

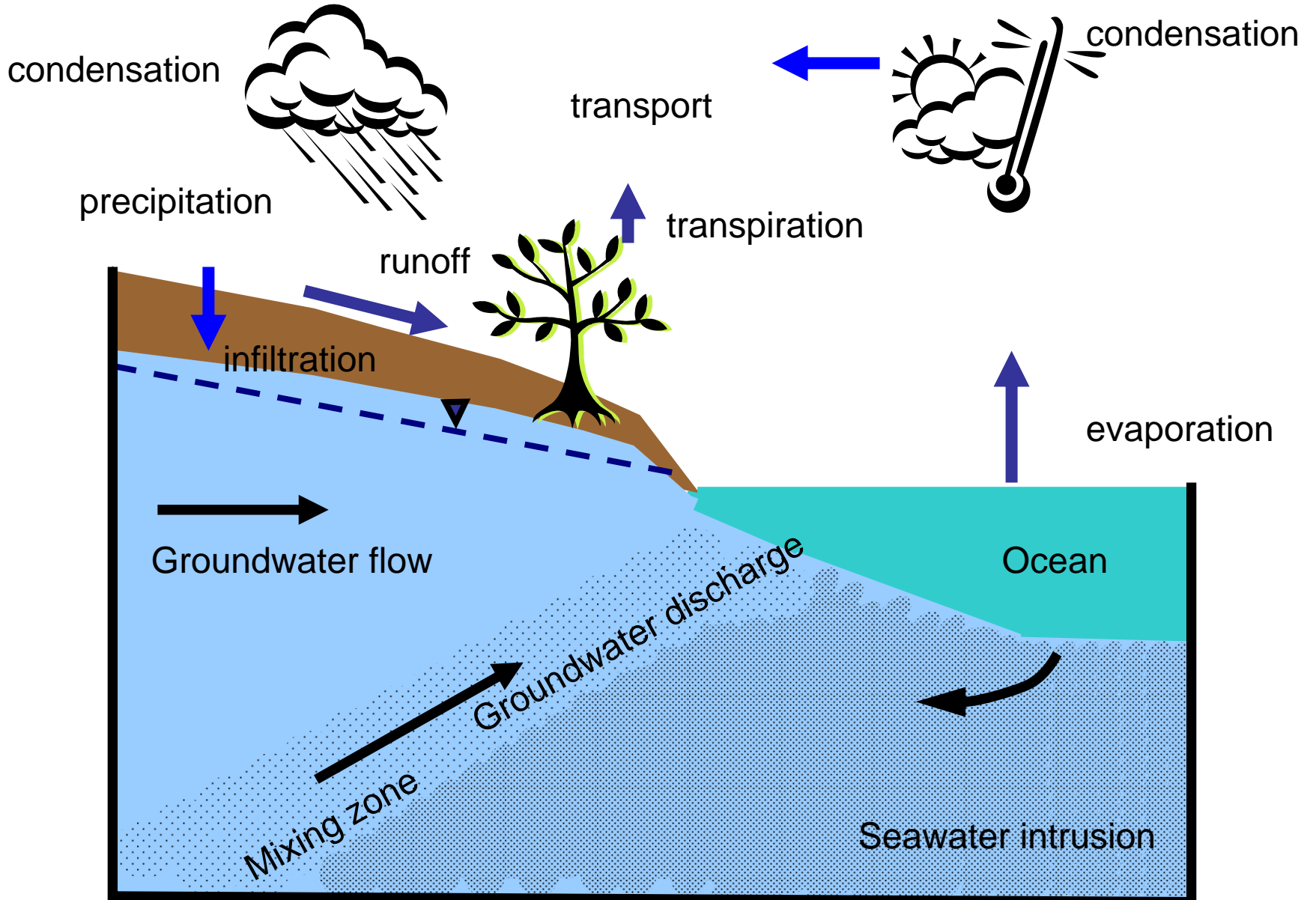
FCE II HYDROLOGY WORKING GROUP

Co-Leads

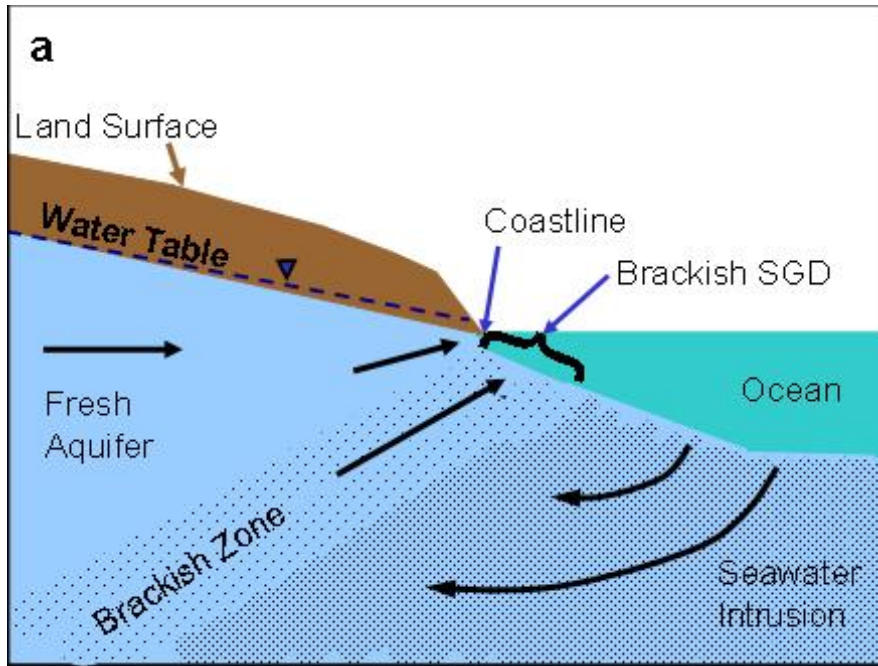
René M. Price – FIU
Vic Engel - ENP



Hydrologic Cycle

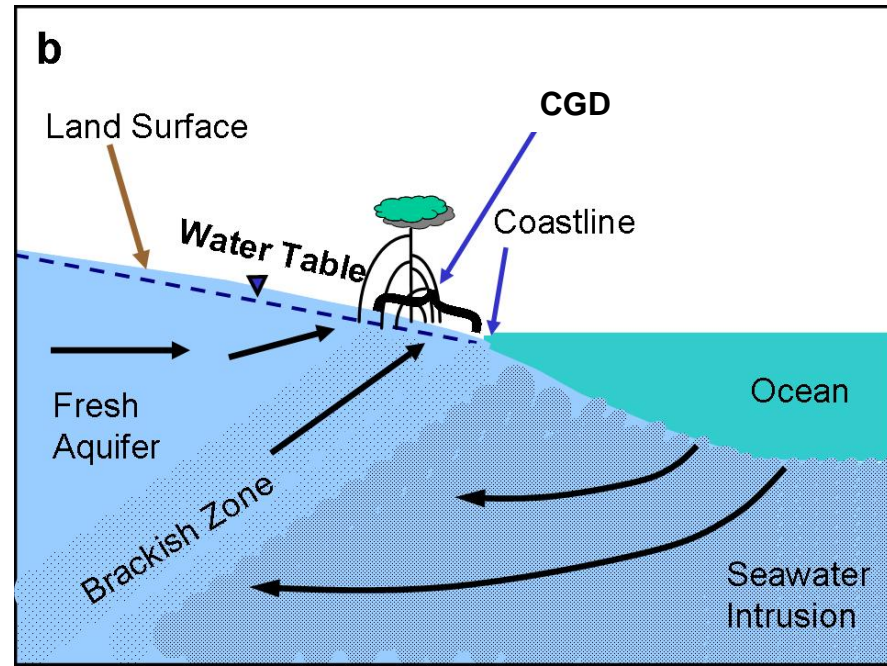


Submarine Groundwater Discharge (SGD)

