Environmental Resilience for Agriculture —Water Management Challenges in Florida

January 2022 Round Table Meeting

Farm Foundation®

Remember: Round Table is off the record.

Jack Payne

MODERATOR

SENIOR VICE PRESIDENT OF AGRICULTURE AND NATURAL RESOURCES

UNIVERSITY OF FLORIDA, RETIRED

Tom MacVicar

MACVICAR CONSULTING

Kerry Kates

FLORIDA FRUIT & VEGETABLE ASSOCIATION (FFVA)

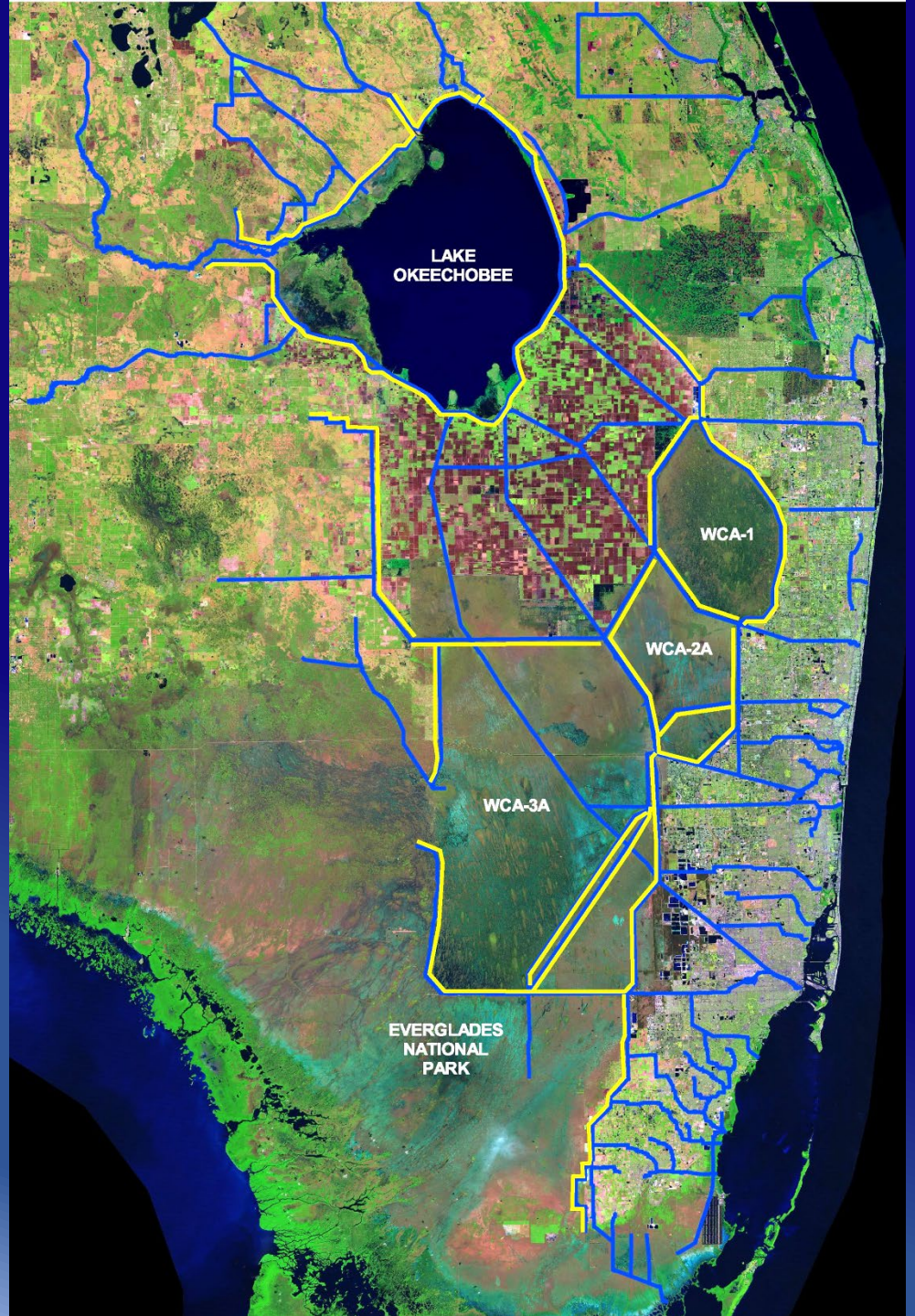
Kati Migliaccio

UNIVERSITY OF FLORIDA

Tom MacVicar

OWNER

MACVICAR CONSULTING

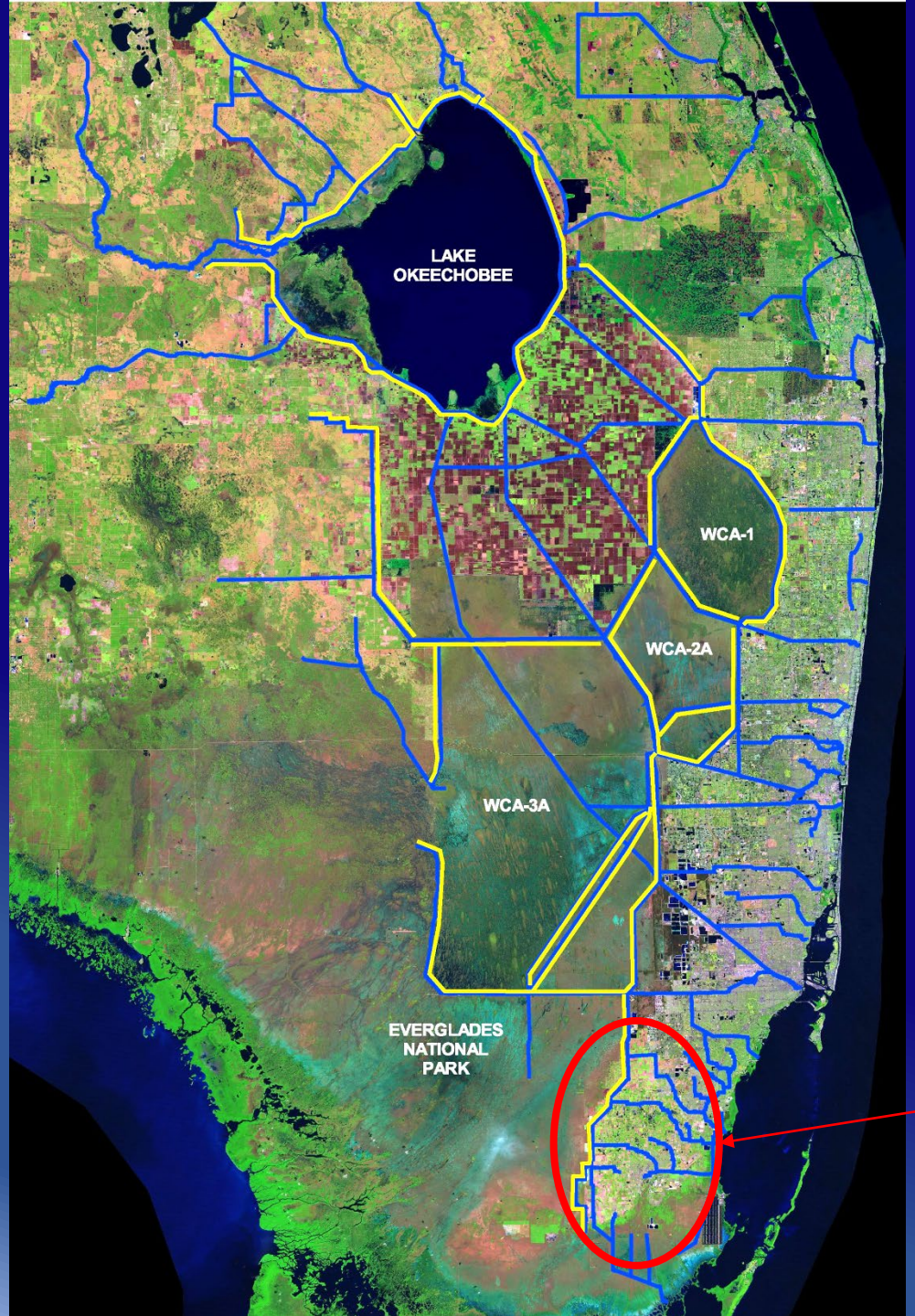


Living with Lake Okeechobee and the Everglades
An Agricultural Perspective

The Central And Southern Florida Project

- Conceived by the state in the 1930s,
- Approved by Congress in 1948
- Constructed by the Corps from 1950 to 1968
- Continuously modified by the Corps and the State for the last 50 years

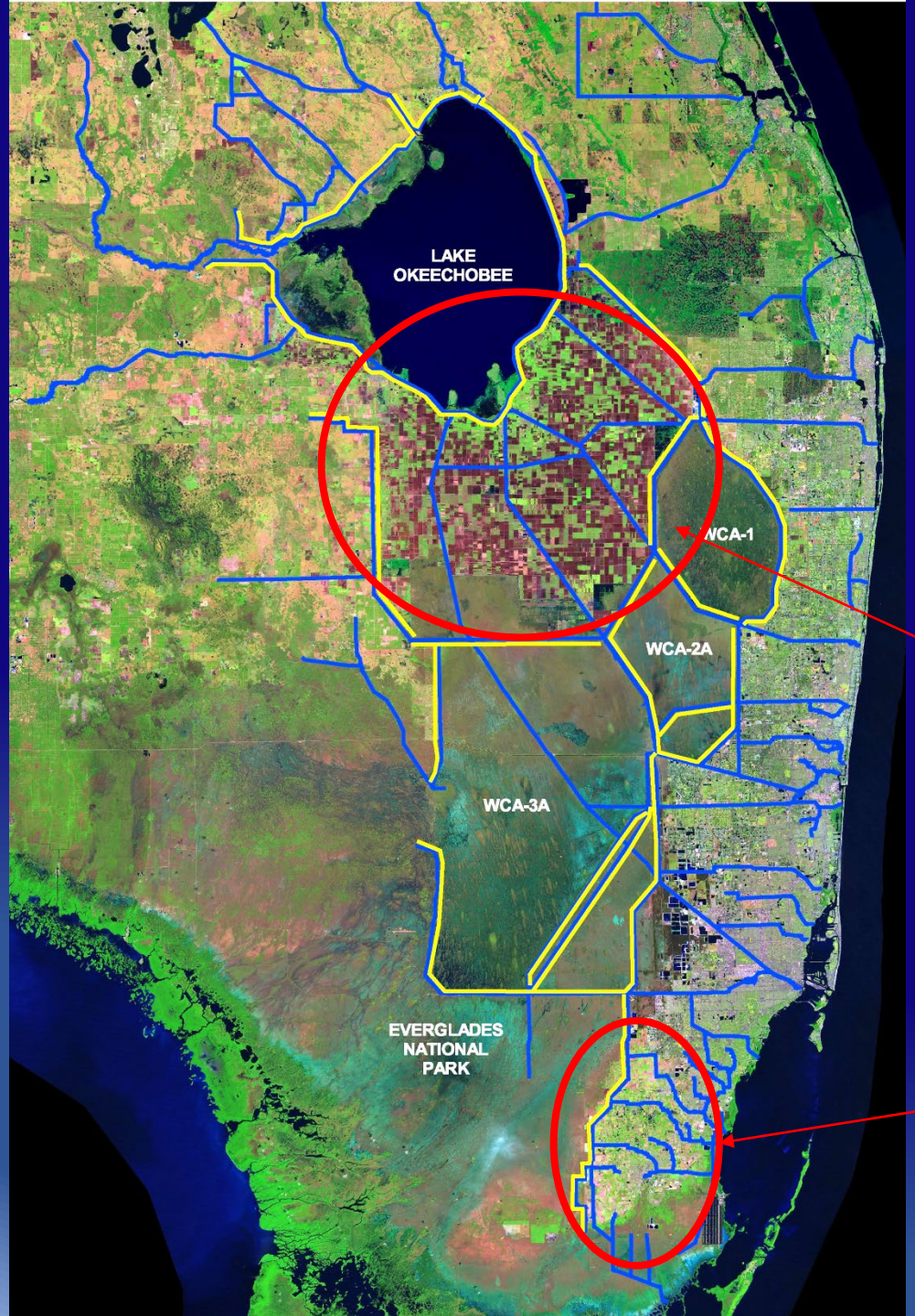
Living with Lake Okeechobee and the Everglades
An Agricultural Perspective



