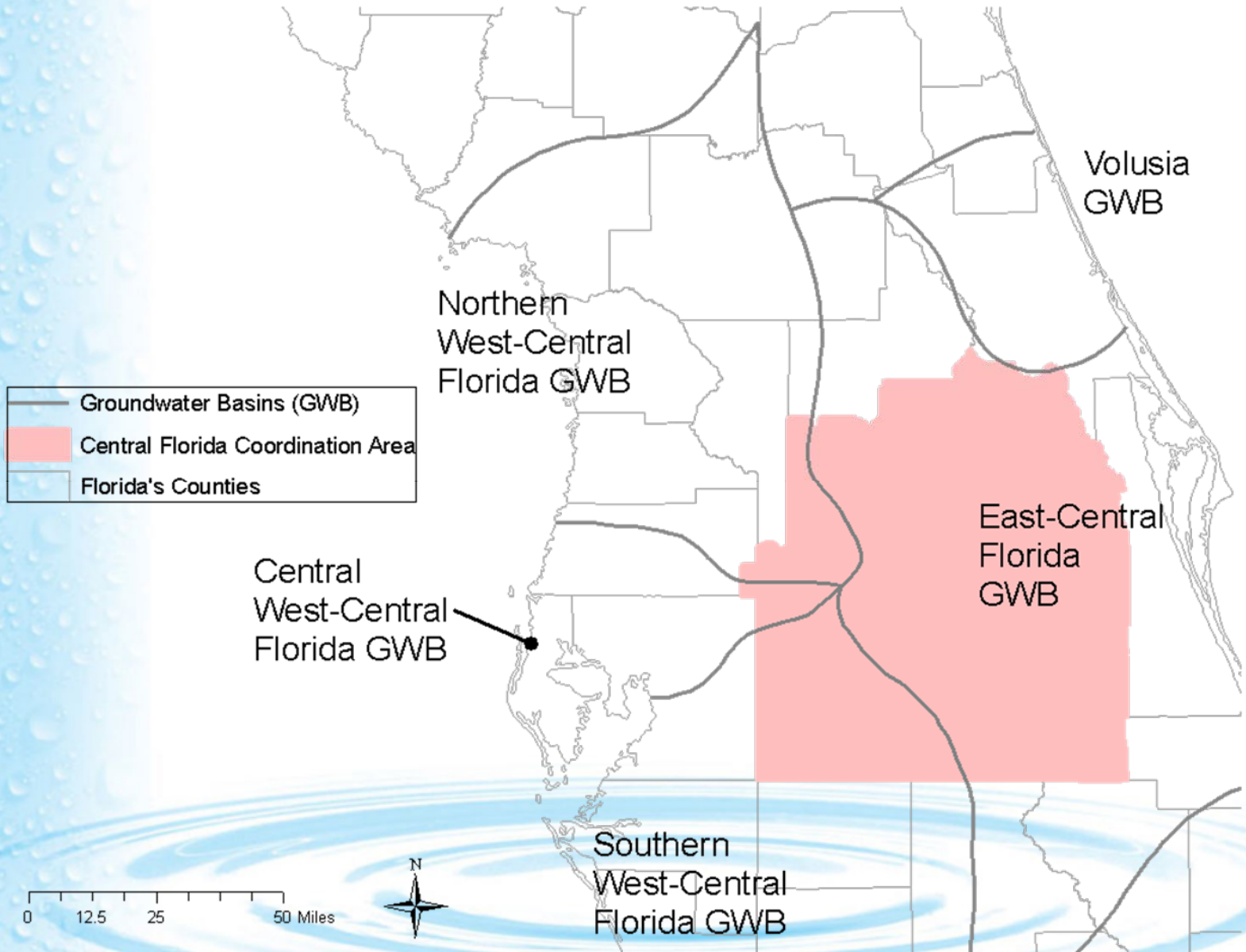


# DWRM2 - CFCA

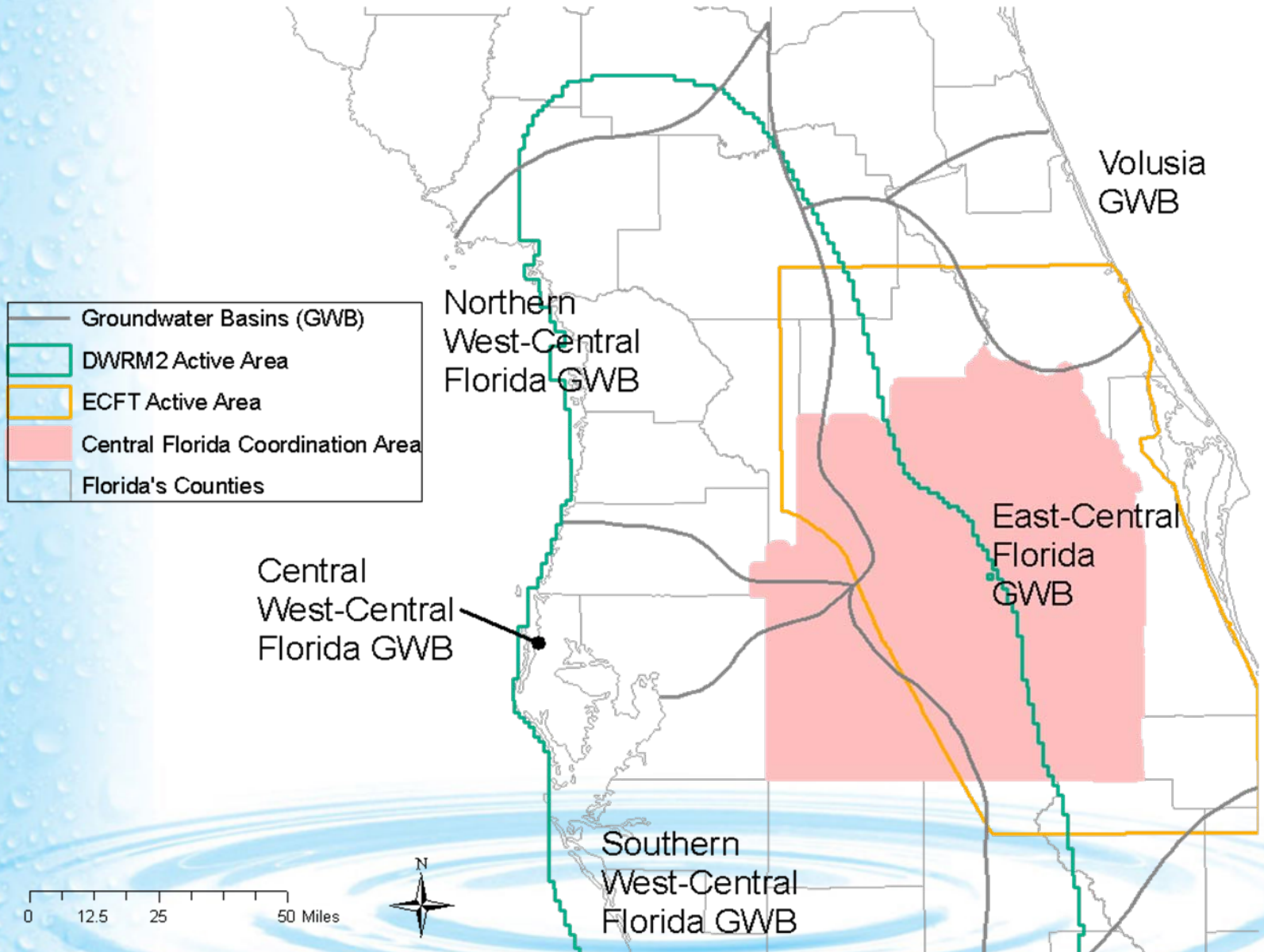
Central Florida Coordination Area  
Tools Development Team Workshop  
July 29, 2010

*Presented by Mark Barcelo, P.E.; Program Director  
Southwest Florida Water Management District*

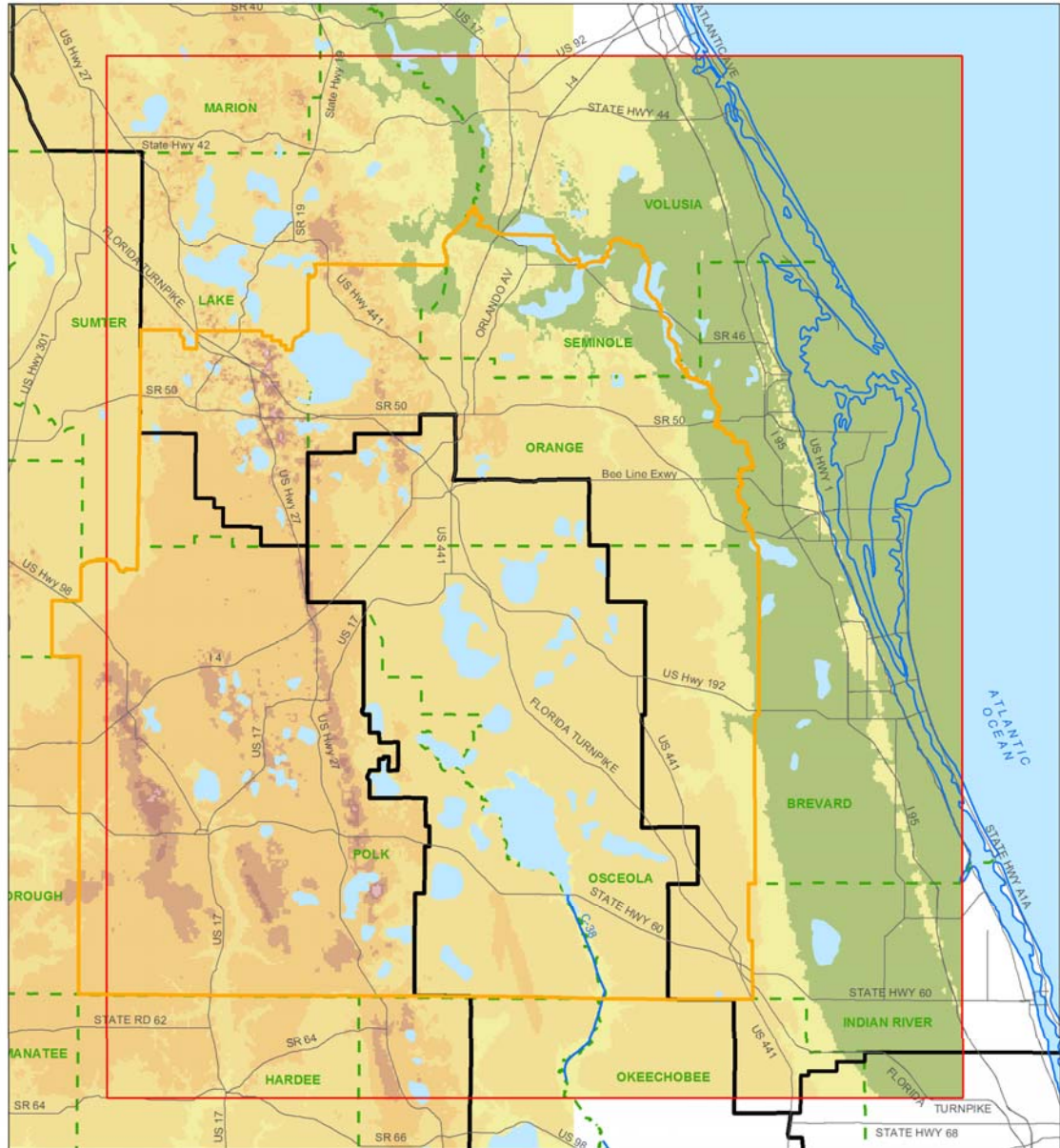
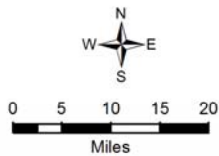
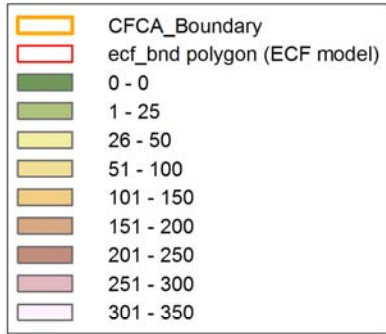
# Groundwater Basins



