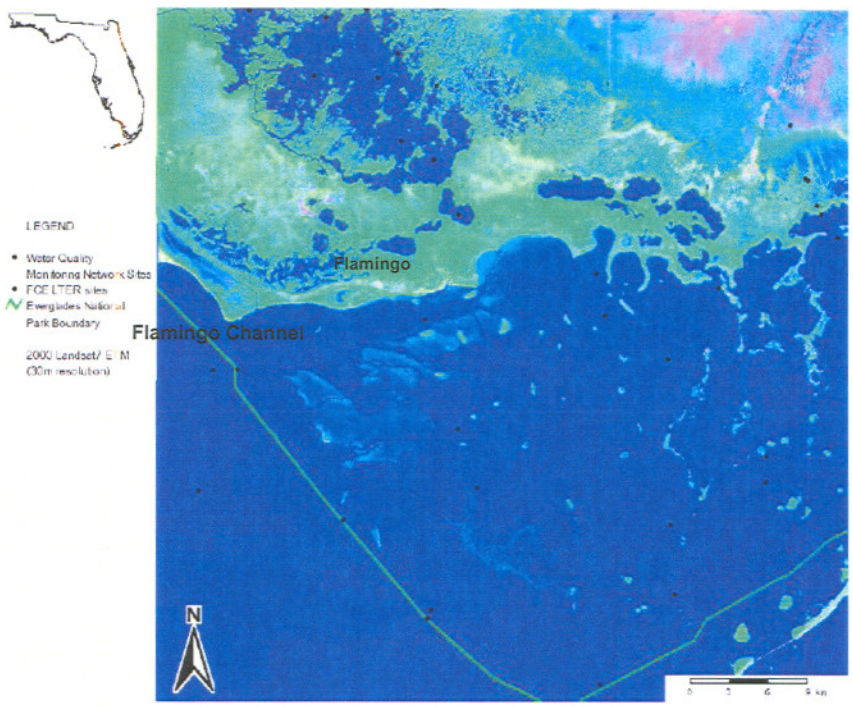

Figure 2: *Satellite image of western and central Florida Bay depicting Flamingo Channel. Note the shallow banks flaking the western margin of Everglades National Park and the extension of relatively deep Flamingo Channel extending into central Florida Bay past Flamingo.*

Proposed Methods:

Study Site

The sampling platform used in this study is owned and maintained by the University of South Florida's Coastal Ocean Monitoring and Prediction System (COMPS) in association with the Florida Institute of Oceanography. The NFBF1 site is a 5-piling USCG structure located in 4 meters of water, 1 nm SSW of Cape Sable at 25° 05.061' N (25.084° N) 81° 05.744' W (81.096° W) http://comps1.marine.usf.edu/nfb/index.shtml. Onboard instrumentation includes wind speed/direction, relative humidity/air temperature, barometric pressure, precipitation, water level, water temperature, and salinity, as well as outputs from a flourometer and transmissometer. Data is transmitted hourly via the GOES satellite for internet posting.

Physical Oceanography

Flamingo Channel will be calibrated, and lateral variations in east-west flow will be investigated early in the field study, using a boat-mounted (*Name of Manufacturer*) acoustic Doppler current meter (ADCM). The ADCM integrates vertically-averaged currents from one side of the channel to the other to quantify along-channel volume transport. Channel crossings are repeated several times during both flood and ebb phases of the tidal cycle. Regressing total channel volume transports against mid-channel current and water level measurements provides a channel calibration coefficient. This coefficient can then be used with time series of mid-channel measurements to provide a time series of total inflow and outflow for the channel. The

ADCM will also be used for shorter segments across the channel to investigate lateral current structure. This information can be used to guide the placement or repositioning of the current meter used for long-term measurements.

Mid-channel measurements of current speed and direction and water depth will be made with a SonTek Argonaut acoustic Doppler current meter. The bottom-mounted, upward-looking Argonaut provides vertically-averaged current speeds and directions from the top of a 0.2 m "blanking zone" to the surface, or through a five-meter layer (whichever is lower). In a non-stratified system, the vertically-averaged current speed, multiplied by the thickness of the layer it represents, gives the vertically-integrated transport, T_{2D}, in $m^2 s^{-1}$. The raw T_{2D} values are extrapolated downward through the blanking zone, and upward if necessary, assuming a logarithmic profile, to obtain corrected surface-to-bottom transport values. The current meter used in this study is capable of measuring current speed and direction in up to 5 individual depth layers within the water column which facilitates observation of stratification or lateral transport events. Current speeds will be recorded hourly by integrating for a period 120 s to dampen high frequency variation caused by wind waves or disturbances. In past studies, hourly time series of along-channel transport have been adequate for describing tidal and longer-period transport. Data from the current meter will be downloaded and the instrument will be cleared of any fouling accumulated at an interval of 3 to 6 weeks or as necessary.

