



COMPREHENSIVE EVERGLADES RESTORATION PLAN ADAPTIVE MANAGEMENT: INTEGRATING SCIENCE ACROSS PROJECTS TO INCREASE RESTORATION SUCCESS

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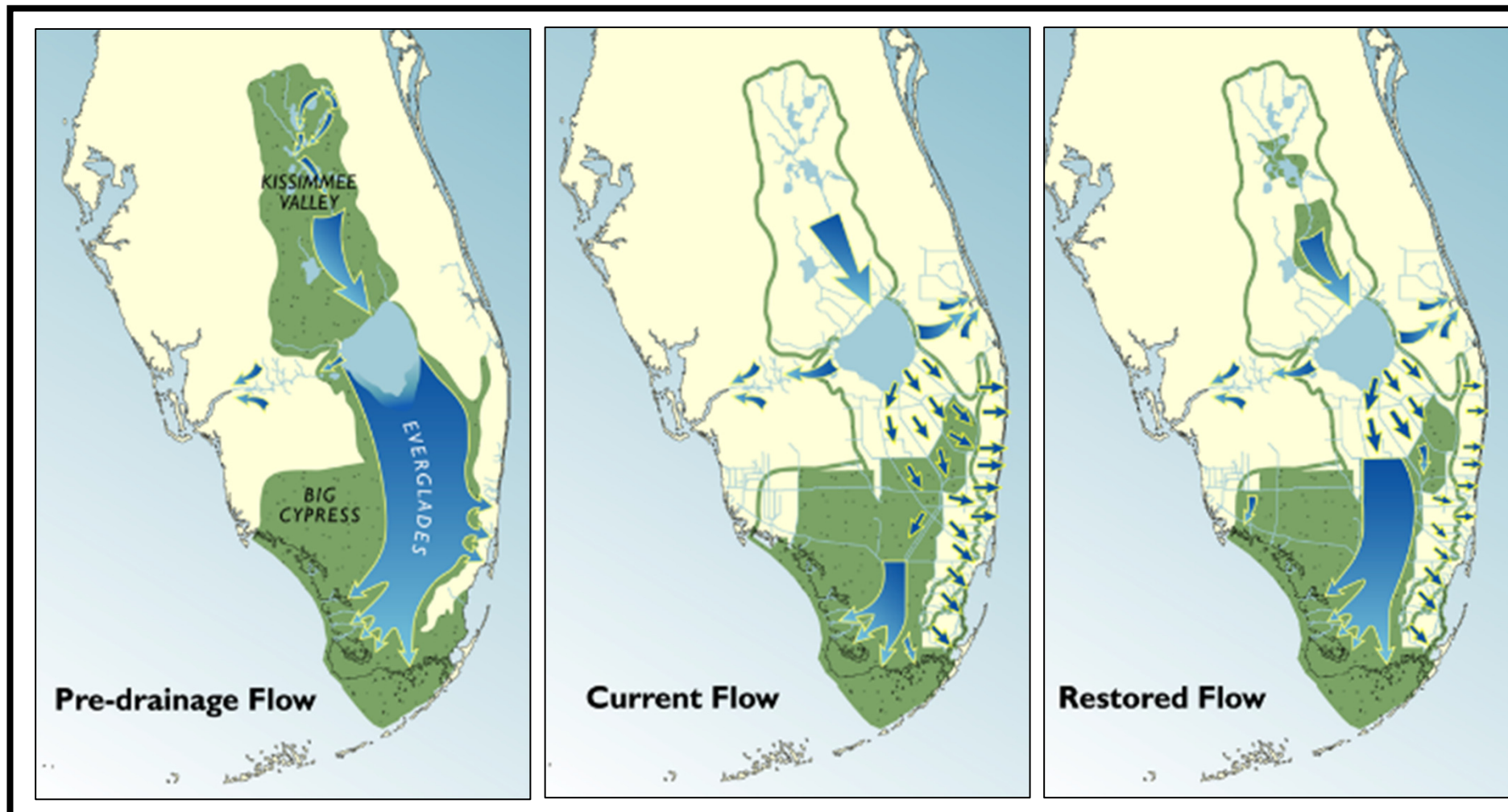
Image Credit: USGS

