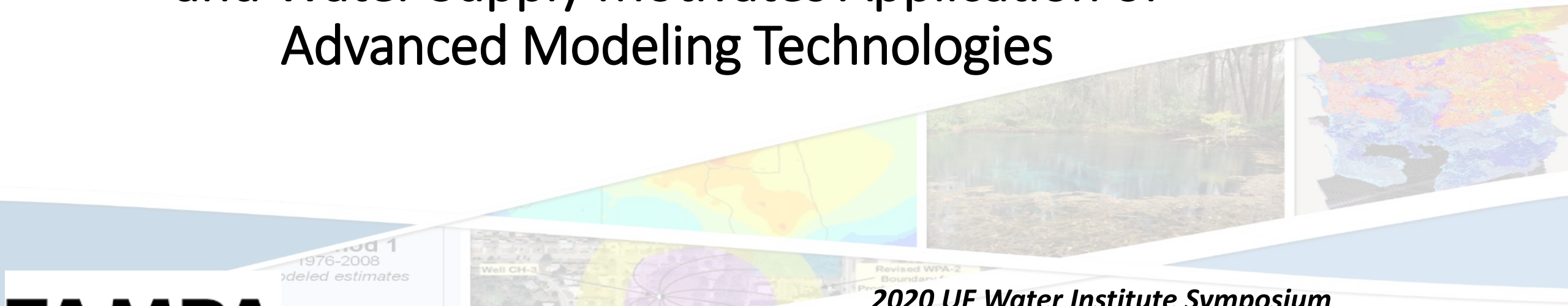
Sustainability Concerns for Florida Natural Systems and Water Supply Motivates Application of Advanced Modeling Technologies



TAMPA BAY WATER
Supplying Water To The Region

2020 UF Water Institute Symposium

February 25-26, 2020, Gainesville, FL

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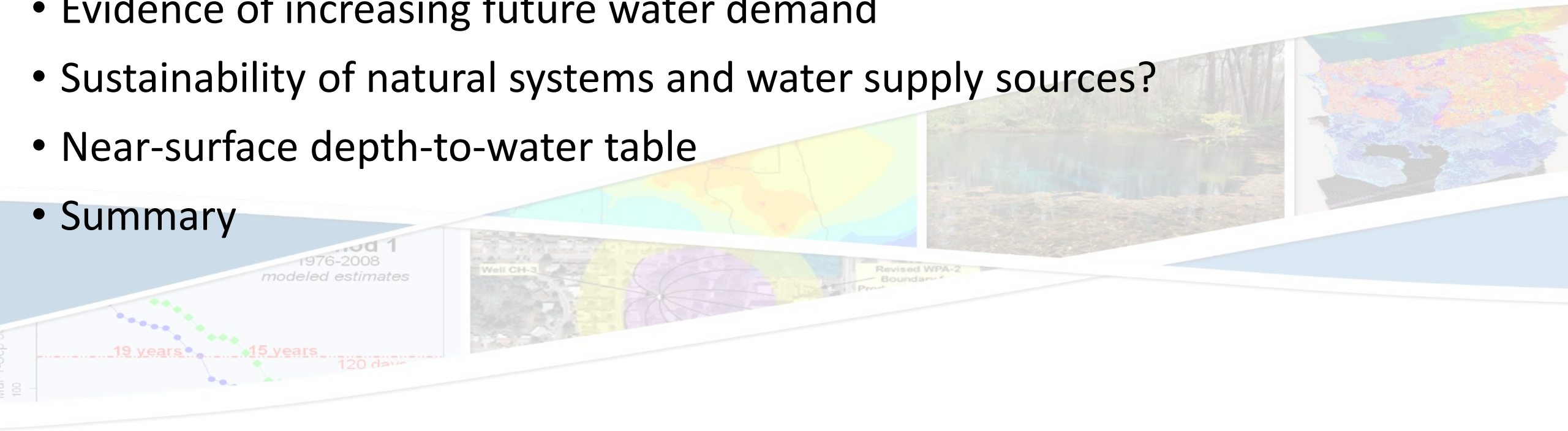
INTERA
GEOSCIENCE & ENGINEERING SOLUTIONS

Outline

- Evidence of existing or anticipated stressed natural systems
- Evidence of increasing regulation complexity
- Evidence of increasing future water demand
- Sustainability of natural systems and water supply sources?
- Near-surface depth-to-water table
- Summary



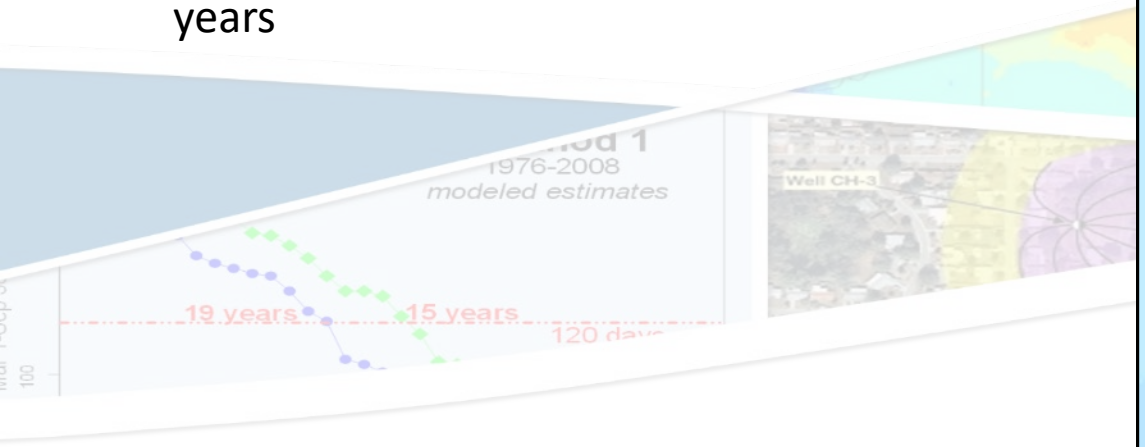
Florida Water Management Districts
Water Supply Regulation and Planning