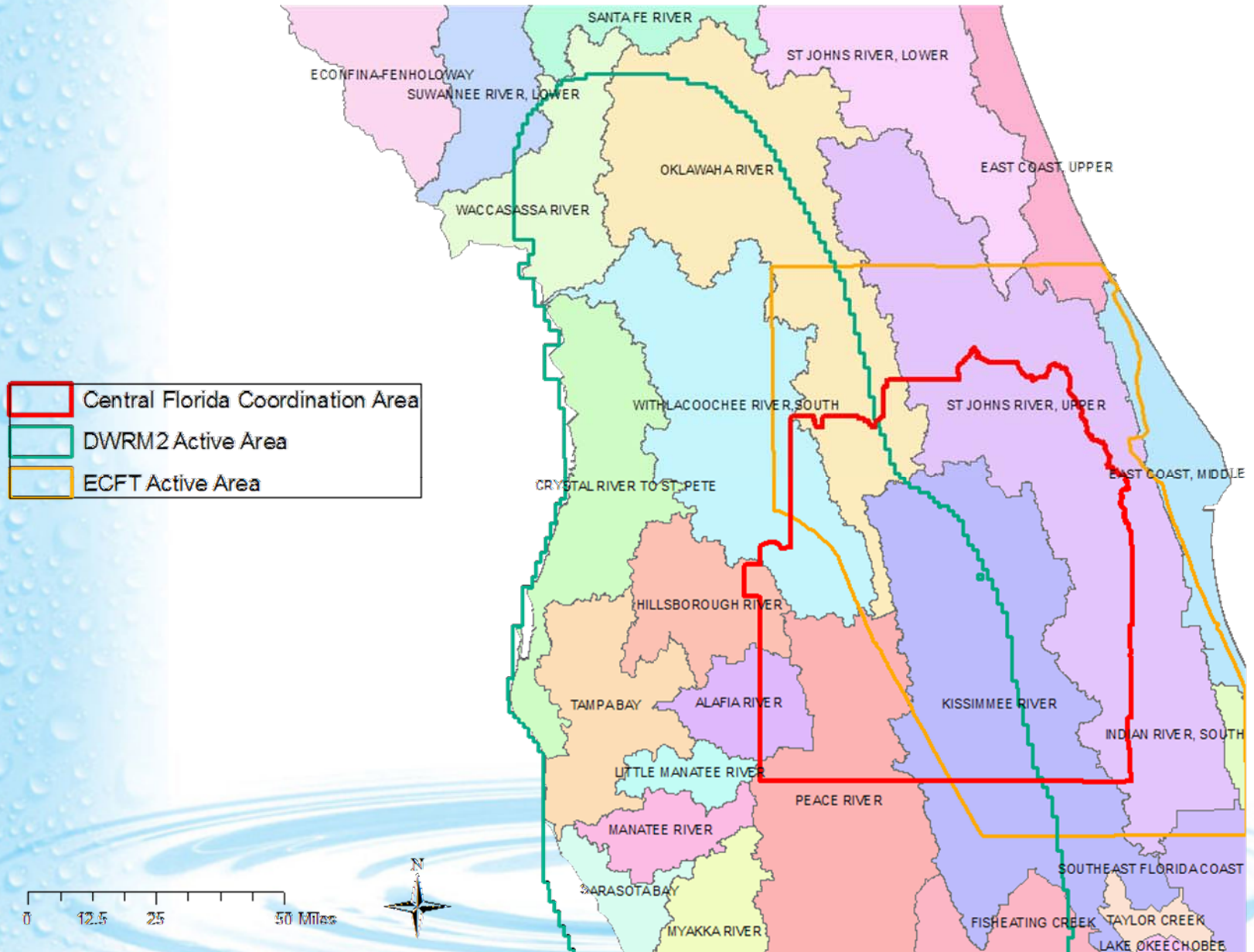
# Groundwater Basins



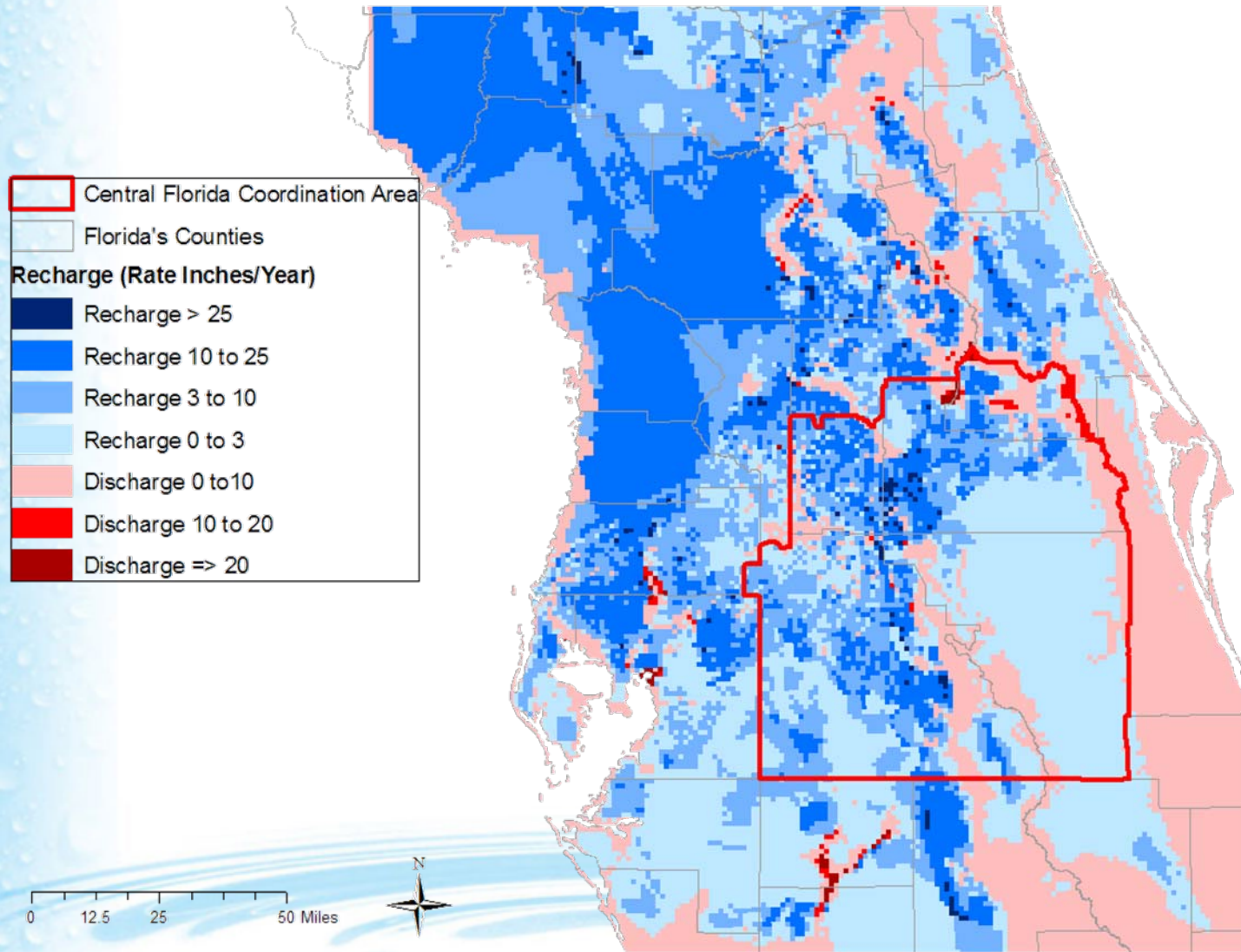
# Topography



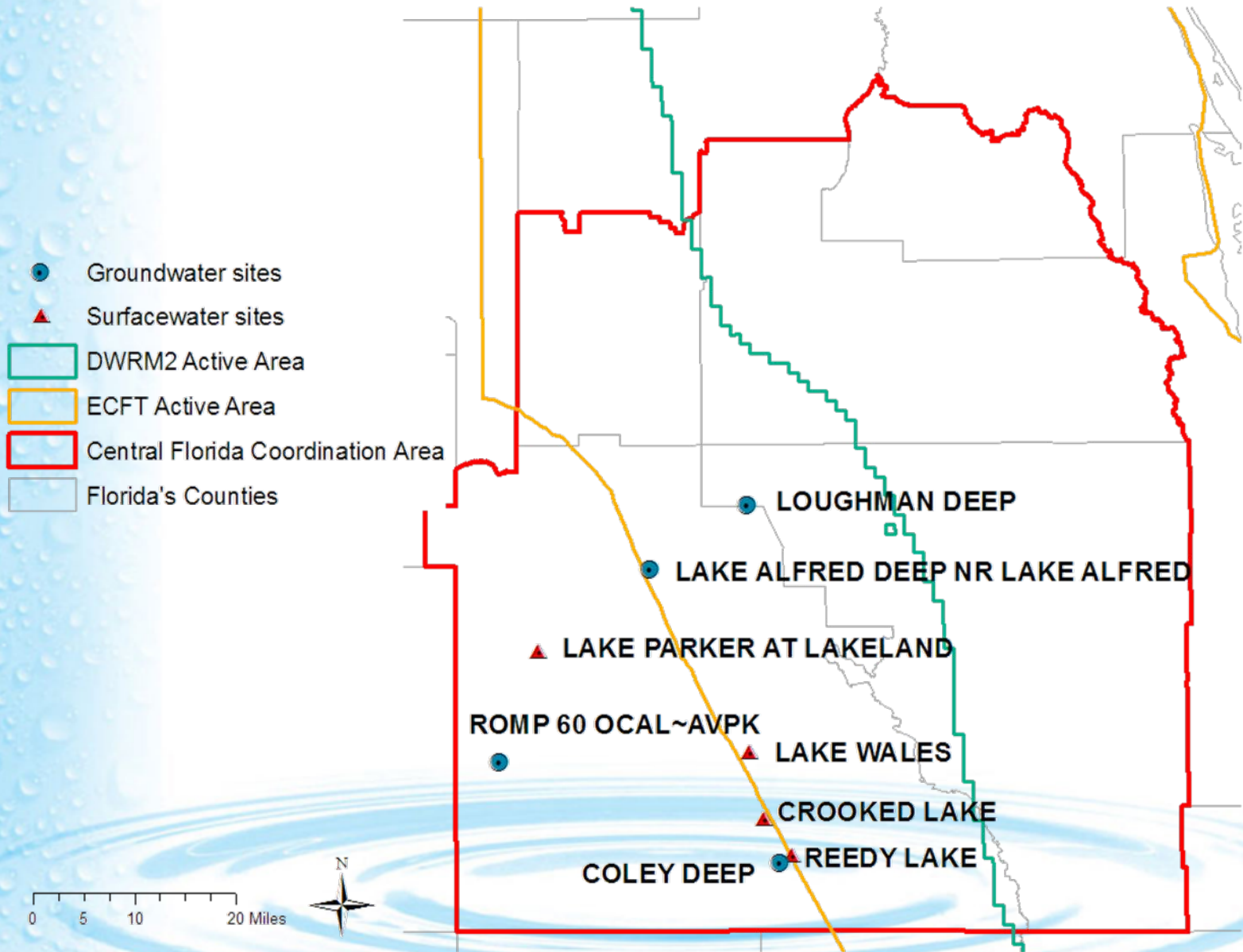
# Surface Water Basins



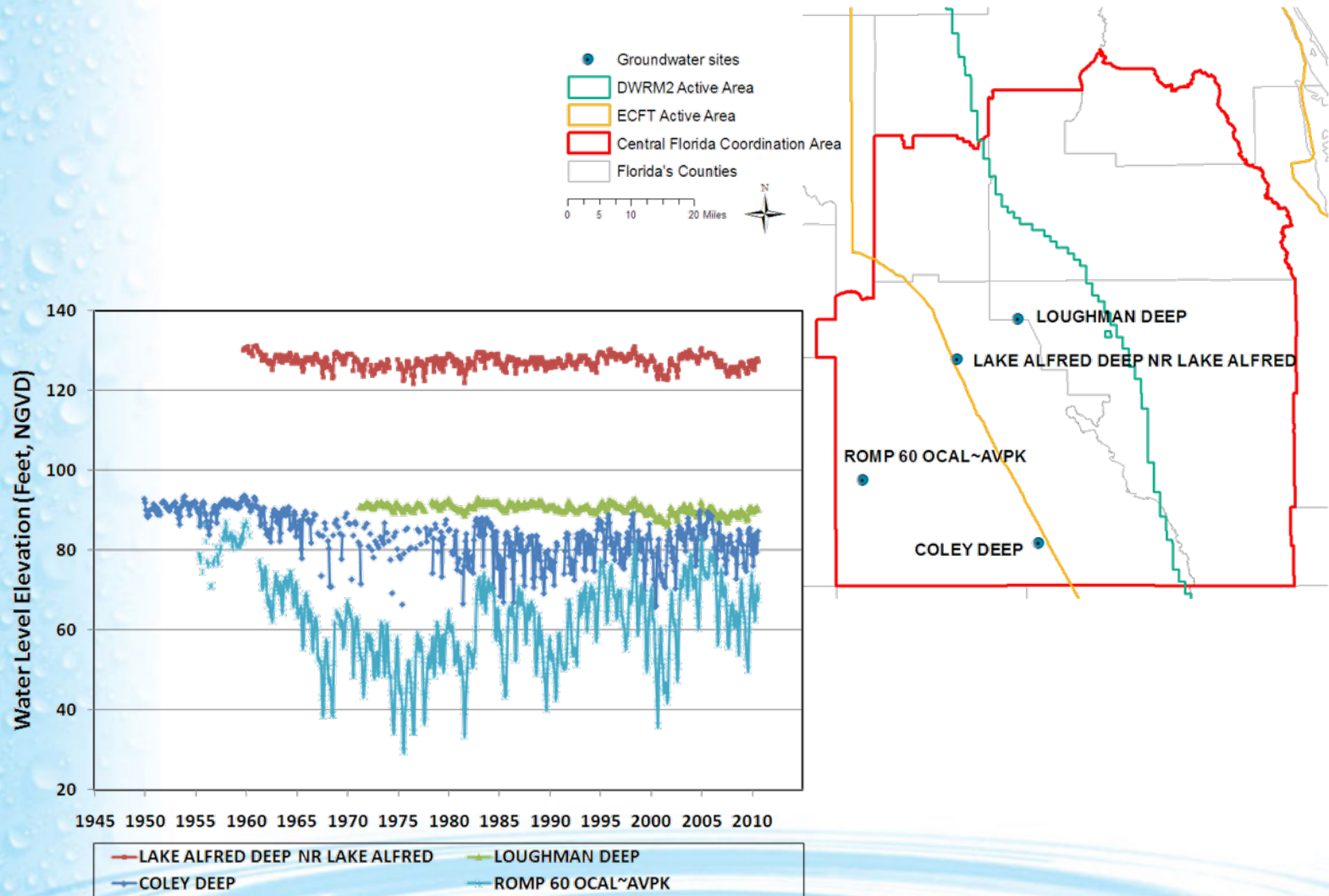
# Recharge To Upper Floridan Aquifer



# Water Level Monitor Locations

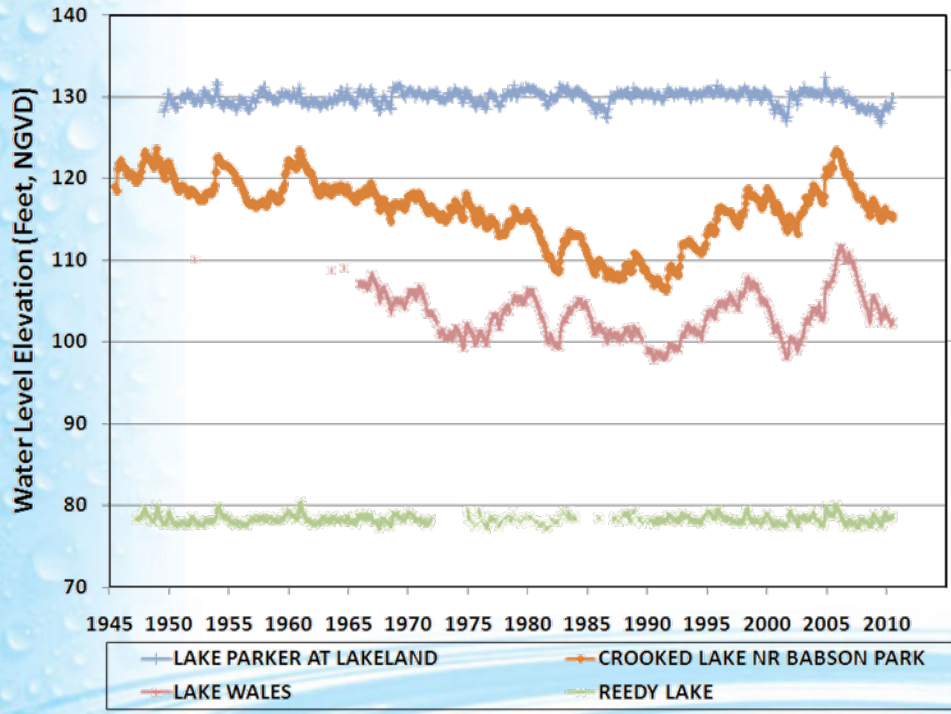
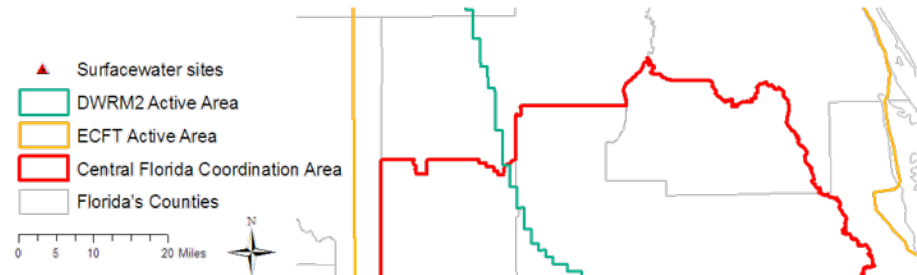


