

Technical Methods Workshop Agenda

Date: Thursday, Nov. 7, 2013

Time: 10:00 a.m. – Noon

Meeting Objective: To provide an overview of the technical data and modeling tools used to support the CFWI Regional Water Supply Plan

Welcome and Overview of CFWI and Regional Water Supply Plan

Mark Elsner, South Florida Water Management District

Overview of Technical Methods

David MacIntyre, Hydrologic Analysis Team Lead

Doug Leeper, MFLs and Reservations Team Lead

John Zahina-Ramos, Environmental Measures Team Lead

Mark Barcelo, Groundwater Availability Team

Public Comments

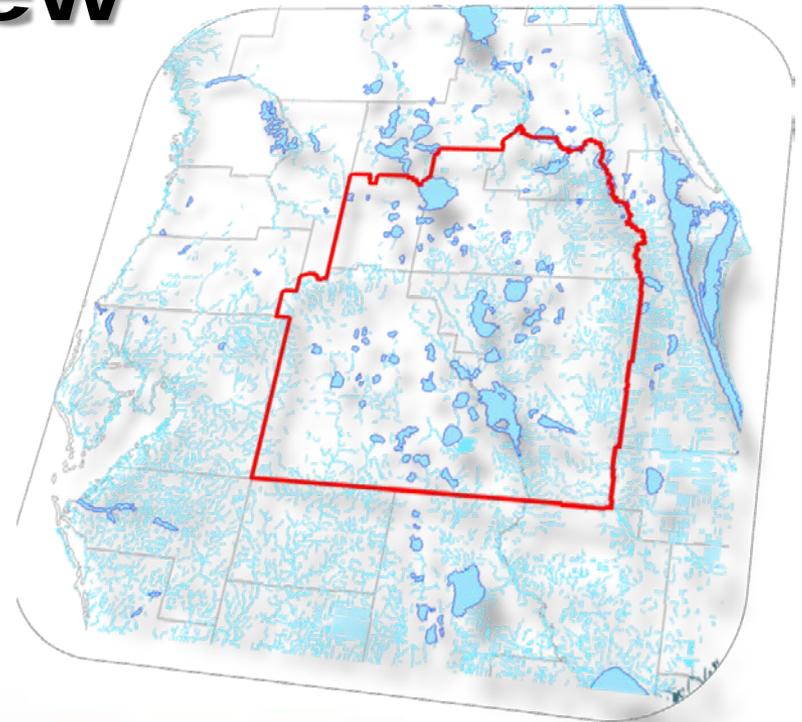
Note: Q & A will follow each of the presentations

Central Florida Water Initiative (CFWI) Overview

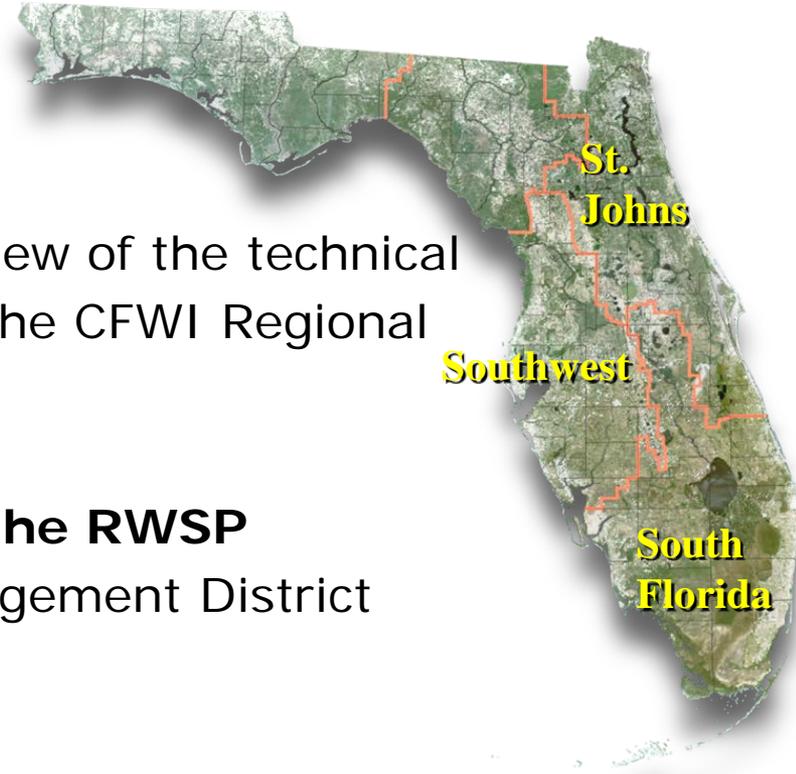
*A collaborative water supply
planning endeavor to protect,
develop, conserve and
restore our water resources*

**Technical Methods
Public Workshop**
November 7, 2013

Mark Elsner, P.E.
South Florida Water Management District



Today's Agenda



Meeting Objective: To provide an overview of the technical data and modeling tools used to support the CFWI Regional Water Supply Plan (RWSP)

Welcome and Overview of CFWI and the RWSP

Mark Elsner, South Florida Water Management District

Overview of Technical Methods

David MacIntyre, Hydrologic Analysis Team Lead

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John Zahina-Ramos, Environmental Measures Team Lead

Mark Barcelo, Groundwater Availability Team

Public Comments

What is the CFWI?

A collaborative water supply planning effort to protect, develop, conserve and restore central Florida's water resources

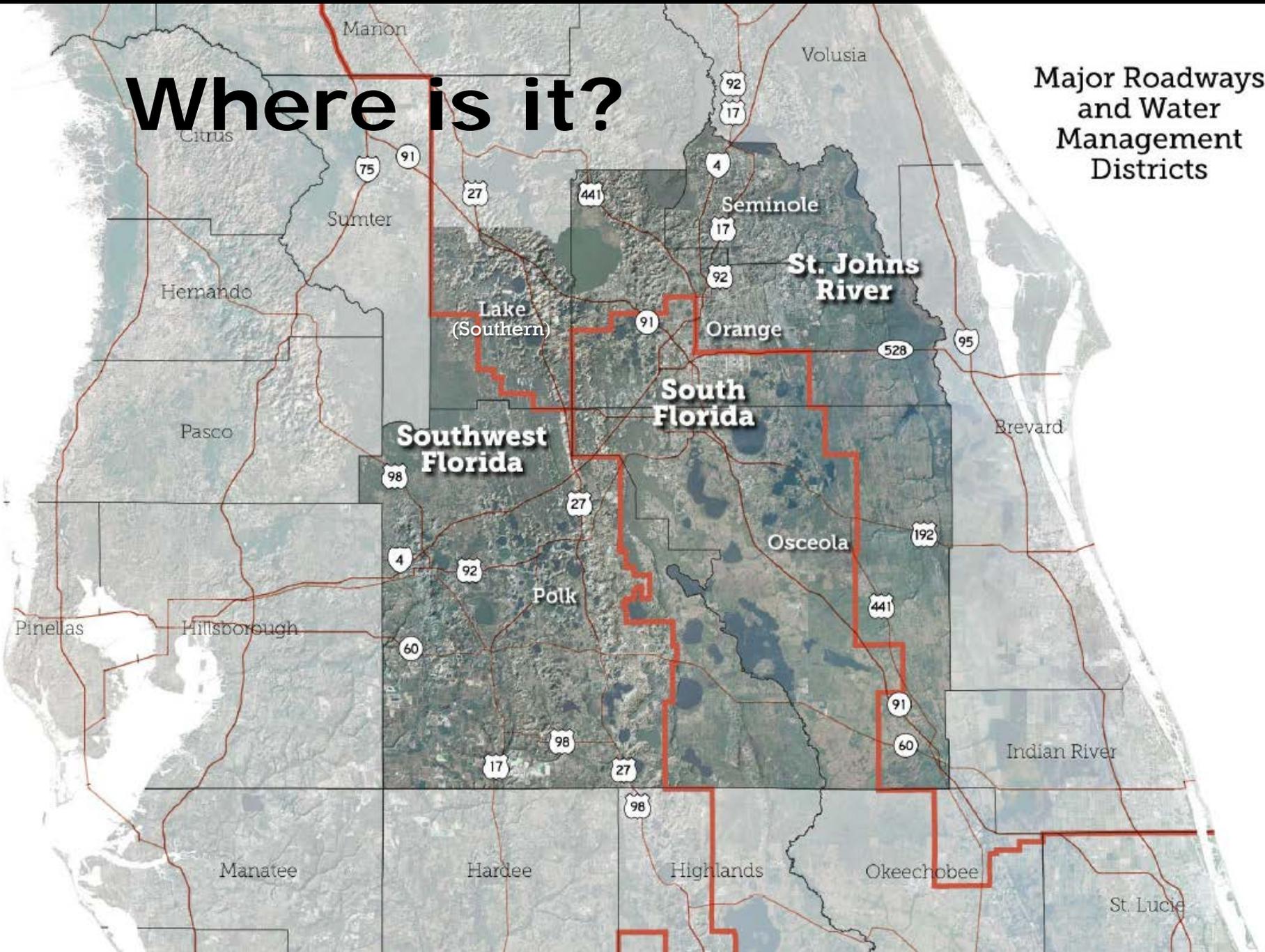
Guiding Principles

1. Identify sustainable quantities of groundwater sources
2. Develop strategies to meet water demands
3. Establish consistent rules

Central Florida Water Initiative

Where is it?

Major Roadways
and Water
Management
Districts



CFWI Timeline

Ongoing

Technical Teams:

- Data Monitoring & Investigations
- Environmental Measures
- Groundwater Availability
- Hydrologic Analysis
- MFLs & Reservations
- Regional Water Supply Plan

Nov. 26, 2013

Technical Work:

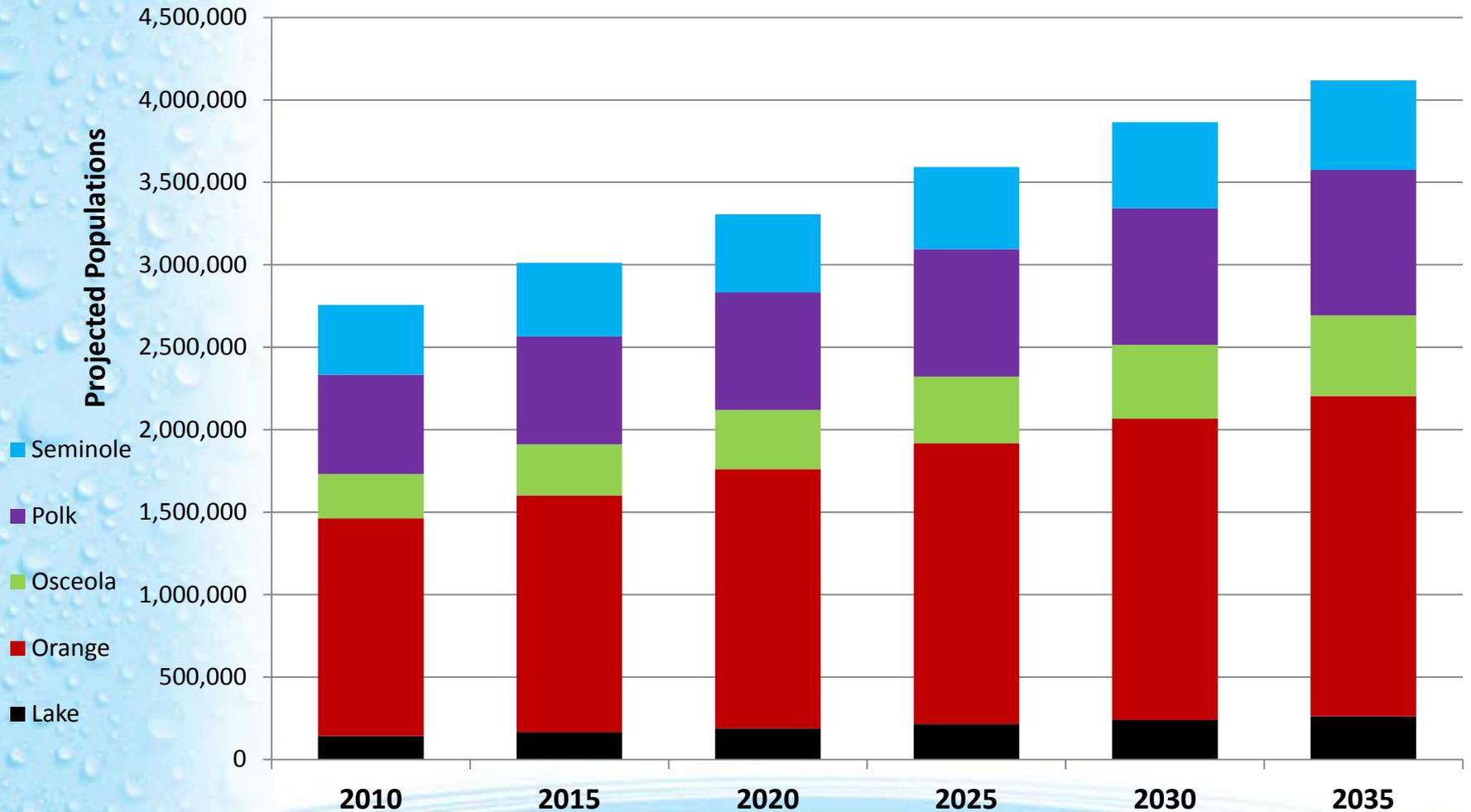
- Findings & Conclusions
- Draft Regional Water Supply Plan

Dec. 31, 2014

Solutions Work:

- Projects
- Regulatory
- Financing
- Monitoring

Projected Population



Projected Increase of 1.4 Million People

Water Use

All Classes

MGD

1200

1000

800

600

400

200

0

1960

1970

1980

1990

2000

2010

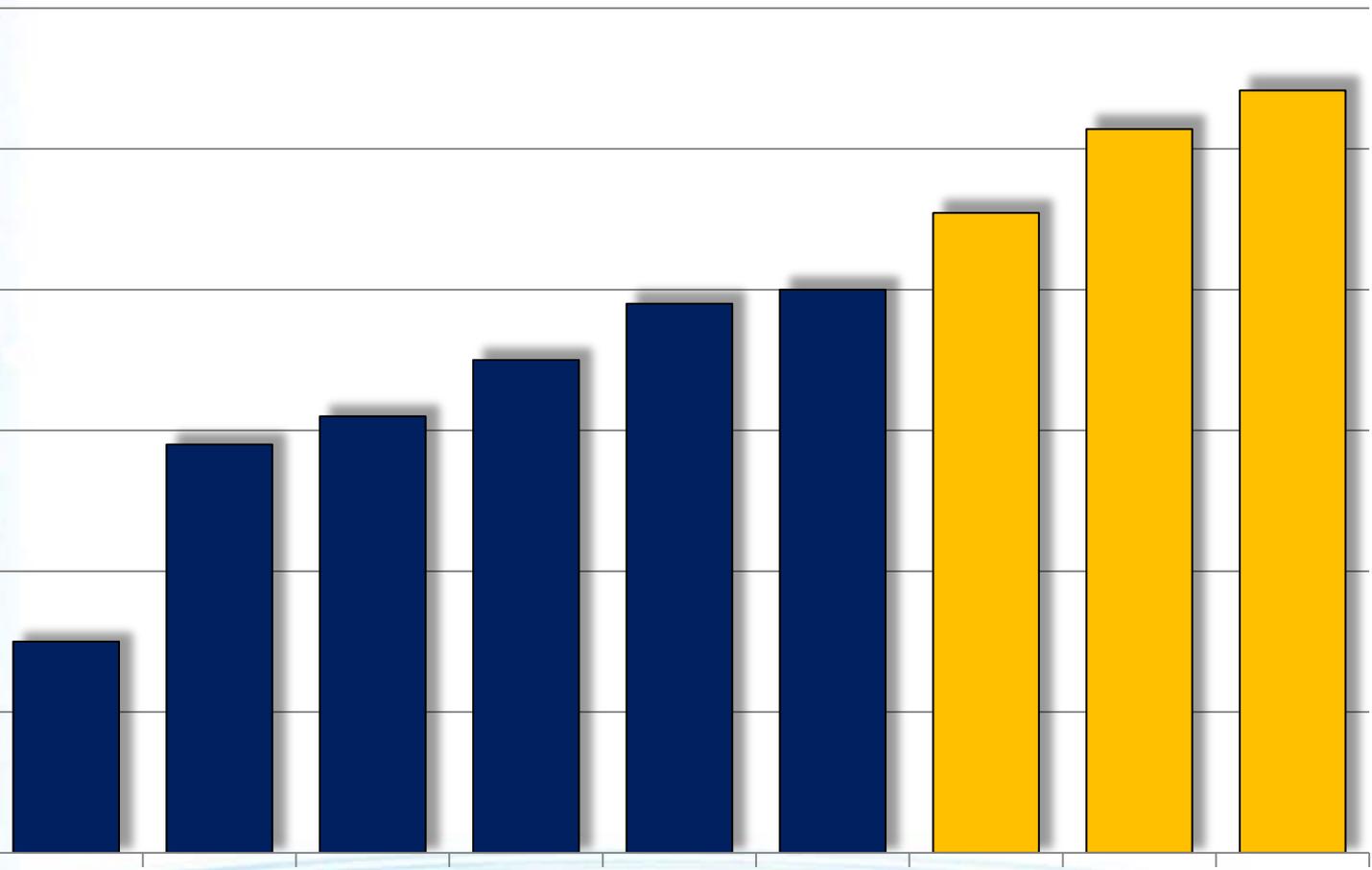
2020

2030

2035

Historic

Projected



One Plan for CFWI Region

- Developing first-ever regional water supply plan for CFWI
- Ensuring protection of the water resources and related natural systems
- Identifying sustainable water supply for all water uses in the CFWI through the 20-year planning horizon (2035)

Regional Water Supply Plan

- Demands from all categories
 - 20-year planning horizon
- Evaluation of water resources
- How to meet the demands
 - Potential sources
 - Project options
- Funding mechanisms
- Update every 5 years



Importance of Public Involvement

- Ensure plan reflects local needs
- Review of population projections and documents
- Coordination among:
 - County Commission/City Council
 - Utility staff
 - Planning staff
- Identify projects to meet future water demand



RWSP Public Comment & Approval

- Draft Plan Available – November 26, 2013
 - 45-day comment period
 - Ends January 10, 2014

- Final Draft Plan Approval (tentative)
 - SJRWMD Governing Board: April 8, 2014
 - SFWMD Governing Board: April 10, 2014
 - SWFWMD Governing Board: April 29, 2014

Upcoming Public Workshop

- Please join us...

