CENTRAL EVERGLADES PLANNING PROJECT

How Monitoring for Restoration Success Informs Water Management and Project Implementation

GEER Conference 2015 Session 9

Linking Hydrology to Ecology in Restoration Planning, Design, and Implementation

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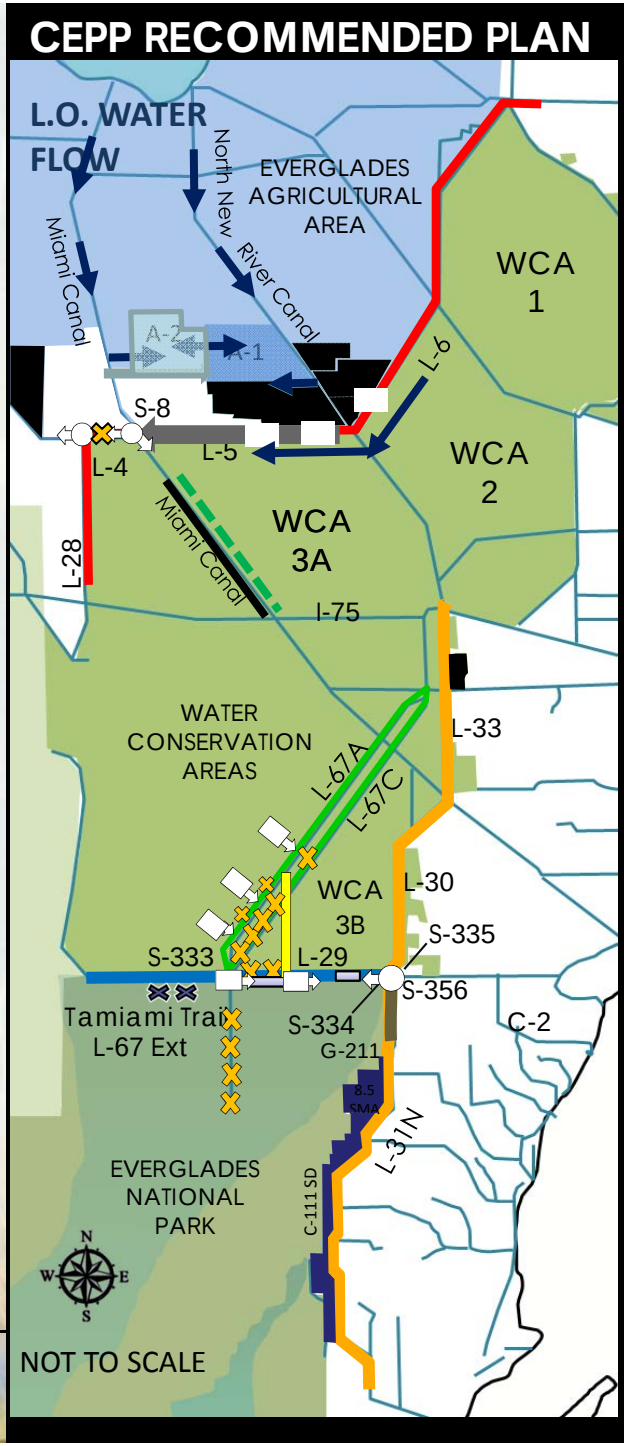
CEPP ADAPTIVE MANAGEMENT & MONITORING PLANS

