SURFACE WATER / GROUNDWATER INTERACTIONS IN TAYLOR SLOUGH – EVERGLADES NATIONAL PARK.

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INTRODUCTION

Surface water /groundwater water interactions are defined as the exchange of water across the soil/sediment water interface. This flow can occur both ways, with surface water recharging the groundwater or groundwater discharging to the surface water. In the Everglades National Park (ENP), these interactions may be important not only for the transport of water, but also for the transport of nutrients and chemicals between the two water reservoirs (Harvey et al, 2000; Harvey et al, 2004; Sutula et al, 2001; Price et al, 2006; Noe & Childers, 2007).

OBJECTIVE

The main objective of this research is to estimate the regions and timing of surface-groundwater interactions in Taylor Slough (Fig 1).

METHODS AND PRELIMINARY RESULTS

There are a wide variety of tools and approaches applied at different time and spatial scales that can be used to estimate surface/groundwater interactions. For this research, four conventional methodologies such as a water budget, hydraulic gradient, hydrochemistry tracers and temperature studies were selected

The **WATER BUDGET** method is based on the principle of conservation of mass. The major water balance parameters to be estimated include precipitation, surface water and groundwater flow, change in storage, evapotranspiration and recharge. The common way of estimating recharge (R) by this method is the indirect or residual approach, whereby all the variables in the water budget equation except R are measured, and R is set equal to the residual (Scanlon et al 2002). Recharge is used to represent the surface water/ groundwater exchange and maybe positive or negative. All the variables in the water budget equation will be estimated from 29 stations that are managed from different agencies such as USGS and the ENP. Precipitation, solar radiation, temperature, humidity, wind velocity and direction are also acquired directly in this project at TSPh7b (Fig 2).

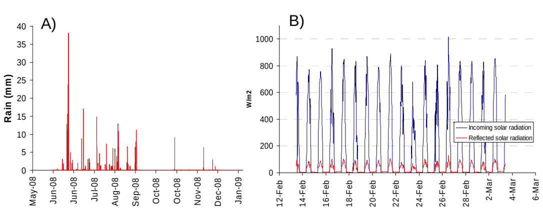

Figure 2. A) Precipitation and B) Solar radiation at TSPh7b

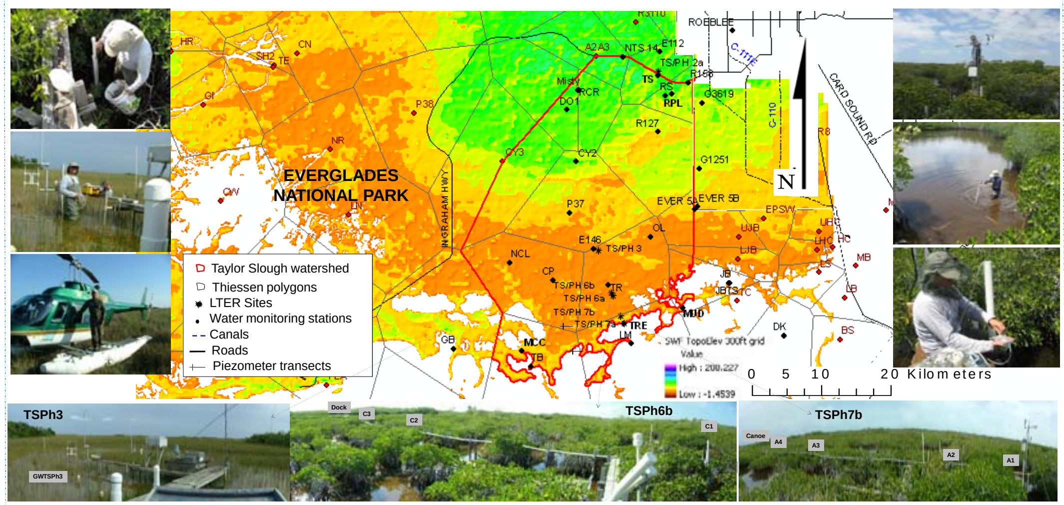

Figure 1. Taylor Slough and research sites location

The **HYDRAULIC GRADIENT METHOD** is based on Darcy's law for fluid movement in a porous medium (Fetter, 1994). The vertical rate and direction of vertical water flow can be estimated by measuring the head difference between the stream and the groundwater levels, the vertical distance between the measuring point in the aquifer and the stream bed and the vertical hydraulic conductivity of the material. Water levels are monitored every 30 min at TSPh7b (Fig 3).

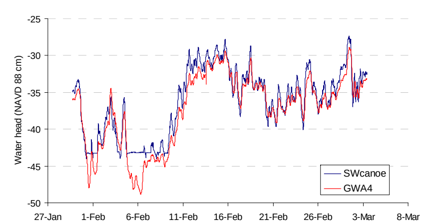

Figure 3. Water heads at GWA4 and SW Canoe vary similarly

Water head data in this figure suggest that surface and groundwater are connected and respond instantaneously to changes in water pressure.

ENVIRONMENTAL TRACERS. Surface water samples are collecting along Taylor Slough at the LTER sites on a 3-day interval. Groundwater chemistry is not expected to vary greatly with time and will be collected monthly. By way of comparing ion content in groundwater and surface water and using a mass balance equation, this data can provide useful information on the temporal variability of solute loads and, by inference, groundwater discharge (Kalbus et al, 2006).

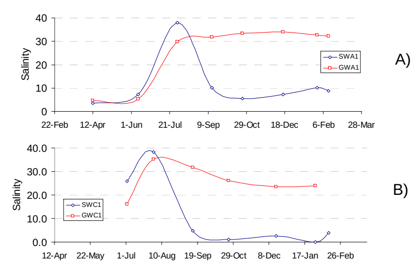

Figure 4. Monthly salinity data at A) TSPh7b and B) TSPh6b

This figure shows monthly salinity data corresponding to the last 12 months, and it suggests that surface-groundwater interactions occur between April and July. Salinity data during the last month (fig 5) suggest that surface water salinity is increasing and approaching groundwater salinity.28

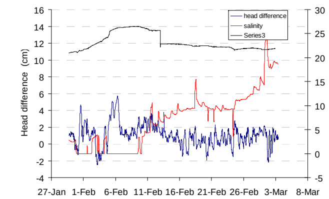

Figure 5. Head difference between GWA4 and SW Vs. salinity at TSPh7b

Time series monitoring of **TEMPERATURE** fluctuations for surface water, groundwater and soil are a tool for assessing water interactions. Stream temperature varies on a daily and seasonal basis, in contrast to groundwater temperature that is relative stable throughout the year. Consequently groundwater discharge produce stable sediment temperatures and damped diurnal variations in surface water temperatures, whereas highly variable sediment temperatures are a proof of surface water recharge (Kalbus et al, 2006). Surface water, groundwater and soil temperature at a depth of 0.3 m are monitored at TSPh7b using 107L temperature probes (Fig 6).

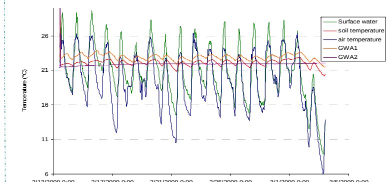

Figure 6. Temperature time series at TSPh7b

SUMMARY:

Water head data (Fig 3), salinity data (Fig 4) and the temperature profiles (Fig 6) suggest that surface water is connected to groundwater. Additional geochemistry data is needed to interpret the increase in salinity in Fig 5 and determine if the salinity increase is due to Florida Bay water incursion, surface water evaporation or groundwater discharge.

ACKNOWLEDGMENTS:

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