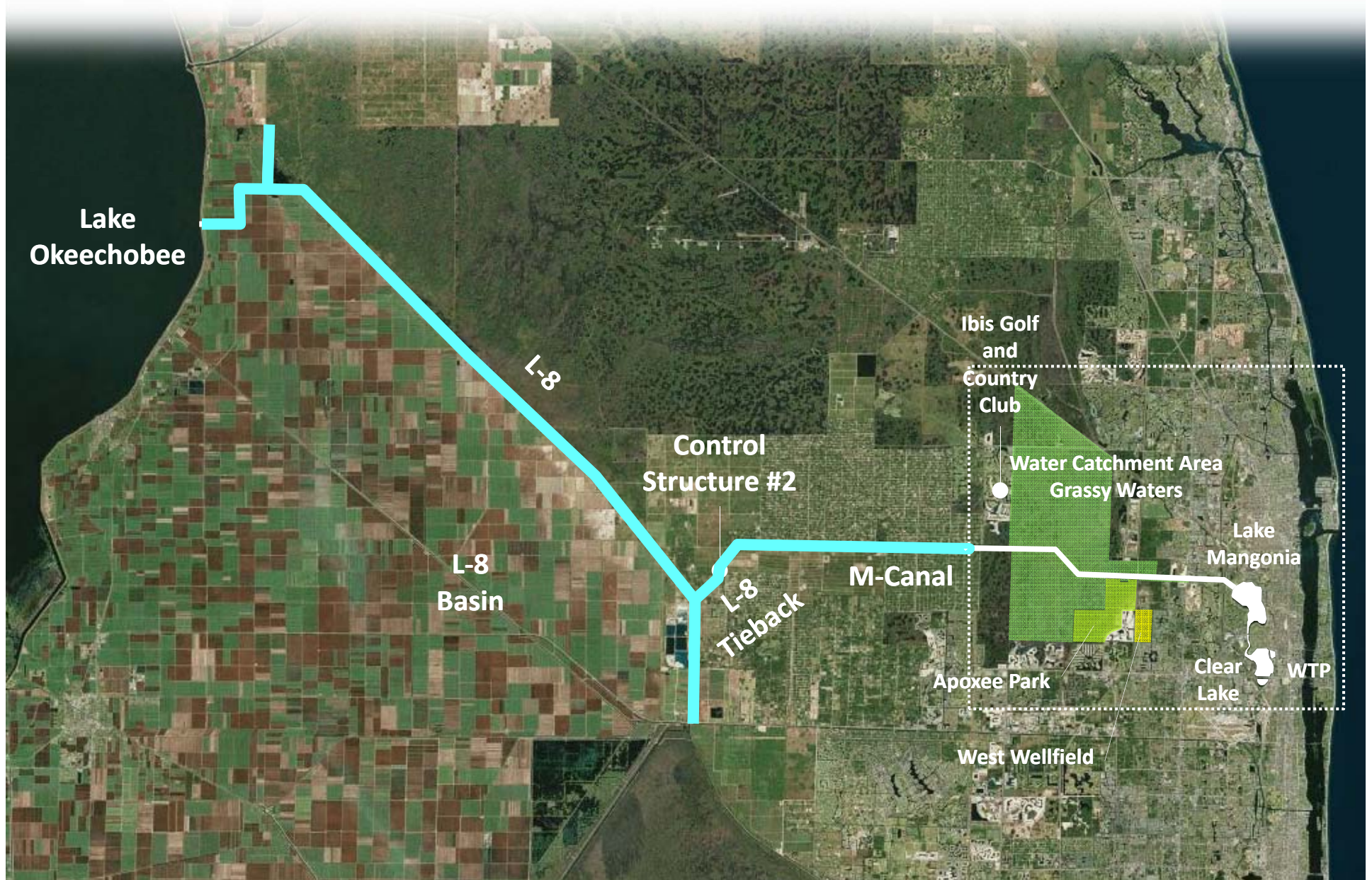# City of West Palm Beach Water Supply Plan Update

Palm Beach County Water Resource Task Force
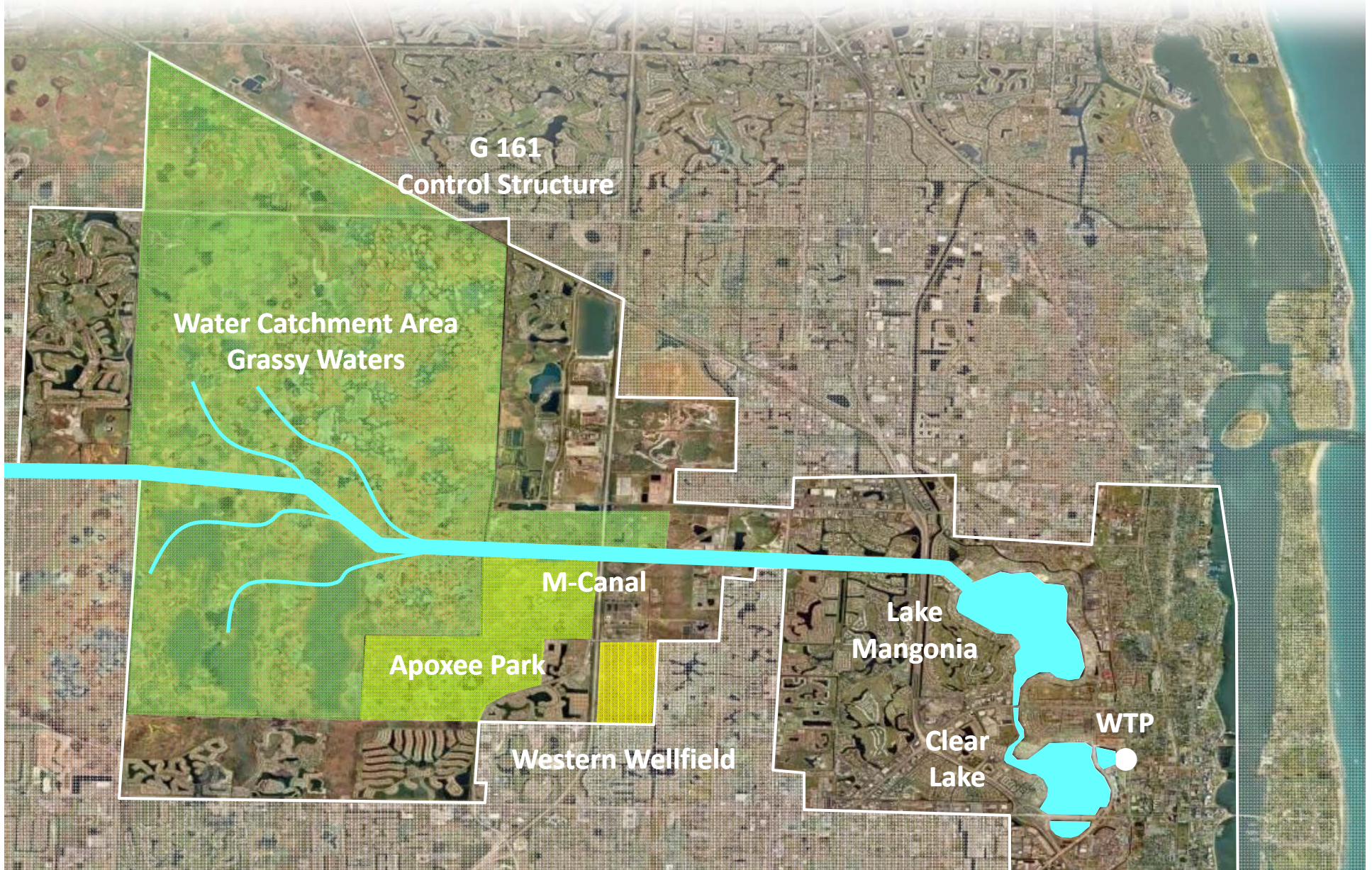
April 16, 2015