South Dade: Major fruit, vegetable and nursery production confronted by:

1. Two federal agendas, Everglades National Park, and NAFTA, and
2. Intense urbanization

Living with Lake Okeechobee and the Everglades
An Agricultural Perspective



The Everglades Agricultural Area: Most productive agricultural area east of the Mississippi:

1. Sugar cane, rice, winter vegetables
2. Very dynamic, diversified and innovative businesses,
3. Major employment center

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Living with Lake Okeechobee and the Everglades
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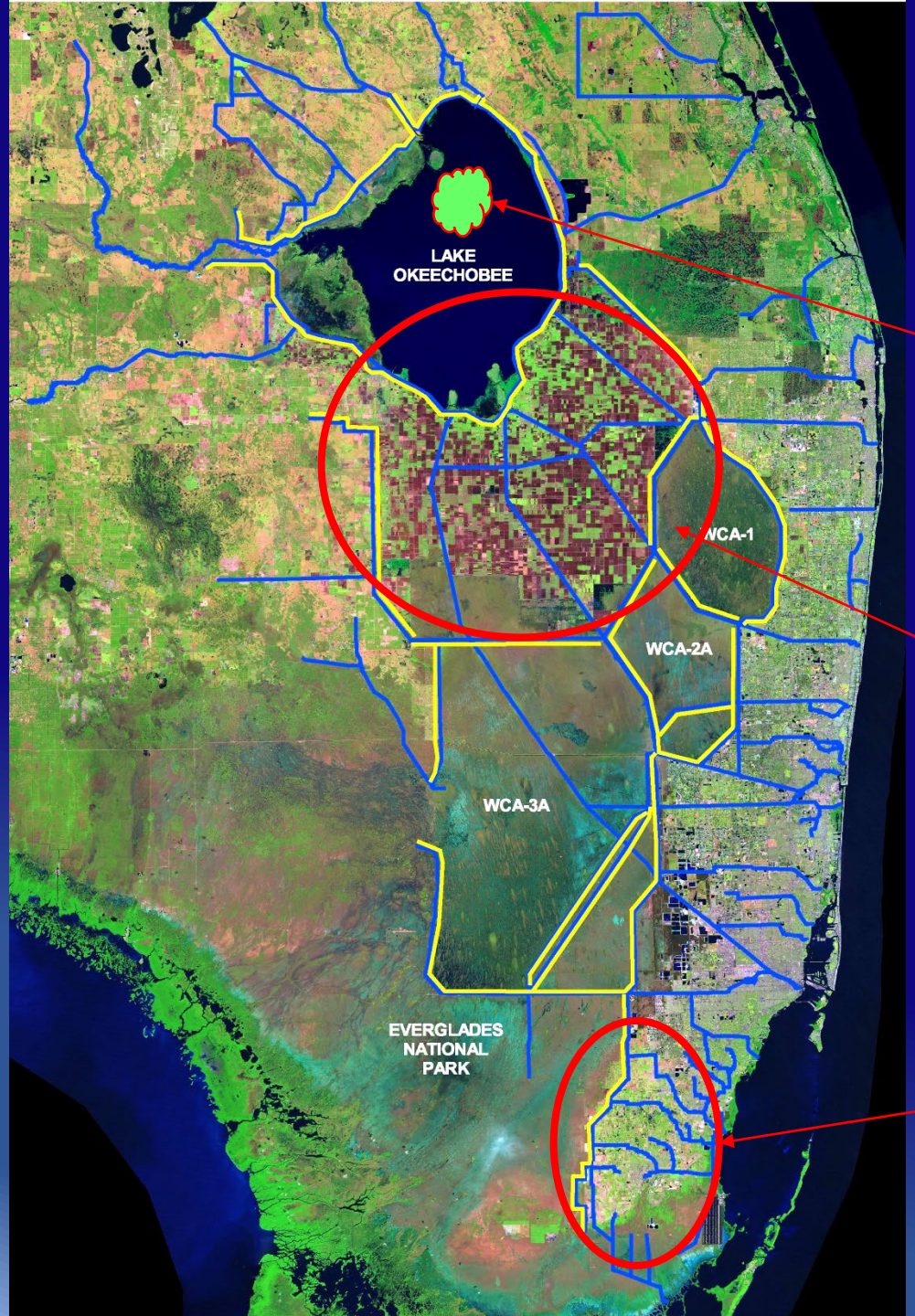

Lake Okeechobee: Impending Doom

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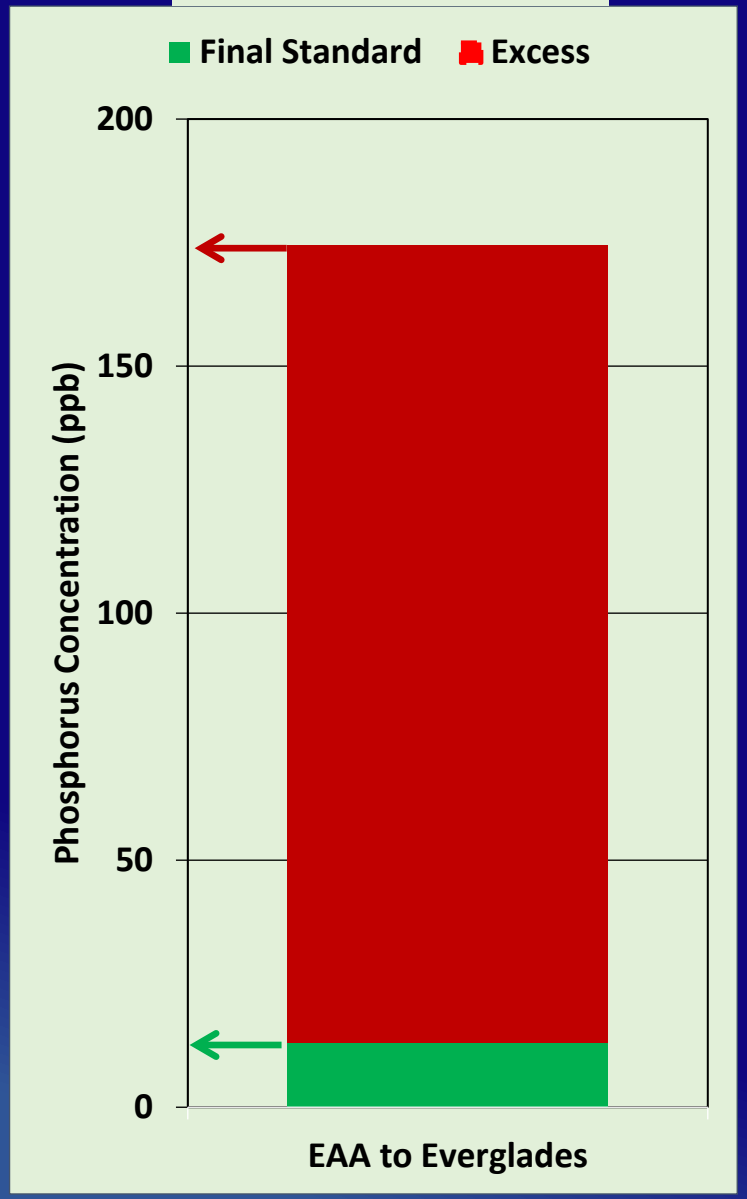
Farming in the EAA

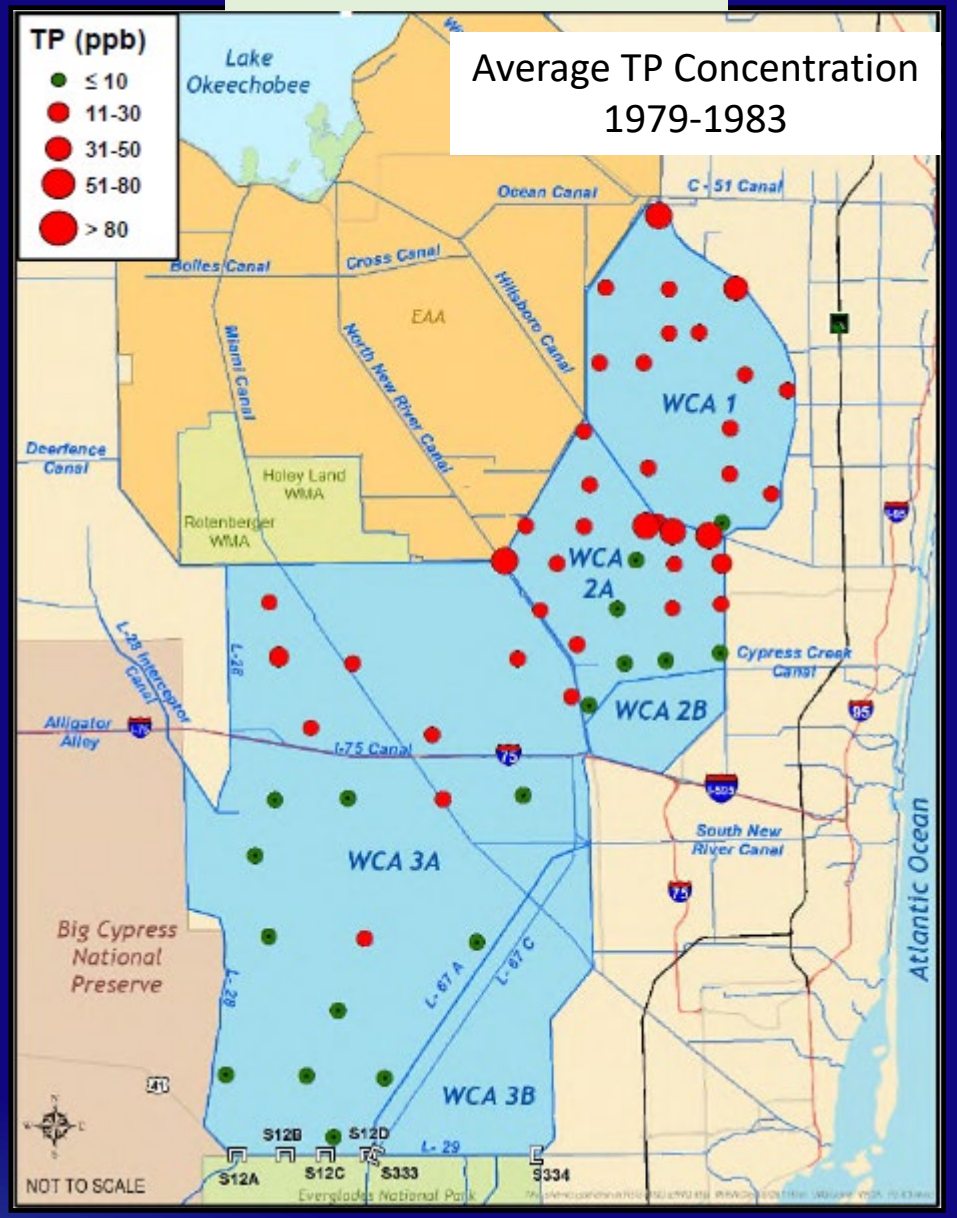
- Confronted with a Water Quality Challenge in the 1990s
- Litigation, Legislation, Partnership, Commitment, Follow Through

