

## ***Melissa M. Romigh***

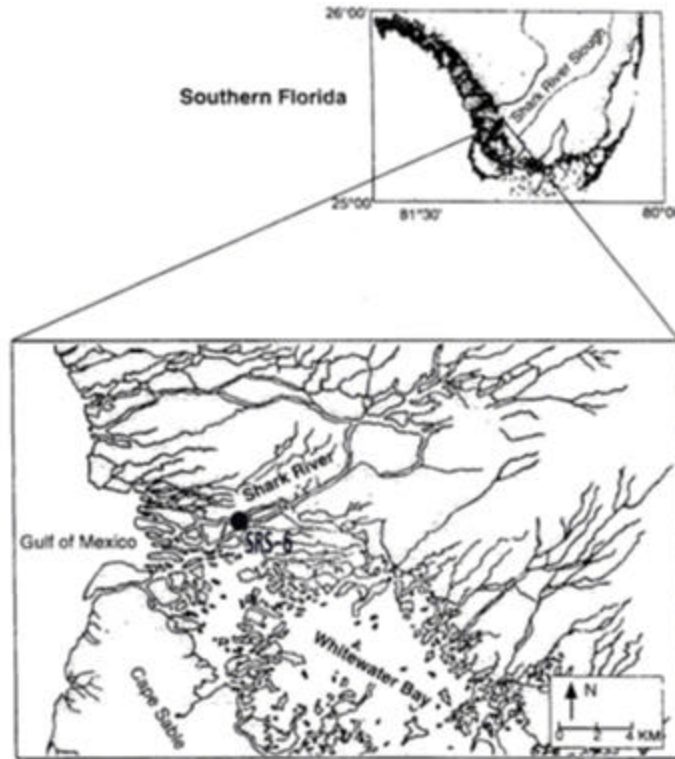
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### **Nature of the Problem**

In the United States, mangrove wetlands occur naturally in southern Florida, with small mangrove stands scattered as far north as Louisiana and Texas. In Florida, where about 200,000 ha of mangrove habitat remain, there are three species: the red mangrove, the black mangrove, and the white mangrove. There are approximately 2,000 ha of mainly black mangrove habitat in Texas and a few hundred hectares in Louisiana, centered around Grand Isle. Extensive population growth and the construction of canals and roads in south Florida have led to a continued decline in freshwater inflow to the lower Everglades ecosystem. The proposed project will be part of ongoing research into how regional processes mediated by water flow control population and ecosystem level dynamics within the coastal Everglades landscape. Regional freshwater depletion, diversion, and climate change are not processes unique to south Florida, and the results of this research could be applied to other, both inland and coastal, wetland ecosystems affected by changing water management strategies.

To better understand the importance of freshwater inputs on mangrove carbon fluxes, we propose a study to quantify the carbon exchange between the water column and soil in a tidally influenced riverine mangrove wetland in Shark River, Florida. This study will attempt to identify both the particulate and dissolved fractions of organic matter import and export. The major objectives of this study are to (1) measure total carbon (TC), dissolved inorganic carbon (DIC), total organic carbon (TOC) and dissolved organic carbon (DOC) concentrations of tidal creek water using a flow-through flume sampling technique, (2) examine differences in concentration of organic matter across the flume to determine export and import rates during a tidal cycle, and (3) examine seasonal changes in organic matter export and import rates. Knowledge of short term changes in organic matter export from Everglades mangroves will be useful in quantifying the small scale carbon fluxes at the soil interface and for making comparisons of organic matter "outwelling" from different types of systems including upland systems, salt marshes, and other mangrove environments. Knowledge of the seasonal changes in organic matter export will be a useful key to researchers and freshwater regulators worldwide in predicting the effects that major changes in freshwater inflow have on the carbon cycling of a natural mangrove ecosystem. Research on these small scale and seasonal carbon fluxes within mangroves will also improve our understanding of the magnitude that mangrove wetland carbon budgets have on the global carbon budget.

The mangrove wetland and tidal creek established for this study is located at station SRS-6 (Figure 1) within the Shark River estuary, approximately 1.8 km inland from the estuary mouth (25°19'30"N, 81°09'W). A monitoring station for the Florida Coastal Everglades Long Term Ecological Research (LTER) program is also located at this site, collecting data on water level, temperature and salinity.



**Figure 1. Study site location along the Shark River estuary in the Everglades National Park**

A flume will be constructed at site SRS-6, extending 20 meters from the high marsh to the marsh-creek interface. We will determine the carbon exchange between the mangrove and the tidal creek through carbon analysis of water samples taken over time. Water in the flume will be measured at one hour intervals over a period of one tidal cycle, and will be repeated over multiple tidal cycles. Sampling will occur once during the dry season (May), once during the wet season (September) and once during a month representing a transition between the wet and dry season (December). These sampling periods will allow us to compare the carbon exchange occurring in the mangrove during differing river discharge periods. Microtopography within the flume will be surveyed to calculate changes in water volume during a tide. Fluxes will be calculated from estimates of changes in water volume and measures of total carbon, total organic carbon, and dissolved organic carbon concentrations at each end of the flume. Total carbon, total organic carbon, and dissolved organic carbon concentrations of all samples will be determined in the laboratory with a Shimadzu Model 5000 TOC analyzer.

This project will address the effects of changes in freshwater inflow on the ecological and biogeochemical processes of wetlands and will contribute to a better understanding of the carbon budgets of mangrove wetland systems. In Florida, freshwater input is greatest during the wet summer season, causing the highest water levels and the lowest salinity in the soils during that time. Greater freshwater inputs from Shark Slough River will probably increase wetland flushing and carbon turnover, and therefore lead to higher exports of carbon from the system during the wet season. This seasonal component of

carbon flux from the mangrove will be key to understanding the effects that changes in freshwater flow have on these natural systems.

### **Intended Career Path Statement**

I plan to continue my research on the topic of carbon fluxes in mangrove wetlands, with emphasis on the effects of changes in freshwater inflow, for my Master's thesis at Texas A&M University. Following my defense, I plan to pursue a career in the environmental sciences in either a governmental or academic research position. This will allow me the opportunity to apply my research to other ecosystems and areas of environmental science.