Overview of West Palm Beach Water System

Overview of West Palm Beach Water System

Overview of West Palm Beach Water System

2011 Drought Initiated New Management Strategies

Clear Lake Divide
Structure and Pump Station

Eastern Wellfield

C-51 Canal Tidal
Discharge Capture

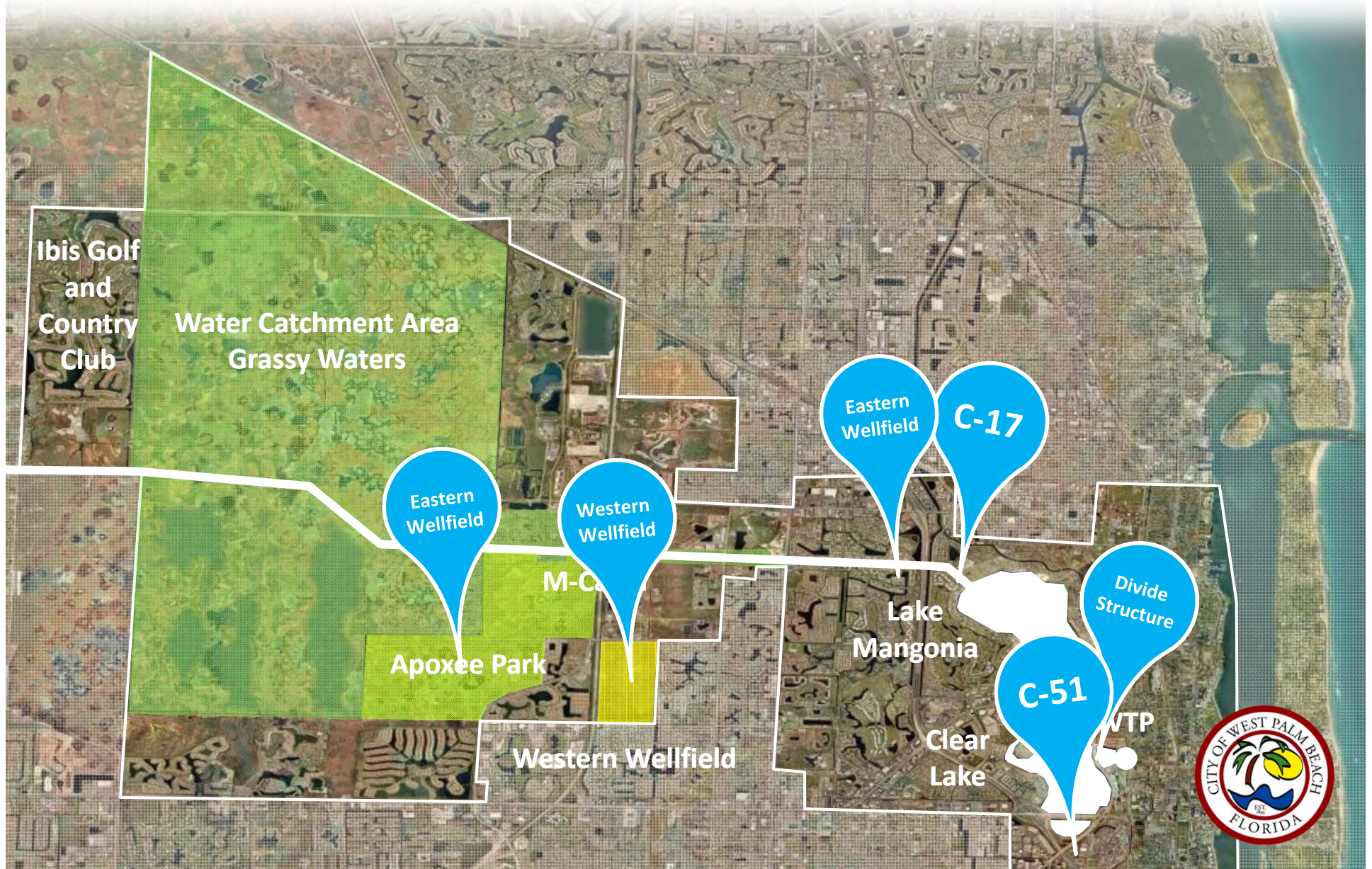C-17 Canal Tidal
Discharge Capture

Aquifer Storage and Recovery Well

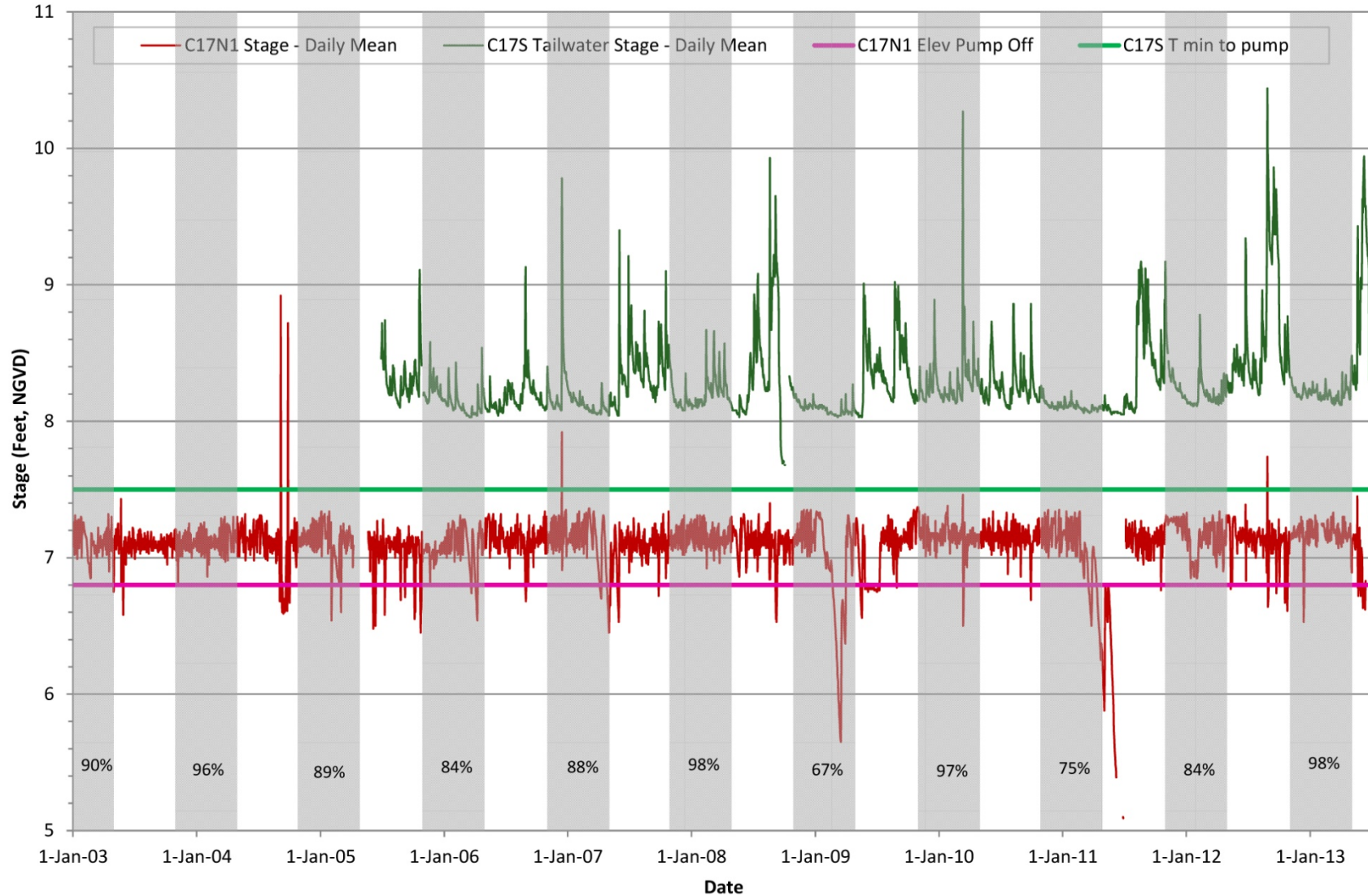Western Wellfield
(Last Option)

