



An Application of the Northern Everglades Regional Simulation Model (NERSM) to the St. Lucie and Caloosahatchee River Watersheds for Improving Hydrology and Water Quality

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# Introduction

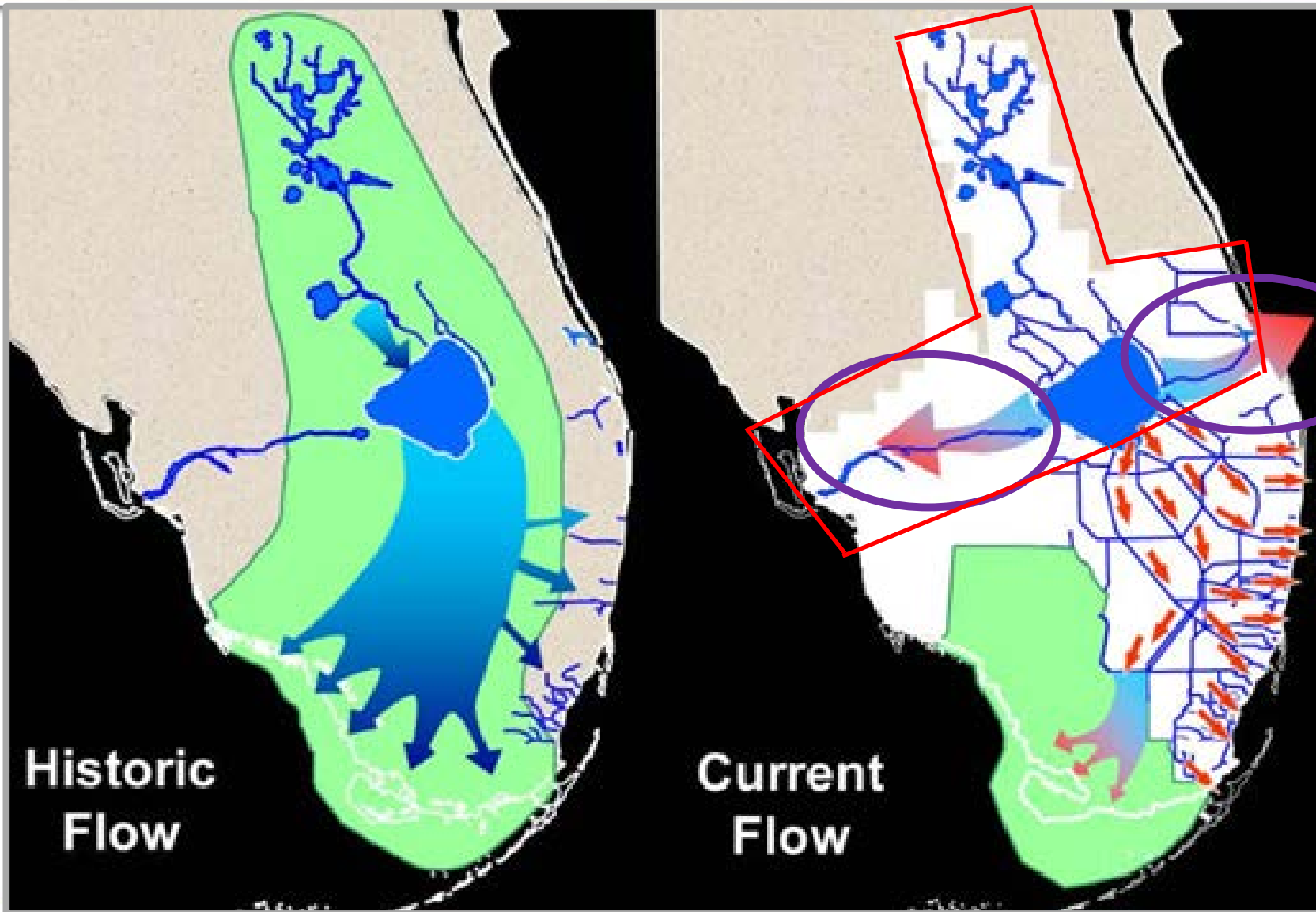
- On January 2009, River Watershed Protection Plan (RWPP) was developed with the goal of protecting and restoring Caloosahatchee and St. Lucie rivers and estuaries.



[sfwmd.gov](http://sfwmd.gov)



- RWPP built upon the Northern Everglades Lake Okeechobee Watershed Protection Plan Construction Project, Phase 2 Technical plan (LOP2TP).
- LOP2TP identified water storage alternatives north of Lake Okeechobee to achieve healthier lake levels and improve water quality of lake inflows.