Draft RWSP Public Workshop

Thursday, December 12 from 4 – 7 p.m.

Clermont Community Center (Lake Co.)

620 W. Montrose St., Clermont, FL

Central Florida Water Initiative

Home

Meetings

Regional Water Supply Plan

Minimum Flows and Levels and Water Reservations

Hydrologic Analysis

Environmental Measures

Data, Monitoring and Investigations

Groundwater Availability

CFWI Resources

CFCA Resources

Contacts

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The CFWI builds on the prior work of the Central Florida Coordination Area (CFCA). Both efforts focus on an area that includes southern Lake, Orange, Osceola, Seminole and Polk counties. The three water management districts, along with the Florida Department of Environmental Protection (DEP), Florida Department of Agriculture and Consumer Services (FDACS), regional public water supply utilities and other stakeholders are collaborating to develop a unified process to address central Florida's current and long-term water supply needs.



Click for more detailed map, including public water supply utility service areas.



The Central Florida Parkway passes central Florida's theme park region and communities.

Guiding principles

The guiding principles of the CFWI are to:

- Identify the sustainable quantities of traditional groundwater sources available for water supplies that can be used without causing unacceptable harm to the water resources and associated natural systems.
- Develop strategies to meet water demands that are in excess of the sustainable yield of existing traditional groundwater sources.
- Establish consistent rules and regulations for the three water management districts that meet their collective goals, and implement the results of the Central Florida Water Initiative.

Questions?

Additional information
can be found at
cfwiwater.com

Approach

- Data and Tools

- Projected demands (RWSPT)
- ECFT Model (HAT)
- Measuring sticks (MFLRT and EMT)

- Methods (GAT)

- Conduct future withdrawal scenarios
- Determine measuring stick exceedances
- Observe spatial pattern of exceedances

Hydrologic Analysis Team

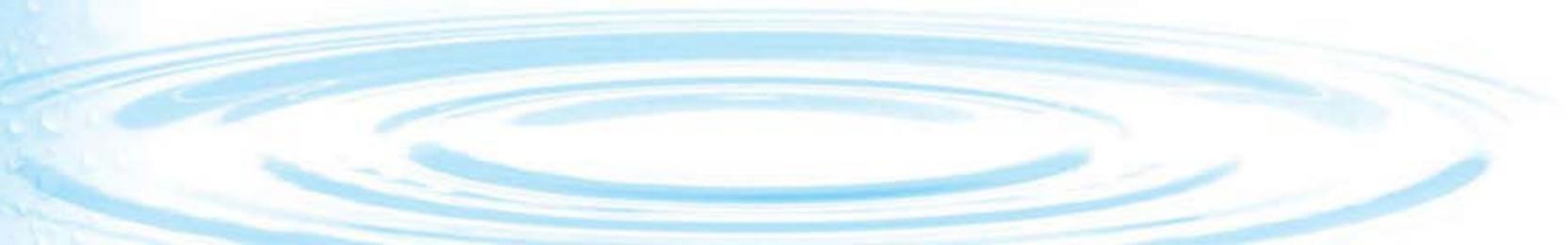
David MacIntyre, P.E., D.WRE
Parsons Brinkerhoff

www.cfwiwater.com

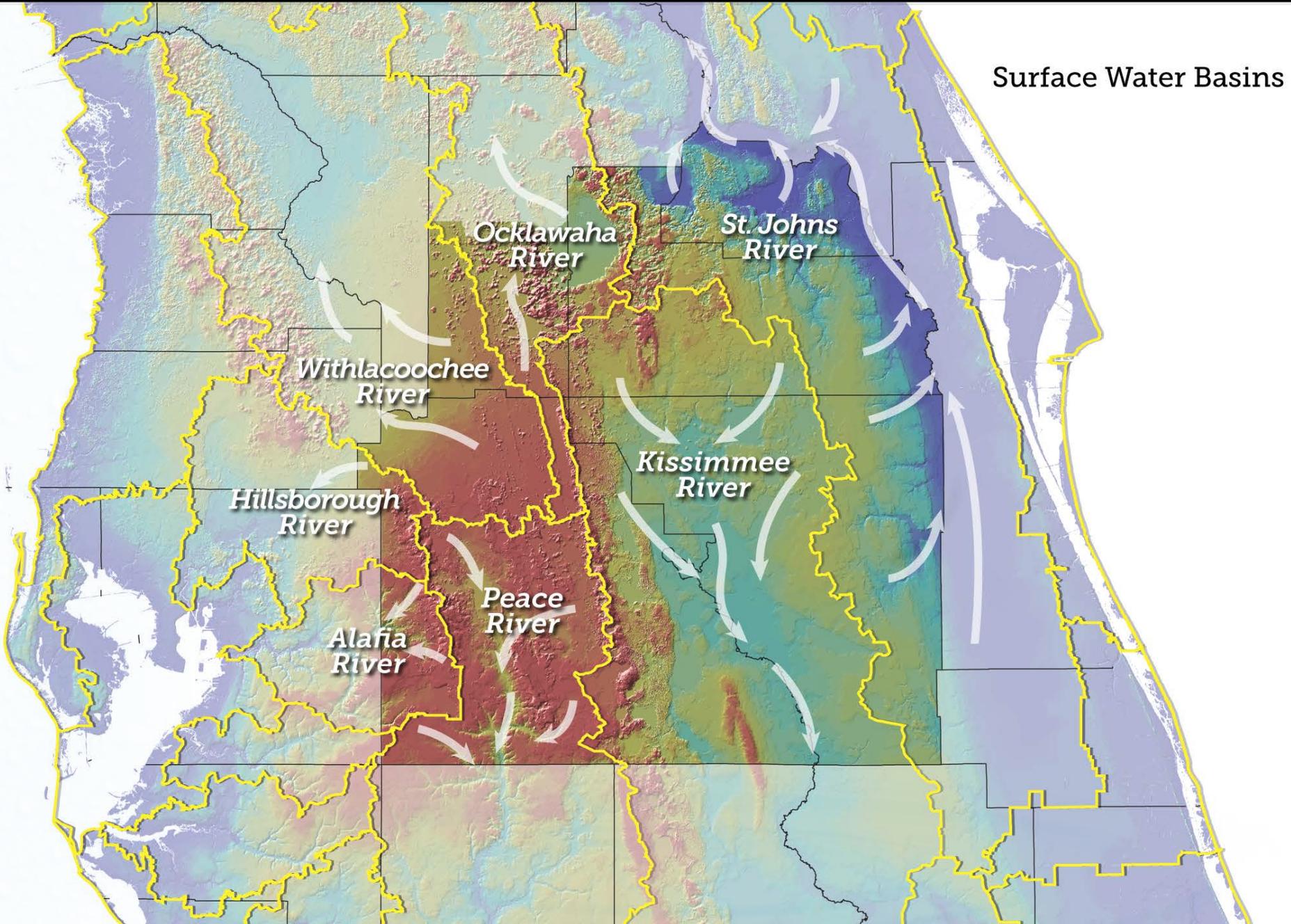
East-Central Florida Transient (ECFT) Groundwater Flow Model

Purpose

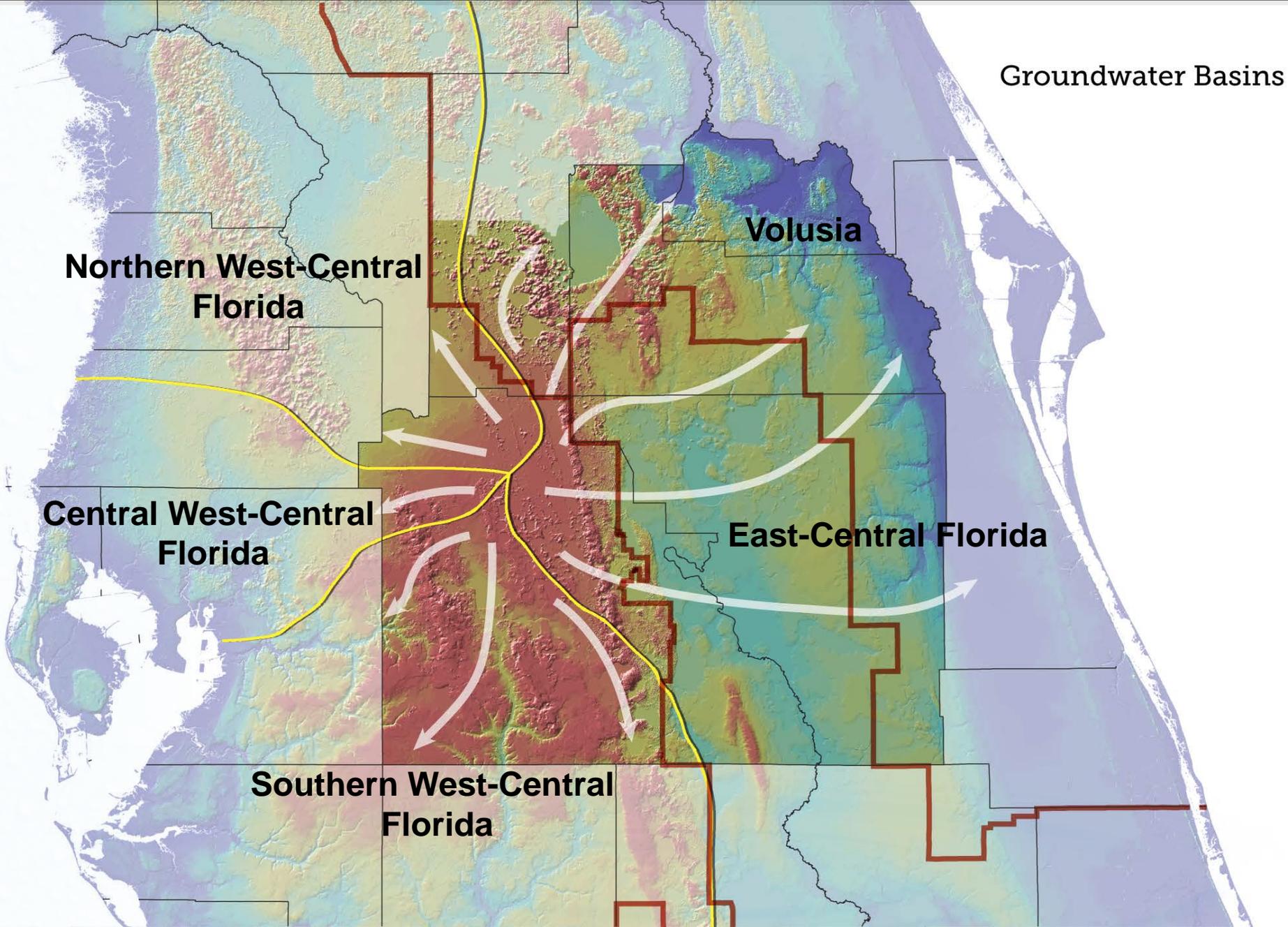
- Simulate effects of groundwater withdrawals
- Quantify sustainable limits of groundwater
- Tool to evaluate future options