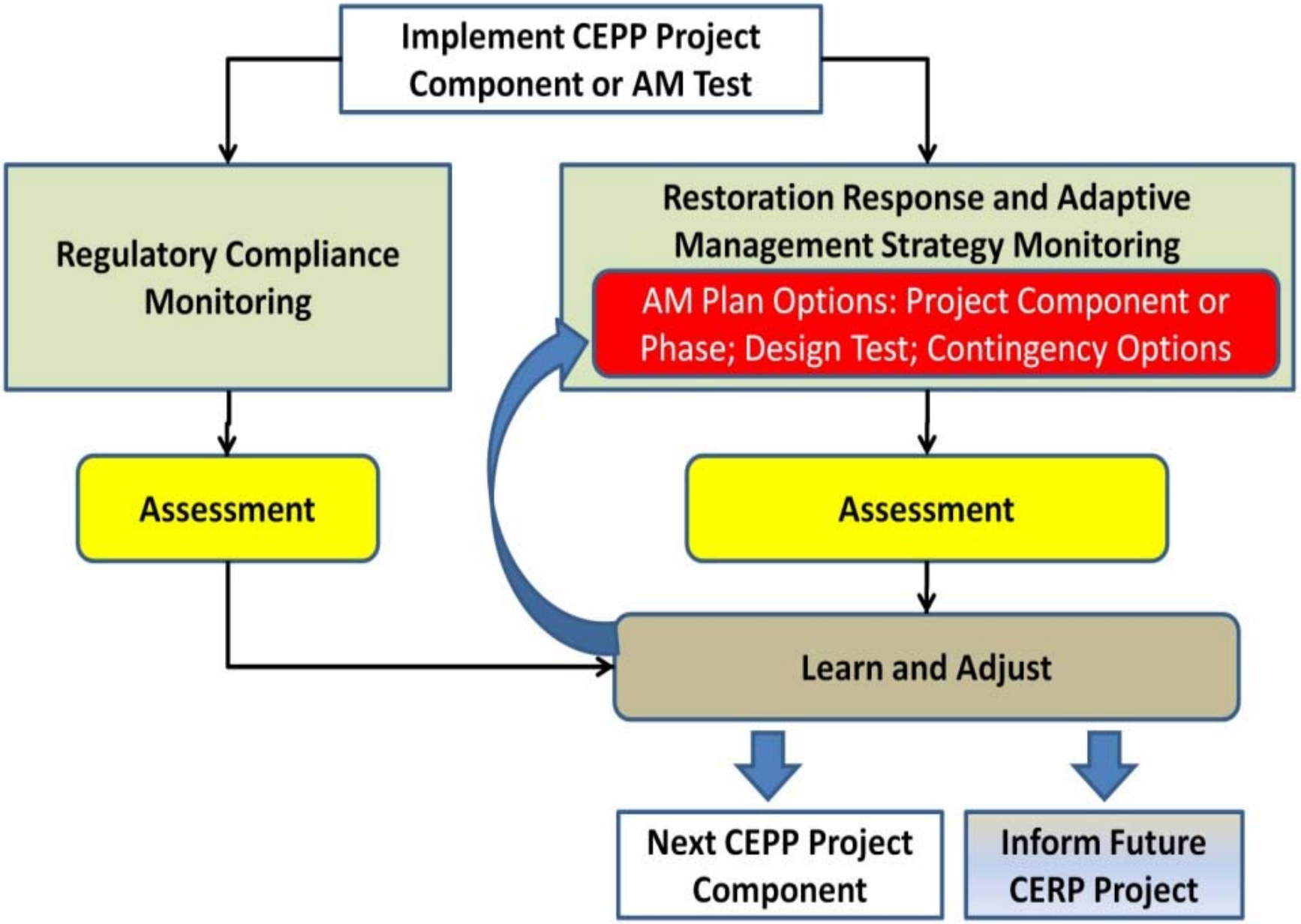
- Identify the monitoring information needed to inform CEPP implementation
- Document restoration progress
- Consists of:
  - Adaptive Management Plan
  - Hydrometeorological monitoring plan
  - Water quality monitoring plan
  - Ecological monitoring plan



WHAT IS ADAPTIVE MANAGEMENT?

- A structured approach for addressing uncertainties by:
  - Testing
  - Providing scientifically sound information for decision making
  - Adjusting project implementation if necessary
- Takes place throughout the life cycle of the project, including during planning
- Focuses on confirming & improving project performance related to project objectives & constraints

ADAPTIVE MANAGEMENT STRATEGIES & PROJECT IMPLEMENTATION DIAGRAM



WHAT IS A PROJECT'S MONITORING AND ADAPTIVE MANAGEMENT PLAN?

The Plan is a combination of two required pieces of CERP Project Implementation Reports (PIRs):

- A monitoring plan specifies the data collection, analysis, & reporting that will inform project performance
- An Adaptive Management Plan guides the use of collected data to:
  - Maximize project benefits while reducing project costs
  - Help inform implementation sequencing of CEPP
  - Understand how monitoring will determine if adjustments are needed in project implementation to improve performance

HOW DOES THE AM PLAN RELATE TO THE REST OF THE MONITORING PLAN?

