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Shaping the Future

Impacts to Water Resources in N.E. Florida from Groundwater Pumping

What We Know and What We don't Know

What We Know

- Groundwater Pumping has Resulted in Large Declines in Floridan Aquifer Groundwater Levels in N.E. Florida.
- Declining Groundwater Levels have Caused Declines in the Flow of Some Rivers and Springs and the Levels of Some Lakes and Wetlands.

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What We Don't Know

- How Wide-Spread the Declines in Flows and Levels are and how Great the Declines Have Been.
- The Degree that Each Large Groundwater User is Responsible for the Declining Trends.
  - State of Georgia?
  - Public Supply Utilities?
  - Agriculture?
  - Industry?
  - All of the Above!
- These Questions Must be Answered Before Solutions Can be Developed.

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Information Sources for the Presentation

- The Suwannee River Water Management District's 2010 Districtwide Water Supply Assessment Report.

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Presentation Topics

- Basic Geology/Hydrology of the Region
- Current, and Projected Groundwater Pumping in the Region.
- Water Resource Impacts - Groundwater, Springs, Rivers, Lakes
  - Data is Limited
  - Influence of Rainfall
  - Trends in Groundwater Levels.
  - Impacts of Declining Groundwater Levels.
    - Spring Flow, River Flow, Lake Levels
- What Remains to be done to thoroughly Understand the Problem and Develop Solutions.

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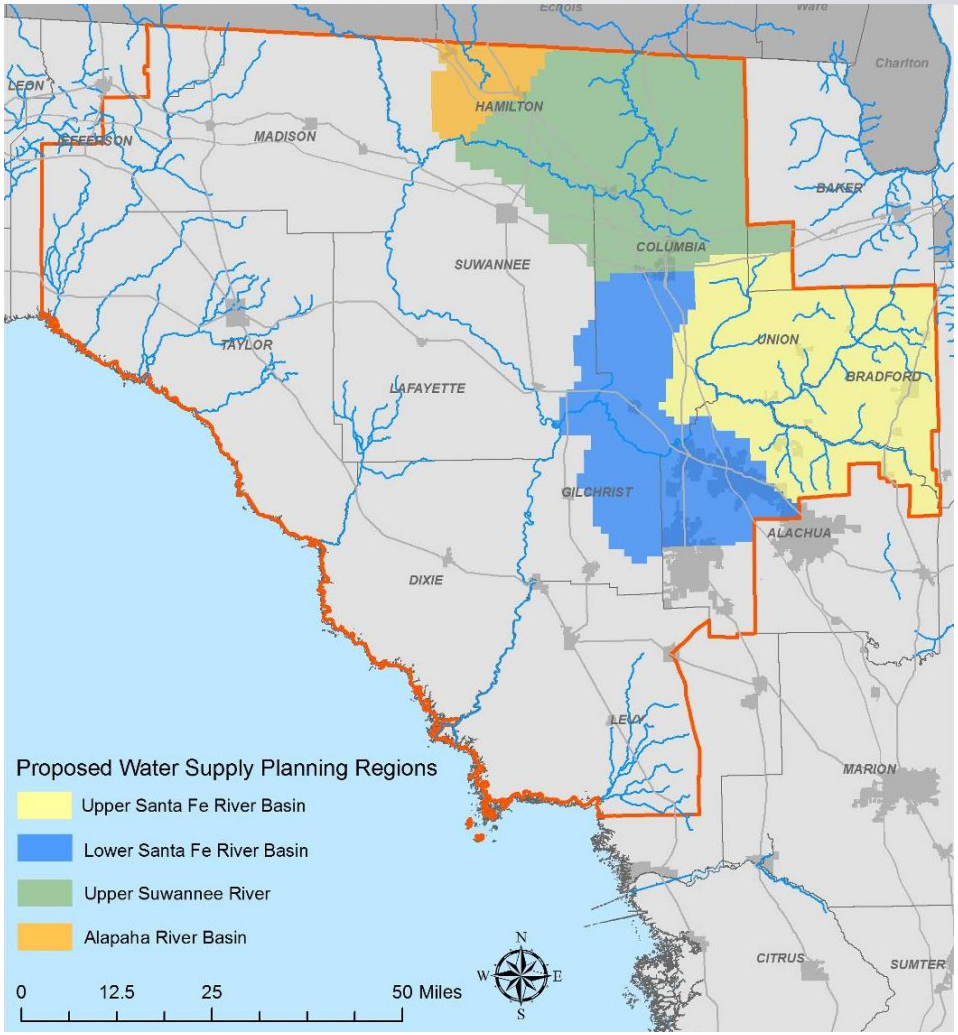
SRWMD Water Supply Planning Regions (Area of Concern)



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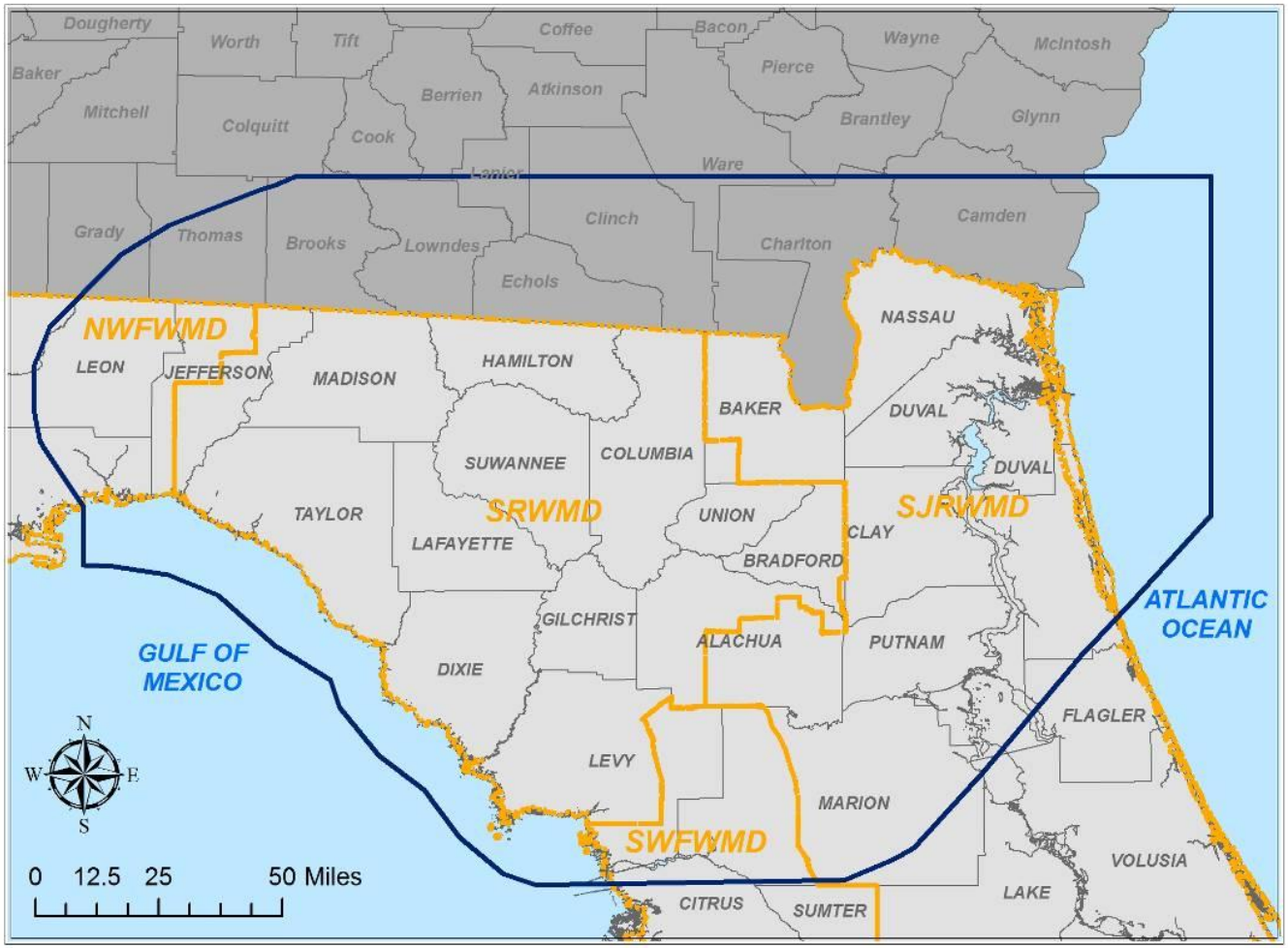
Area of Concern



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Presentation Topics

- Basic Geology/Hydrology of the Region

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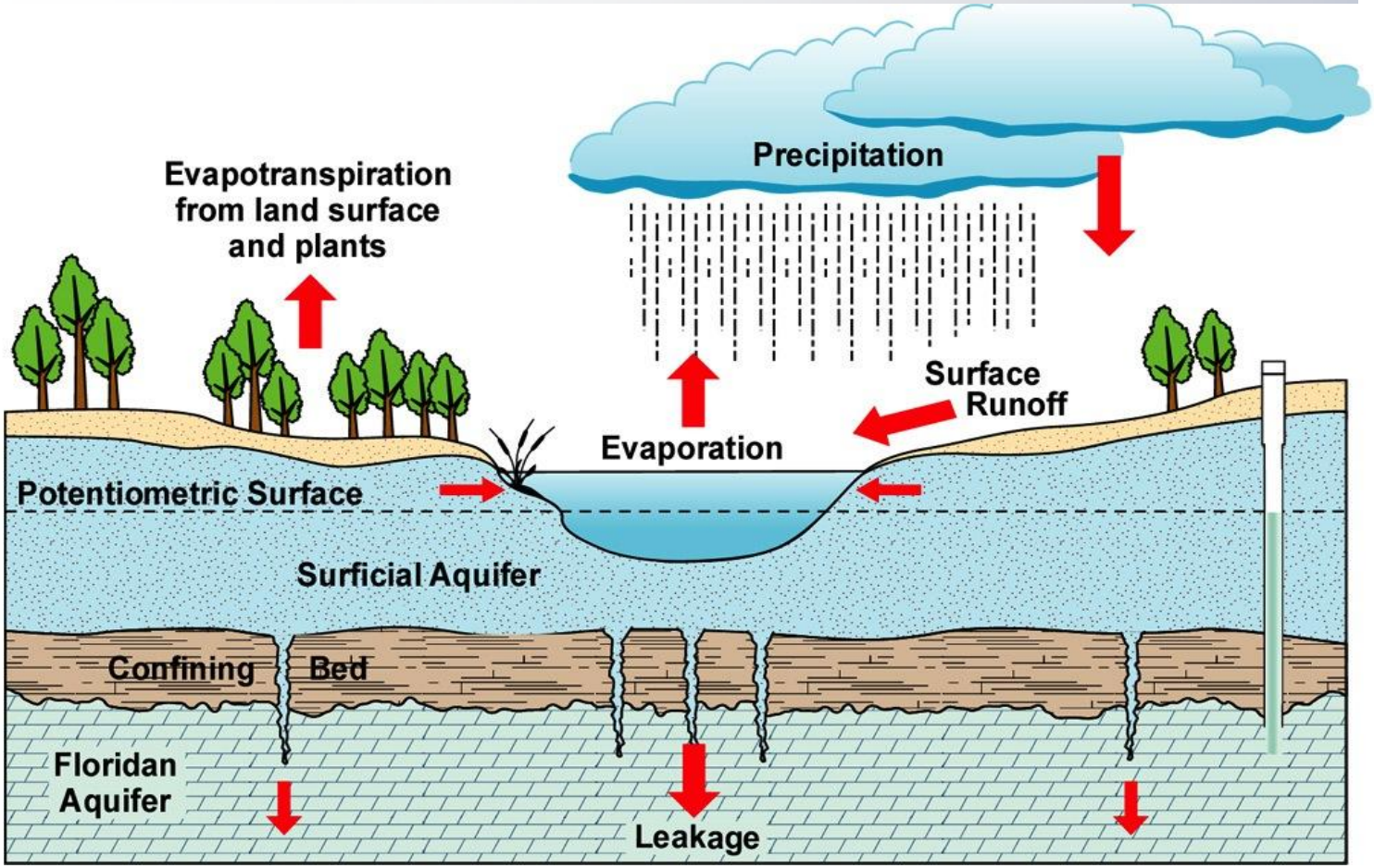
Basic Geology/Hydrology



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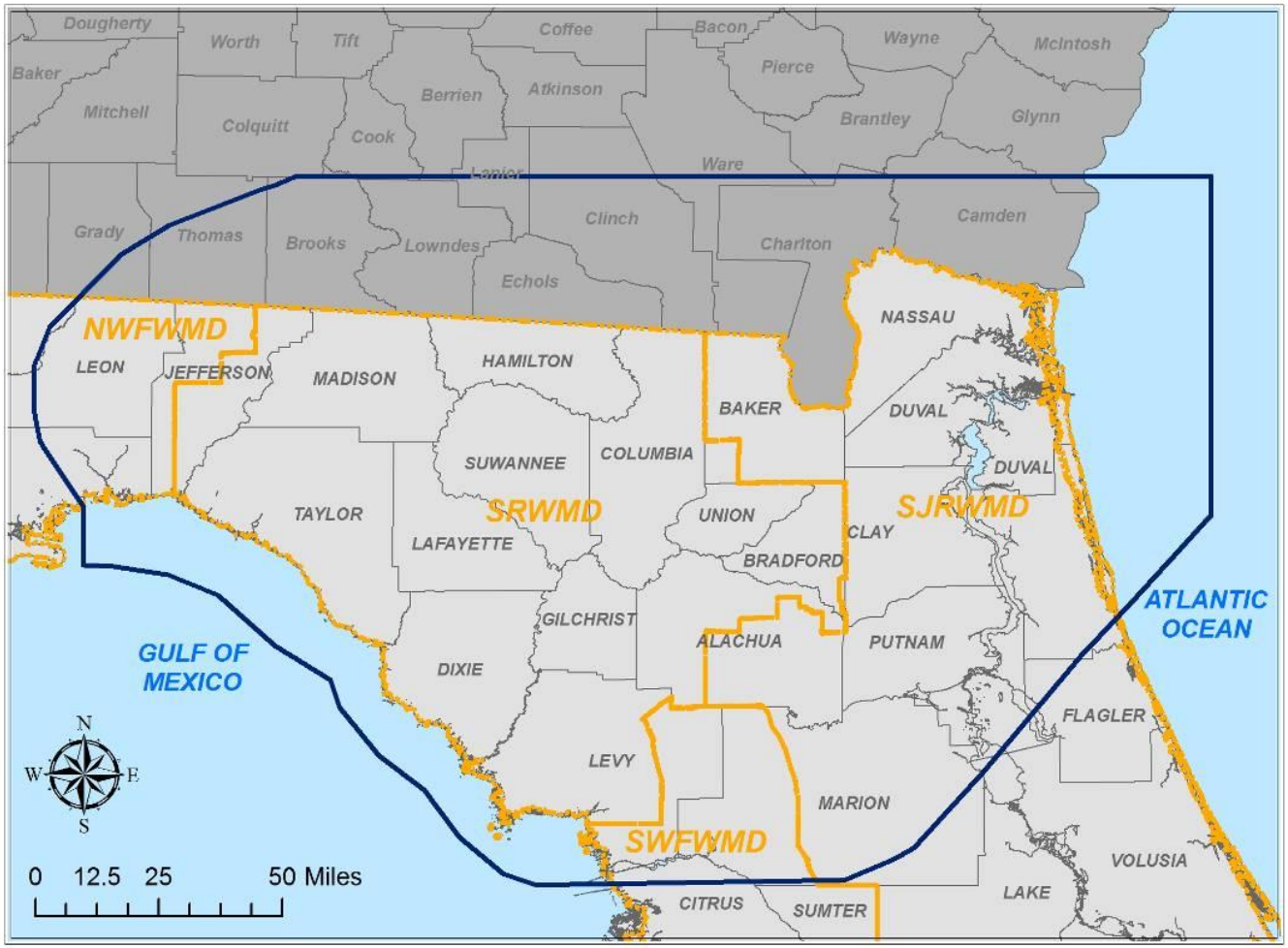
Area of Concern



