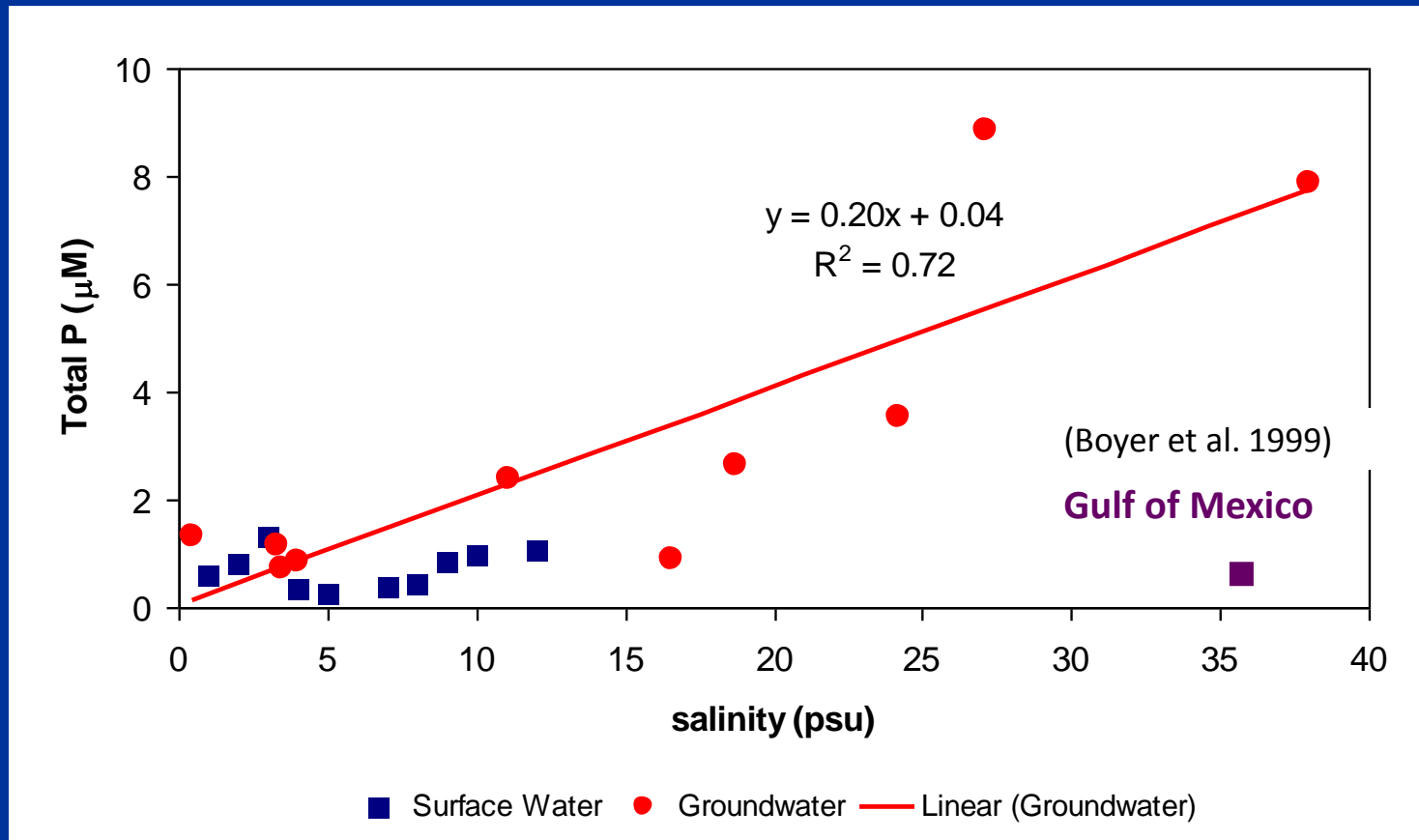
Seawater Intrusion

— 5 salinity contour
In shallow groundwater



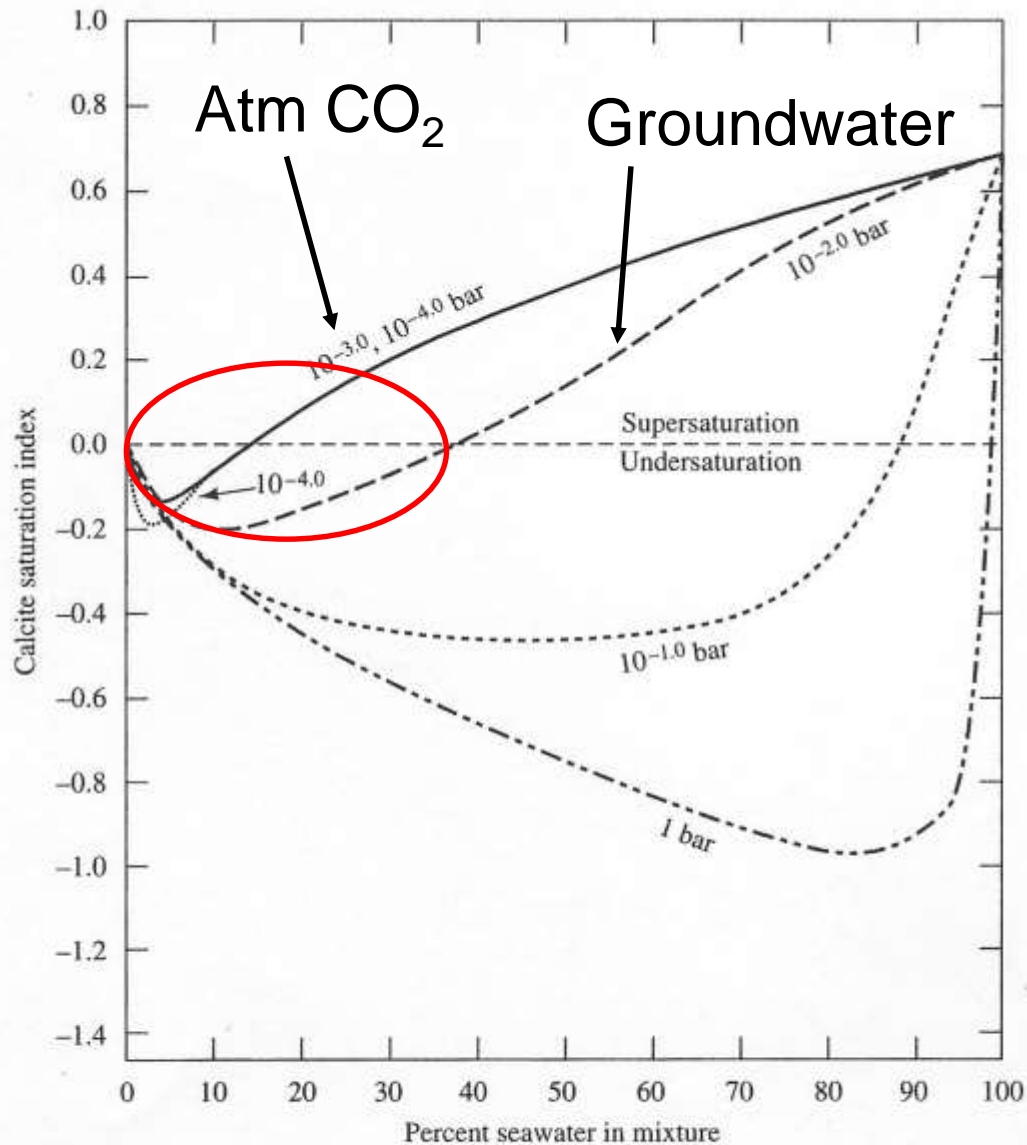
Price, et al., 2006, Hydrobiologia, 569:23-36.

Groundwater TP with salinity



Price, Swart, & Fourqurean. 2006. *Coastal Groundwater Discharge - an additional source of phosphorus for the oligotrophic wetlands of the Everglades*. *Hydrobiologia*, 569: 23-36.

