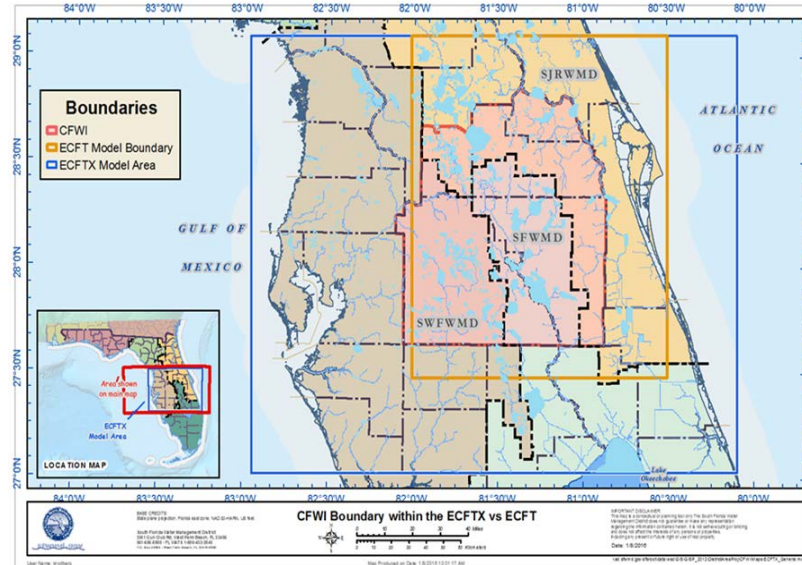# ECFTX Model Update



*CFWI Management Oversight Committee (MOC) Meeting*

*October 30, 2017*

*Peter J. Kwiatkowski, P.G.*

*Hydrologic Analysis Team*

www.cfwiwater.com

# Objectives

Improve confidence in model and associated predictions by:

- Reducing boundary issues

- Becoming more computationally efficient

- Resolving water use discrepancies

- Reaching consensus on hydrostratigraphy and model layering

- Incorporating more recent data and extending calibration period (1995 to 2014)