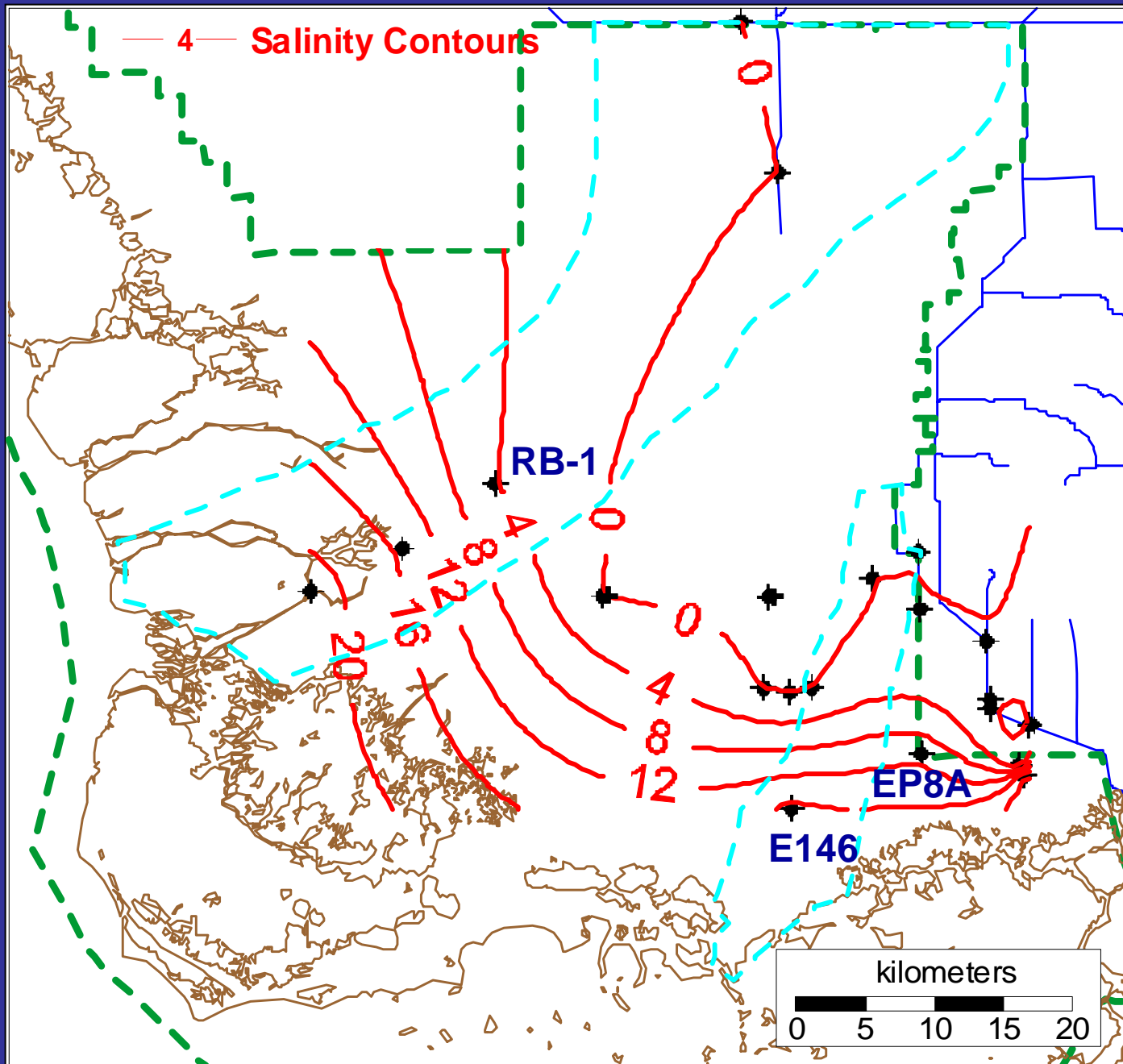


Biscayne Bay

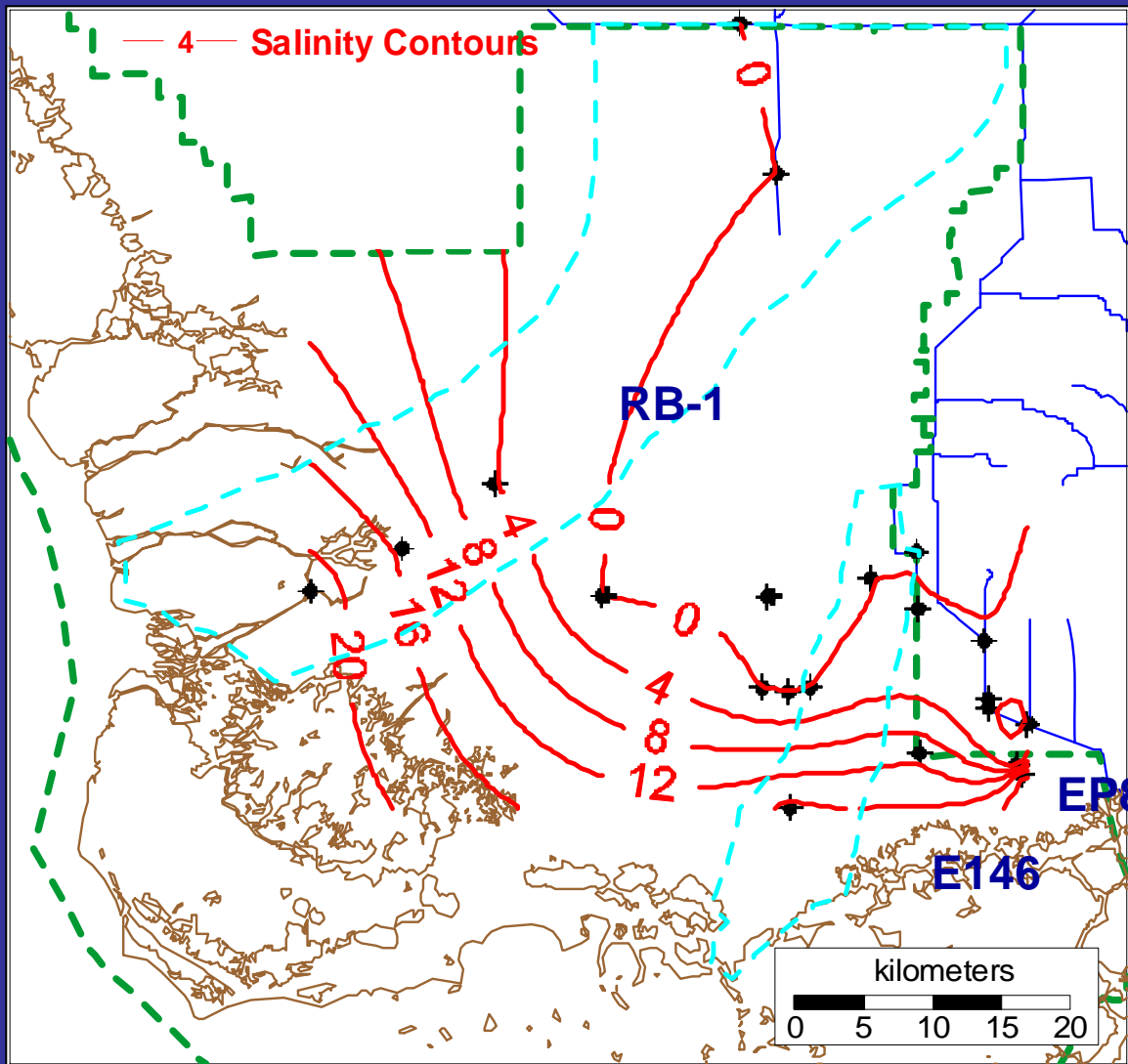
Coastal Groundwater Discharge (CGD)



Florida Bay



Salinity
Contours
of Shallow
Groundwater
(<28 m)

