Application of a Hydrologic Model (LECSR-NP) to Determine Interim Restoration Benefits for the Northwest Fork of the Loxahatchee River

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Presentation Overview

- Loxahatchee River Watershed

  - Adverse alterations have led to lack of freshwater flow for this National Wild and Scenic River

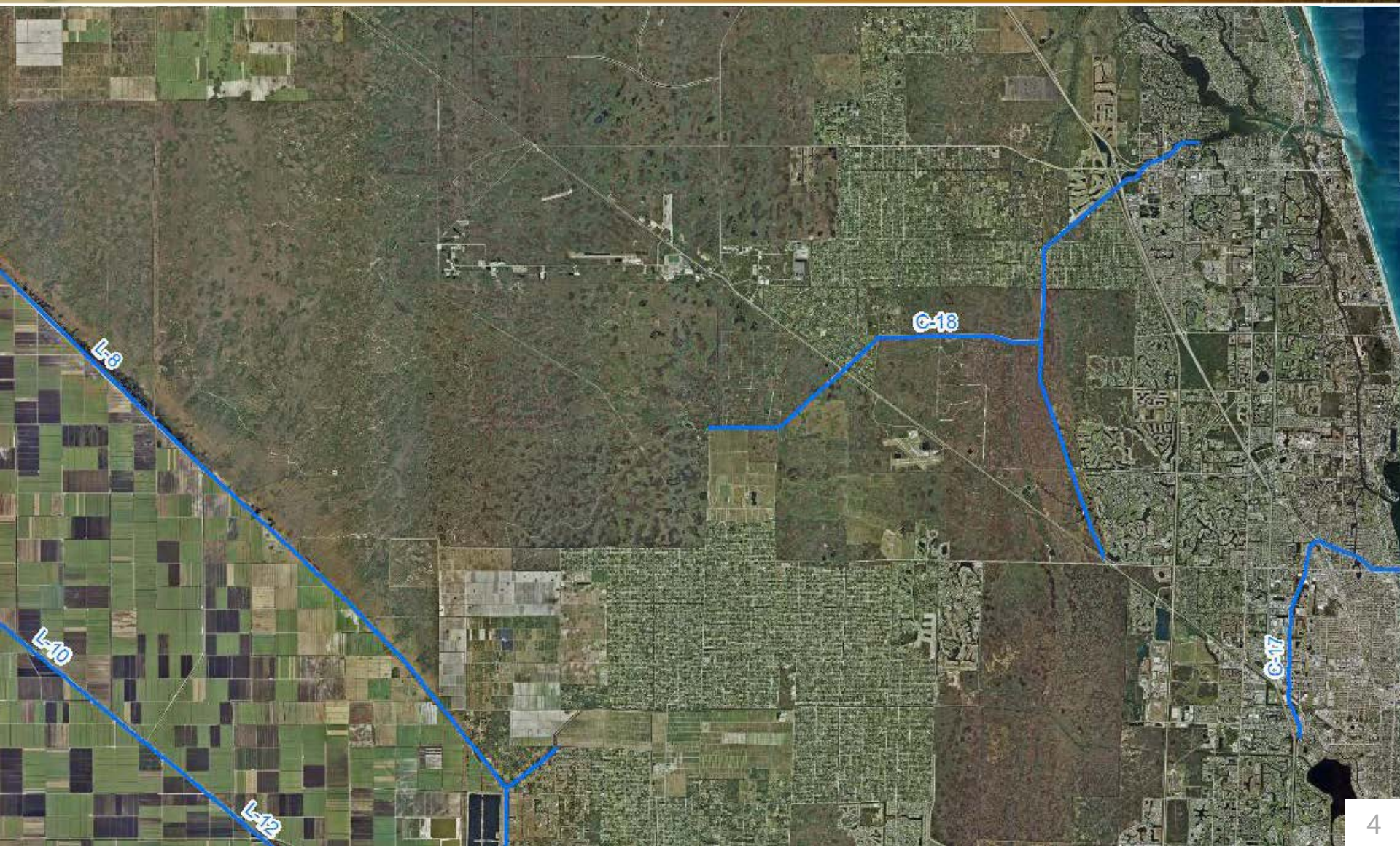- Recovery and restoration projects

- LECSR-NP Model overview & application

~ 25-35 cfs at Lainhart Dam