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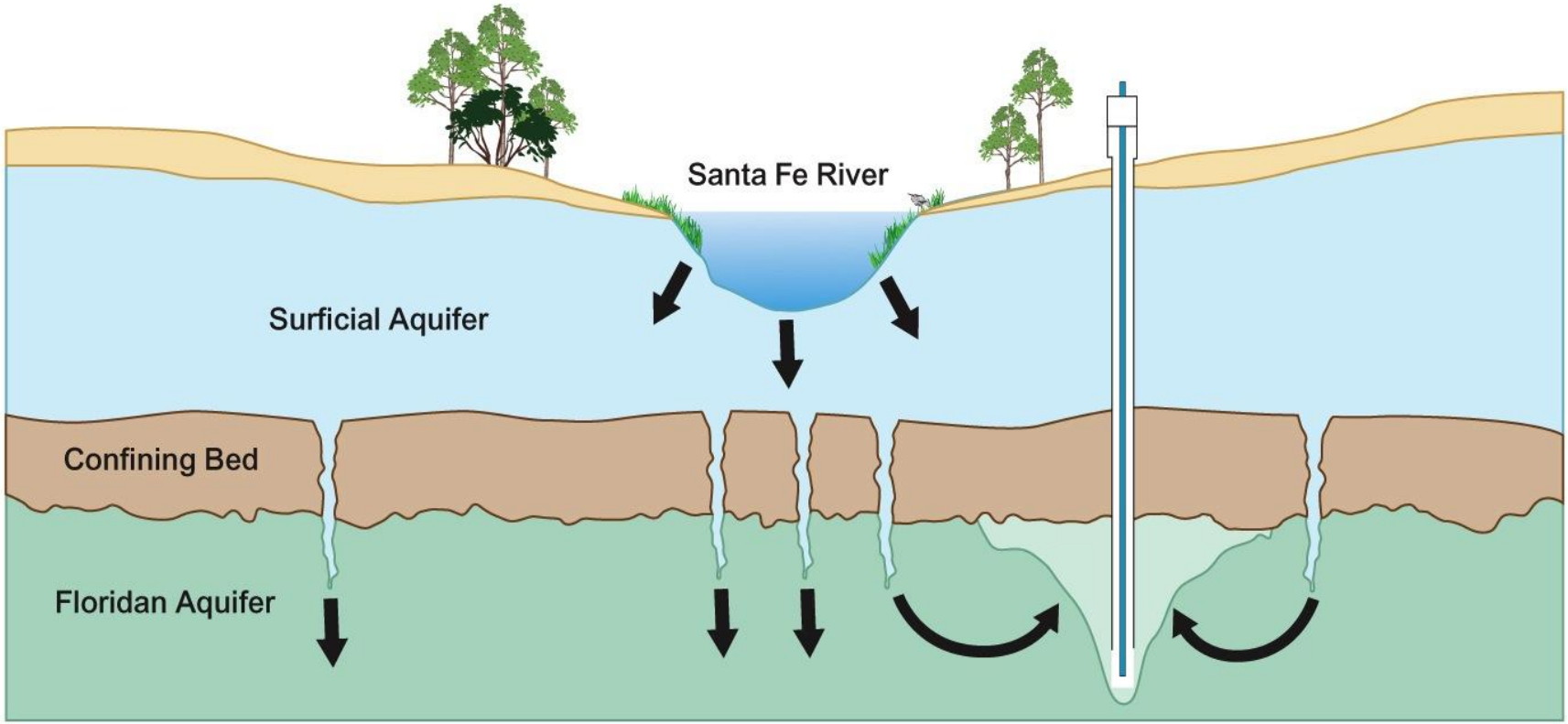
Basic Hydrology - Impacts of Excessive Groundwater Pumping

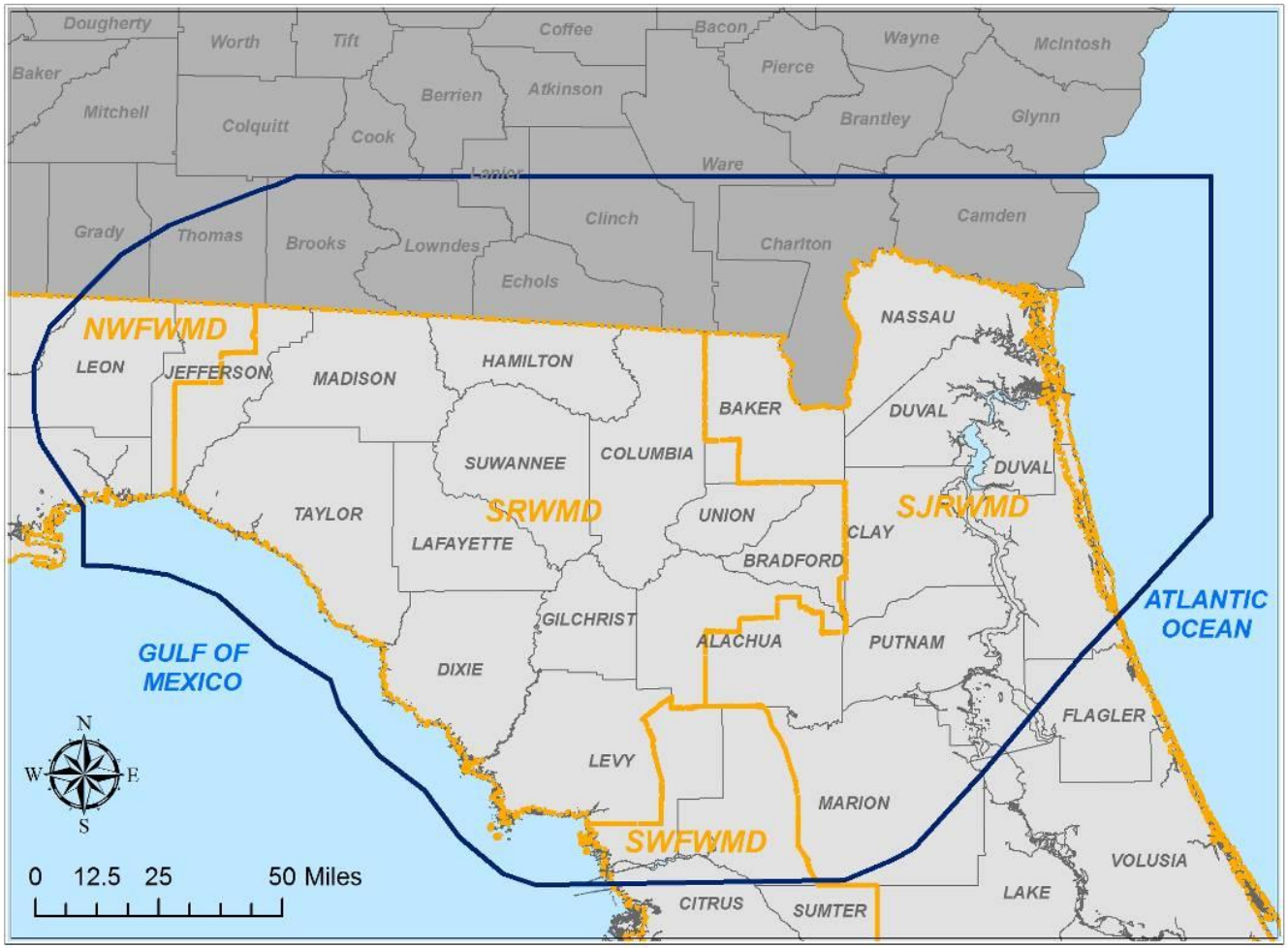


Presentation Topics

- Basic Geology/Hydrology of the Region
- Current, and Projected Groundwater Pumping in the Region.

Cardno ENTRIX

Area of Concern



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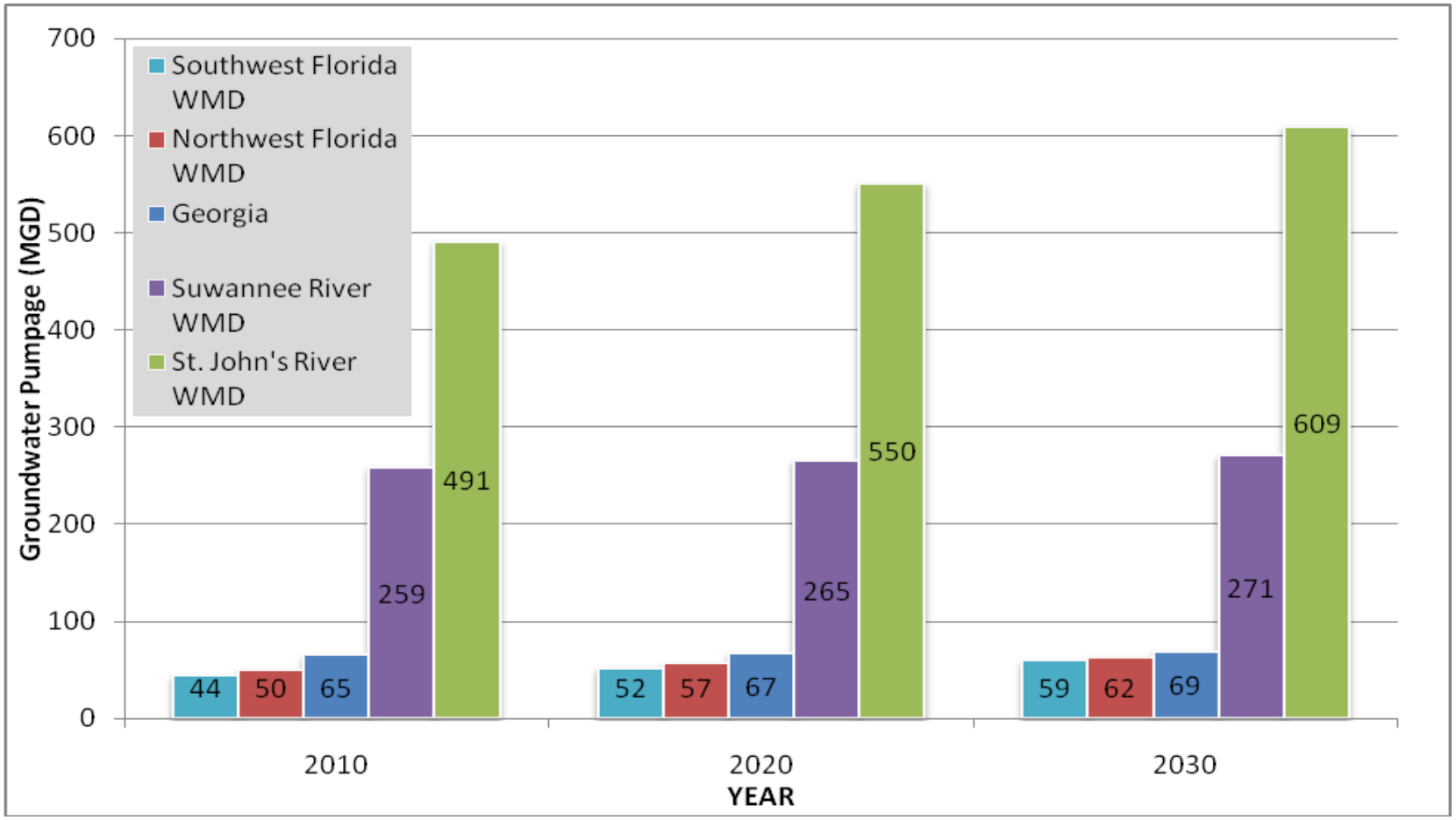
Current Groundwater Use and Future Demands in North Florida (2010 -2030)



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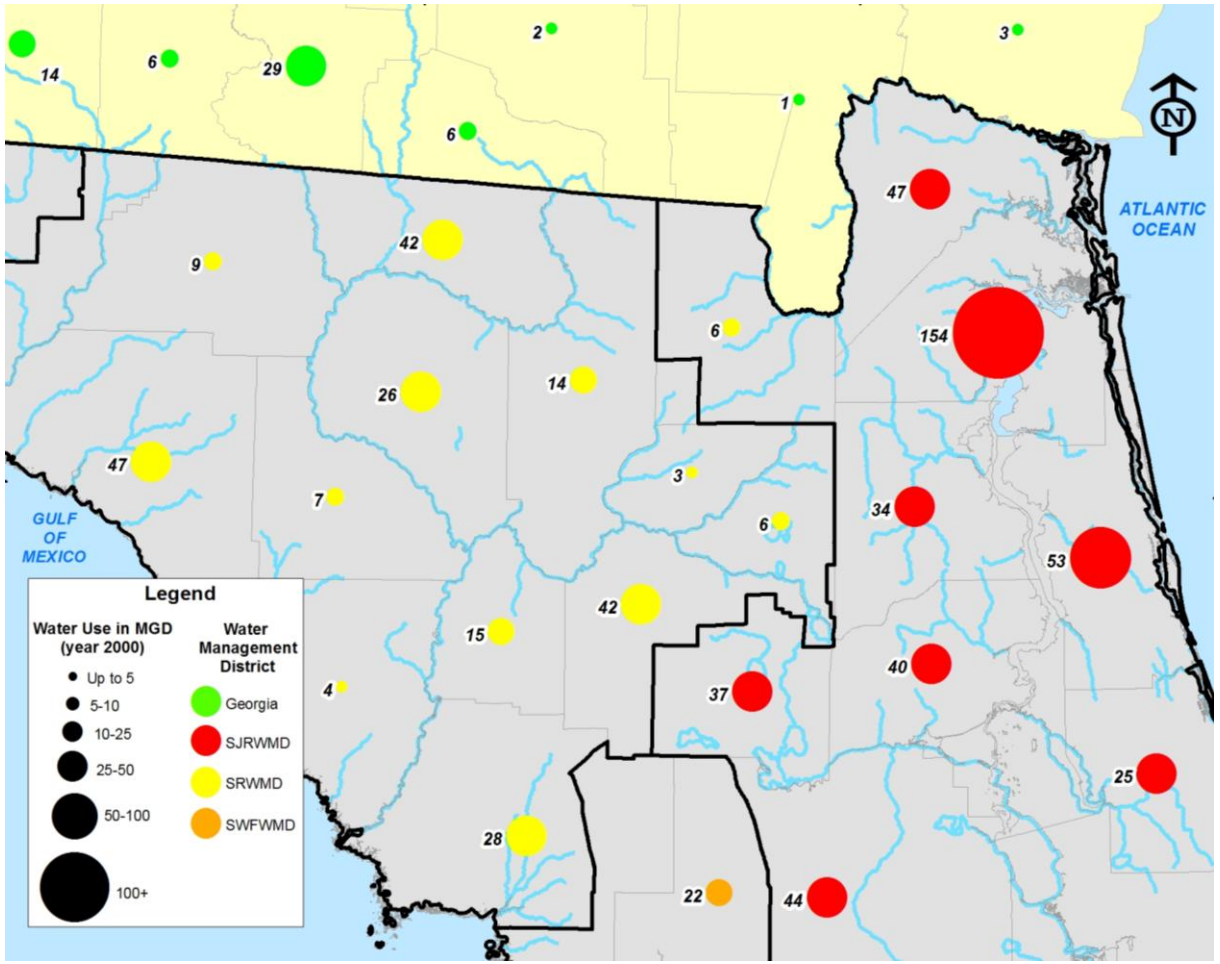
Average Daily Groundwater Use (mgd) Year 2000



Presentation Topics

- Basic Geology/Hydrology of the Region
- Current, and Projected Groundwater Pumping in the Region.
- Water Resource Impacts - Groundwater, Springs, Rivers, Lakes
  - Trends in Groundwater Levels.