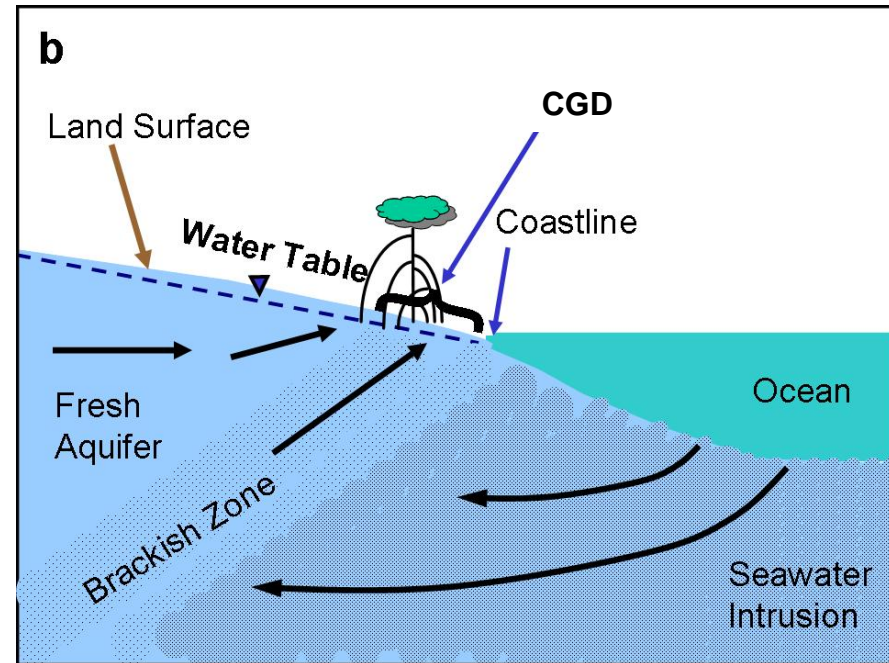


Position of groundwater
Mixing zone

CGD Observations

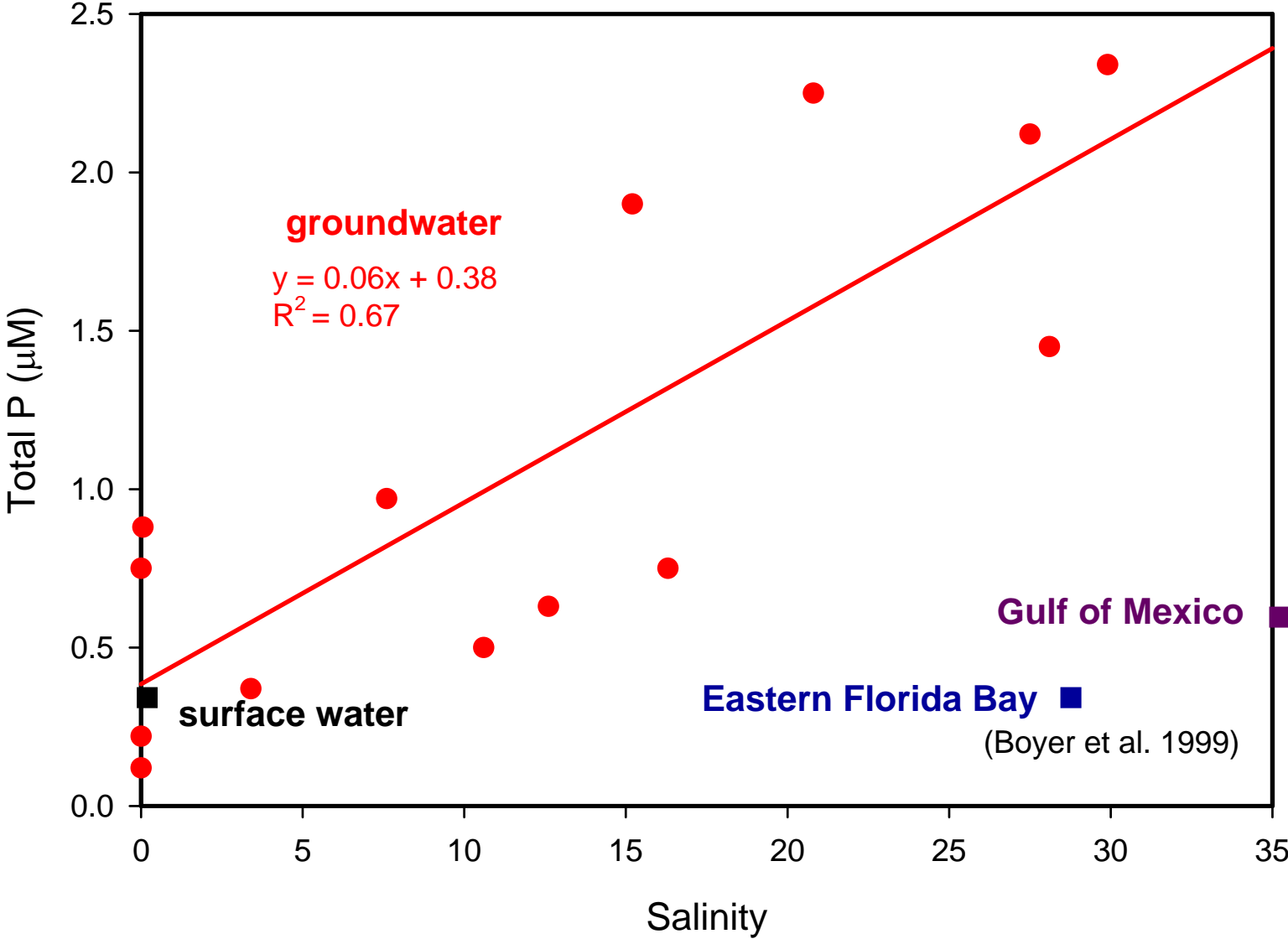
- Elevated concentrations of sodium, chloride and calcium in surface water
- Observed in the dry season, when surface water levels are low
- Groundwater contains elevated P concentrations.