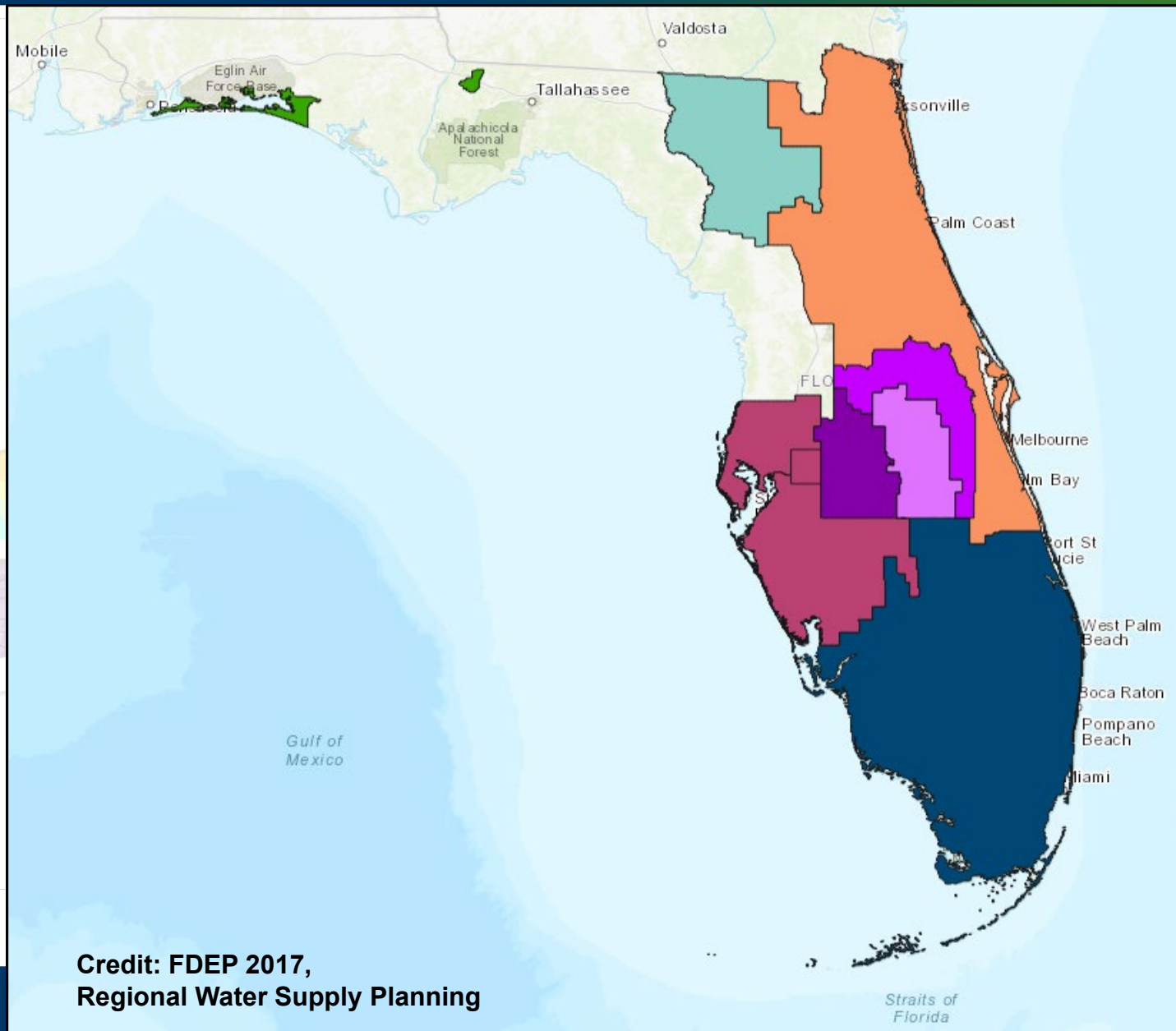
- Five Districts
  - Northwest Florida
  - Suwannee River
  - St. Johns River
  - Southwest Florida
  - South Florida
- Water supply regulation and planning
  - Water Use Permitting
  - Water Resource Caution Areas
  - Minimum Flows and Levels
  - Recovery and Prevention Strategies
  - Regional Water Supply Plan
  - Cooperative funding

Credit: FDEP 2017,
Regional Water Supply Planning

Statewide Water Resource (Use) Caution Areas Cover Significant Portion of the State

- Water Resource Caution Area (WRCA)
  - Identified by a Water Management District (WMD)
  - Existing water resource problems
  - Projected water resource problems during the next 20 years