2011 Drought Initiated Projects
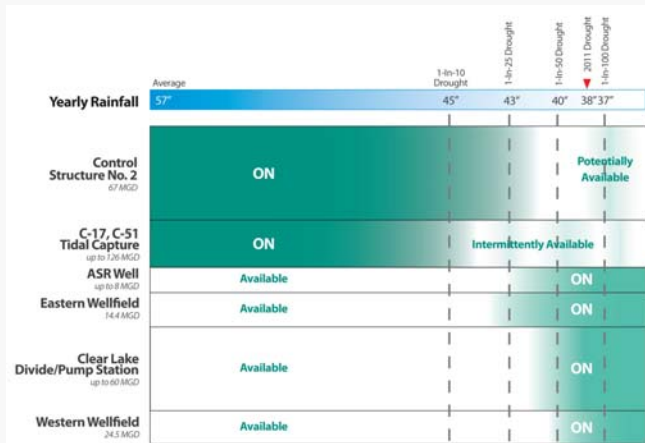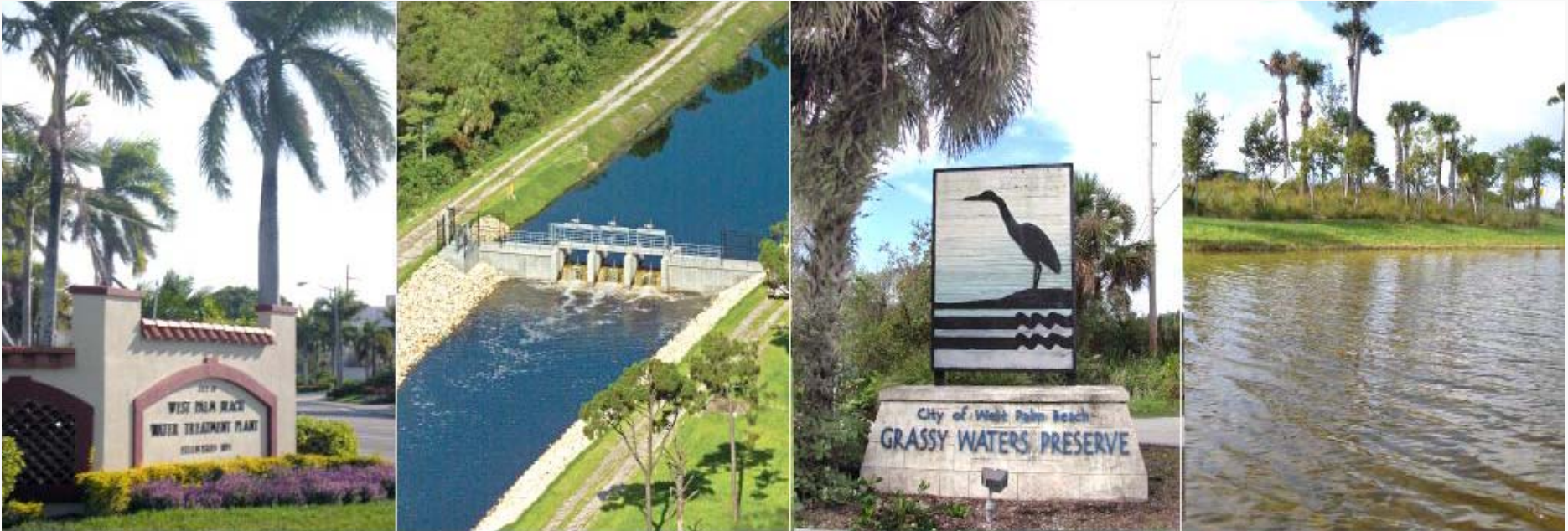
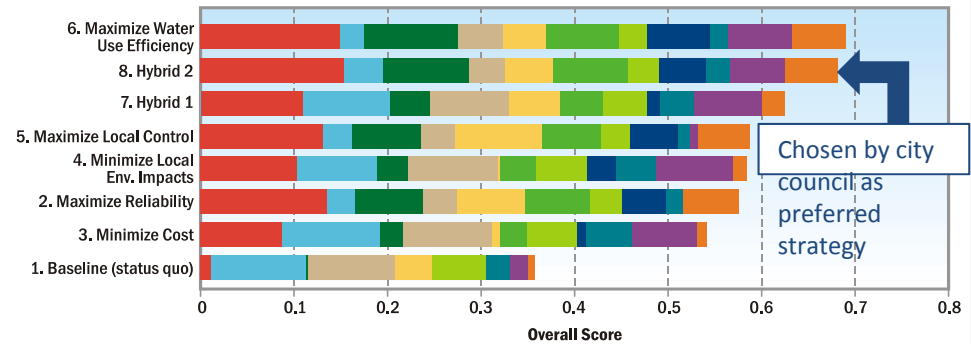# Location of C 17 Tidal Capture Pumping Station

C-17 Dry Season Availability

C-17 Canal Stage Data - Drought Periods with % Available Pumping Days

Long Term Water Supply Plan

Long Term Water Supply Planning Process

Characterize Water Supply Options (building blocks)

Build Integrated Alternatives to Achieve Objectives

Systems Model

Analyze Alternatives

Conduct Water Supply Gap Analysis

Test Under Scenarios

Alt 3								
Alt 2								
Alt 1								

0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6

■ Reliability ■ Cost ■ WQ

Use Multi-Criteria Decision Making Tool to Rank Alternatives

Utility Objectives

Supply Reliability

Cost-Effectiveness

Water Quality

Define Planning Objectives & Performance Measures

Preferred Strategies & Actions

Develop Recommendations

Gap Analysis
Base Line 2011 Drought Management Results

- Conducted Model Simulations with all 2013 Drought Management Facilities Online
  - Eastern Wellfield
  - Aquifer Storage and Recovery (ASR) Well
  - C-17 and C-51 Tidal Capture
  - Western Wellfield
- Used 2016 and 2033 Projected Demands and applied the 2011 Drought Conditions
- More than 3 billion gallons would have been in place at the height of the 2011 drought if the additional 2013 facilities had been in place
- The 2011 drought would not have been a concern if the 2013 drought management plan had been in place