Central Florida Water Initiative



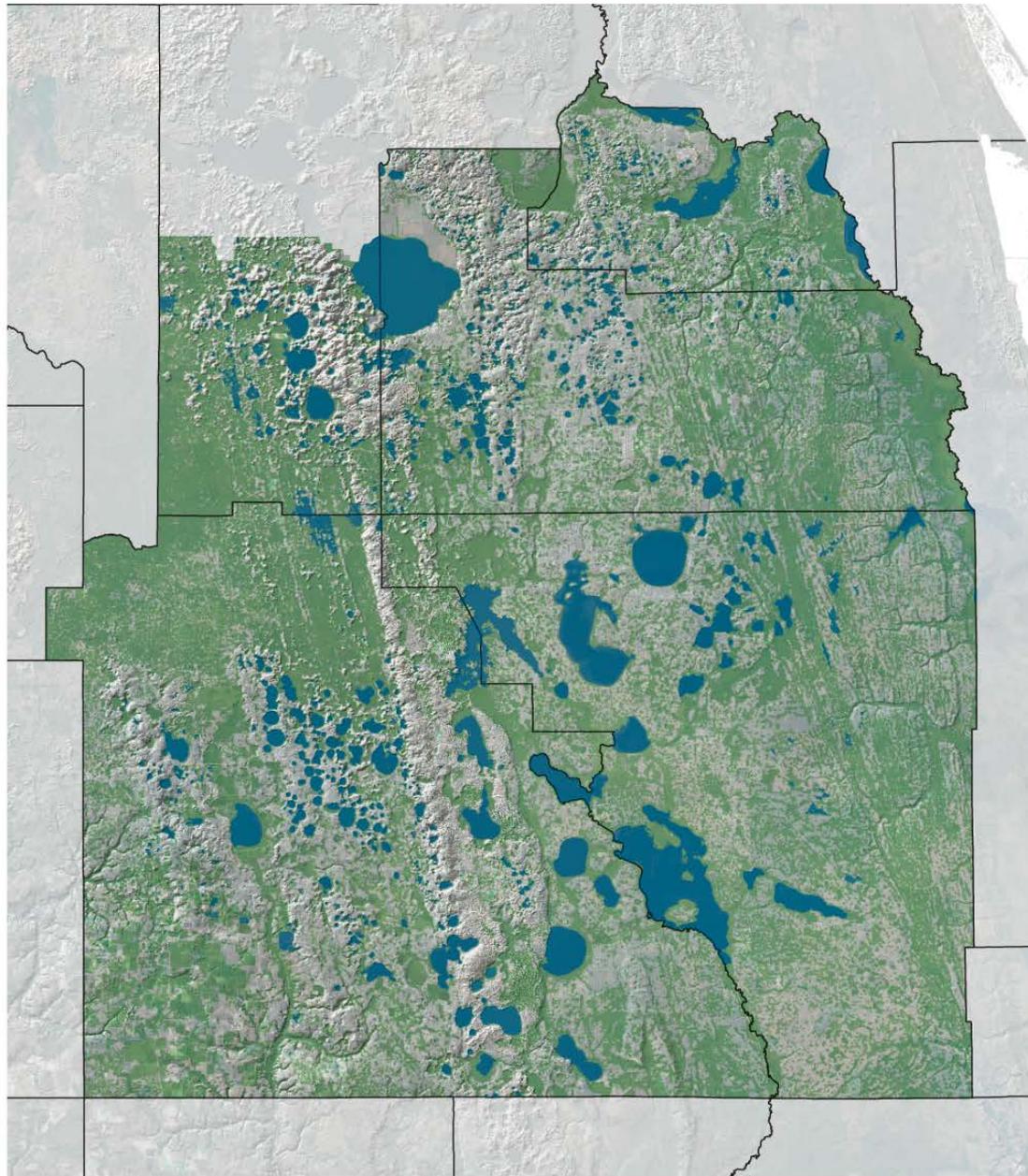
Central Florida Water Initiative



Central Florida Water Initiative

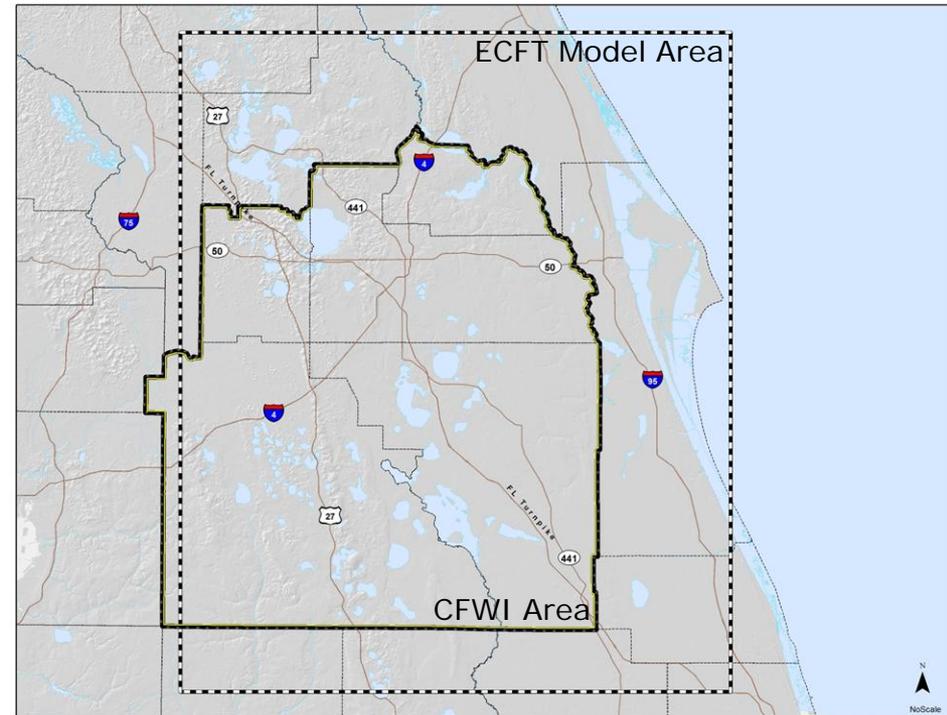
Lakes and Wetlands

-  lakes
-  wetlands



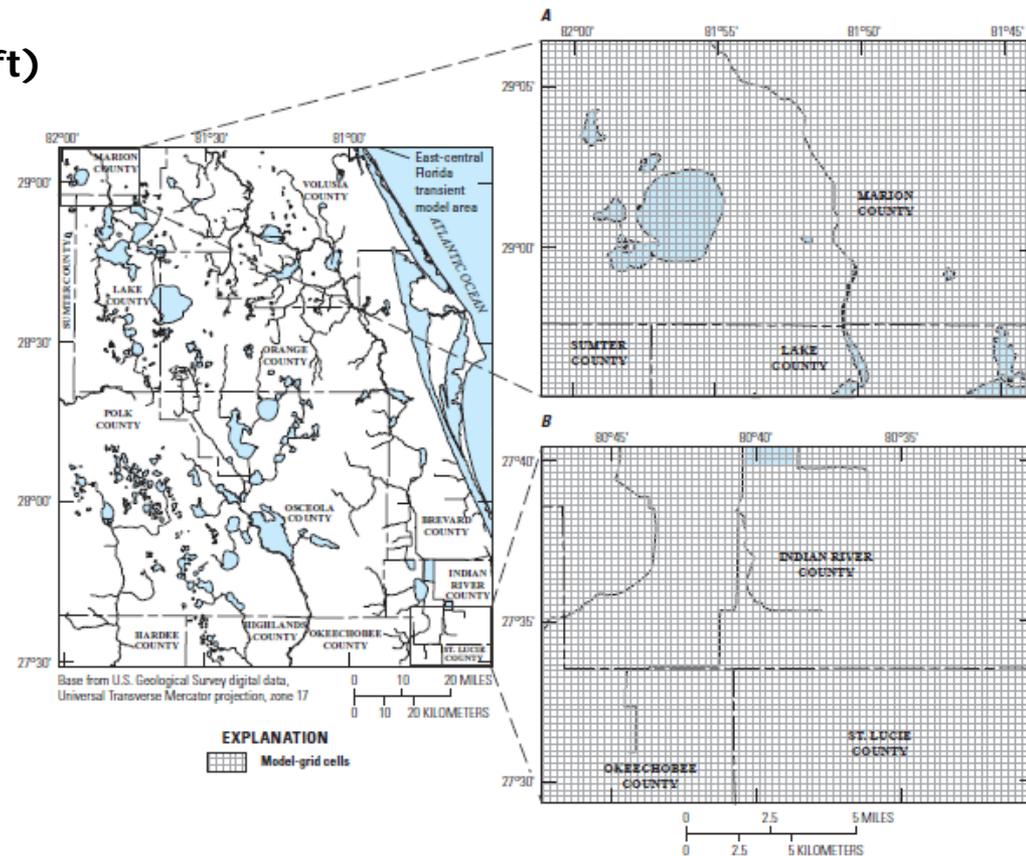
East-Central Florida Transient Groundwater Flow Model

- Based on USGS MODFLOW code
- Fully three-dimensional
- 9,000 square miles
 - 112 miles north/south
 - 92 miles east/west



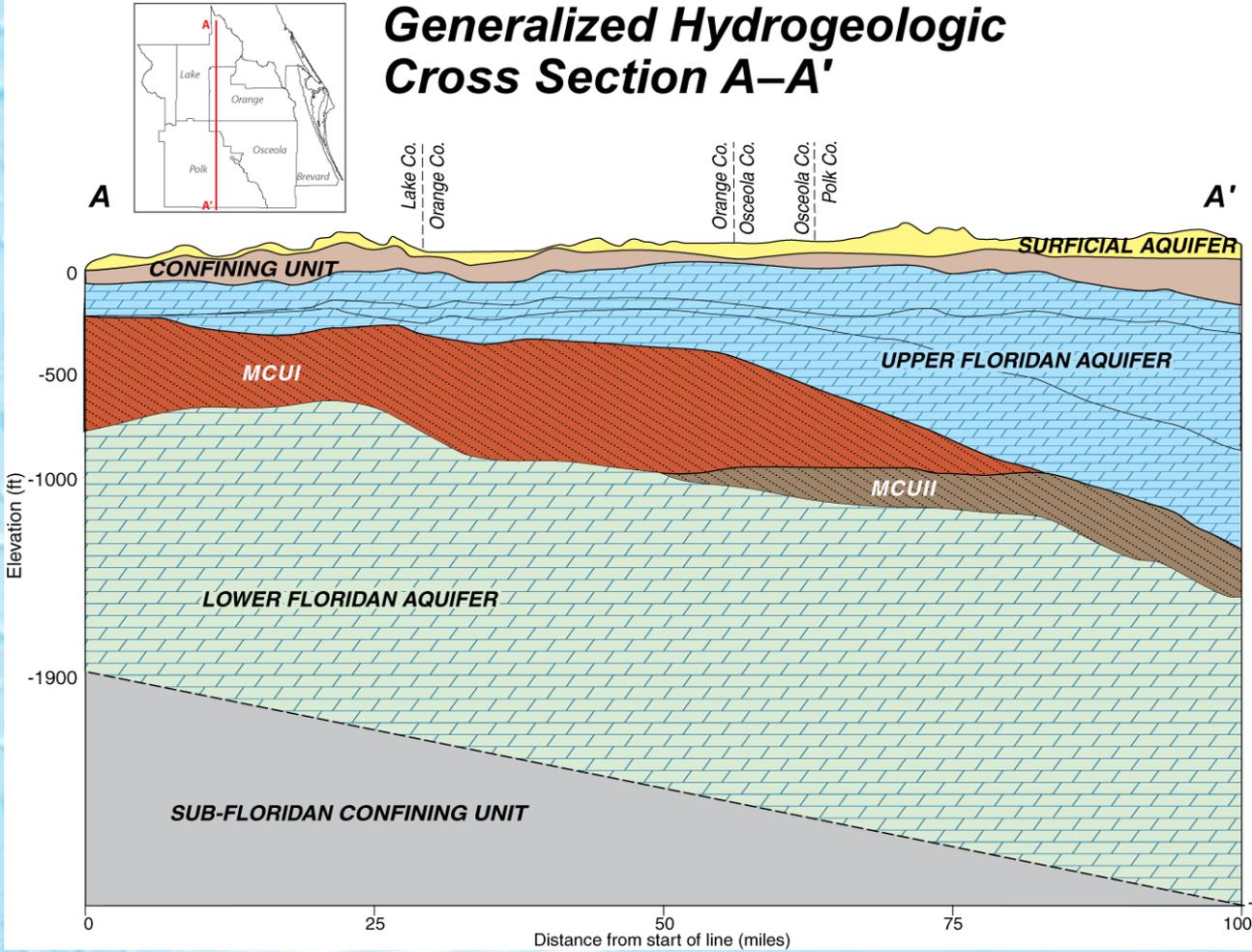
East-Central Florida Transient Groundwater Flow Model

- Grid spacing (1,250 ft by 1,250 ft)
- 472 rows and 388 columns
- Calibration period: 1995 to 2006



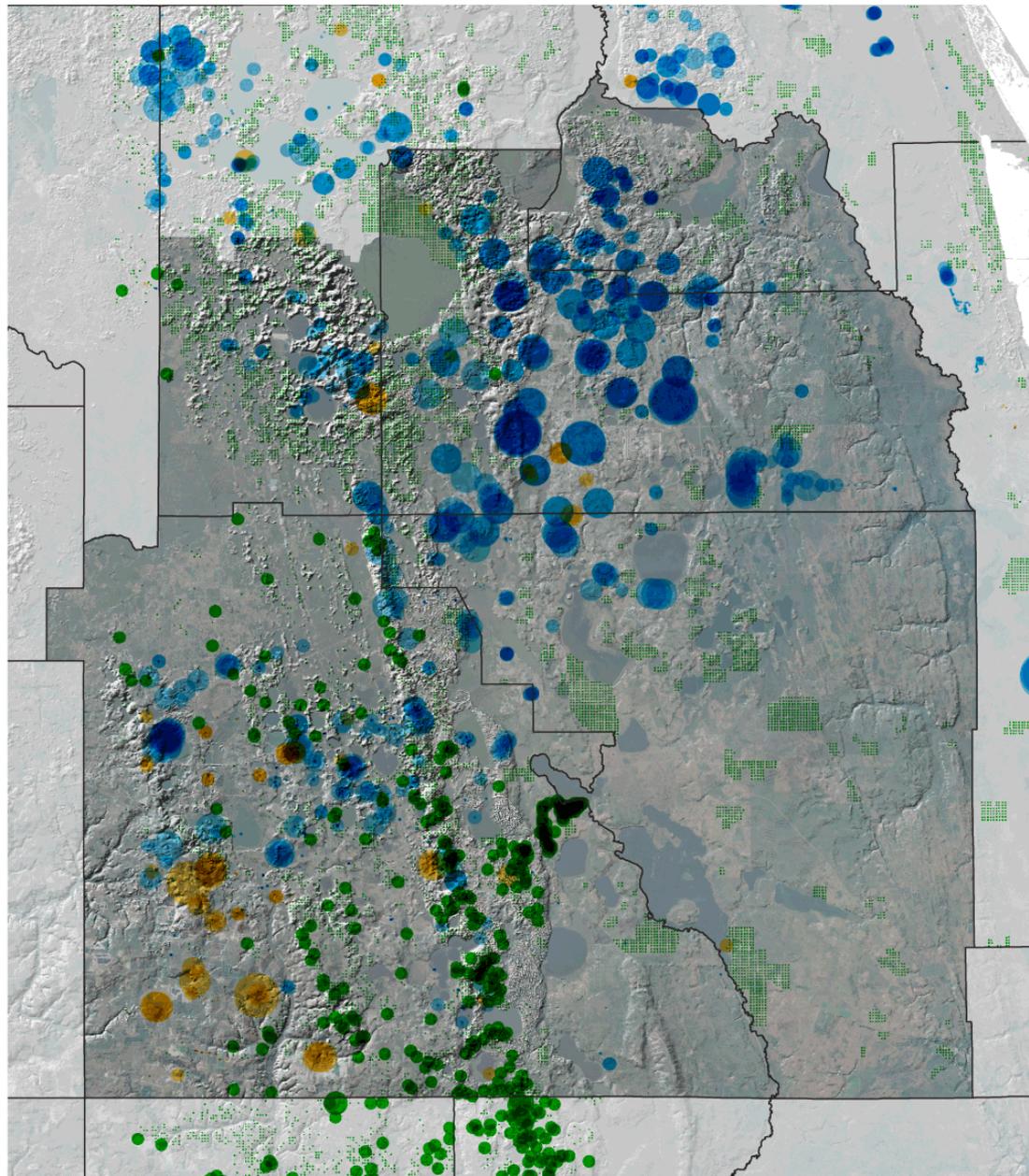
Central Florida Water Initiative

Generalized Hydrogeologic Cross Section A–A'



STRATIGRAPHIC UNIT	LOCAL MODEL LAYER
SURFICIAL DEPOSITS	LAKES, STREAMS, AND SURFICIAL AQUIFER SYSTEM (LAYER 1)
HAWTHORN GROUP	INTERMEDIATE CONFINING UNIT OR INTERMEDIATE AQUIFER SYSTEM (LAYER 2)
SUWANNEE LIMESTONE	SUWANNEE/OCALA PERMEABLE ZONE (LAYER 3)
OCALA LIMESTONE	OCALA LOW PERMEABLE ZONE (LAYER 4)
AVON PARK FORMATION	AVON PARK PERMEABLE ZONE (LAYER 5)
	MIDDLE CONFINING UNIT I OR MIDDLE CONFINING UNIT II (LAYER 6)
OLDSMAR FORMATION	LOWER FLORIDAN AQUIFER (LAYER 7)
CEDAR KEYS FORMATION	SUB-FLORIDAN CONFINING UNIT (LOW PERMEABILITY)

Central Florida Water Initiative

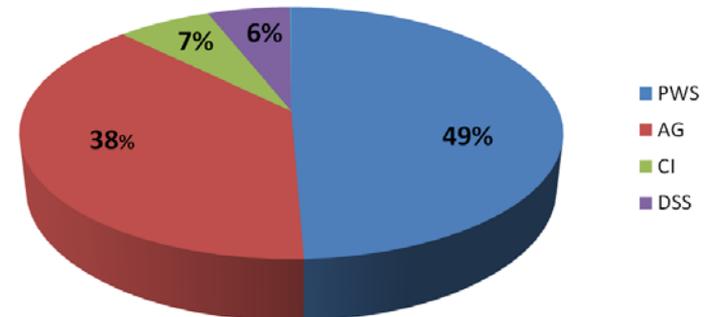


Withdrawal Types 2006 Annual Average

- < 0.1 mgd
- 0.1–0.5 mgd
- 0.5–1 mgd
- 1–3 mgd
- > 3 mgd

- Public Supply
- Agriculture
- Commercial/Industrial

ECFT Groundwater Use
(Calibration Period: 1995 to 2006)



Central Florida Water Initiative

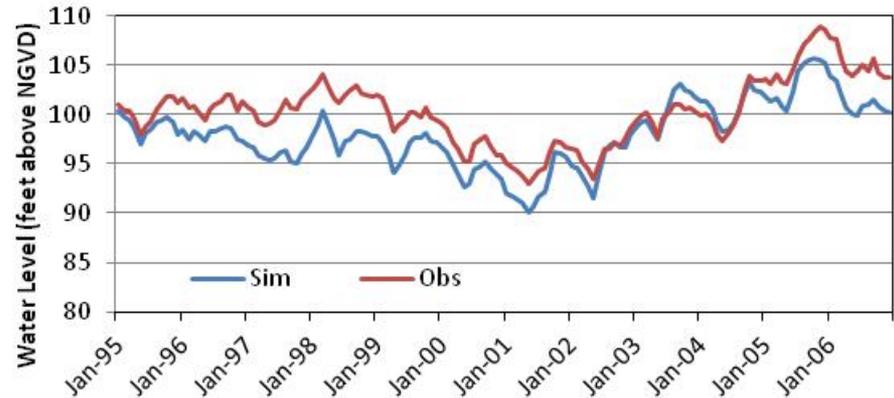
Hydrologic Process/Component	General Comment
1. Unsaturated zone	Simulates changes in soil moisture
2. Green-Ampt Infiltration	Calculates runoff and infiltration from daily rainfall and ET
3. Stream Flow	Routes water in streams and receives runoff from the surface and lakes discharging to streams
4. Lakes	Simulates water levels at over 277 lakes
5. Evapotranspiration (ET)	Actual ET rates – surface and groundwater ET
6. Fully three dimensional	Simulates groundwater flow in 7 layers
7. Simulates 12 years with varying climatic input	144 monthly stress periods using daily rainfall and ET to define recharge to water table
8. Lateral boundaries	General Head Boundaries based on observed heads