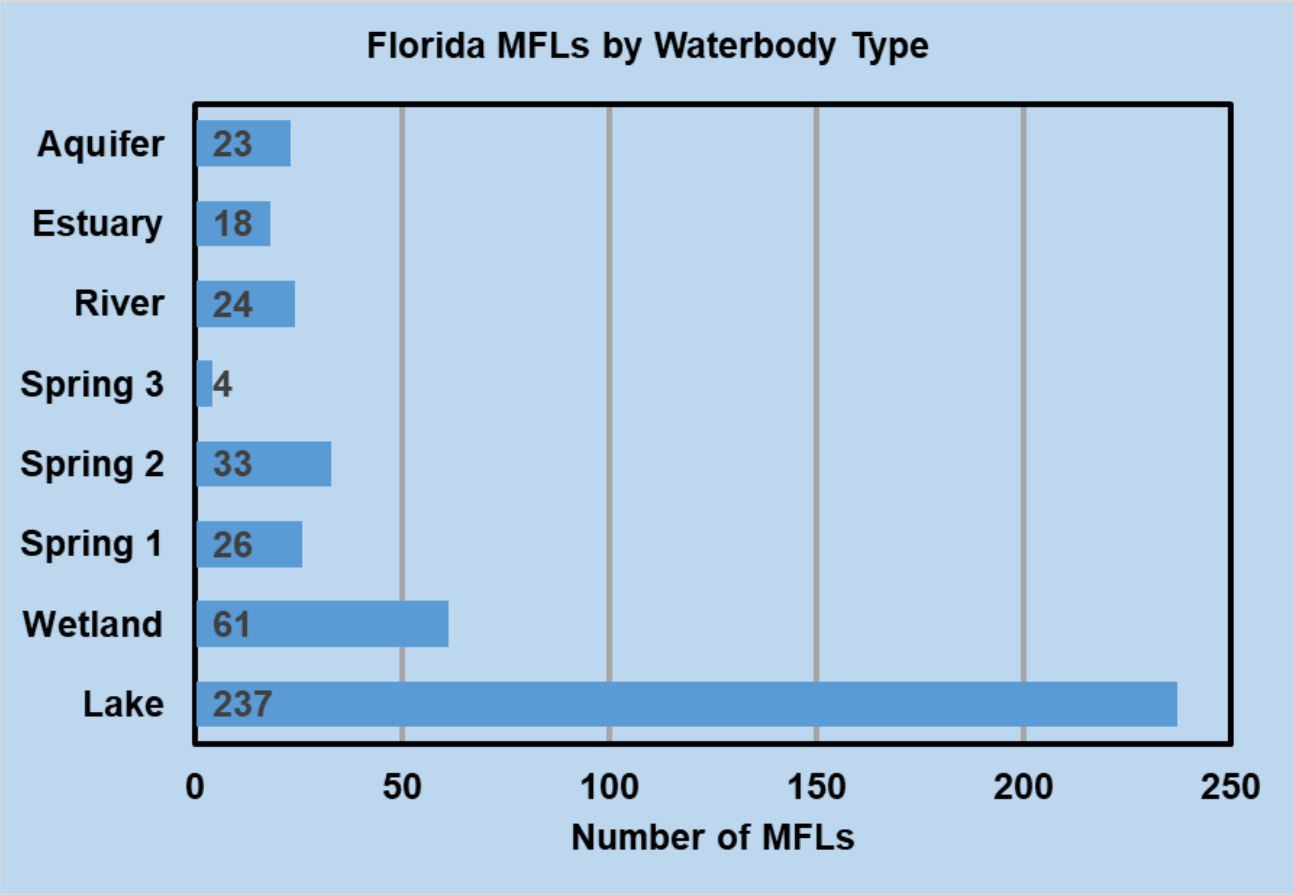


Credit: FDEP 2017, Regional Water Supply Planning

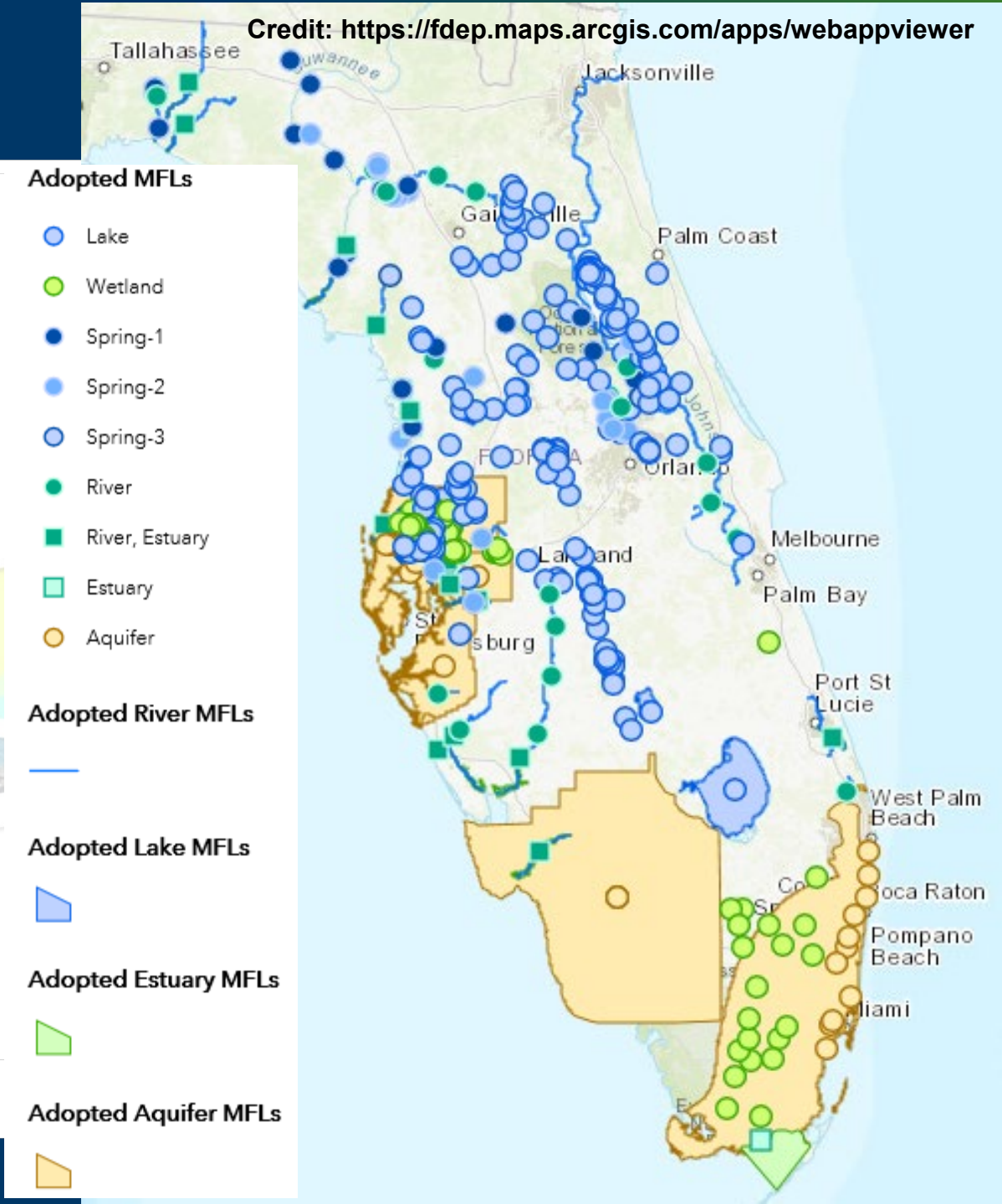
Minimum Flows and Minimum Water Levels (MFLs)
Natural Systems Sustainability Metrics

- What are MFLs?
  - Limits at which further water withdrawals would be significantly harmful to water resources or ecology
  - Adopted by rule by a water management district or FDEP
  - Priority list for future MFL development updated annually
- How are MFLs used?
  - Review applications for water withdrawal permits and environmental resource permits
  - Environmental constraints applied to planning for future water needs
- How are MFLs developed?
  - System understanding of climate-hydrology-biology-soils-environmental interactions
  - Development process and assumptions (hydrologic, hydraulic, and ecosystems models)
  - Analysis of empirical data and model results
  - Rulemaking