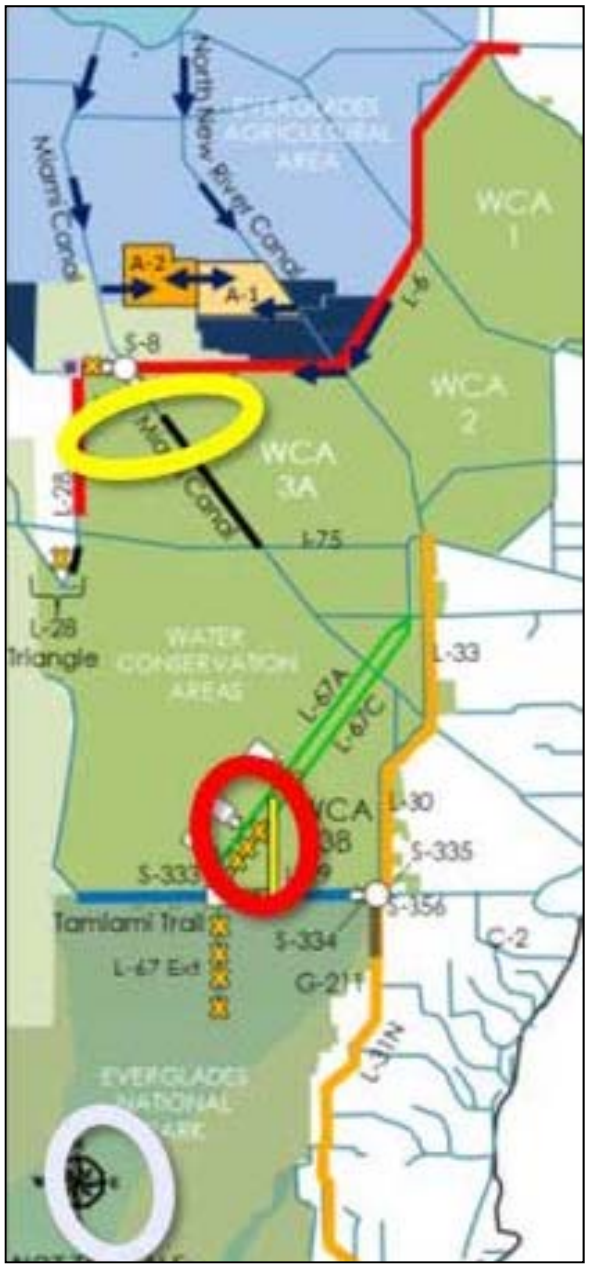
Adaptive Management Plan (AM Plan) includes:

- AM-relevant uncertainties
- Strategies for adjusting certain aspects of CEPP if necessary
- Recommendations
- Potential adjustments based on a scientifically efficient & sound process of learning from data
  - Hydrometeorological Monitoring
  - Water Quality Monitoring
  - Ecological Monitoring
  - RECOVER Monitoring & Assessment Plan (MAP)
  - Other monitoring data

CEPP ECOLOGICAL MONITORING PLAN

- Identify monitoring necessary to inform decision-makers, agencies & public on CEPP's achievement of ecological restoration success
- Monitor ecosystem responses to:
  - Changes in water depth
  - Hydroperiod duration
  - Water flow velocity
- Ensure temporal &spatial coverage of monitoring parameters to detect changes at the project level
- Coordinate with the RECOVER MAP to address CEPP-specific needs not included in the MAP
- Contribute to the CEPP AM Plan

CEPP-ECOLOGICAL MONITORING PLAN IN THE GREATER EVERGLADES



- CEPP-ECM will focus in the areas where CEPP modifications are expected to have the greatest impacts and across ecotones
- Design sampling to optimize RECOVER & Compliance monitoring networks

NORTHERN WCA-3A HRF

BLUE SHANTY FLOW-WAY

SHARK RIVER SLOUGH

CEPP PROJECT OBJECTIVE 1

Restore seasonal hydroperiods & freshwater distribution to support a natural mosaic of wetland & upland habitat in the Everglades System

- Quantification of subsidence, accretion, & sediment transport are required to understand the role that flow direction, velocity, & water depth play in restoring & maintaining the ridge-slough-tree island landscape

- Monitoring Attributes:
  - soil elevation & accretion along the ridge-slough-tree islands landscape
  - vegetation change along hydrologic gradients

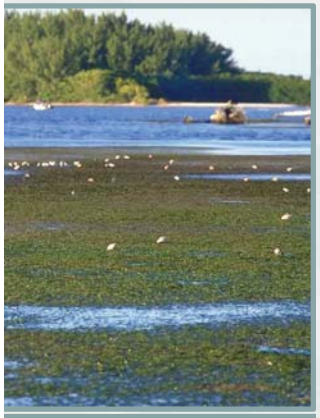
CEPP PROJECT OBJECTIVE 2

Improve sheet flow patterns and surface water depths and durations in the Everglades system in order to reduce soil subsidence, frequency of damaging fires, & decline of tree islands and decrease salt water intrusion

- Organic soil loss & accumulation are in equilibrium as a function of sheet flow & water depth patterns the effect of muck fire events on soil oxidation & subsidence
- Improvement of water sheet flow will help to decrease the rate of mangrove expansion into the freshwater wetlands
- Monitoring Attributes:
  - Soil accretion & soil elevation in mangrove communities
  - Porewater & soil salinity
  - Biological indicators such as algae and pink shrimp