BACKGROUND | COMPREHENSIVE EVERGLADES RESTORATION PLAN (CERP) AND RECOVER

Authorized by Congress in 2000, the CERP aims to restore, preserve, and protect the Florida Everglades while providing for other economic and cultural water-related needs of the region. By changing the quantity, quality, timing, and distribution of water, the CERP intends to improved ecosystem health and quality of life in southern Florida.

RECOVER (REstoration, COordination and VERification) is an interdisciplinary collaboration of agencies, tribes, and institutions that conducts scientific and technical evaluations and assessments to improve the CERP. Partners include members from 10 federal and state agencies and 2 federally-recognized Tribes (the Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida), and the South Florida Water Management District (SFWMD). RECOVER program management rests jointly with the U.S. Army Corps of Engineers (USACE) and the SFWMD.

RECOVER Mission: Evaluation | Assessment | Planning/Integration



Two primary components of RECOVER include the:

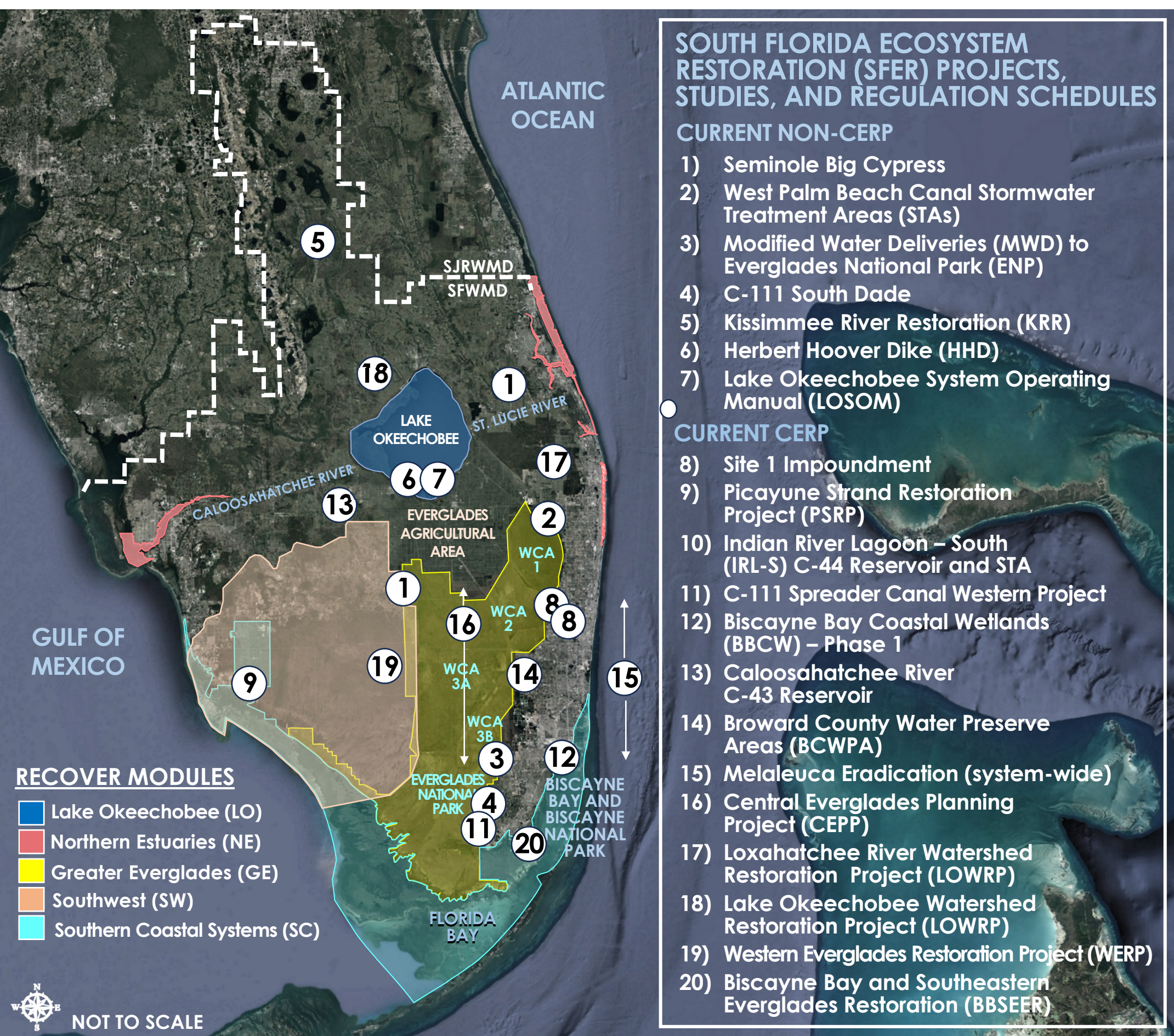
- Monitoring and Assessment Plan
- Adaptive Management Program