Example Model Results

ECFT Model Results:
Lake Level



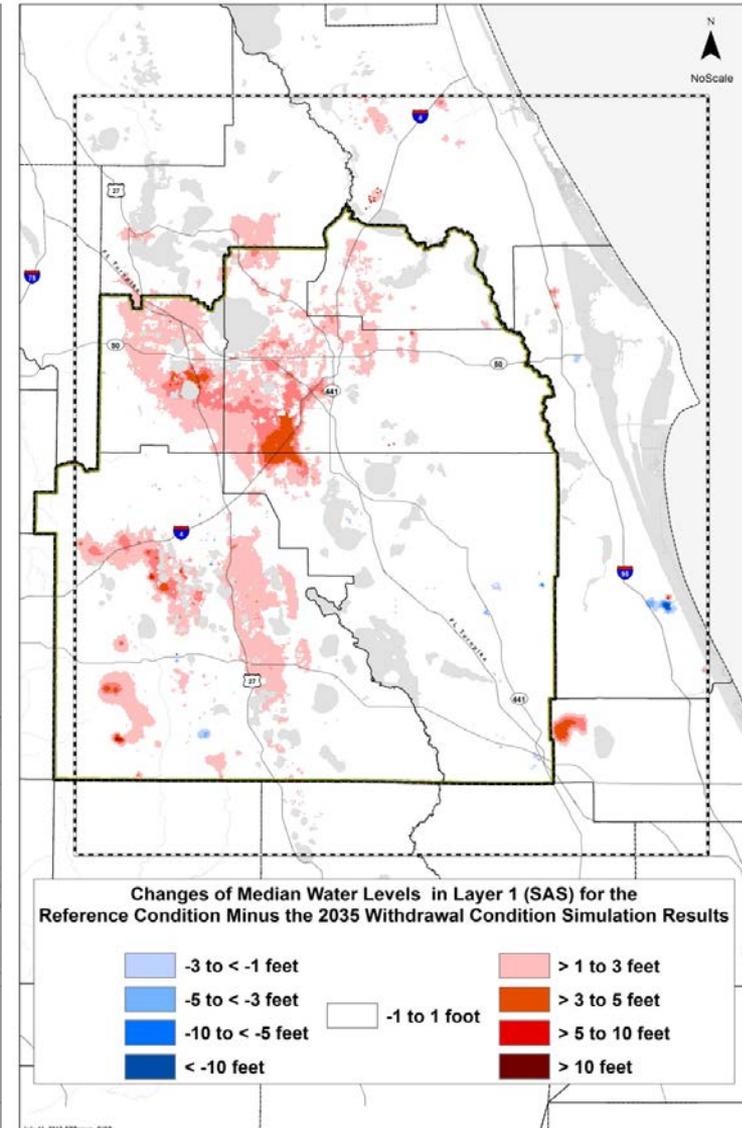
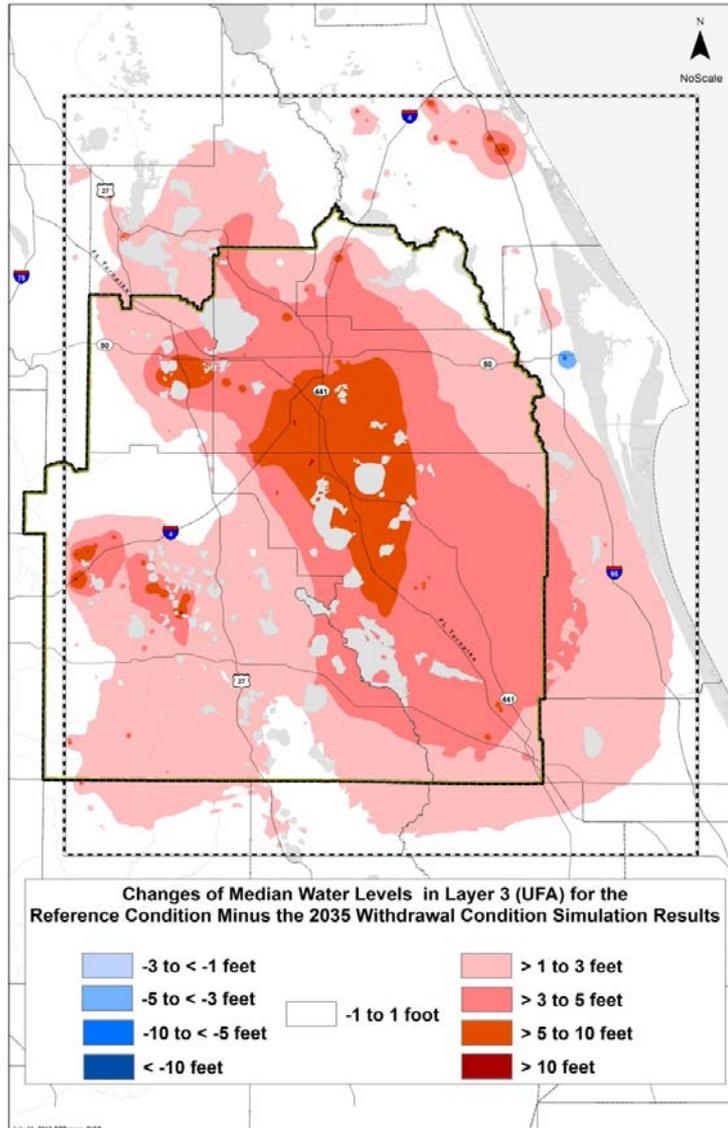
ECFT Model Results:
Upper Floridan Aquifer



CFWI Groundwater Availability Scenarios

- Calibration from 1995 to 2006
- Scenarios (include rainfall for 1995 to 2006)
 - Reference Condition
 - 2005 withdrawal condition
 - Future Conditions
 - 2015 withdrawal condition
 - 2025 withdrawal condition
 - 2035 withdrawal condition
 - End of Permit

Example Scenario Results



Central Florida Water Initiative

Home

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The Central Florida Parks assess central Florida's theme park region and communities.

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Minimum Flows and Levels and Reservations Team

Douglas Leeper

Southwest Florida Water Management District

www.cfwewater.com

Presentation Outline



- Minimum flows and levels (MFLs) background information
- Recent status of MFLs compliance
- MFL measuring stick data/tools/methods

What are MFLs?

Minimum flows and levels

-Section 373.042, Florida Statutes

(1) Within each section, or the water management district as whole, the department or the governing board shall establish the following:

(a) **Minimum flows** for all watercourses in the area. The minimum flow for a given watercourse shall be the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area.

(b) **Minimum water level.** The minimum water level shall be the level of groundwater in an aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area.

MFLs Considerations

Minimum flows and levels

-Rule 62-40.473, Florida Administrative Code

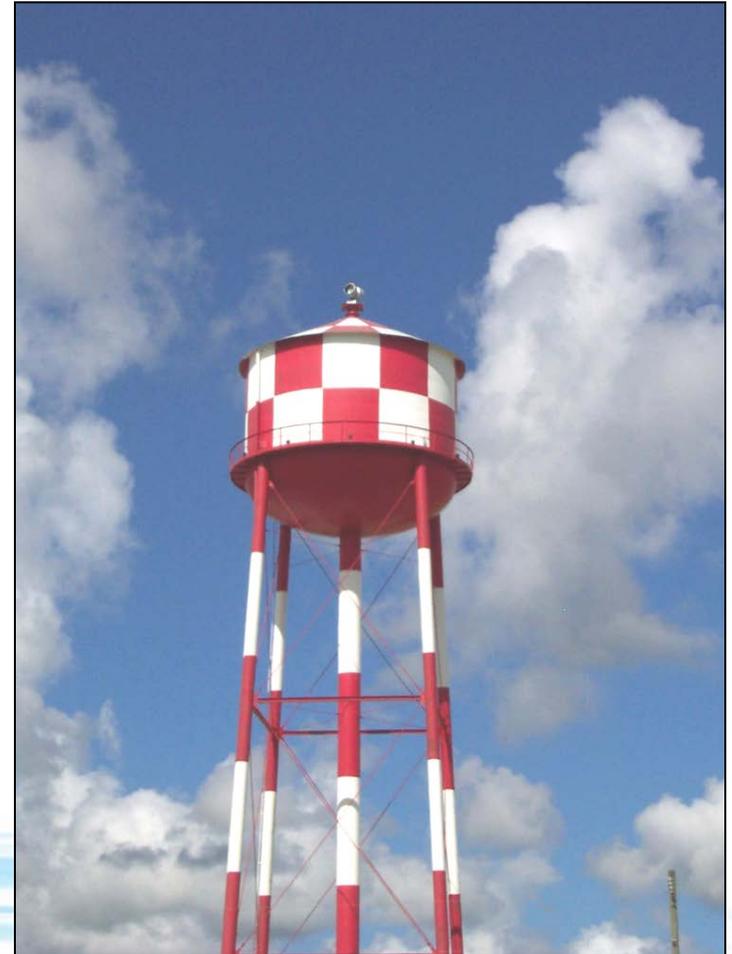
(1) In establishing MFLs consideration shall be given natural seasonal fluctuations in water flows or levels, nonconsumptive uses, and environmental values associated with coastal, estuarine, riverine, spring, aquatic, and wetland ecology, including:

- (a) Recreation in and on the water;
- (b) Fish and wildlife habitats and the passage of fish;
- (c) Estuarine resources;
- (d) Transfer of detrital material;
- (e) Maintenance of freshwater storage and supply;
- (f) Aesthetic and scenic attributes;
- (g) Filtration and absorption of nutrients and other pollutants;
- (h) Sediment loads;
- (i) Water quality; and
- (j) Navigation.

Use of MFLs



- Water supply planning
- Water use permitting
- Environmental resource permitting



MFLs Prevention/Recovery Strategies

Establishment and implementation of minimum flows and levels

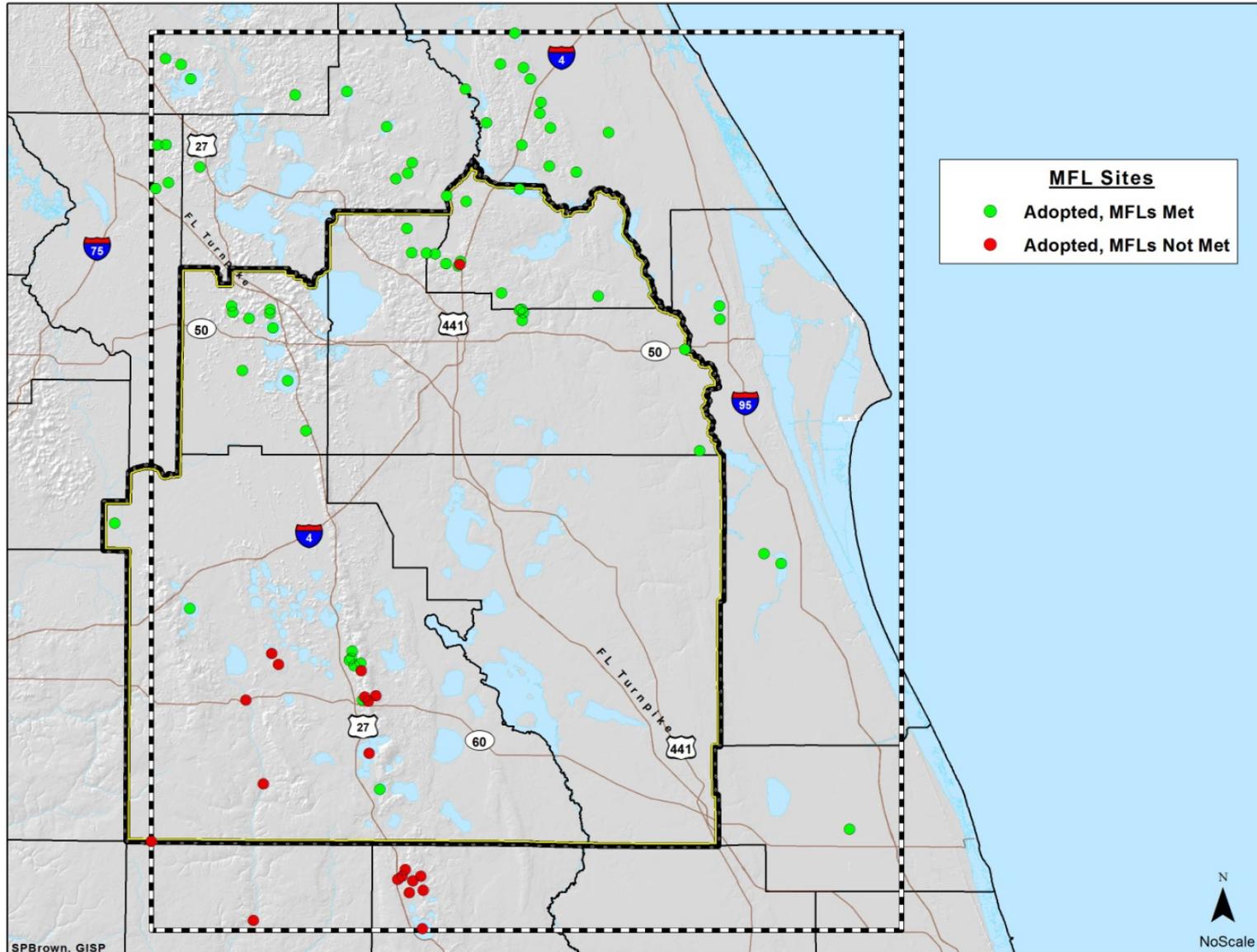
-Section 373.0421(2), Florida Statutes

(2) If the existing flow or level in a water body is below, or is projected to fall within 20 years below, the applicable minimum flow or level established pursuant to s. 373.042, the department or governing board, as part of the regional water supply plan described in s. 373.709, shall expeditiously implement a recovery or prevention strategy, which includes the development of additional water supplies and other actions, consistent with the authority granted by this chapter, to:

- (a) Achieve recovery to the established minimum flow or level as soon as practicable; or
- (b) Prevent the existing flow or level from falling below the established minimum flow or level.



Recent Status of MFLs Compliance in the CFWI Planning Area and ECFT Model Domain

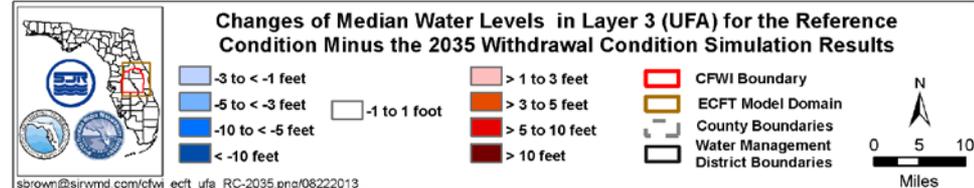
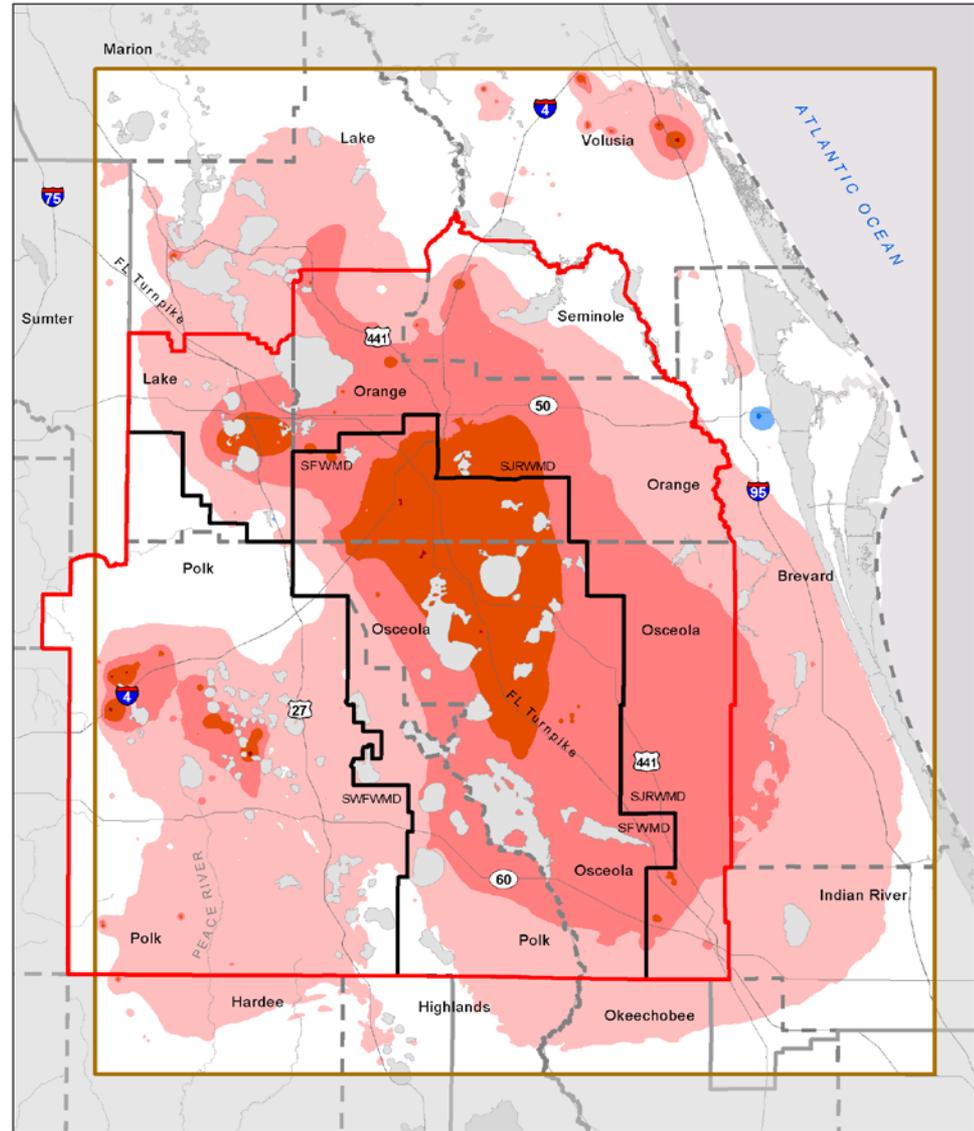


