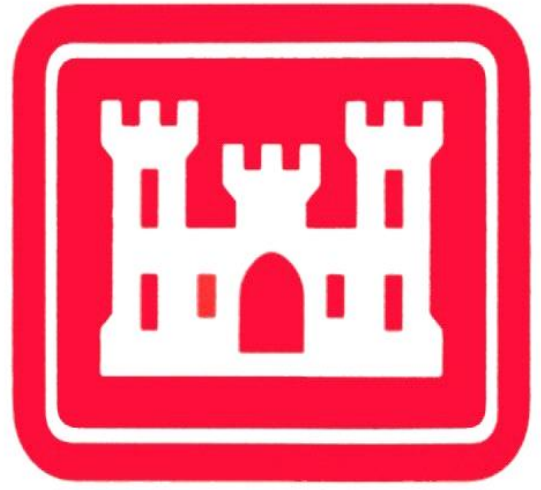


# Submerged Aquatic Vegetation (SAV) Monitoring in the Southern Indian River Lagoon, St. Lucie Estuary, Lake Worth Lagoon and the Caloosahatchee River and Estuary



US Army Corps  
of Engineers



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## Introduction and Background

Natural Systems Analysts, Inc (NSA, Inc) has been contracted by the United States Army Corps of Engineers (USACE) to conduct bi-monthly monitoring of submerged aquatic vegetation (SAV) sea grasses and calcareous marine algae as part of the Restoration, Coordination and Verification (RECOVER) program of the Comprehensive Everglades Restoration Plan (CERP).

The contracted scope of work includes support for a team of environmental scientists to work under the direction of USACE's Principal Investigator who is charged with overall responsibility for the project, including analysis and interpretation of collected data in support of the USACE's goals as defined by the RECOVER program under the CERP.

The tasks assigned to NSA, Inc under this contract are key component of the Northern Estuaries module of the Monitoring and Assessment Plan (MAP). In addition, the data collected under this contract will provide critical information to the RECOVER Assessment Team (AT) and will be used by the USACE to aid in evaluation of the success of implementing the CERP.

### Monitoring and Assessment Plan (MAP)

The Water Resources Development Act (WRDA) of 2000 authorized the Comprehensive Everglades Restoration Plan (CERP) as a framework for modifications and operational changes to the Central and Southern Florida Project needed to restore the South Florida ecosystem. Provisions within WRDA 2000 provide for specific authorization for an adaptive assessment and monitoring program. A CERP Monitoring and Assessment Plan (MAP) has been developed as the primary tool to assess the system-wide performance of the CERP by the Restoration Coordination and Verification (RECOVER) program. The MAP presents the monitoring and supporting research needed to measure the responses of the South Florida ecosystem to CERP implementation.

The MAP also presents system-wide performance measures representative of the natural and human systems found in South Florida that will be evaluated to help determine CERP success. These system-wide performance measures addresses the responses of the South Florida ecosystem that the CERP is explicitly designed to improve, correct, or otherwise directly affect. A separate document, the Development and Application of Comprehensive Everglades Restoration Plan System-wide Performance Measures (RECOVER 2007), has been prepared by RECOVER and provides the scientific, technical, and legal basis for the performance measures.

## Program and project objectives

The work described in this work plan is intended to support four broad objectives of the RECOVER monitoring program:

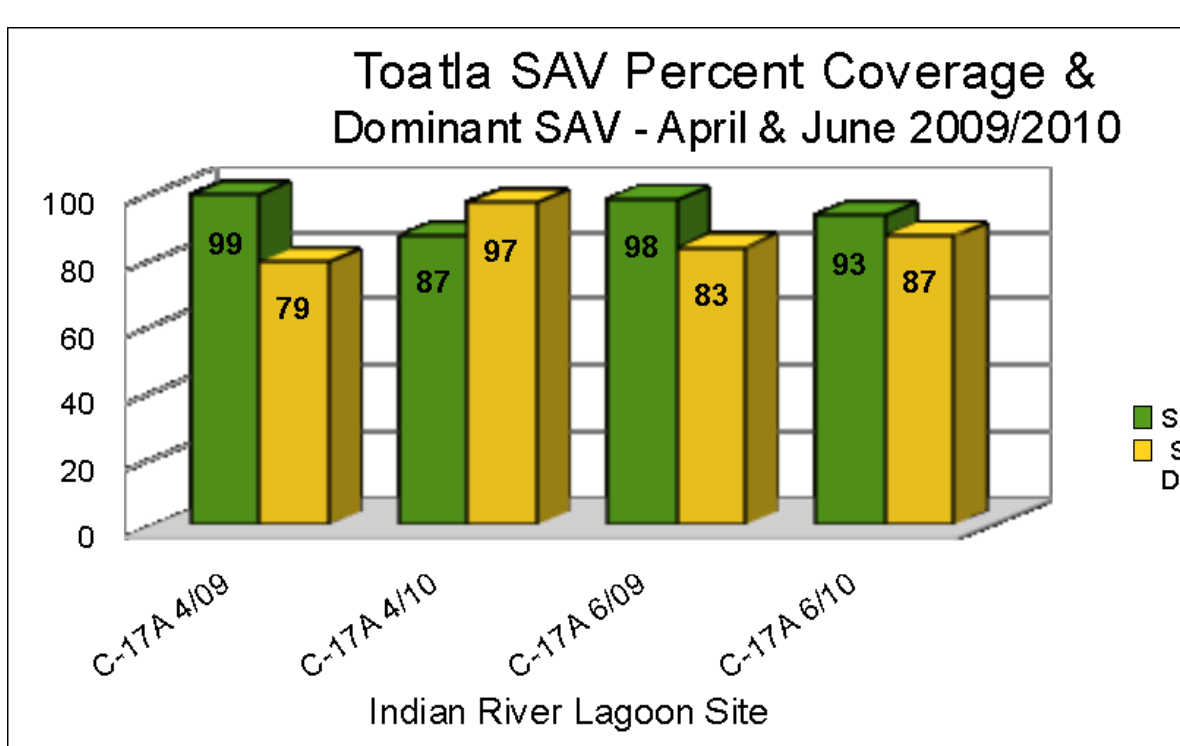
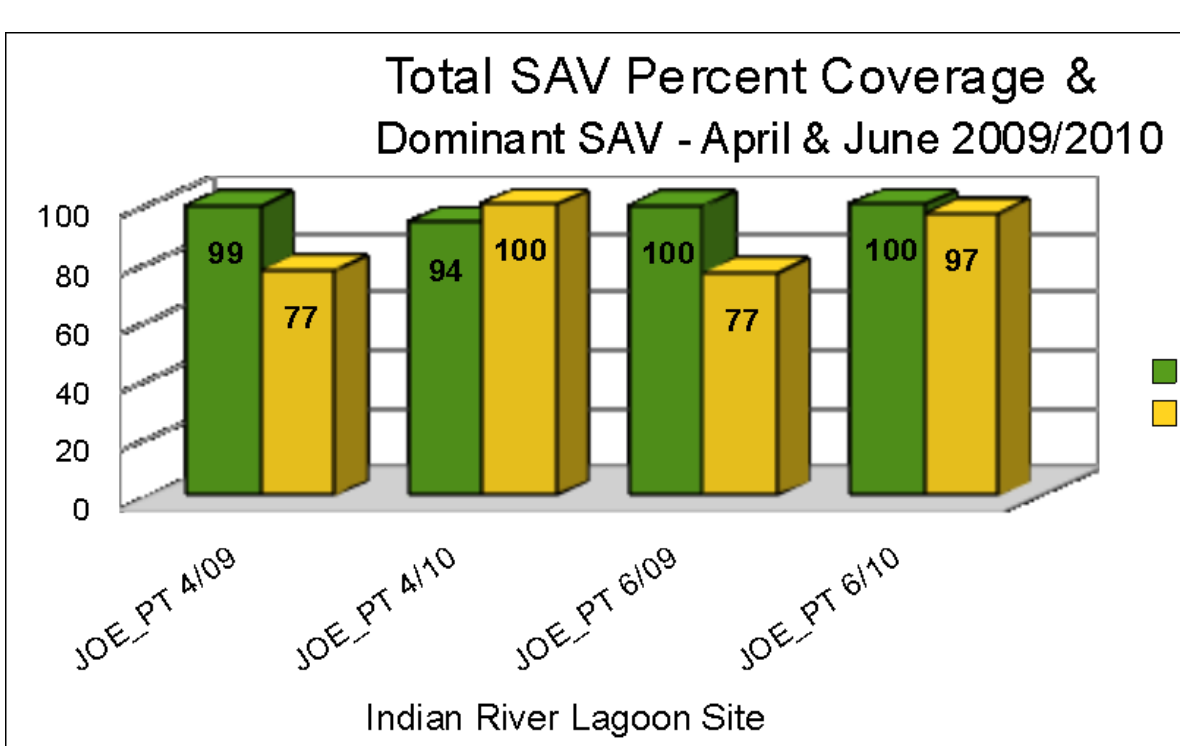
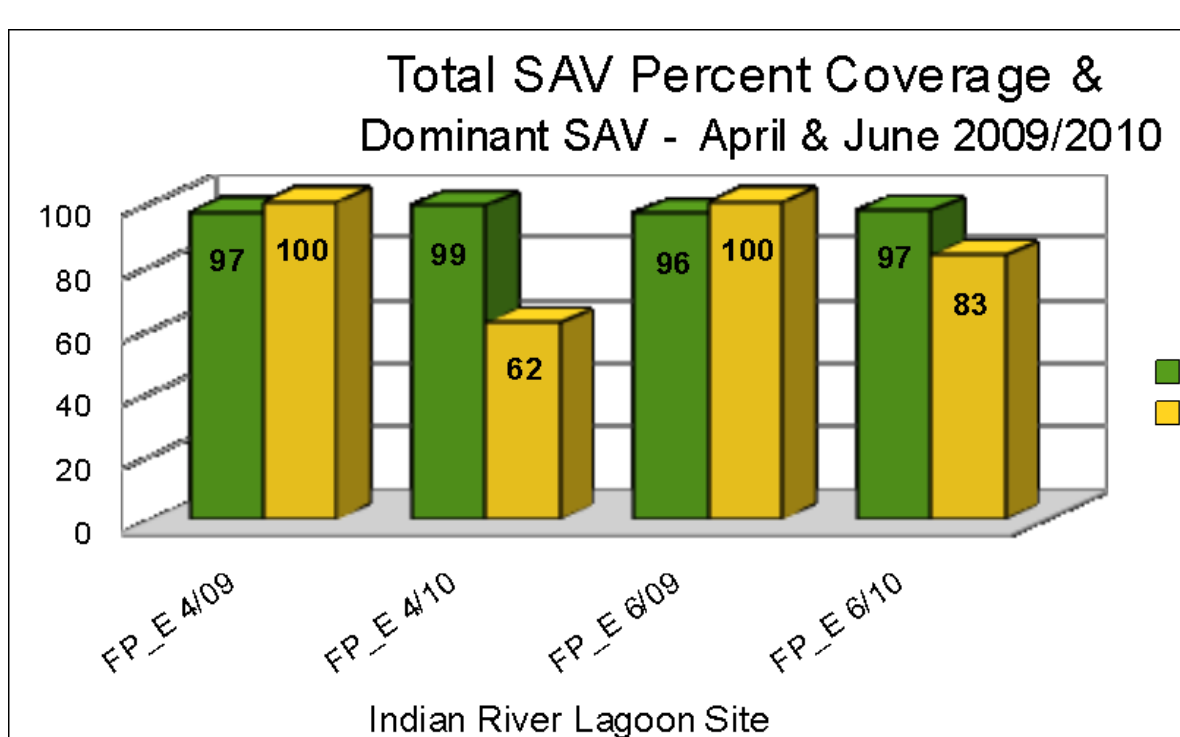
