ABSTRACT /PROJECT SUMMARY

SFP 2006 **Nitrogen Cycling in Freshwater and Estuarine Wetlands of the Taylor Slough and Its Influence on Nitrogen Exchange between Taylor River and Florida Bay.**

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Florida Bay is a critical region of an estuarine continuum that spans from freshwater and mangrove wetlands in the upper estuary linking with coral reef ecosystems along the outer edge of the Florida Keys. As a result of its position along this continuum, changes in the timing, duration and magnitude of freshwater flow at the head of the estuary have affected salinity patterns and nutrient loading into Florida Bay. These hydrologic alterations have been linked to changes in seagrass community structure and productivity, phytoplankton dynamics, and water clarity in parts of the bay, and may threaten the survival and permanence of coral reefs. To alleviate the current environmental impacts in Florida Bay, the Comprehensive Everglades Restoration Plan (CERP) will increase freshwater delivery by modifying (or eliminating) within the next 30 years water structures that currently control water delivery to creek systems of lower Taylor Slough that directly discharge into Florida Bay. One of the major concerns of the CERP is the potential effect of the re-introduction of freshwater on Florida Bay water quality. But despite the vulnerability of Florida Bay to potential increases in N loading, there is a lack of information on how N processing (e.g., denitrification, nitrogen fixation, nitrification) will be modified across Taylor Slough and how these changes will affect the exchange of N at the mangrove ecotone—bay interface. *The objective of this proposed research is to evaluate how nitrogen transformations within key vegetation units across Taylor Slough contribute to regulating the net exchange of N between a major tidal creek (Taylor River) and Florida Bay.* We propose the use of the biogeochemical "hot spot" concept to evaluate nitrogen fluxes across Taylor Slough and at the boundary with Florida Bay. In the southern Everglades, well-defined "hot spots" that are sensitive to changes in freshwater delivery (and sea level rise) are freshwater sawgrass marsh, mixed eleocharis/graminoid marsh, tree islands, and continuous scrub-mangrove forest. The research questions we plan to address in this work are: *How do nitrogen transformation rates vary along the longitudinal axis of the Mangrove Salinity Transition Zone (MSTZ) in response to seasonal patterns in hydrology and water quality, 2) How does local N processing along the salinity transition zone control the net exchange of N (inorganic and organic) at the mangrove-Florida Bay interface? and 3) What is the anticipated change in N processing and exchange from upstream to downstream locations due to changes in regional hydrologic restoration in the Everglades region.* We hypothesize that rates of N transformations will vary in magnitude depending on seasonal changes in water residence time, hydroperiod, and salinity along the hydrological gradient where weekly and monthly scales bound the rates as result of the tremendous influence of climatic drivers controlling hydrological patterns. We also expect high N sequestration reflected by low denitrification rates and high nitrogen fixation rates in all landscape patches particularly in freshwater marshes, tree islands, and scrub mangrove wetlands. We will use cross-sectional flux studies, natural and isotope enrichment techniques, and a mass balance approach to determine the role of vegetation landscape units as sink, sources or transformers of N. Our results will provide information to calibrate and validate Florida Bay water quality models and submerged aquatic vegetation simulation models.