

South Florida Ecosystem Program

Gaging Flows in Northeastern Florida Bay



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The South Florida Ecosystem Restoration Program is an intergovernmental effort, involving a number of agencies, to reestablish and maintain the ecosystem of south Florida. One element of the restoration effort is the development of a firm scientific basis for resource decision making. The U.S. Geological Survey (USGS), one of the agencies, provides scientific information as part of the South Florida Ecosystem Restoration Program. The USGS began their own program, called the South Florida Ecosystem Program, in fiscal year 1995 for the purpose of gathering hydrologic, cartographic, and geologic data that relate to the mainland of south Florida, Florida Bay, and the Florida Keys and Reef ecosystems.

Management of the south Florida ecosystem involves the use of hydrologic models that simulate the flow of water through the region. As sheetflow is reestablished by flow management in the wetlands of the Everglades, it is expected that changes also will be reflected in the amount of freshwater exiting the mainland through the principal streams or as sheetflow into Florida Bay. Several agencies, including the USGS and the U.S. Army Corps of Engineers (COE), are planning to use hydrologic models to simulate and predict the flows into Florida Bay and the circulation patterns within the bay itself. These models can then be used to determine the effects that management of the inland water system will have on the amount of freshwater the bay receives from the mainland. This project will provide modelers with essential flow and specific conductance data along the mangrove zone where data have not been previously available.

Project Goal

The objective of this project is to provide hydrologic modelers with information on flow and specific conductance at key outflow points (streams) along the

mangrove zone in northeastern Florida Bay (fig. 1). Monthly water samples for "total" nutrient analysis will be collected to complement work by other agencies and to determine possible trends. Additionally, various field data-collection and data-analysis techniques will be explored to determine the most suitable technique for gaging flows in the shallow and slow-moving estuarine streams that discharge into Florida Bay.

Background

Flow through the mangrove zone in northeastern Florida Bay is naturally controlled by the wet or dry conditions of the Everglades wetlands, regional wind patterns and, to some extent, by tidal action in the Gulf of Mexico toward the western part of the bay. The flow of freshwater from the mainland into northeastern Florida Bay is mostly confined to several streams or creeks, except during extreme high-water conditions when significant sheetflow also can be observed through low-lying mangrove areas between the streams. Gaging surface-water flows

using acoustic technology has been in practice for some time and is considered to be the most suitable method for measuring water velocities in streams that discharge water into Florida Bay.

Research Plan

Eight sites located in Terrapin Bay and Long Sound will be studied in northeastern Florida Bay (fig. 1). These sites are: McCormick Creek (1), Taylor River (2), East Creek (3), Mud Creek (4), Trout Creek (5), a small unnamed creek (6), West Highway Creek (7), and East Highway Creek (8). Activities at these sites will include the collection of continuous water-level and velocity data with periodic field measurements of discharge. Five of the eight sites (1, 2, 4, 5, and 7) will be equipped with the following instruments for the continuous collection of field data: acoustic velocity meters (AVM's) to record water velocities at predetermined elevations within the water column, water-level recorders for the calculation of stage dependent cross-sectional areas,

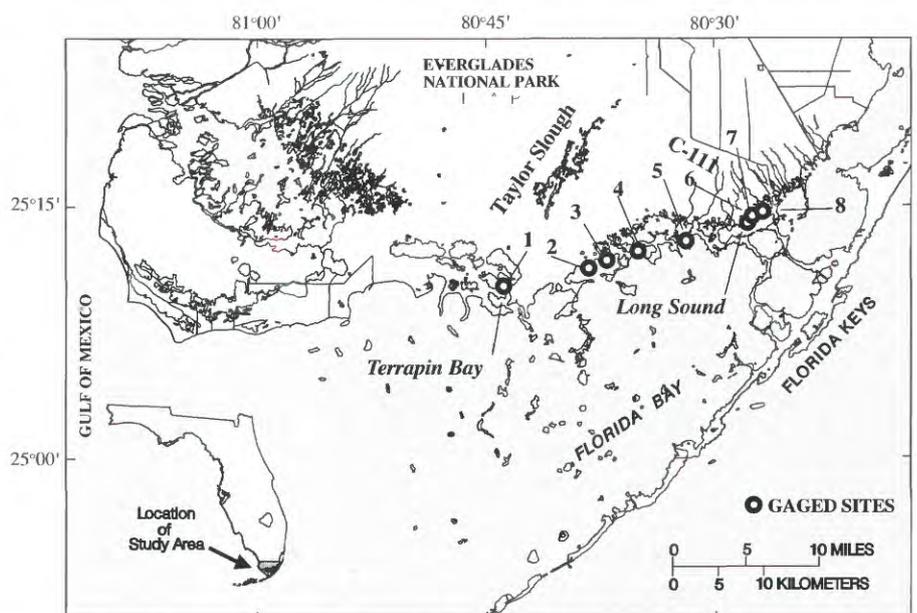


Figure 1. Location of estuarine streams being gaged in Florida Bay.