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Regional Groundwater Level Declines (Pre-Development to 1980)

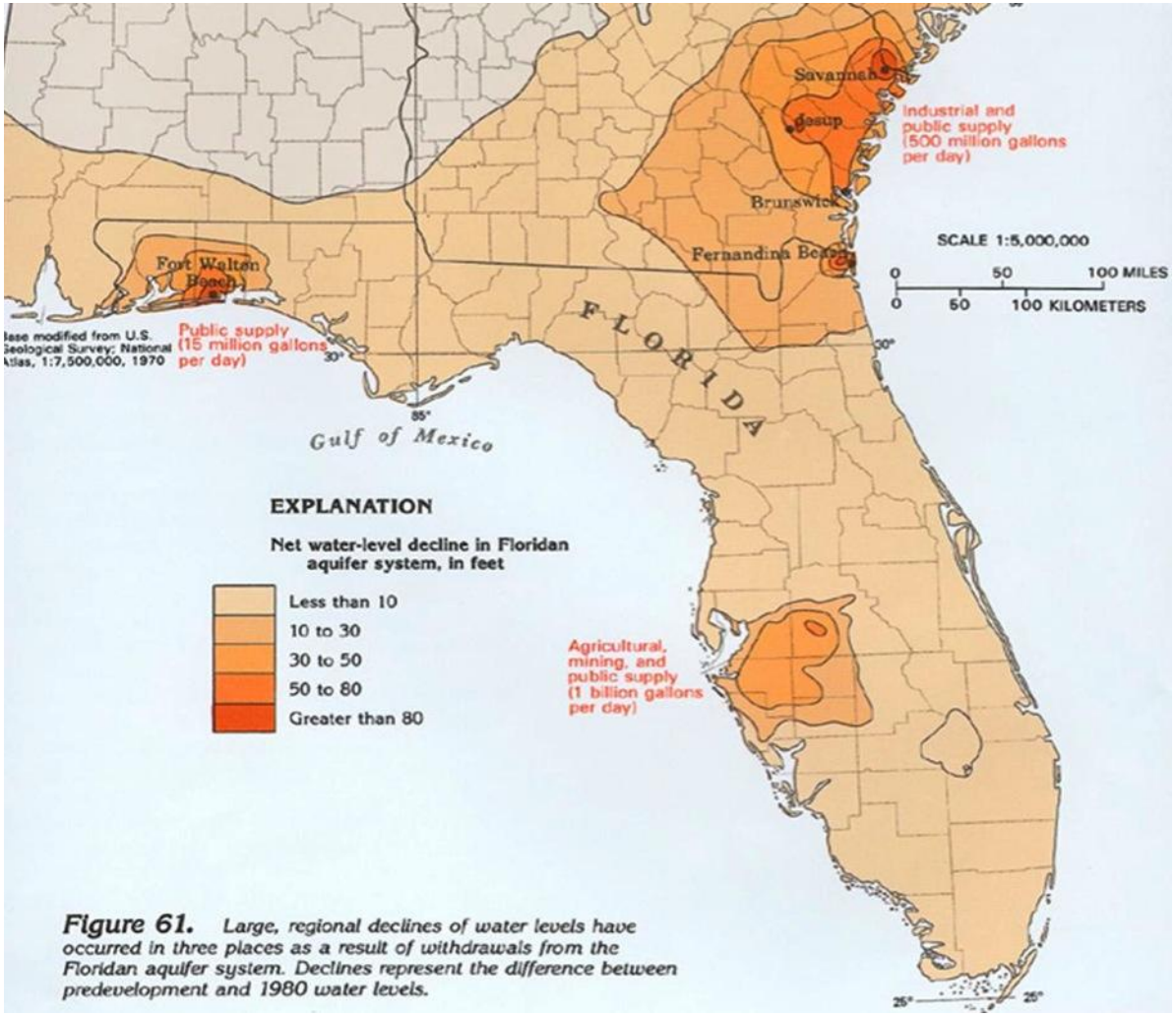

Figure 61. *Large, regional declines of water levels have occurred in three places as a result of withdrawals from the Floridan aquifer system. Declines represent the difference between predevelopment and 1980 water levels.*

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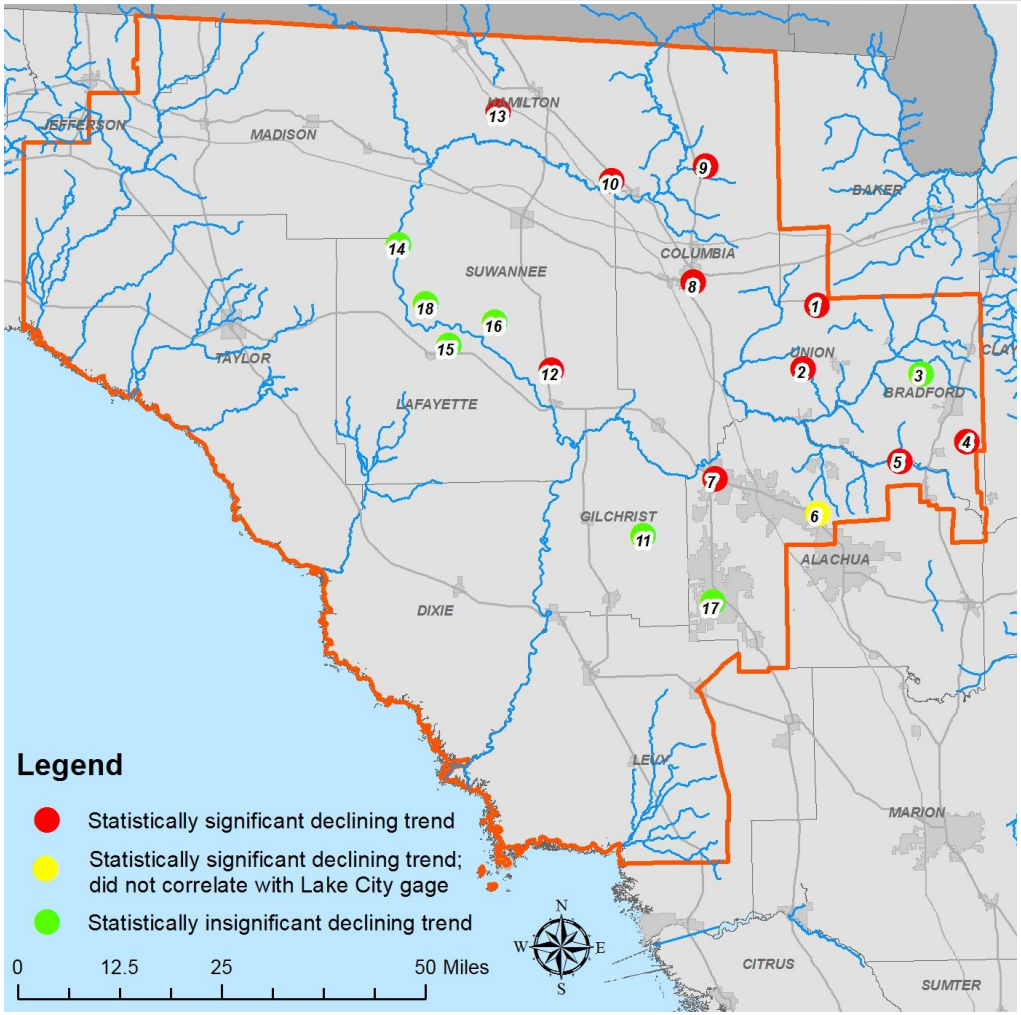
Suwannee River Water Management District - Sentinel Monitor Well Network



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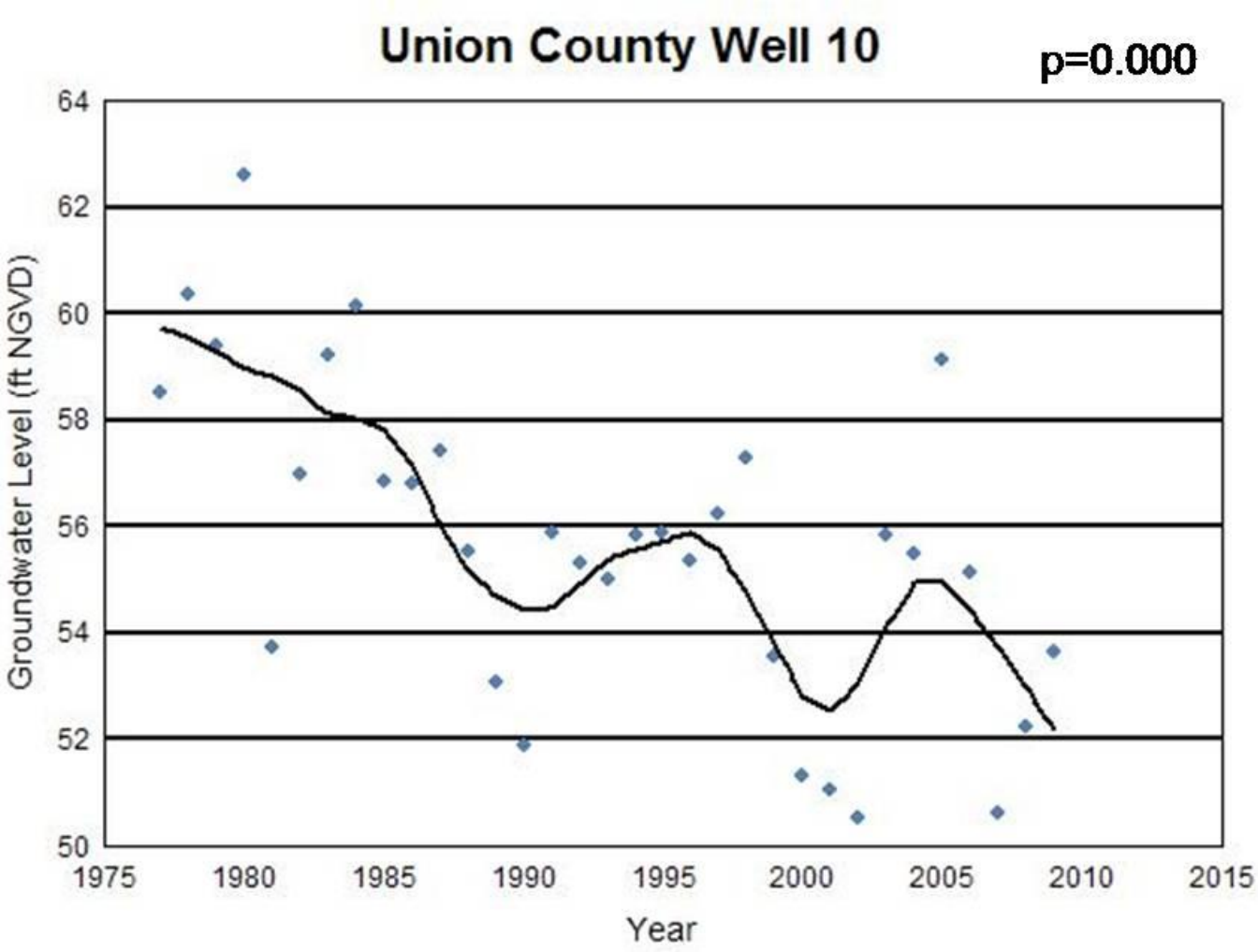
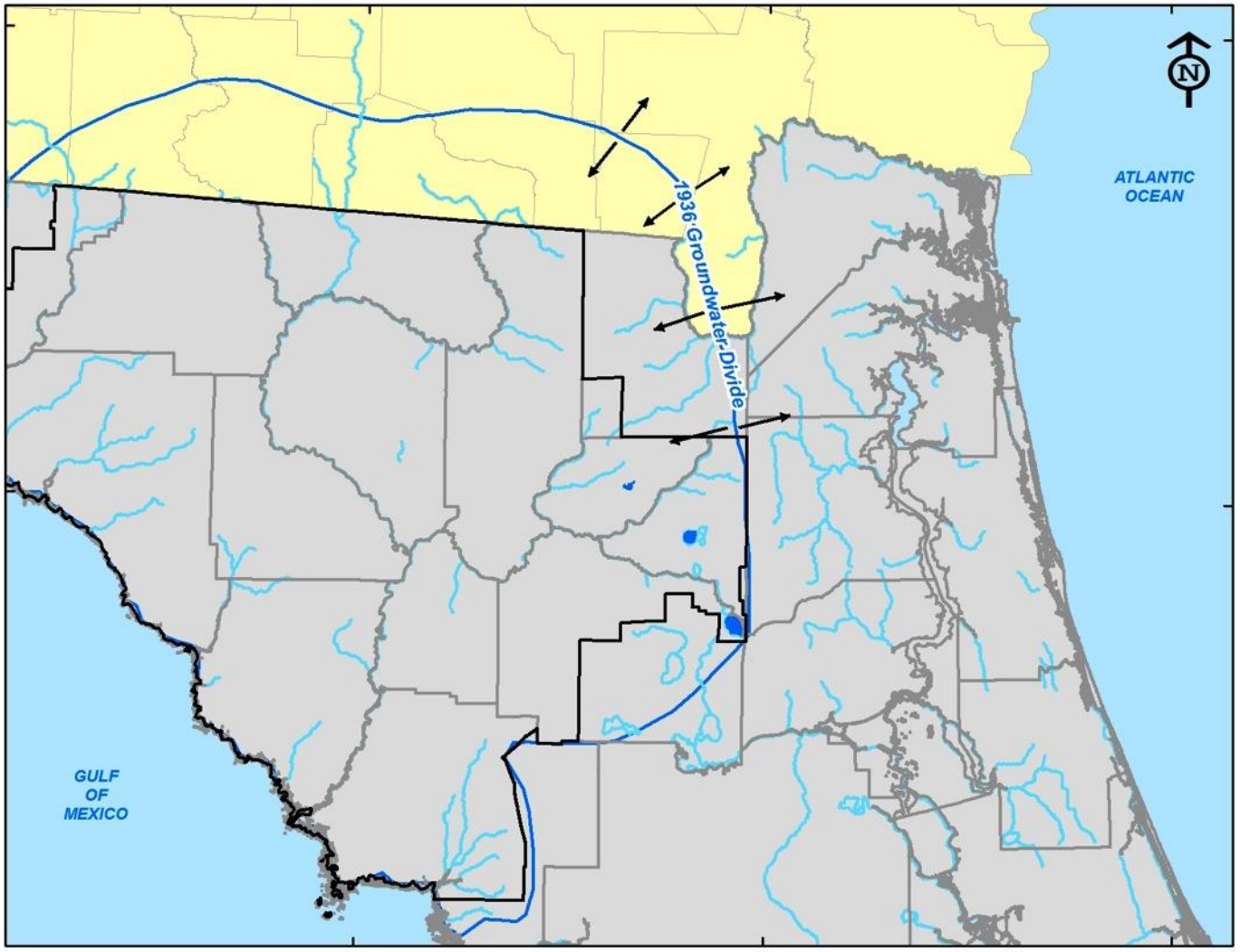
Groundwater Level Declines
(Influence of Rainfall Minimized)