Together they facilitate the continuous improvement in implementation of the plan and its operations by using and building upon existing science and technology.

As illustrated in the South Florida Ecosystem Restoration Project Map, to facilitate restoration evaluation, assessment and planning, the CERP footprint is sub-divided into regions or "modules" that have similar ecology and natural characteristics.



REDUCING UNCERTAINTY ACROSS THE CERP PROJECT LIFECYCLE



WHAT IS AN UNCERTAINTY?

A question that:

- ✓ Relates to the best actions to achieve desired goals and objectives within constraints, or
- ✓ Cannot be fully answered with available data or monitoring

WHY AND HOW DO WE ADDRESS UNCERTAINTIES?

- ✓ Improve the probability of restoration success
 - ✓ Test hypotheses
 - ✓ Link science to decision making
- ✓ Adjust project implementation as necessary

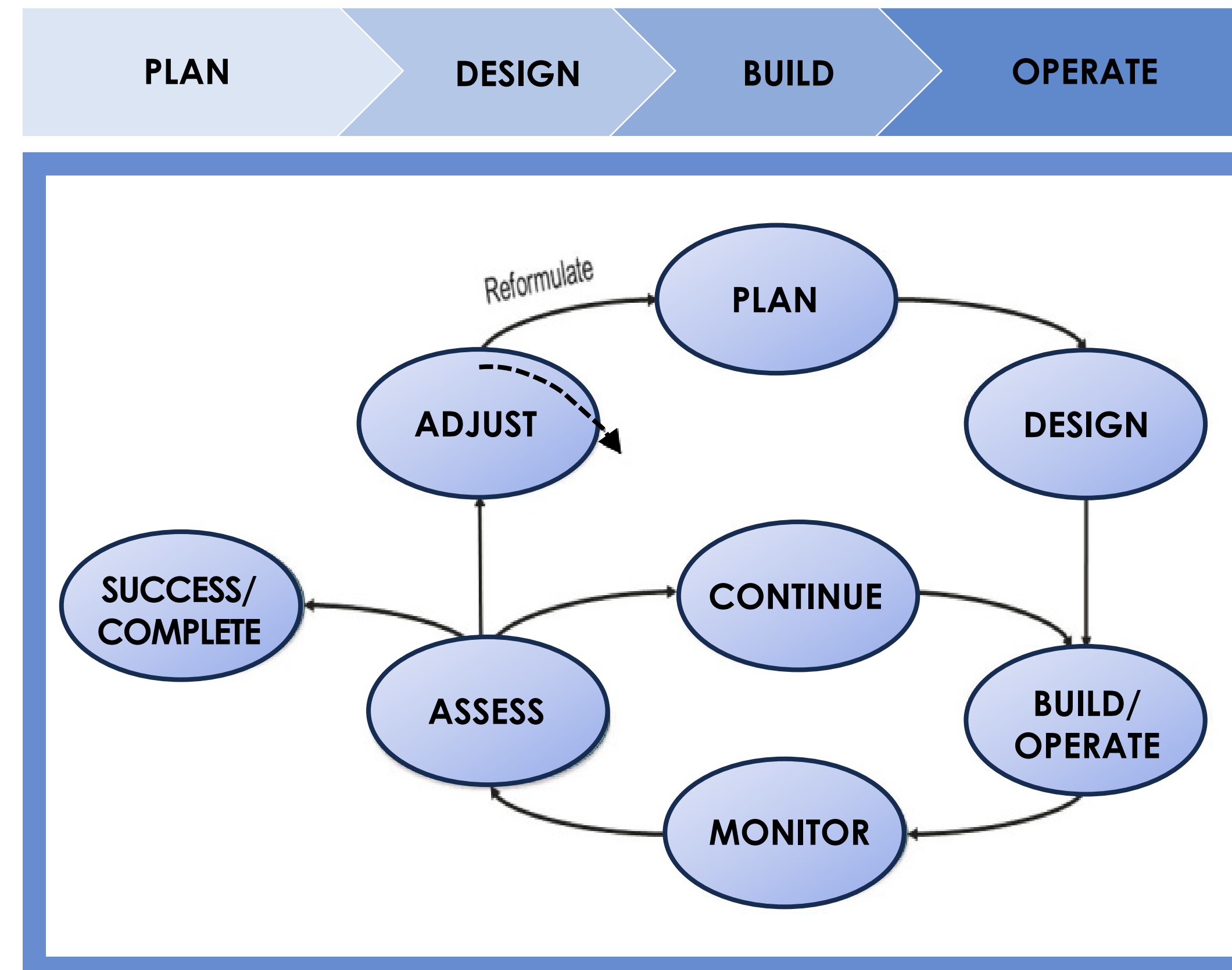
WHAT IS BASELINE MONITORING?

- ✓ Collection of data prior to project implementation
- ✓ Comparisons to future project monitoring data to inform project adjustments, improve project performance, and meet goals and objectives

WHAT IS ADAPTIVE MANAGEMENT?

- ✓ A structured management approach for addressing uncertainties
- ✓ Incorporating relevant information (i.e., monitoring data, other information) into decision making to improve CERP program design and execution

RECOVER ADAPTIVE MANAGEMENT AND THE PROJECT LIFECYCLE



CERP ADAPTIVE MANAGEMENT: ADDRESSING DECISION-CRITICAL UNCERTAINTIES WITH TARGETED STUDIES



ACTIVE ADAPTIVE MANAGEMENT: Decrease uncertainty using multiple designs or operational criteria (i.e., field tests) to test competing hypotheses about the hydrological, ecological, or water quality responses to management actions.



DECISION-CRITICAL UNCERTAINTIES: Uncertainties that, if not addressed, may impair decision-making during CERP planning and implementation and increase the risk that the project will not meet its restoration goals and objectives.



EXAMPLES OF ADAPTIVE MANAGEMENT: PROPOSED TARGETED STUDIES TO ADDRESS DECISION-CRITICAL UNCERTAINTIES



COASTAL ACTIVE FLOW ENHANCEMENT (CAFE)