temperature and specific conductance sensors, and data-collection platforms (DCP's) for the transmission of all data to the USGS office in Miami for processing and storage. Instrument configurations are shown in a cross section and sketch maps in figure 2. Velocities and specific conductance will be recorded at three different elevations with temperature only recorded at top and bottom elevations. Periodic measurements of discharge will be made at East Creek (3) in Little Madeira Bay and also at East Highway Creek (8) and a small unnamed creek (6), both in Long Sound. All discharge measurements will be performed using an Acoustic Doppler Current Profiler (ADCP). Discharge records for all instrumented sites will be calculated by using stage dependent cross-sectional areas and relations established between recorded velocities (AVM) and mean measured velocities (ADCP).

Water samples for nutrient analysis (nitrogen and phosphorus) will be collected on a monthly basis at all five instrumented sites. One vertically integrated sample will be collected for each site at a point near the center of the stream. In the event that bidirectional flow is observed at the time of sampling, two additional samples will be taken, one near the water surface and the other near the streambed.

Product Plans

- A comprehensive report is planned. This report will include the description of data-collection and data-analysis techniques as well as discharge and nutrient records for all gaged sites.
- Fact Sheets are planned on an annual basis to present the progress of the project and specific findings.

Project Schedule

Dates and project activities are summarized below. For those project activities that have not yet begun or have not been completed, tentative dates are given.

- 10/95–12/95: Preliminary measurements made at streams discharging into northeastern Florida Bay.
- 01/95–06/95: Platform designed for remote sites. Processed permits with Everglades National Park for the construction of semipermanent platforms and instrument installation at selected sites. Procured materials and instrumentation.
- 08/95–01/96: Construction of platforms and instrument installation.
- 10/95–12/95: Began ADCP measurements at instrumented sites.
- 10/95–12/98: Monthly visits to all instrumented sites for instrument maintenance and recalibration.
- 01/96–12/96: Monthly ADCP measurements at all gaged sites. Begin development of AVM calibration curves.
- 03/96–12/98: Monthly collection of water samples for total nutrient analysis.
- 01/97–12/97: ADCP measurements during extreme hydrologic events. Finalize AVM calibration curves.
- 01/98–12/98: ADCP measurements as needed. Computation of flow records for all gaged sites. Begin preparation of comprehensive report.
- 01/99–03/99: Complete comprehensive report.
- 10/99: Delivery of published report.

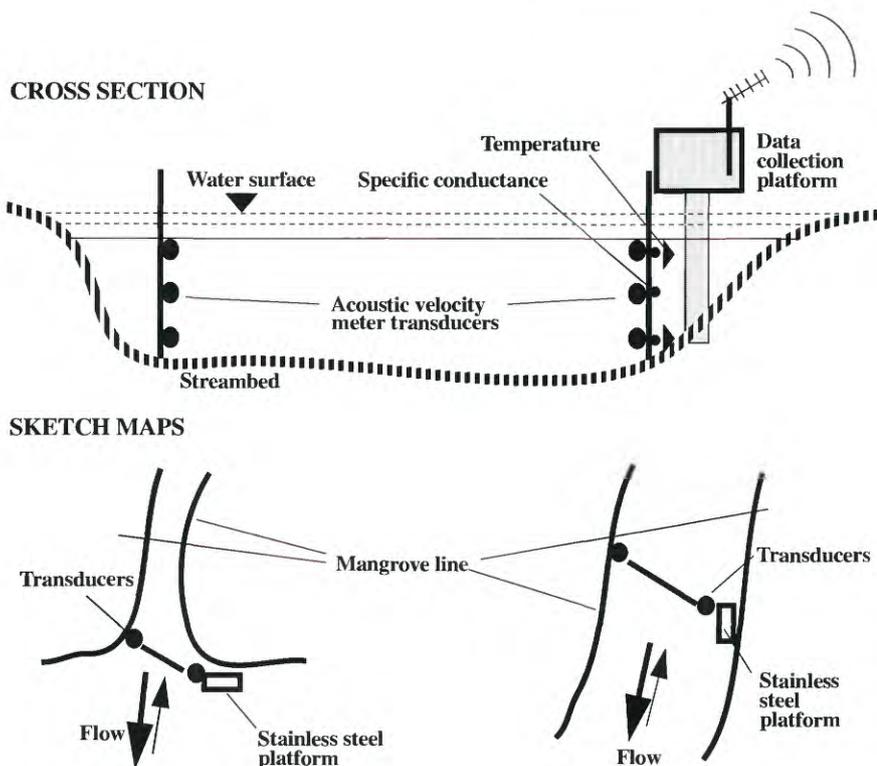


Figure 2. Instrument configurations for acoustic velocity meter stations in Florida Bay (instrument housing on platforms).

For More Information

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