Adopted MFLs
March 2019 Status



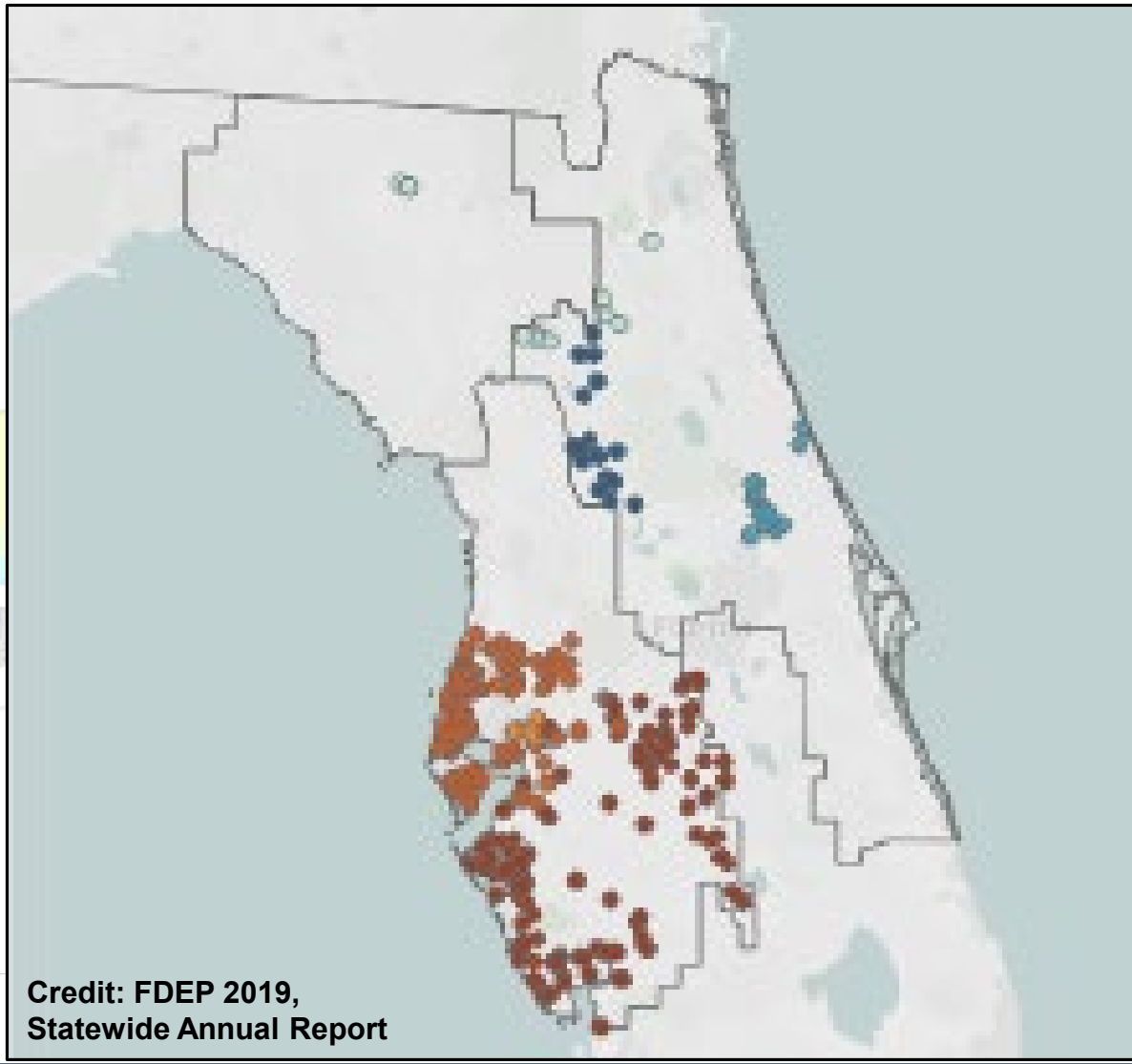
Credit: https://fdep.maps.arcgis.com/apps/webappviewer



Recovery and Prevention Strategies

- Recovery and prevention strategies identify projects to
  - Restore and protect MFL waterbodies, and
  - Provide water for future users
- Recovery strategy developed if MFL is not currently being met
- Prevention strategy developed if MFL currently met, but projected to not be met in next 20 years