- Model Area
- Study Area

Historic Flow

Current Flow



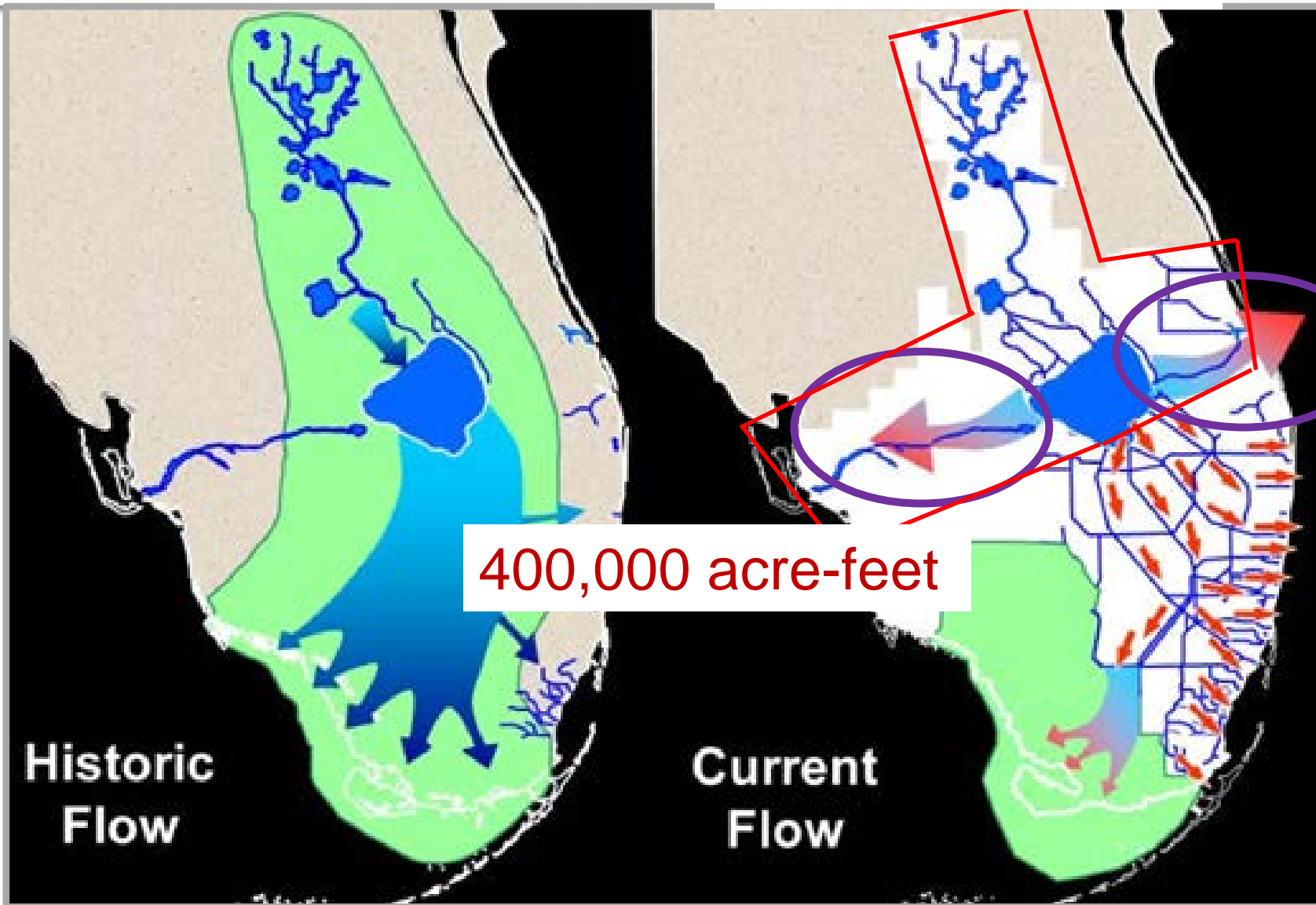
# Introduction

- The overall objective of RWPP (“the plan”) was to improve the quality, timing and distribution of water in the St. Lucie and Caloosahatchee river watershed. In particular,
  - Reduce the frequency and duration of harmful excess freshwater discharges to the estuaries (high & extremely high flows)
  - Maintain minimum flow to the estuaries (minimum flow criteria)
  - Minimize nitrogen and phosphorus loads to the estuaries.
- The plan proposed a number of watershed storage and water quality alternatives, east and west of Lake Okeechobee.



# Storage Identified in this plan

900,000 acre-feet



400,000 acre-feet

- Model Area
- Study Area

200,000 acre-feet



## Introduction – “water quantity issues”

- Besides local runoff, Lake Okeechobee (“LOK” or “Lake”) is the only major source of water into both river watersheds.
- During high rainfall events as LOK levels continues to rise, releases from the LOK occur as per LOK regulation schedule.
- LOK releases to the east and west towards the estuaries are further exacerbated due to:
  - Legal limits for phosphorous loading to the south into the Everglades Protection Area (EPA) and Everglades National Park (ENP).
  - Flooding risks in urban and agricultural areas limit releases south of the Lake.
  - There is also much smaller capacity of canals and structures that provide outflow south of the Lake relative to east and west.



## Introduction – “water quality issues”

- For both St. Lucie & Caloosahatchee basins, local basin runoff is the largest contributor of freshwater inflows to the estuaries especially during the wet season.
- Local basin runoff carry high amounts of nitrogen (N) and phosphorus (P) into the river and estuary resulting in algal blooms and fish kills.
- Too much or too little freshwater flowing to the estuaries (seagrass, oyster populations & fish larvae)([salinity envelope criteria](#))



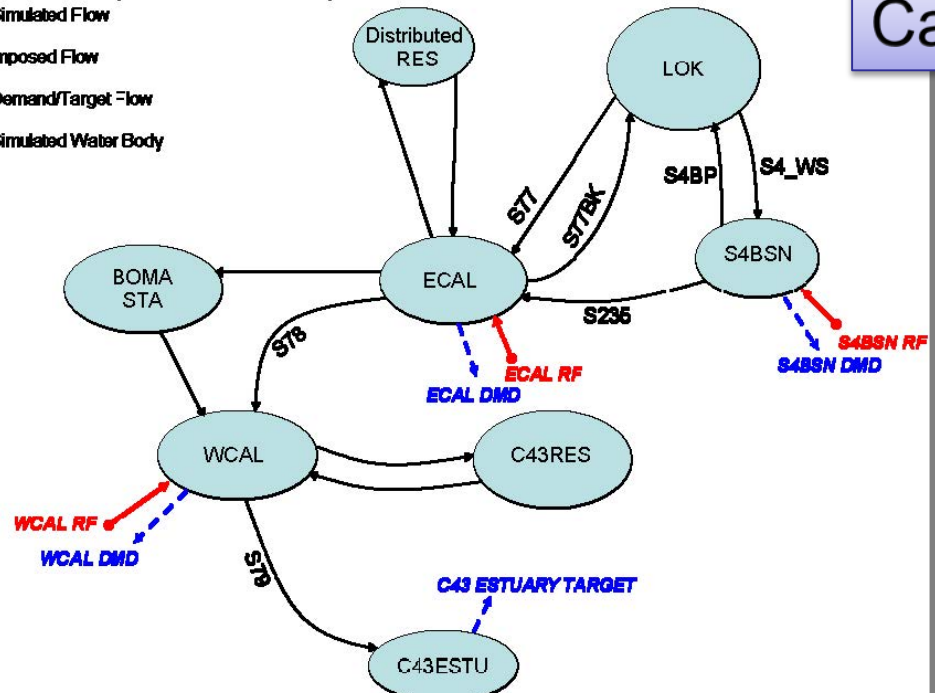
## Plan Formulation Strategy

- Four alternatives were formulated (unique combination of watershed storage and water quality projects)
- “Current Base” – represents 2005 conditions.
- “RWPPB” – represents 2015 conditions
- “Alt1” – Added features to “RWPPB” (imminent)
- “Alt2” – Maximize water storage capacity (“Alt1” + storage)
- “Alt3” – Maximize water quality capacity (“Alt1” + water quality)
- “Alt4” – Optimize both water storage & water quality capacity (“Alt2”+”Alt3”)