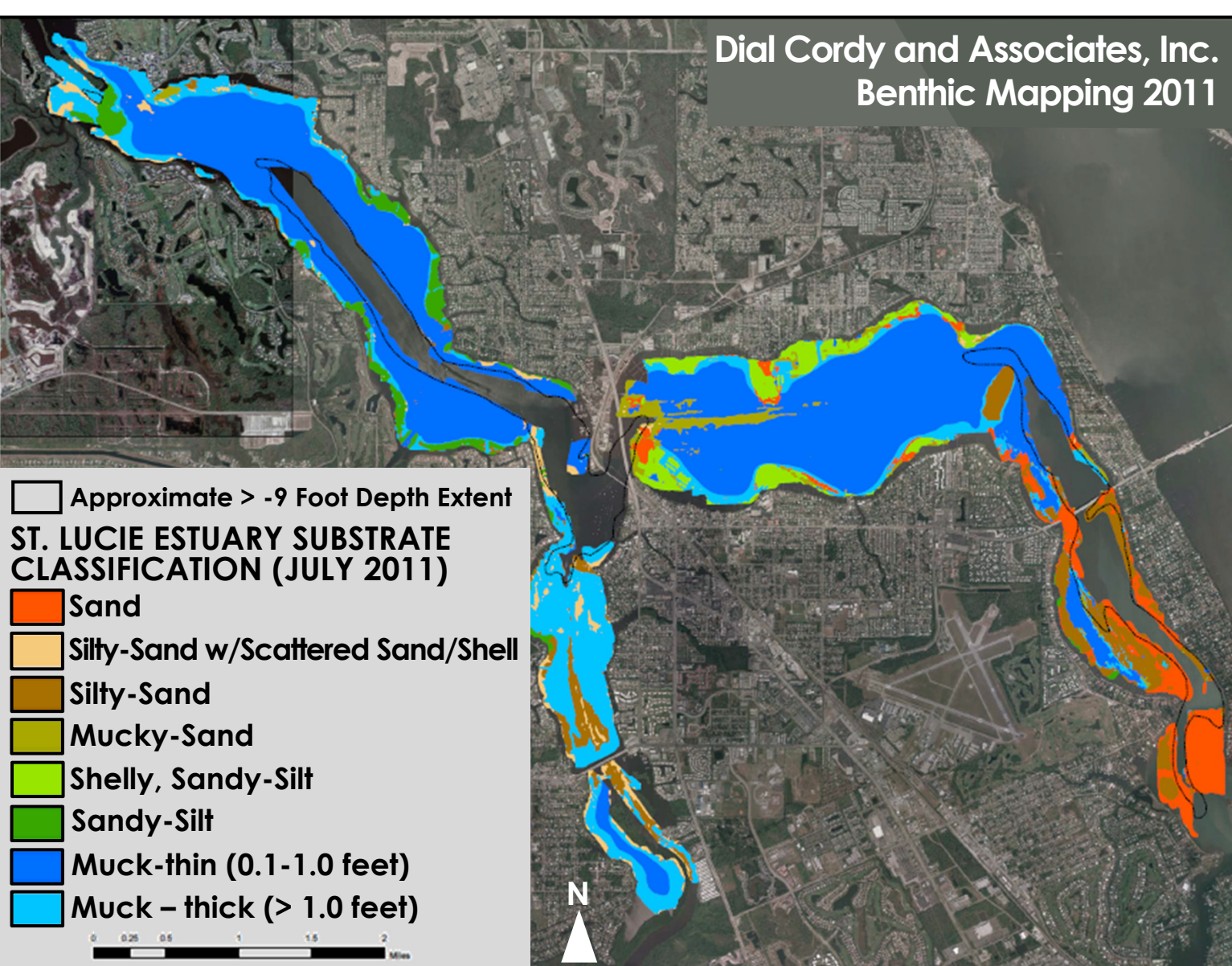
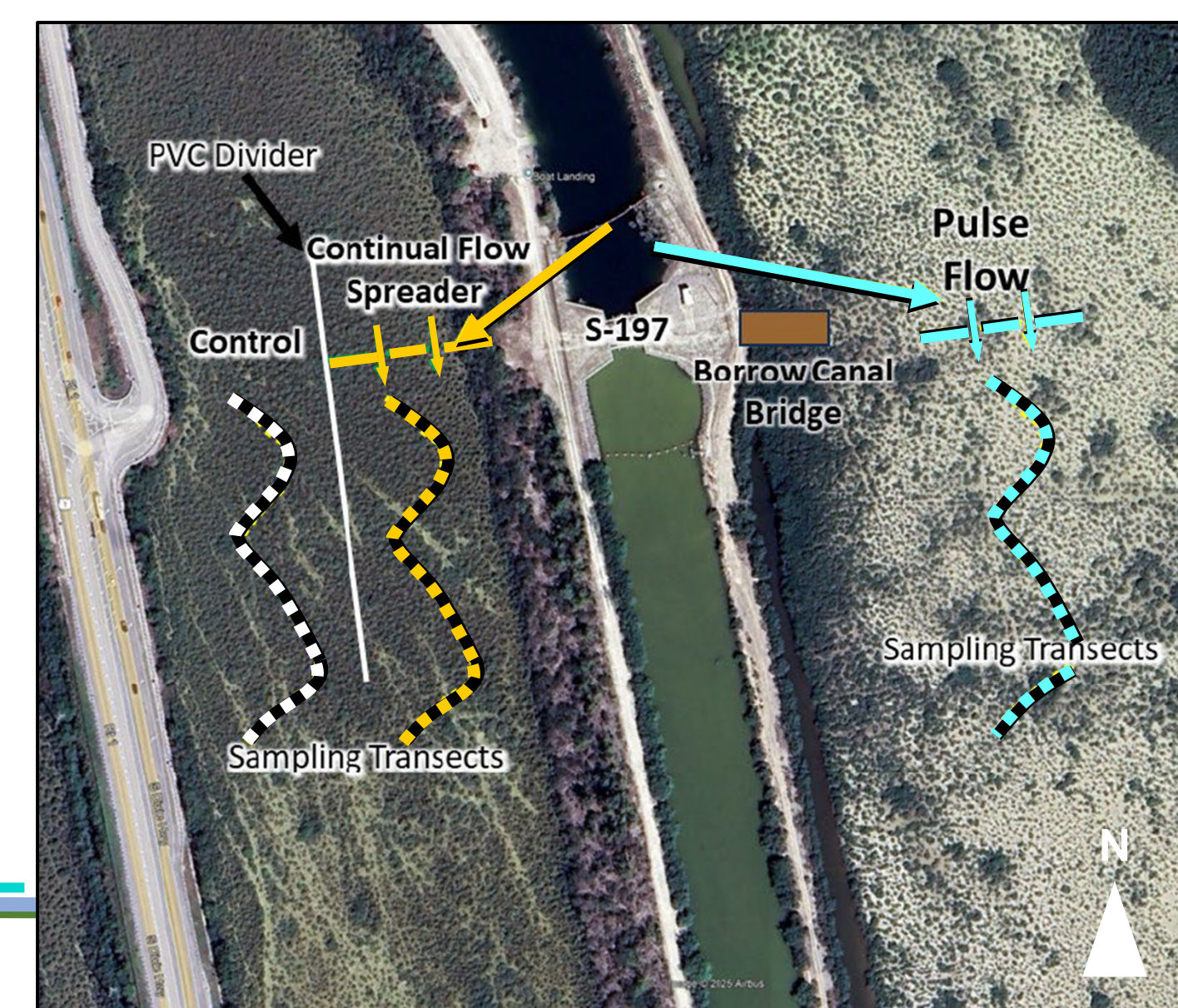
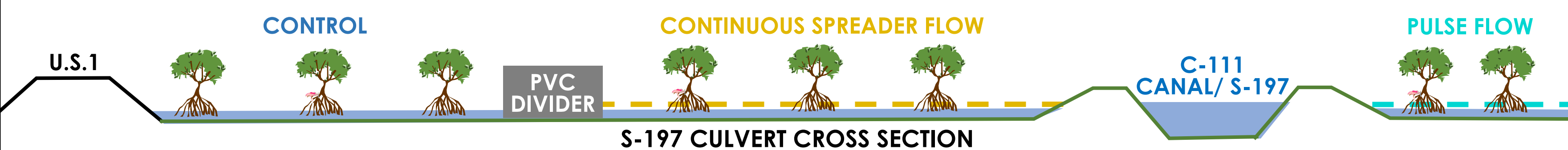
Understanding the ecological benefits of enhanced freshwater flows to a mangrove or salt marsh ecosystem will inform future projects within the southern Everglades targeted to increase resilience, reduce mangrove encroachment, and improve flood management decisions.