Loxahatchee River Watershed

CERP North Palm Study Area

Loxahatchee River Watershed

Project Boundary

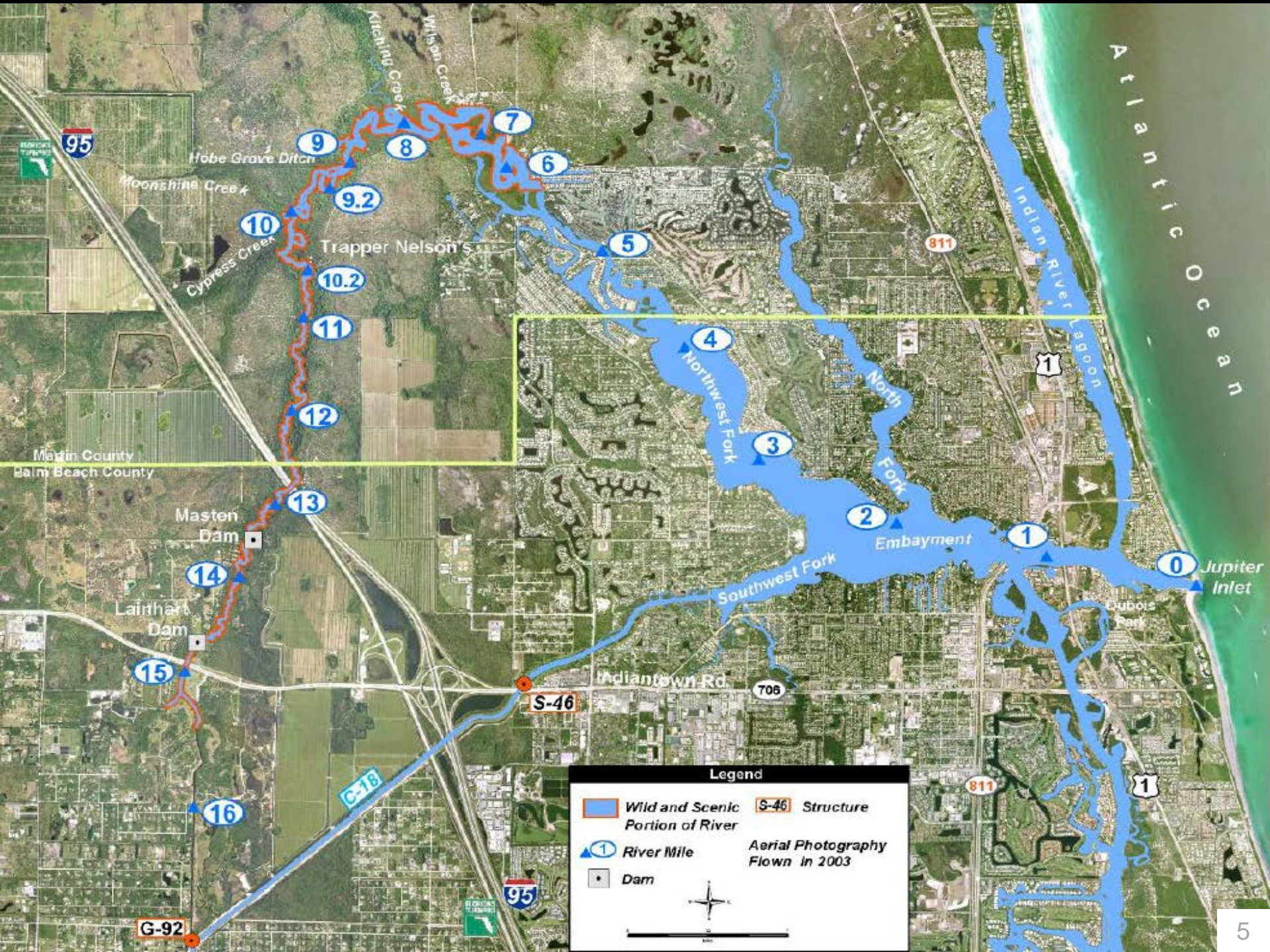Model Boundary
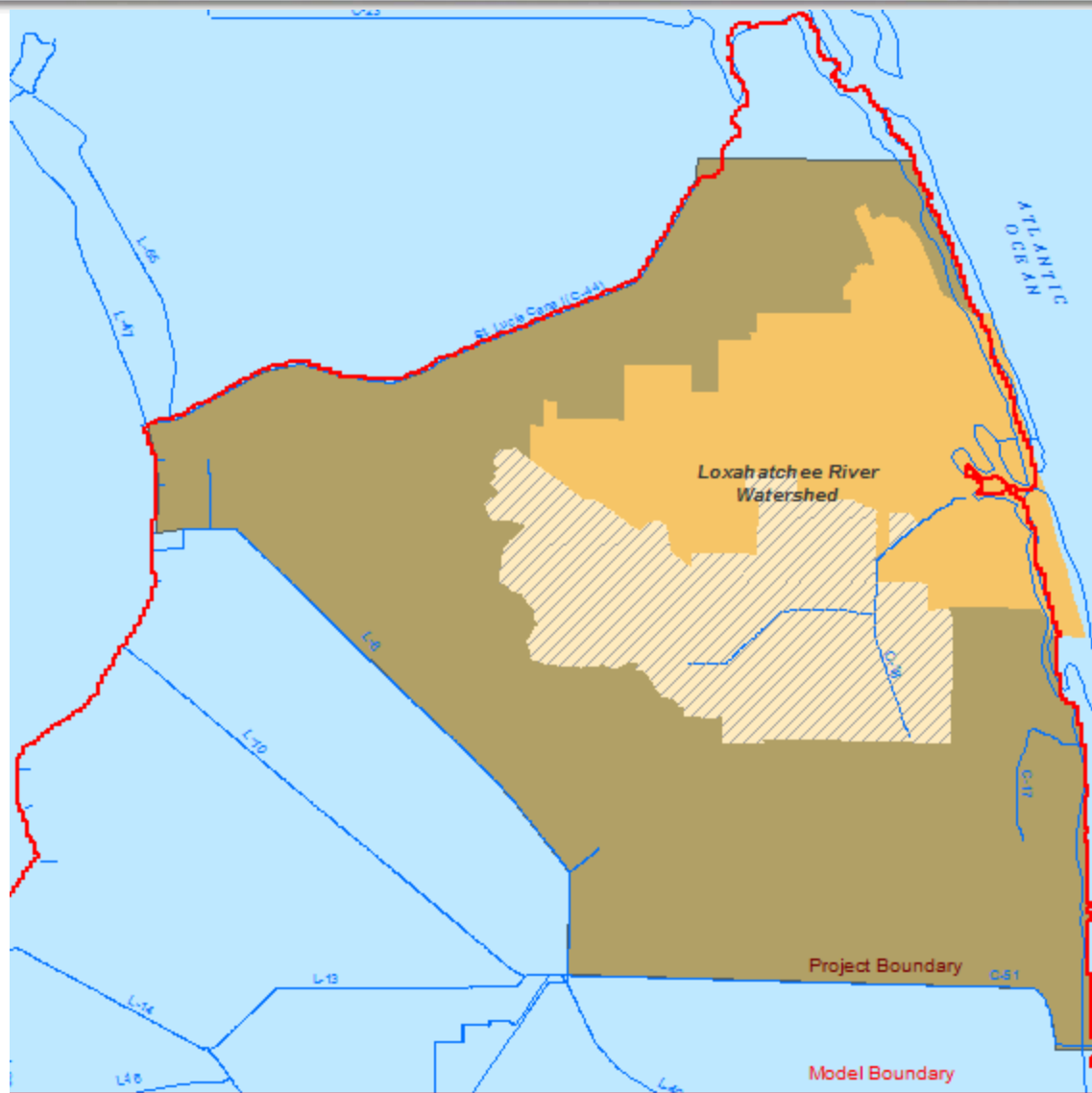
Loxahatchee River Watershed