# Groundwater Level History





# Surface Water Level History



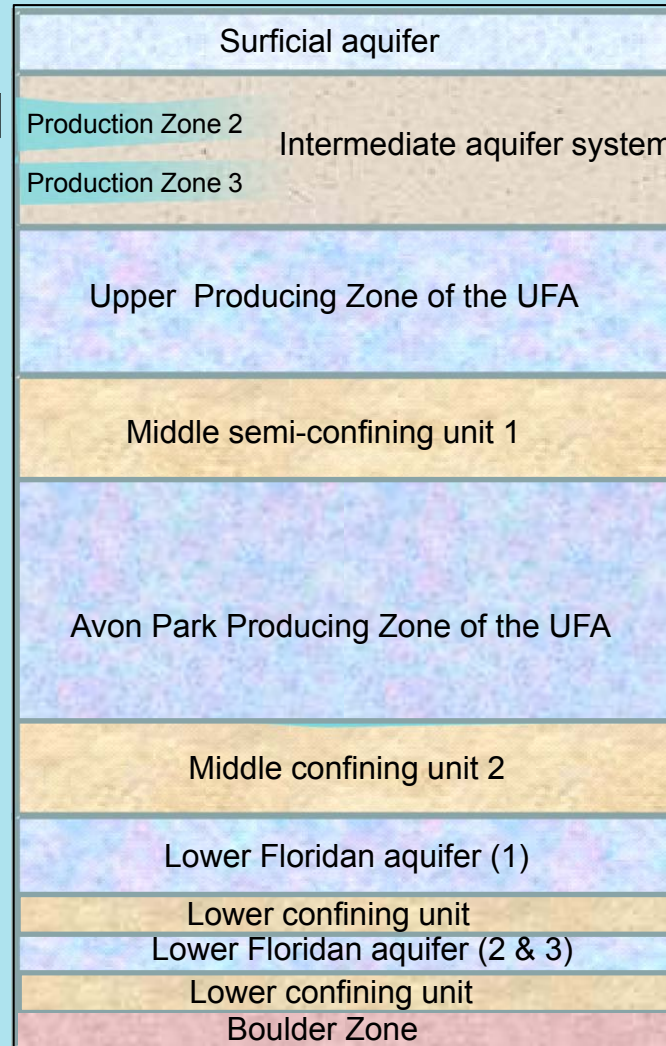
# District-wide Regulation Model Version 2/CFCA

- Regional model of the SWFWMD
  - Based on USGS Mega Model
  - 10 mile buffer
  - 5,000 ft by 5,000 ft grid spacing
- 5 layers
- Focus telescopic mesh refinement option
- Active surficial aquifer
- Steady-state and transient calibrations
- Peer Review

# Hydrogeology and Conceptualization DWRM2 – CFCA and ECFT

## DWRM2 - CFCA

L 1
L 2
L 3
L 4
L 5



## ECFT

L 1
L 2
L 3
L 4
L 5

# CENTRAL FLORIDA COORDINATION AREA

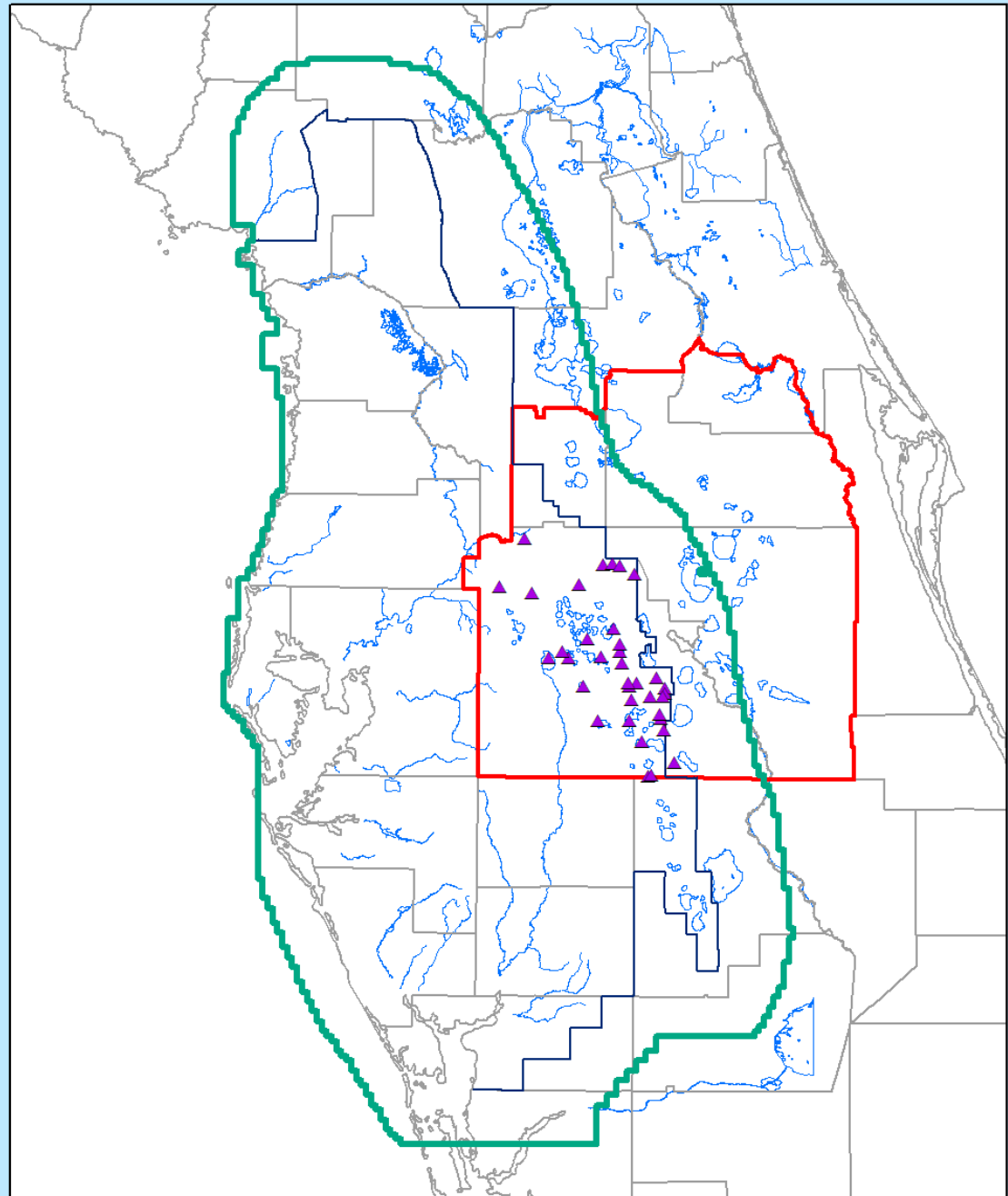
## DWRM CFCA Model

### DWRM Active Area

- ▲ CFCA Environmental Sites
- ▭ CFCA Boundary
- ▭ DWRM Active Area



0 10 20 40 Miles



# CENTRAL FLORIDA COORDINATION AREA

## DWRM CFCA Model

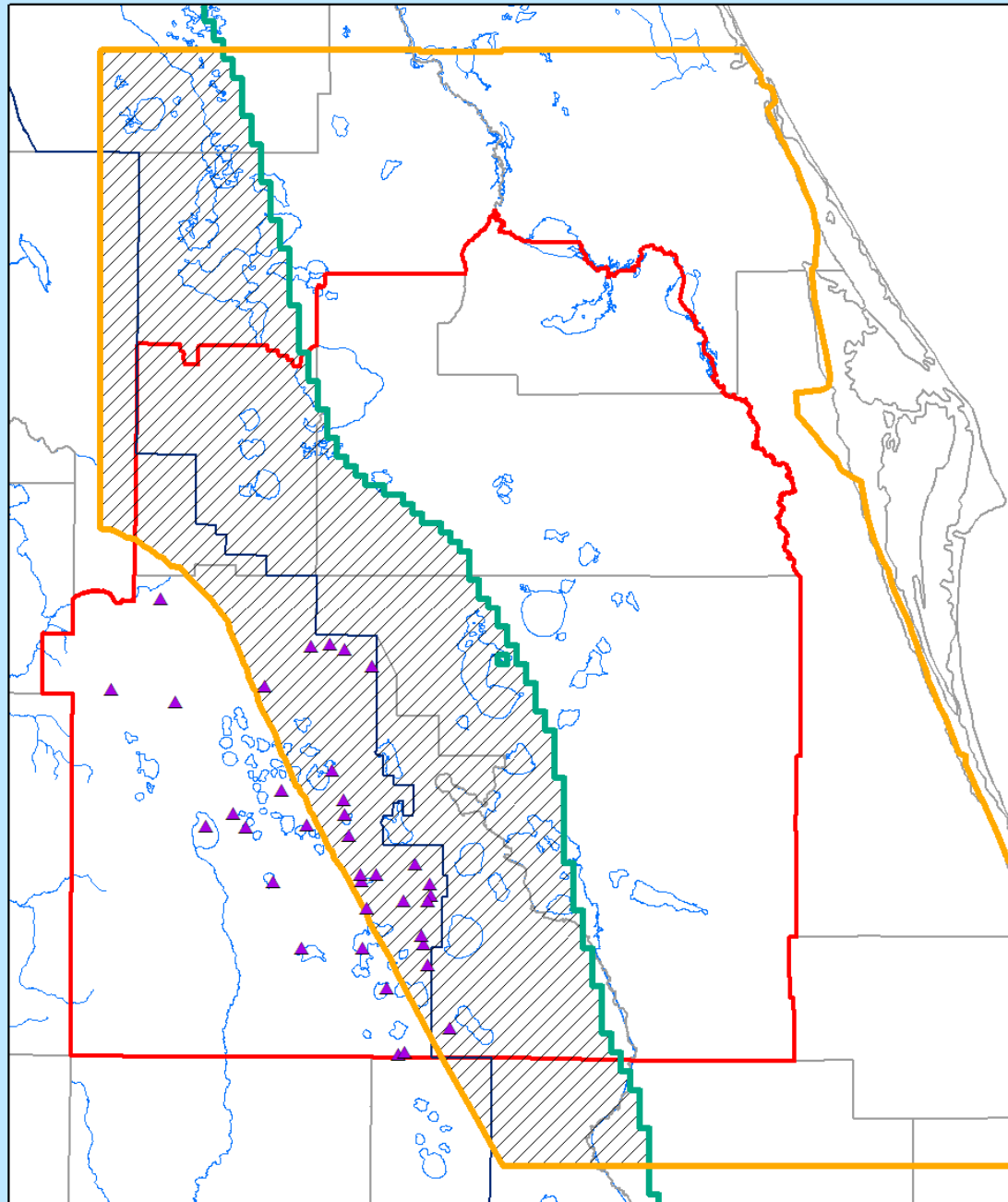
### DWRM and ECFT Area of Overlap

- ▲ CFCFA Environmental Sites
- ▭ CFCFA Boundary
- ▭ ECFT Active Area
- ▭ DWRM Active Area
- ▨ Model Overlap