MFLs Measuring Sticks Data/Tools/Methods



Change in Upper Floridan Aquifer Water Levels

Reference Condition to 2035 Withdrawal Condition



MFLs Measuring Stick Data and Tools/Methods

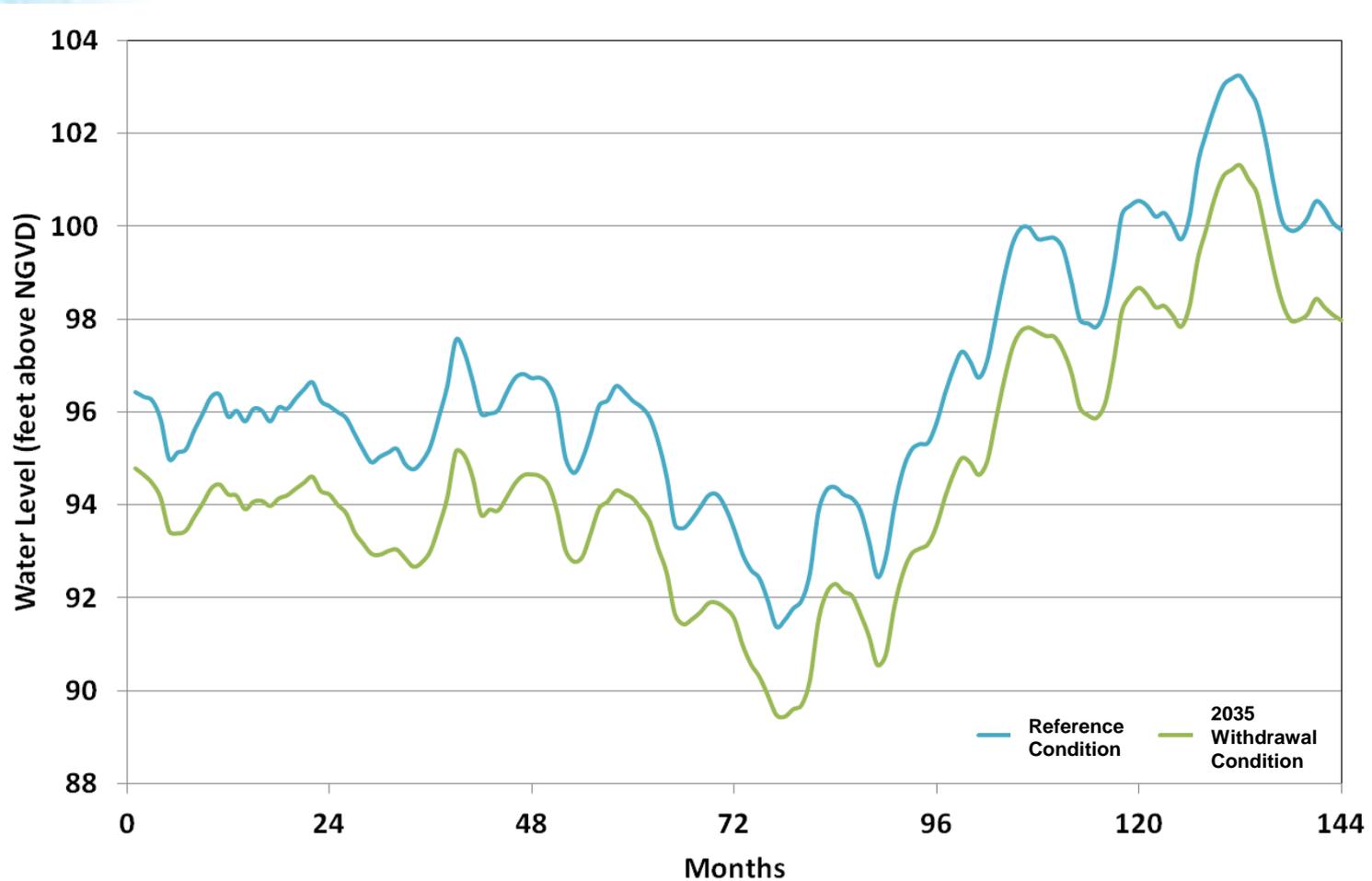
■ Data

- ❑ Surface water levels/flows, well water levels, rainfall, evapotranspiration, and other hydrologic data
- ❑ Adopted and proposed MFLs
- ❑ Other MFL-related regulatory considerations

■ Tools/Methods

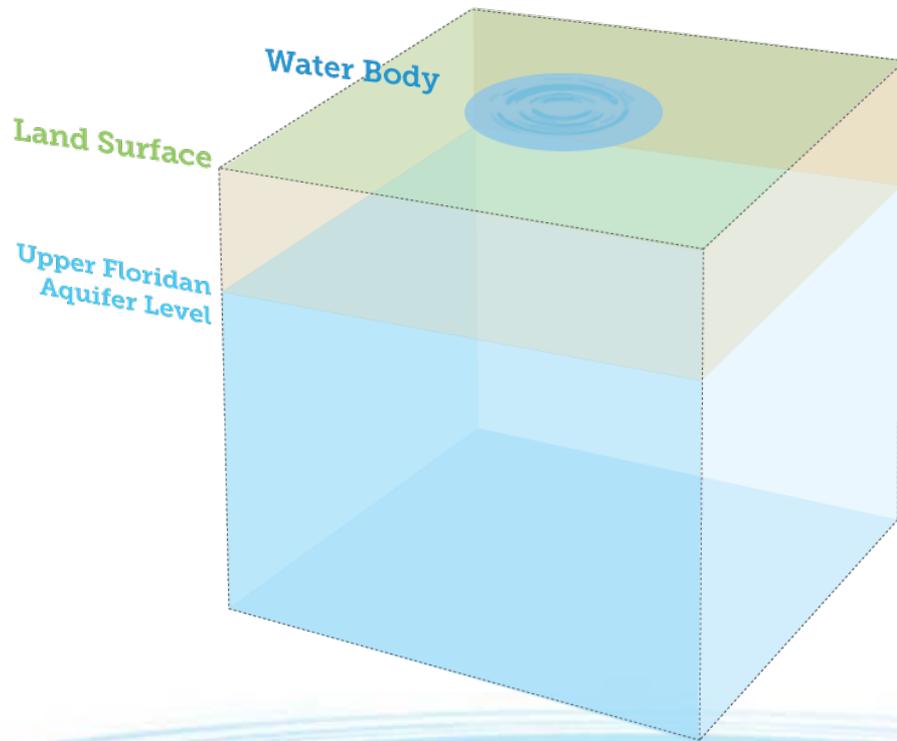
- ❑ ECFT model output and water budget models used to determine drawdown effects on MFL measuring sticks

Modeled Changes in Upper Floridan Aquifer (UFA) Water Levels



MFL Measuring Sticks

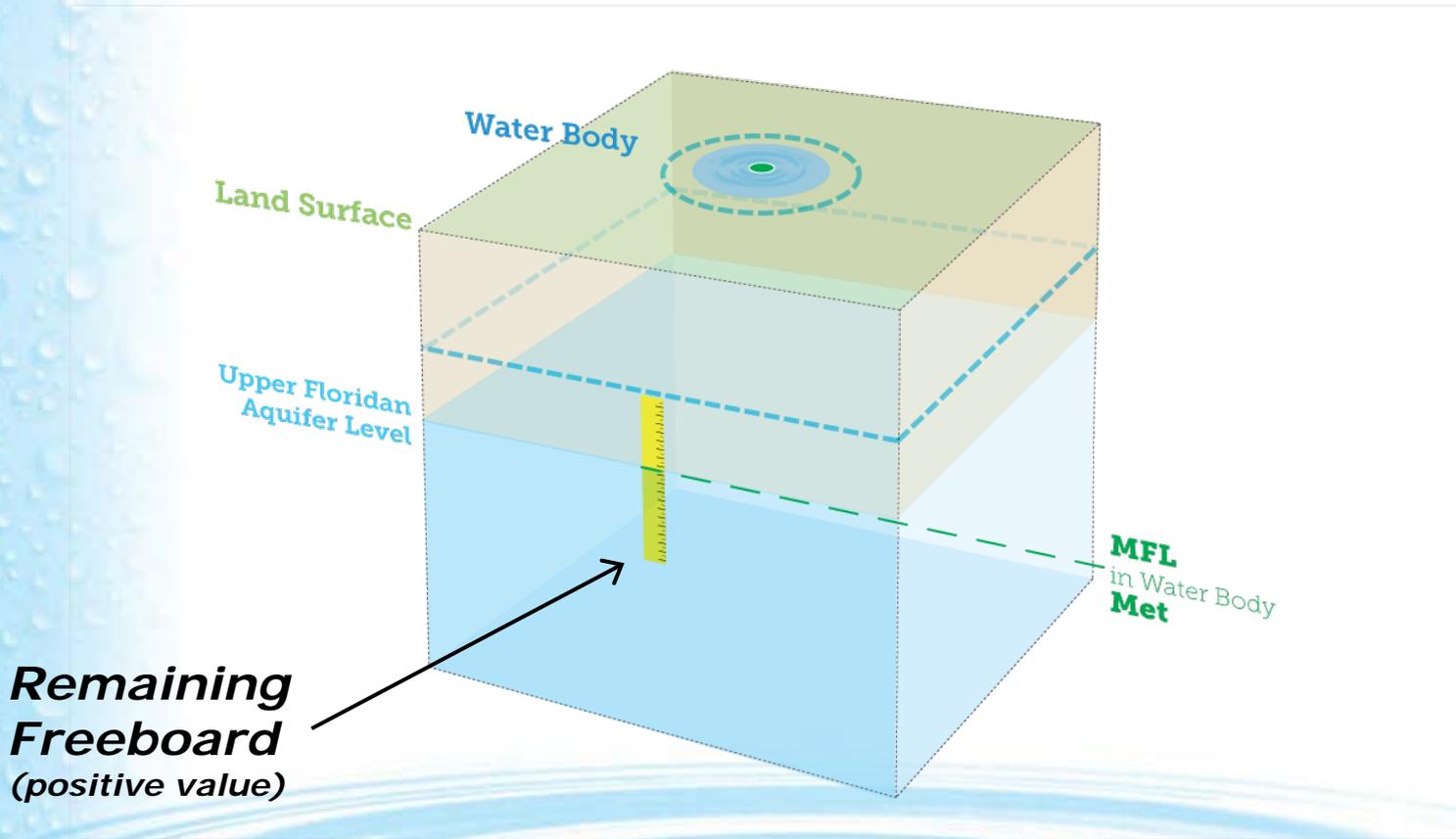
Linking Upper Floridan Aquifer Levels to Surface Water Levels



Water budget models link predicted Upper Floridan aquifer levels with surface water body levels

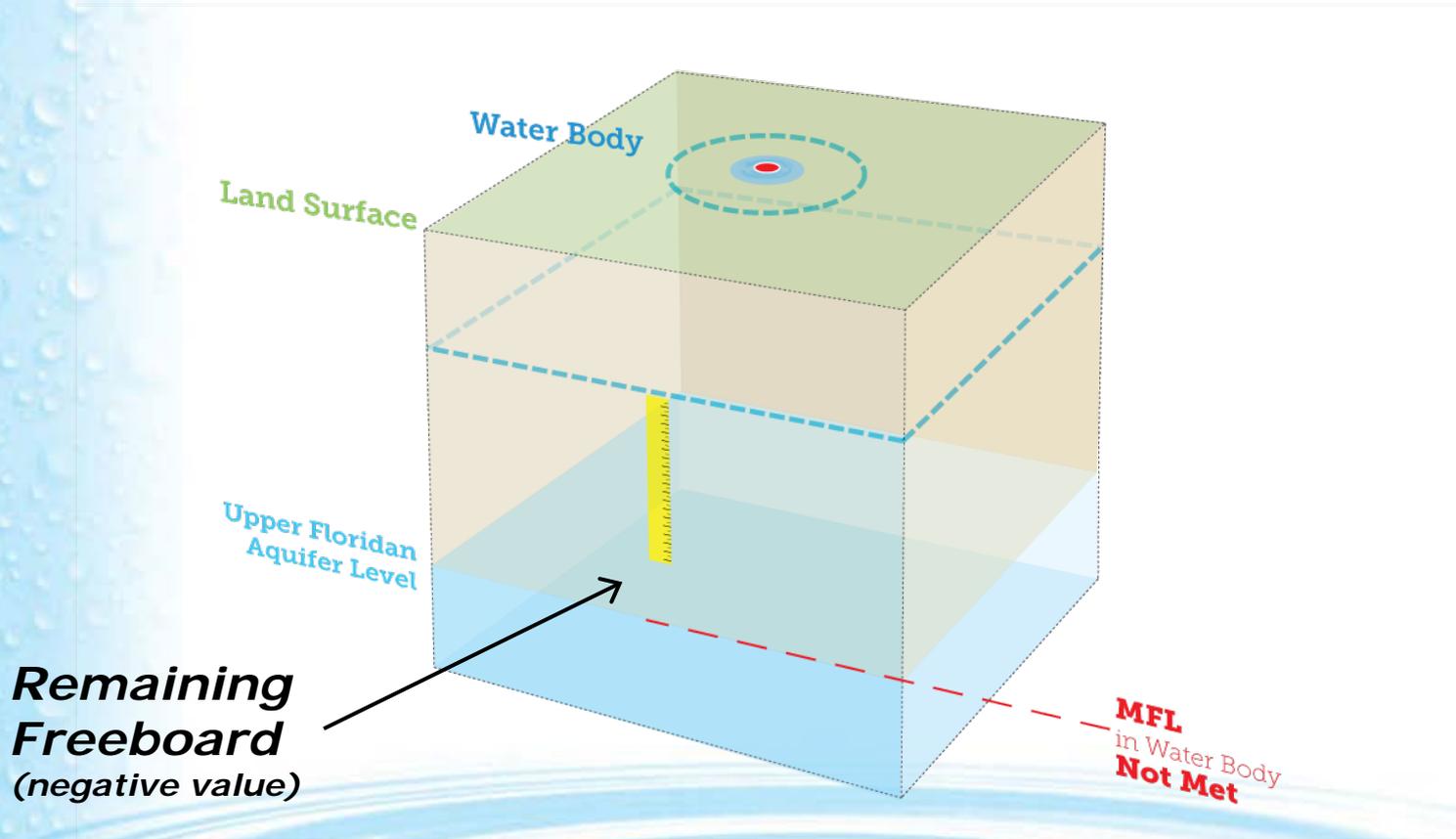
MFL Measuring Sticks

Remaining Freeboard Concept



MFL Measuring Sticks

Remaining Freeboard Concept (continued)



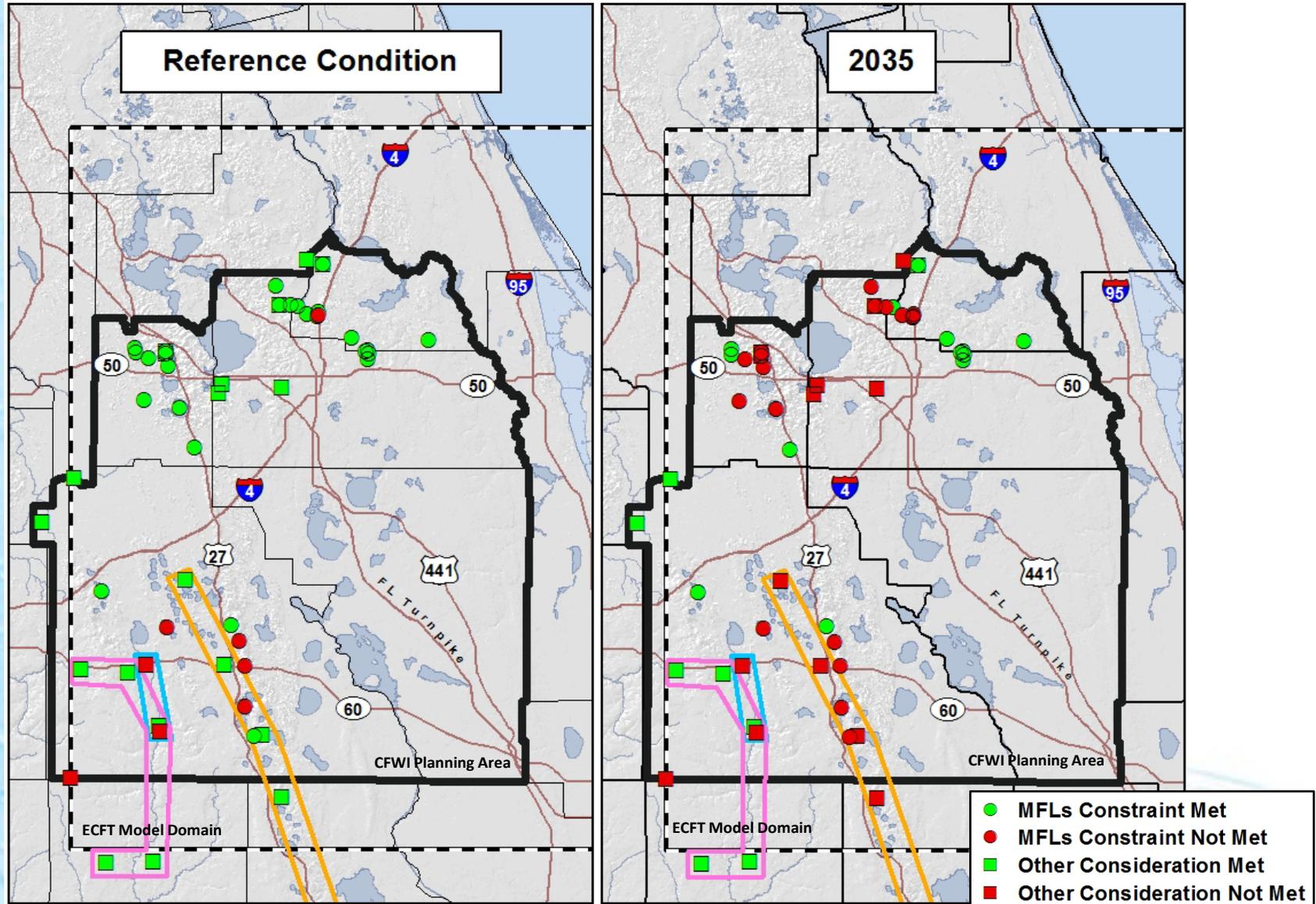
Other Remaining Freeboard Metrics

- Change in spring discharge
- Exchange between river channel and underlying aquifers
- Change in ECFT model boundary groundwater flows