The situation before the Everglades Forever Act (1994)

Water Leaving the EAA



Situation in the Everglades



Everglades Forever Act
A Collaborative Approach That is Working

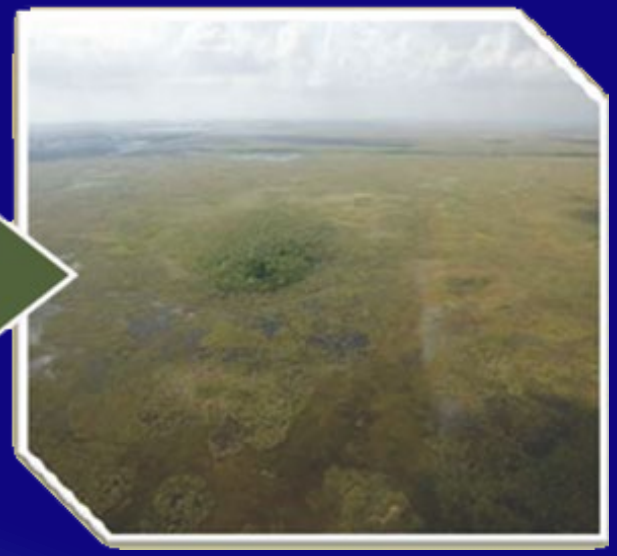
Landowner BMPs (Best Management Practices)

Paid for by Farmers

STAs

Public Works Projects
(cost shared with farmers)

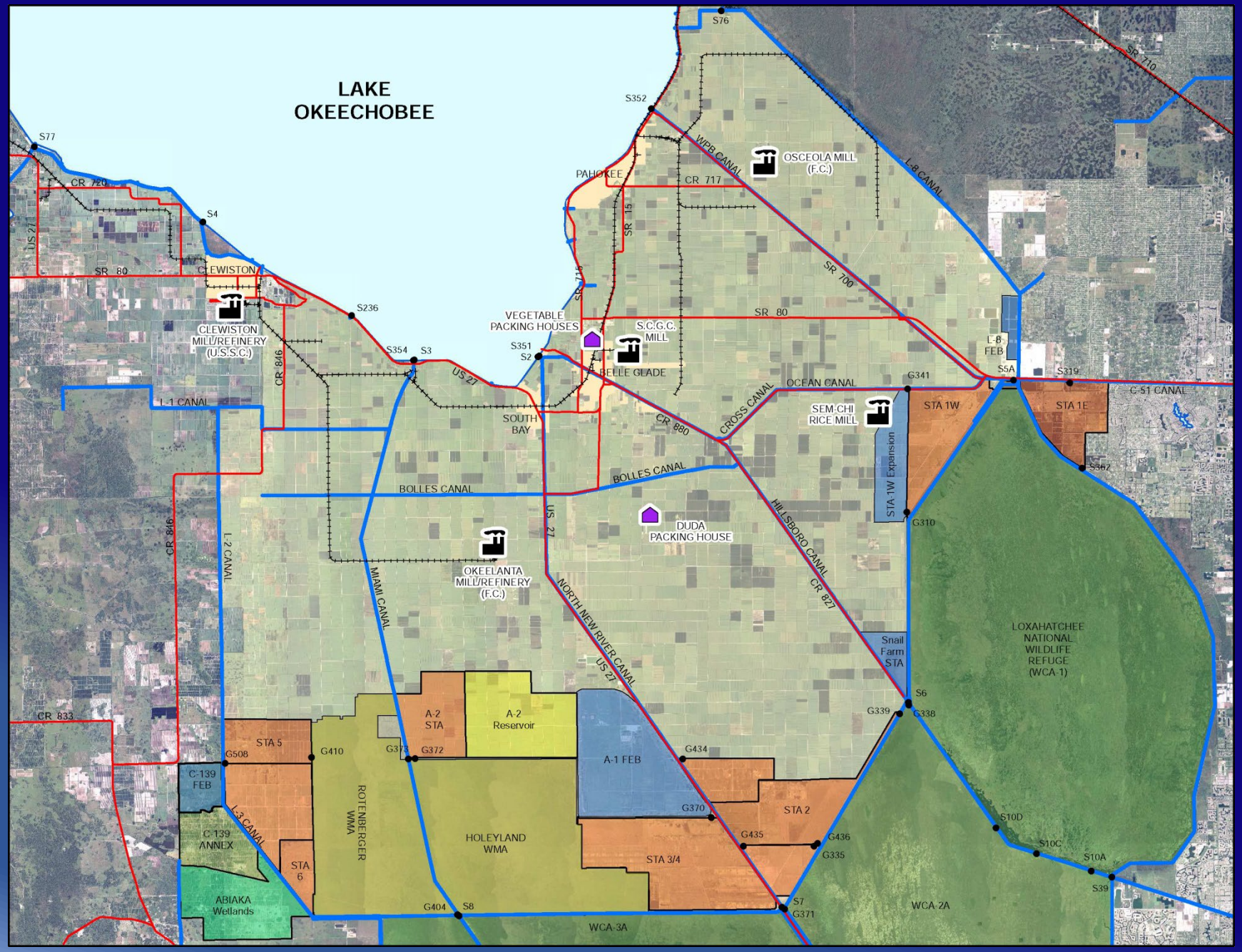
Everglades



Pristine Everglades

On- Farm Requirements Upstream of Significant Environmental Resources

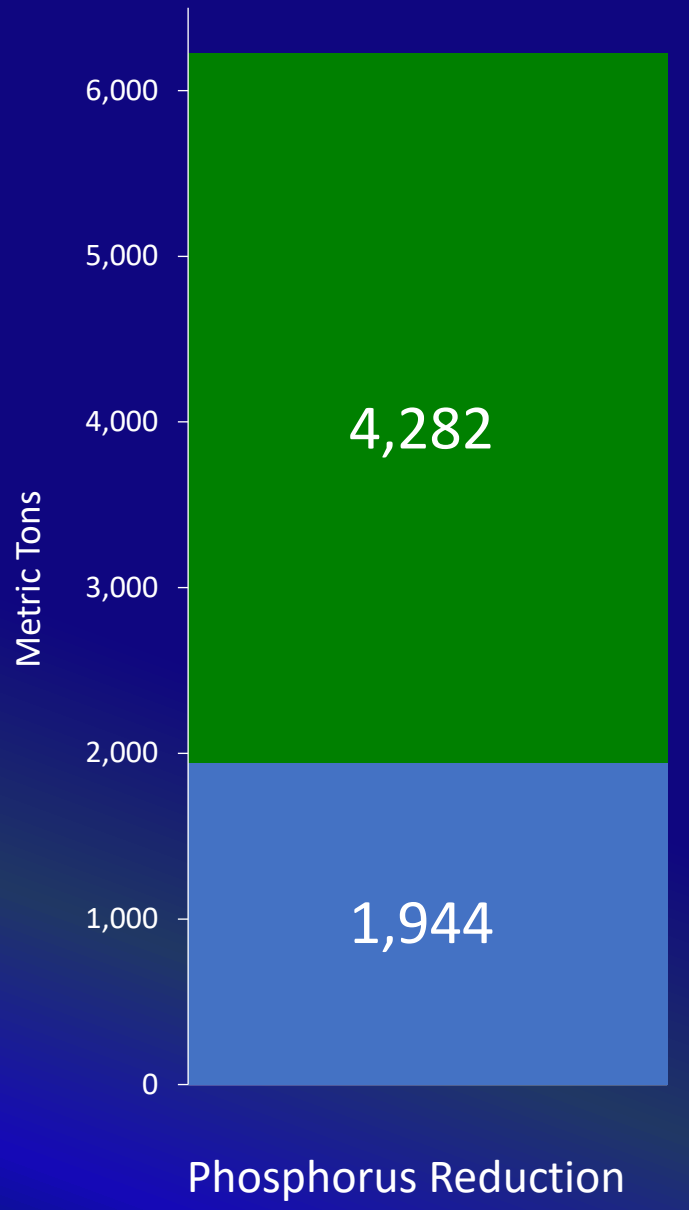
Water Quality Action Required to Comply with Law	Agricultural Watershed					
	EAA	Lake Okeechobee	Indian River Lagoon	Chesapeake Bay	Sacramento River Delta	Mississippi River
Mandatory Water Quality Permit for Every Farm.	Yes	Yes	Yes	Varies by State	Yes	No
Report rainfall and flow for every event.	Yes	No	No	No	No	No
Report the water quality of every runoff event.	Yes	No	No	No	No	No
Mandatory performance standard for Phosphorus Reduction.	Yes	No	No	No	No	No
Periodic audits of on-farm practices by agency personnel.	Yes	Yes	Yes	Varies by State	Yes	No
Annual per-acre tax	Yes	No	No	No	No	No



Since the Everglades Forever Act

- 123,000 acres of farmland dedicated to restoration
- Every Farm Under WQ Permit
- All farm runoff monitored and reported since 1996

Phosphorus Prevented from Entering the Everglades Since 1996



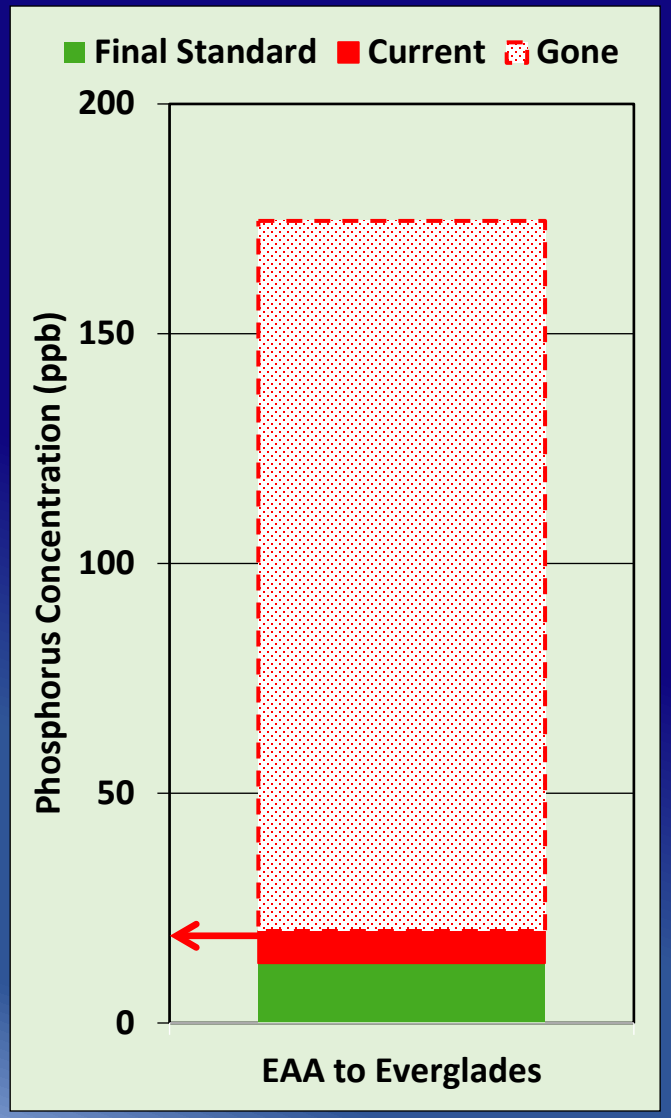
Amount removed by Agricultural Best Management Program, Paid for and Implemented 100% by Farmers