0 5 10 20  
Miles

Southwest Florida  
Water Management District



# CENTRAL FLORIDA COORDINATION AREA

## DWRM CFCA Model

### Rivers and Lakes (Layer-1) Boundary Conditions

▲ CFCA Environmental Sites

□ CFCA Boundary

■ Lakes

#### River / Stream Hierarchy

■ 1

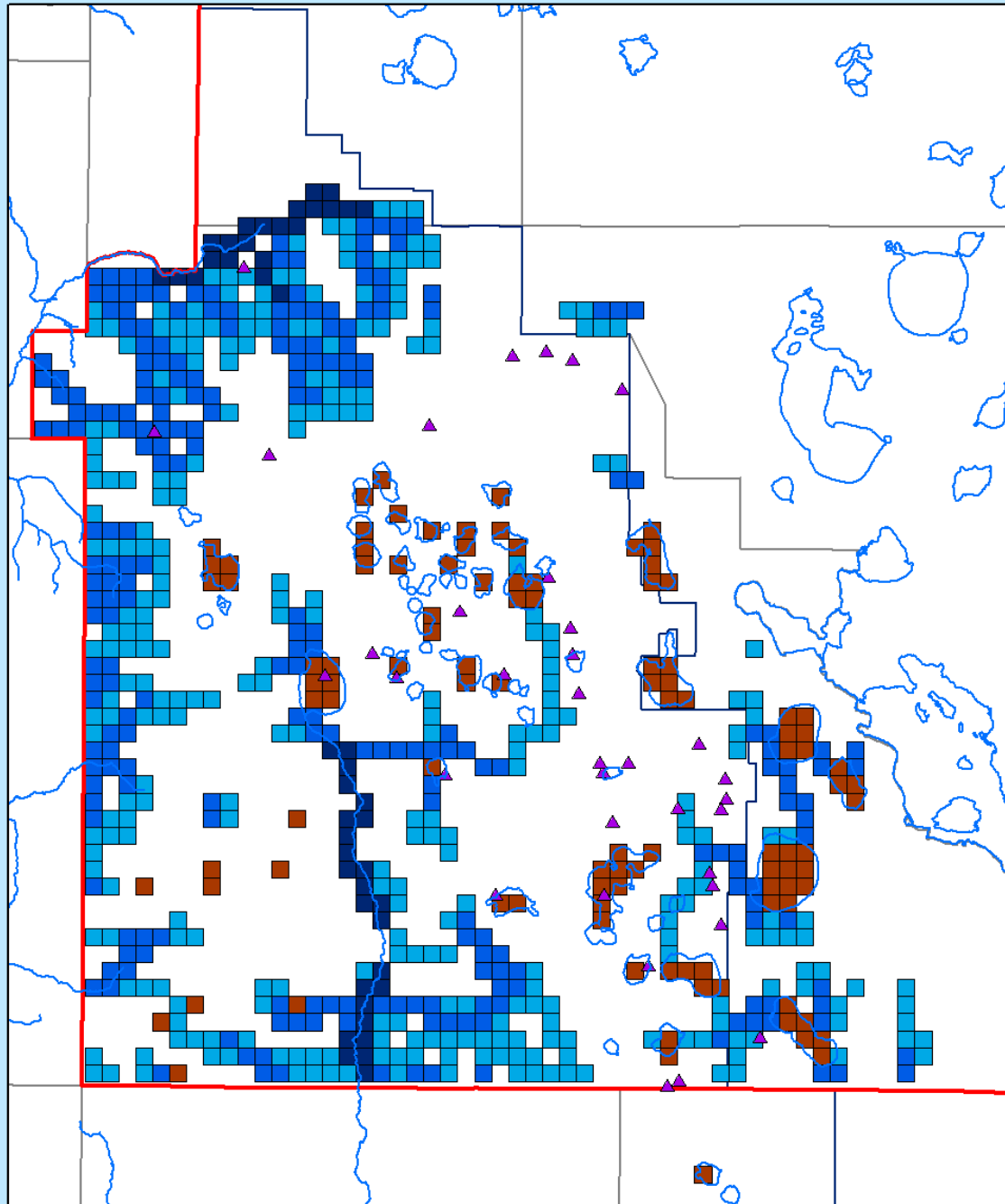
■ 2

■ 3



0 5 10 20 Miles





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Water Management District



# CENTRAL FLORIDA COORDINATION AREA

## DWRM CFCA Model

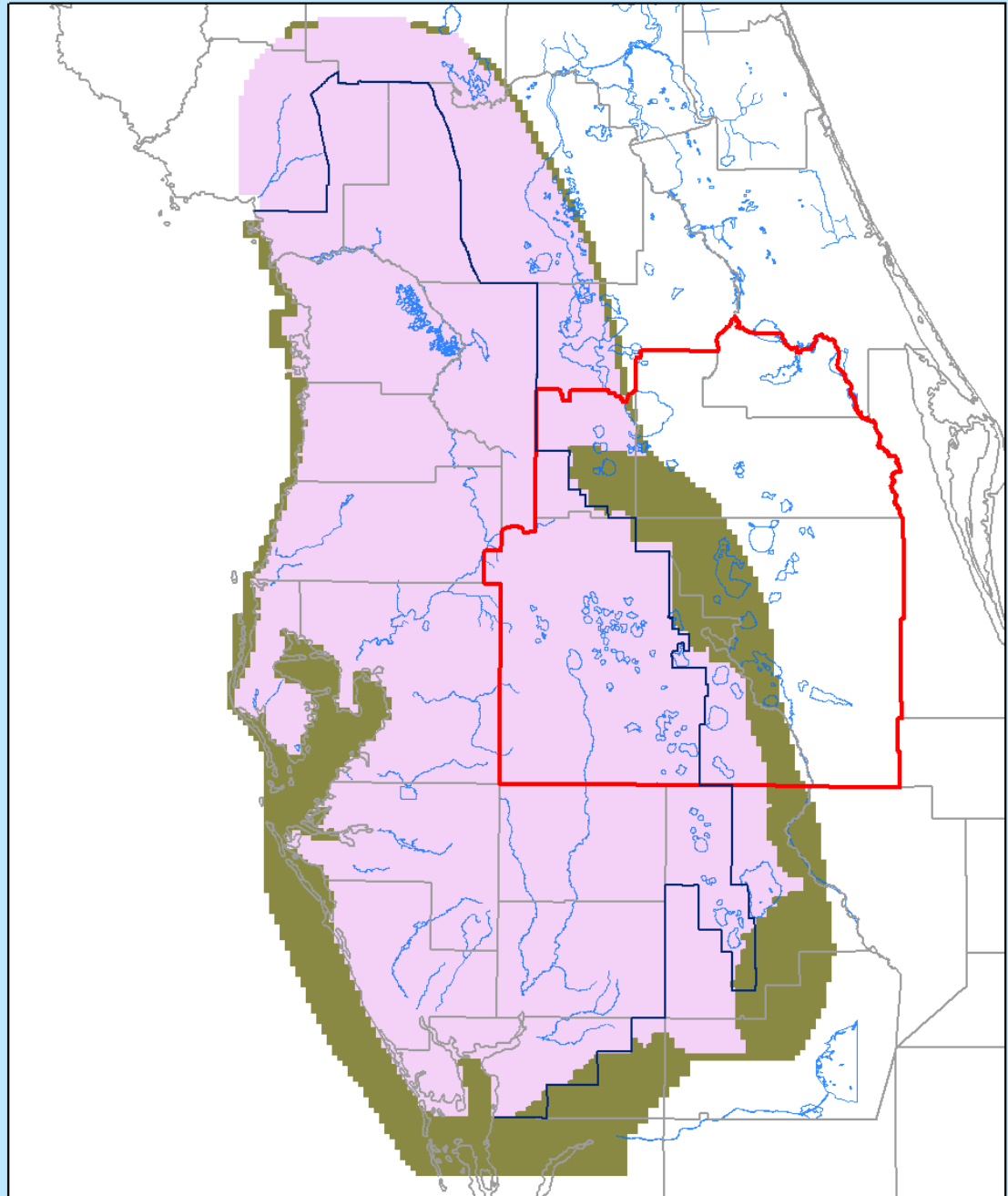
### Surficial Aquifer (Layer-1) Boundary Conditions

-  CFCA Boundary
-  Drain
-  Constant Head
-  Area of Recharge






0 10 20 40  
Miles

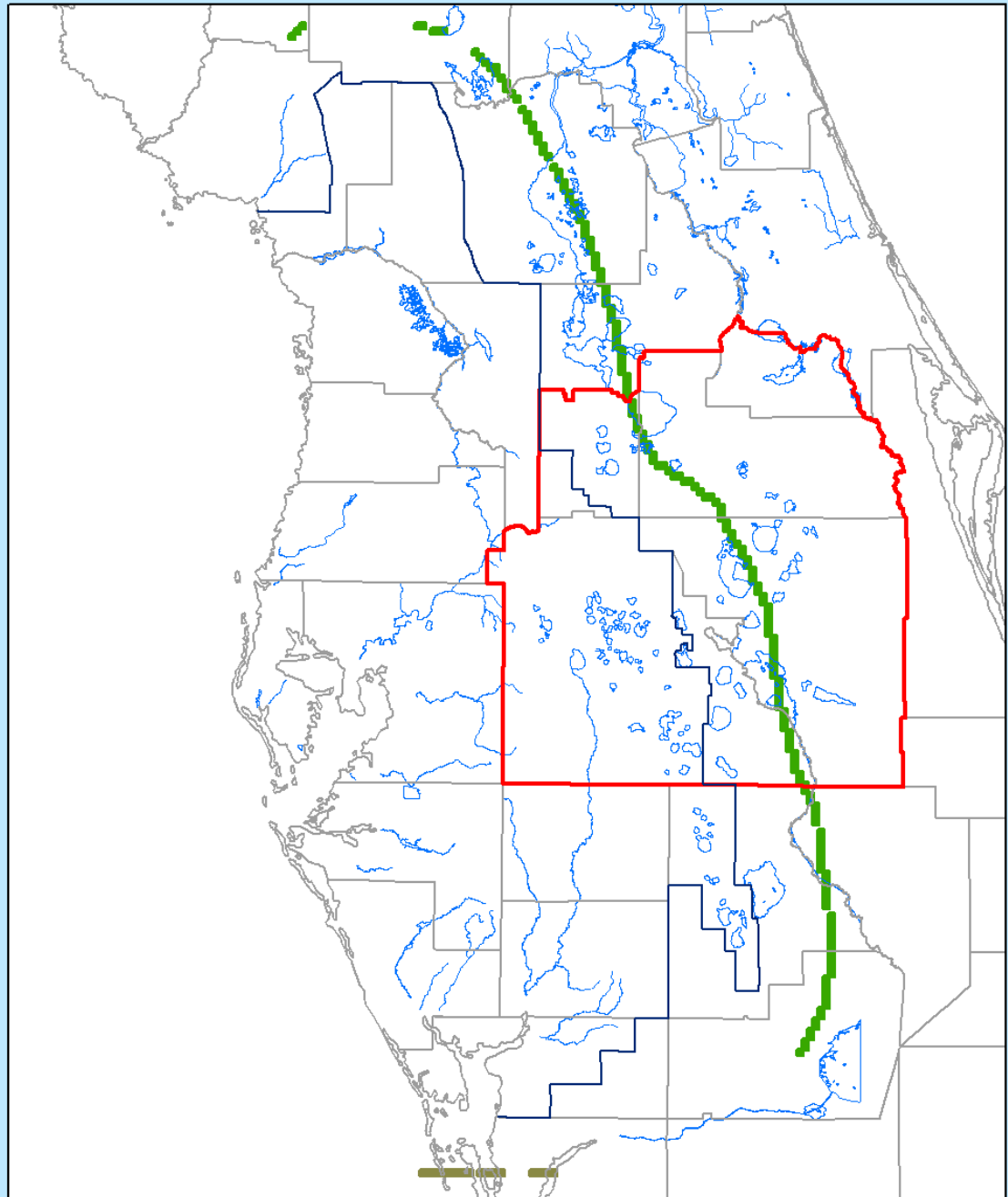
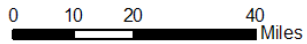
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Water Management District



DWRM CFCA Model

Intermediate Aquifer  
(Layer- 2 and 3)  
Boundary Conditions





-  CFCA Boundary
-  Constant Head
-  General Head Boundary





DWRM CFCA Model

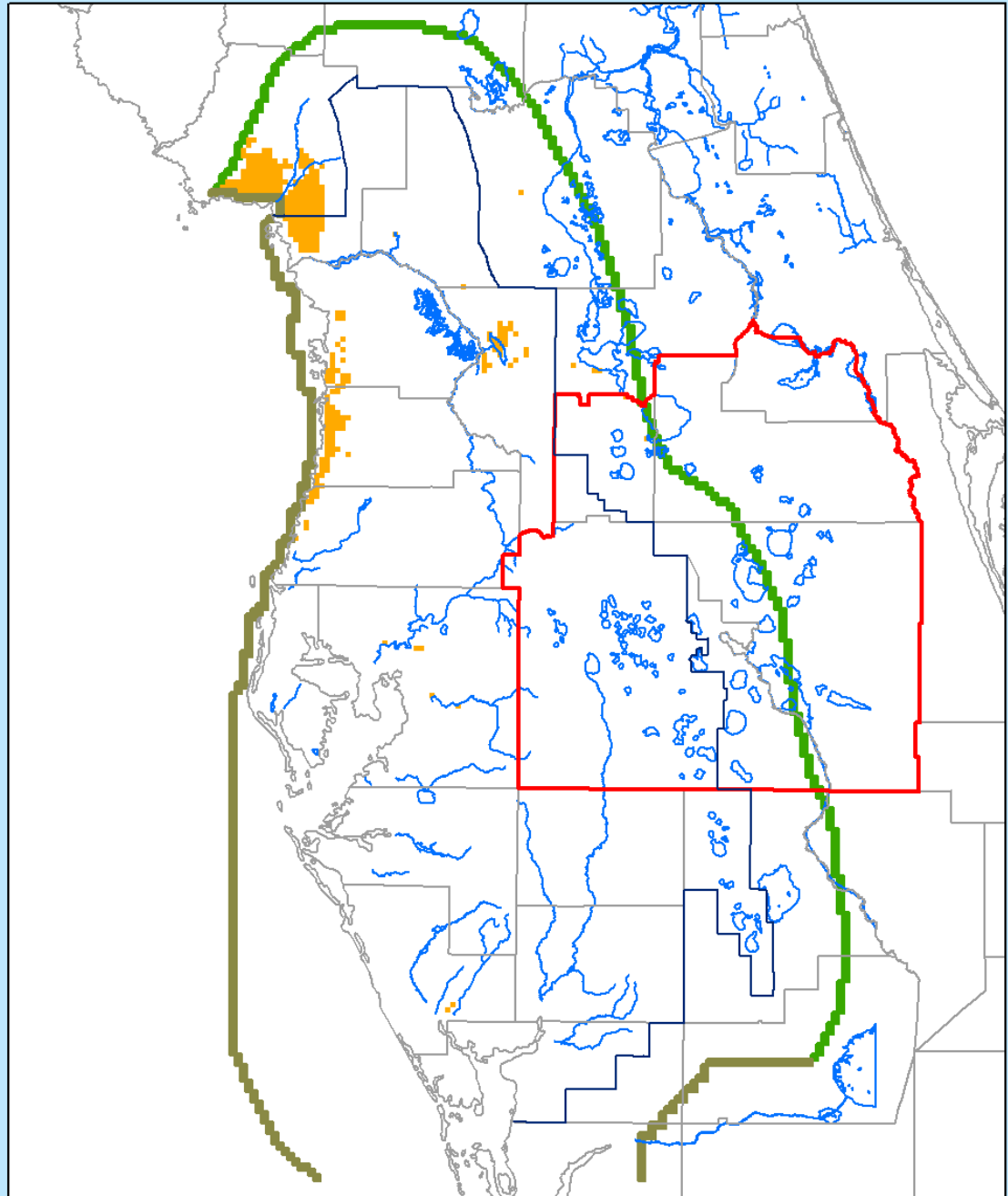
Upper Floridan Aquifer  
(Layer- 4)  
Boundary Conditions

-  CFCA Boundary
-  Constant Head
-  Drain
-  General Head Boundary







0 10 20 40 Miles

Southwest Florida  
Water Management District



DWRM CFCA Model

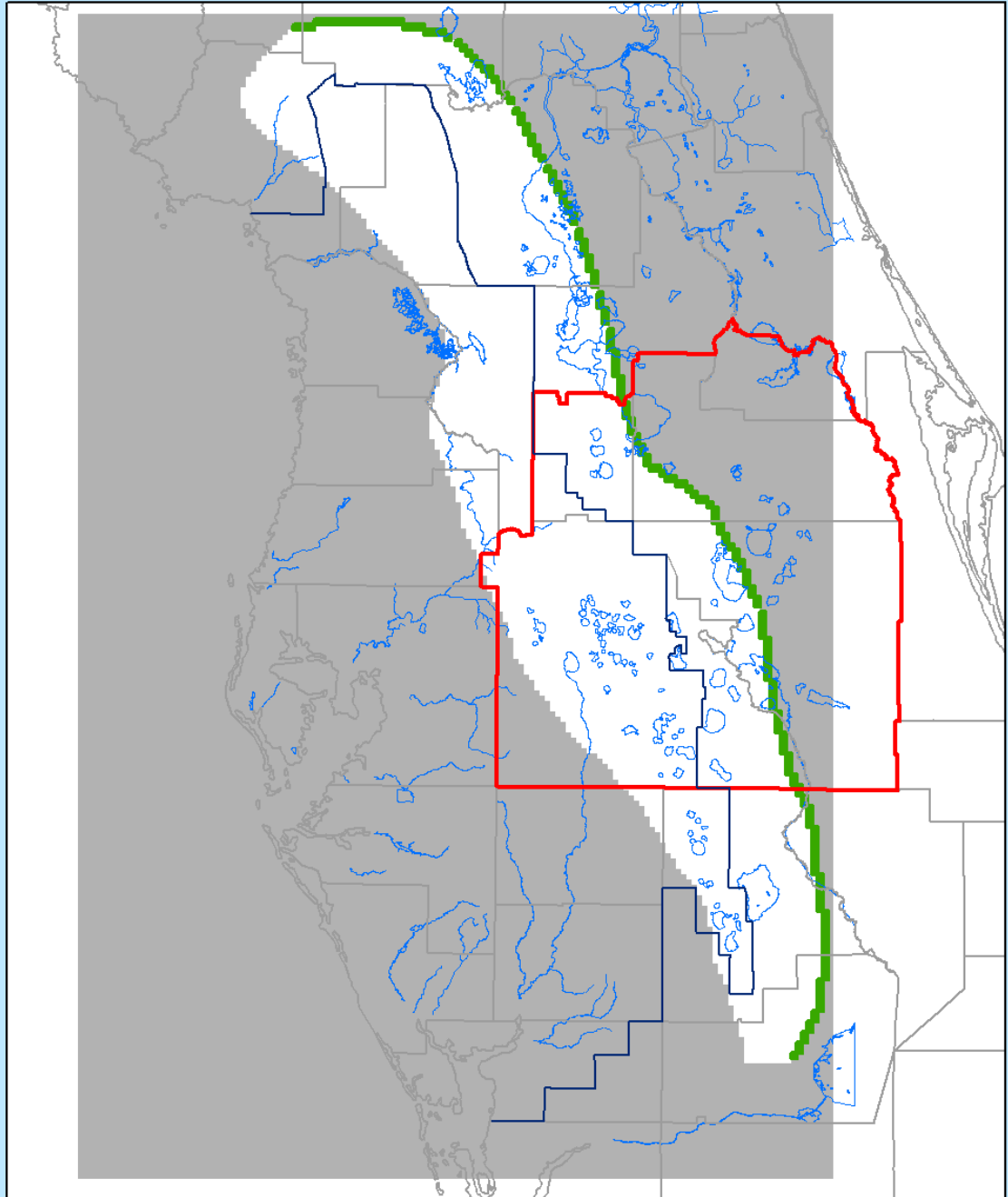
Lower Floridan Aquifer  
(Layer- 5)  
Boundary Conditions

-  CFCA Boundary
-  General Head Boundary
-  Constant Head
-  No Flow/ Inactive



0 10 20 40 Miles

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# 2006 Estimated Groundwater Withdrawals