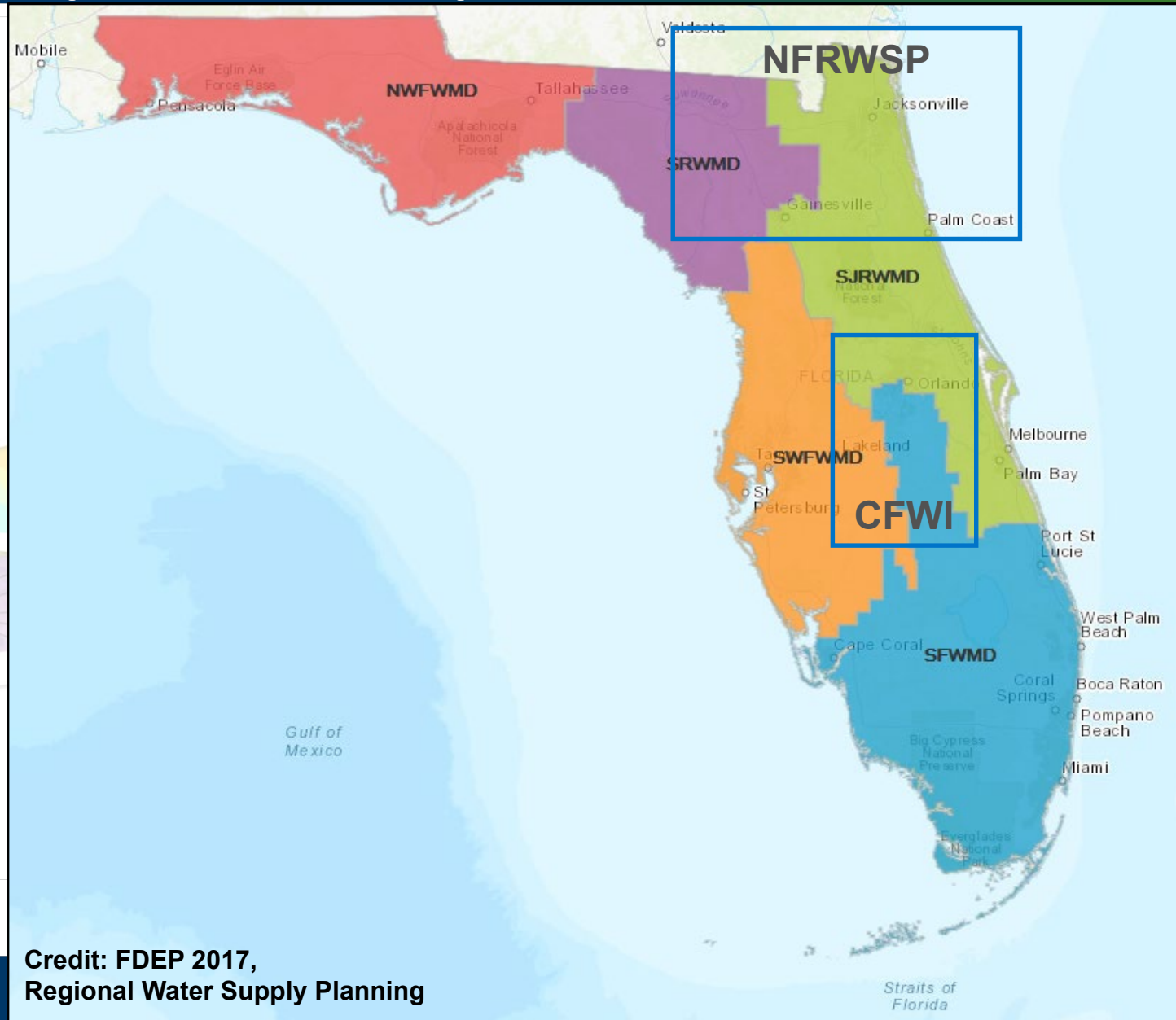
Projects Designed to Achieve MFLs



Credit: FDEP 2019, Statewide Annual Report

Statewide Regional Water Supply Planning
Projected Increase in Water Use (2015 to 2035)

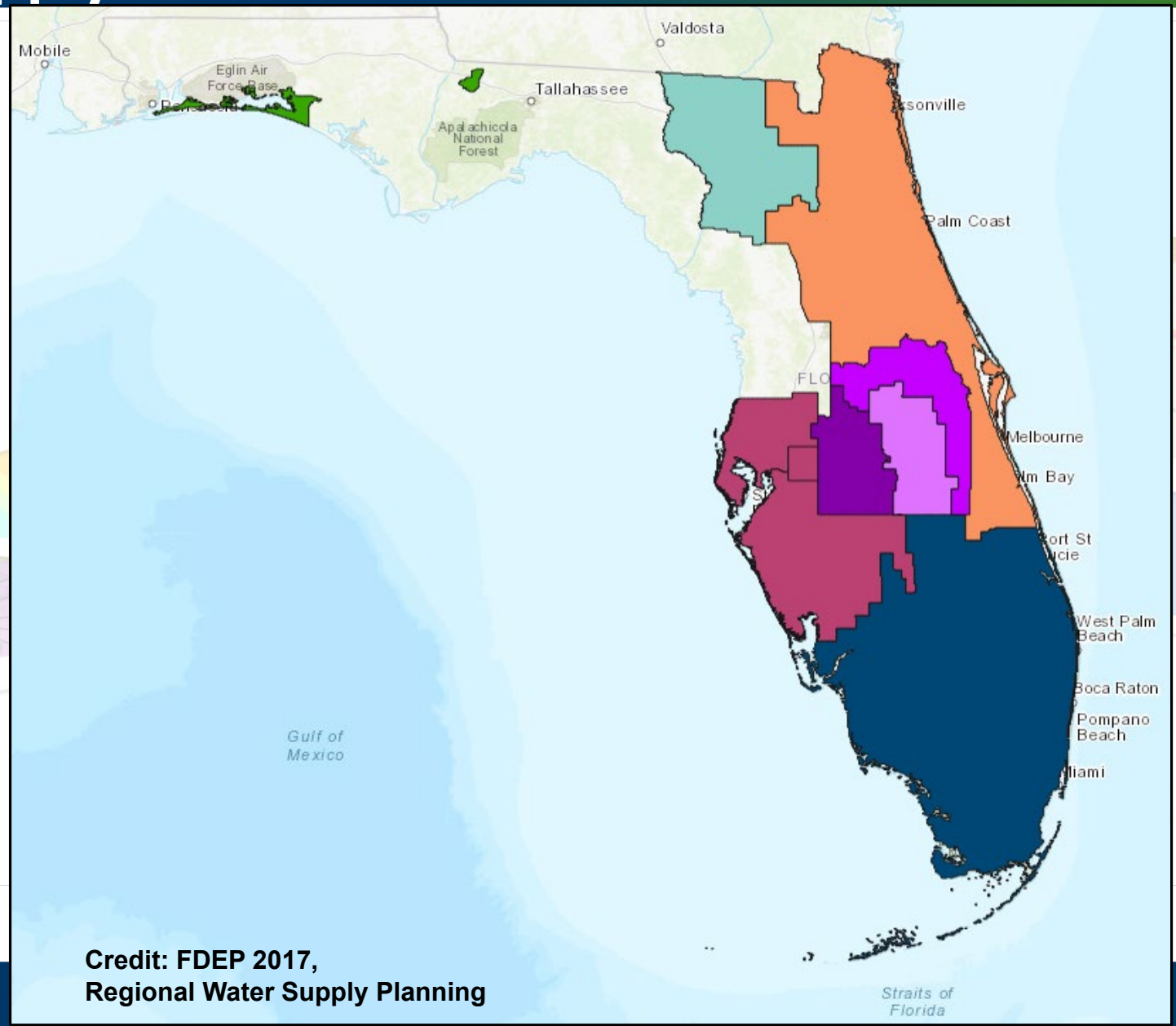
- 20 year projections
- Statewide average: 17%
- Water Management District averages: 11% to 28%
- Joint Planning Regions
  - Central Florida Water Initiative: 27%
  - North Florida Regional Water Supply Partnership: 20%