Amount Removed to Achieve Restoration Water Quality Targets through Stormwater Treatment Areas, paid for jointly by Farmers and SFWMD

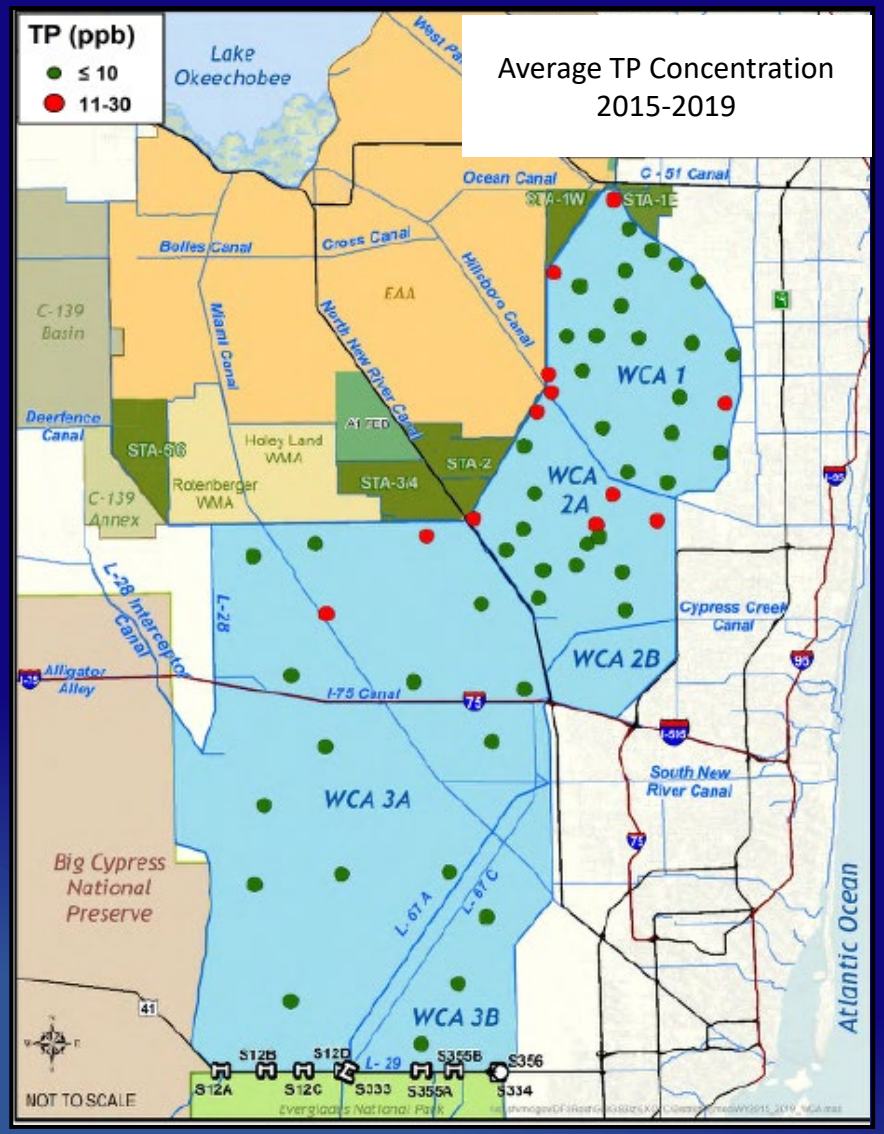
Note: All data from South Florida Water Management District

The Everglades Water Quality Challenge Has Been Met

Inflow TP concentration reduced from 170 to 20 ppb



Very few red dots remain and all large red dots have disappeared



The Current Challenge

- How do you manage Lake Okeechobee?
- Who gets to make that decision?
- Will Agriculture be at the table?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Kerry Kates

DIRECTOR OF WATER AND NATURAL RESOURCES

FLORIDA FRUIT AND VEGETABLE ASSOCIATION (FFVA)

Farm Foundation Round Table

Agricultural Water Supply & Water Quality Challenges

January 13th, 2022



Kerry Kates, P.E.
Director of Water & Natural Resources
Florida Fruit & Vegetable Association

Water Supply

Source: Southwest Florida Water Management District

Does Florida Have a Water Supply Problem?

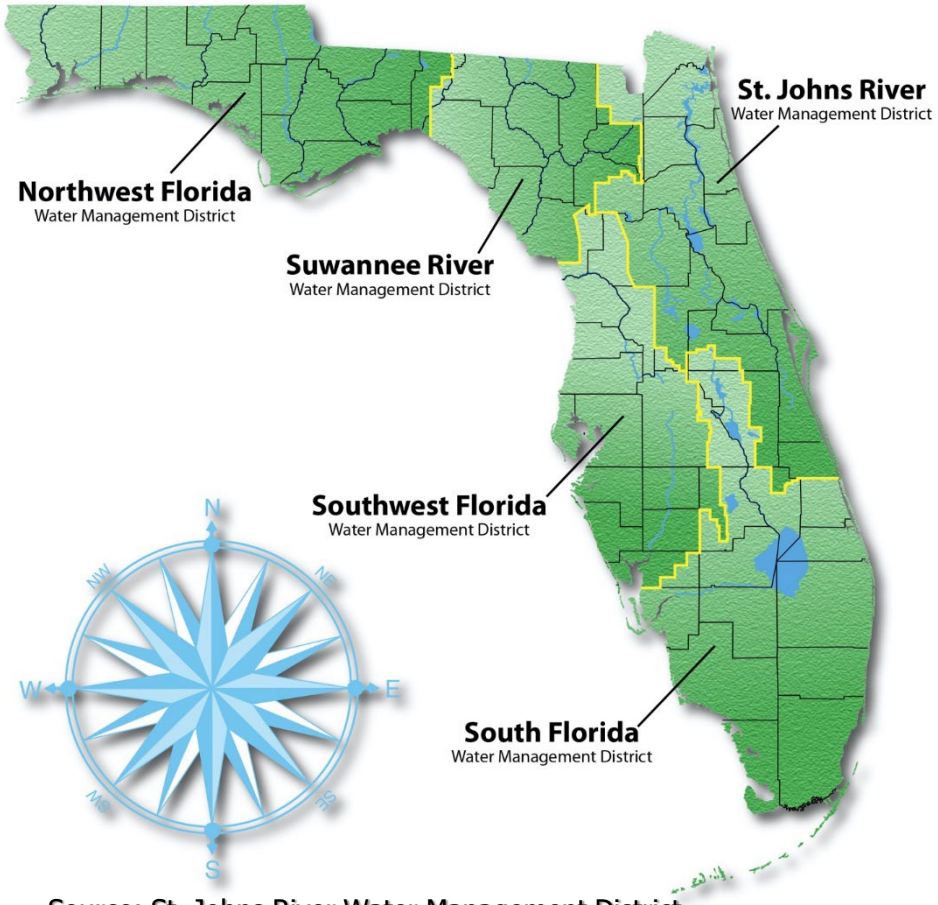
Source: Beverly Hill

Source: Miami Herald

Source: newfloridians.com

- Water is a prominent feature of Florida's landscape
  - Reinforces disconnect regarding water supply

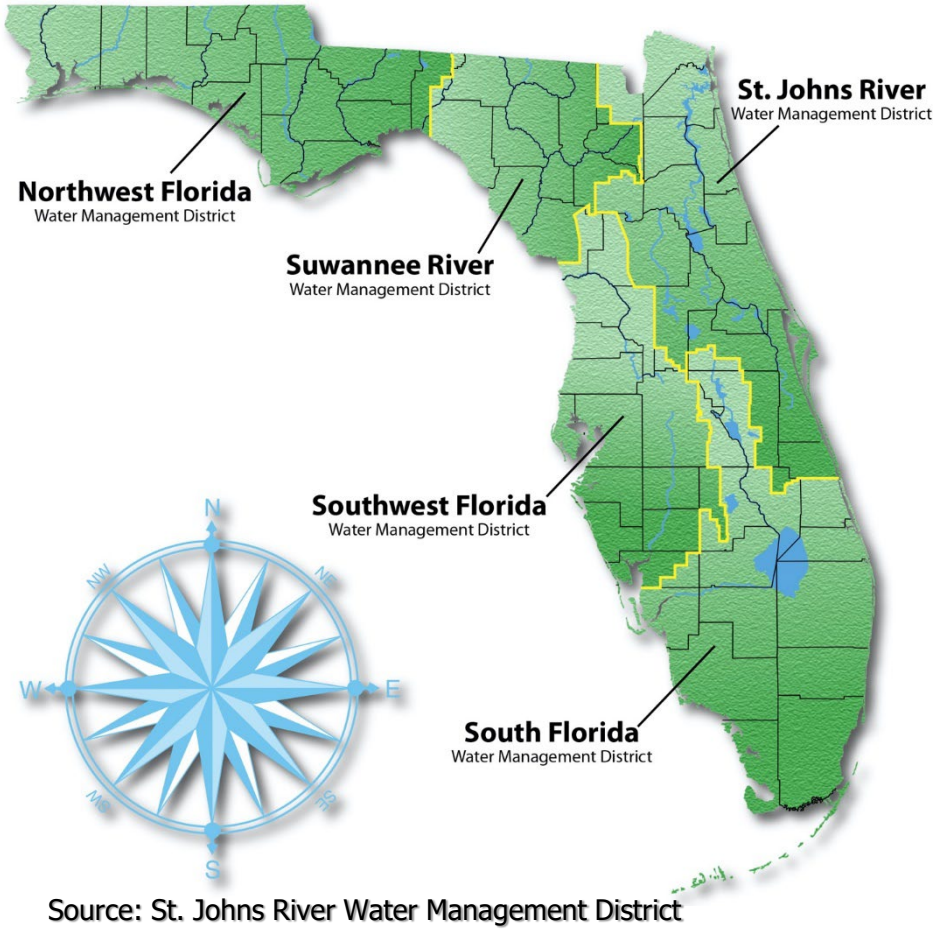
Water Supply



Source: St. Johns River Water Management District

- Five Water Management Districts
- Jurisdictional authority over allocation of water
- Water rights are defined by the consumptive use permit (CUP)
- Permitted for specific allocation (10-20 year)
- Water rights are not a separate property interest