Long Term Water Supply Options Under Study

Demand side management/conservation

Below ground reservoirs to store surface water (addition of Aquifer Storage and Recovery or ASR)

Surficial aquifer groundwater Expanded Eastern wellfield

Floridan brackish ground water wells and treatment plant

Long Term Water Supply Options Under Study

Seawater desalination treatment plant

Tidal capture expansion

Above ground reservoirs to store surface water (Lake Point and C-51)

Reclaimed irrigation water

Water Supply Options Evaluated to Date

· Eastern Wellfield Expansion "No Cost Options"

  - Seek District approval to either extend the amount of days the current wells can operate
  - Or seek District approval to increase the amount of flow permitted to be withdrawn from the current wells
  - Or both

· Eastern Wellfield Expansion – Add an additional 5 wells

· ASR Wellfield Expansion – Add an additional 3 wells

· Brackish Groundwater Reverse Osmosis – Additional water supply/treatment – Desktop study

· C-51 Reservoir – Additional water supply/storage
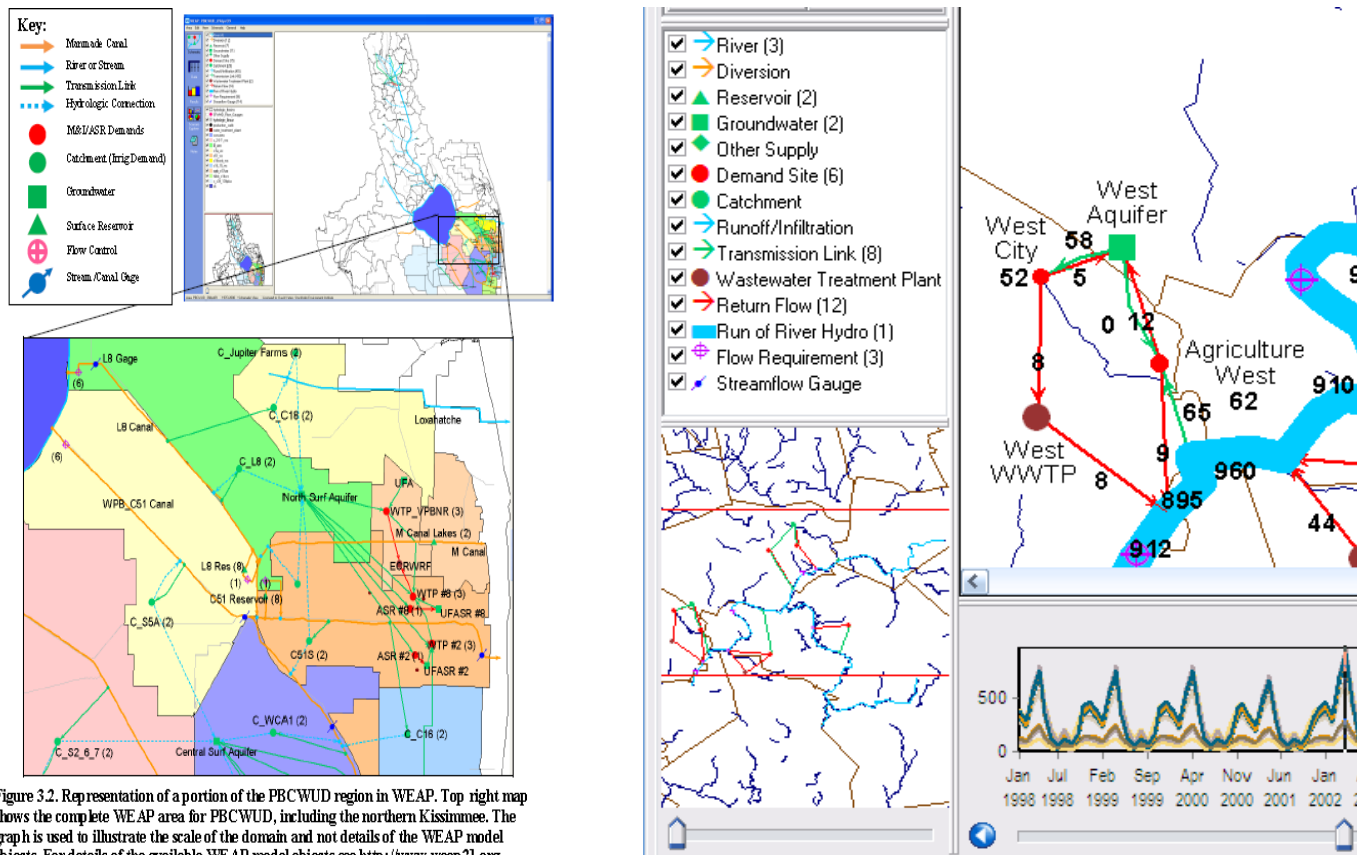
Additional Water Supply Options Under Evaluation

- Seawater Desalination – Desktop Study

- Lake Point Reservoir

- Reclaimed Irrigation Water – Desktop Study

- Demand Side Management/Conservation – Desktop Study

Managing Risks: Dynamic Decision Support System

Water Evaluation And Planning Model (WEAP)

- Utilize Palm Beach County baseline model
- Incorporate drought proofing alternatives

**'Drag & Drop'
Infrastructure**

Figure 3.2. Representation of a portion of the PBCWUD region in WEAP. Top right map shows the complete WEAP area for PBCWUD, including the northern Kissimmee. The graph is used to illustrate the scale of the domain and not details of the WEAP model objects. For details of the available WEAP model objects see http://www.weap21.org.