Legend

▢	Wild and Scenic Portion of River	S-46	Structure
▲①	River Mile		Aerial Photography Flown in 2003
▪	Dam		

5

Recovery and Restoration Goals

- Minimum flows and levels (MFL)

  - Exceedance: Lainhart Dam < 35 cfs for more than 20 consecutive days

  - Violation: when an exceedance occurs more than once in a six year period

- Restoration targets

  - Dry season: Lainhart Dam > 70 cfs

  - Wet season: Lainhart Dam >110 cfs

Recovery and Restoration Projects for Modeling

- Loxahatchee River Replacement Project

  - Meet minimum flows and levels (MFL) criteria

  - Partial dry season restoration flow

- Loxahatchee River Watershed Restoration Project (LRWRP)

  - Full restoration flows and hydrologic improvements within the watershed

  - Salinity wedge downstream of River mile 7.5

CERP Proposed Storage and Flow way Improvements (Tentatively Selected Plan)
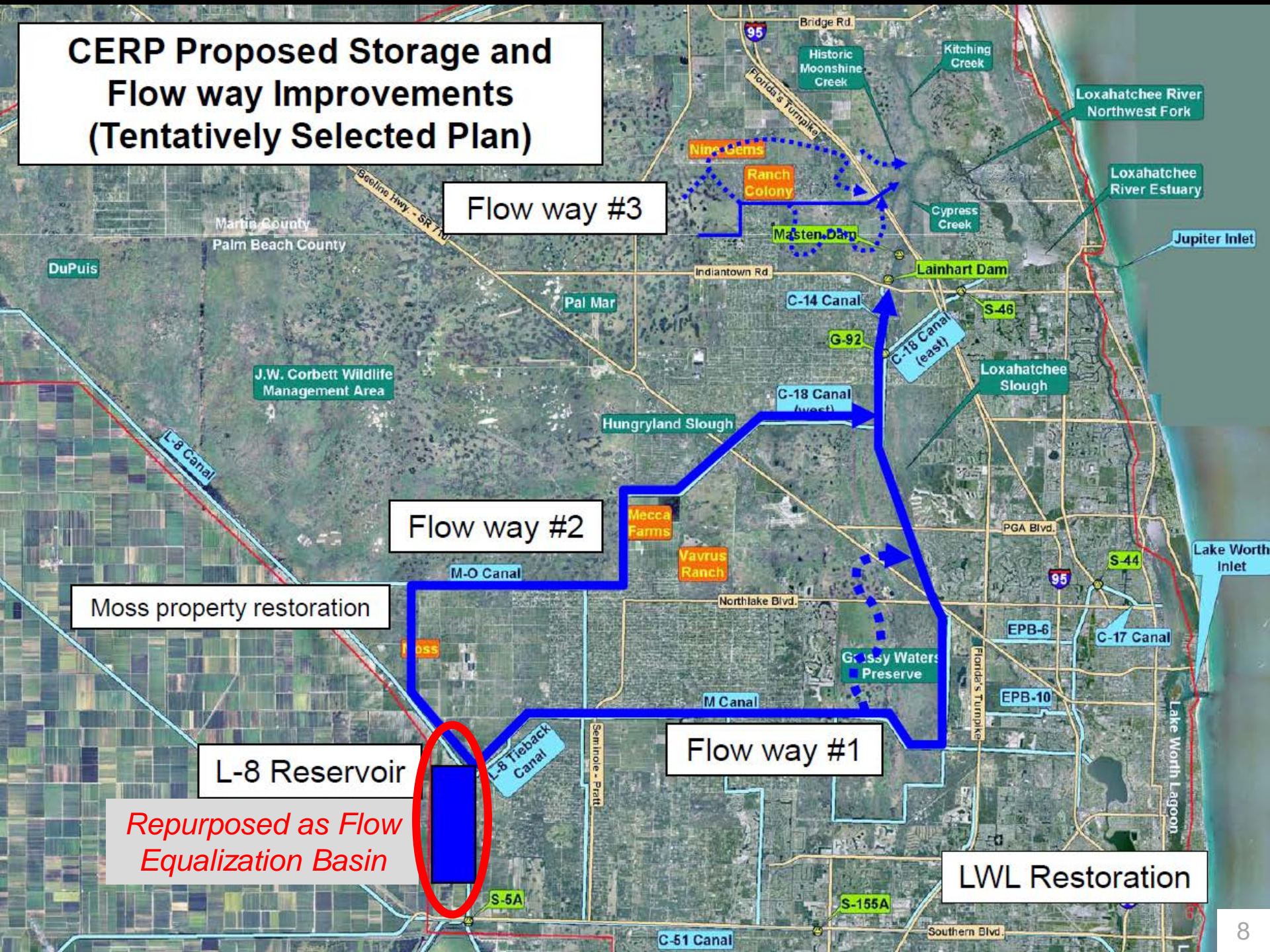
Flow way #3