Saturation Index of Calcite



$$SI_c = \frac{\{Ca^{2+}\}\{CO_3^{2-}\}}{K_{sp}}$$

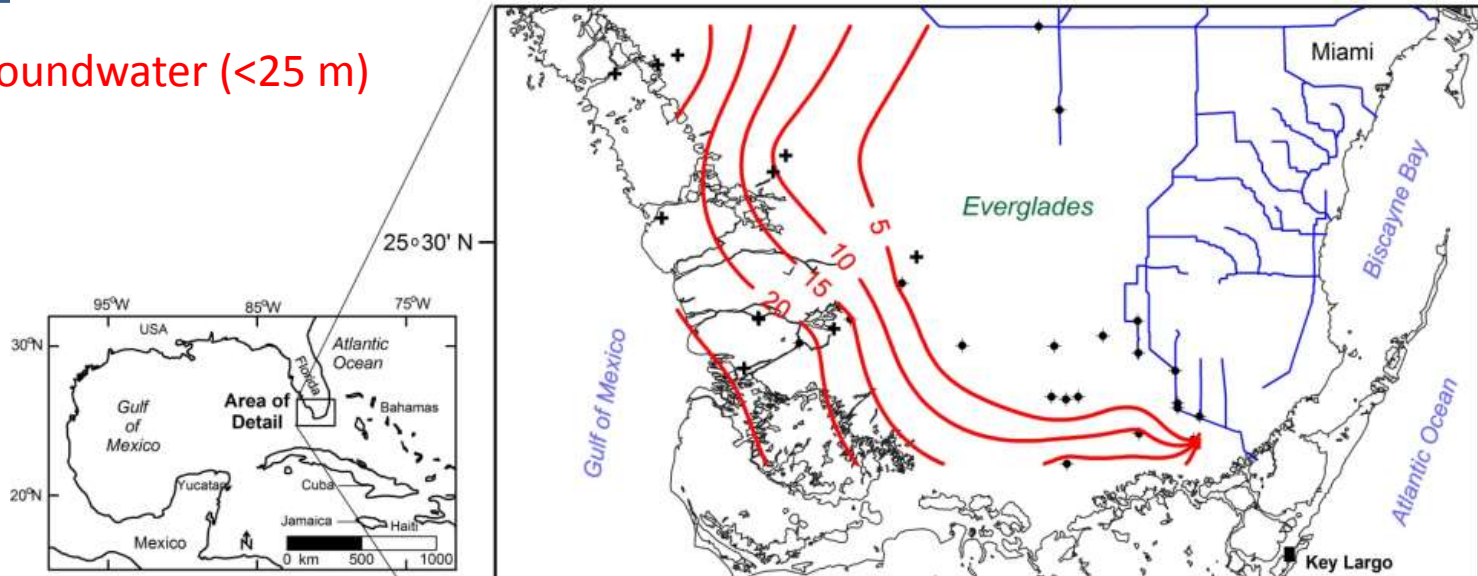
Figure 6.10 Saturation index of calcite in mixtures of seawater and freshwater in equilibrium with calcite at 25°C and different CO₂ pressures. From L. N. Plummer, Mixing of seawater with calcium carbonate water, *Geol. Soc. Am. Memoir* 142. © 1975 by The Geological Society of America. Used by permission.