Water Supply



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- Water rights are defined by the consumptive use permit (CUP)
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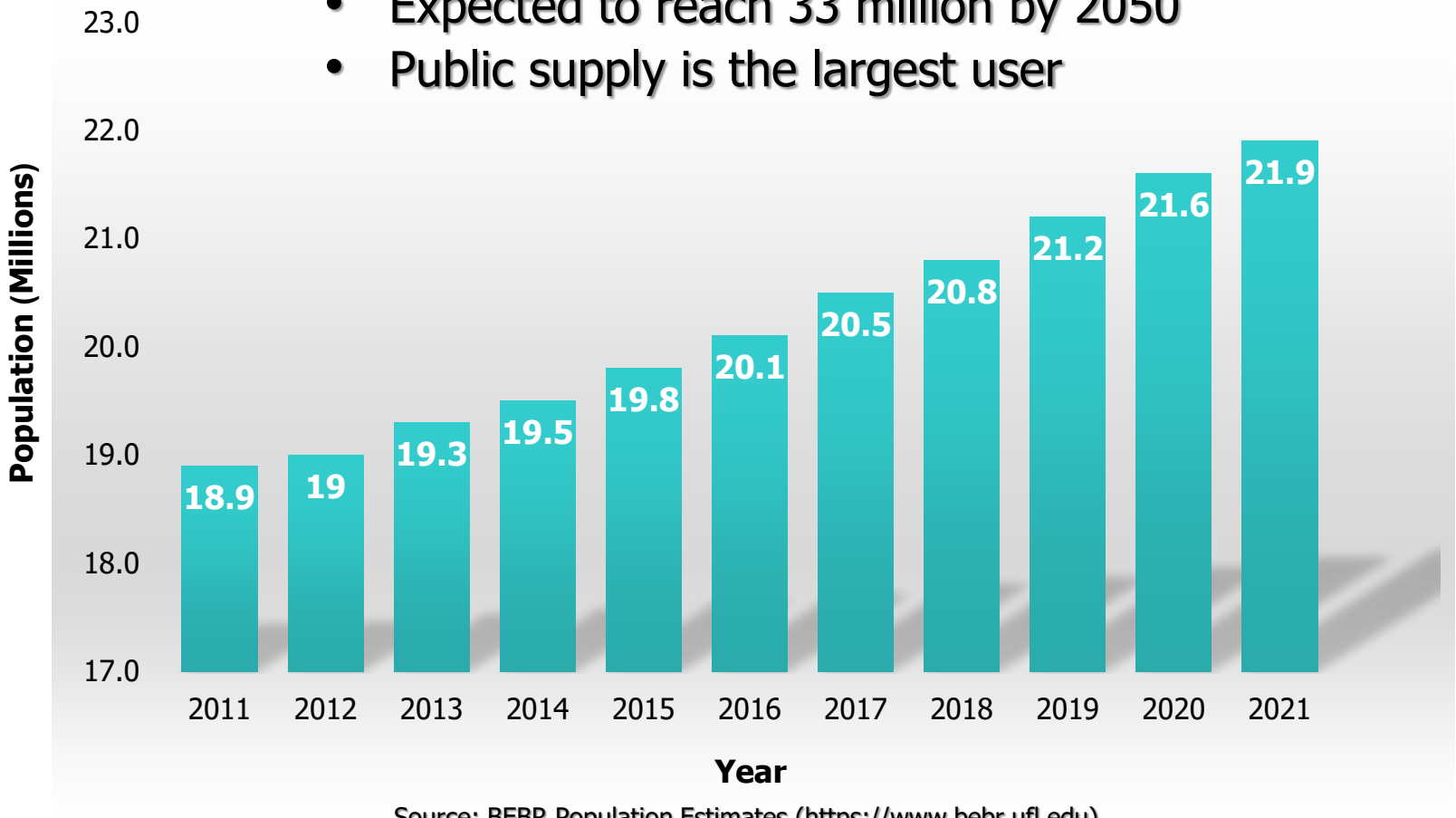
- Water rights are not a separate property interest
- **<u>Need an additional 1 billion gallons of water per day by 2040</u>**

Florida's Population Growth

- Expected to reach 33 million by 2050
- Public supply is the largest user



Source: BEBR Population Estimates (https://www.bebr.ufl.edu)

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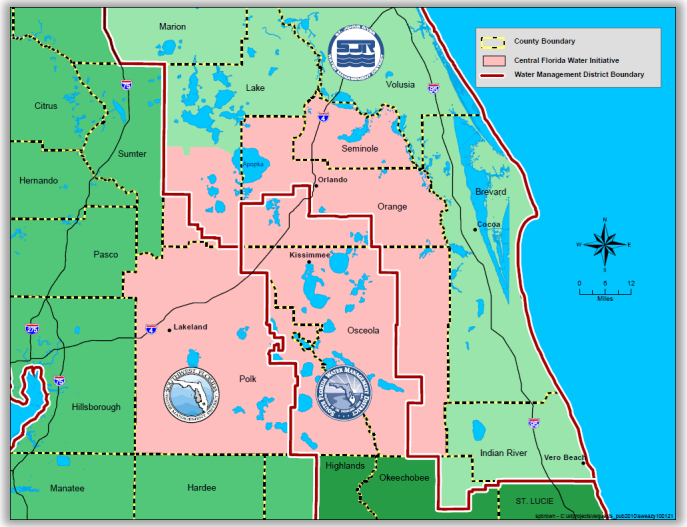

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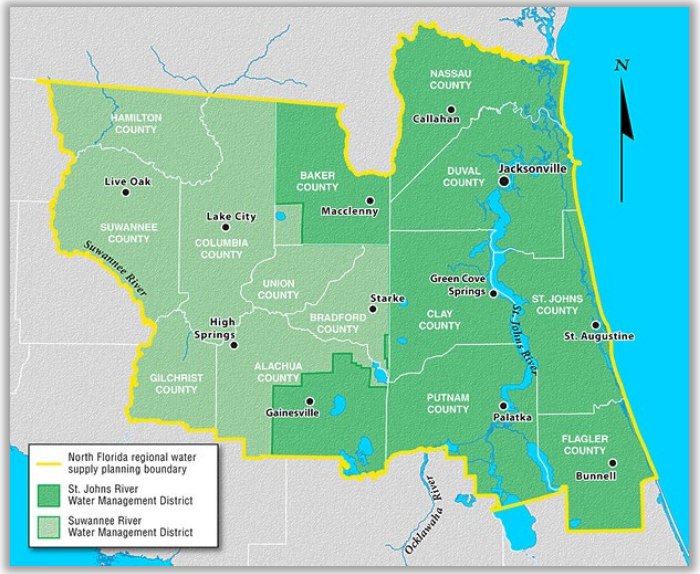

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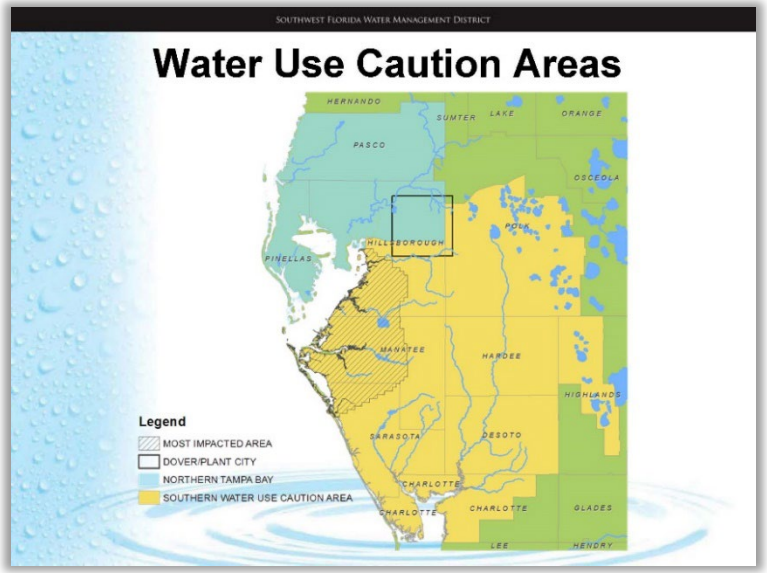
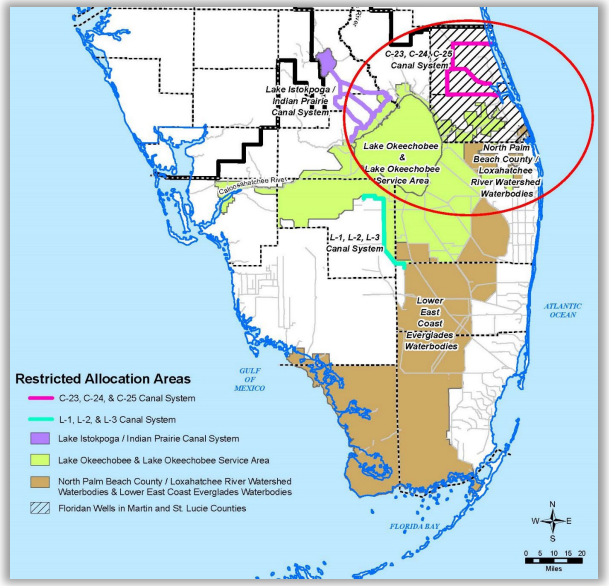


Source: Southwest Florida Water Management District



Source: South Florida Water Management District

Restricted Water Use Availability

- Addresses constraints & environmental impacts
  - Lowered aquifer/lake levels & reduced river/spring flows
  - Deterioration of wetlands
  - Saltwater intrusion
- Increased competition/less availability
- More onerous permitting criteria
- Continuous improvement in efficiency

Water Supply

What Are the Options?

- Heavy reliance on technology & cost-share funding
  - Irrigation efficiency improvements
  - Soil moisture probes
  - Weather stations
  - Tailwater recovery (where appropriate)
- Strategic partnerships

Florida Potable Reuse Commission

Framework for the Implementation of Potable Reuse in Florida

- Develop science-based recommendations
- Protect public health and the environment
- Provide a regulatory path for potable reuse projects in Florida

Consensus based effort by water professionals and a **diverse stakeholder group** to identify and address technical, regulatory, and implementation barriers to potable reuse in Florida.

Develop a **framework document** for potable reuse implementation in Florida to **augment** future **water supply** and support **water quality** initiatives.

Source: WateReuse Florida

OneWaterFlorida.org

Source: Florida Department of Environmental Protection

Engagement With Partners. . .

RETAILERS

Walmart Seeks More Sustainability Action from Suppliers

Retailer looks to get more small and midsize producers making progress against goals

By Christine LaFave Grace on Dec. 08, 2021

Get great content like this in your inbox. Subscribe

Photograph: Shutterstock

Walmart is aiming to prompt more action on climate change from businesses throughout its supply chain—including small and midsize suppliers—with the launch of new sustainability resources and incentives.

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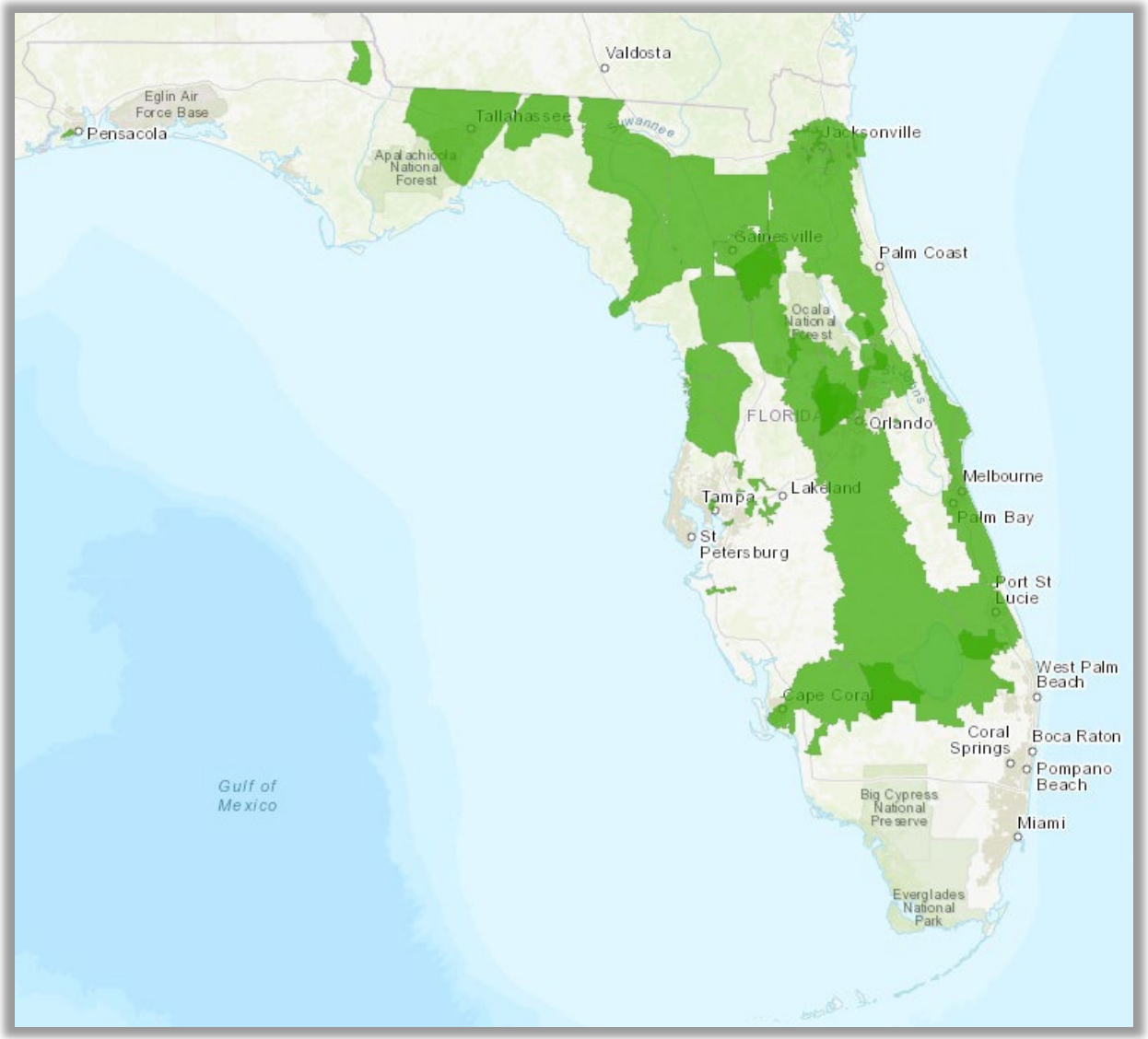
Water Quality