CEPP PROJECT OBJECTIVE 3

Reduce high volume discharges from Lake Okeechobee to improve the quality of oyster & SAV habitat in the Northern Estuaries



- Salinity conditions will improve the habitat for oysters & submerged aquatic vegetation (SAV)
- Monitoring attributes:
  - Oysters
  - SAV
- Clear opportunity for adaptive management because the monitoring data will readily inform potential project adjustments
  - The Adaptive Management Plan provides more detail about the potential management actions that could be taken in response to the data

CEPP PROJECT OBJECTIVE 4

Reduce water loss out of the natural system to promote appropriate dry season recession rates for wildlife utilization

- Successful nesting of wading birds requires habitat conditions, including wet season prey production & dry season prey availability, which depend on hydroperiods & well-timed water level recession rates
- Restoration of multi-year hydroperiods in historically appropriate places in the Everglades will result in increased density of aquatic fauna & large fish
- Monitoring attributes:
  - Monitoring aquatic prey populations during the wet season & dry season
  - Monitoring wading bird nesting success

CEPP PROJECT OBJECTIVE 5

Restore more natural water level responses to rainfall to promote plant & animal diversity & habitat function

- Crocodilians are directly dependent on prey density & thus they provide a surrogate for status of many other species
- Alligators create “alligator holes” across the landscape that have proven to be a keystone feature of Everglades habitat (due to the topographic relief that they provide)
- More natural hydrological patterns with dry downs, no more frequent than once every 3-5 years will improve both alligator body condition & relative density of alligators
- Monitoring attributes:
  - Alligator & crocodile density in the landscape
  - Alligator & crocodile body condition

ELEMENTS OF THE CEPP ECOLOGICAL MONITORING PLAN

CEPP OBJECTIVE

1. Restore seasonal hydroperiods...
2. Improve sheetflow...
3. Reduce high volume discharges...
4. Reduce water loss ...
5. Restore more natural water level responses to rainfall

ATTRIBUTE TO BE MONITORED

Marsh Soil Elevations

Marsh Vegetation Change

Vegetation Mapping

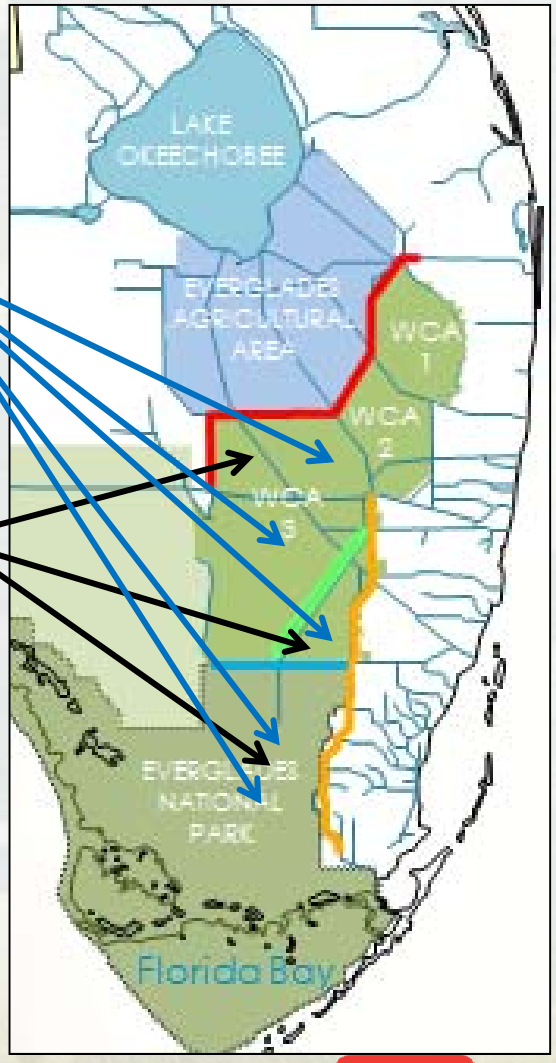
Stage, Flow, Saltwater Intrusion

Tree Island Soils & Vegetation

Biological Indicators
(Algae, Cattail)

Prey
(Small Fish, Crayfish, Shrimp)

Predators
(Alligators, Crocodiles, Wading Birds)



ACKNOWLEDGEMENTS

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CEPP Project Delivery Team Members

Many interagency team members who contributed to the CEPP Adaptive Management and Monitoring Plans

Restoration Coordination & Verification (RECOVER) Team Members

QUESTIONS?