MFL Measuring Stick Example Results

Reference Condition & 2035 Withdrawal Condition



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Environmental Measures Team

John Zahina-Ramos, PhD, PWS
South Florida Water Management District

www.cfwewater.com

Environmental Measures Team (EMT)

- EMT's primary tasks:
 - Evaluate recent environmental conditions of wetlands in the CFWI study area
 - Stress from lowered water levels
 - Considered alterations that could have affected water levels
 - Develop tools to evaluate modeled future conditions
 - Apply model output to assess likely condition of wetlands under various scenarios

Evaluation of Recent Conditions

- Field assessments at 357 wetlands
- Other information acquired
 - Soils, historic aerial photography, topography, etc.
- Reviewed available data and information
 - Determination of wetland hydrologic stress
 - Identified sites with substantial hydrologic alteration

Wetland Stress

- Observed wetland change indicating long-term lowered water levels



Invasion of upland species, wetland tree falls and death



Soil loss because of drying



Extreme dry causes soil fissures and kills wetland vegetation

Wetland Stress



1947



2000



1969



2009

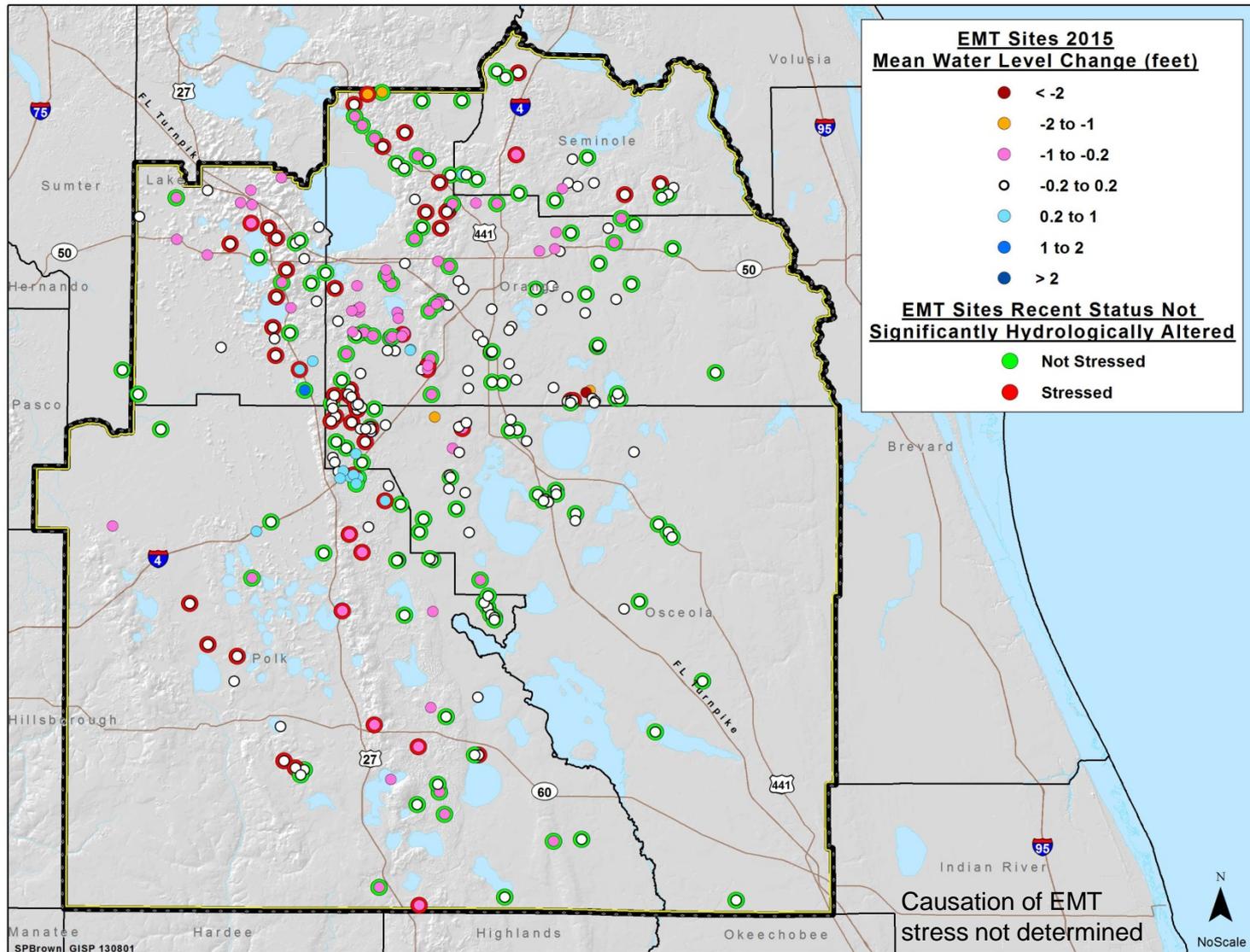
Hydrologic Alteration

- Basin or local alterations that could have affected wetland water levels
 - ❑ Ditches, canals, impoundments
 - ❑ Development
 - ❑ Control structures or regulation schedules
 - ❑ Impoundment
 - ❑ Rapid infiltration basin systems (RIBS)
 - ❑ Modified area of watershed, lake or wetland
 - ❑ Other

Measuring Sticks

- Two approaches used
- First approach examined modeled changes in surficial aquifer water levels under future scenarios
 - If currently stressed wetlands have no change or lowered water levels under future scenarios
 - If currently unstressed wetland have substantially lowered water levels

Evaluation Product



Measuring Sticks

- Second approach calculated quantitative relationships between observed wetland stress and changes in modeled surficial and Upper Floridan water levels
 - Used to determine the probability that a wetland would be stressed, based on hydrology
 - Applied to model output to calculate an approximate acres of stressed wetlands

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Groundwater Availability Team

Mark Barcelo, P.E.

Southwest Florida Water Management District

www.cfwewater.com

Guiding Principle #1

Identify the sustainable quantities of traditional groundwater sources available for water supply that can be used without causing unacceptable harm to the water resources and associated natural systems.



Assessing Groundwater Availability

- Multiple factors
 - Hydrogeologic setting and rainfall
 - Drainage
 - Surrounding land use changes
 - Basin configuration changes
 - Withdrawals
- Focus on groundwater withdrawal based changes

Measuring Sticks

- Established and proposed MFLs in the CFWI
 - Regulatory constraints including Southern Water Use Caution Area (SWUCA)
- Non-MFL lakes/wetlands
- Non-MFL springs
- Aquifer water quality/saltwater intrusion

Approach

- Data

- Projected demands
- Measuring sticks

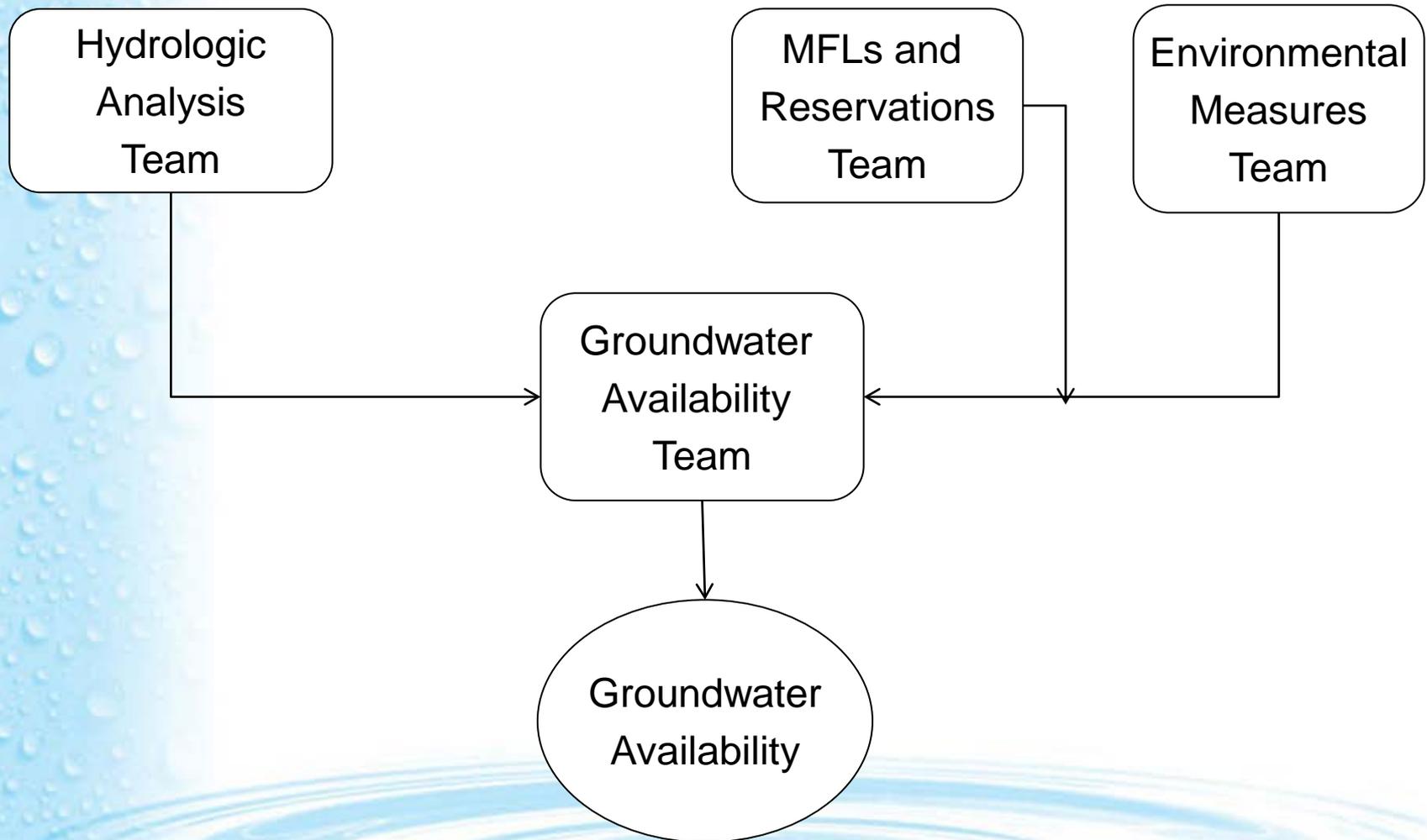
- Tools

- ECFT Model

- Methods

- Conduct future withdrawal scenarios
- Determine measuring stick exceedances
- Observe spatial pattern of exceedances