Flow way #2

Moss property restoration

Flow way #1

L-8 Reservoir

*Repurposed as Flow Equalization Basin*

LWL Restoration

LECSR-NP Model Overview

- MODFLOW-based (Harbaugh et al. 2000) groundwater model with several SFWMD add-on packages to simulate additional hydrologic functionality

  - Wetland systems

  - Barriers to flow

  - Reservoirs and canals

  - Water diversions

  - Water restrictions

  - Evapotranspiration (ET), recharge, runoff and soil water balance
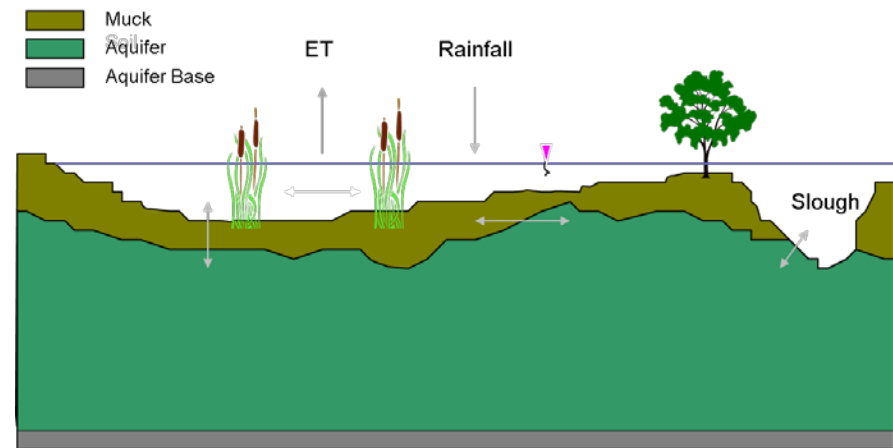
SFWMD Package	Description
Wetland (WTL)	Simulates overland flow and barriers to flow (Restrepo et al. 1998)
Reinjection Drainflow (RDF)	Redirects water to another location (Jones 1999)
Diversion (DIV)	Simulates water control structures (Restrepo et al.1998)
Trigger (TRG)	Simulates wellfield withdrawal cutbacks (Randall 1992)
Utility Generation (UGEN)	Links static data with time series data (Restrepo et al. 2003)
Multibud (BUD)	Outputs water budgets (Ecology and Environment, Inc. 2004)