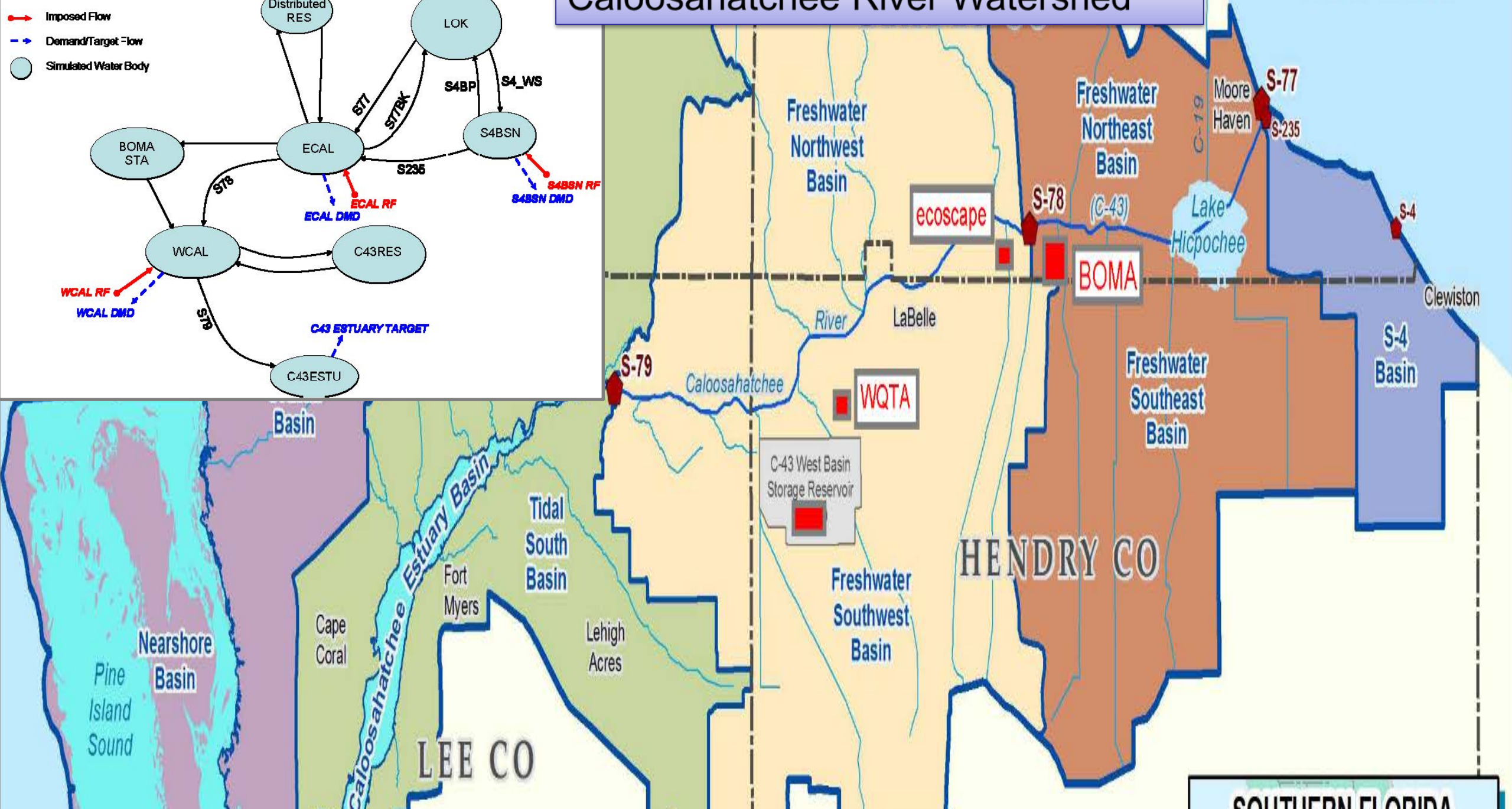


C-43 Watershed (Alternatives 1 & 2)