# Boundary Locations
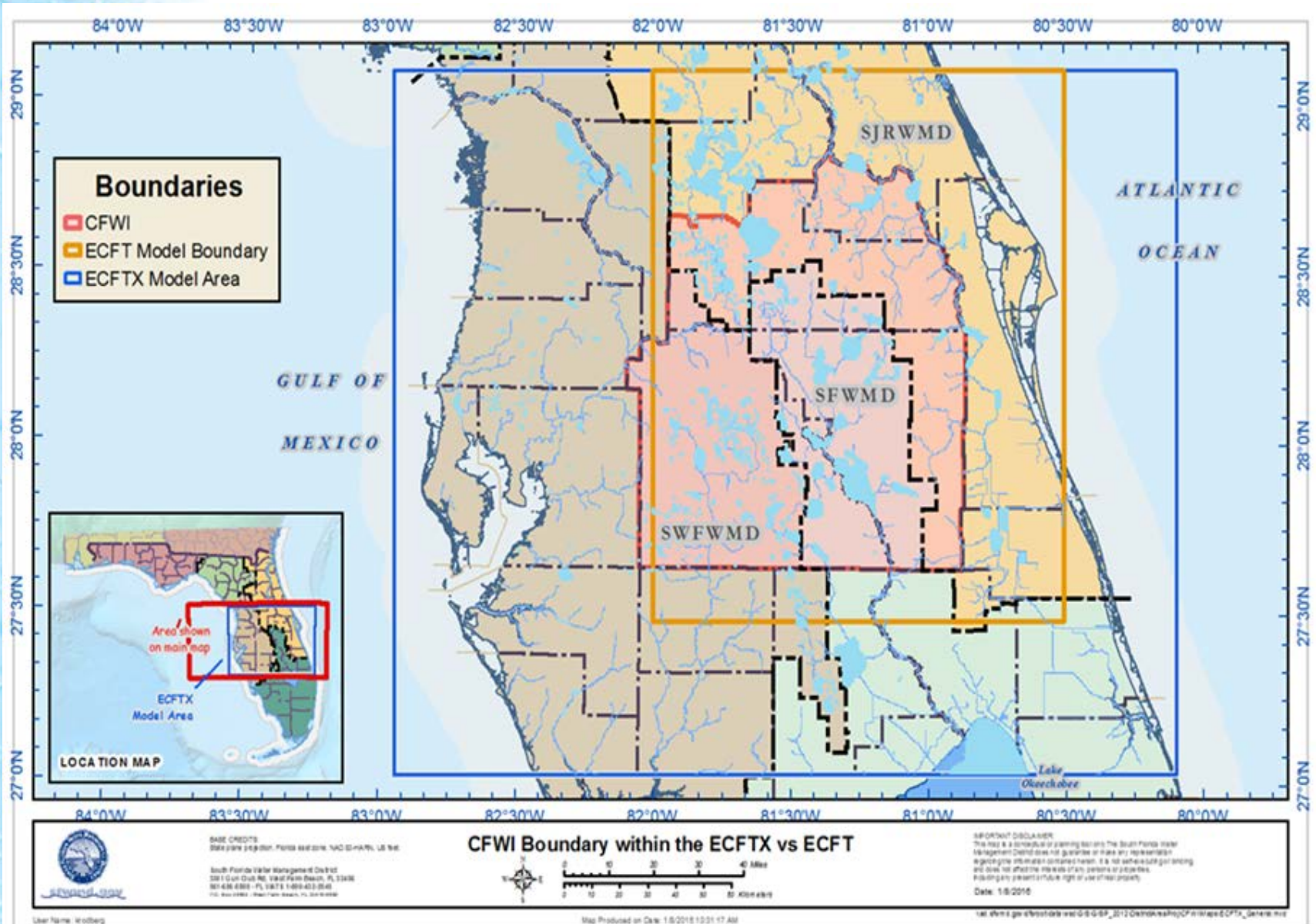
# Water Use Update

- Estimate historical water use

- Use measured values where available

- Resolve database issues (zeros, duplicates, errors, etc.) over the period of record

- Develop consistency between the model and reported use described in the water supply plan using a single water use database

- Identify areas where the model cannot match reported values due to inherent limitations

# Hydrostratigraphic Framework

- Update with new well information

- Resolve interpretation differences across District boundaries

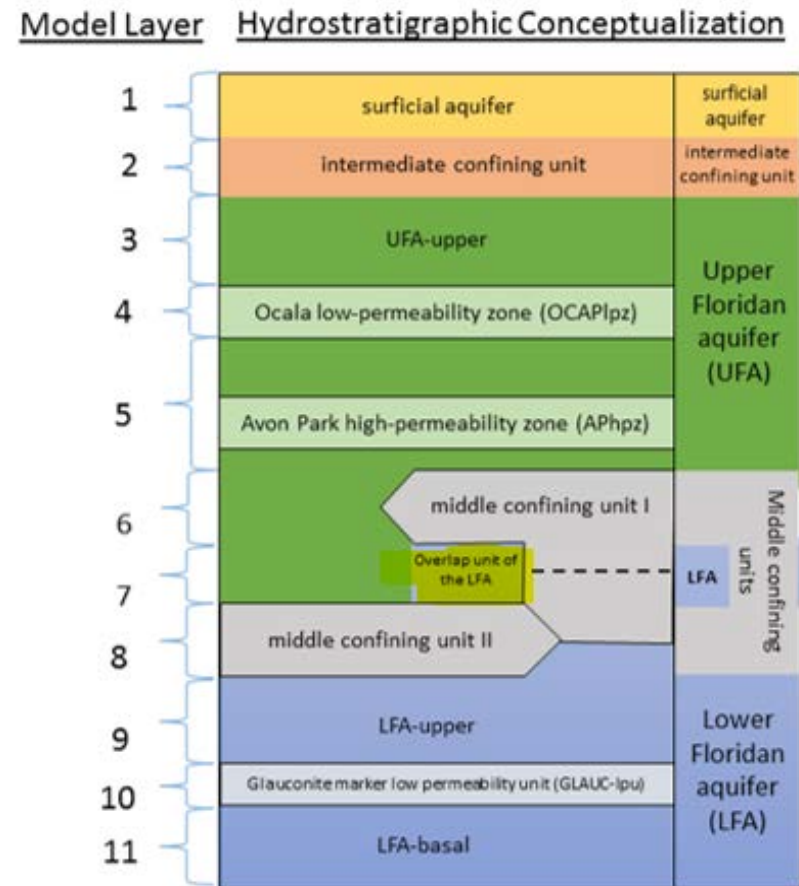- Incorporate additional model layering of the Lower Floridan Aquifer