Coastal Groundwater Discharge (CGD)



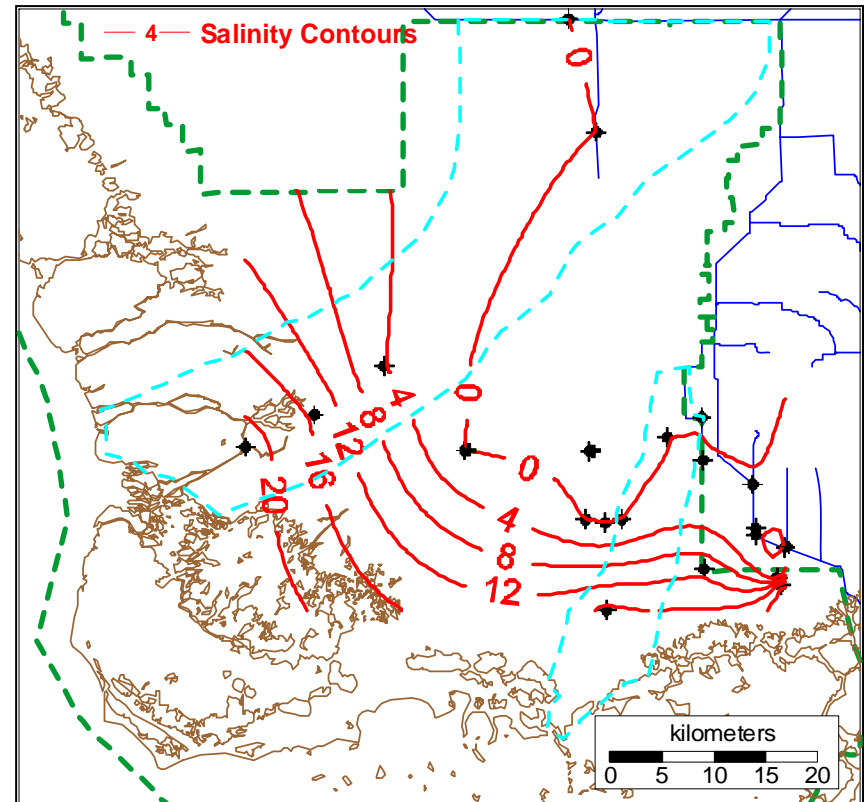
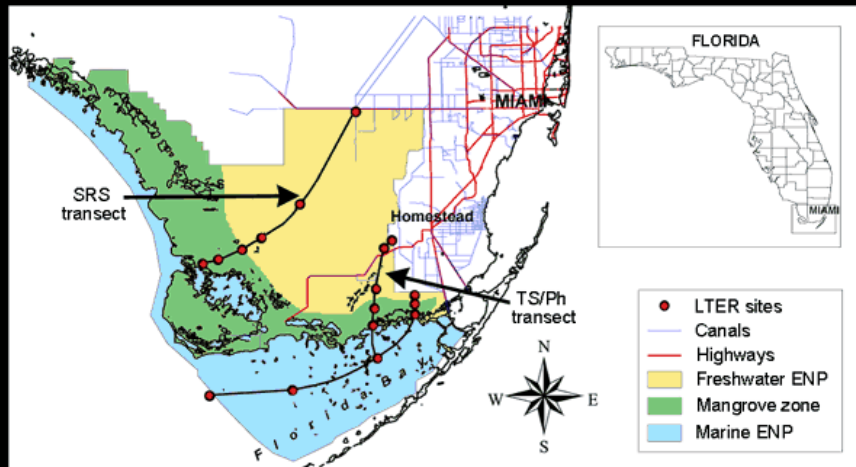
Florida Bay

Phosphorus Concentrations



Is there a connection between location of Mangrove Ecotone and underlying groundwater salinity and P content?

Florida Coastal Everglades LTER Sites



FCE II GENERAL QUESTION :

How will the interaction of surface and groundwater inflows, tidal energy and seawater intrusion, local rainfall, and evapotranspiration control (physical and chemical) hydrologic conditions in the oligohaline ecotone under conditions of increasing freshwater inflows from the Everglades?

Research Questions

- 1. How will changing inflows from the upstream Everglades affect the position of the salinity mixing zone and alter geochemical conditions in the ecotone by suppressing brackish groundwater discharge?**
- 2. How will changing freshwater inflows affect water residence times in the oligohaline ecotones of Taylor and Shark River Sloughs?**