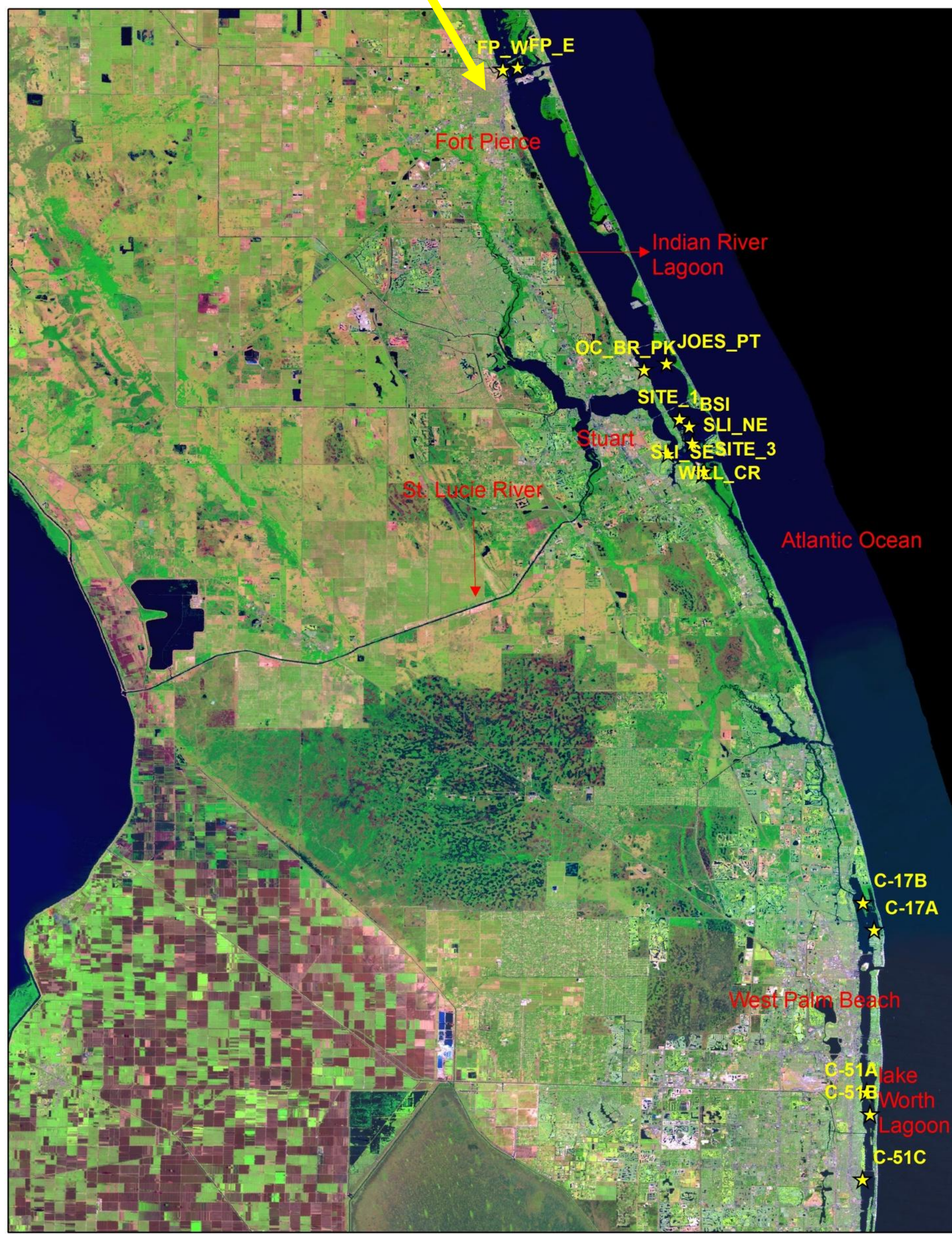
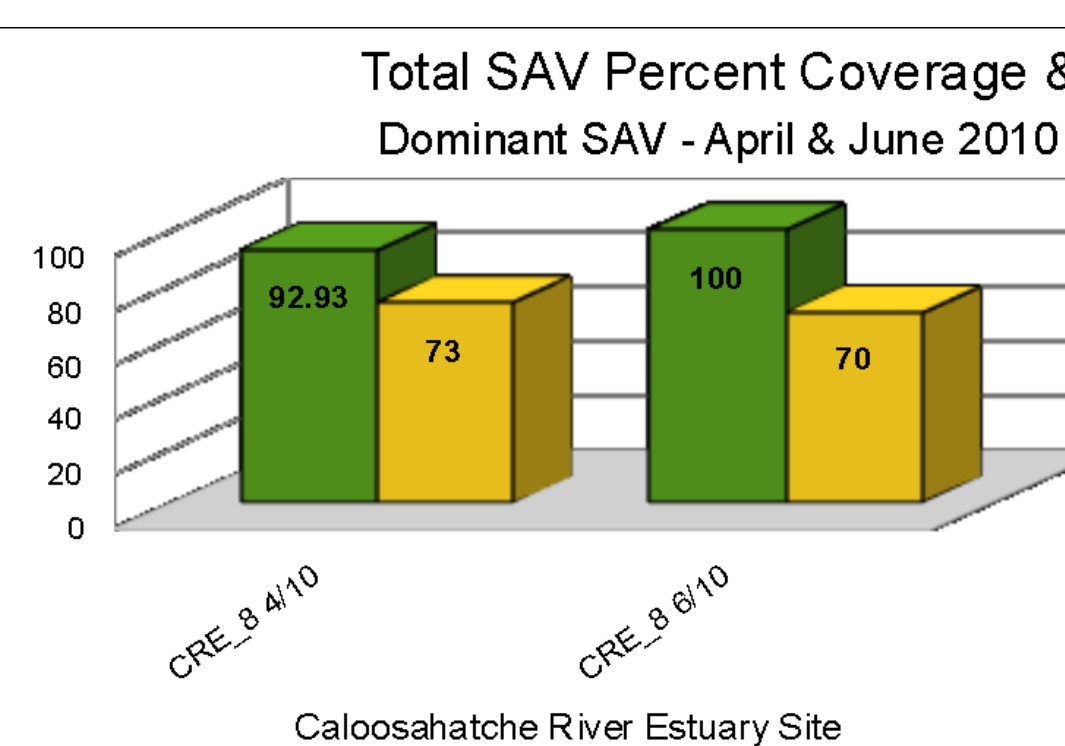
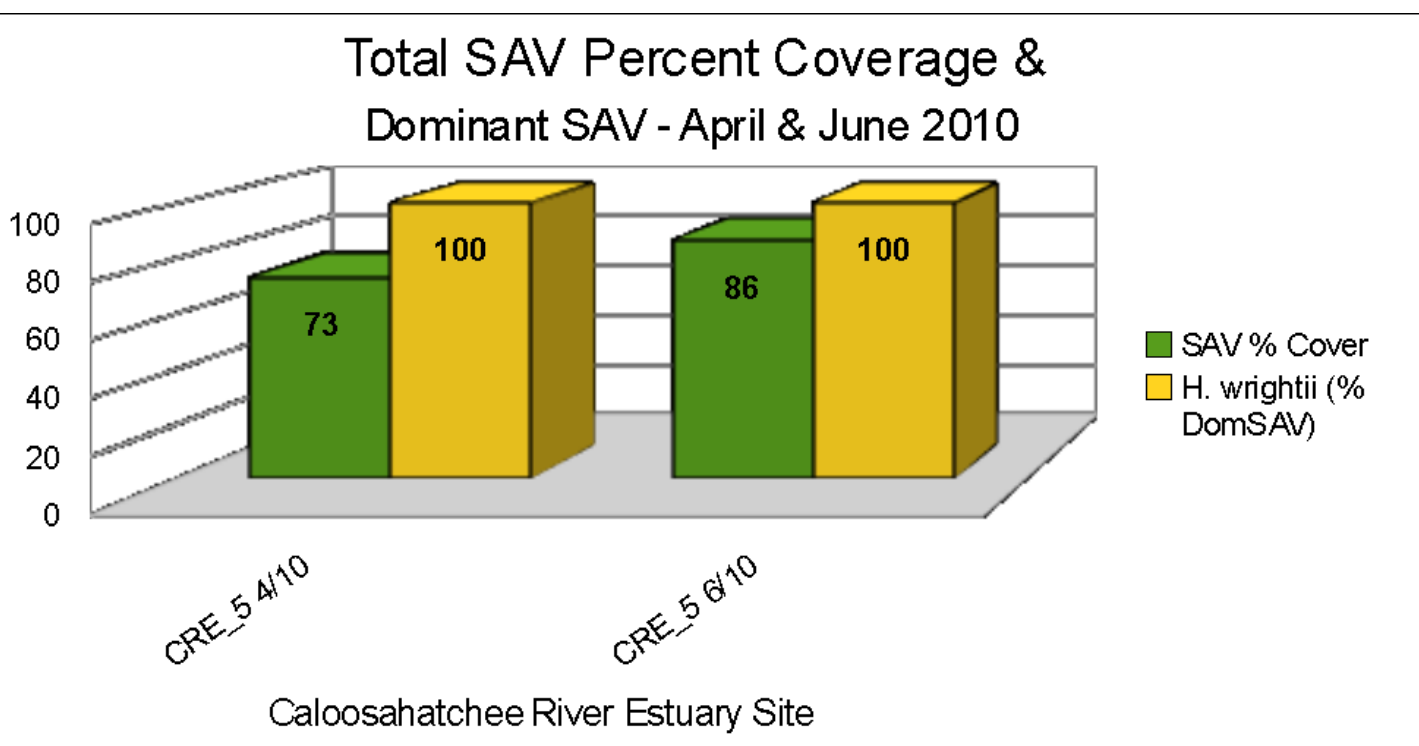