P from Aquifer



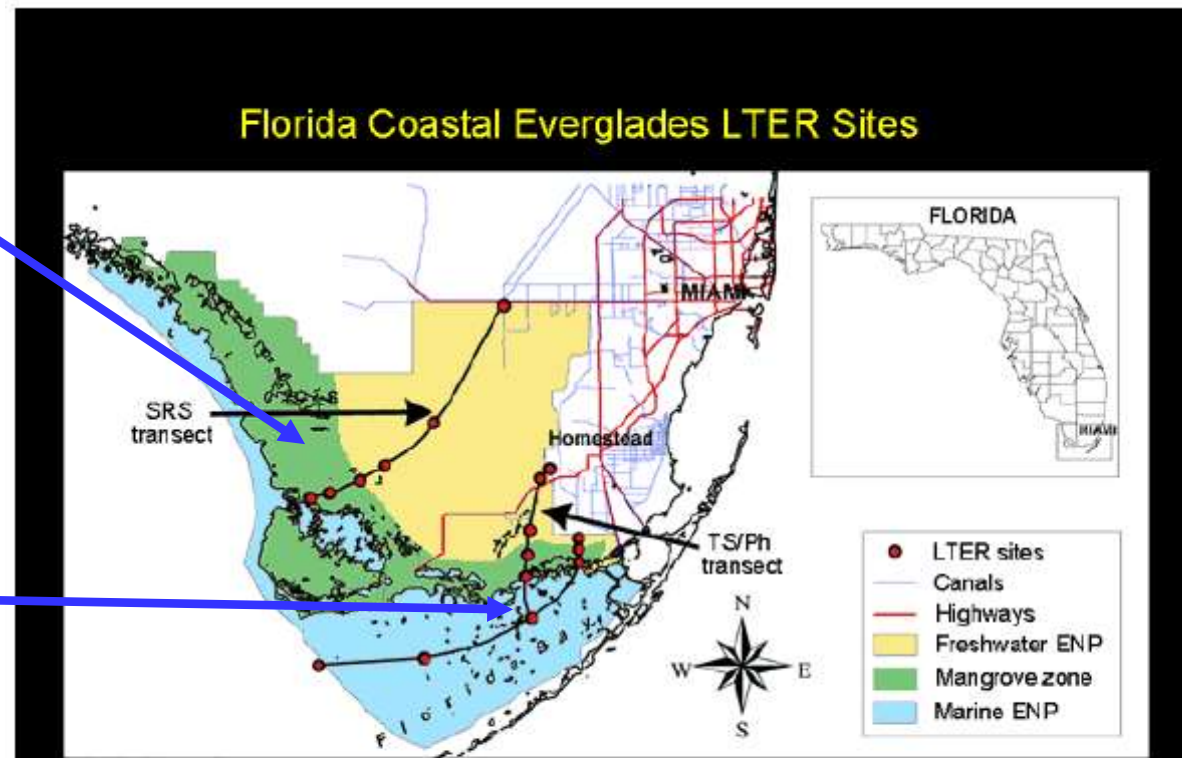
Average = 50 μg P/g rock

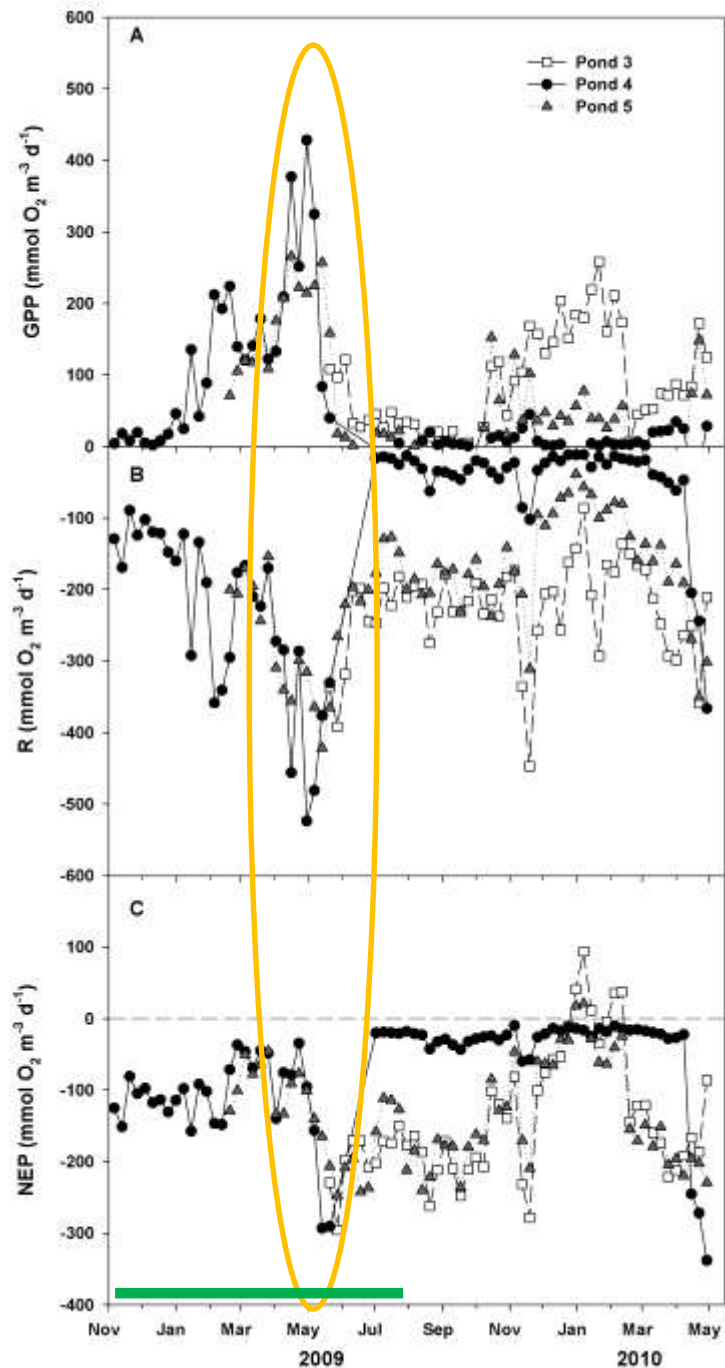