*Figure 1. Critical Hydrogeologic Units*

# Improvements

■ Better data -- less time during calibration resolving errors

■ Use of information from other peer-reviewed models

■ Improved conceptualization of boundary conditions – Atlantic Ocean and Gulf

- • Polk County water use issue resolved

■ Peer Review – incorporate comments as we go

■ Water Use data and QA/QC review by Utilities

- • Resolve discrepancies between model and plan

■ Simulation Period – 1995 to 2014 vs. 1995 to 2006

# **Peer Review Panel**

- ■ Groundwater Modeling Experts

  - Louis Motz, PhD, Associate Professor Emeritus, University of Florida

  - Mark Stewart, PhD, Professor Emeritus, University of South Florida

  - Peter Anderson, P.E., M.S.,  Principal Engineer, Tetra Tech GEO

- ■ Scope of Work – Review:

  - Conceptual Model Documentation

  - Calibration Plan and Implementation

  - Final Documentation

# Calibration Overview

1.  Conduct Steady-State calibration using PEST (automated calibration) and use resulting parameters and heads as starting point for Transient calibration

2.  In parallel, create a one-layer transient model to conduct preliminary calibration of surface-groundwater interaction processes

3.  Transient calibration: iterative calibration of ET-Recharge and SCS Curve Number Methods and PEST calibration of MODFLOW after each model run

    a.  Conduct Manual Calibration in areas/layers where prior information is available or where PEST is not converging towards an appropriate solution