Cardno ENTRIX

Migration of the Groundwater Flow Divide (1936-2005)



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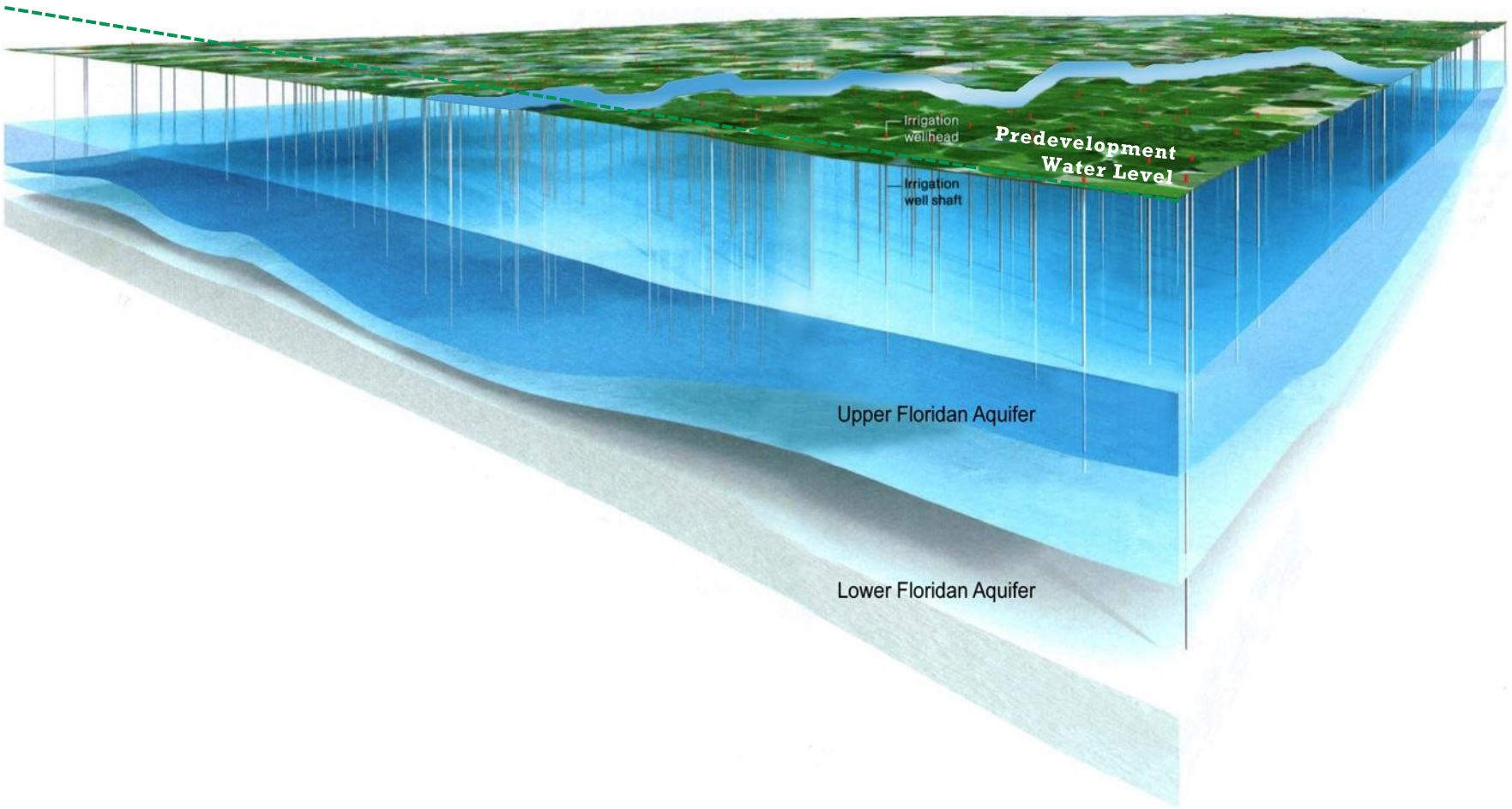
Northeastern SRWMD

(Generalized Block Diagram)



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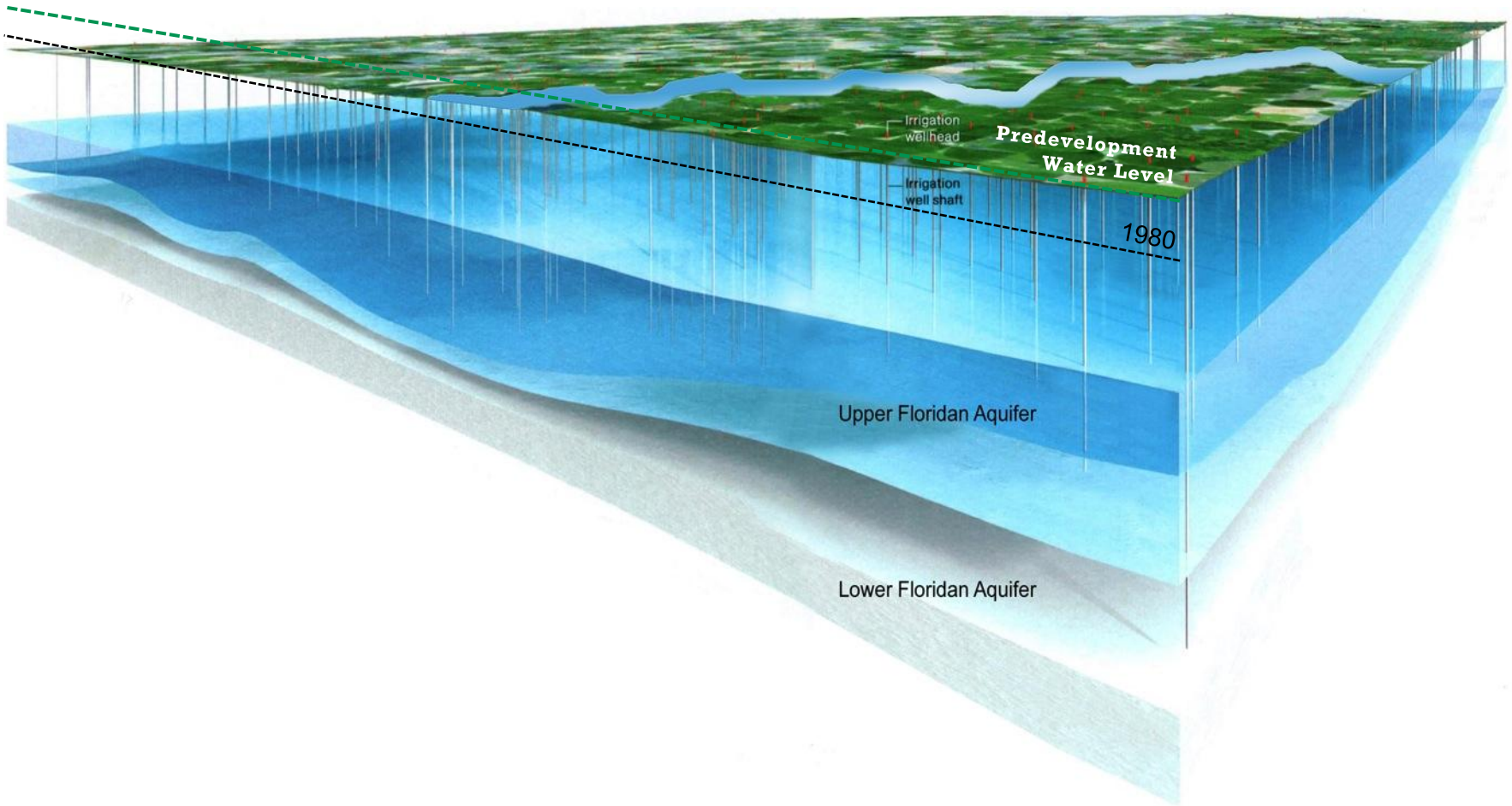
Northeastern SRWMD
(Generalized Block Diagram)



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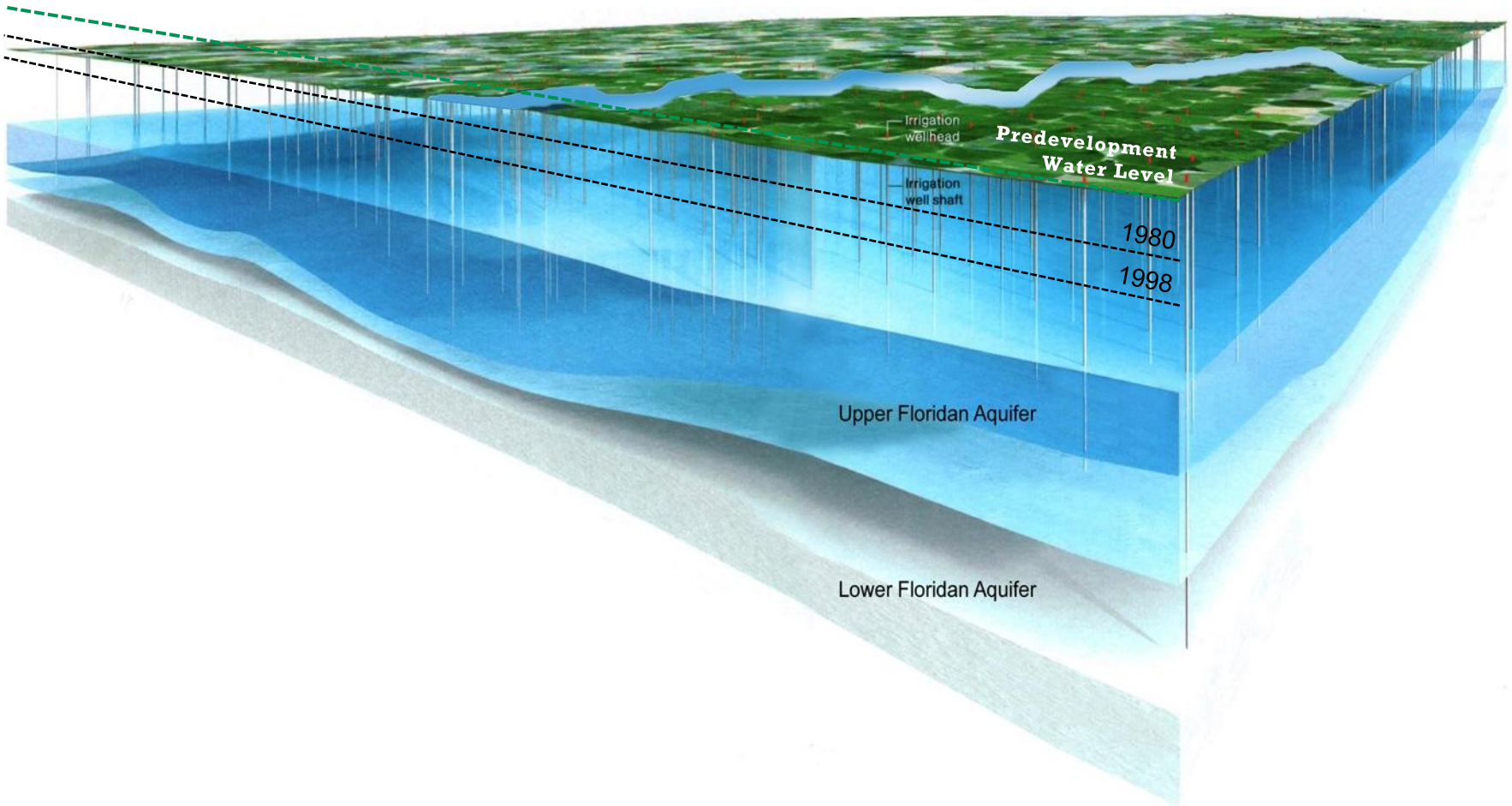
Northeastern SRWMD

(Generalized Block Diagram)