UNCERTAINTY: Will CERP coastal freshwater flow enhancements result in enough vegetation productivity and soil accretion to provide increased stormwater protection, less peat collapse, and greater mangrove resilience?

HOW UNCERTAINTY ADDRESSED:

- 1) Scrub mangroves will receive freshwater sheet flow (continual in west and pulse in east) to simulate discharge during storm events. Soil accretion/erosion monitoring and environmental and biological monitoring will occur.
- 2) Mesocosm study to simulate hydrology conditions to monitor below-ground biomass accumulation compared to above-ground biomass.

PROJECT CONTACT: Jenna May (jenna.c.may@usace.army.mil)



FIELD-BASED SEDIMENT CHARACTERIZATION OF THE ST. LUCIE ESTUARY

Understanding the sediment characteristics and dynamics prior to CERP implementation could direct management actions that are critical to rebuilding healthy estuaries including Loxahatchee, Caloosahatchee, and Lake Worth Lagoon.

UNCERTAINTIES:

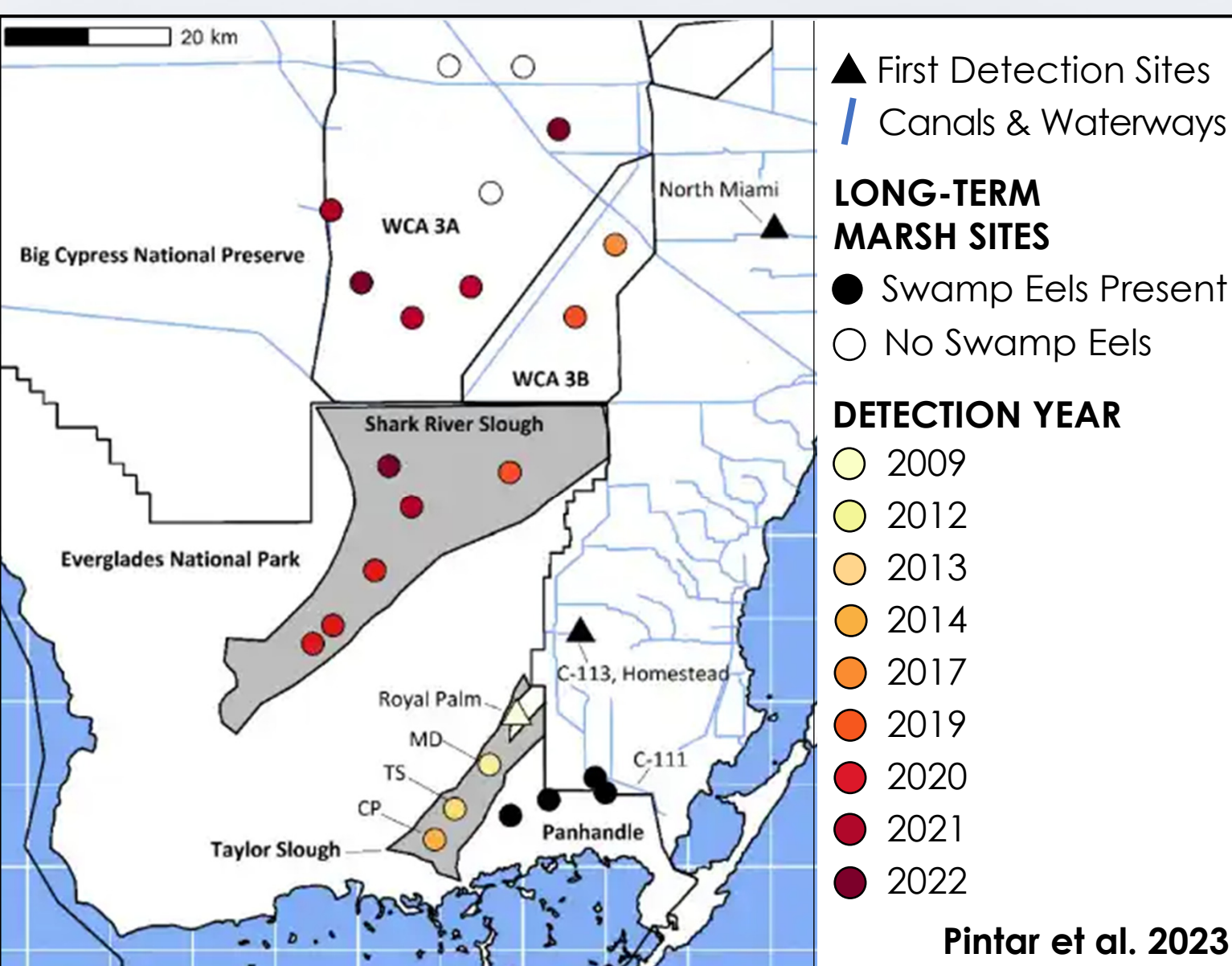
- 1) Will additional measures be necessary to reestablish oysters (e.g., muck removal, substrate remediation, adding cultch)?
- 2) How will anticipated changes in flow and salinity in the Northern Estuaries from CERP activities affect ecological restoration of submerged aquatic vegetation (SAV) populations/habitat?
- 3) Will additional measures be necessary to reestablish SAV (e.g., muck removal, substrate remediation, outplanting, or predator exclusion)?
- 4) Will appropriate salinity and sediment conditions, because of CERP implementation, lead to a healthy benthic infaunal community?