# Selected Watersheds for Calibration
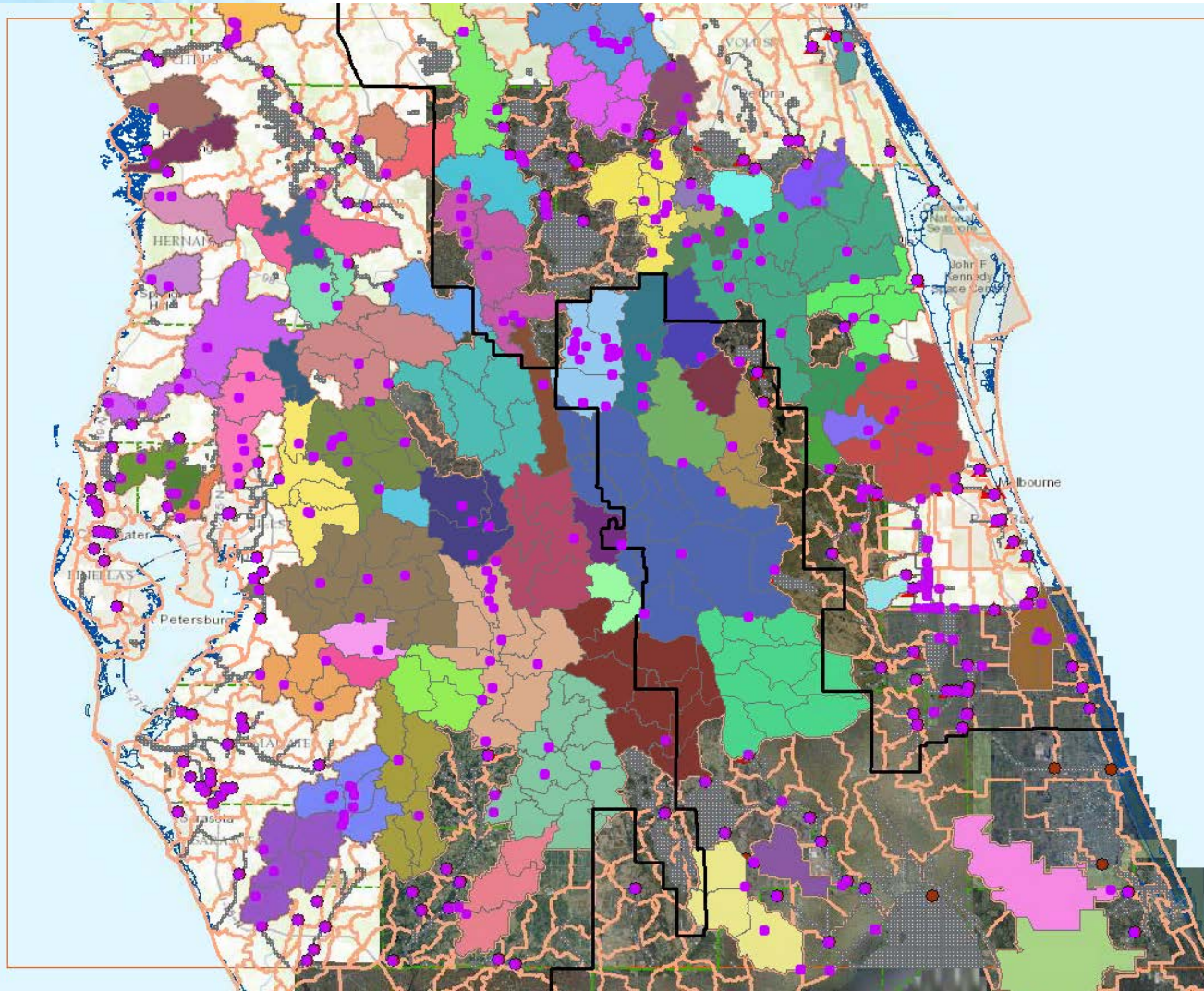


For gauged basins, compare MODFLOW output (baseflow) together with computed runoffs, with observed structure flows and adjust curve numbers, Muskingum parameters, and river bed conductance to achieve better match after each run

# Timeline

- Started Work – March 2015

- Peer Review Kickoff – September 2016

- Data Compilation Tasks -- October 2016

  - Land Use (1995, 1999, 2005, 2009, 2014)
  - Man-Made Drainage
  - Model Layering
  - Water Use (Wells)
  - Basic MODFLOW packages
  - Drainage Wells
  - Conceptual Model Documentation

  - Rainfall and Reference ET
  - Hydrostratigraphy
  - Rivers, Lakes, Springs
  - Aquifer Properties
  - Reclaimed Water, RIBs
  - Return Flow
  - Groundwater Levels – Potentiometric Surfaces

- Steering Committee Update – October 2016

# January to July 2017

- January 2017 – Begin PEST (automated) calibration – Dry and flooded model cells observed