Groundwater Availability Process



Water Use

All Classes

MGD

1200

1000

800

600

400

200

0

1960

1970

1980

1990

2000

2010

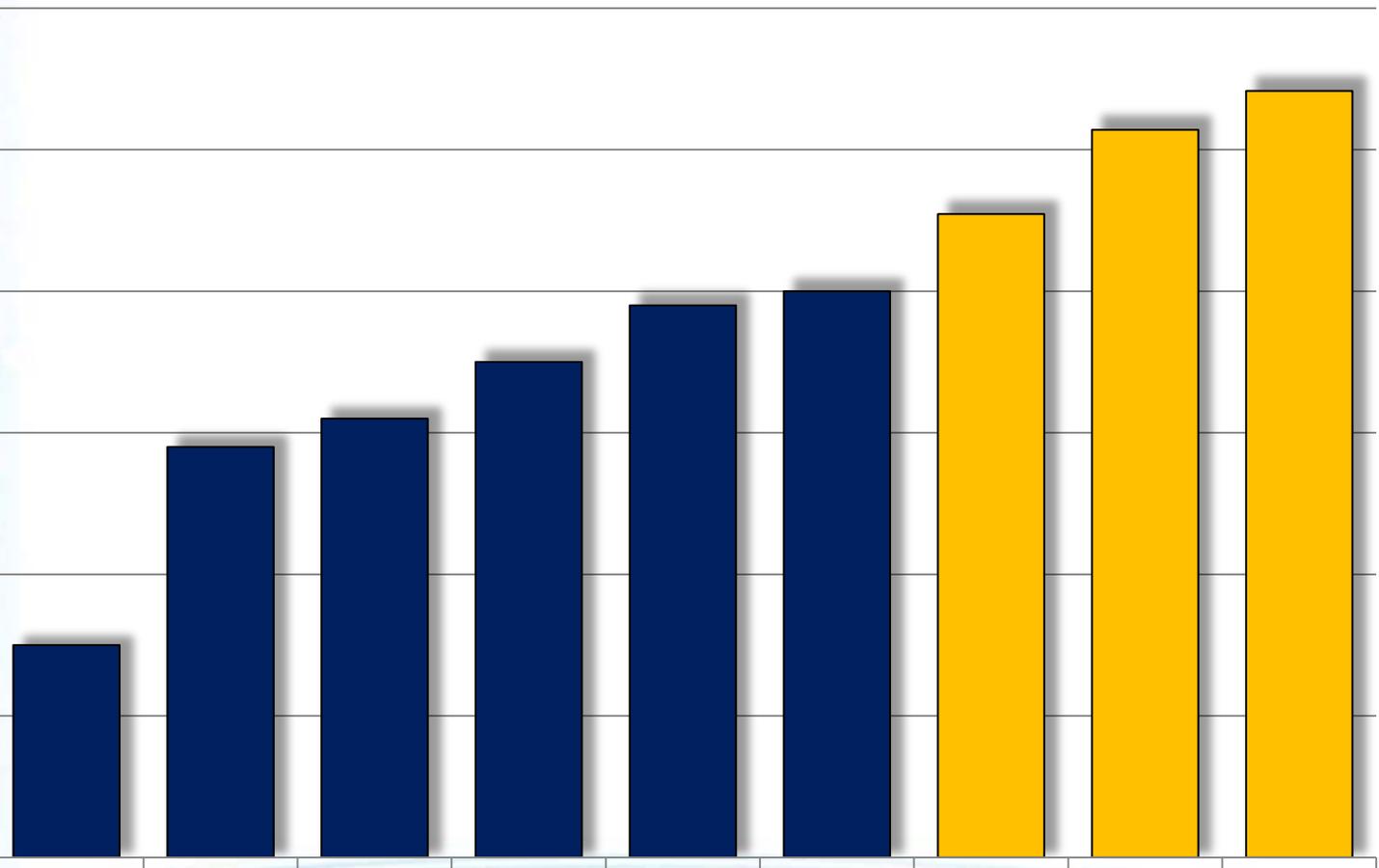
2020

2030

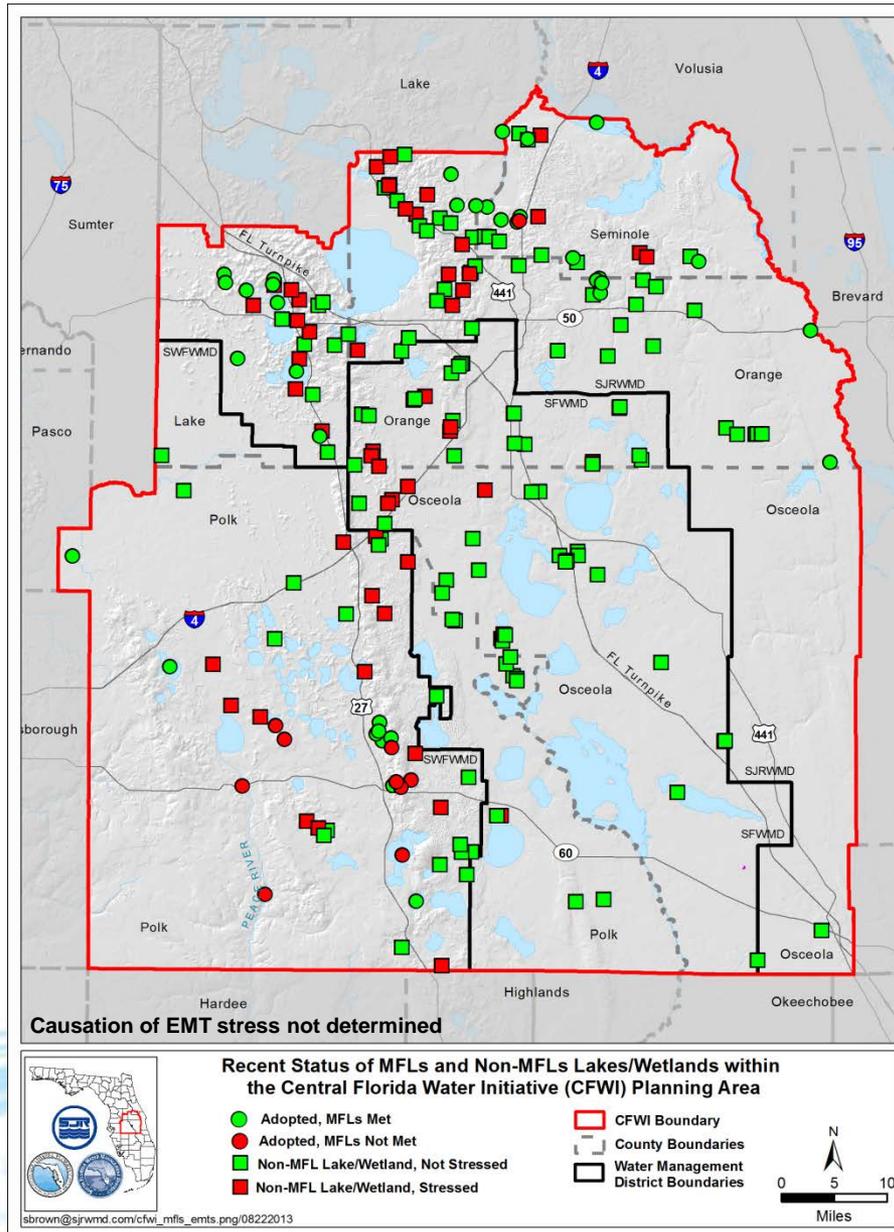
2035

Historic

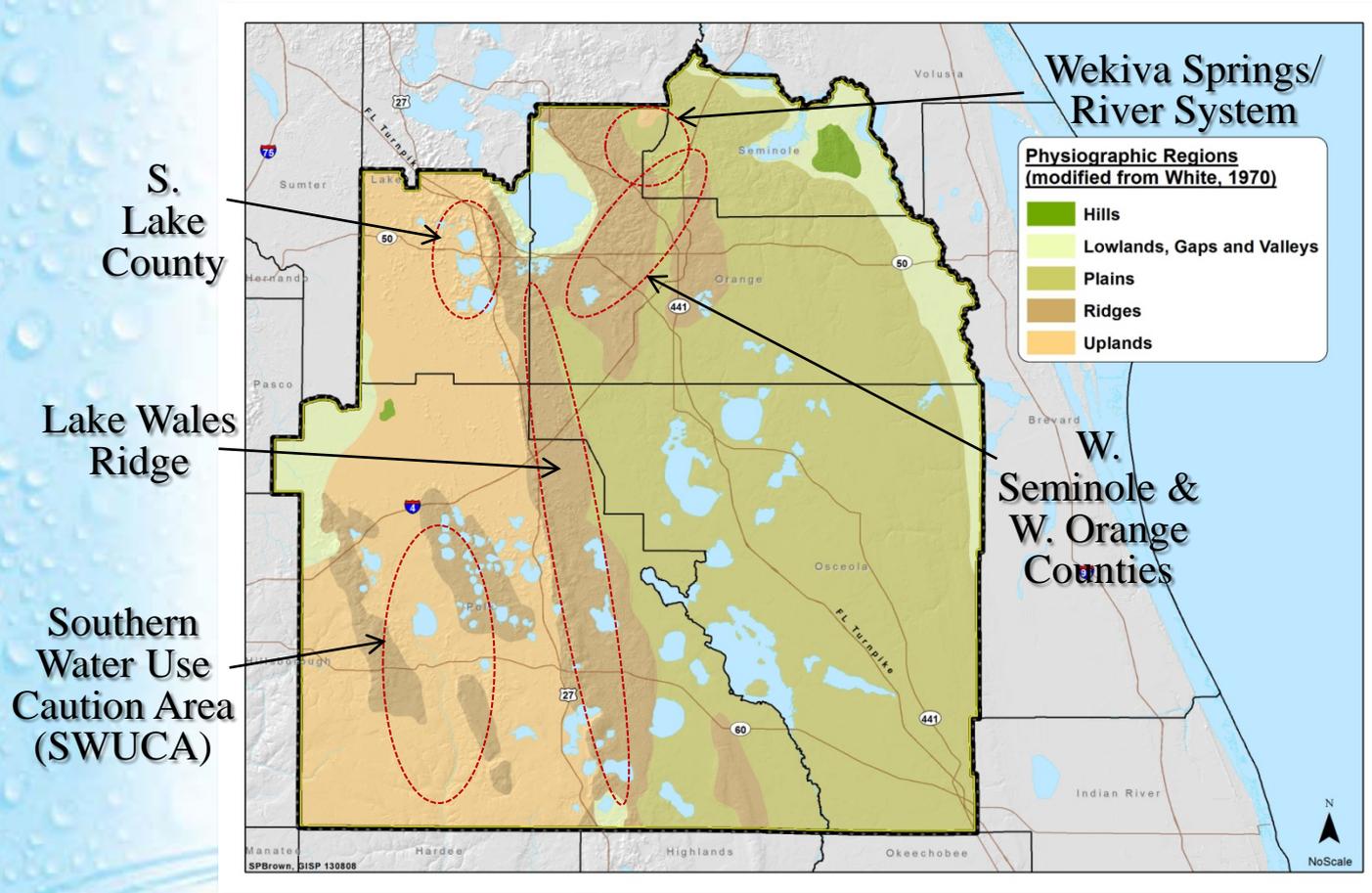
Projected



Recent Status of MFLs and EMT Sites



Primary Areas Susceptible to Groundwater Withdrawals



Model Scenarios

■ Purpose

- To quantify effects of withdrawals

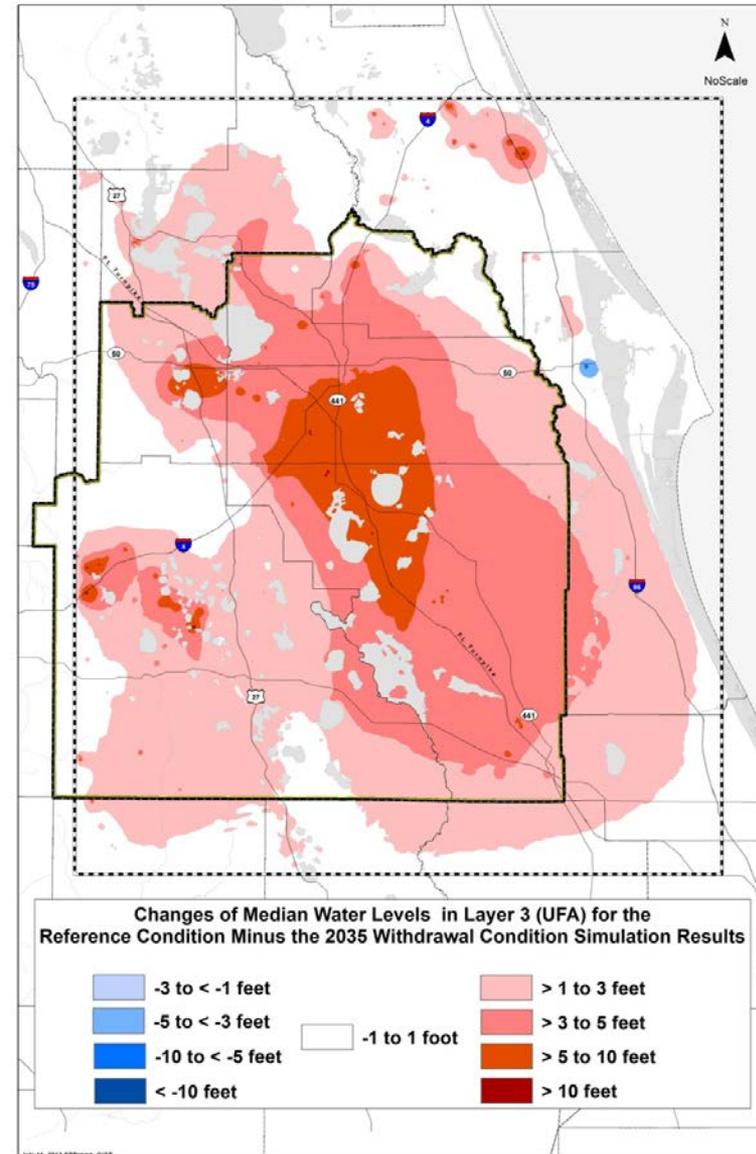
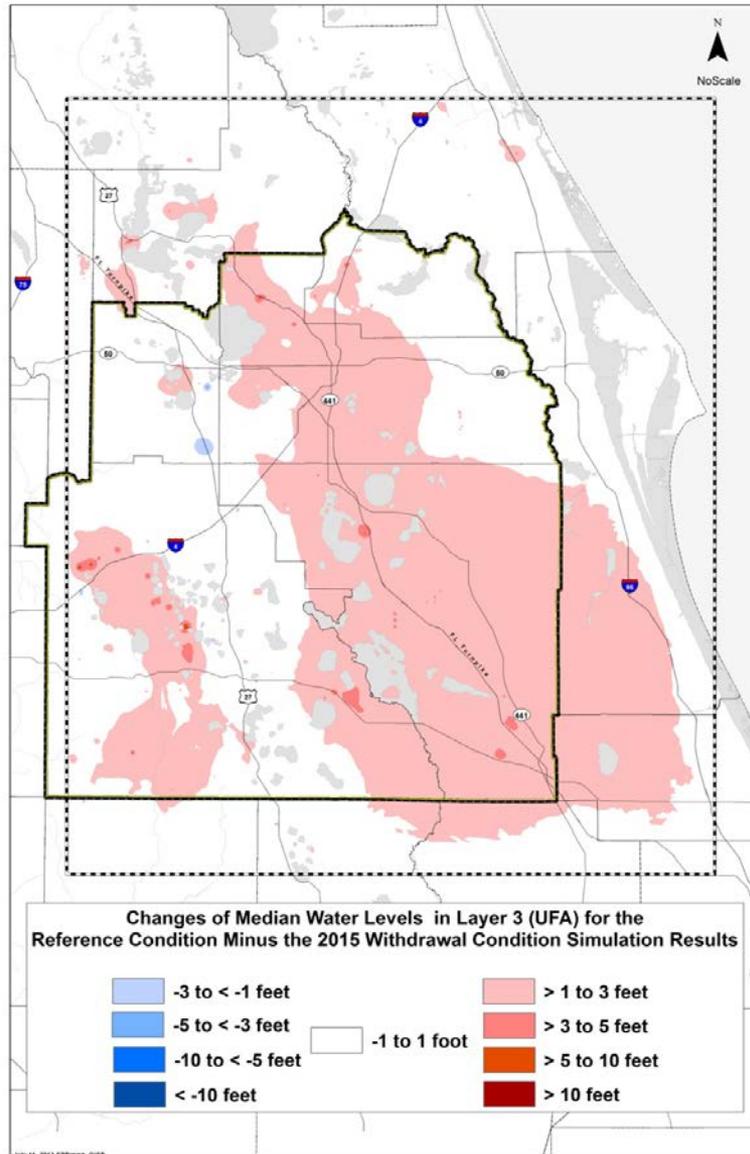
■ Scenarios

- Reference condition
- Future withdrawal conditions
 - 2015
 - 2025
 - 2035
 - End of Permit
- Sensitivity runs

Example Model Scenarios

RC minus 2015

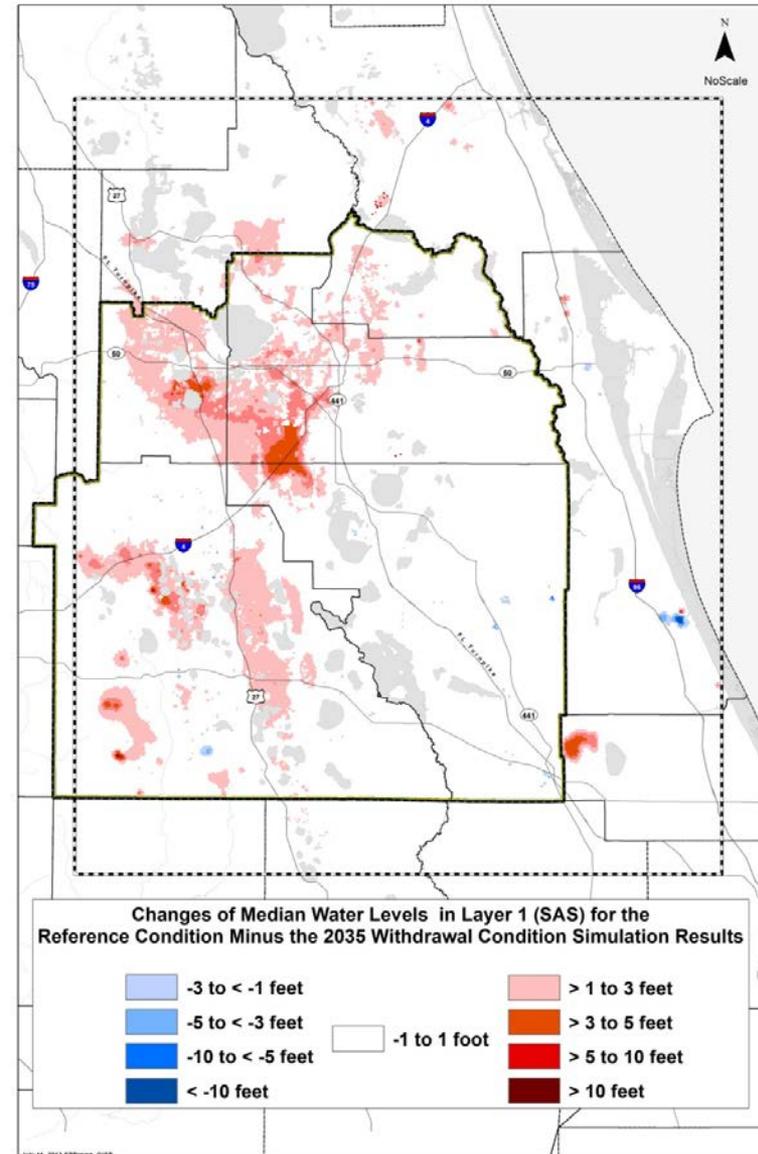
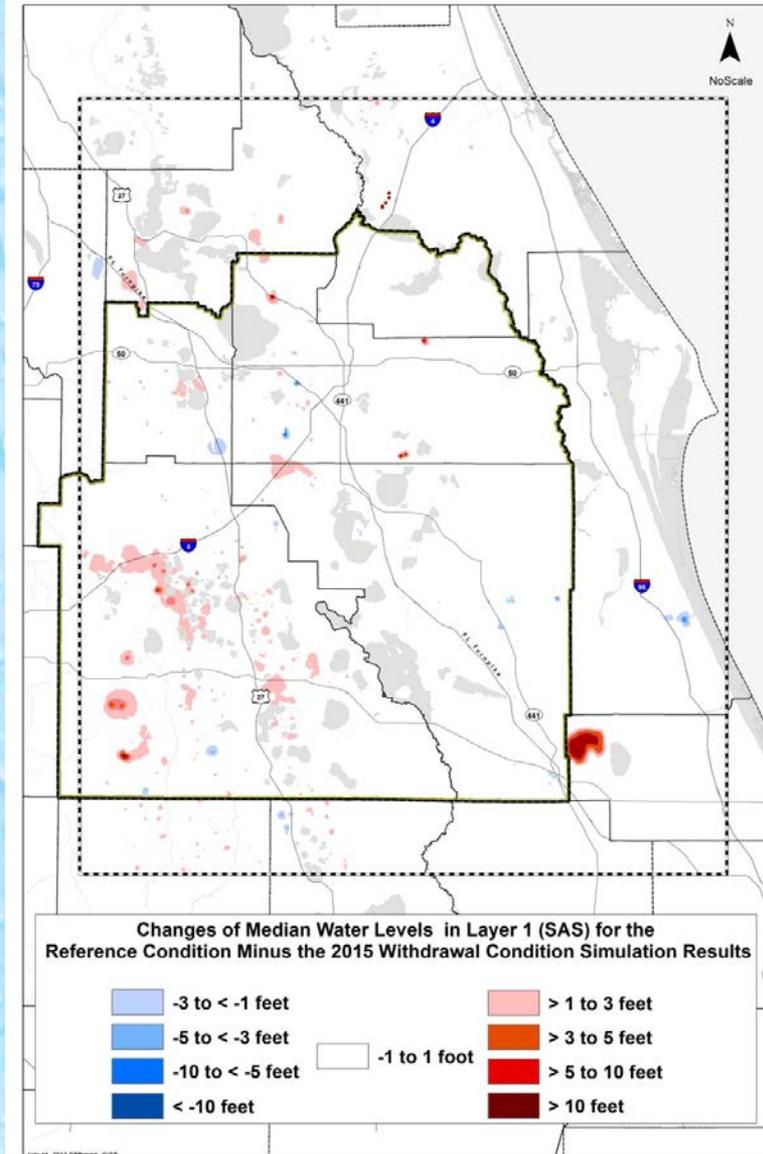
RC minus 2035