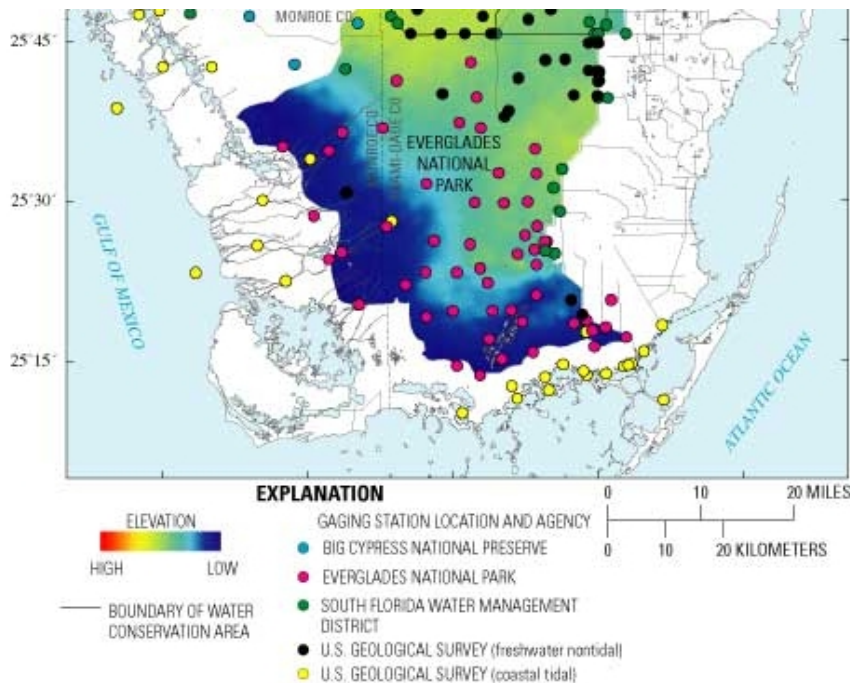
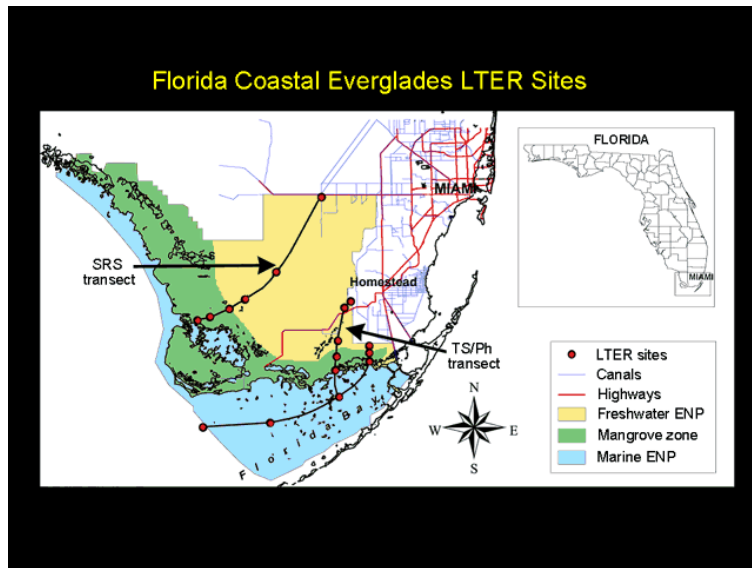
Research Question 1

Methods

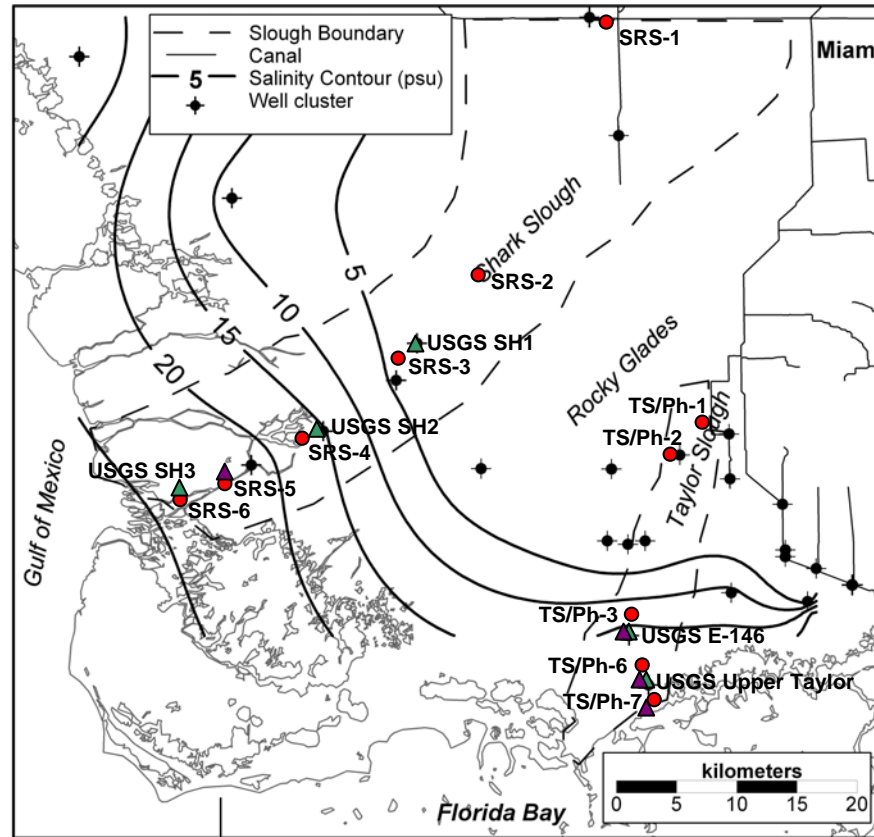
Continuous surface water level monitoring stations: ENP, USGS, SFWMD, LTER

Everglades Depth Estimation Network (EDEN) interpolates water depths between stations