Credit: FDEP 2017,
Regional Water Supply Planning

Sustainability Assessments
Natural Systems and Water Supply Sources

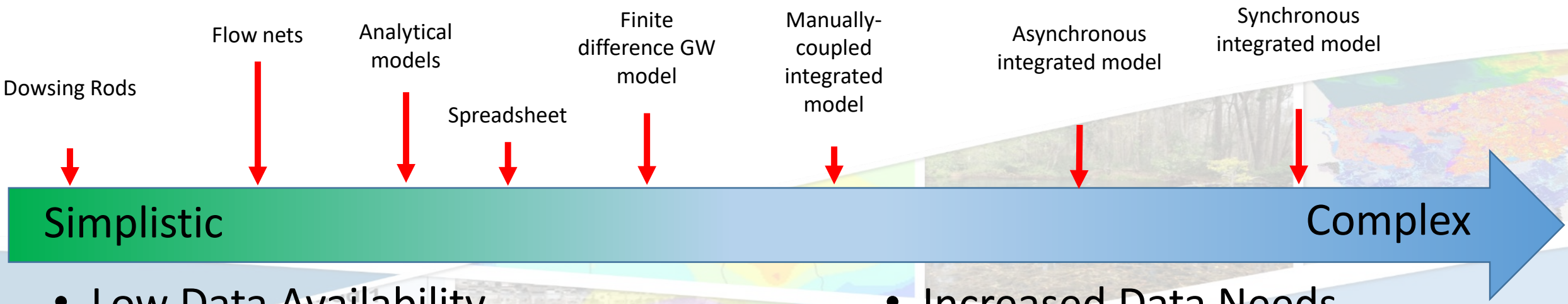
- Environmental and water supply sustainability
- Regulation complexity
- Local supply via regional scale assessment context
- Relevance of rainfall uncertainty, with or without climate change
- Hydrologic impact of landuse change
- Hydrologic responses for near-surface water table
- Future role for integrated hydrologic models?



Credit: FDEP 2017,
Regional Water Supply Planning

Model Complexity Spectrum

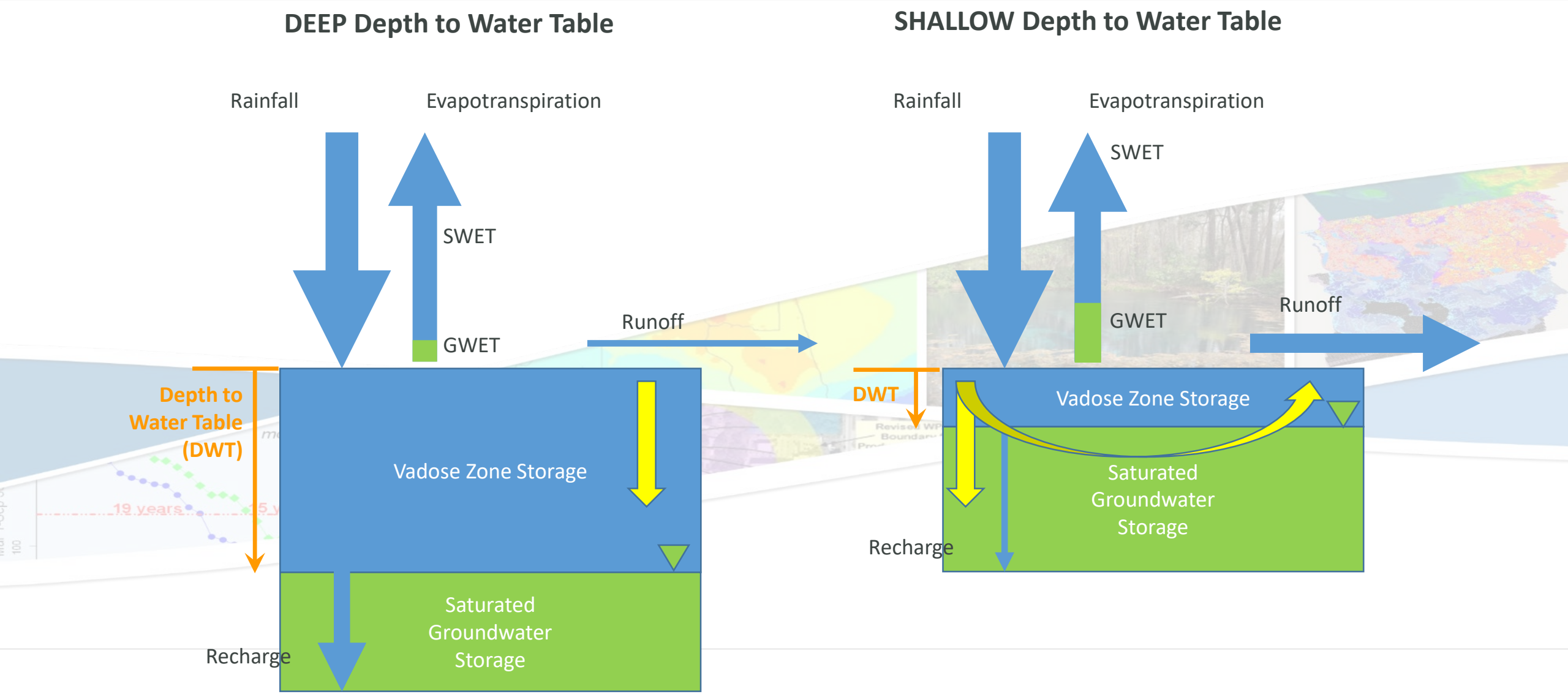
Increased Competition with Stressed Conditions Drives Need for Greater Model Accuracy



- Low Data Availability
- Simplifying Assumptions
- High Uncertainty
- High Safety Factor