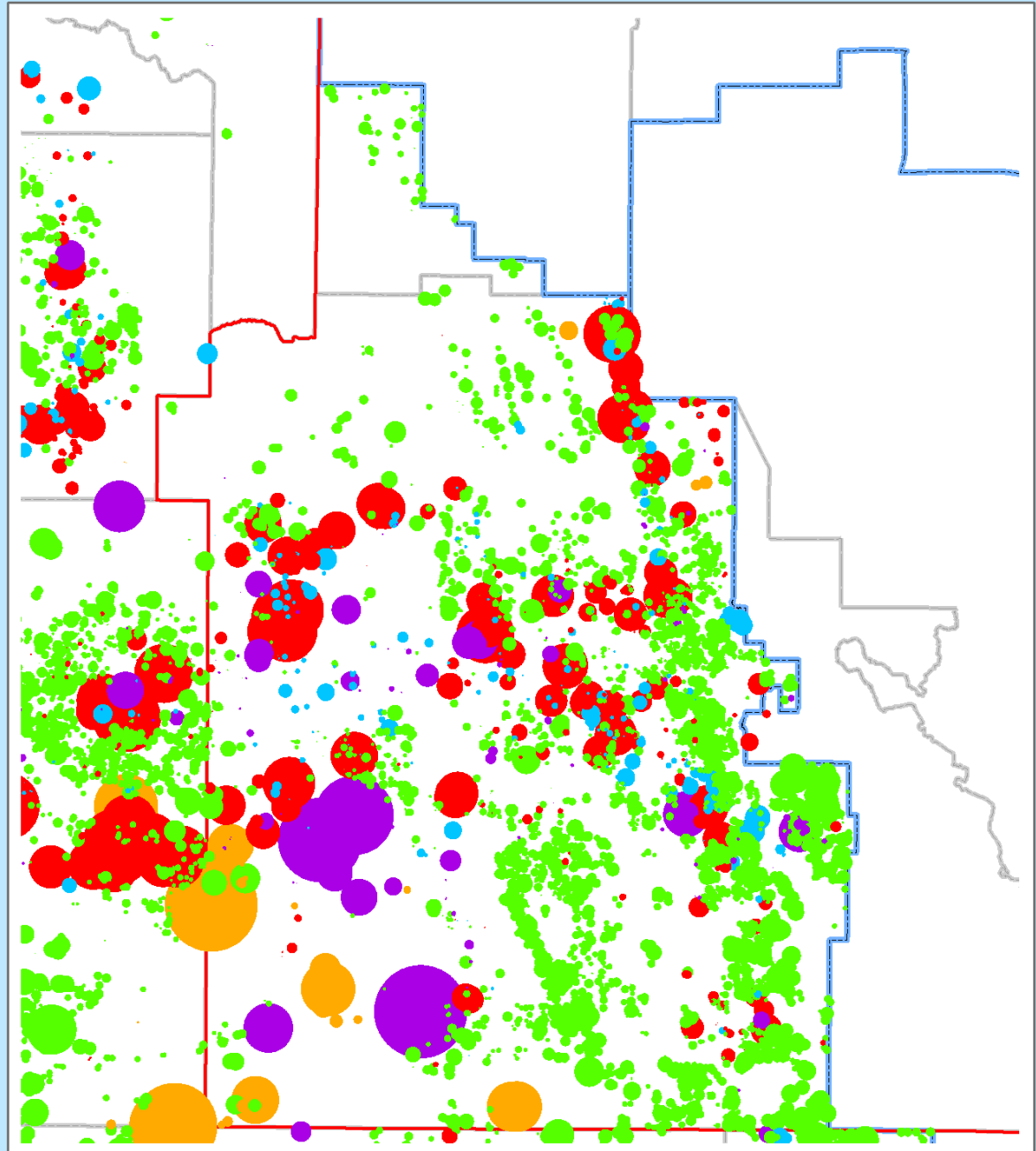
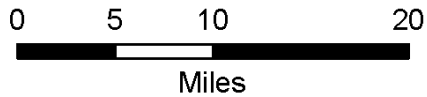
 CFCFA Boundary

## Water Use Type

-  Agricultural
-  Industrial/Commercial
-  Mining/Dewatering
-  Public Supply
-  Recreational

## Dot Size Indicates Pumping Rate

-  0.1 MGD
-  1 MGD
-  5 MGD



**DWRM CFCA Model**

**Estimated Water Use for  
Polk County in SWFWMD**

**EXPLANATION**

**AG - Agriculture**

**PS - Public Supply**

**MD - Mining/Dewatering**

**IC - Industrial/Commercial**

**RA - Recreation/Aesthetics**

**DSS - Domestic Self Supply**

NA = Not Available

Units are in million gallons  
per day (Mgd)

Source: SWFWMD estimated  
Water Use Report 1995 and  
2006



<b>USE</b>	<b>AG</b>	<b>PS</b>	<b>MD</b>	<b>IC</b>	<b>RA</b>	<b>DSS</b>	<b>TOTALS</b>
<b>1995</b>	89.4	56.1	28.8	38.5	7.7	NA	220.5
<b>2006</b>	94.2	79.2	20.2	39.7	9.1	0.5	242.9
<b>CHANGE</b>	4.8	23.1	-8.6	1.2	1.4	-	22.4

# CENTRAL FLORIDA COORDINATION AREA

## DWRM CFCA Model

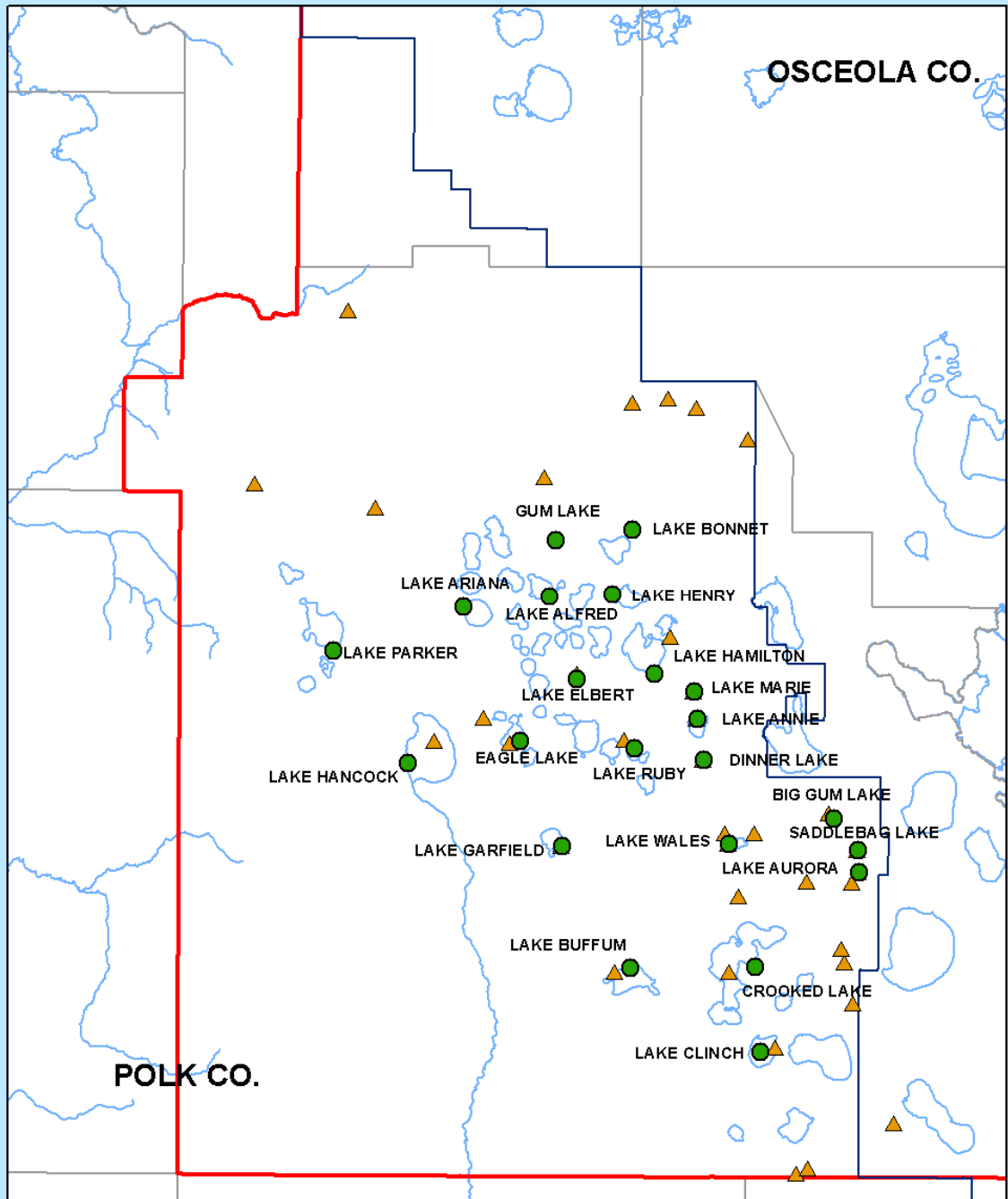
### Surficial Aquifer (Layer-1) Lake Locations

- Calibration Lakes
- ▲ CFCA Environmental Sites
- CFCA Boundary



0 4.5 9 18 Miles

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# CENTRAL FLORIDA COORDINATION AREA

## DWRM CFCA Model

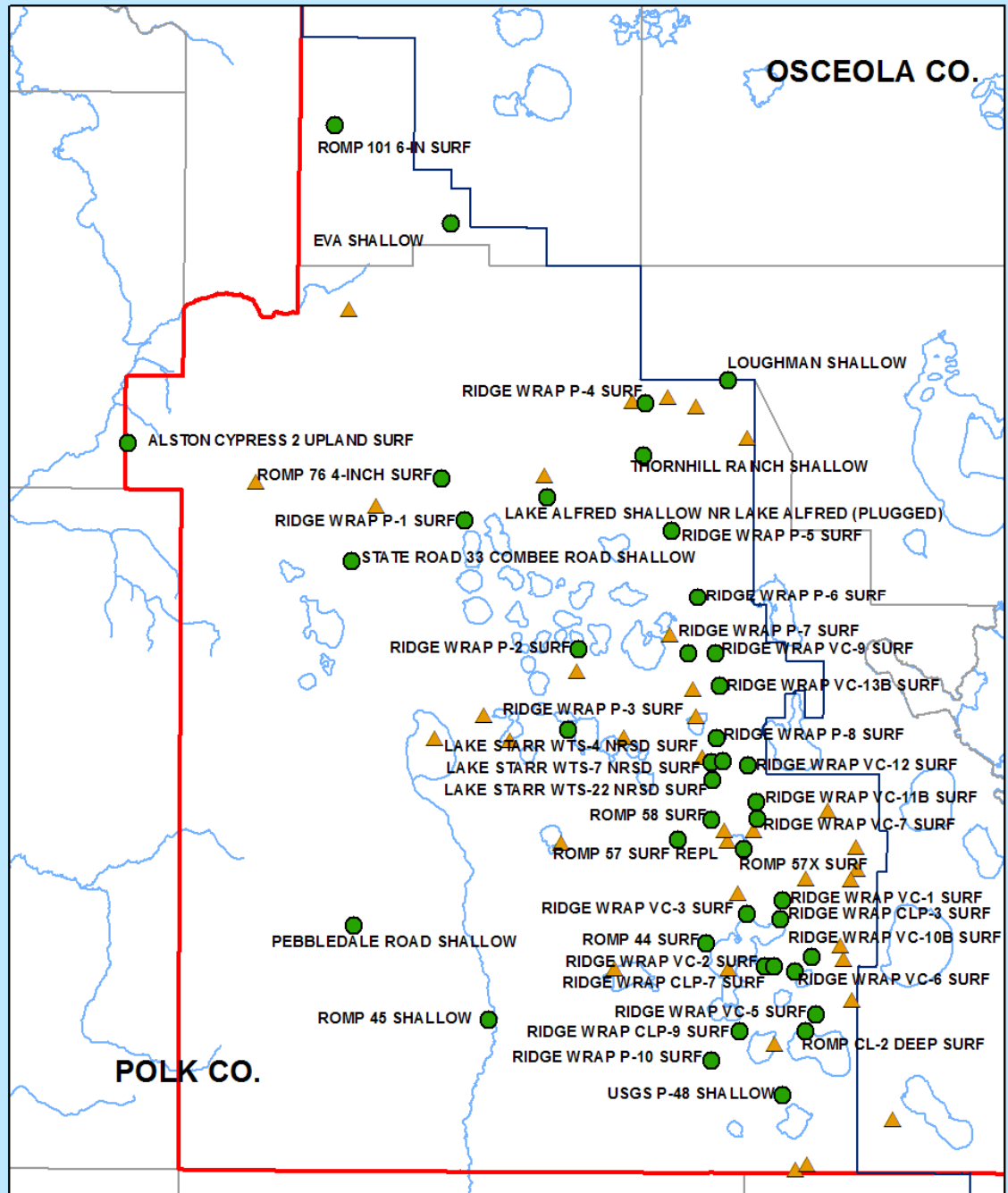
### Surficial Aquifer (Layer-1) Well Locations