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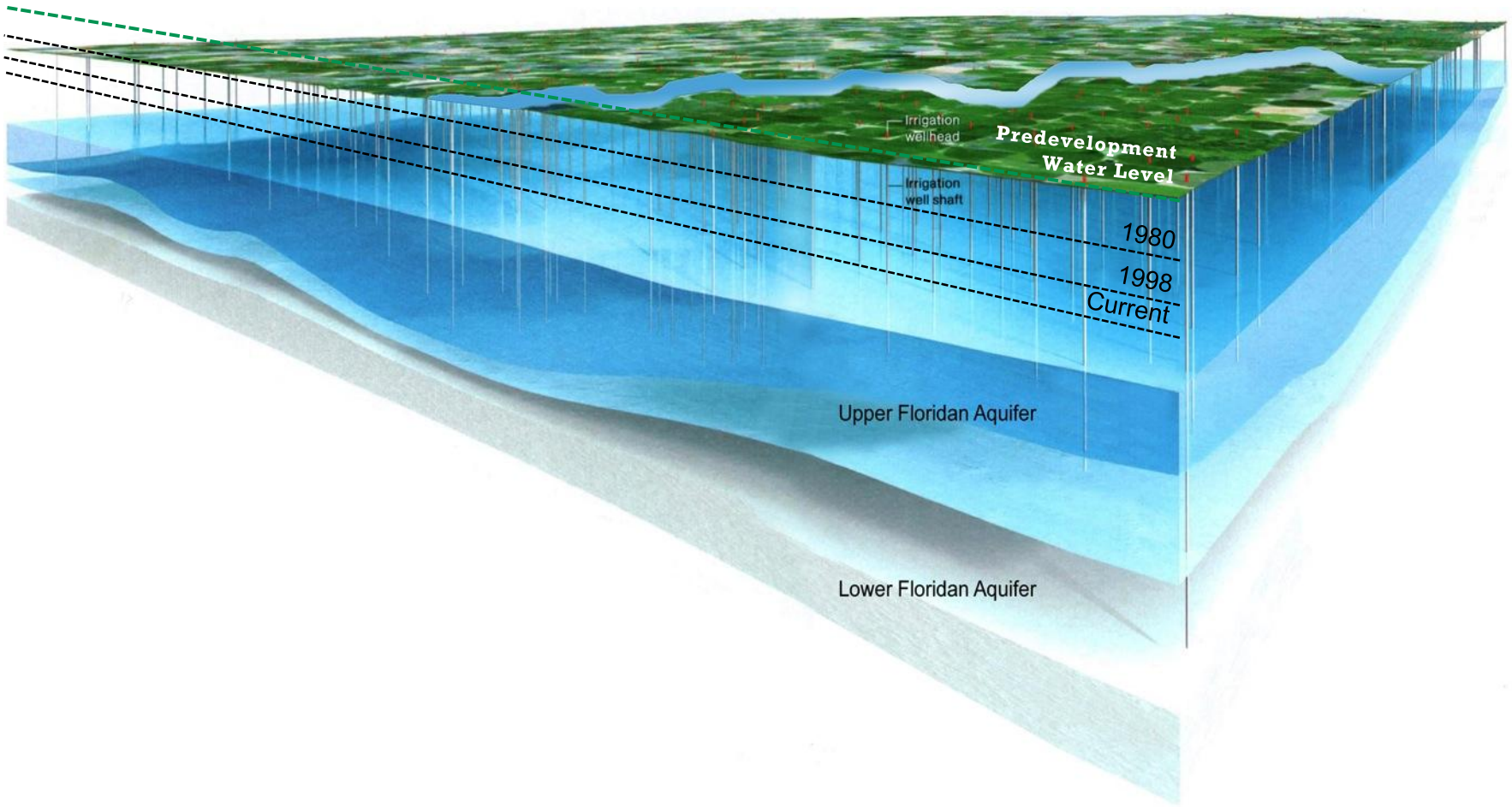
Northeastern SRWMD

(Generalized Block Diagram)



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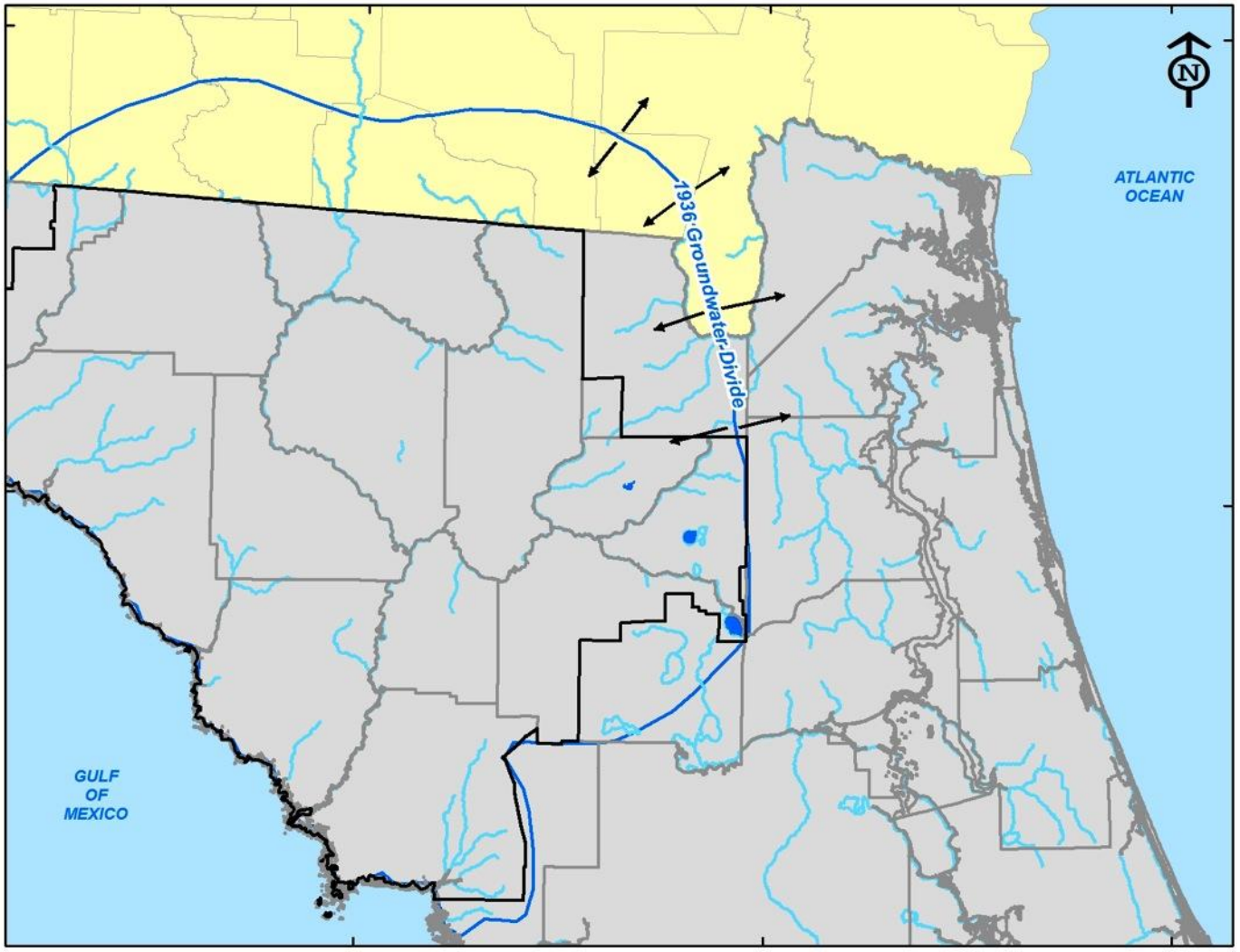

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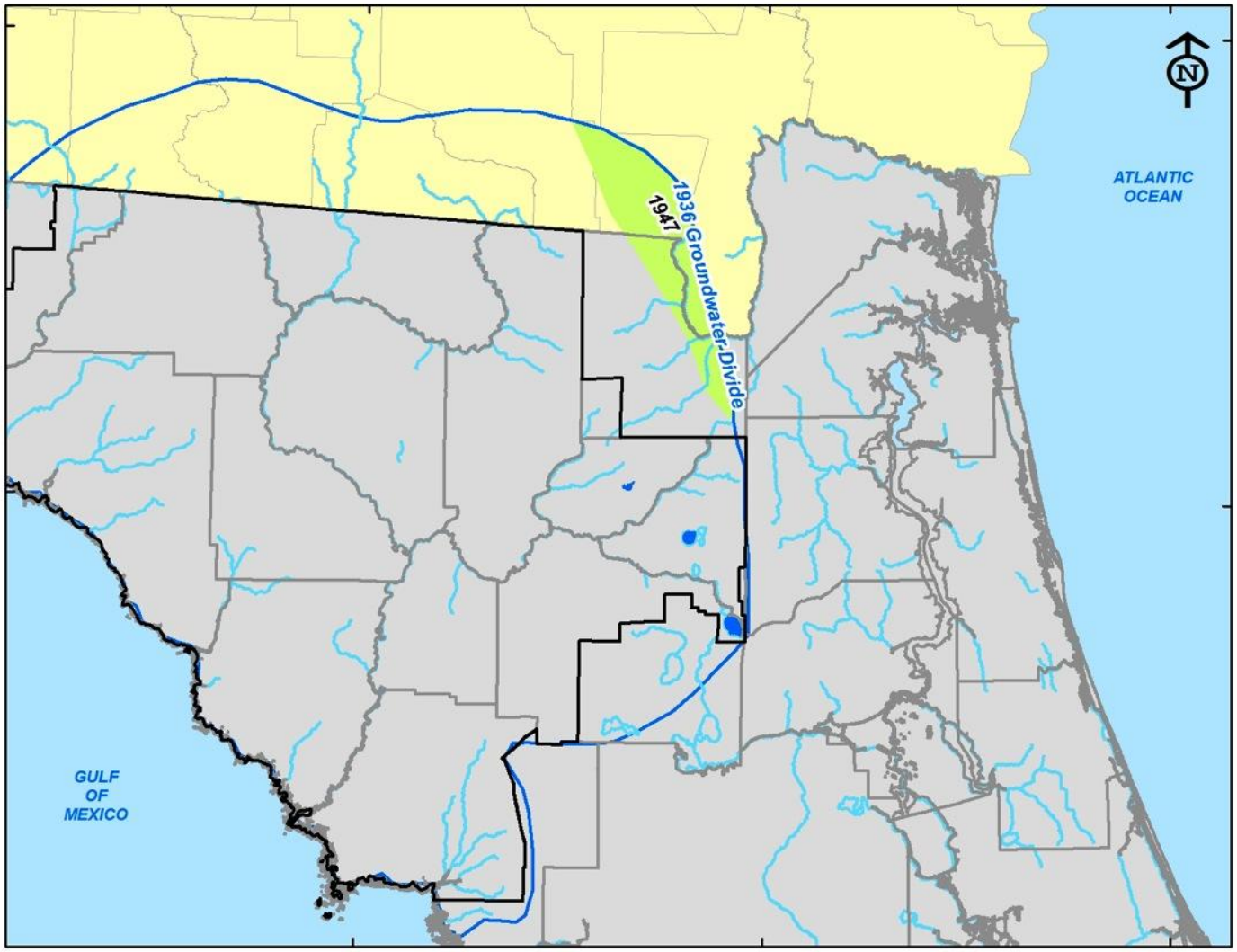
Groundwater Flow Divide (1947)



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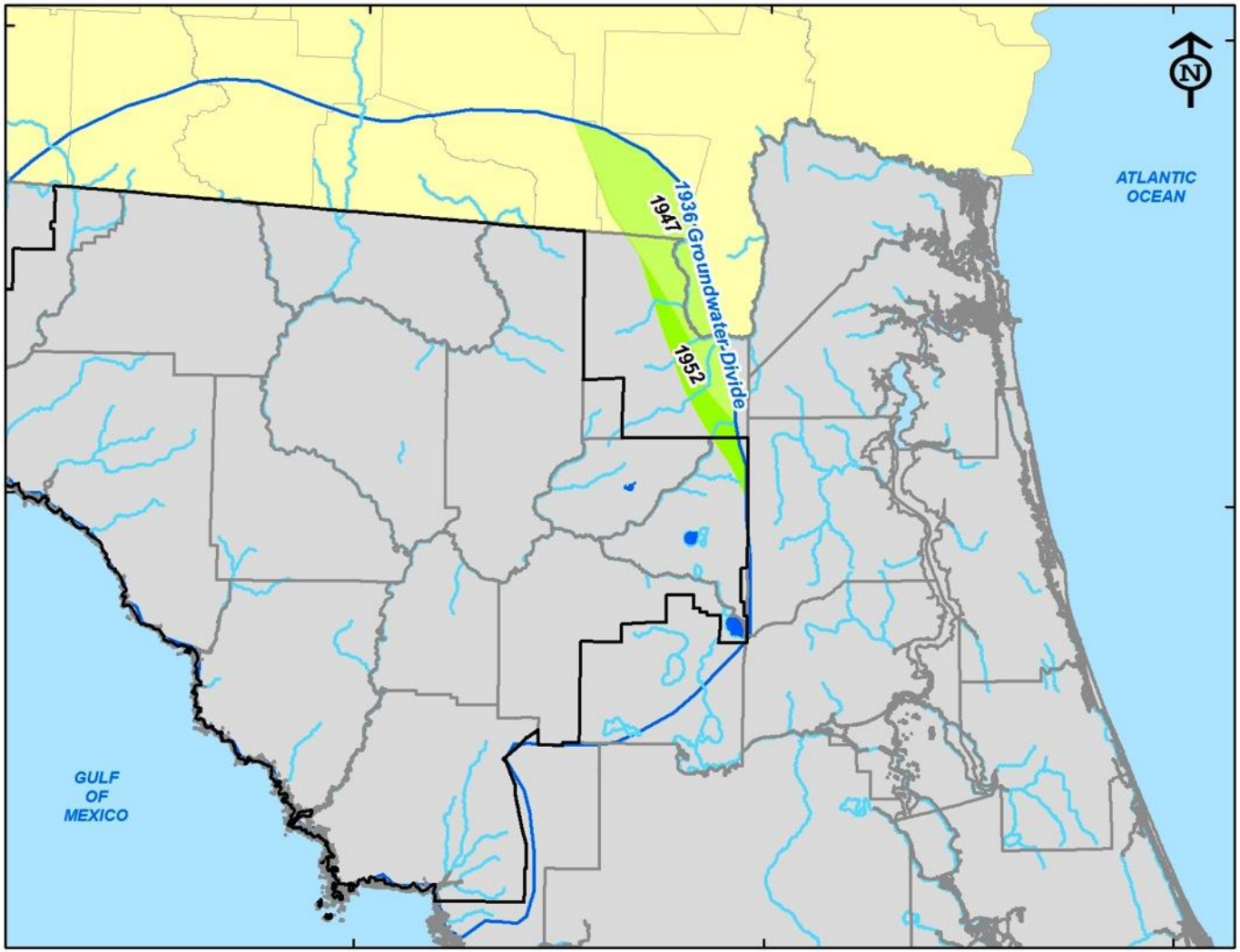
Groundwater Flow Divide (1952)