HOW UNCERTAINTY ADDRESSED:

- 1) Muck mapping and dredge site prioritization: locate deposits of muck that can be prioritized for future removal via dredging for restoration of oyster, seagrass, and infauna habitat.
- 2) Identification of sediments conducive for benthic restoration by leveraging long-term infaunal and environmental monitoring data.
- 3) Quantification of sediment deposition in key locations of the estuary, focused on areas near water control structures and known muck hotspots from long-term monitoring and previous muck mapping efforts.

PROJECT CONTACT: Curtis Szewczyk (cszewczyk@sfwmd.gov)

Image to the right: Sediment core sampling (Photo Credit: Smithsonian Institution).



EXPERIMENTAL DEVELOPMENT OF AN ASIAN SWAMP EEL ADAPTIVE MANAGEMENT STRATEGY

Develop effective invasive Asian Swamp Eel removal protocol to equip all CERP partners with tools to remove eels, preventing spread and mitigating direct and indirect pressures on CERP indicators.

UNCERTAINTIES:

- 1) What trapping technique can be deployed to efficiently and effectively remove Asian Swamp Eels from CERP infrastructure?
- 2) Can removing Asian Swamp Eels from water management infrastructure (i.e., canals, reservoirs) serve as an effective Adaptive Management action to curtail invasions of Asian Swamp Eels into natural areas of the ecosystem?

HOW UNCERTAINTY ADDRESSED:

Test Asian Swamp Eel bait preferences and trap effectiveness in a laboratory setting to develop trapping protocol for field trials.

PROJECT CONTACT: Jake Edwards (jake.r.edwards@usace.army.mil)

Image to the right: Asian Swamp Eels (ASE) have been implicated in severe declines of fish and crayfish populations within Everglades National Park (Pintar et al. 2023). If ASE are allowed to propagate unchecked through the entirety of the Everglades, the ecological goals of CERP may likely be undermined (Photo Credit: Neylon Bryan, Florida International University).