Source: South Florida Water Management District

Florida Department of Environmental Protection



Source: Florida Department of Environmental Protection

- Basin management action plans (BMAPs) address areas of the state impaired for water quality
- BMAPs are the blueprint to achieve reductions in identified pollutants
- Agricultural operations must enroll in the Florida Dept. of Agriculture and Consumer Services' (FDACS) Best Management Practices (BMP) program *or* conduct water-quality monitoring
  - State law grants a ***presumption of compliance*** with water quality standards to enrolled agricultural producers



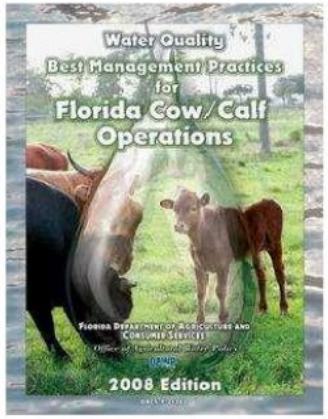


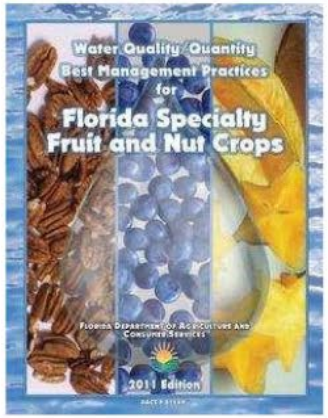

Water Quality

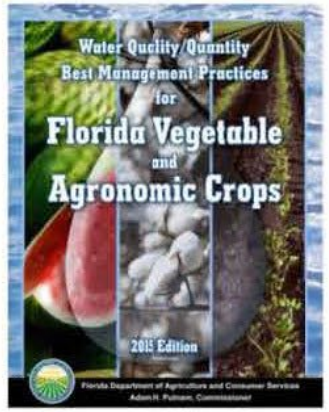
FDACS' BMP Program

- FDACS' BMPs are designed to benefit water quality while maintaining or even enhancing agricultural production
- Examples of common BMPs include:
  - Laser leveling of farm
  - Banded fertilizer applications (precision agriculture)
  - Cover crops
  - Buffers between water bodies and fertilized areas
  - Soil and crop tissue testing

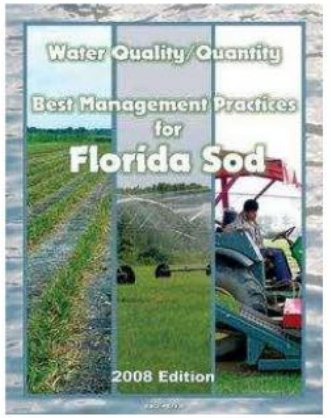
BMP Manuals


Water Quality
Best Management Practices
for
Florida Cow/Calf
Operations
2008 Edition


Water Quality/Quantity
Best Management Practices
for
Florida Specialty
Fruit and Nut Crops
2011 Edition


Water Quality/Quantity
Best Management Practices
for
Florida Vegetable
and
Agronomic Crops
2015 Edition


Water Quality/Quantity
Best Management Practices
for
Florida Equine Operations
2011 Edition


Water Quality/Quantity
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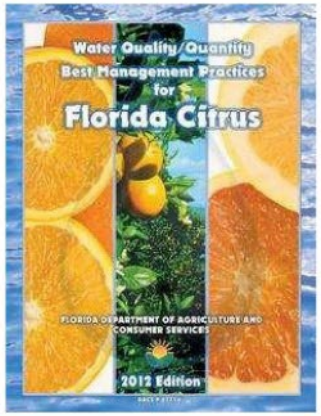
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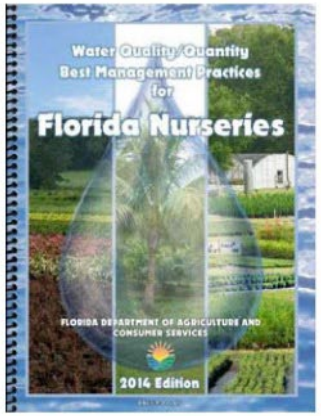
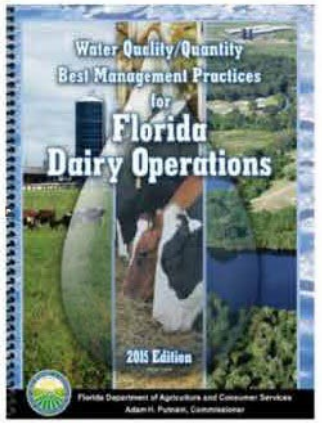
Florida Citrus
2012 Edition


Water Quality/Quantity
Best Management Practices
for
Florida Nurseries
2014 Edition


Water Quality/Quantity
Best Management Practices
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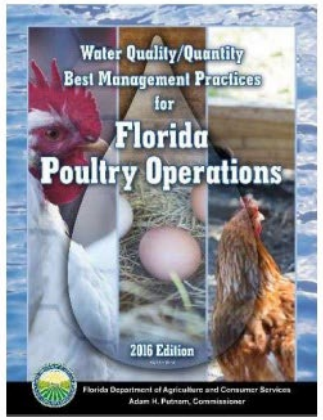
Florida
Dairy Operations
2015 Edition


Water Quality/Quantity
Best Management Practices
for
Florida
Poultry Operations
2016 Edition

ADAM H. PUTNAM
COMMISSIONER

Florida Department of Agriculture and Consumer Services
Office of Agricultural Water Policy

FDACS-OAWP
Mayo Building
407 S. Calhoun St. MS-E1
Tallahassee, FL 32399

NOTICE OF INTENT TO IMPLEMENT
WATER QUALITY / QUANTITY BMPs FOR FLORIDA VEGETABLE AND AGRONOMIC CROPS (2015)

Rule 5M-8.002, F.A.C.

- **Complete all sections of the Notice of Intent** (NOI). The NOI may list multiple properties only if they are within the same county, they are owned or leased by the same person or entity, and the same BMPs identified on the checklist are applicable to them.
- Submit the **NOI** and the **BMP Checklist**, to the Florida Department of Agriculture and Consumer Services (FDACS), at the address below.
- **Keep a copy of the NOI and the BMP checklist in your files** as part of your BMP record keeping.

You can visit https://www.flrules.org/gateway/ChapterHome.asp?Chapter=5m-8 to obtain an electronic version of this NOI form.

If you would like assistance in completing this NOI form or the BMP Checklist, or with implementing BMPs, contact FDACS staff at (850) 617-1727 or AgBmpHelp@freshfromflorida.com.

Mail this completed form and the BMP Checklist to: FDACS Office of Agricultural Water Policy, Mayo Building, 407 S. Calhoun Street, MS-E1, Tallahassee, Florida 32399

Person To Contact

Name: _____

Business Relationship to Landowner/Leaseholder: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone: _____ FAX: _____

Email: _____

☐ **Landowner** or ☐ **Leaseholder Information** *(check all that apply)*

NOTE: If the Landowner/Leaseholder information is the same as the Contact Information listed above, please check: ☐ **Same as above**. If not, complete the contact information below.

Name: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone: _____ FAX: _____

Email: _____

APPENDIX 7: EXAMPLE RECORD-KEEPING FORMS

Keeping records aids in operating and maintaining BMPs. To reiterate, BMPs that have a pencil icon require records to be kept for a minimum of five years.

You may maintain your records as hard copies or in an electronic format, depending on your preference. Below is an example of a set of record-keeping forms. You may use these tables, develop your own, or choose commercially available record-keeping software suited to your operation.

Soil Sample Records (Retain all Lab Results)

Sample Date	Field Location	# of Samples	Name of Lab	Records Location

Tissue Sample Records (Retain all Lab Results)

Sample Date	Field Location	# of Samples	Name of Lab	Records Location

Fertilization Records (Retain all Receipts)

Field Name					Production Acreage		Year	
Brand	Application method	Grade $N\text{-}P_2O_5\text{-}K_2O$	% CRN	% CRP_2O_5	Amount of fertilizer applied (lbs/total production acreage)	Amount of fertilizer applied (lbs/acre)	Total N applied (lbs/acre)	Total P_2O_5 applied (lbs/acre)

Rainfall (inches)

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.

Well Records

Location	Year Constructed	Constructed By	Last Modified	Modified By	Records Location

FFVA

Water Quality

Challenges for BMP Enrollees:

- BMPs could evolve to become more costly and challenging to implement (i.e. edge of farm stormwater treatment)
- Must follow UF/IFAS recommended fertilizer rates
  - IFAS only intended their rates to be guidelines
  - Research has not been able to keep up with new varietals and considerations such as disease and variability in site conditions
  - Currently working with our partners at IFAS and our legislators to devise a path forward

Thank You

Kerry Kates, P.E.
Director of Water & Natural Resources
Florida Fruit & Vegetable Association

Kerry.Kates@FFVA.com
407-489-3157


Farm
Foundation®

Kati Migliaccio

CHAIR AND PROFESSOR,
AGRICULTURAL AND BIOLOGICAL ENGINEERING

UNIVERSITY OF FLORIDA

UF IFAS
UNIVERSITY of FLORIDA

Water Management Solutions

FOR THE
#GATORGOOD

Farm Foundation, January 13, 2021

Kati Migliaccio, PhD PE
Agricultural and Biological Engineering

Artificial Intelligence at UF

$70 M NVIDIA-UF partnership

- Nation's fastest supercomputer in higher education (3rd globally)
- UF hiring 100+ faculty in AI; among largest faculty concentrations in AI
- Research, teaching, workforce readiness, equity and inclusion