  - Case01 – February 2017

  - Case02 – May 2017

  - Case03 – July 2017

  - STOP PEST efforts

- Peer Review Panel – April 2017

  - Check model conceptualization

  - QA/QC checks

  - Compare measured and simulated ET
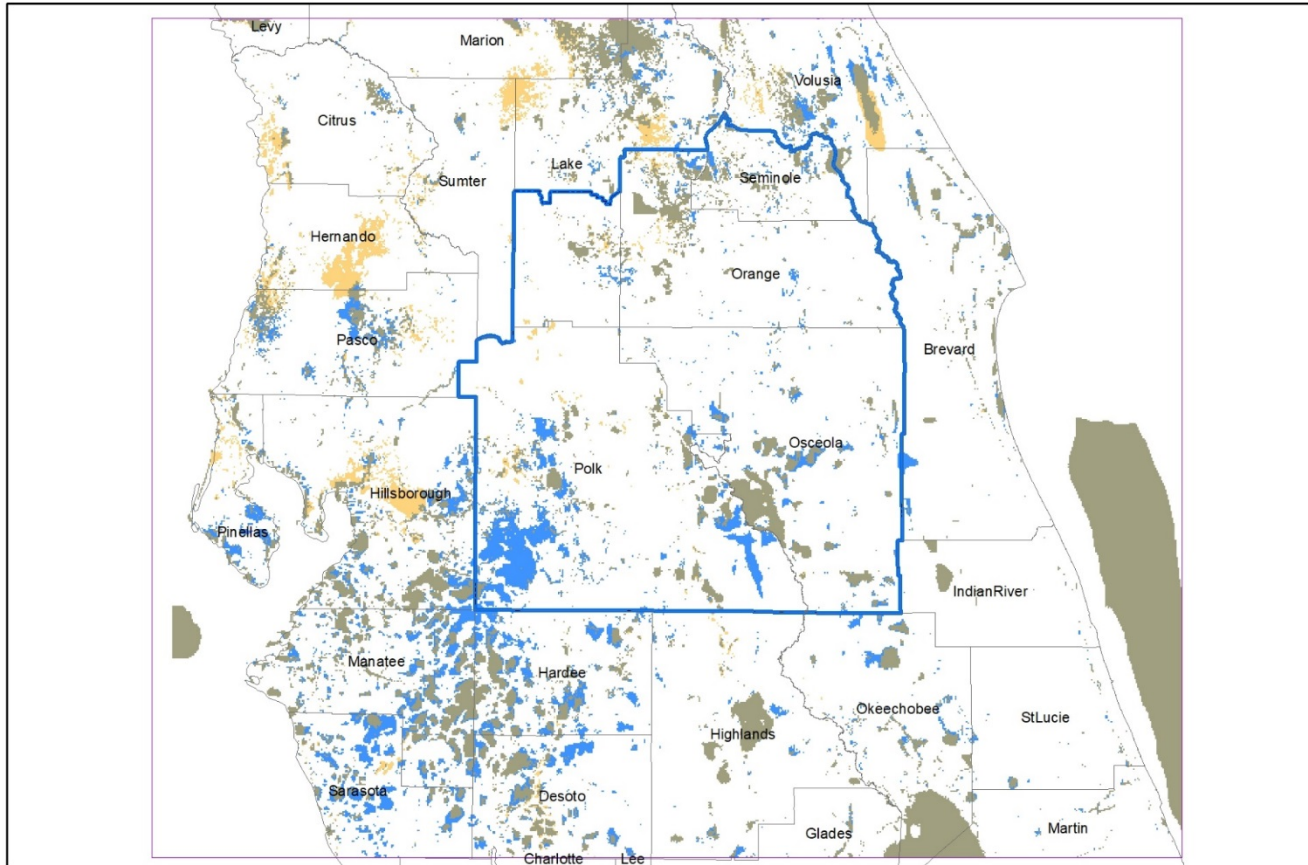
# Recent Attempt to Fix Dry Cells
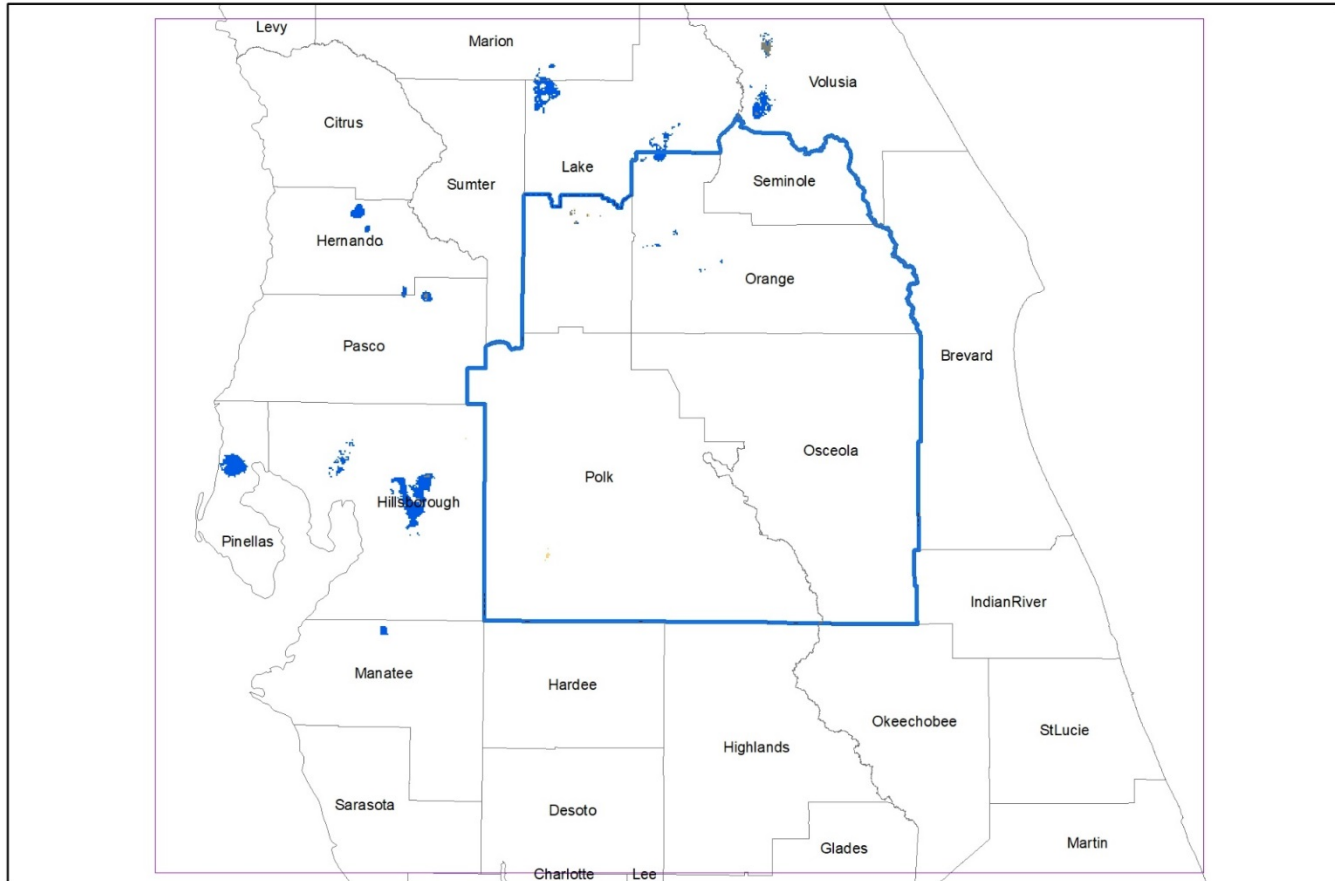