Example
Possible Planning Objectives and Metrics for Water Plan

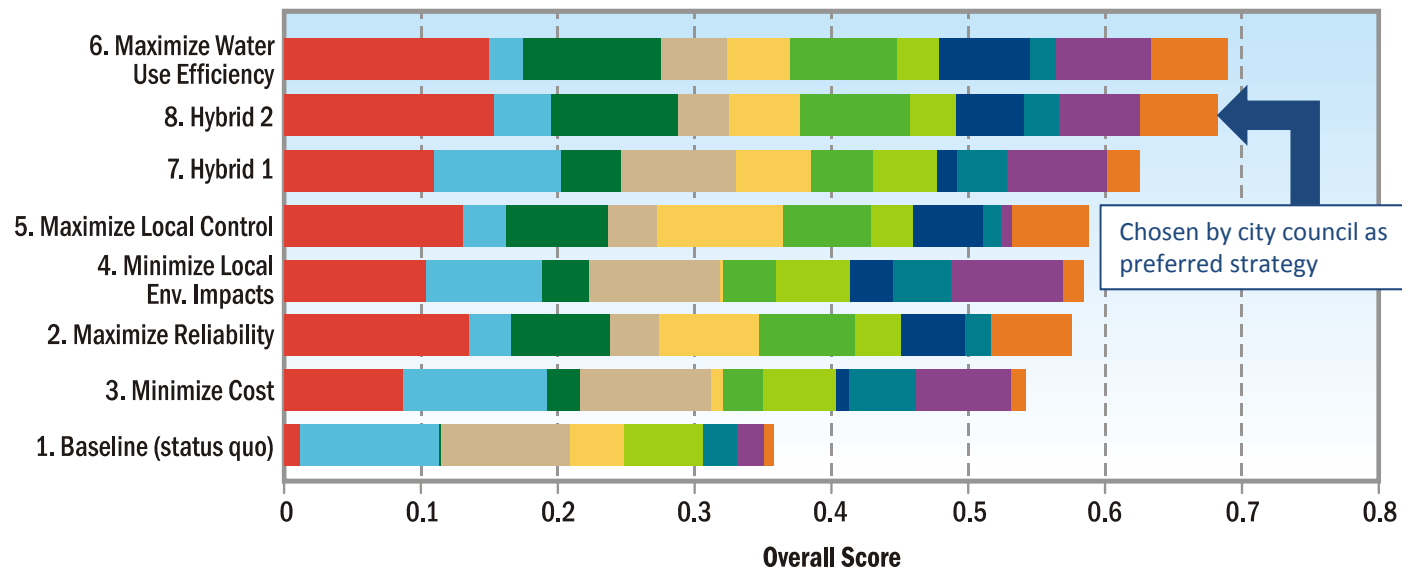|	
Reliability	Provide dependable water supply under droughts for current and future demands
Cost Effectiveness	Develop cost-effective solutions with rate payers in mind
Implementation Ease	Maximize alternatives that are scalable, permittable, easy to maintain, and acceptable to customers
Water Quality Impacts	Assurance of meeting primary drinking water regulations and degree of taste, order, and other secondary water quality attributes
Environmental impacts	Impacts on Grassy Waters and Clearlake
Stewardship	Reductions in wasteful use of water and provide regional solutions

Multi-Criteria Rating Decision Model

Decision Support Tool

- Multi-criteria rating decision analysis
- Ranking of alternatives; Trade-offs
- Stacked bar charts that show sensitivity
- Economic accounting
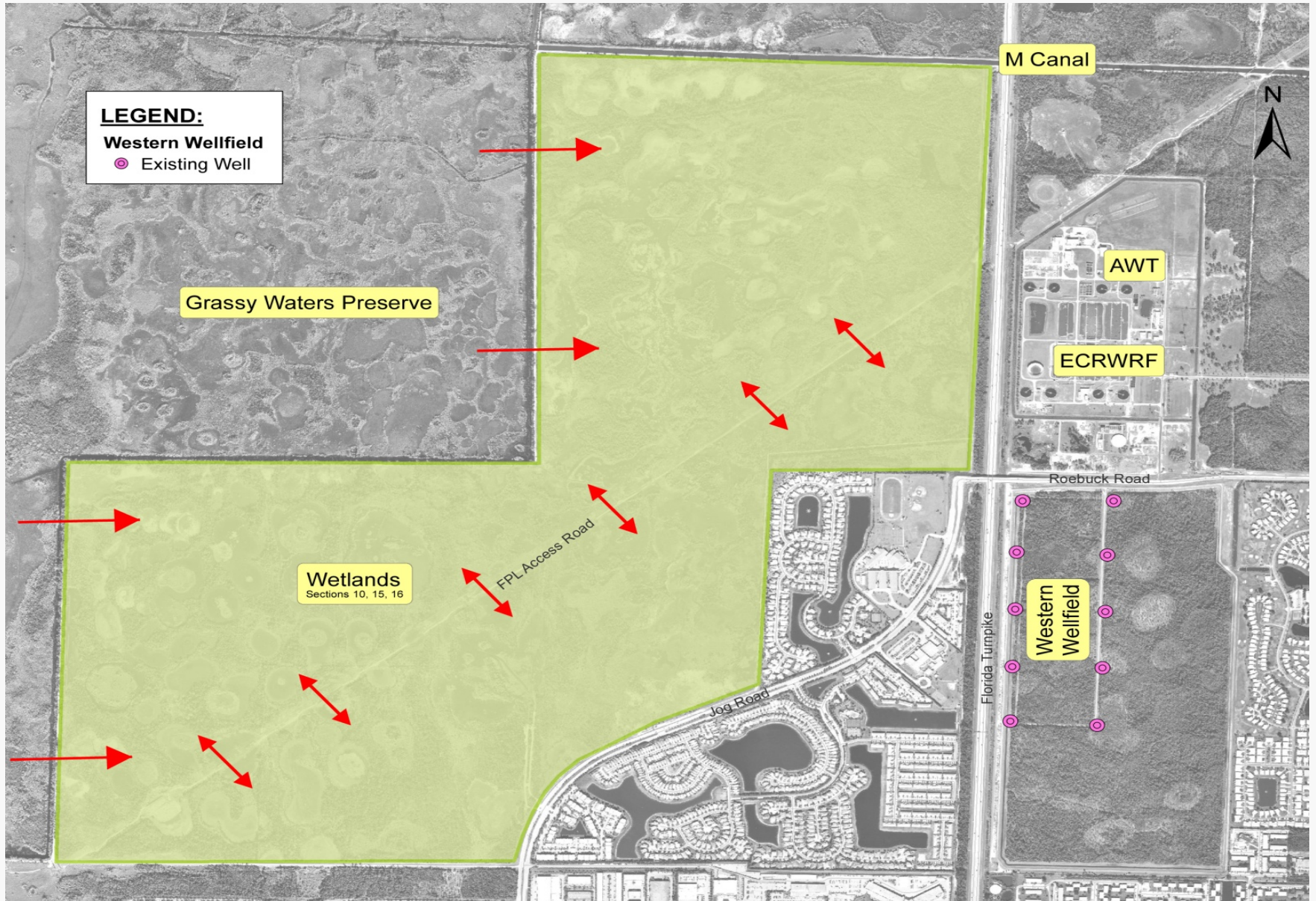
Example Shown for illustrative purposes

Legend:
- 1. Provide Reliability & Robustness
- 2. Manage Cost & Provide Affordability
- 3. Maximize Efficiency of Water Use
- 4. Provide for Scalability of Implementation
- 5. Maintain Current & Future Assets
- 6. Provide for Local Control/Independence
- 7. Maximize Project Readiness
- 8. Protect Quality of Life
- 9. Protect Habitats & Wildlife
- 10. Reduce Energy Footprint
- 11. Protect Quality of Receiving Waters

Chart categories (top to bottom):
- 6. Maximize Water Use Efficiency
- 8. Hybrid 2
- 7. Hybrid 1
- 5. Maximize Local Control
- 4. Minimize Local Env. Impacts
- 2. Maximize Reliability
- 3. Minimize Cost
- 1. Baseline (status quo)

Chosen by city council as preferred strategy

X-axis: Overall Score (0 to 0.8)

Other Related Initiatives

- Wetland hydration
- Storm water master plan
- Loxahatchee restoration PDT

Apoxee Wetland Hydration Project

Apoxee Wetland Hydration Project

City Storm water Master Planning
# Integrating Watersheds

Stormwater Master Plan

Outreach
- Citizen Committees*
- WAB
- Regulators
- Adjacent Governments
- County
- Special Districts
- City-wide