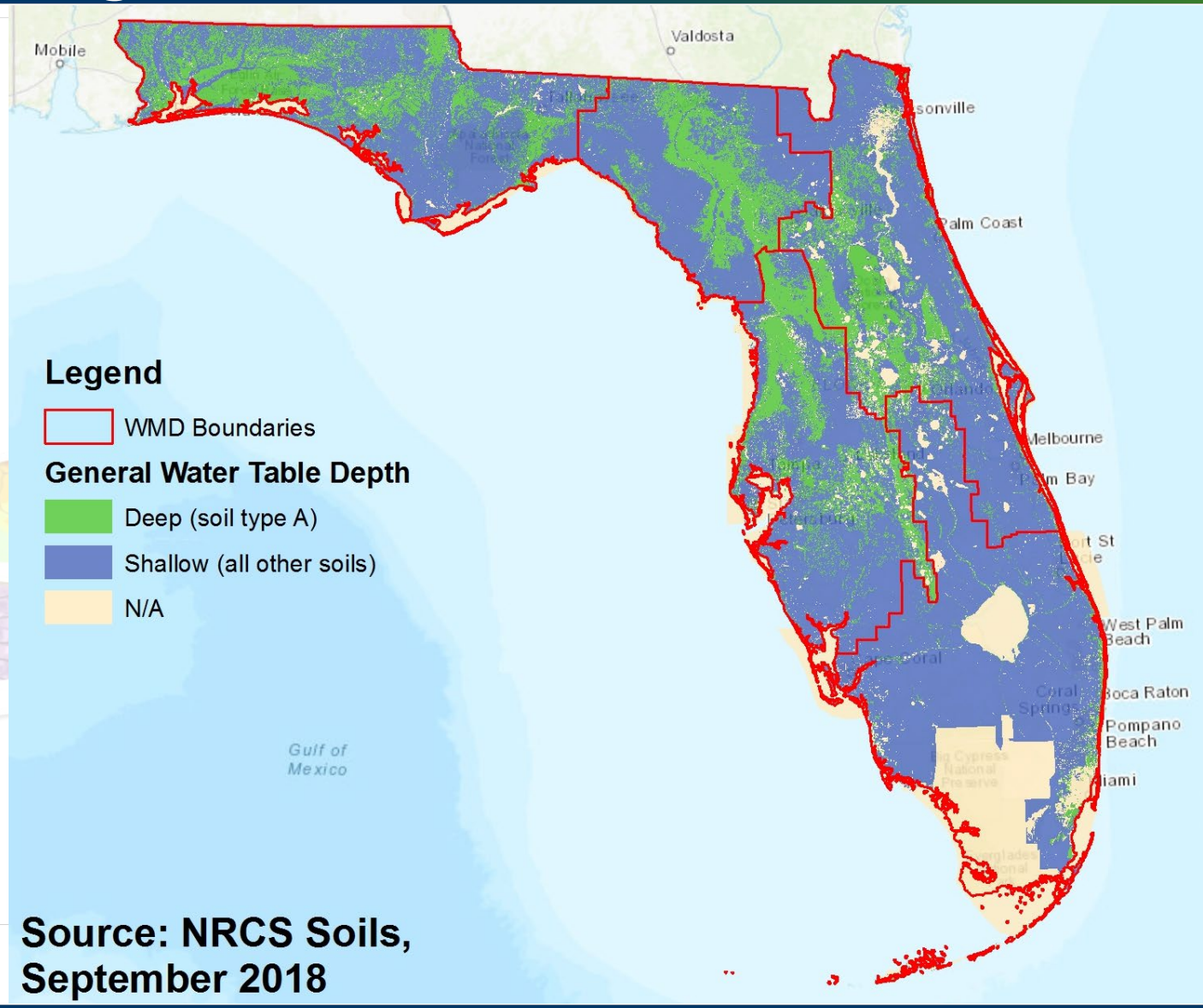
- Increased Data Needs
- Limited Assumptions
- Reduced Uncertainty
- Reduced Safety Factor

Relative Change in Flux Magnitude
Deep vs Shallow Depth-To-Water Table



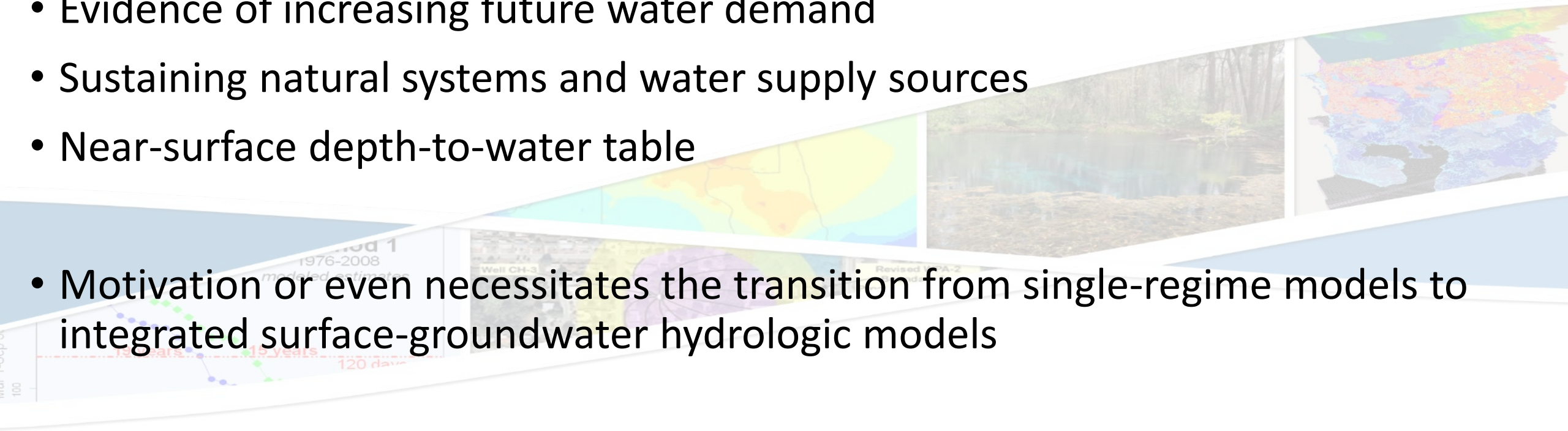
Areas With Near-Surface Depth-To-Water Table Assessment Advantages Using Integrated Models