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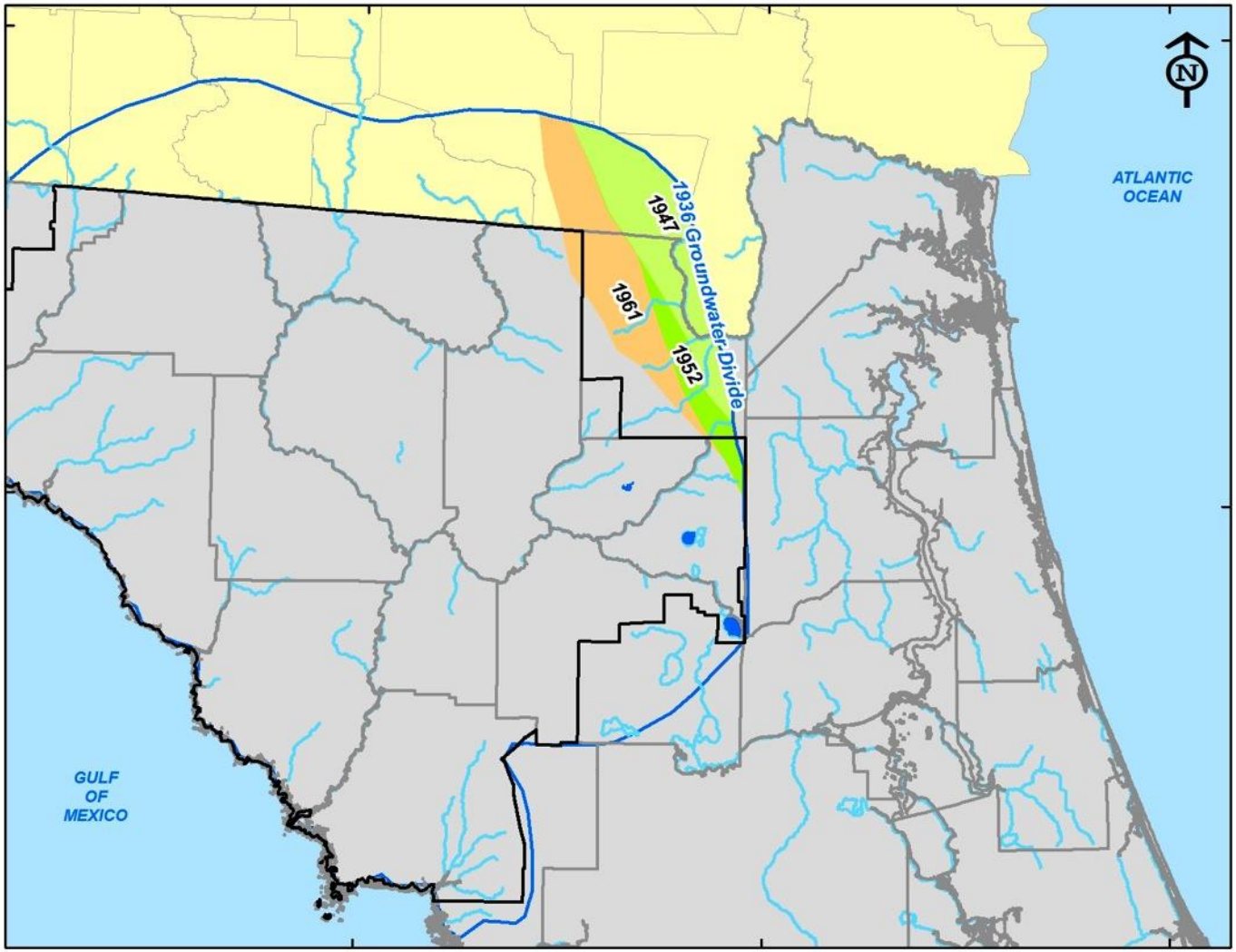
Groundwater Flow Divide (1961)



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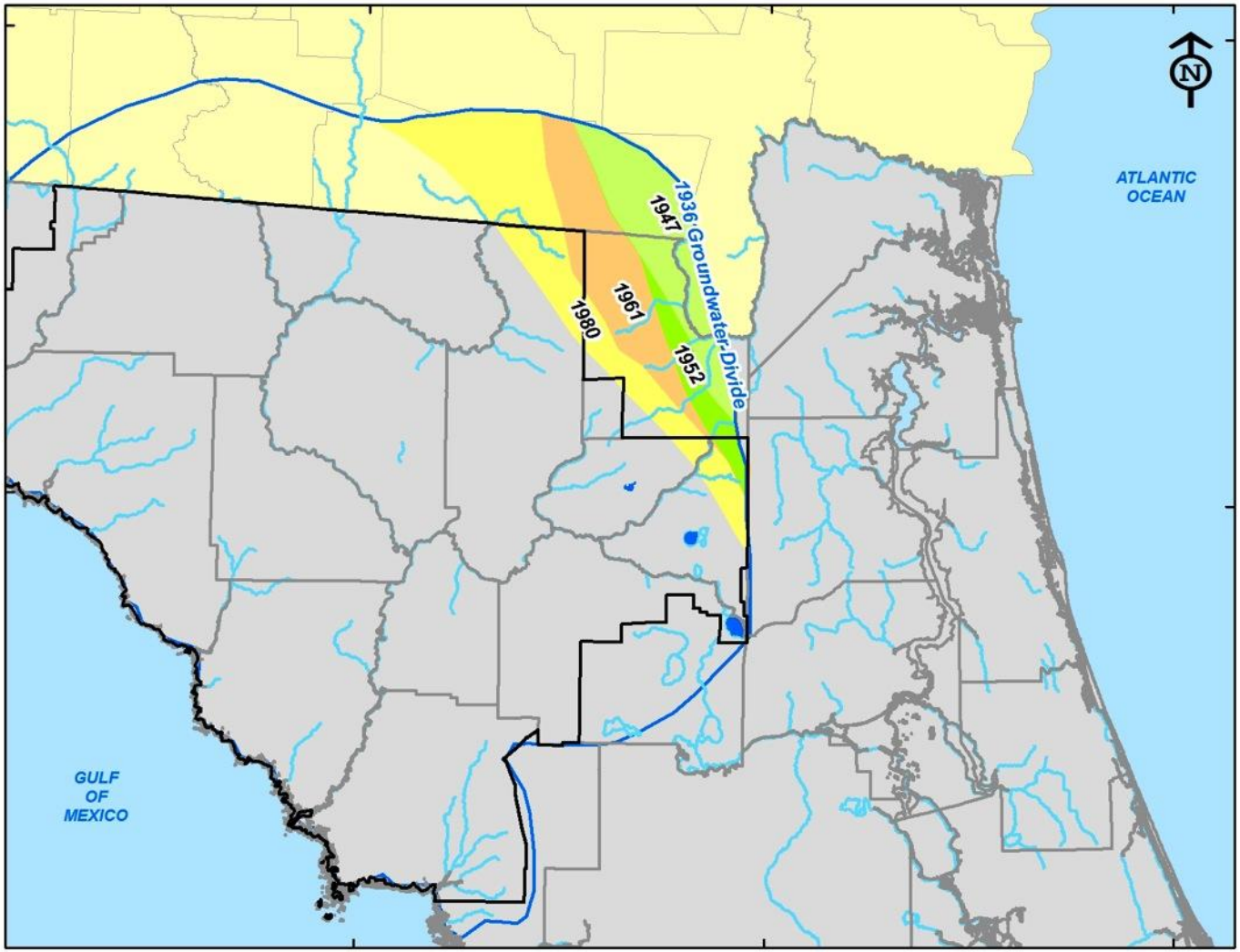
Groundwater Flow Divide (1980)



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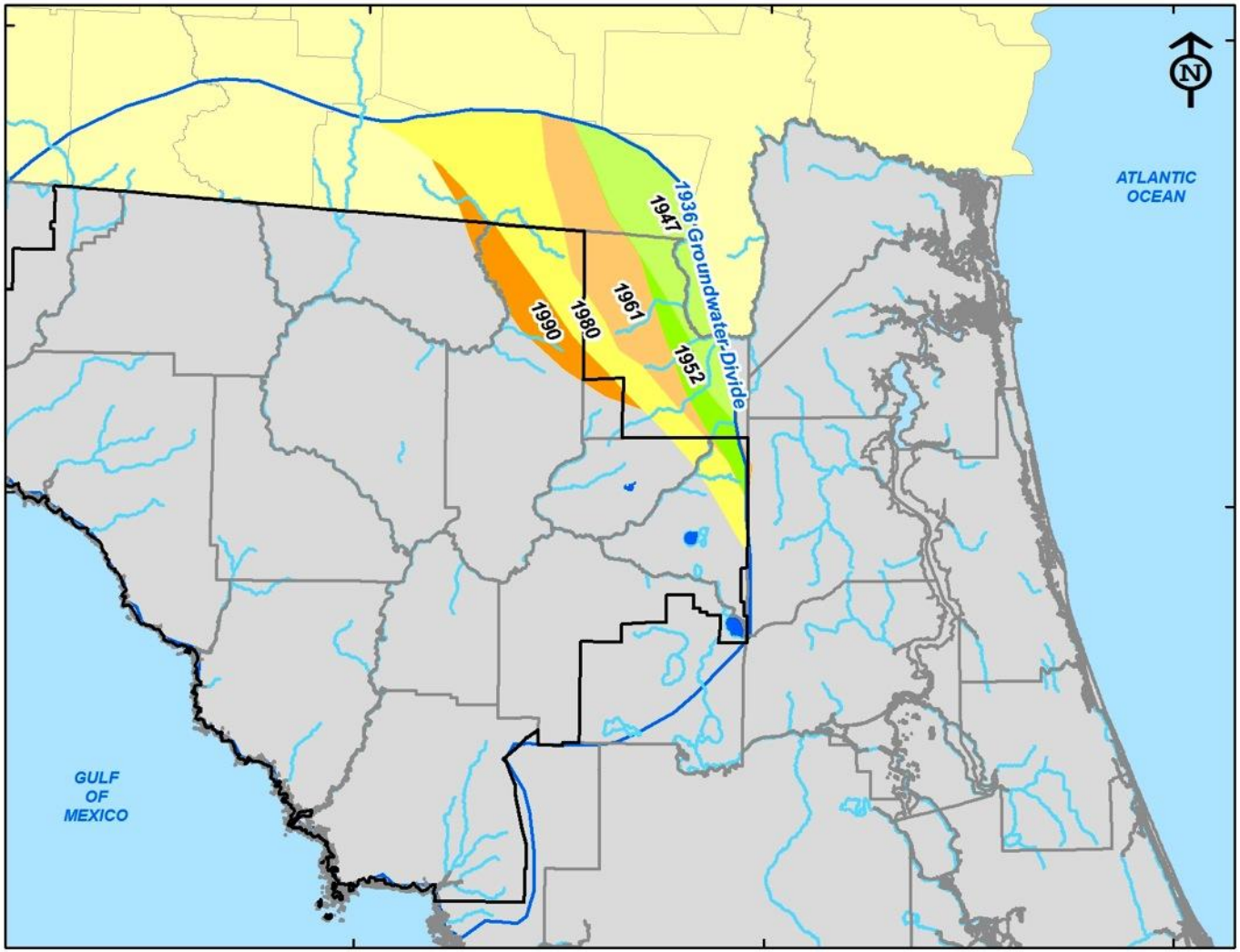
Groundwater Flow Divide (1990)



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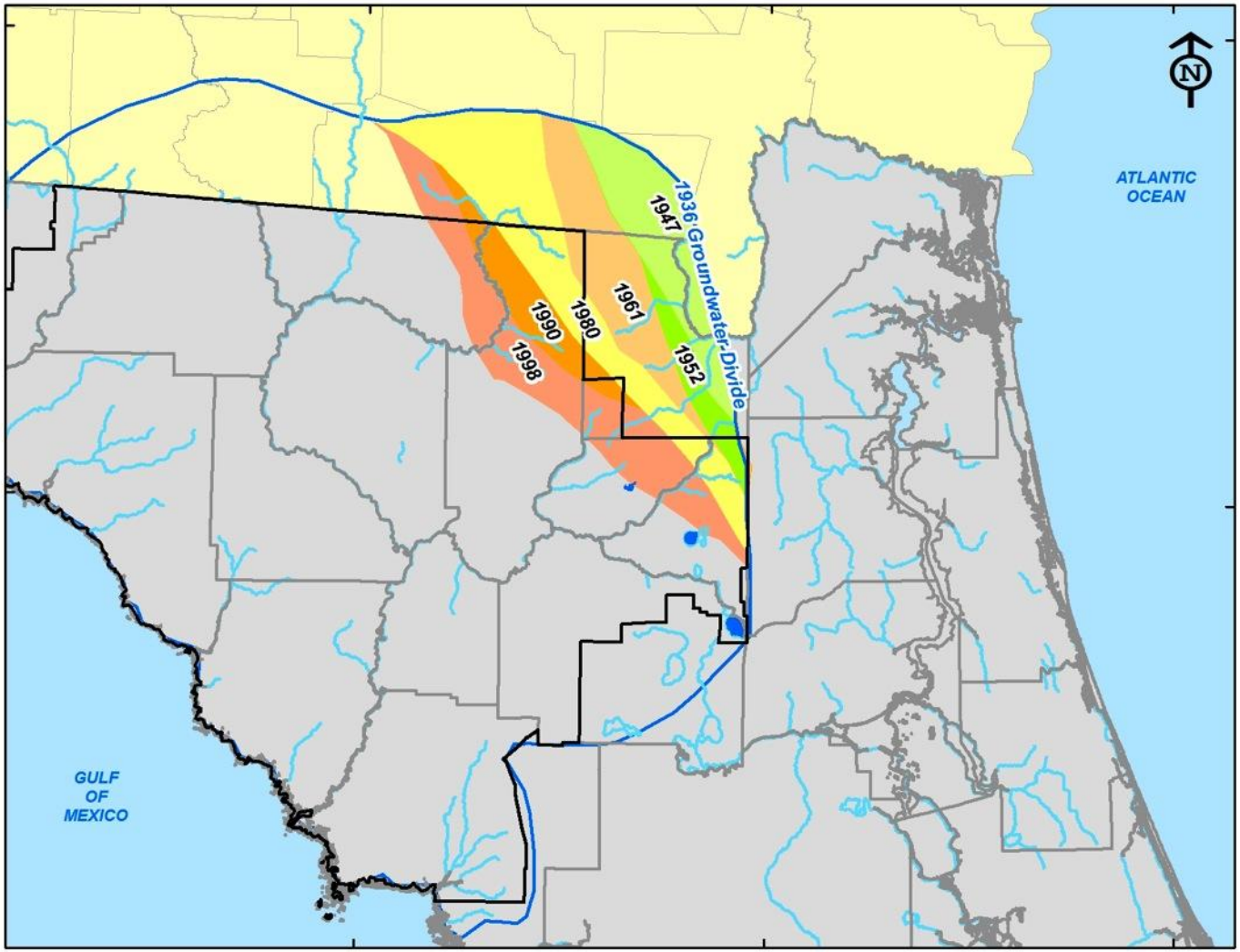
Groundwater Flow Divide (1998)