Data
- GIS
- Collection
- Refinement
- Creation
- Terrain

Flooding
- Investigate*
- Prescreen
- Modeling
- Study
- Mitigate
- Floodplains

Science
- Water Quality
- Pollution Sources
- Pollutant Load Modeling
- Sea Level Rise
- Climate Change
- LID
- Green Infrastructure

CRS
- Rating Analysis*
- Planning
- 2015 Cycle Visit*
- Repetitive Loss Reduction
- FEMA Coordination

Funding/ Programmatic
- Code and Ordinance Review
- Grants*
- Utility Analysis

O&M
- Complaint tracking
- Program Review – Maintenance and Inspection
- Cost sharing

Master Planning
- CIP Analysis*
- Alternatives Analysis
- Recommendations
- 2014 Stormwater Master Plan

Connecting the City's Watersheds – Now and In the Future

* = indicates a fast-tracked task

Loxahatchee River Restoration Planning Efforts
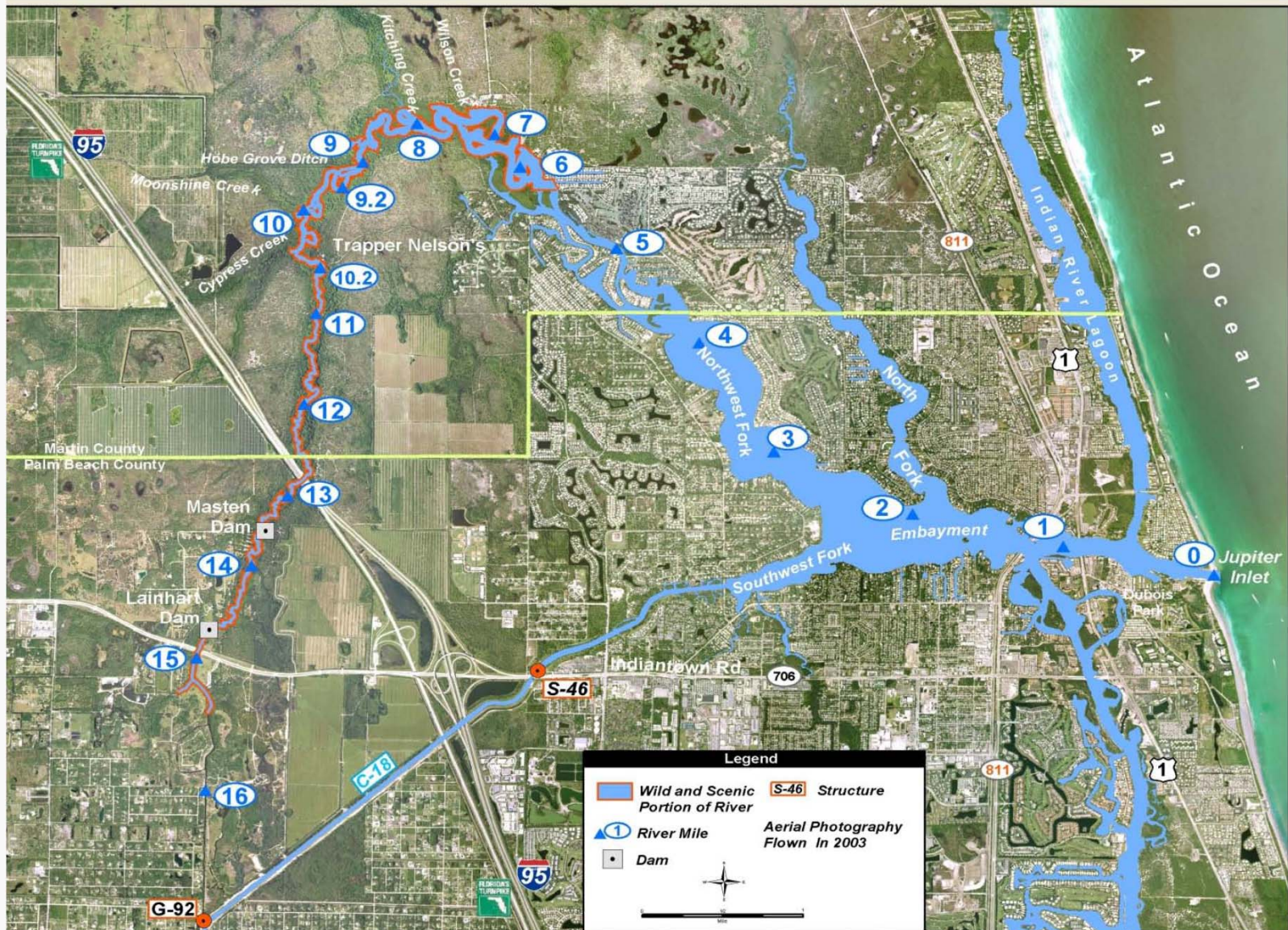
Flow Ways Drive Restoration Efforts
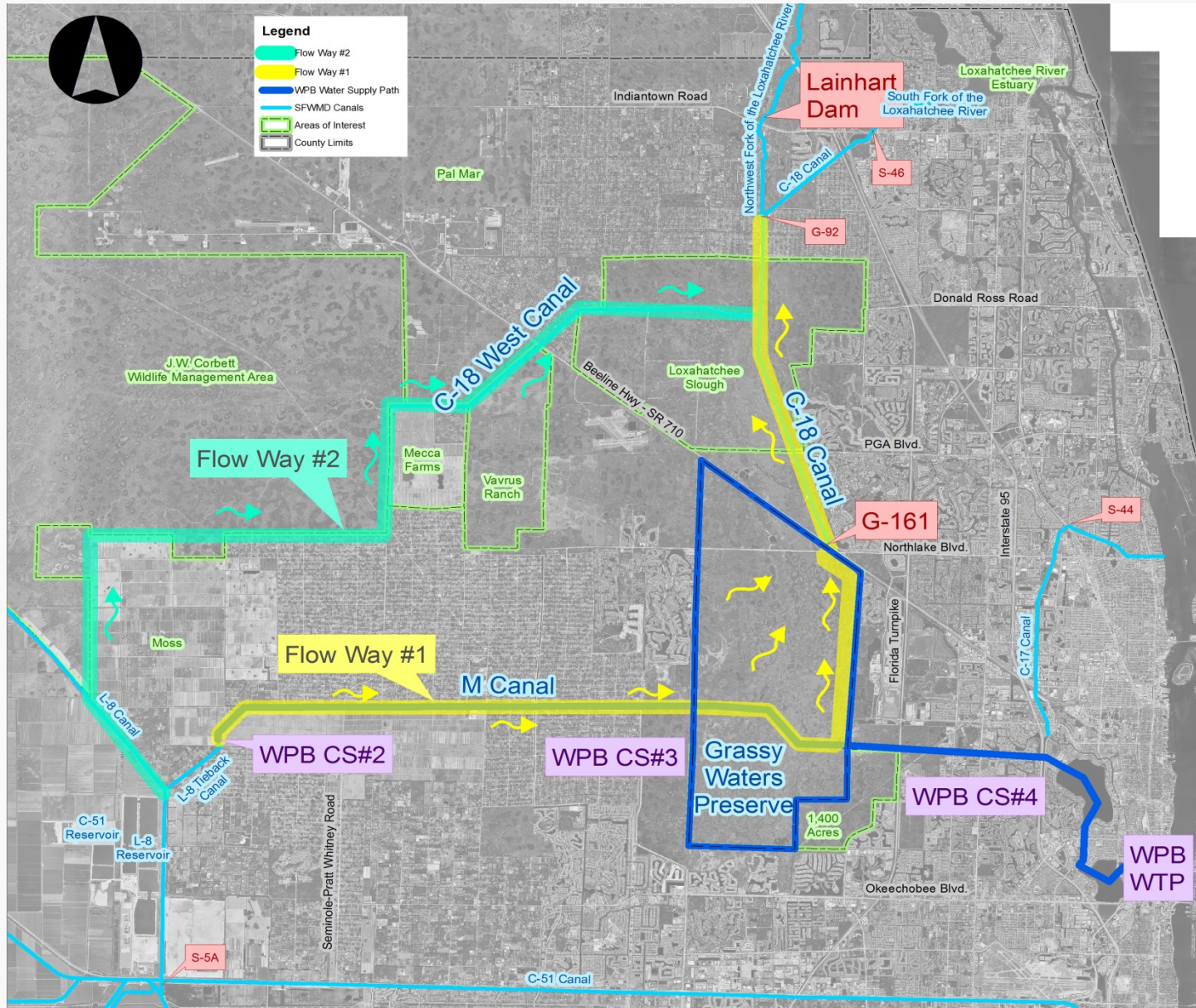
Questions?