**Surface Water Discharge: SFWMD canals
USGS Tidal stations**



Position of seawater mixing zone will be monitored with groundwater wells



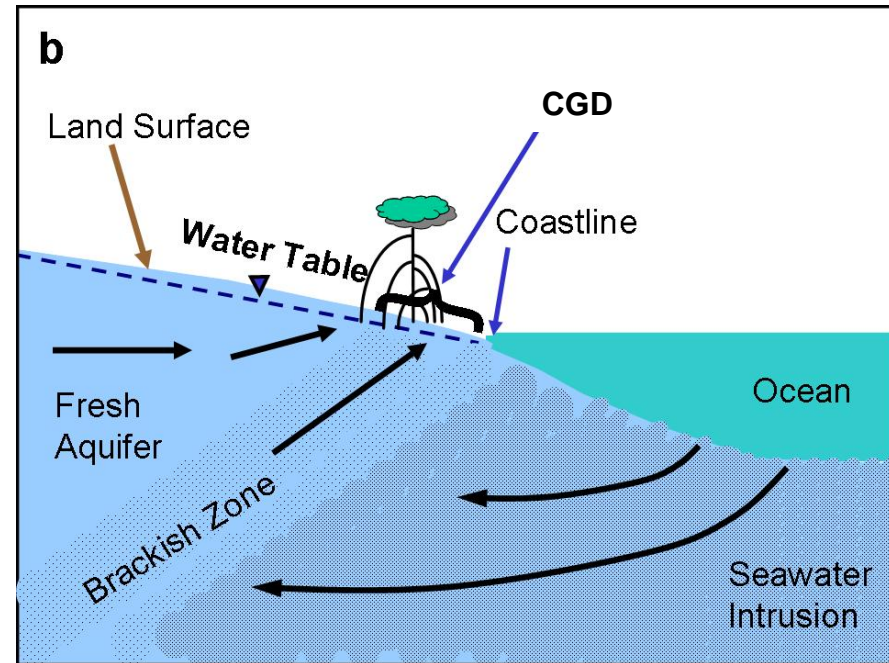
- LTER sites
- ▲ USGS Groundwater sites
- ▲ LTER II Proposed Groundwater sites

Quantifying CGD

Most challenging- using a variety of methods

- Mass balance on chloride and calcium
- Oxygen and hydrogen isotopes
- Streaming resistivity and ^{222}Rn : Pete Swarzenski –USGS
- Subsurface heat flux monitoring and modeling: Mark Rains –USF

Coastal Groundwater Discharge (CGD)



Research Question 2:

How will changing freshwater inflows affect water residence times in the oligohaline ecotones of Taylor and Shark River Sloughs?