Current Only (blue): ecftx03ss_20171018
Previous Only (orange):ecftx03ss_20170929
Both (grey)

Previous: ecftx03ss_20170929

Sim: ecftx03ss_20171018

Comparison: DRY

# Recent Attempt to Fix Flooded Cells



Current Only (blue): ecftx03ss_20171018
Previous Only (orange):ecftx03ss_20170929
Both (grey)

Previous: ecftx03ss_20170929

Sim: ecftx03ss_20171018
Comparison: FLD

# July 2017 to Present

- Revise layering for select pumping wells from Layers 1 (SAS) and 2 (ICU) to Layer 3 (UFA)

- Update ET-RCH-RUNOFF values (previous models, field measured ET and RCH at 5 sites)

- Incorporate local drainage features previously deemed too minor to include

- Update K values with those from previous models (DWRM4/NDM5) on a cell-by-cell basis to better align with hydrogeology

- Adjust select K values per layer based on known composite transmissivity (T) and leakance (L) values and layer thicknesses

# Plan Forward

- Steady-State Calibration – December 2017*

- Transient Calibration – March 2018

- Address Peer Review Comments – April 2018

- Receive Reference Condition Input from Planning Team – May 2018

- Complete Reference Condition – June 2018

- Receive Future Demand Data Set from Planning Team – July 2018

- Complete Predictive Simulations – September 2018

NOTE: *Assumes dry/flooded cells resolved by Dec. 1

# Questions?