- Calibration Wells
- ▲ CFCA Environmental Sites
- CFCA Boundary



0 4.5 9 18 Miles

Southwest Florida  
Water Management District

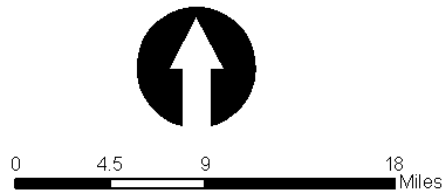


# CENTRAL FLORIDA COORDINATION AREA

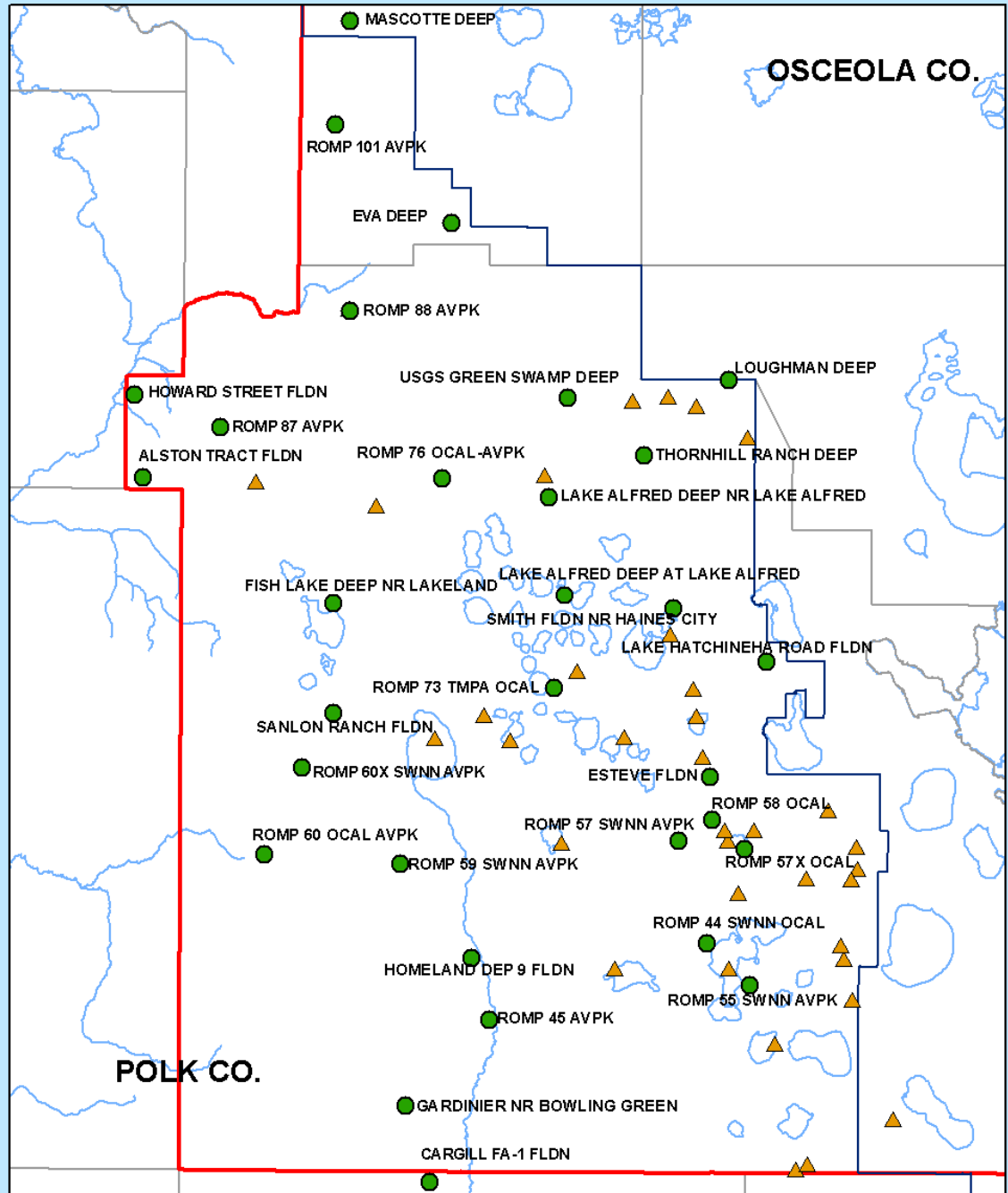
## DWRM CFCA Model

### Upper Floridan Aquifer (Layer-4) Well Locations

- Calibration Wells
- ▲ CFCA Environmental Sites
- CFCA Boundary



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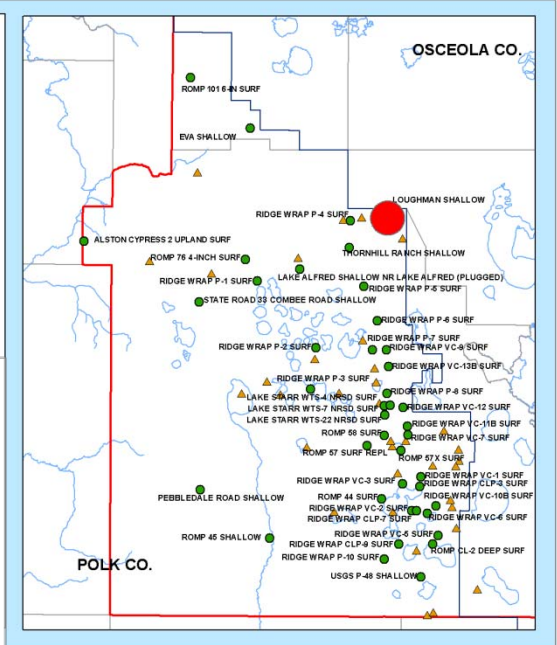