- Near-surface depth-to-water table (DWT) exhibits SW-GW flow exchange over uplands
- Integrated model advantages over groundwater models
  - Conserve mass
  - Dynamically change flows, fluxes, and levels when well pumping changes
  - Account for total change to streamflow and ET
  - More accurately represent change to baseflow, GW ET, and aquifer heads
  - Assess landuse and climate change responses

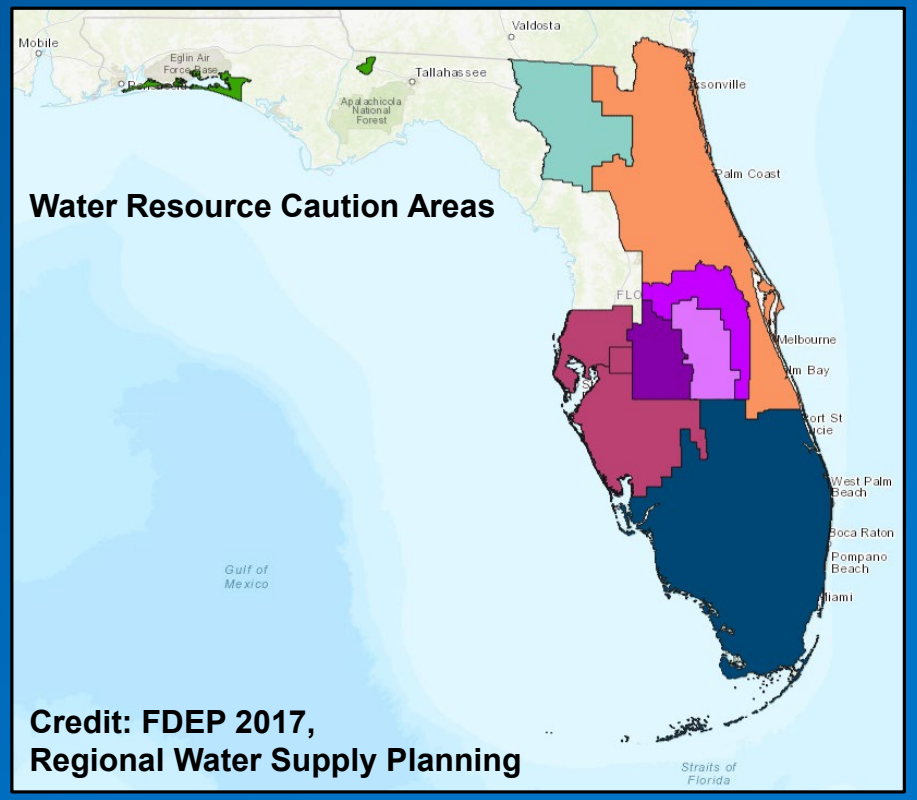


Summary

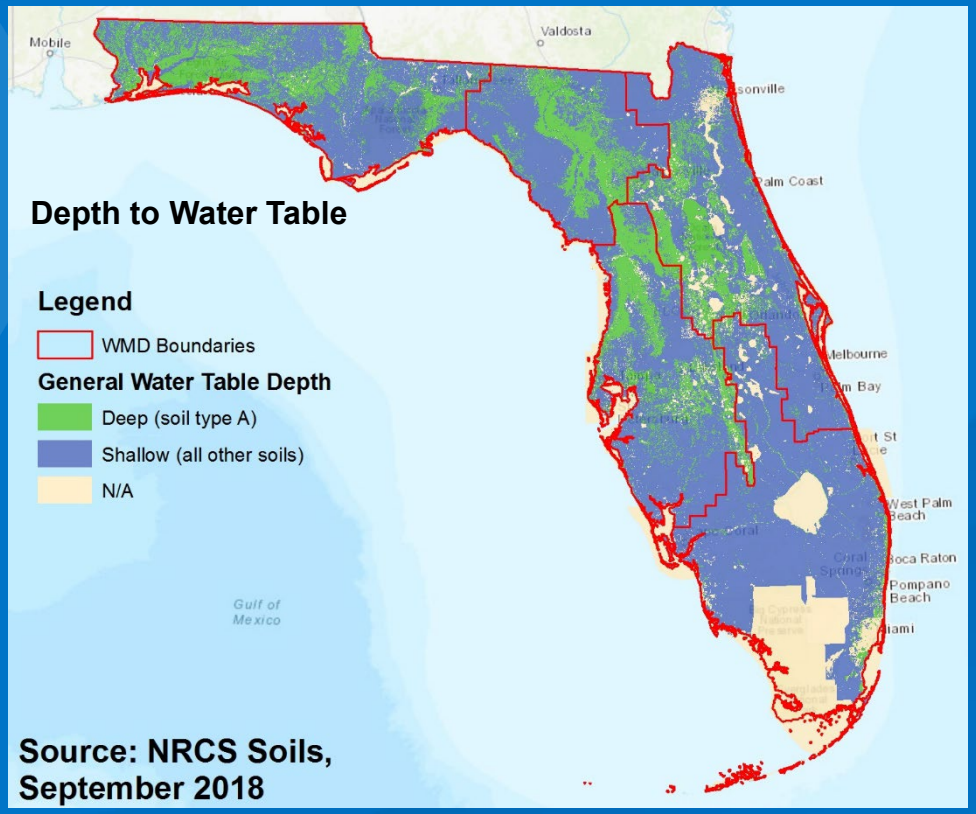
- Evidence of existing or anticipated stressed natural systems
- Evidence of increasing regulation complexity
- Evidence of increasing future water demand
- Sustaining natural systems and water supply sources
- Near-surface depth-to-water table



- Motivation or even necessitates the transition from single-regime models to integrated surface-groundwater hydrologic models


Water Resource Caution Areas
Credit: FDEP 2017,
Regional Water Supply Planning
Mobile
Valdosta
Tallahassee
Eglin Air Force Base
Apalachicola National Forest
Palm Coast
Melbourne
West Palm Beach
Boca Raton
Pompano Beach
Gulf of Mexico
Straits of Florida

Questions


Depth to Water Table
Legend
WMD Boundaries
General Water Table Depth
Deep (soil type A)
Shallow (all other soils)
N/A
Source: NRCS Soils,
September 2018
Mobile
Valdosta
Palm Coast
Melbourne
West Palm Beach
Boca Raton
Pompano Beach
Gulf of Mexico