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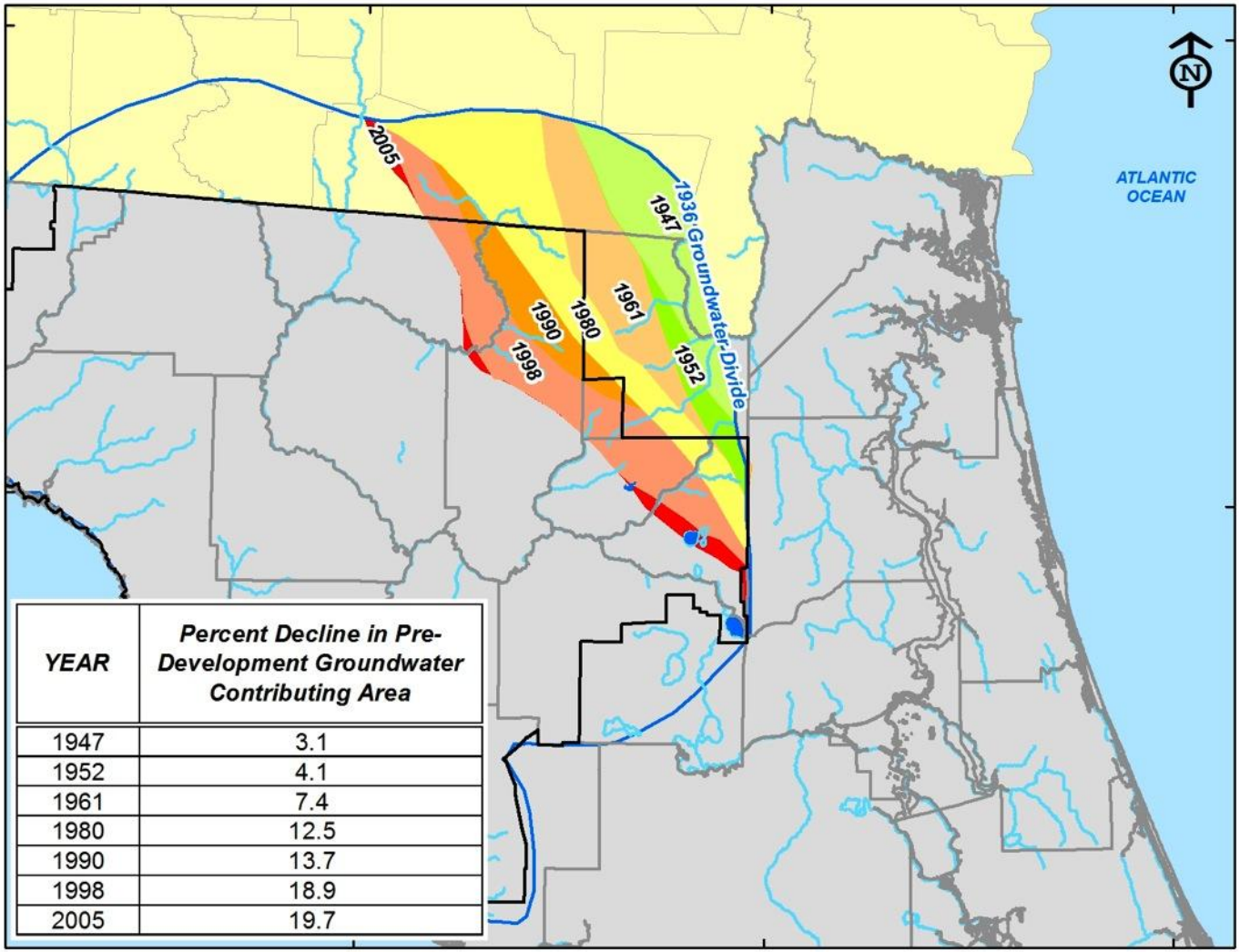
Groundwater Flow Divide (2005)



YEAR	Percent Decline in Pre-Development Groundwater Contributing Area
1947	3.1
1952	4.1
1961	7.4
1980	12.5
1990	13.7
1998	18.9
2005	19.7

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Groundwater Level Declines in Northeastern SRWMD Region

- The Decline in the Size of the Groundwater Basin from 1936 to 2005 was Over 2000 Square Miles (19.7%).

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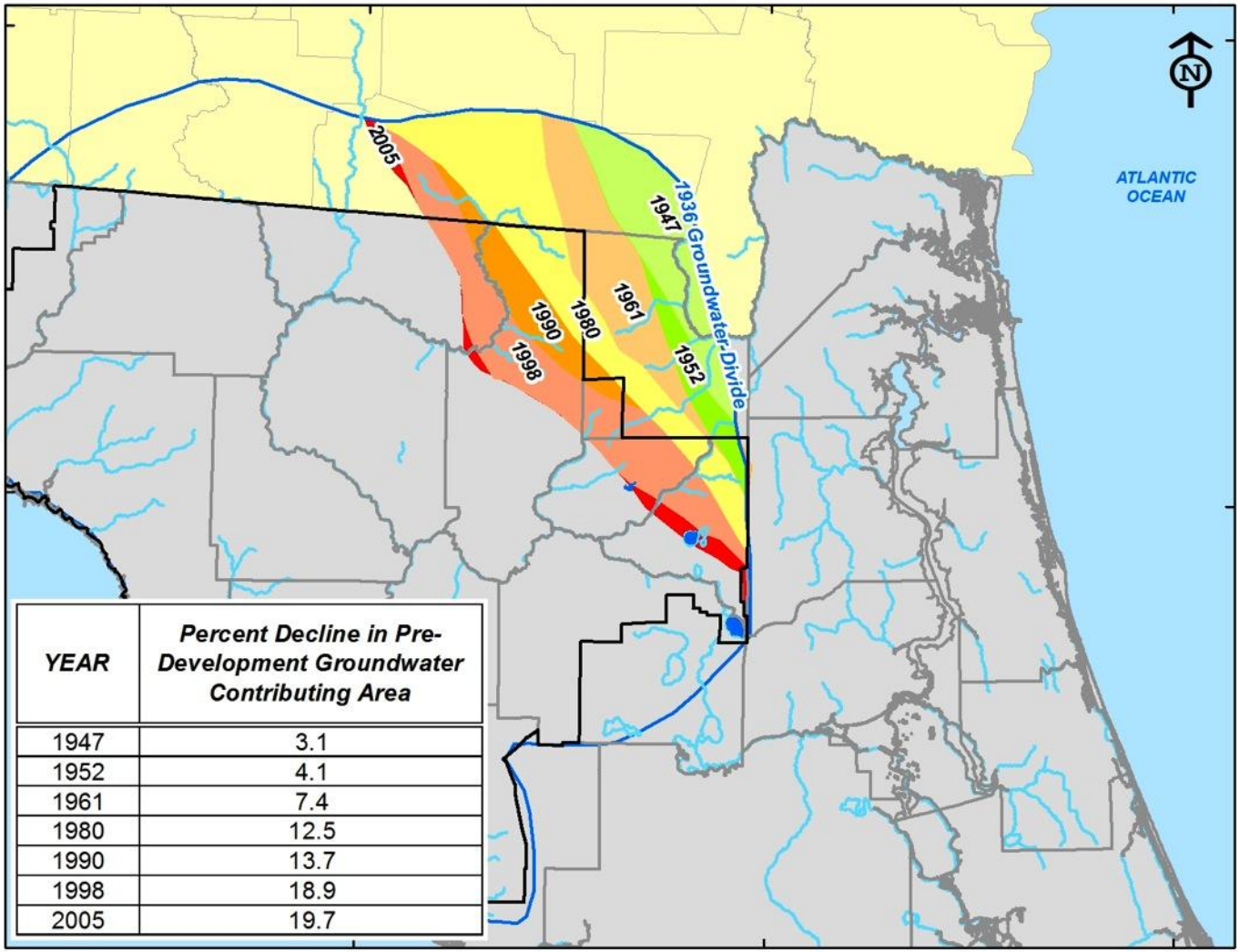
Groundwater Flow Divide (2005)



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  - Trends in Groundwater Levels.
  - Impacts of Declining Groundwater Levels.
    - Spring Flow, River Flow, Lake Levels

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Impacts of Declining Groundwater Levels

- Spring Flow
  - White Springs
  - Ichetucknee Springs

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White Springs - Historical

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White Springs - Recent

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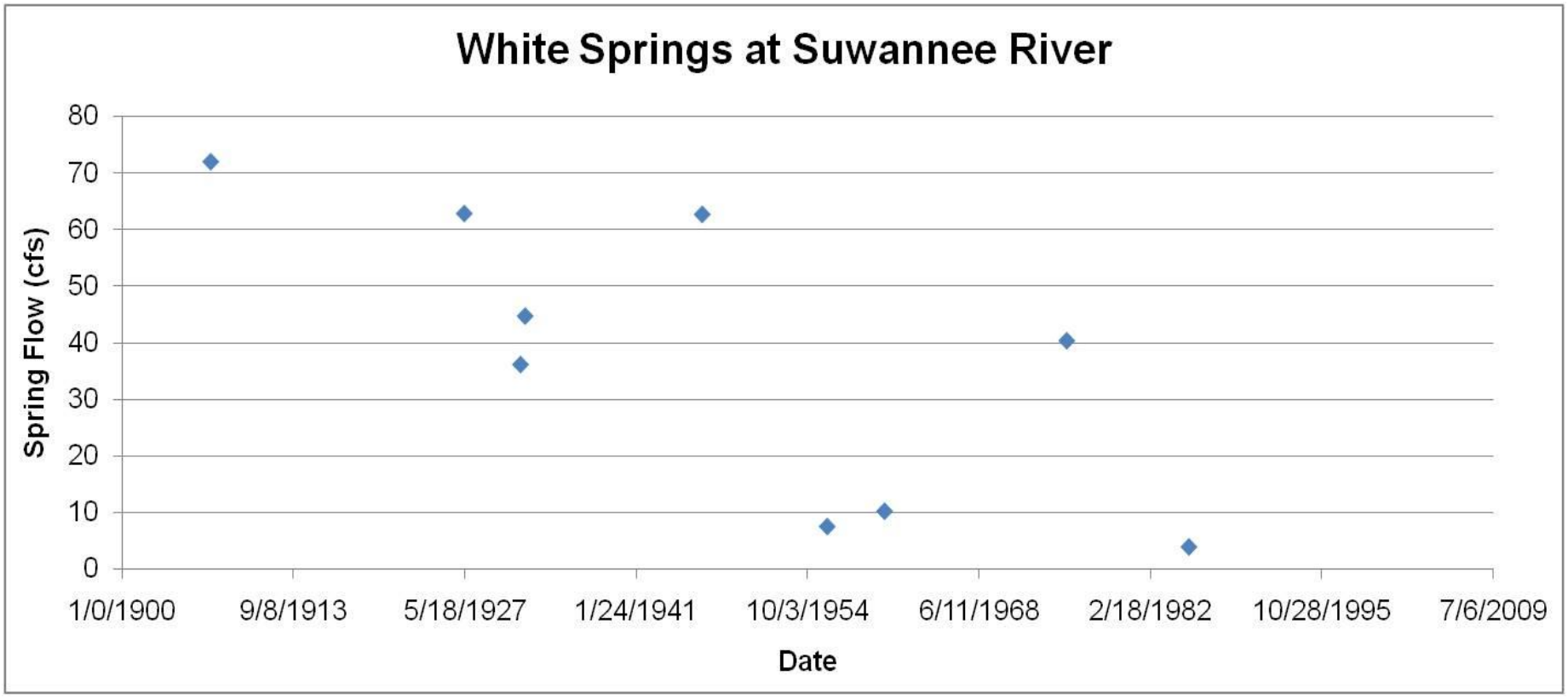
Historical White Springs Discharge



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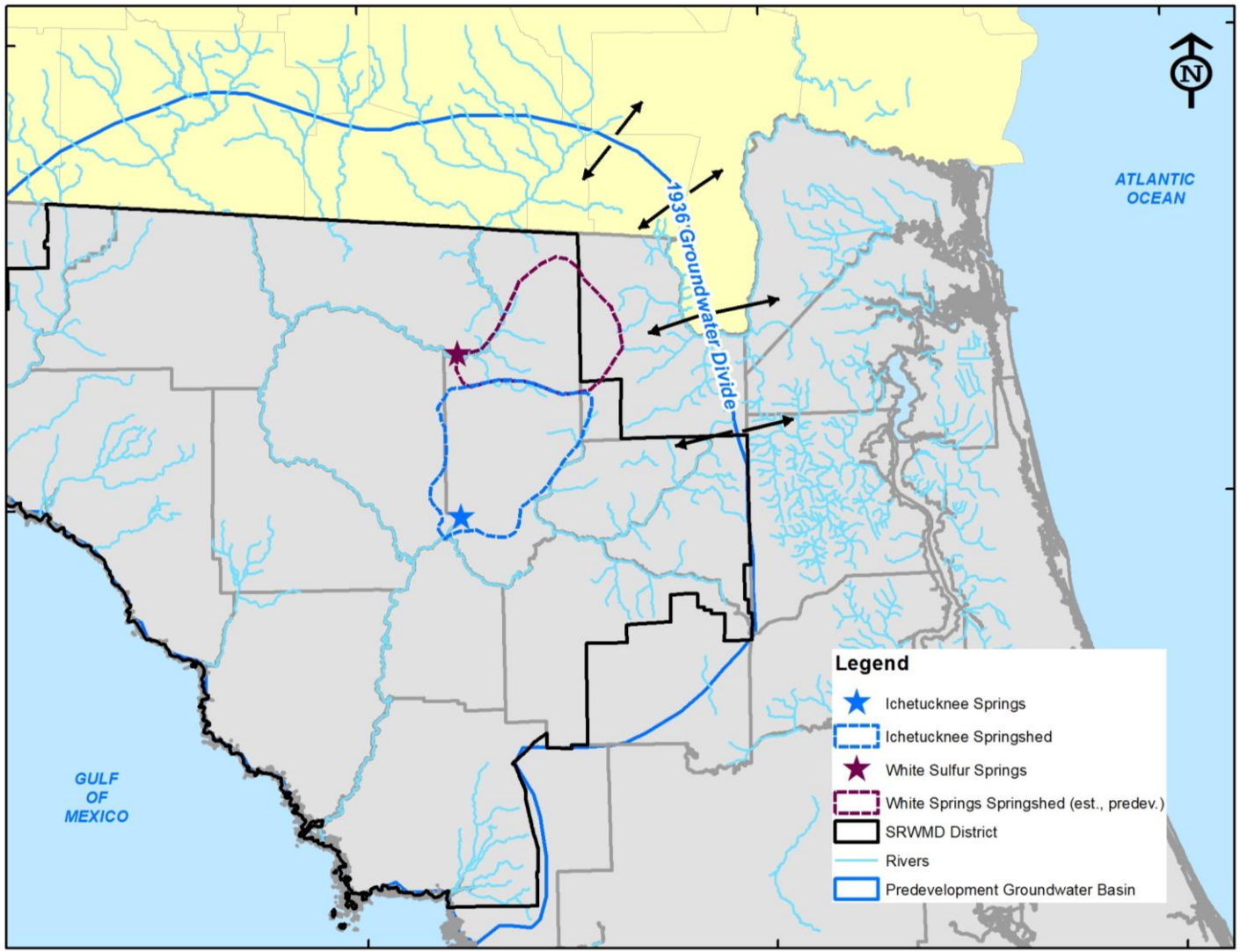
Migration of the Groundwater Flow Divide (1936-2005)