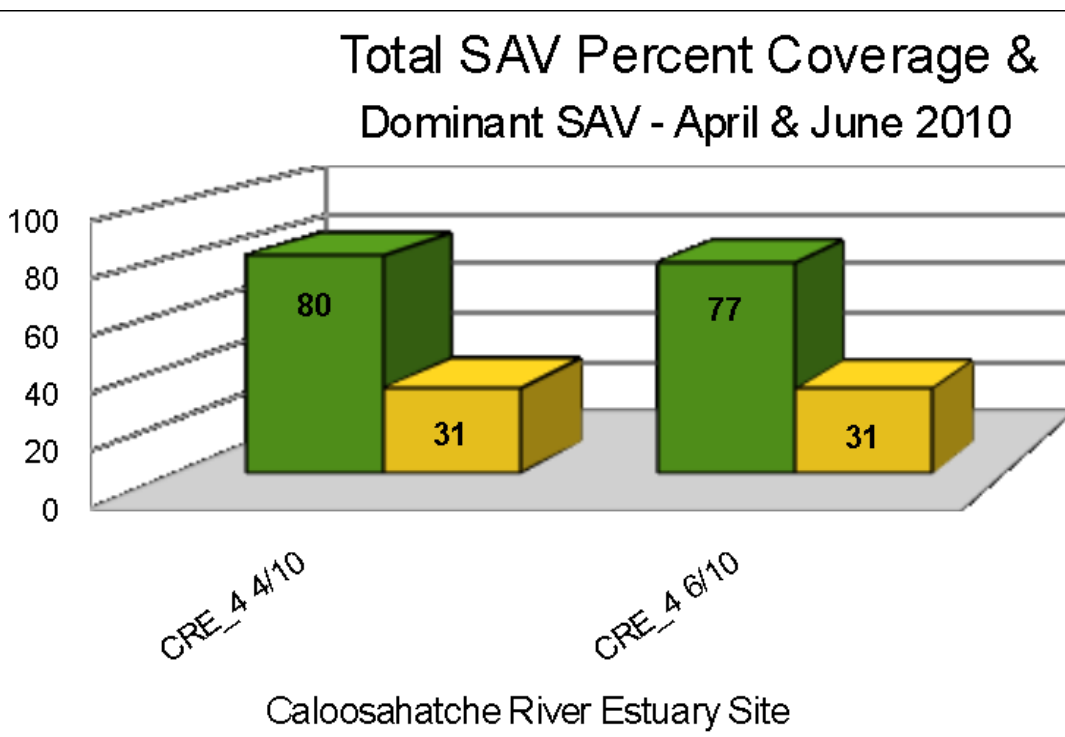
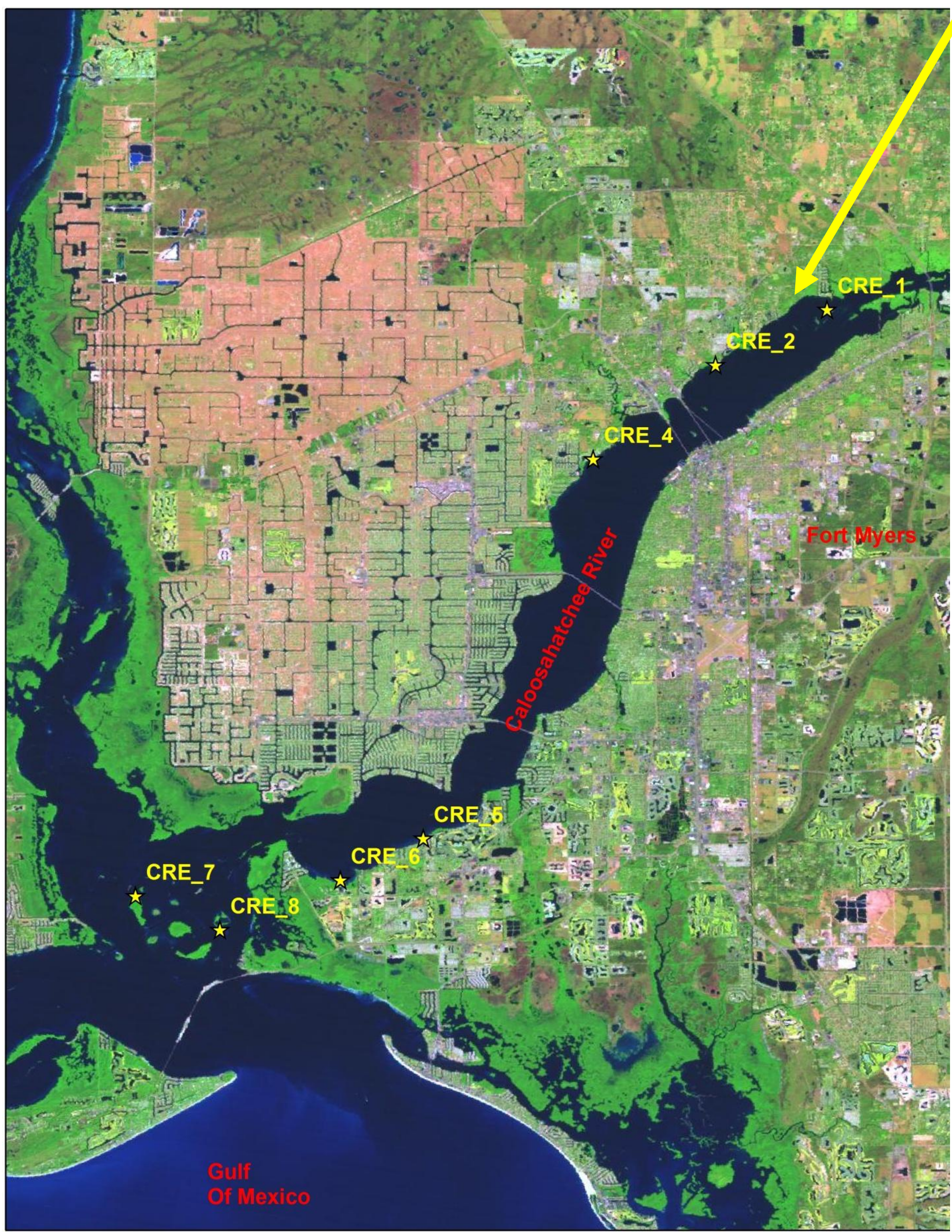
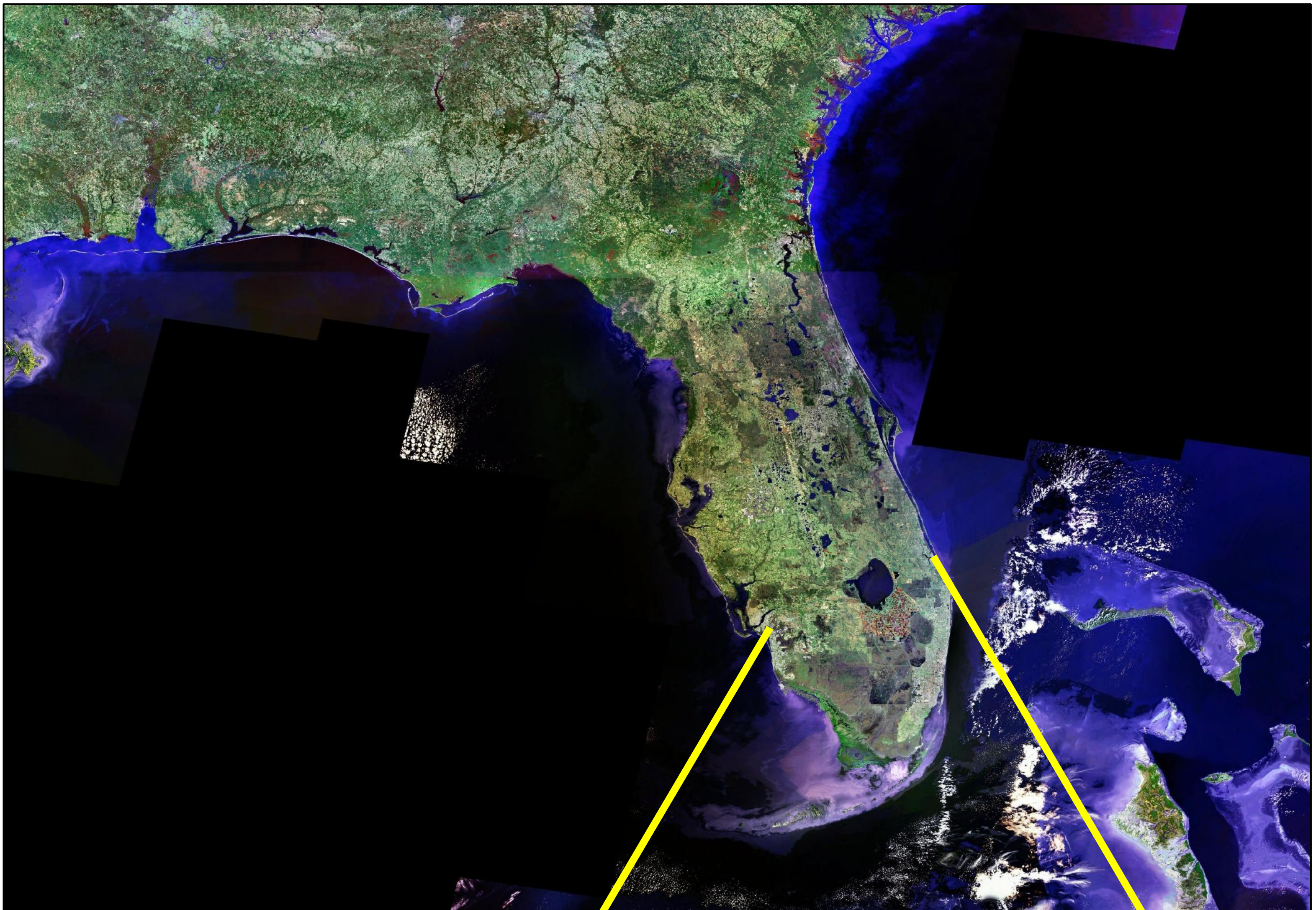
- Establish pre-CERP reference conditions and variability for each performance measure
- Determine the status and trends of the performance measures
- Detect unexpected responses of the ecosystem to changes in stressors resulting from CERP activities
- Support scientific investigations designed to increase ecosystem understanding, cause-and-effect relationships, and interpret unanticipated results