UF Institute of Food and Agricultural Sciences (IFAS) Hires

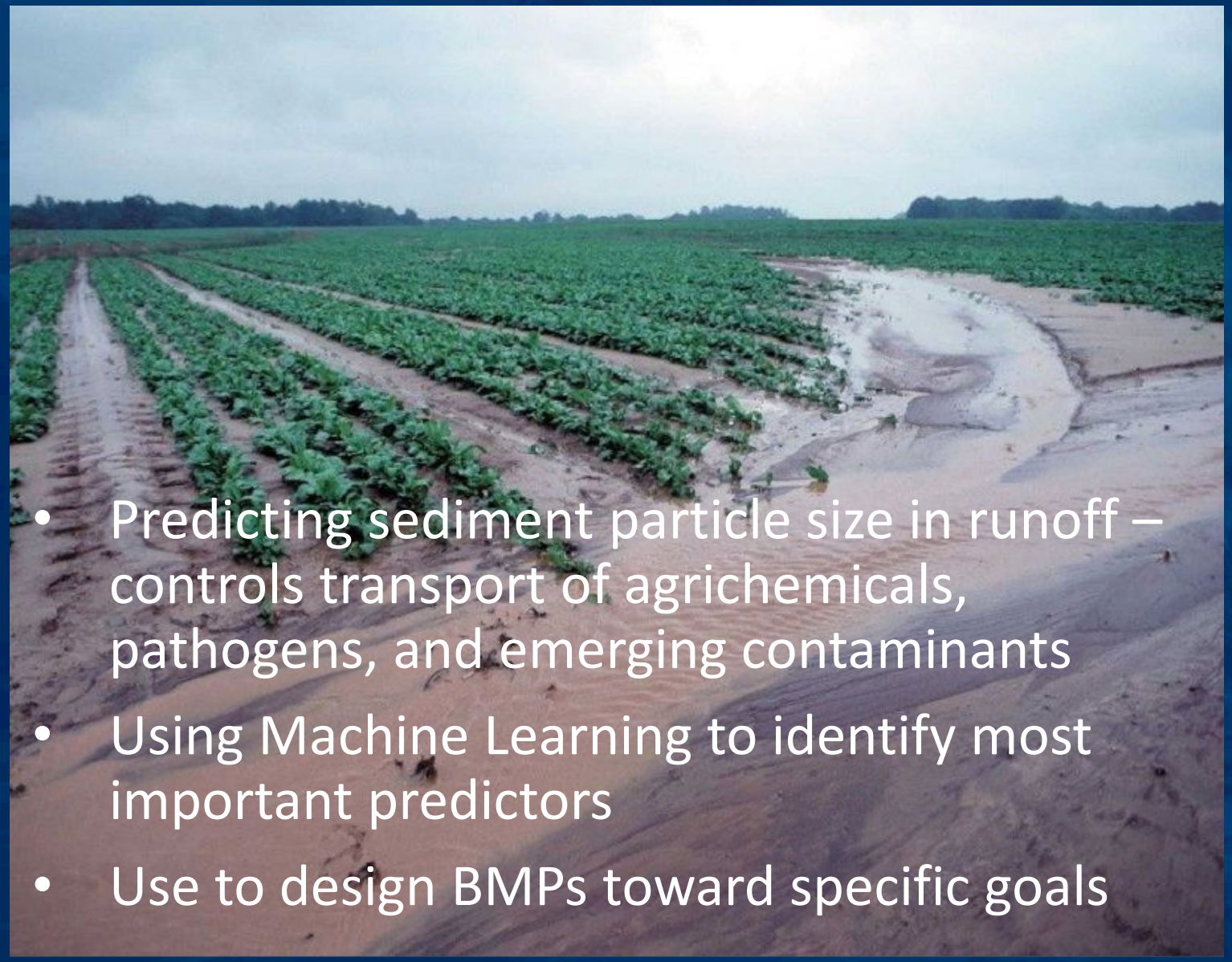
- 10 Core Areas of Strength identified: (1) Accelerated Precision Breeding, (2) Robotics and Precision Agriculture, (3) Omics, (4) Food System Resilience, (5) Environmental Systems, (6) Invasion Science, (7) Human Health, (8) AI Methods and Tools, (9) Hidden Connections and Principles, and (10) Education and Communication
- IFAS hiring in key areas (13 AI core faculty, 7 AI-relevant)

AI and Florida Ag

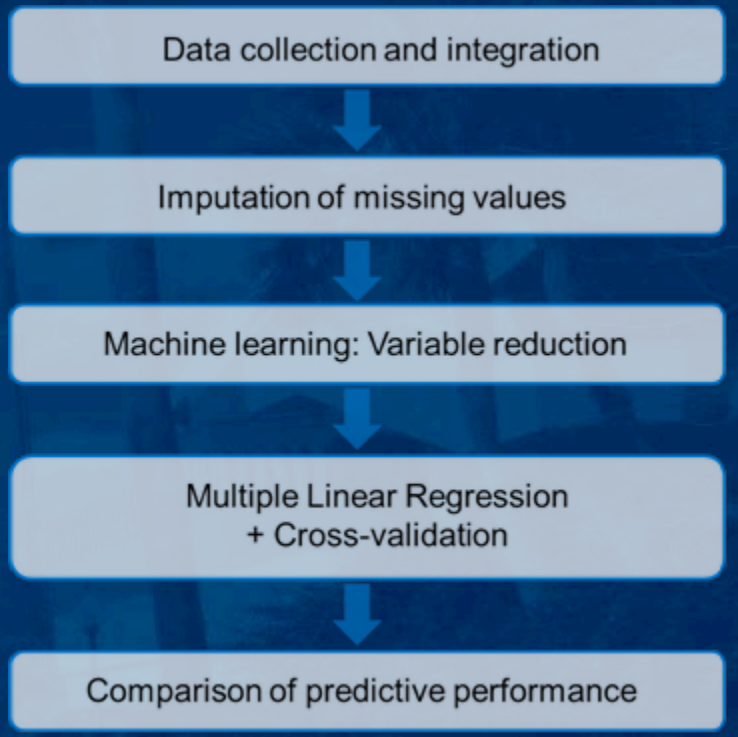
- Labor for agriculture, AI and automation/robotics
- Number of new invasive species, faster identification and tracking, treatment
- Compete with other markets
- Find ‘better’ solutions that use less resources
- Reduce health related injuries/illness in agricultural work
- Create new market flow paths
- Reduce waste
- Adapt and be resilience to changes in the system

UF/IFAS Research Example Programs

AI, sediment transport, and BMPs



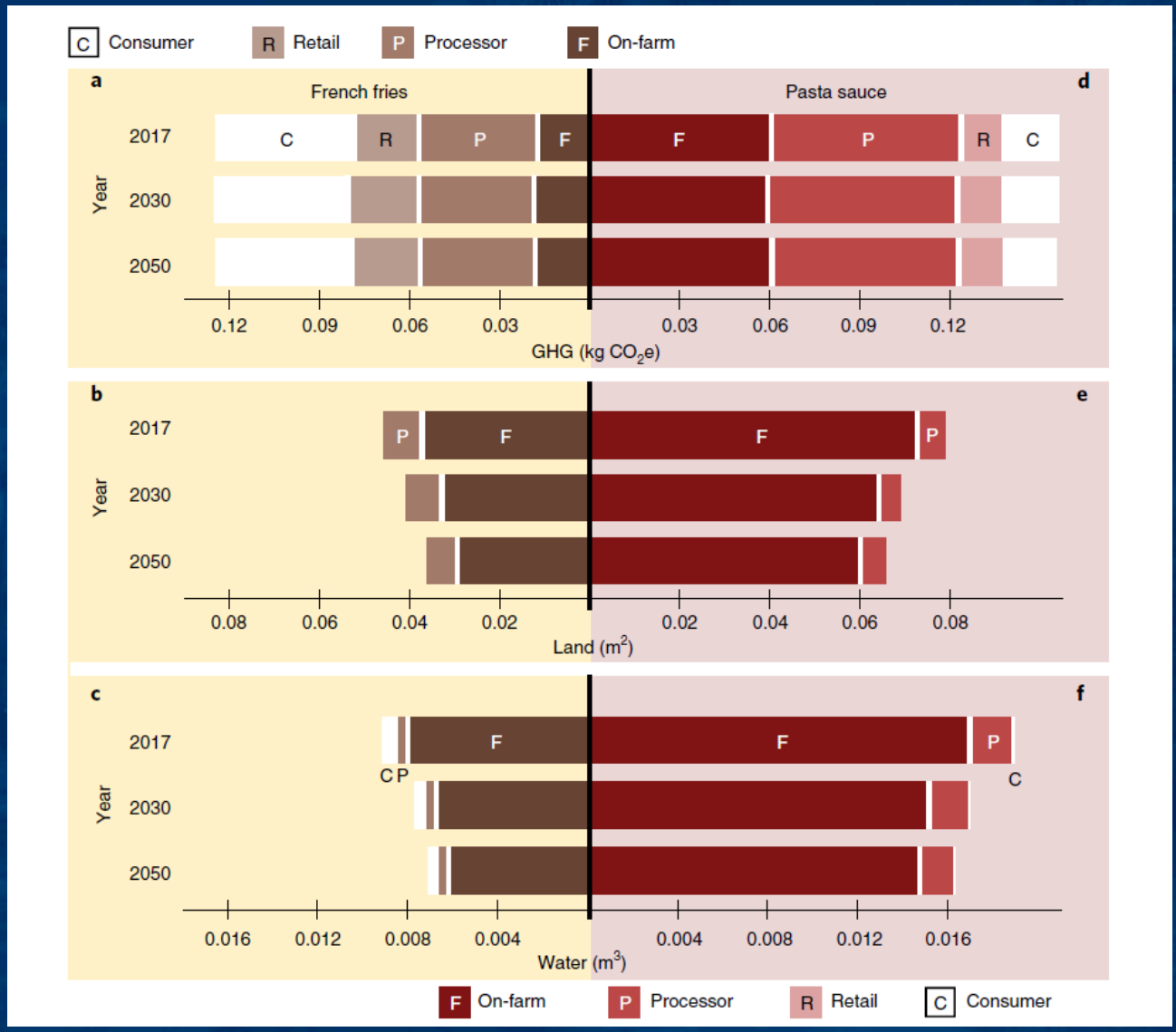
- Predicting sediment particle size in runoff – controls transport of agrichemicals, pathogens, and emerging contaminants
- Using Machine Learning to identify most important predictors
- Use to design BMPs toward specific goals



Rafael Munoz-Carpena
UF/IFAS ABE

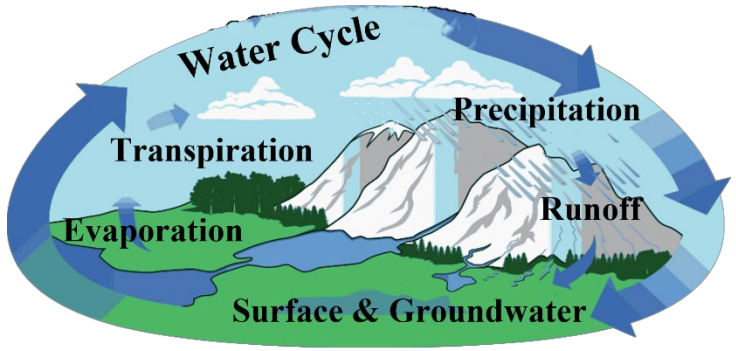
Climate change and crop production

- Integrated modeling – including climate, crop, economic, and life cycle assessment modeling
- Adapt to changing climate and resource availability