Example Model Scenarios

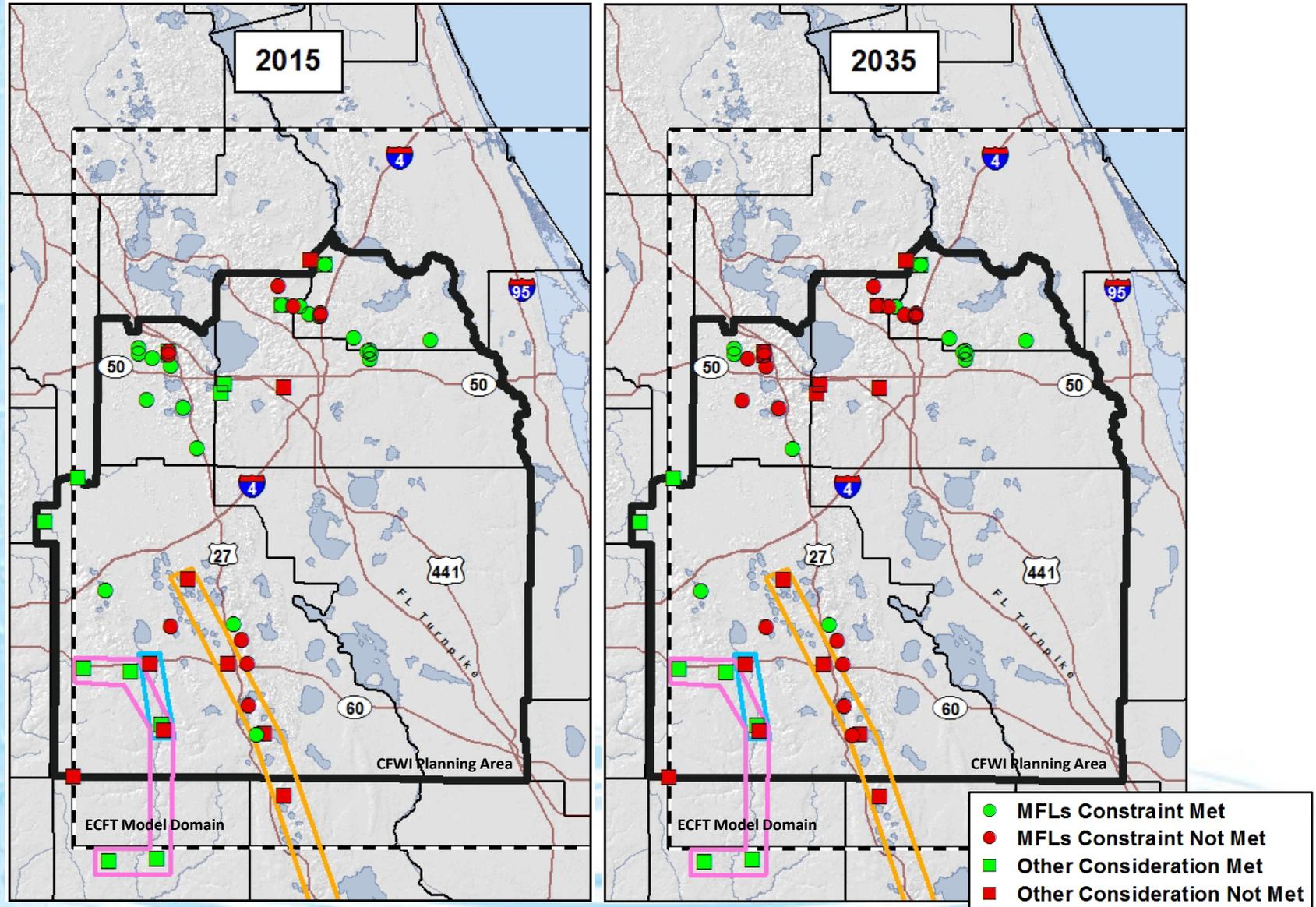
RC minus 2015

RC minus 2035



MFL Measuring Stick Example Results

2015 & 2035 Withdrawal Conditions

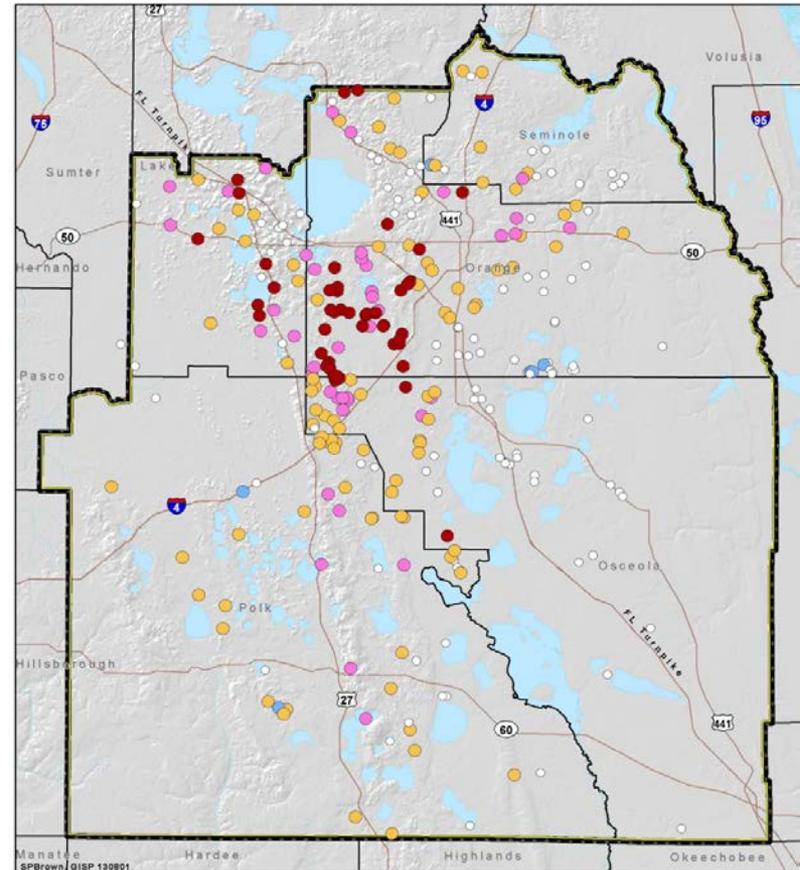
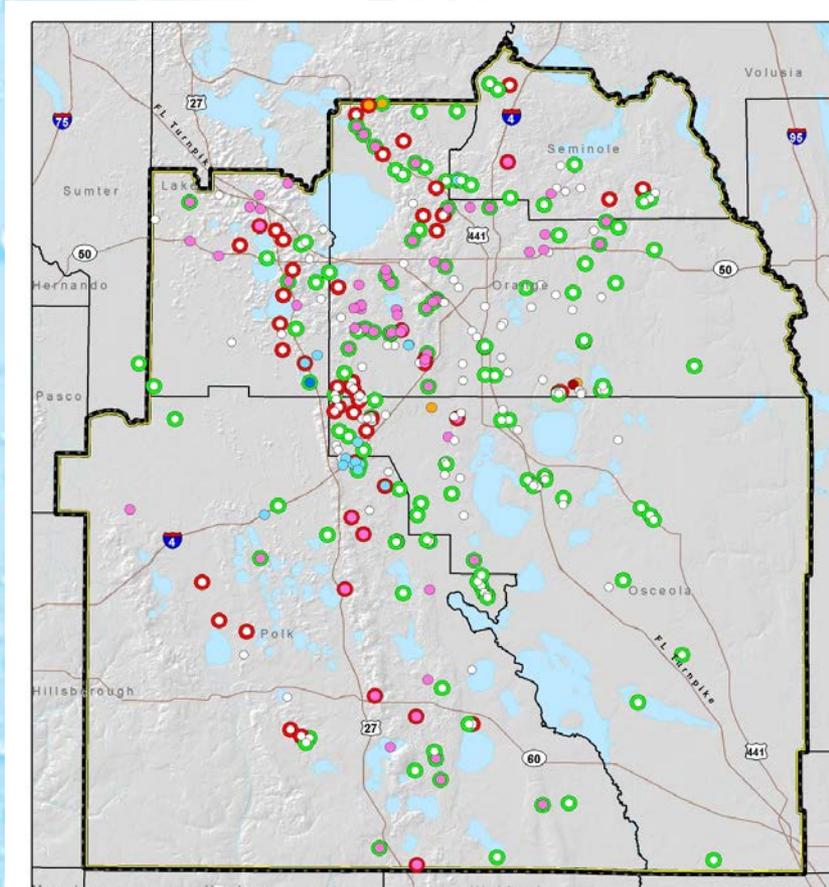


EMT Measuring Stick Example Results

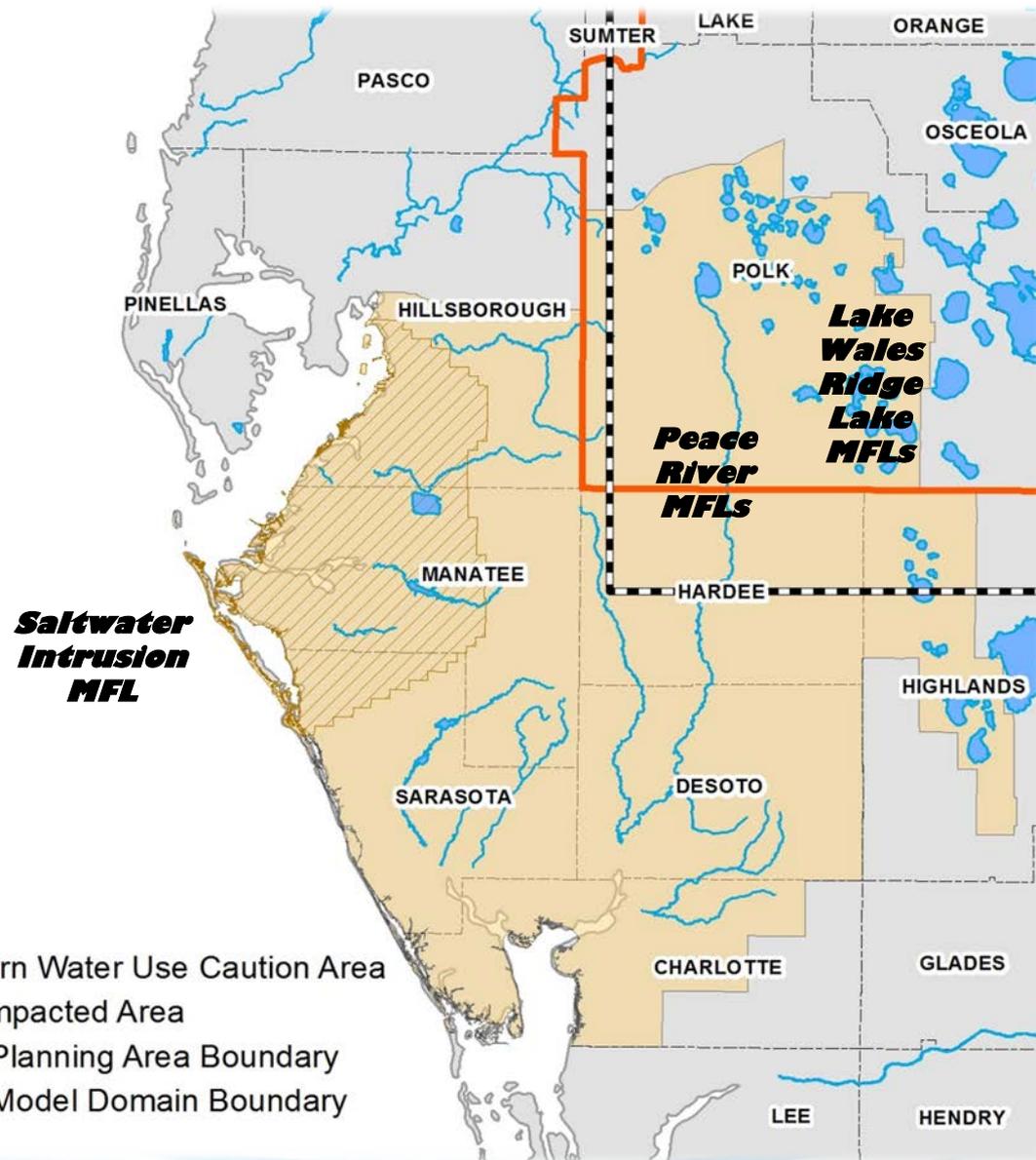
2015 & 2035 Withdrawal Conditions

2015

2035

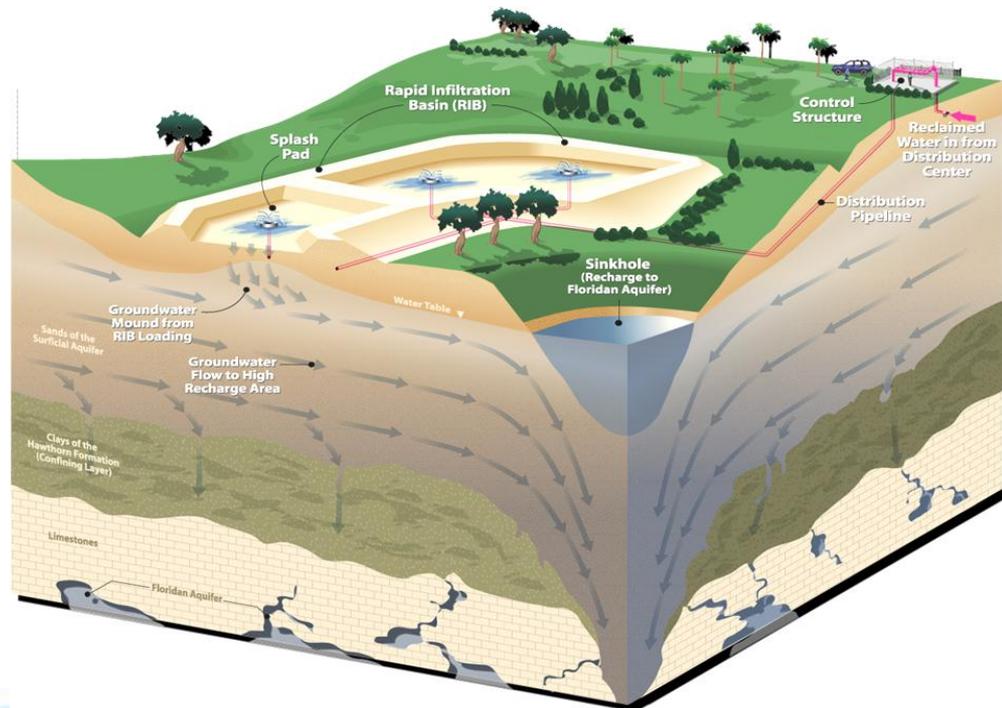


Southern Water Use Caution Area



Potential Source Diversification and Management Activities

- Alternative Water Supply
- Restoration/Mitigation activities
- RIBs for focused recharge
- Well deepening to lessen drawdown impacts
- Wetland hydration
- Regional reclaimed water transmission



Graphic prepared by Parsons Brinkerhoff

Central Florida Water Initiative

Home

Meetings

Regional Water Supply Plan

Minimum Flows and Levels and Water Reservations

Hydrologic Analysis

Environmental Measures

Data, Monitoring and Investigations

Groundwater Availability

CFWI Resources

CFCA Resources

Contacts

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Overview of the Central Florida Water Initiative

Florida's water management districts are committed to finding new ways of meeting the demand for freshwater. Historically, the Floridan aquifer system has supplied the vast majority of the water used in the central Florida area. The boundaries of three water management districts — the St. Johns River Water Management District, South Florida Water Management District and Southwest Florida Water Management District — meet in the area. The three districts are studying whether the Floridan aquifer system is reaching its sustainable limits, of use and exploring the need to develop supplemental sources of water.

In the past, the three districts worked independently to resolve water resource issues, but the decisions of one district can impact the water resources of another. Today, the districts are working collaboratively with other agencies and stakeholders to implement effective and consistent water resource planning, development and management through the Central Florida Water Initiative (CFWI).

The CFWI builds on the prior work of the Central Florida Coordination Area (CFCA). Both efforts focus on an area that includes southern Lake, Orange, Osceola, Seminole and Polk counties. The three water management districts, along with the Florida Department of Environmental Protection (DEP), Florida Department of Agriculture and Consumer Services (FDACS), regional public water supply utilities and other stakeholders are collaborating to develop a unified process to address central Florida's current and long-term water supply needs.



Click for more detailed map, including public water supply utility service areas.



The Central Florida Parks assess central Florida's theme park region and communities.

Guiding principles

The guiding principles of the CFWI are:

- Identify the sustainable quantities of traditional groundwater sources available for water supplies that can be used without causing unacceptable harm to the water resources and associated natural systems.
- Develop strategies to meet water demands that are in excess of the sustainable yield of existing traditional groundwater sources.
- Establish consistent rules and regulations for the three water management districts that meet their collective goals, and implement the results of the Central Florida Water Initiative.

Questions?

Additional information
can be found at
cfwiwater.com

Public Comment



Central Florida Water Initiative



Central Florida Water Initiative