ET-Recharge-Runoff Pre-Processing Program

- Use <u>modified</u> Agricultural Field Scale Irrigation Requirements Simulation Model (AFSIRS) (Smajstrla 1990)

  - Based on land use, soil, rainfall, ET, pervious/impervious areas

  - Runoff computed with Soil Conservation Service Curve Number method and attenuated with hydrologic routing procedure

- Watershed surface runoff, groundwater recharge, ET, irrigation demands

LECSR-NP Model Overview

- Project area hydrology

- Discretization
  - 704-ft grid cell size and three layers
  - Daily stress periods

- Calibration
  - 1986-2005
  - Flows at key monitoring stations
 - Surface water and groundwater levels

LECSR-NP Surface Water and Groundwater Interaction

- Mass balance approach

  - MODFLOW cell-based

  - Main component is the groundwater flow

  - Overland flow simulated with WTL Package

- Canal drainage and recharge

  - Transfer of water using DIV or RDF Package

  - Water control structures - source & sink areas

  - Based on pumpage capacity & control levels

LECSR-NP Model Application

- Assisted in identifying the replacement project and determining interim benefits

  - CERP model applications were updated with state modeling assumptions

- Formulated for existing (without project) and future (with project) conditions

  - Period of simulation: 1965-2005

  - Model results were applied to evaluation criteria for state goals
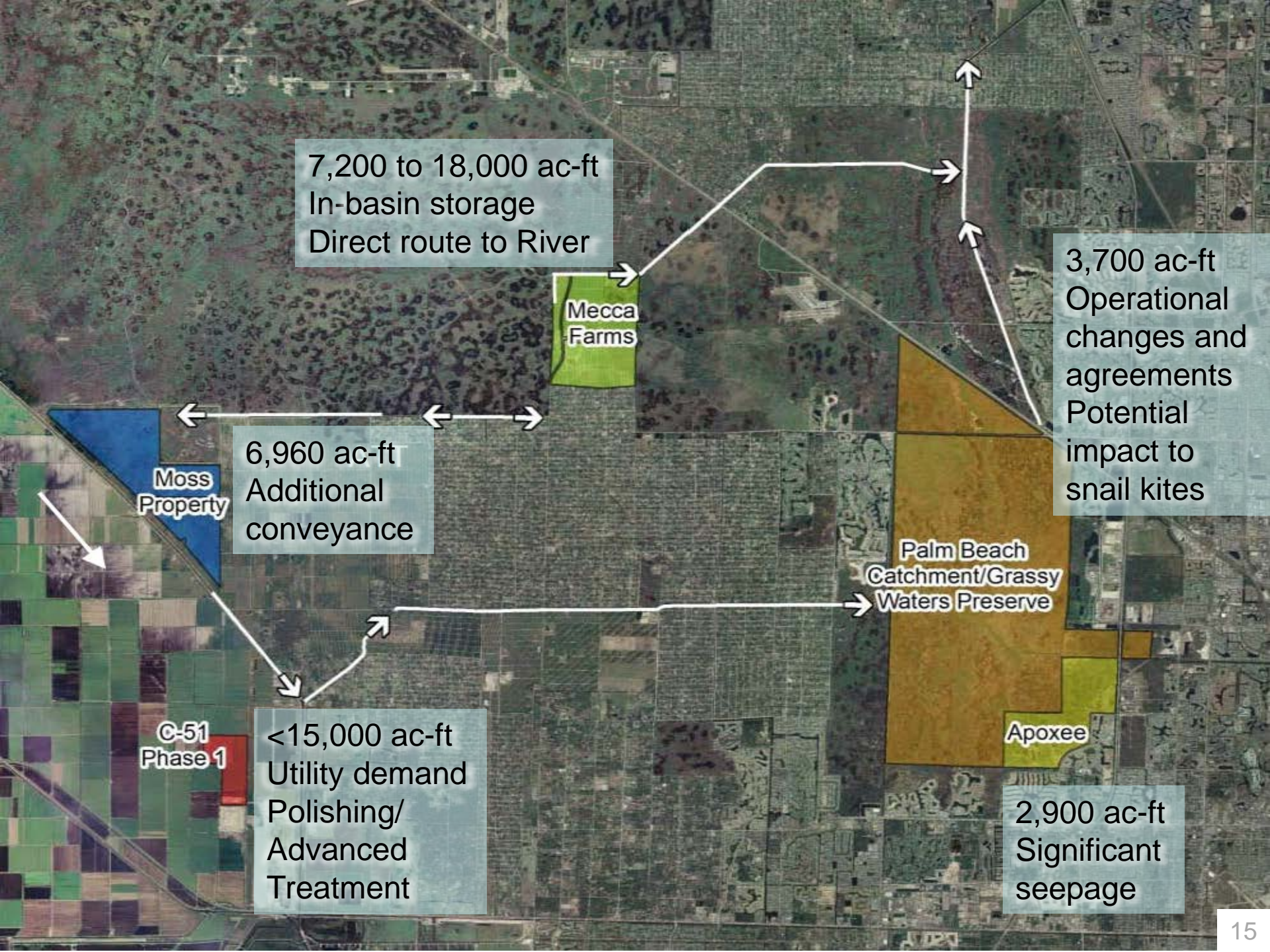
7,200 to 18,000 ac-ft
In-basin storage
Direct route to River