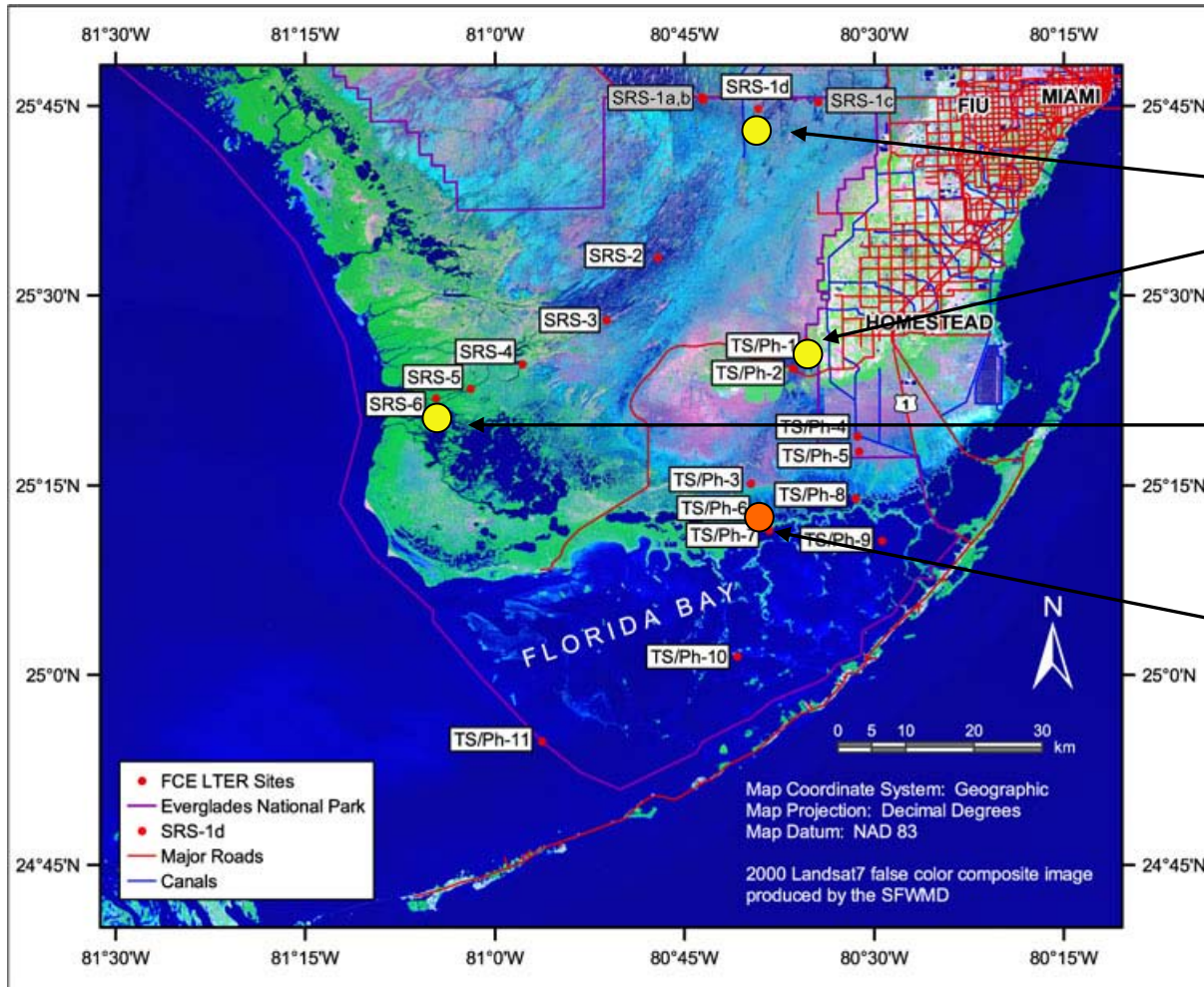
Methods

Estimating water residence times through a number of techniques

- Mass-Balance of water

Rainfall, ET, surface water flows, groundwater and seawater influences

ET Stations

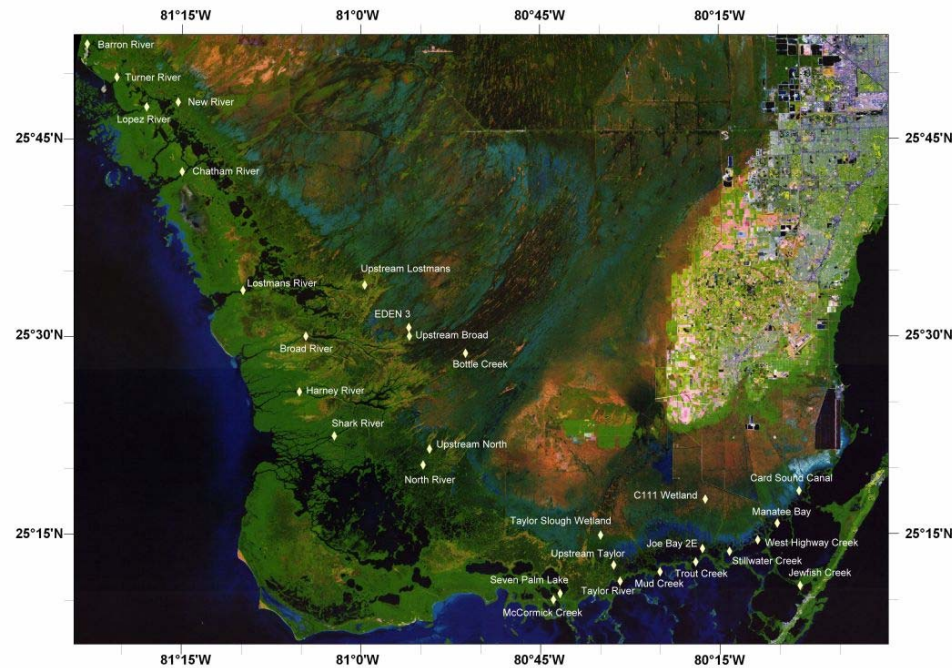
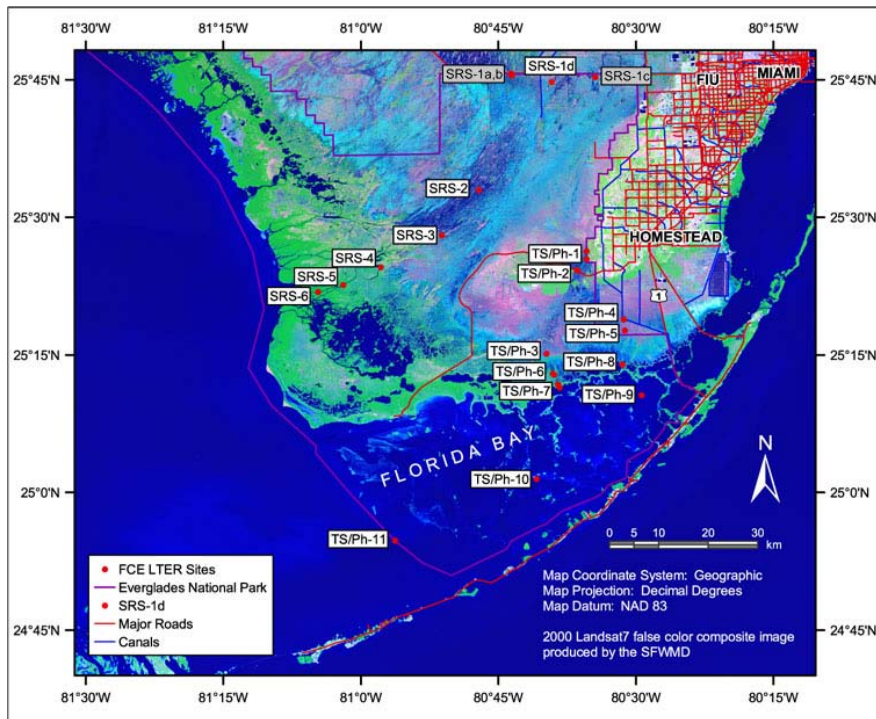


Eddy-flux towers-
Steve Oberbauer- FIU

Eddy-flux tower-
University of VA

Proposed Installation
of a Campbell
Scientific, Inc. ET106
Evapotranspiration
Station at TS/PH-6b

Surface water flow monitoring sites



USGS Tide stations

Chemical approaches to estimate surface water flow and residence times

- Chemical Mass balance of chloride, oxygen and hydrogen isotopes
- Radium Isotopes ($^{223}, ^{224}, ^{226}, ^{228}\text{Ra}$)
in surface water (Pete Swarzenski –USGS)
- SF-6 tracer of surface water flow (Vic Engel – ENP)

Ultimate Goal

Combine estimates of water and chemical mass balances with hydrological modeling and nutrient concentrations to calculate fluxes of water and nutrients into and out of the Mangrove ecotone and at individual ecotone sites.