Shallow Groundwater (<25 m) salinity



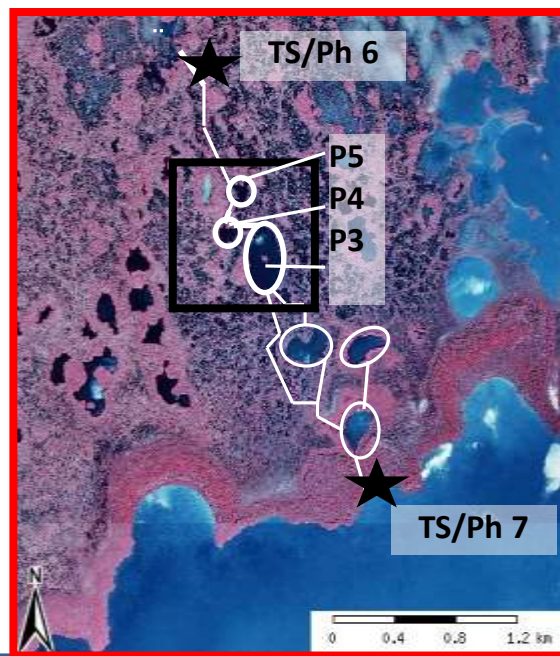
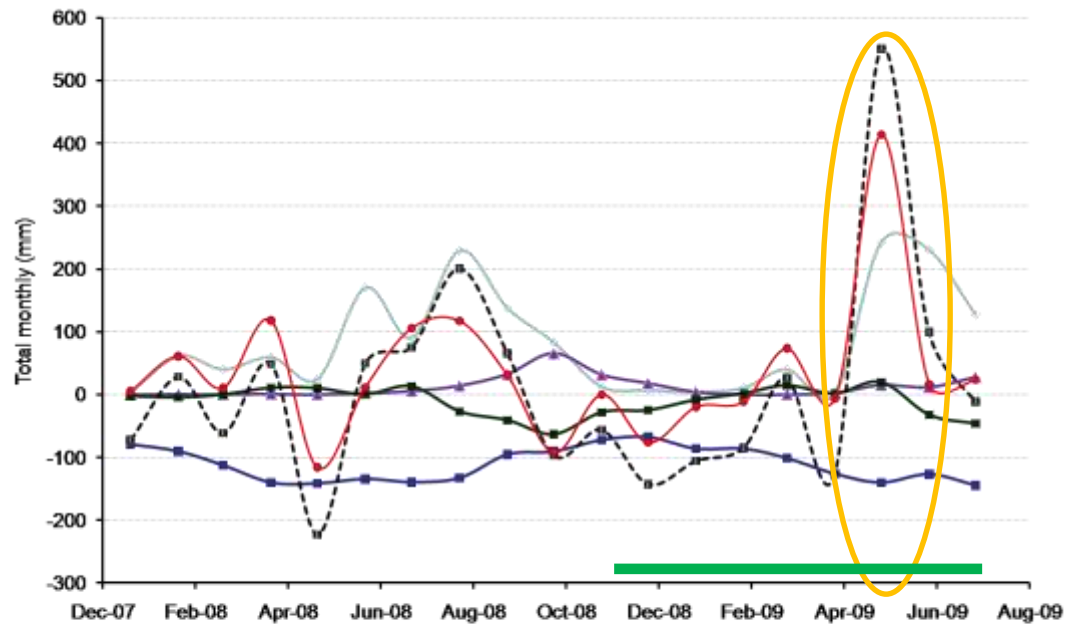
Mangroves
(Simard et al. 2006)