- Simulated Flow
- Imposed Flow
- > Demand/Target Flow
- Simulated Water Body

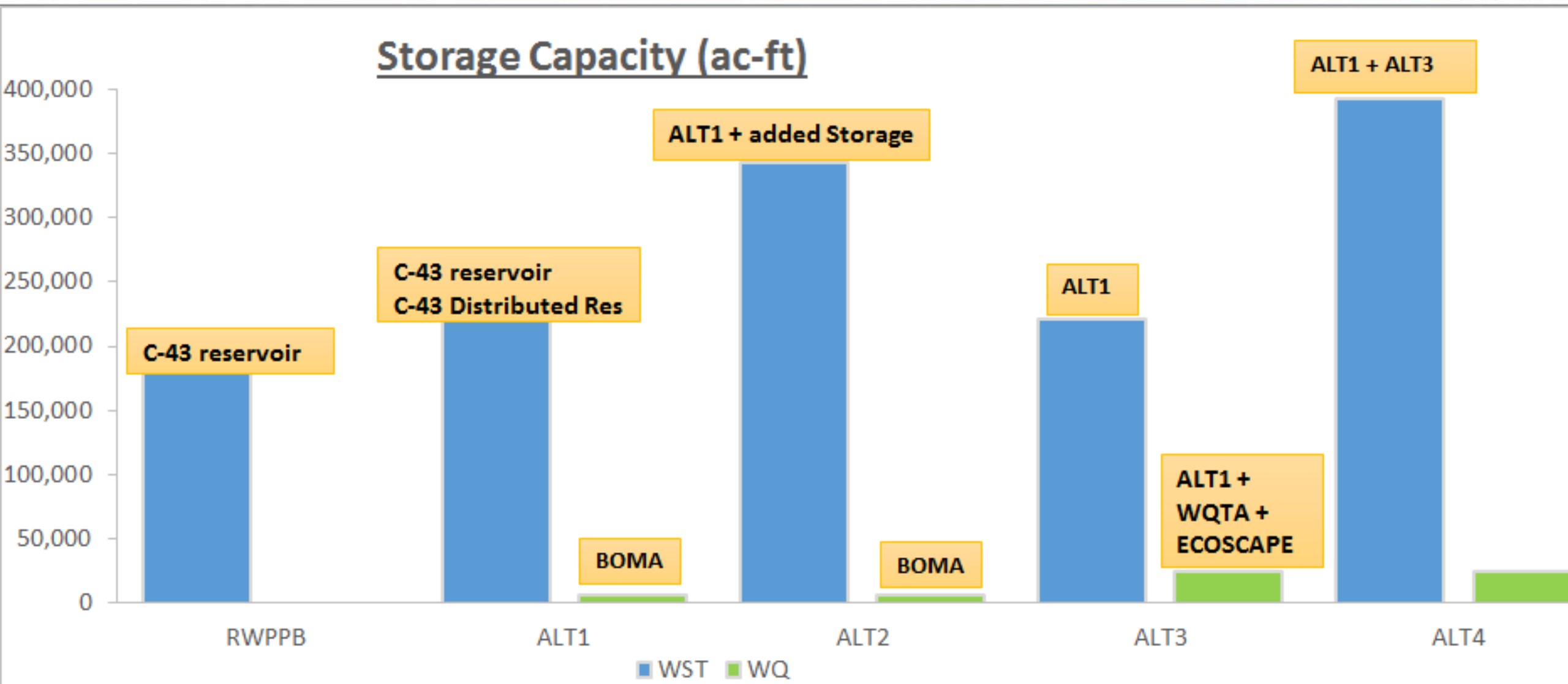


# Caloosahatchee River Watershed

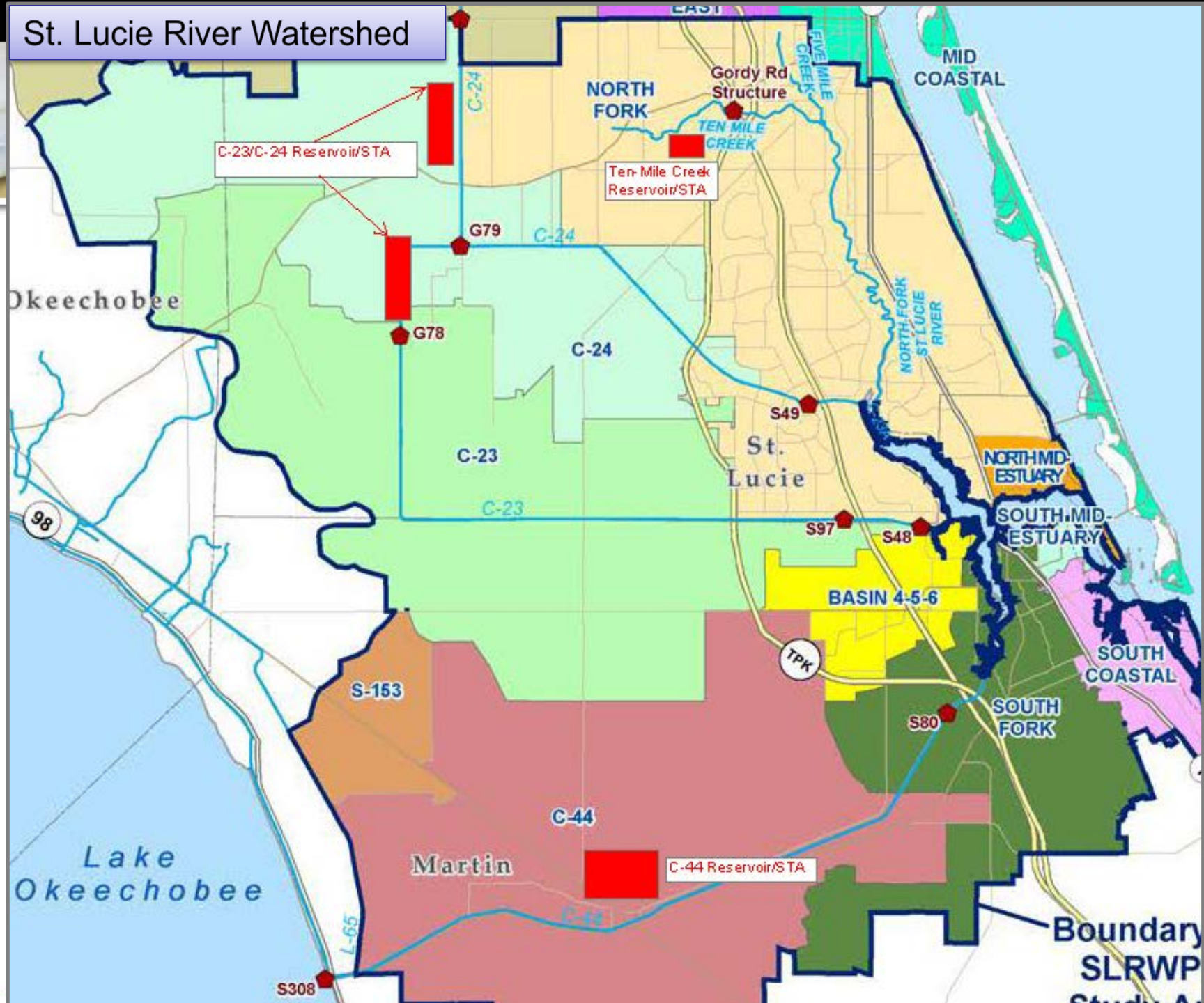




# Caloosahatchee Modeling Specifications



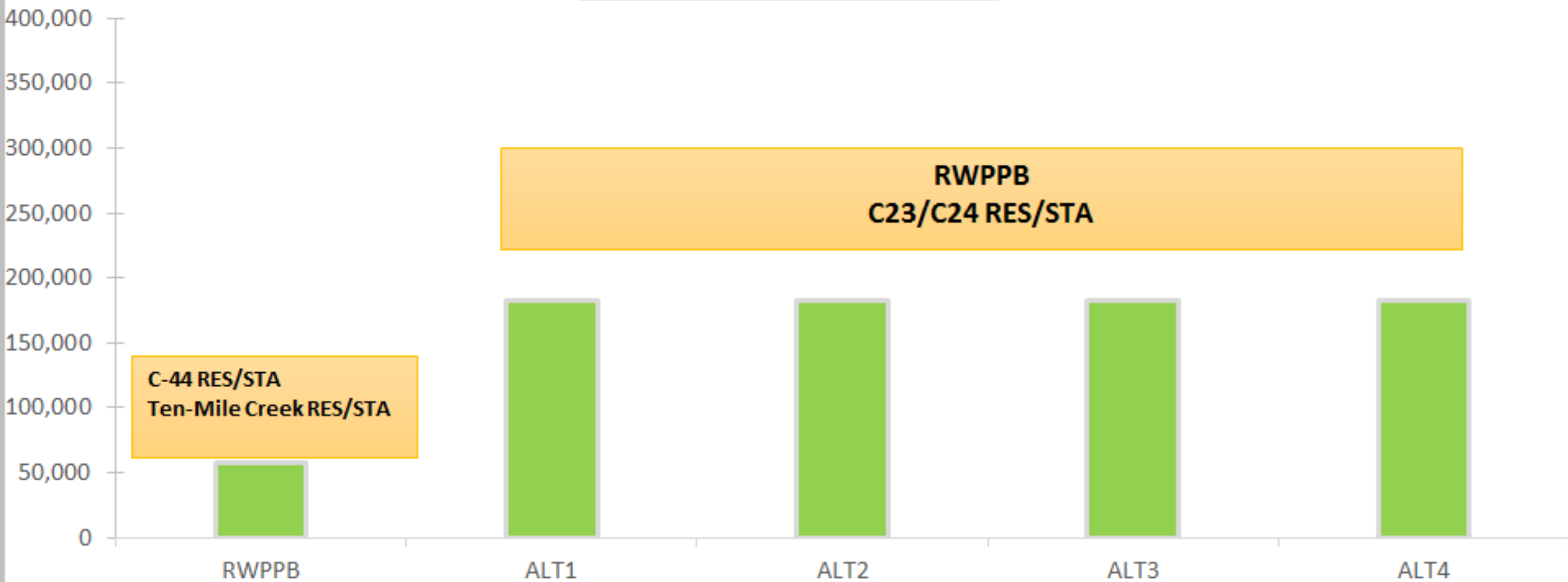
St. Lucie River Watershed





# St. Lucie Modeling Specifications

Storage Capacity (ac-ft)