# CENTRAL FLORIDA COORDINATION AREA

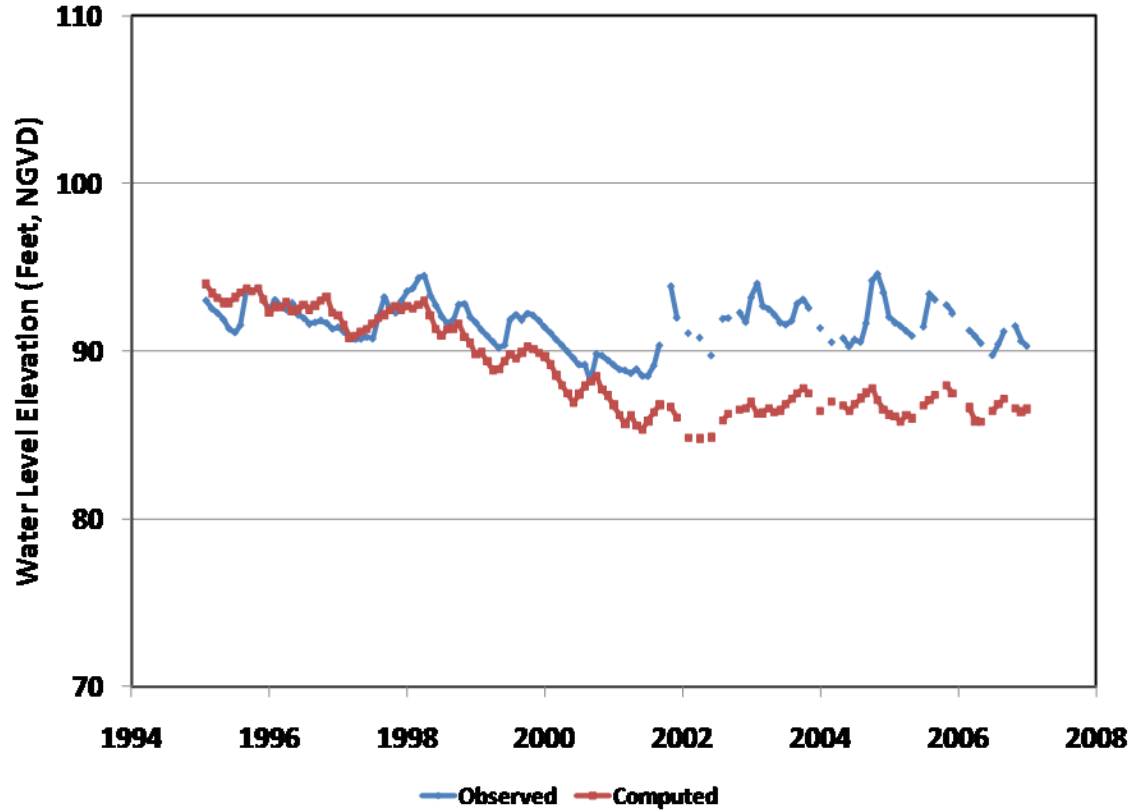
DWRM CFCA Model

Surficial Aquifer  
(Layer-1)  
Well Locations

- Calibration Wells
- ▲ CFCA Environmental Sites
- CFCA Boundary



## LOUGHMAN SHALLOW



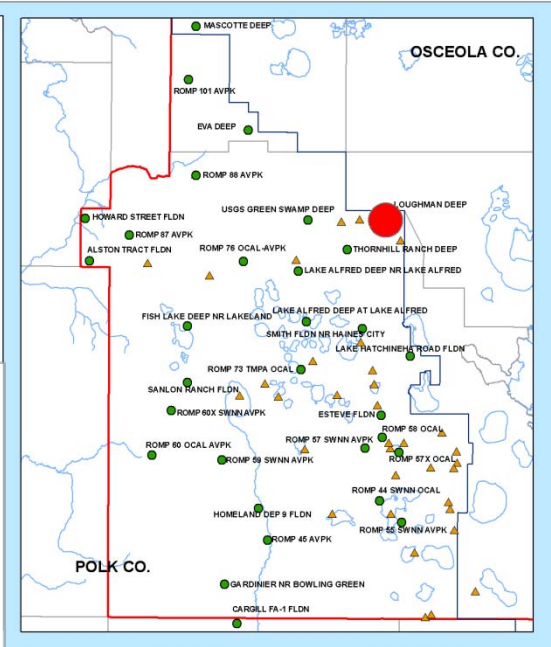


# CENTRAL FLORIDA COORDINATION AREA

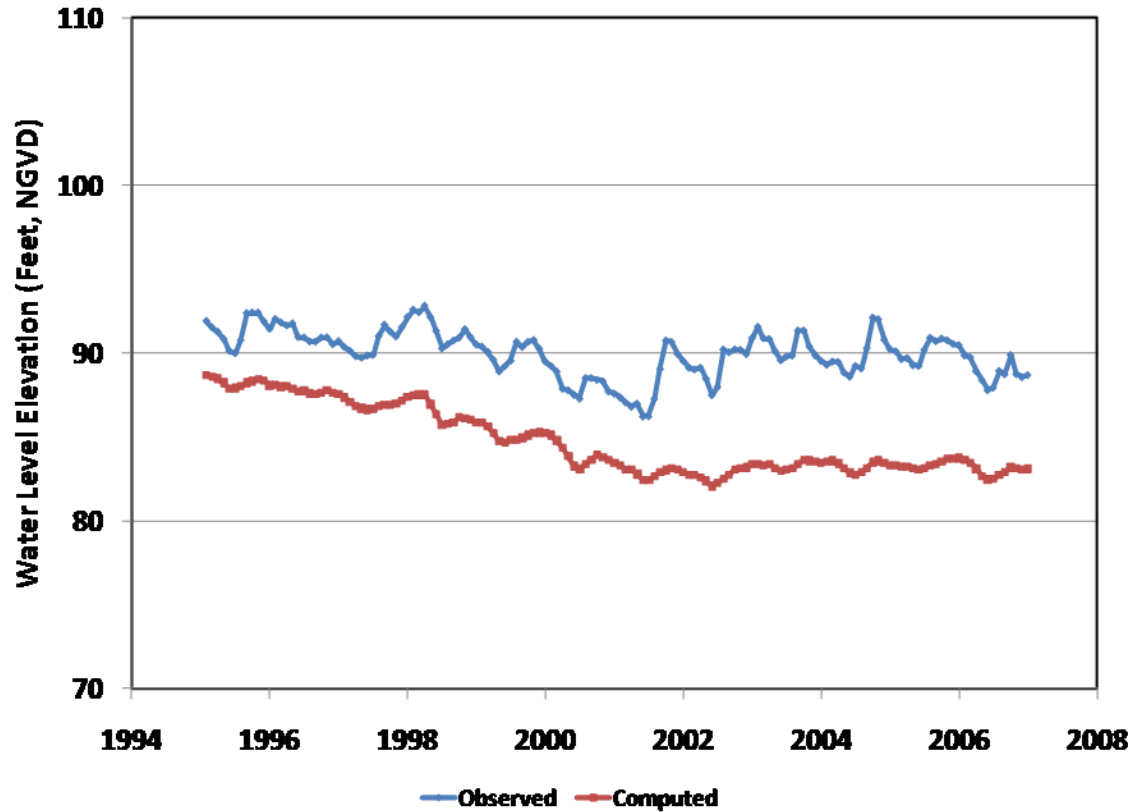
## DWRM CFCA Model

### Upper Floridan Aquifer (Layer-4) Well Locations

- Calibration Wells
- ▲ CFCA Environmental Sites
- CFCA Boundary



## LOUGHMAN DEEP

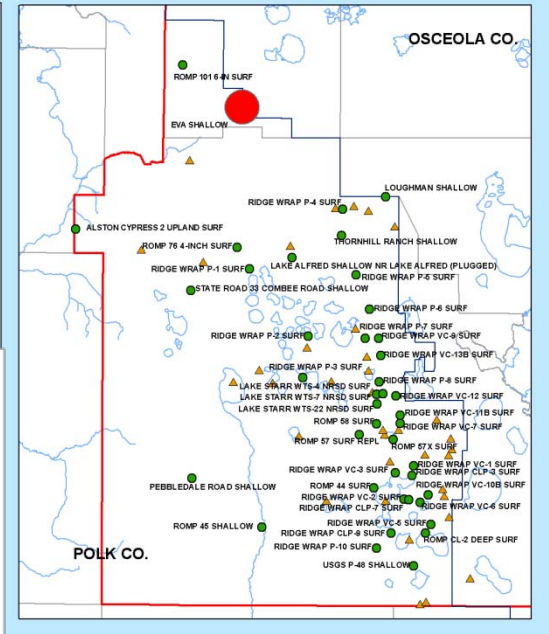


# CENTRAL FLORIDA COORDINATION AREA

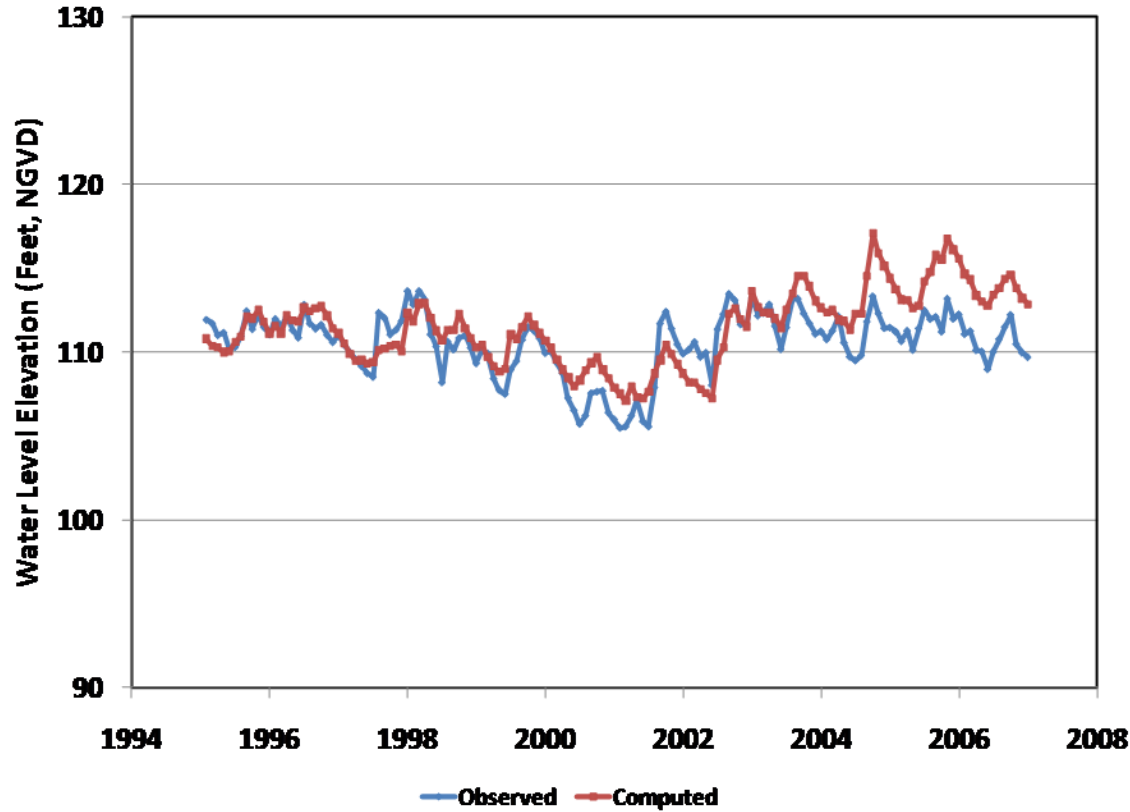
## DWRM CFCA Model

### Surficial Aquifer (Layer-1) Well Locations

- Calibration Wells
- ▲ CFCA Environmental Sites
- CFCA Boundary



## EVA SHALLOW

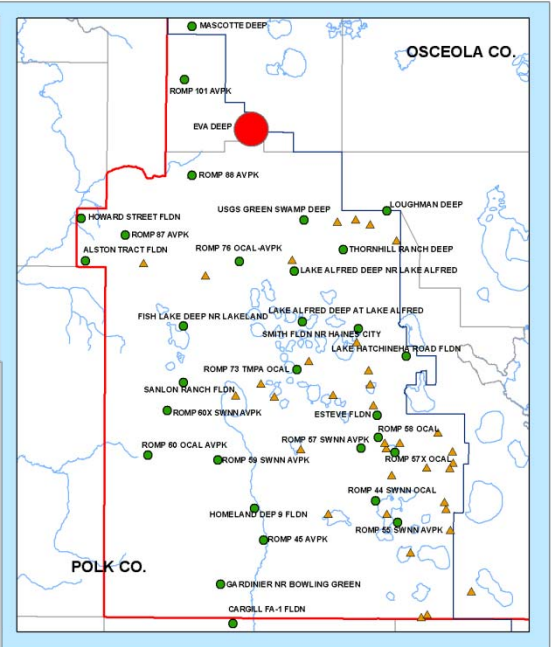


# CENTRAL FLORIDA COORDINATION AREA

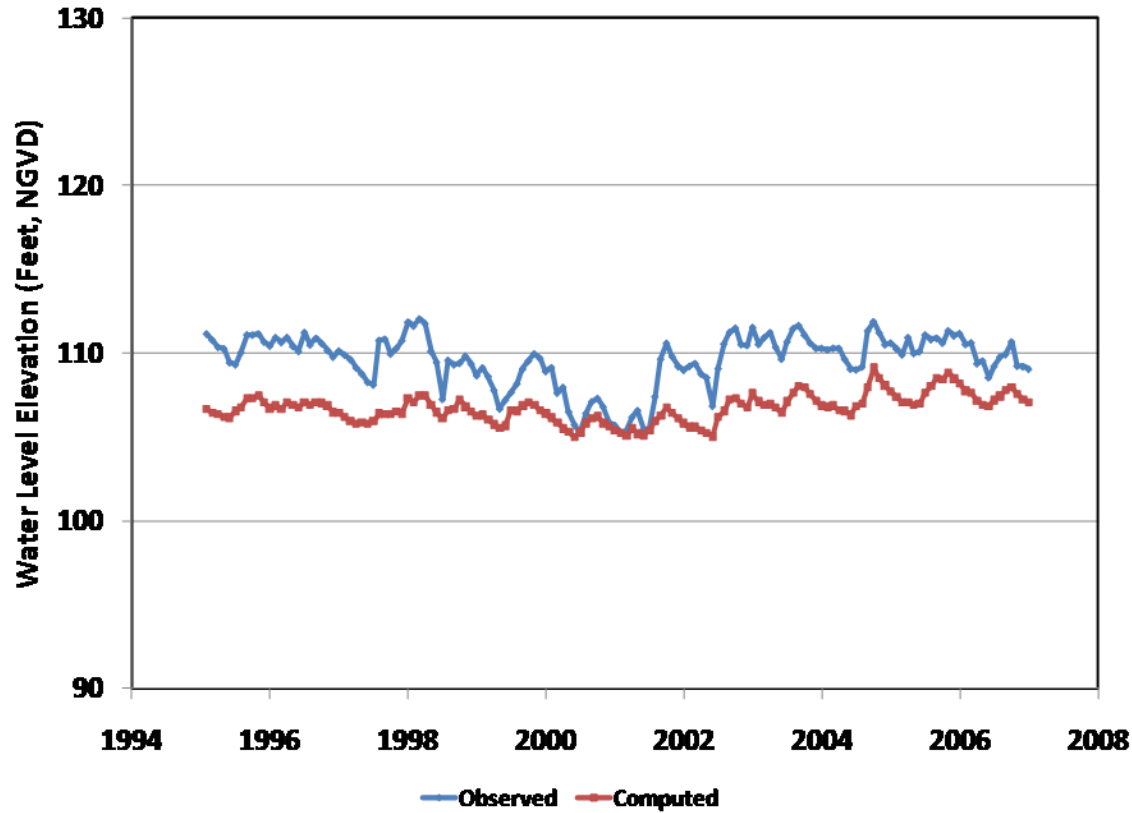
## DWRM CFCA Model

### Upper Floridan Aquifer (Layer-4) Well Locations

- Calibration Wells
- ▲ CFCA Environmental Sites
- CFCA Boundary



## EVA DEEP

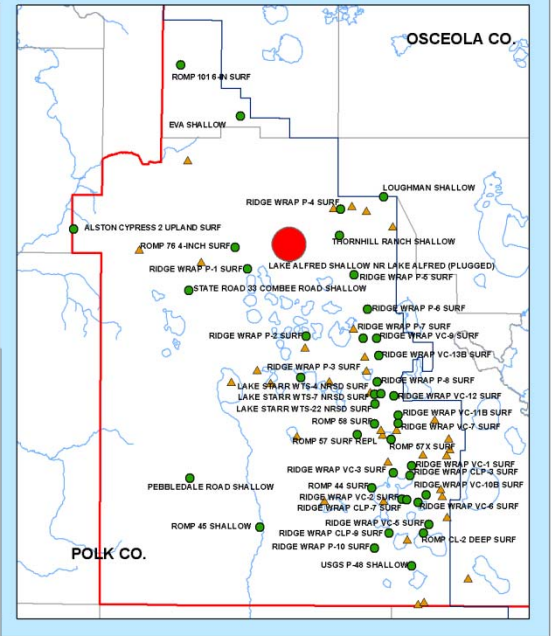


# CENTRAL FLORIDA COORDINATION AREA

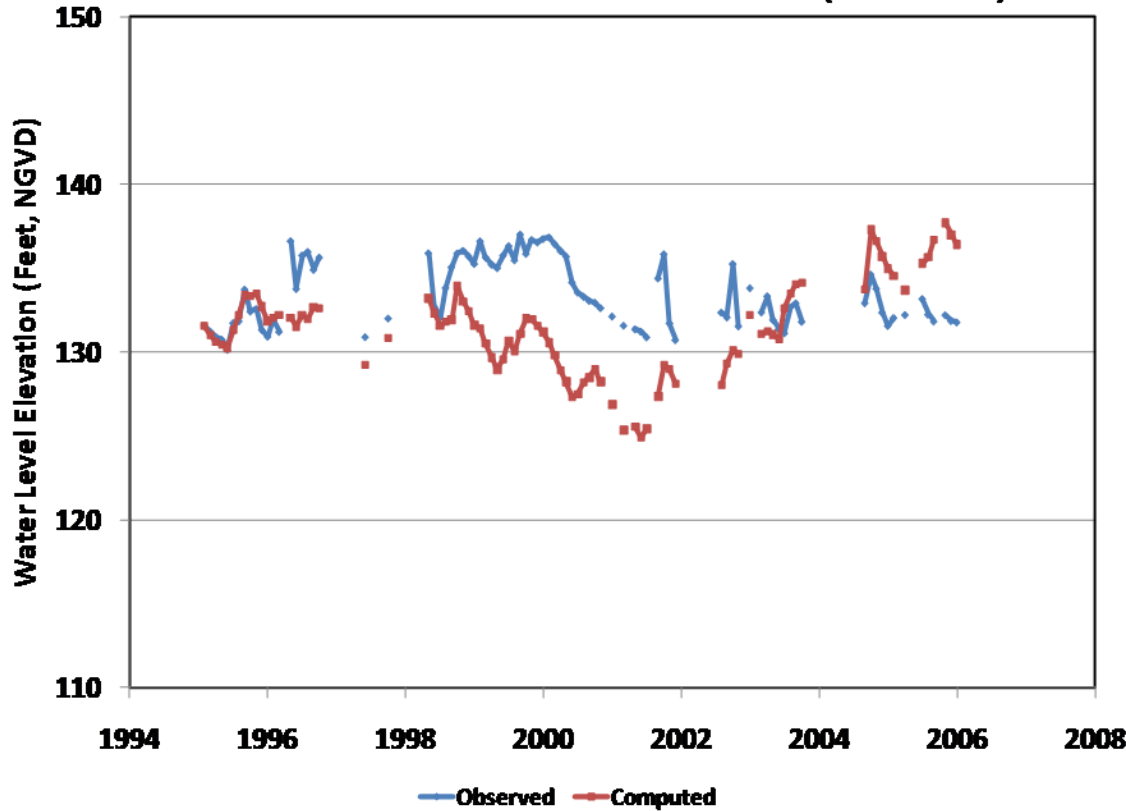
DWRM CFCA Model

Surficial Aquifer  
(Layer-1)  
Well Locations

- Calibration Wells
- ▲ CFCA Environmental Sites
- CFCA Boundary



## LAKE ALFRED SHALLOW NR LAKE ALFRED (PLUGGED)

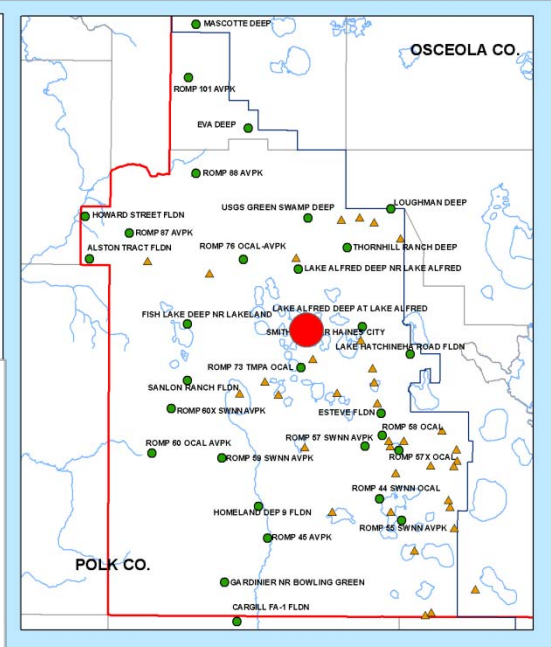


# CENTRAL FLORIDA COORDINATION AREA

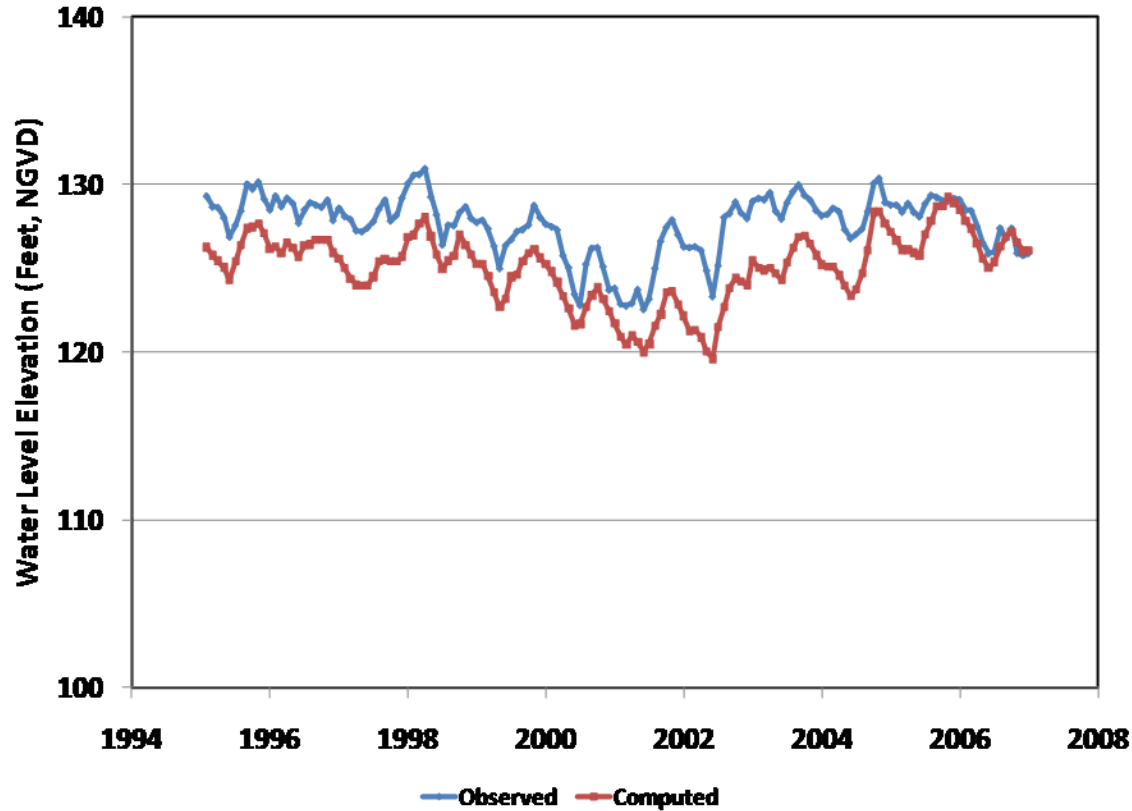
## DWRM CFCA Model

### Upper Floridan Aquifer (Layer-4) Well Locations

- Calibration Wells
- ▲ CFCA Environmental Sites
- CFCA Boundary



## LAKE ALFRED DEEP AT LAKE ALFRED

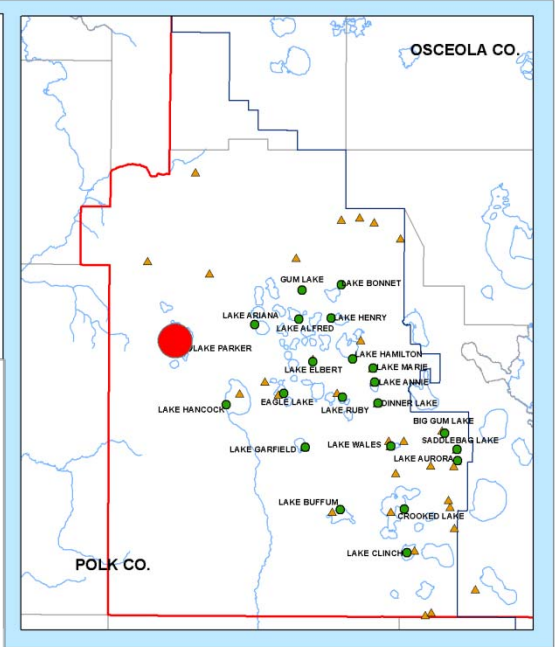


# CENTRAL FLORIDA COORDINATION AREA

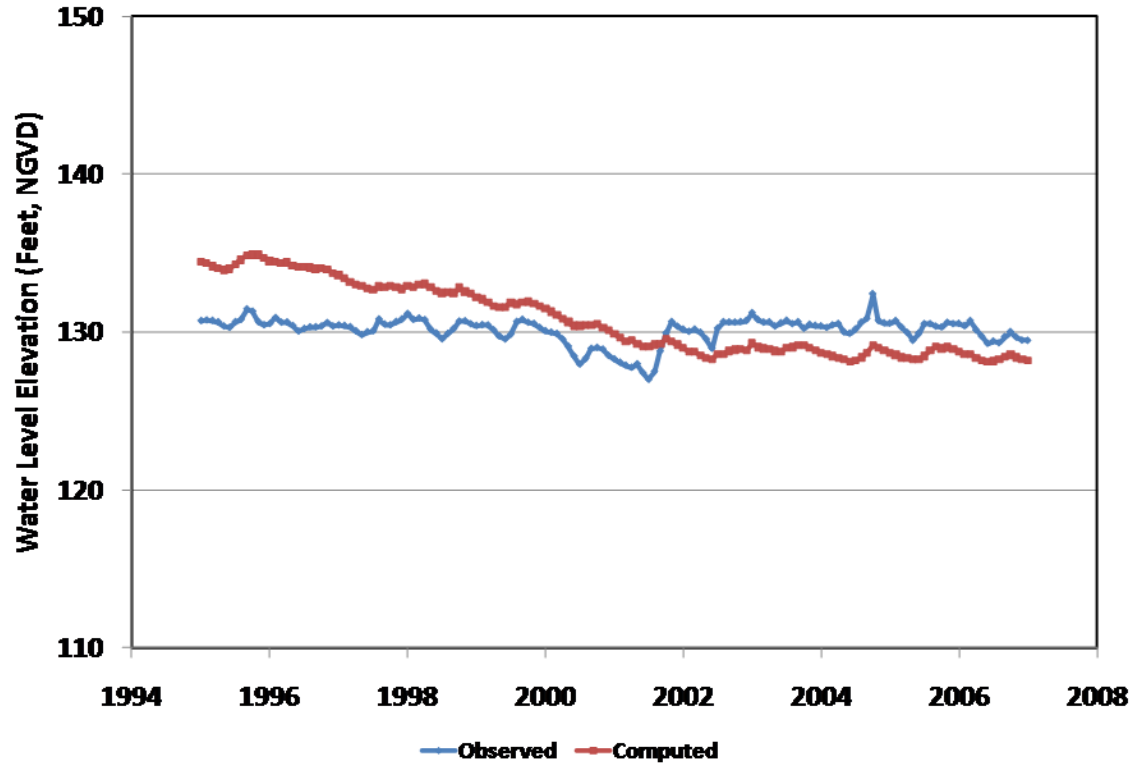