Due to the open nature and indistinct boundaries of the Flamingo Channel, calibration will be necessary to relate single station ADCP readings to entire channel transport. Channel calibration will occur by means of a boat-mounted bottom facing ADCP. Several crossings will be made for both ebb and flood conditions to establish a relationship between mid-channel (T_{2D}) and full-channel (T_{3D}) transport. Prior experience by the research team at the Flamingo site has allowed prediction of tidal conditions to facilitate ADCP crossings over full flood and ebb cycles, as well as to coordinate diving during periods of slack tide. The southern channel boundary will be delineated according to channel geomorphology, or where flow patterns differ distinctly from the strong east-west flow in the channel. The northern boundary of the channel is defined by the East Cape land-water interface. Time series of east-west volume transport will be decomposed into tidal and wind-driven components. The tidal component will be analyzed to determine the magnitude and direction of the tide-induced residual transport. The nontidal component will be compared to wind measurements made nearby at the COMPS meteorological tower to characterize the local response to wind stress forcing.

Chemical Oceanography

Collection of nutrient samples will occur by means of an autosampler deployed upon the Northwest Florida Bay COMPS station at 25°05N 81°05W. The autosampler has a capacity of 24 discrete samples. Samples will be collected for one day at a rate of 4 samples per day and then for 20 days at a rate of 1 sample per day. The unit will be serviced on a 3 week interval when the water samples will be transported to FIU and analyzed for TN and TP concentration according to accepted laboratory practices. In addition, a YSI extended deployment system environmental probe will collect and log data for temperature, salinity, dissolved oxygen, pH, and turbidity for the period of deployment.

In addition to automated samples we will collect grab samples on site and along a cross-channel transect of 5 sites extending from the southern to northern boundary of Flamingo Channel. These samples will be collected on the same day as the autosamplers are being changed out and returned to FIU for analysis of dissolved nutrients NO_3^-, NO_2^-, NH_4^+, soluble

reactive phosphorus (SRP), $Si(OH)_4$, TP, TN, TOC, chlorophyll *a* (CHLA), and total suspended solids (TSS). Samples for the optical characterization analysis of DOC will also be collected. Data obtained from the DOC analysis may serve as an indicator for water mass origin and help differentiate the source of water and nutrient passing through the channel. At the times of sampling we will also perform CTD casts at the five sample sites perpendicular to the channel to ascertain if vertical stratification is present.

Mass Flux Calculations

We will obtain the daily and cumulative nutrient transport values for an individual segment or for the entire channel by multiplying the volume transport by the local nutrient concentration. As they are collected over different time scales, nutrient concentrations will be interpolated to provide values that correspond to the hourly volume transports. Mass flux into Florida Bay from the Southwest Florida Shelf will be coded as positive and those out of the Bay will be negative. Mass fluxes will be binned over time periods of interest such as annual, seasonal, tidal, cold front, hurricane, etc.

Project Outcome and Significance:

The proposal will generate a full year of data on both water flow and nutrient loading into northwest Florida Bay. This research can be integrated into Florida Bay ecosystem modeling efforts being conducted by the SFWMD. The data will serve to refine an ecosystem level nutrient budget for the bay system by providing high-resolution input estimates for N, P, and Salinity. This information can be applied used along with long-term water quality monitoring data and inter-basin exchange studies to elucidate dynamic of both physical and biogeochemical processes occurring within Florida Bay.

Integration with Other Projects:

This project addresses NOAA's responsibilities in the Everglades restoration efforts under CERP and will facilitate modeling and prediction of impacts caused by potential increases in freshwater into Florida Bay from Shark Slough outputs. Under CERP, the largest changes in flows will occur in the Shark Slough, not Taylor Slough. This study will quantify the inputs of water and nutrients though the main channel to Florida Bay under current conditions.

This proposed research will be extremely useful for future modeling efforts proposed in the Comprehensive Everglades Restoration Program, such as the EFDC 2-D/3-D hydrodynamic and water quality model by SFWEMD, the Florida Bay/Florida Keys Feasibility Study, and Restoration Coordination and Verification (RECOVER) Water Quality Team.

This project will also directly tie in with our NSF Florida Coastal Everglades Long Term Ecological Research program (FCE LTER, see http://fcelter.fiu.edu/). The field site in this proposal are part of the FCE-LTER and this close connection will complement our efforts therein by providing a bigger picture of microbial activity in the mangroves and Florida Bay.

This work will also add to and draw from our water quality monitoring activities. The Southeast Environmental Research Center (SERC) at Florida International University operates a network of >300 water quality monitoring stations in coastal South Florida that includes stations

Milestone Chart:

	2006/2007												2007/2008									
TASK	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M
Preparation and Setup	X	X	X																					
Current Measurements				X	X	X	X	X	X	X	X	X	X	X	X	X								
Nutrient Sample Collection				X	X	X	X	X	X	X	X	X	X	X	X	X								
Nutrient Analyses					X	X	X	X	X	X	X	X	X	X	X	X	X	X						
Data Analysis							X			X			X			X	X	X	X	X	X	X		
Data Integration												X								X	X	X	X	
Presentations and Meetings											X						X						X	
Reports and Publications												X									X	X	X	X