# General Model Description and Assumptions

- Northern Everglades Regional Simulation Model (NERSM) is a node-link version of Regional Simulation Model (RSM).
- RSM is a regional-scale hydrologic model developed by SFWMD to simulate managed flow conditions in South Florida.
- Each node represents a distinct drainage basin or hydrologic feature for which a water balance is simulated. Link represents the processes that convey water from one node to another.



# General Model Description and Assumptions

- NERSM Model domain:
  - Lake Okeechobee Watershed
  - Caloosahatchee Watershed
  - St. Lucie Watershed
- Period of Simulation (1970 – 2005)
- Daily time-step



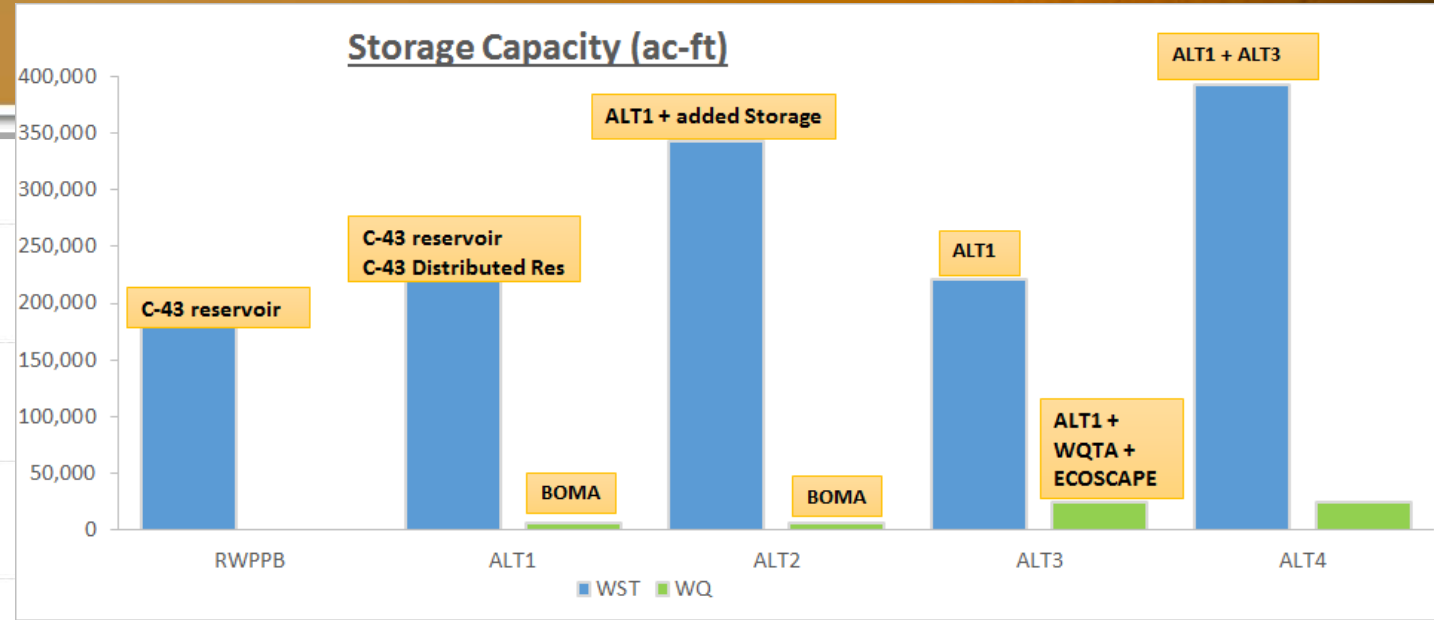
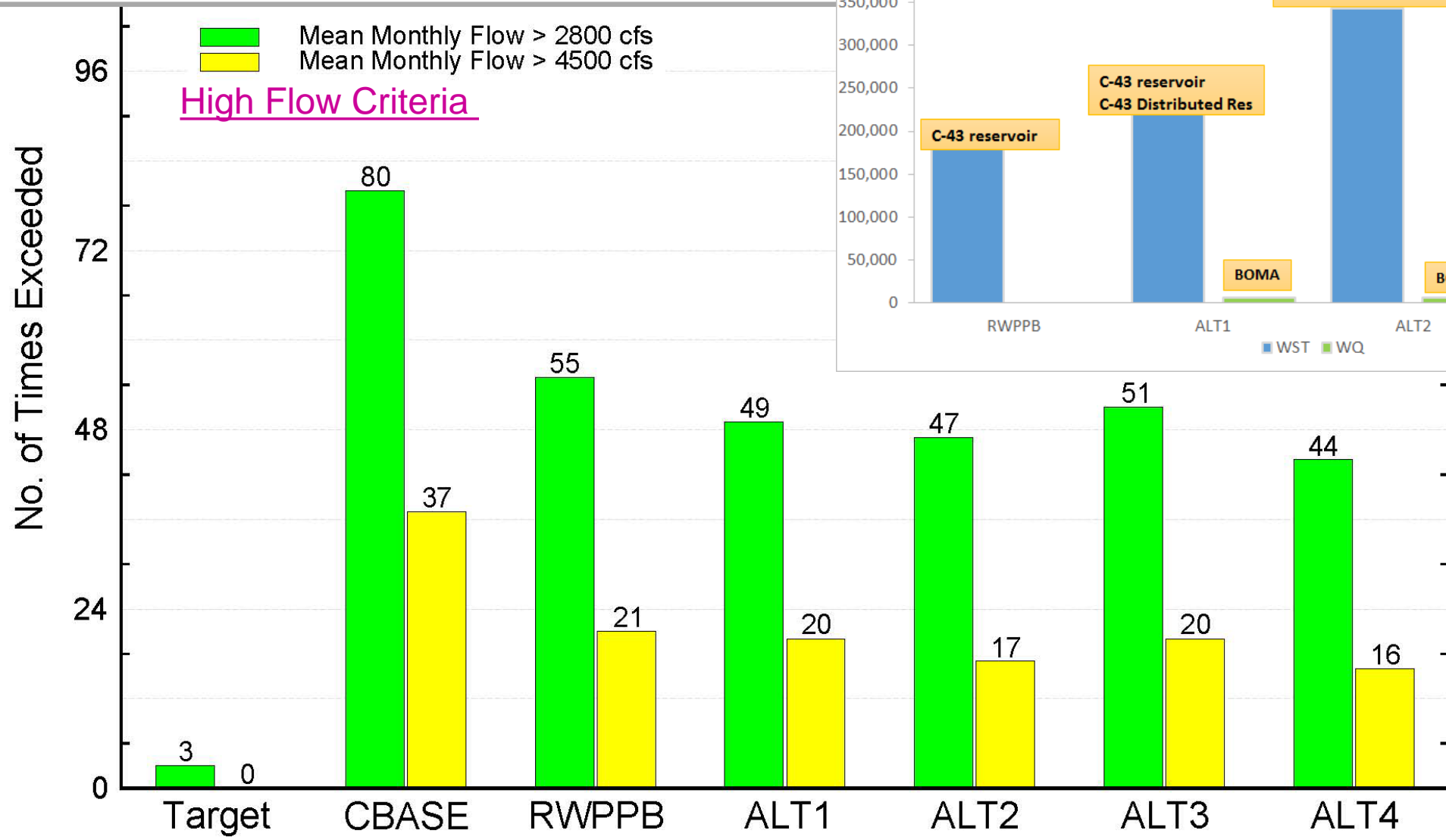
# Performance measures and indicators