As given in the contract SOW, the objectives of this investigation are to:

Continue baseline data collection;

Quantify relationships that exist between changes in freshwater discharges and the subsequent changes in salinity and water quality patterns in the SIRC, SLE, LWL, and CRE; and

Quantify how salinity and water quality patterns impact SAV distribution, community structure, and viability within the system.



## Methodologies

Percent cover by species

Sites shall be sampled bimonthly (every other month) throughout the duration of the study using 30 1-m<sup>2</sup> quadrats that shall be subdivided into 25 equilateral 20 cm x 20 cm quadrants (cells). Quadrats should be deployed in such a manner that the SAV within the site can be appropriately characterized; typically deploying in a haphazard fashion with no less than 5 m separating any two quadrats should be suitable. The position of each quadrat should be georeferenced using, at a minimum, a Wide Area Augmentation System (WAAS)-enabled global positioning system (GPS) unit held over the middle of the quadrat.

SAV should be assessed within each quadrat by enumerating the number of cells (out of 25) housing each species and those cells that are bare. Total seagrass and total macroalgae cells should also be recorded. These data should be converted to overall percent cover data for each quadrat by species by dividing the number of quadrants housing a species by 25. For example, a quadrat with 12 *Syringodium filiforme* cells, 16 *Halodule wrightii* cells, 4 macroalgal cells, and 3 bare cells should be interpreted as having 88% total SAV cover with *S. filiforme* covering 48%, *H. wrightii* covering 64%, and macroalgae covering 16% of the quadrat.

Because of the diversity of macroalgae species, macroalgae will be grouped into categories based on a modified form/function classification rather than by species (Exception: *Caulerpa* spp. should be identified by species).

Canopy height

Seagrass canopy height should be sampled concurrently with the enumeration of SAV by species on a bimonthly schedule throughout the duration of the study. Canopy height should be measured within each quadrat using the following methodology. A small group of shoots of the dominant seagrass species in each quadrat should be loosely gathered together and extended to the maximum height of their blades, without uprooting the shoots. The distance from the substrate to the blade tips should then be measured to the nearest centimeter, ignoring the few (<10%) if any, "extra long" blades. If seagrass is sparse, five individual shoots of the canopy forming species within a quadrat should be measured and the mean of these heights used to calculate an overall mean canopy height for the bed.

Water quality parameters

NSA Inc. shall obtain surface and bottom readings at or near each seagrass monitoring location in a minimum water depth of 1.0 m. These readings shall include dissolved oxygen (DO), pH, temperature, conductivity/salinity, and photosynthetically active radiation (PAR) using standard electronic sensors (e.g., YSI 6600 and/or LiCor Quantum Sensors) calibrated to manufacturer's specifications. NSA Inc. will their own YSI and data logger for use in collecting these water quality data during SAV monitoring events. The District will provide NSA, Inc. with LiCor Quantum Sensors and datalogger in order to measure PAR. The Consultant shall also measure Secchi disk depth (to the nearest 10 cm); if Secchi depth is found to exceed water depth (i.e., "bottom") the depth shall be recorded as a 9999 in the database. NSA, Inc. must meet and follow the minimum requirements in the Florida Department of Environmental Protection (FDEP) Field Sampling Standard Operating Procedures for field testing, field documentation and field quality control.

Acknowledgments:

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