P in sediments & seagrasses
(Herbert et al. 2009)





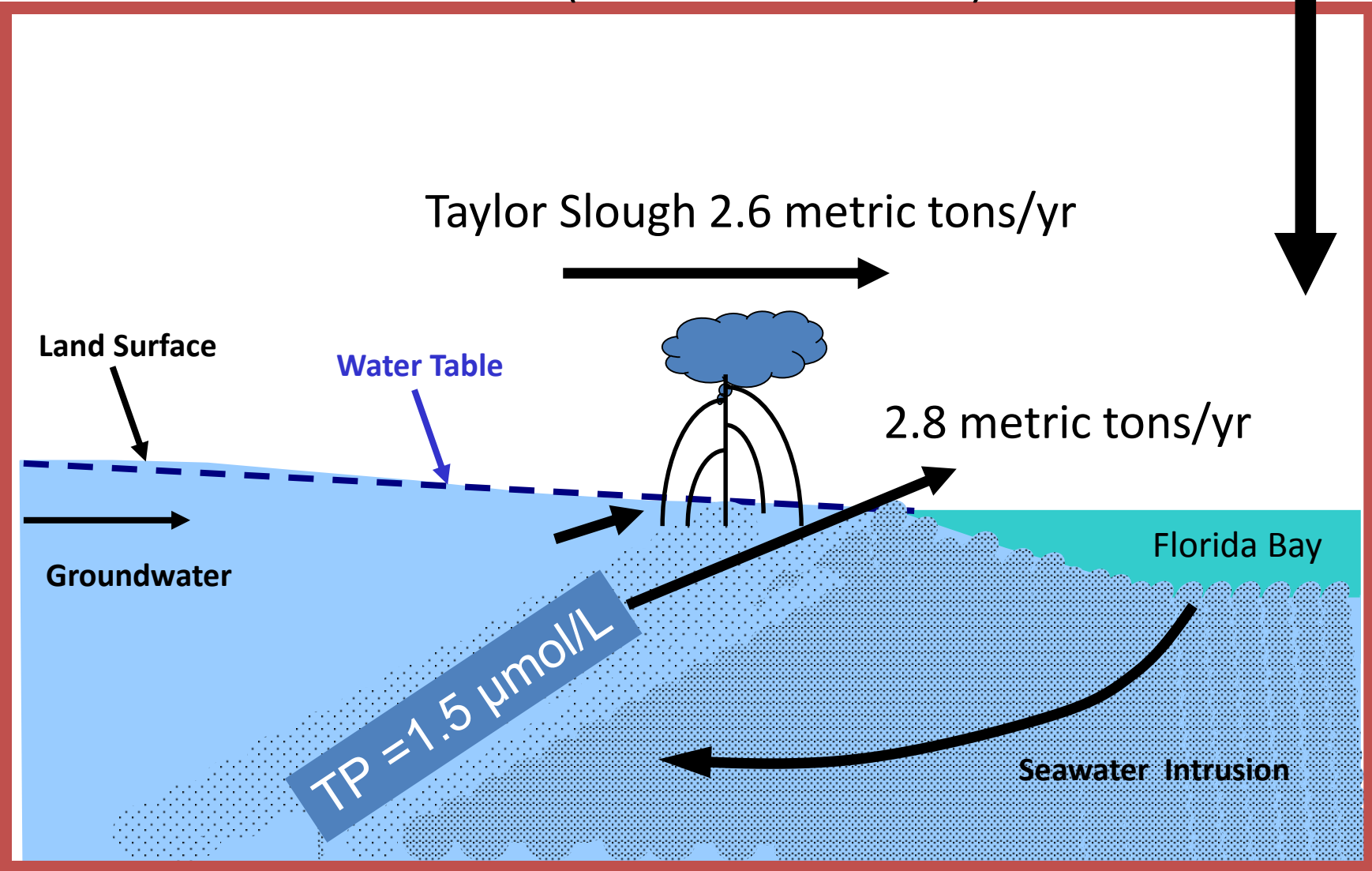
Water Balance Results



--- Change storage --- Recharge

Koch et al. (2012)
Estuaries and Coasts

Atmospheric Inputs 5.6 metric tons/yr
(Pollman et al. 2002)



Taylor Slough 2.6 metric tons/yr

2.8 metric tons/yr

TP = 1.5 μmol/L

Florida Bay

Seawater Intrusion

Land Surface

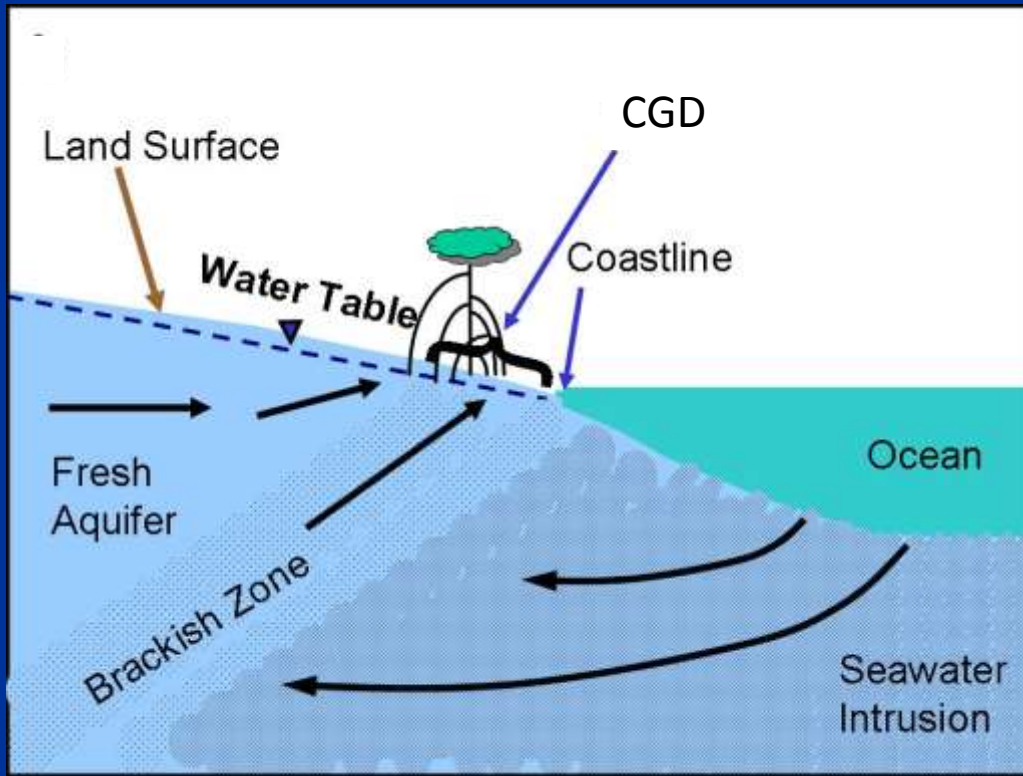
Water Table

Groundwater

Conclusions

CGD Contributes:

- Brackish Water
- Nutrients
- Stimulates Primary Production



Time	Speaker	Title
1:45pm	Hilary Flower	Seawater-induced phosphorus desorption as a source of phosphorus to the Everglades
2:00 pm	Christopher Smith	The Role of Tides in Groundwater-Surface Water Exchange in the Shark River, Florida Coastal Everglades, Florida
2:15 pm	Shimelis Dessu	Taylor Slough Groundwater Discharge Simulation Using Sutra
2:30 pm	Joshua Allen	Hydrochemical Conditions of Two Estuarine Mangrove Lake Drainage Systems in the Everglades