- As per Restoration Coordination and Verification (RECOVER, 2007), the following estuary performance measures were selected:
  - 1) Number of times High Flow Criteria NOT met –
    - Goal is to reduce the occurrence of high discharges to approximate natural conditions.
  2. Number of times Salinity Envelope Criteria NOT met –
    - Goal is to maintain salinity concentrations that are conducive to estuary ecology.



# RWPP Modeling Results

Caloosahatchee River Watershed





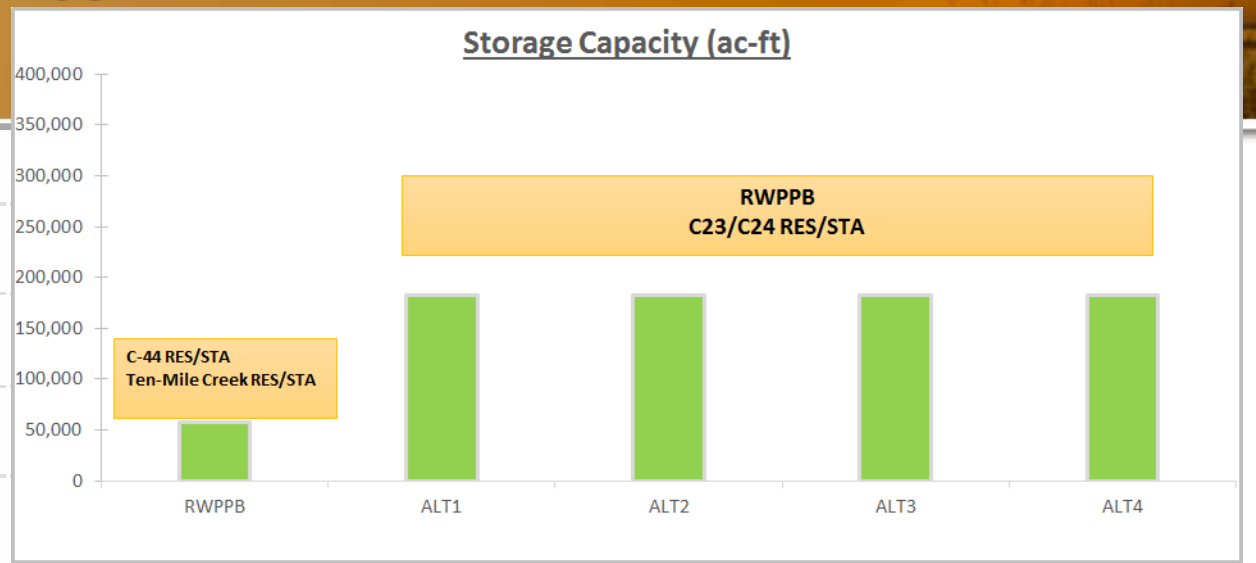
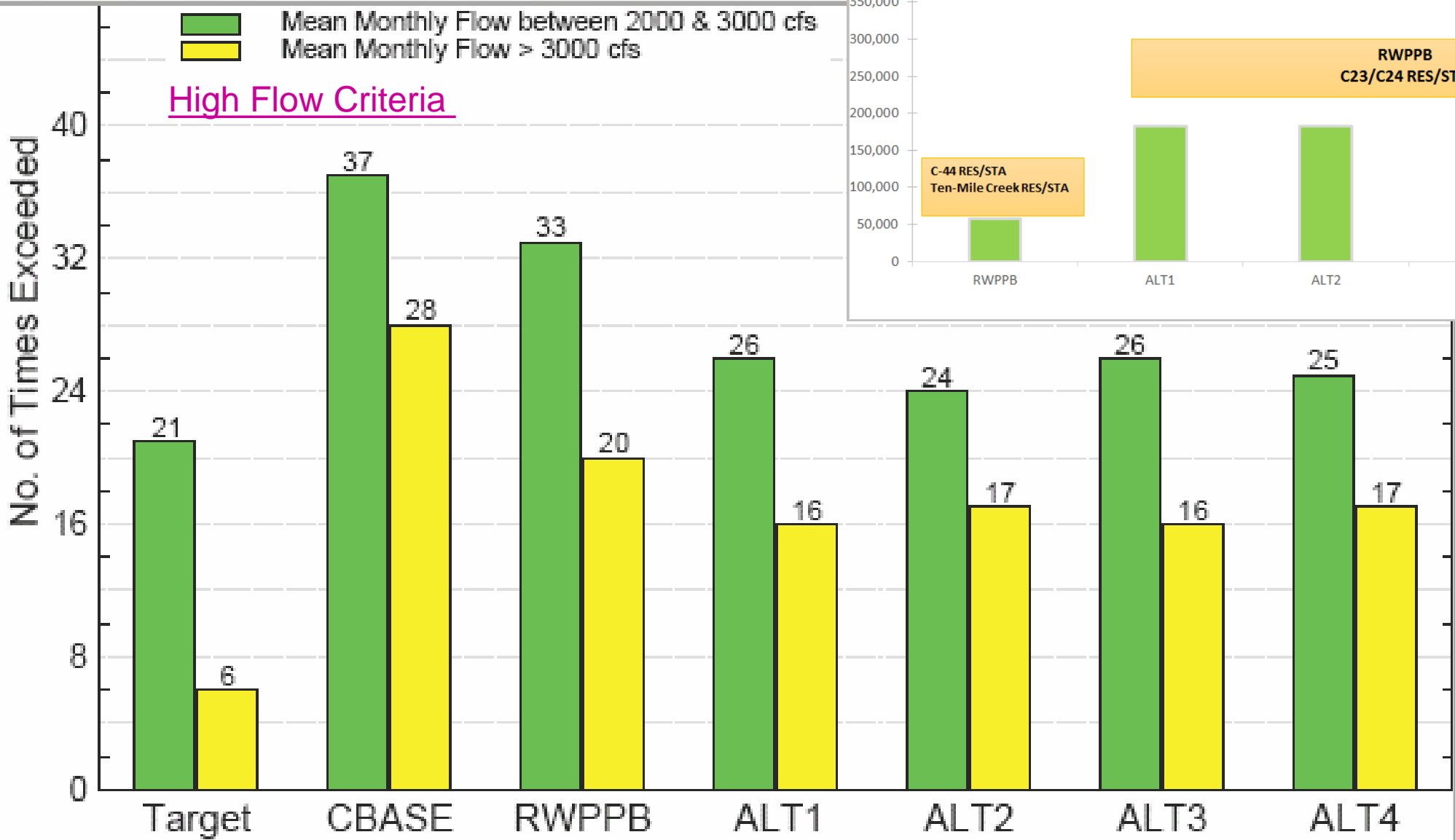