3,700 ac-ft
Operational
changes and
agreements
Potential
impact to
snail kites

Mecca
Farms

6,960 ac-ft
Additional
conveyance

Moss
Property

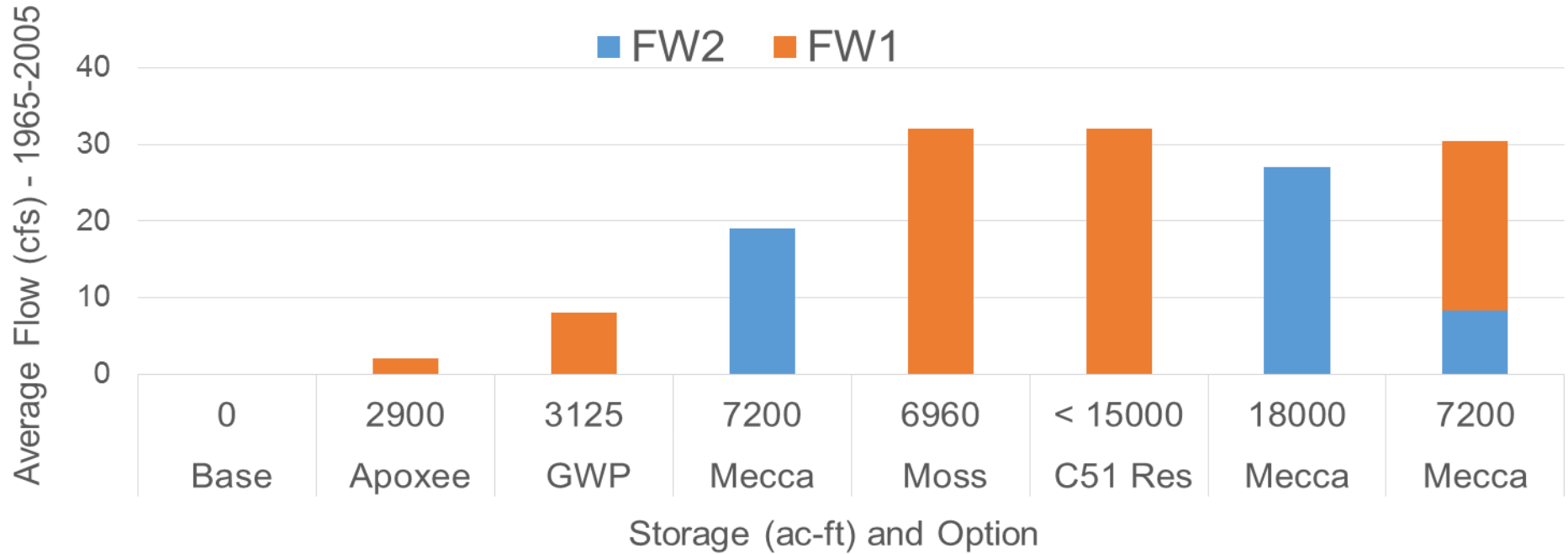Palm Beach
Catchment/Grassy
Waters Preserve