April 16, 2015

WPB
WEST PALM BEACH

Next Steps

- Complete Evaluation of Existing Water Supply
- Finish Evaluating Potential Water Supply Options
- Conduct water balance of surface water system including water losses through out the system
- Evaluate the available water supply needs against the projected available supply to determine long term supply targets
- Build the Decision Support Model

Decision Support Modeling
Introductions of Experts

David Yates

- Scientist in the Research Applications Laboratory at the National Center for Atmospheric Research, Boulder Colorado
- Research focused on hydrologic problems
- Associate of the Stockholm Environment Institute-A Developer of the Water Evaluation and Planning System used here
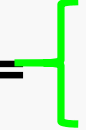
Dan Rodrigo, Vice President with CDM Smith

- 25 years of experience
- Nationally recognized expert in water supply planning and decision support modeling
- Clients include St. Johns County (FL), JEA (FL), Pinellas County (FL), Metropolitan Water District of So. California, San Diego, Atlanta, State of Colorado, Tarrant Regional (TX), EPA

Decision Support Model
Helps Quantify the Alternatives

WATER MANAGEMENT MODEL–Balancing of <u>3 key variables</u>:

1. **Water Demand** – changing demographics, per-capita use, other demands (agriculture, environment, etc.)

2. **Water Supply** – rainfall, runoff, canal flows, groundwater

3. **Capital Investment** – timing & financing of capital projects

KEY TO THIS BALANCE =

Reducing Risk of Uncertain Conditions

Risk Management

Multi-criteria Decision Analysis (MCDA)

- Models and analysis of alternatives can produce lots of metrics, all measured differently

- How does one use these varied metrics to help make decisions?

- MCDA is a process by which multiple criteria are applied to alternatives to facilitate ranking

Cost in $

Water Supply in MGD

Implementation Score of 1 to 5

Water Quality in mg/l

The Water Evaluation and Planning Model

Natural Resources

- Rainfall-Driven Water Supply/Demand
- Water Quality
- Ecosystem
- Needs/Constraints

Human Infrastructure

- Water Demand & Demographics
- Transport: Canals, Pipelines
- Storage: Reservoirs, ASR, GrndWater

Capital Investment

- Revenue & Reserves
- Capital Financing – Net Present Value
- Dynamic Cost-Benefit Analysis
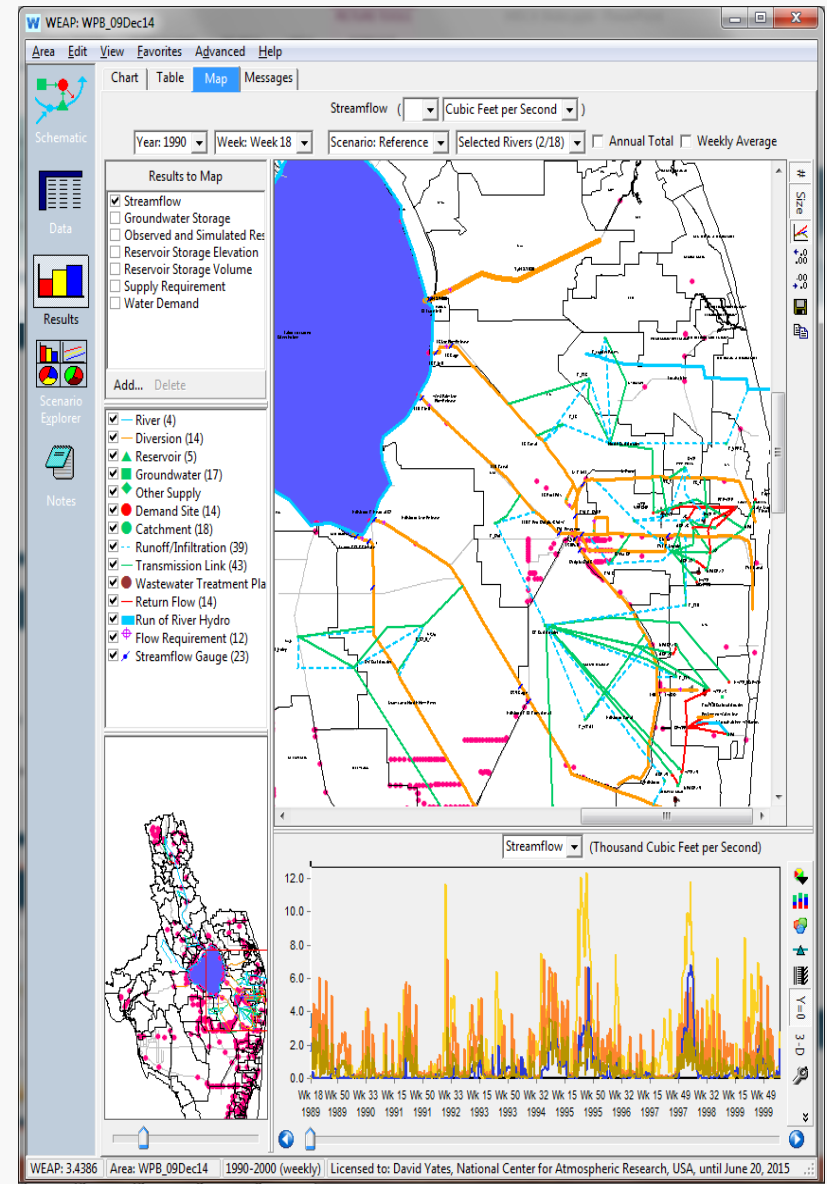
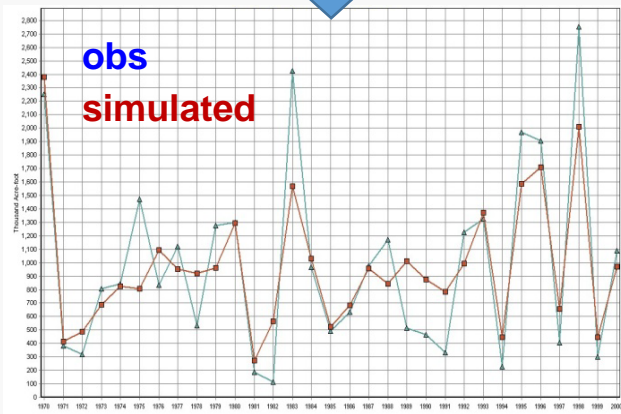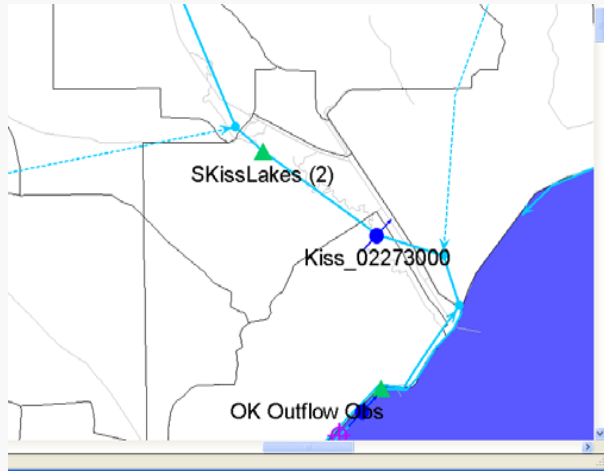# Existing Palm Beach County Model will be Modified