DWRM CFCA Model

Surficial Aquifer  
(Layer-1)  
Lake Locations

- Calibration Lakes
- ▲ CFCA Environmental Sites
- CFCA Boundary



## LAKE PARKER AT LAKELAND

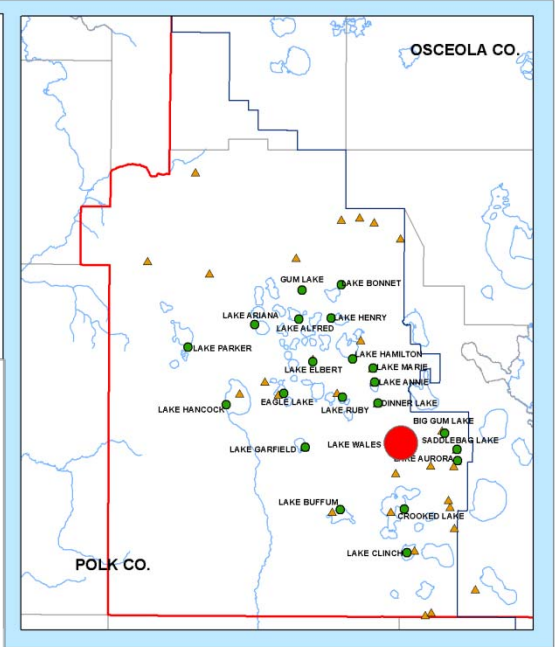


# CENTRAL FLORIDA COORDINATION AREA

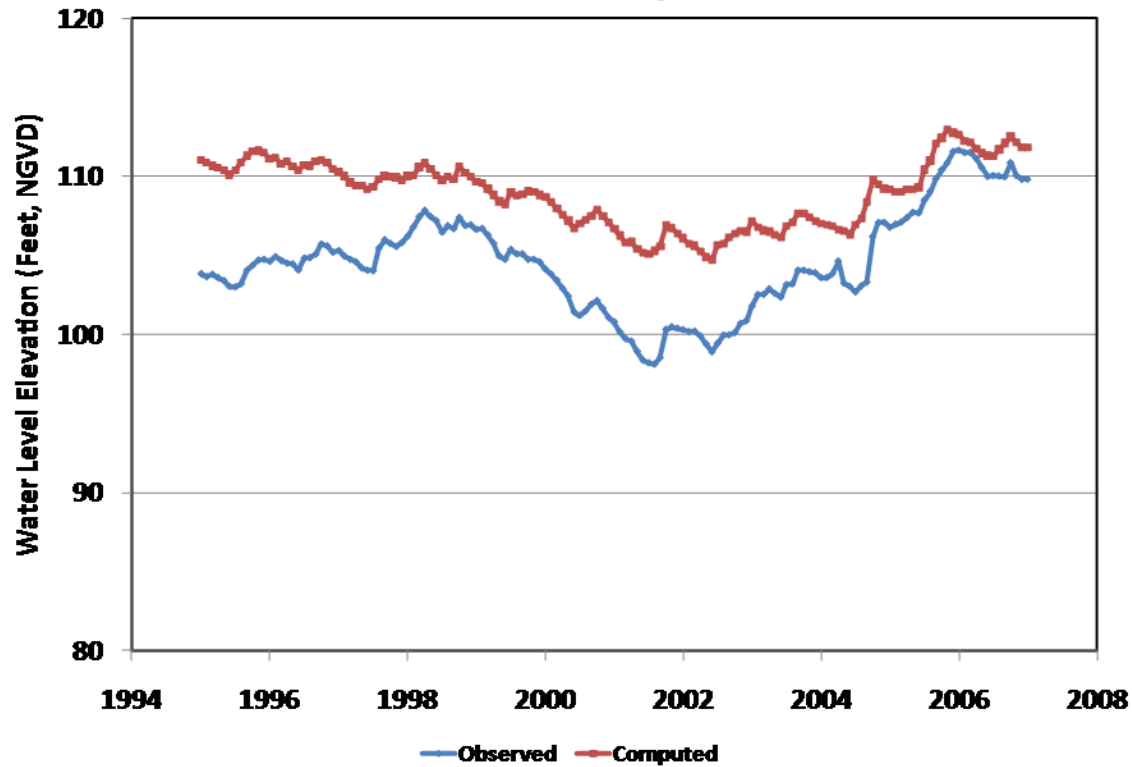
DWRM CFCA Model

Surficial Aquifer  
(Layer-1)  
Lake Locations

- Calibration Lakes
- ▲ CFCA Environmental Sites
- CFCA Boundary



## LAKE WALES



# DWRM2-CFCA Calibration Statistics

Transient model: 1995 to 2006

Type	Layer	# Obs	Mean	Abs Mean	STD	Max	Min	RMSE
Lakes	1	2982	2.94	4.14	4.36	13.65	-7.66	5.26
Wells	1	4777	2.52	3.56	3.93	18.51	-12.64	4.67
	2	495	2.87	4.91	5.93	15.61	-17.59	6.58
	3	466	-0.34	3.22	4.45	12.29	-20.85	4.46
	4	3590	1.9	4.4	5.45	21.34	-28.81	5.77

Calibration goals:

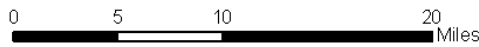
1. minimize mean error
2. absolute mean error is less than 5



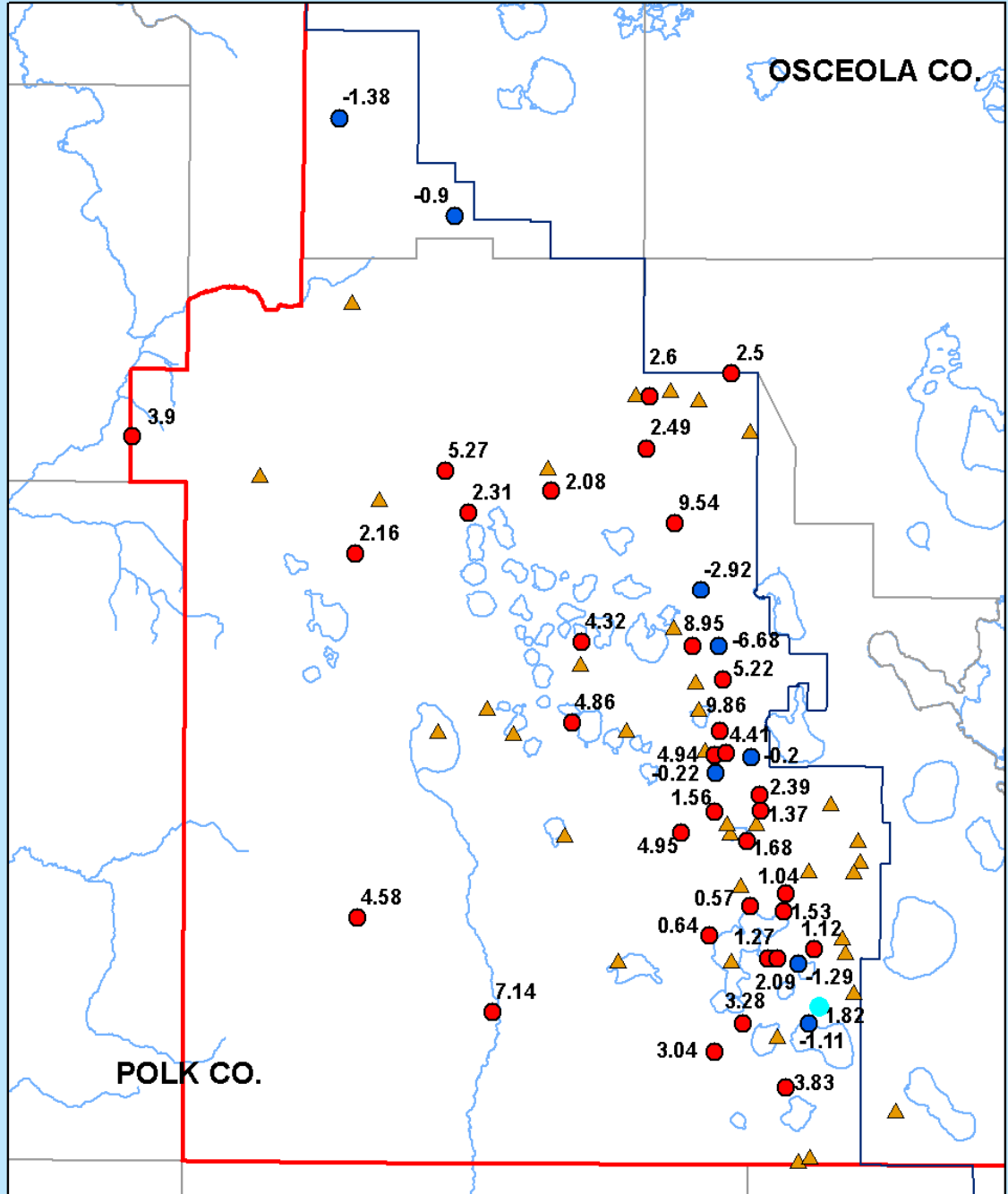
DWRM CFCA Model

Surficial Aquifer  
(Layer-1)  
Residual Mean  
(Obs Mean Minus Sim Mean)

- Wells (Positive Residual)
- Wells (Negative Residual)
- ▲ CFCA Environmental Sites
- CFCA Boundary



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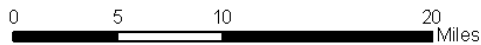


# CENTRAL FLORIDA COORDINATION AREA

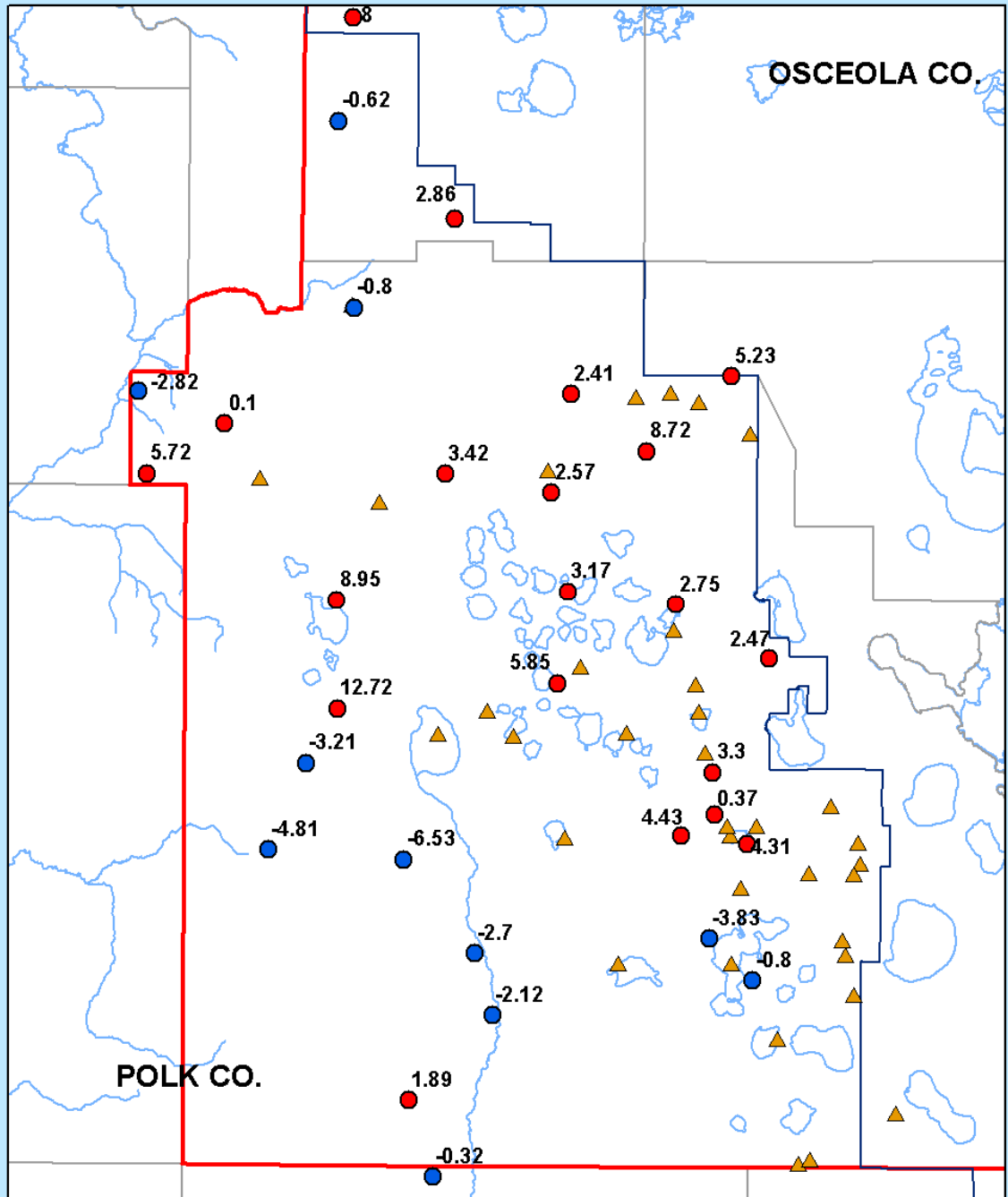
## DWRM CFCA Model

Upper Floridan Aquifer  
(Layer-4)  
Residual Mean  
(Obs Mean Minus Sim Mean)

- Wells (Positive Residual)
- Wells (Negative Residual)
- ▲ CFCFA Environmental Sites
- CFCFA Boundary



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# District-wide Regulation Model Version 2/CFCA

- Continue to assess model performance and refine model calibration where needed
- Perform and evaluate identified model scenarios