C-51
Phase 1

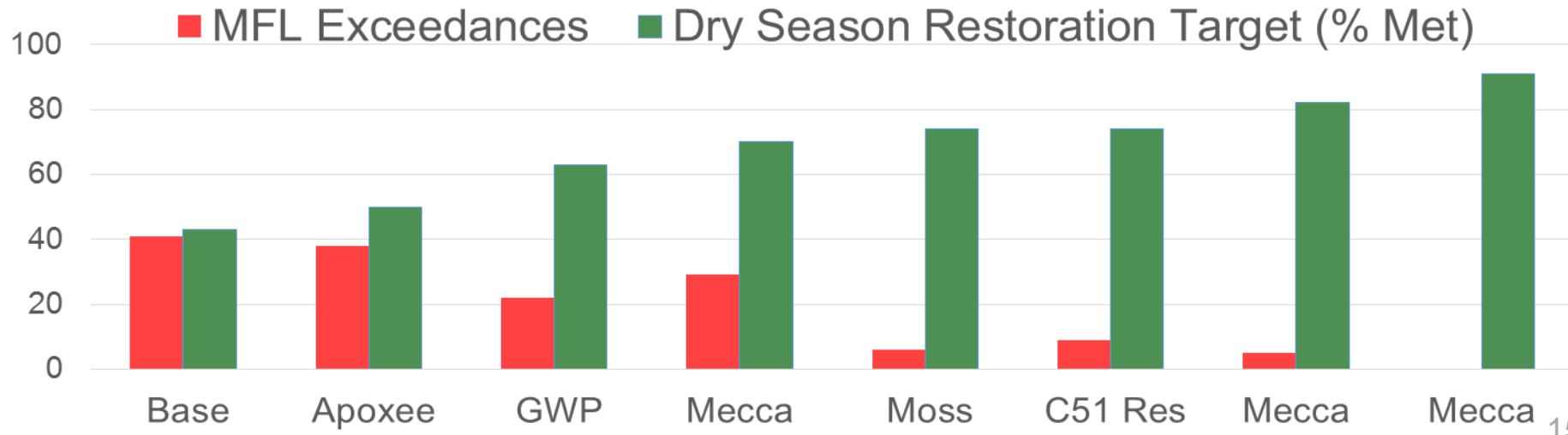<15,000 ac-ft
Utility demand
Polishing/
Advanced
Treatment

Apoxee

2,900 ac-ft
Significant
seepage

Simulated C18 Environmental Deliveries

Average Flow (cfs) - 1965-2005

Legend: FW2, FW1

Storage (ac-ft)	0	2900	3125	7200	6960	< 15000	18000	7200
Option	Base	Apoxee	GWP	Mecca	Moss	C51 Res	Mecca	Mecca

Model Performance

Legend: MFL Exceedances, Dry Season Restoration Target (% Met)

Base, Apoxee, GWP, Mecca, Moss, C51 Res, Mecca, Mecca

Mecca Farms Acquired

Mecca Site

Moving Forward

- Additional model refinements post-Replacement Project

  - Water availability evaluation

  - Updating model calibration through 2014

- Additional model refinements pre-CERP

  - Expanding model to include all NWF tributaries

  - One model to evaluate all NWFLR flows for consistency for planning process

Questions