Gustafson et al. https://doi.org/10.1038/s43016-021-00383-w

1 Trees are essential to the water cycle

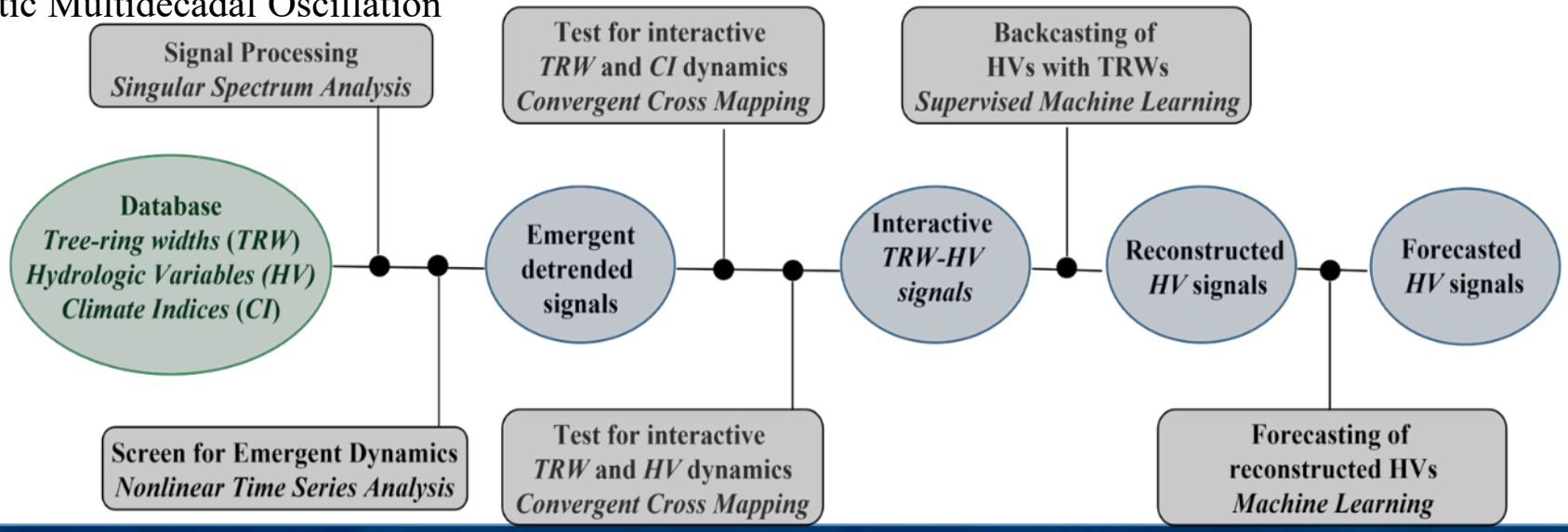


2 Annual growth of trees measured by tree-ring widths (TRWs) preserve natural records of water-cycle components and climatic conditions

Wider TRWs reflect favorable growing conditions driven by the most limiting resources

TRWs can be proxy records to hindcast conditions centuries before human instrumentation and increase information available to water managers on past variability in their regions to understand current change conditions

3 Applying cutting-edge AI to use TRWs in different regions of the US (including Florida) to detect and forecast patterns in hydroclimatic extremes (e.g., floods and droughts), and link to climatic drivers including El-Niño-Southern-Oscillation (ENSO) and the Atlantic Multidecadal Oscillation



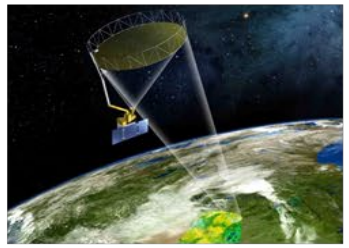
Dr. Ray Huffaker
UF/IFAS ABE

Integrating NASA Earth Systems Data into Water Supply Decision-Making Tools

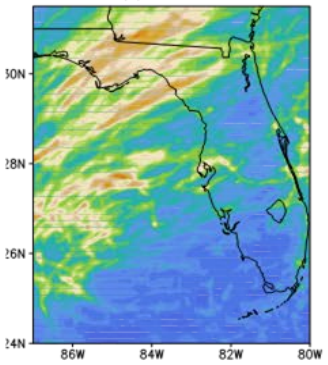
Florida Water & Climate Alliance

www.floridaWCA.org

Remotely Sensed NASA data



Regional Seasonal Climate Forecasts and Hydrologic Models



Water Management Decisions

Goals :

- Increase the regional relevance and usability of climate and sea level rise models for the specific needs of water suppliers and resources managers in Florida.
- Develop decision support systems which use real-time remotely sensed NASA data, climate and hydrologic models to improve water storage, allocation and supply decisions

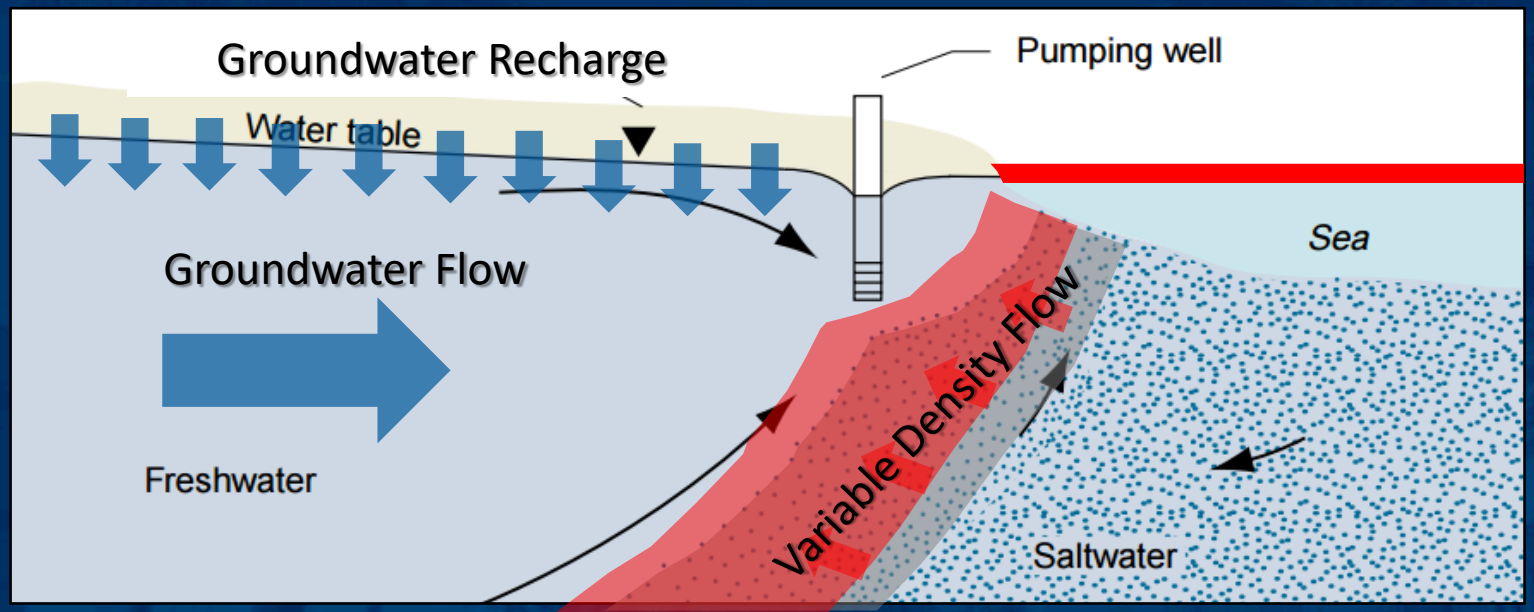
Wendy Graham
Chris Martinez
Jasmeet Judge

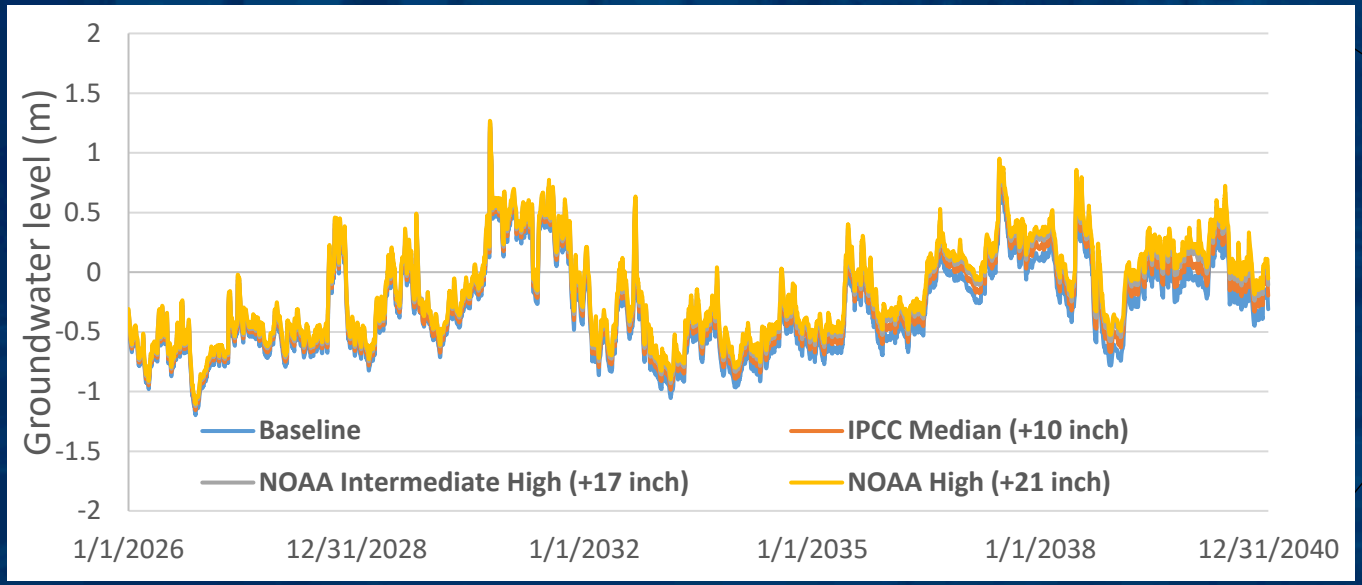
Academic Partners: UF Water Institute, FSU.
Utilities: Tampa Bay Water, Peace River Manasota Water, OUC, GRU, Broward County, Miami-Dade County, Palm Beach County.
Water Management Districts: SFWMD, SWFWMD, SJRWMD, SRWMD.

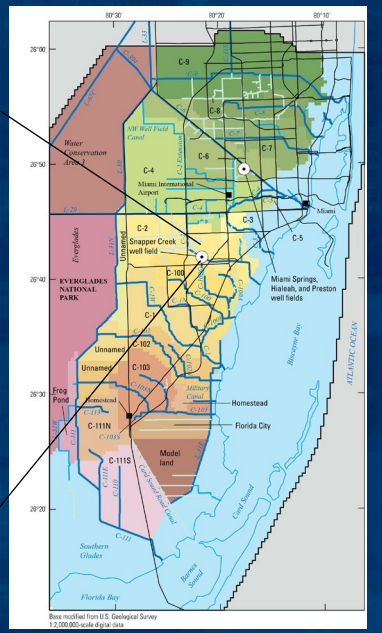
NOAA SARP Sectoral Applications Research Program

NASA

Sea Level Rise Impact Modeling







Young Gu Her
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Initiative toward circular food and agricultural systems

- A systematic approach to economic development that benefits businesses, society, and the environment
- Elements: 1) design out waste and pollution; 2) keep products & materials in use, (reuse, share, repair, refurbish, remanufacture, recycle); 3) regenerate natural systems; 4) increase productivity of resource use; and 5) provide economic benefits to those involved

Future

- New AI resources provide additional tools to re-think how we use our resources to produce food
- Growing initiatives toward circularity of systems that remove wastes and create new uses of by-products
- Changes is climate and groundwater will impact Florida agriculture and others, we can predict and prepare


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Question and Answer for Session 3&4

How to Pose a Question:

- Approach a mic stand
- If you prefer to remain seated, raise your hand and a staff member will bring a mic to you
- Or use the “Ask a Question” function on the Round Table app

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