Regional Supply-Demand

- Regional Watersheds
- Land Use (Ag, Urban…)
- Demand Demographics

- Canals, Reservoirs, ASR
- WW Treatment Plants
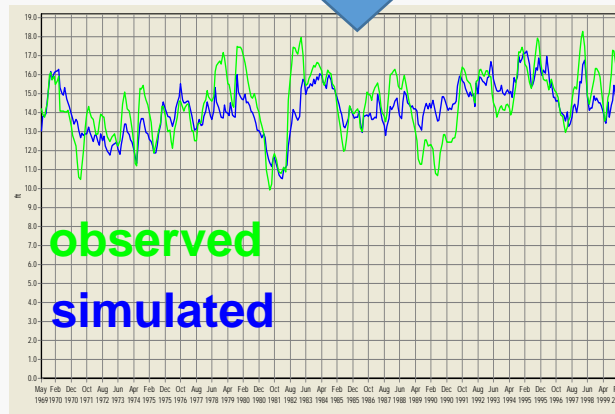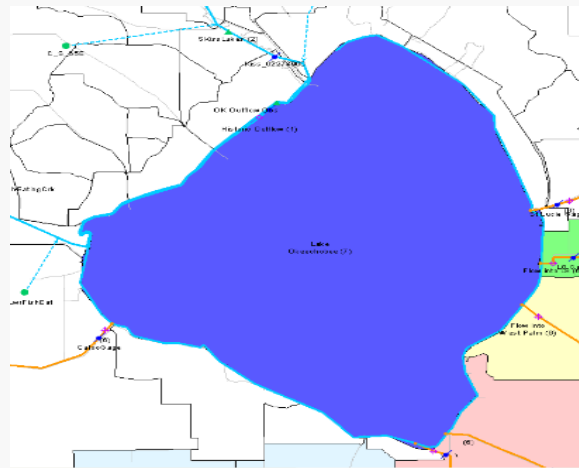- Re-Use Systems

- Water Pricing Schedules
- Dynamic Cost-Benefit
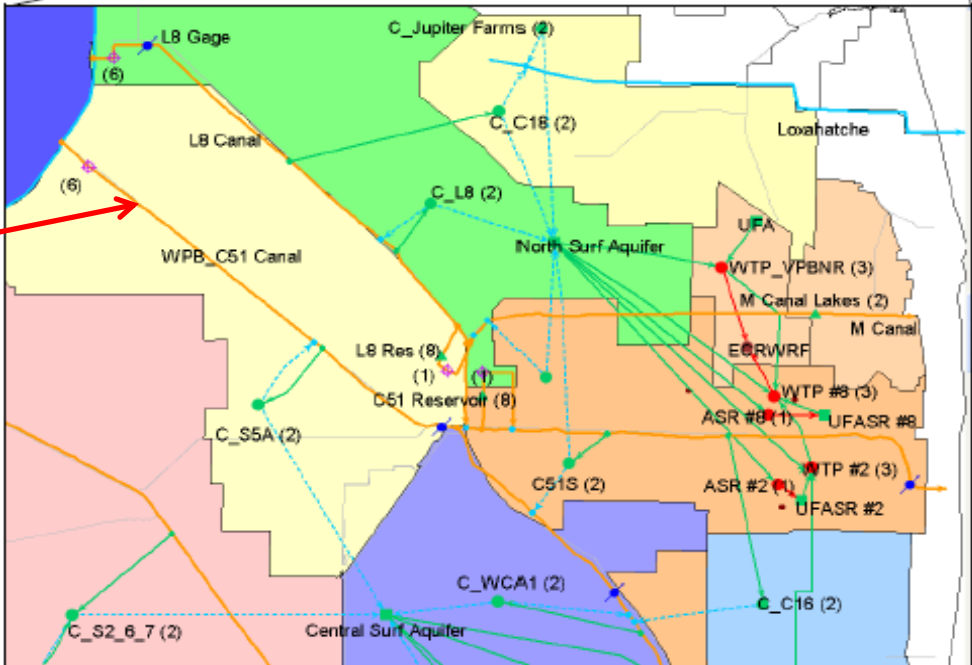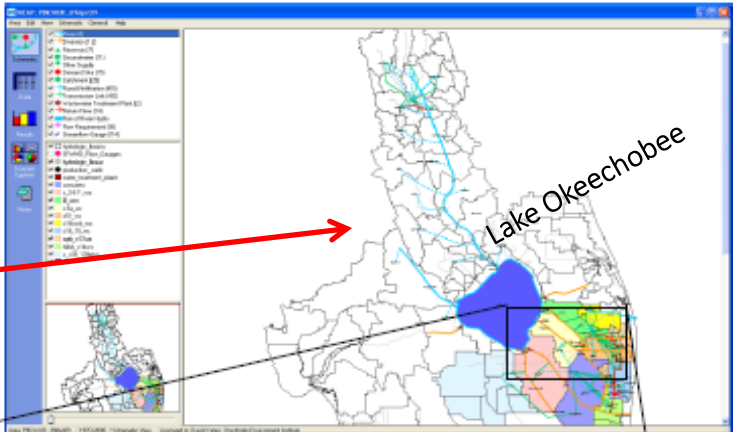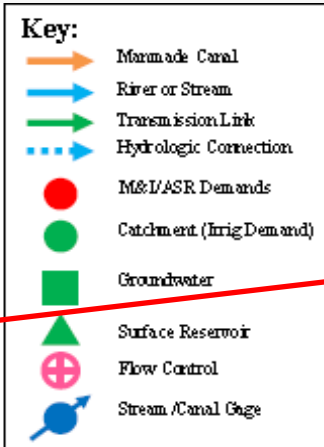
Example of Model Results

Kissimmee Inflows

Lake Okeechobee Storage

C-51 Outflow