# RWPP Modeling Results

St. Lucie River Watershed

█ Mean Monthly Flow between 2000 & 3000 cfs  
█ Mean Monthly Flow > 3000 cfs

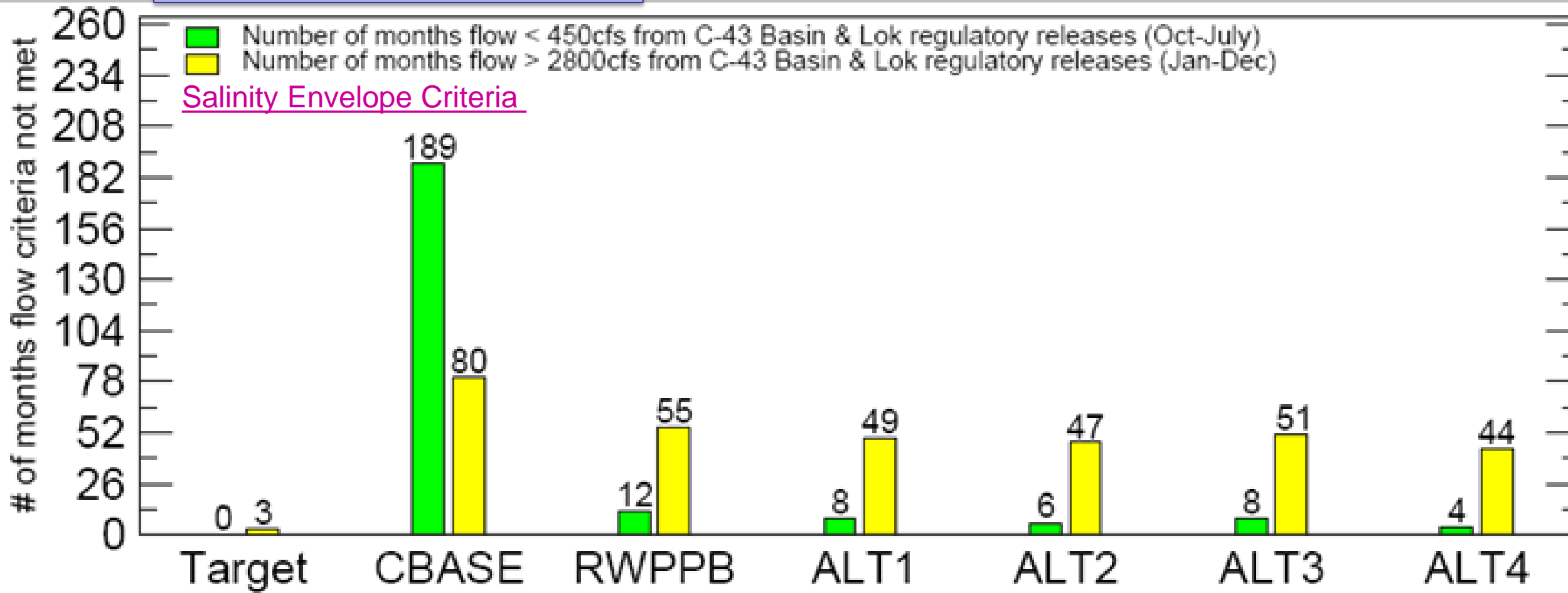
High Flow Criteria





# Salinity Envelope Criteria

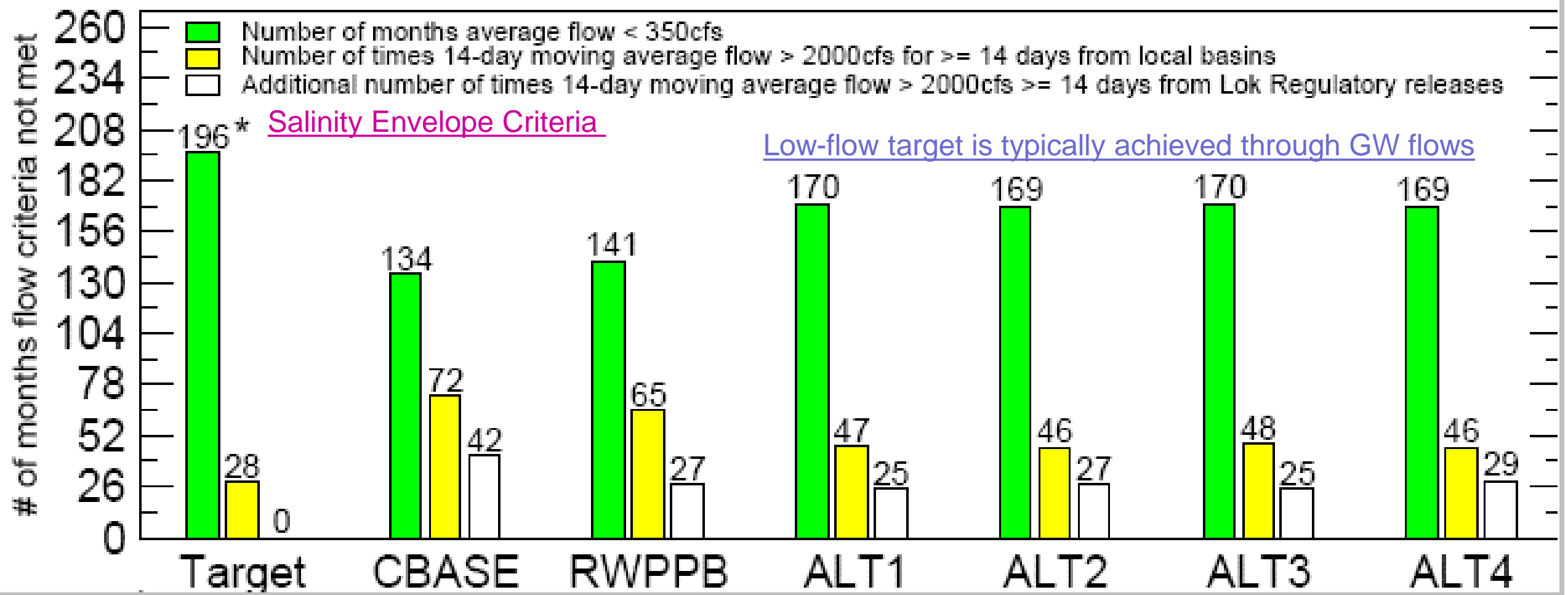
Caloosahatchee River Watershed



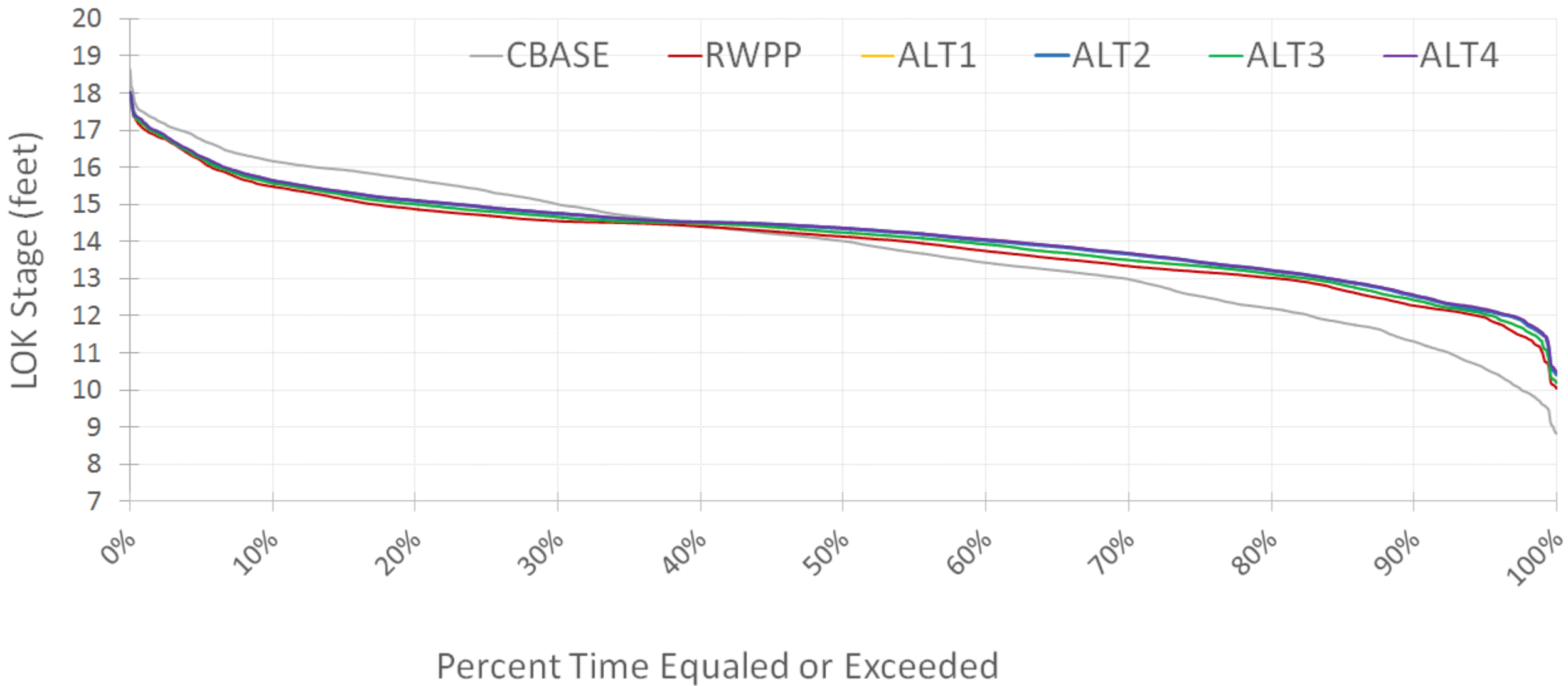


# Salinity Envelope Criteria

St. Lucie River Watershed



Lake Okeechobee Stage Duration Curve (Feet, NGVD 29)





- QUESTIONS?