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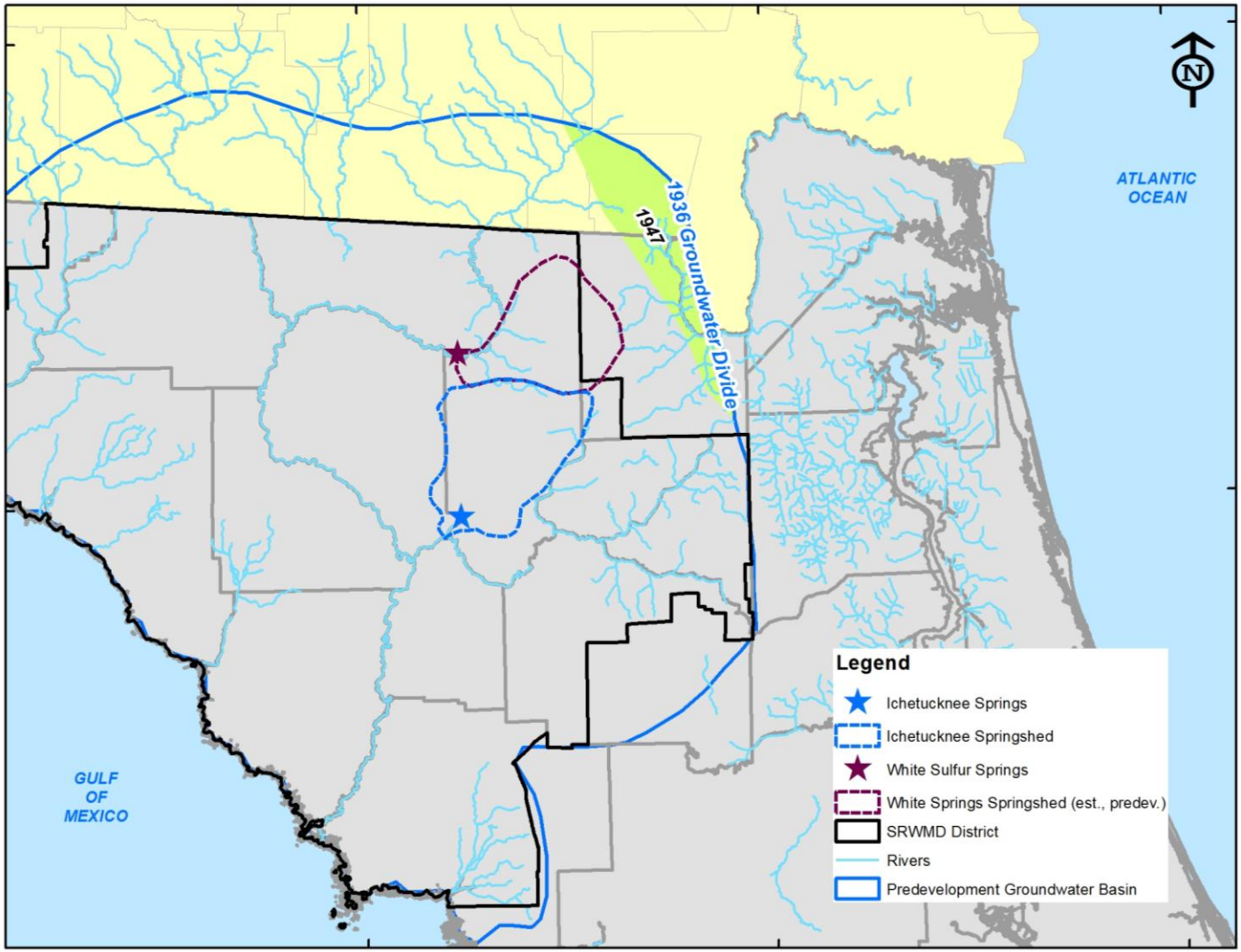
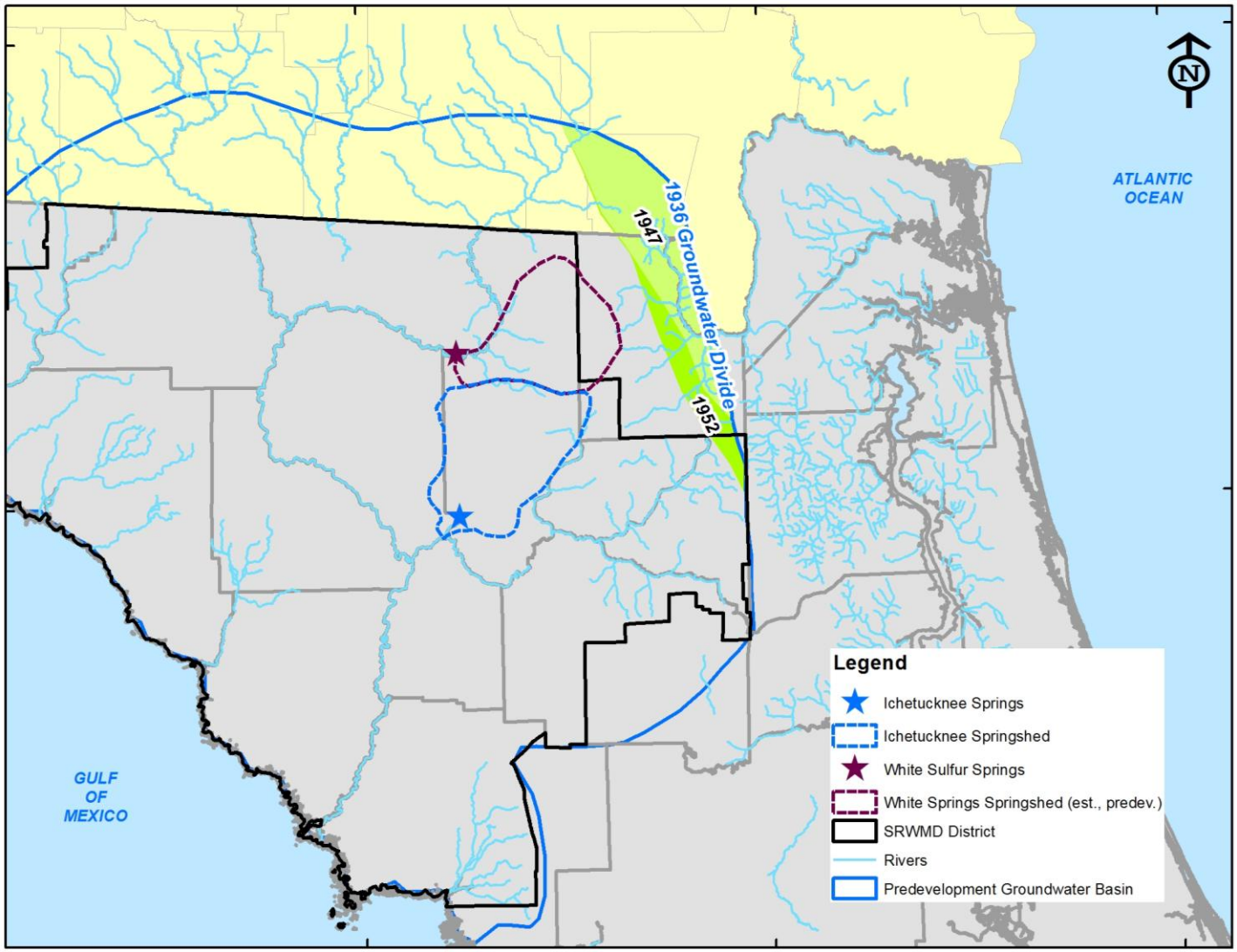
Groundwater Flow Divide (1947)



Cardno ENTRIX

Groundwater Flow Divide (1952)



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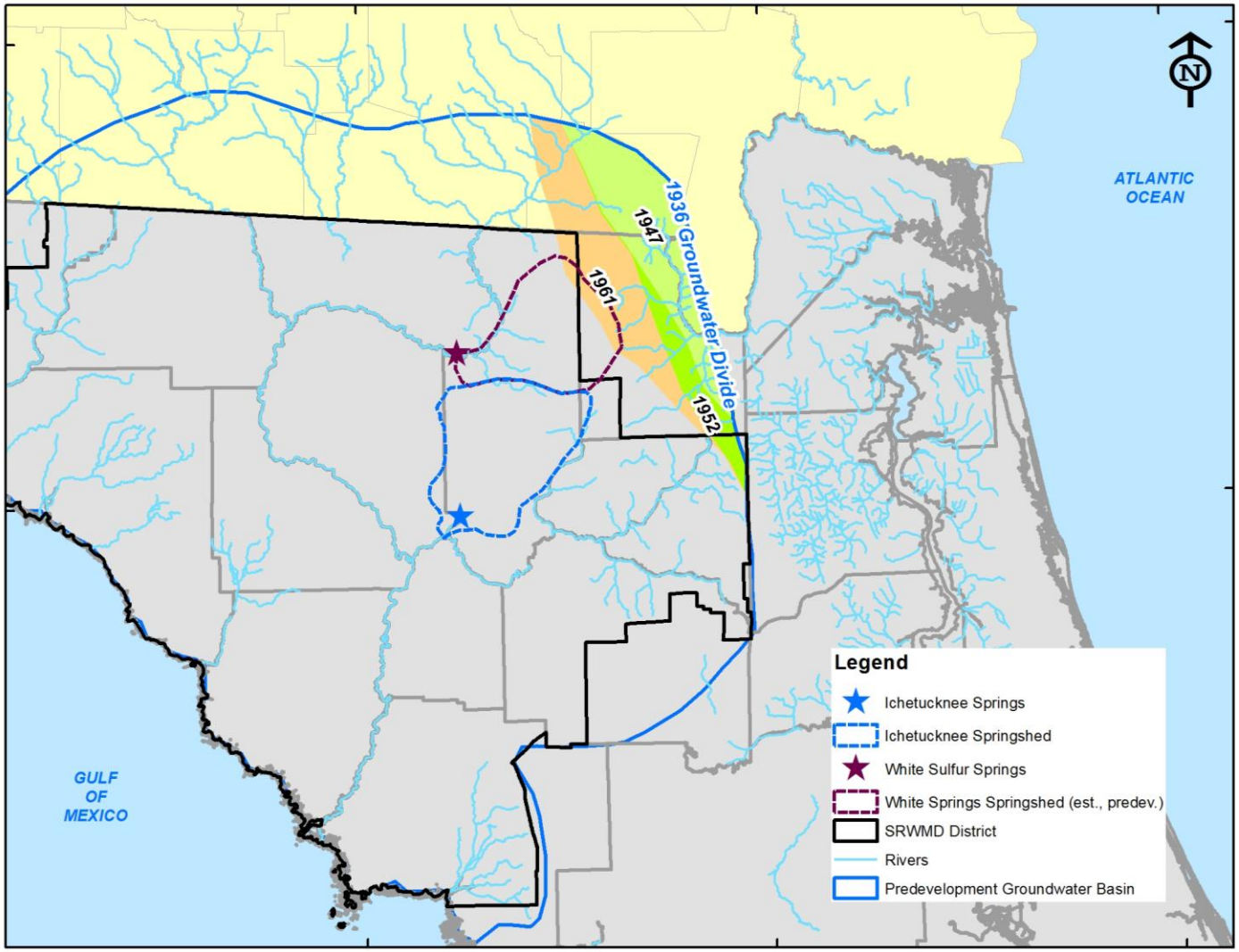
Groundwater Flow Divide (1961)



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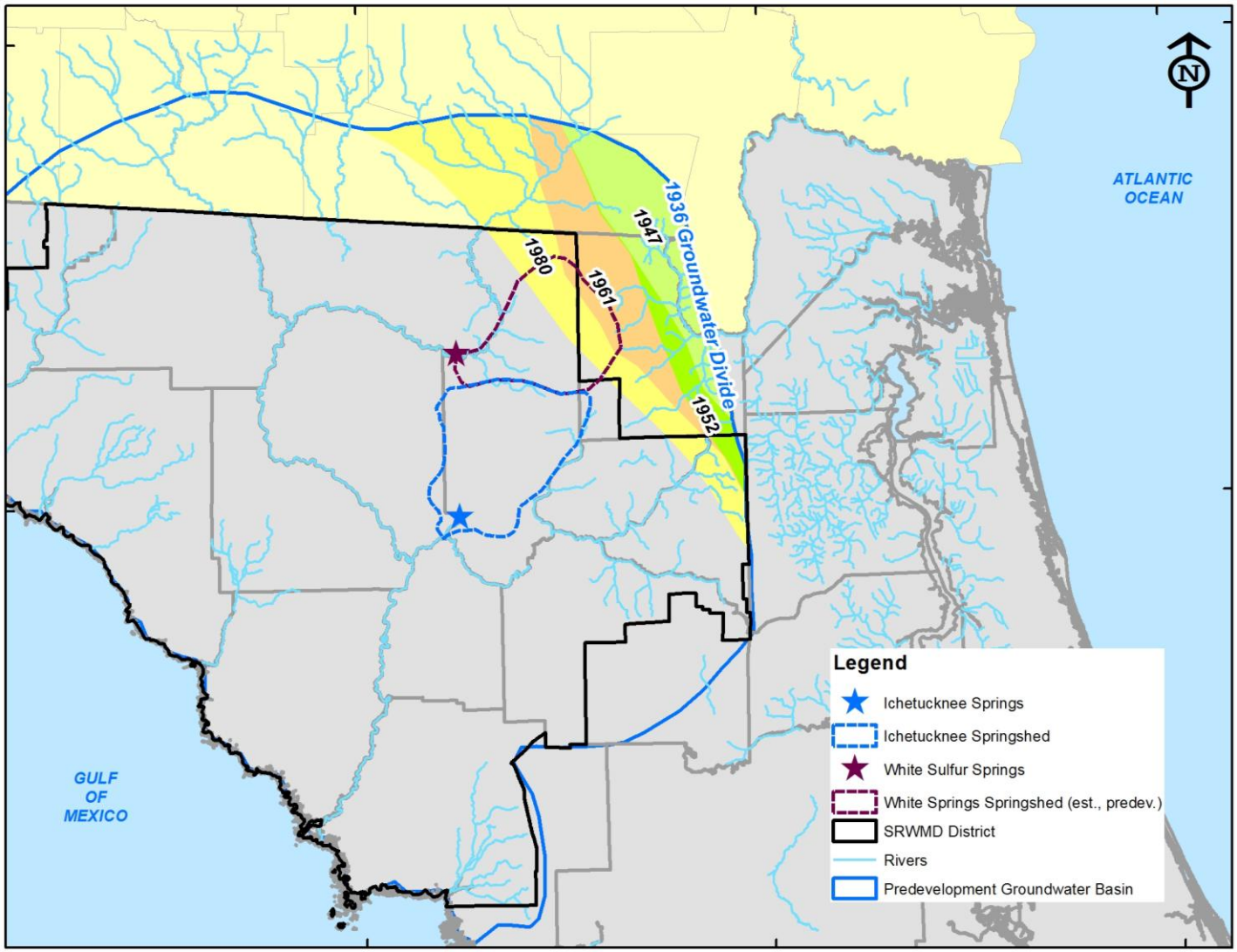
Groundwater Flow Divide (1980)



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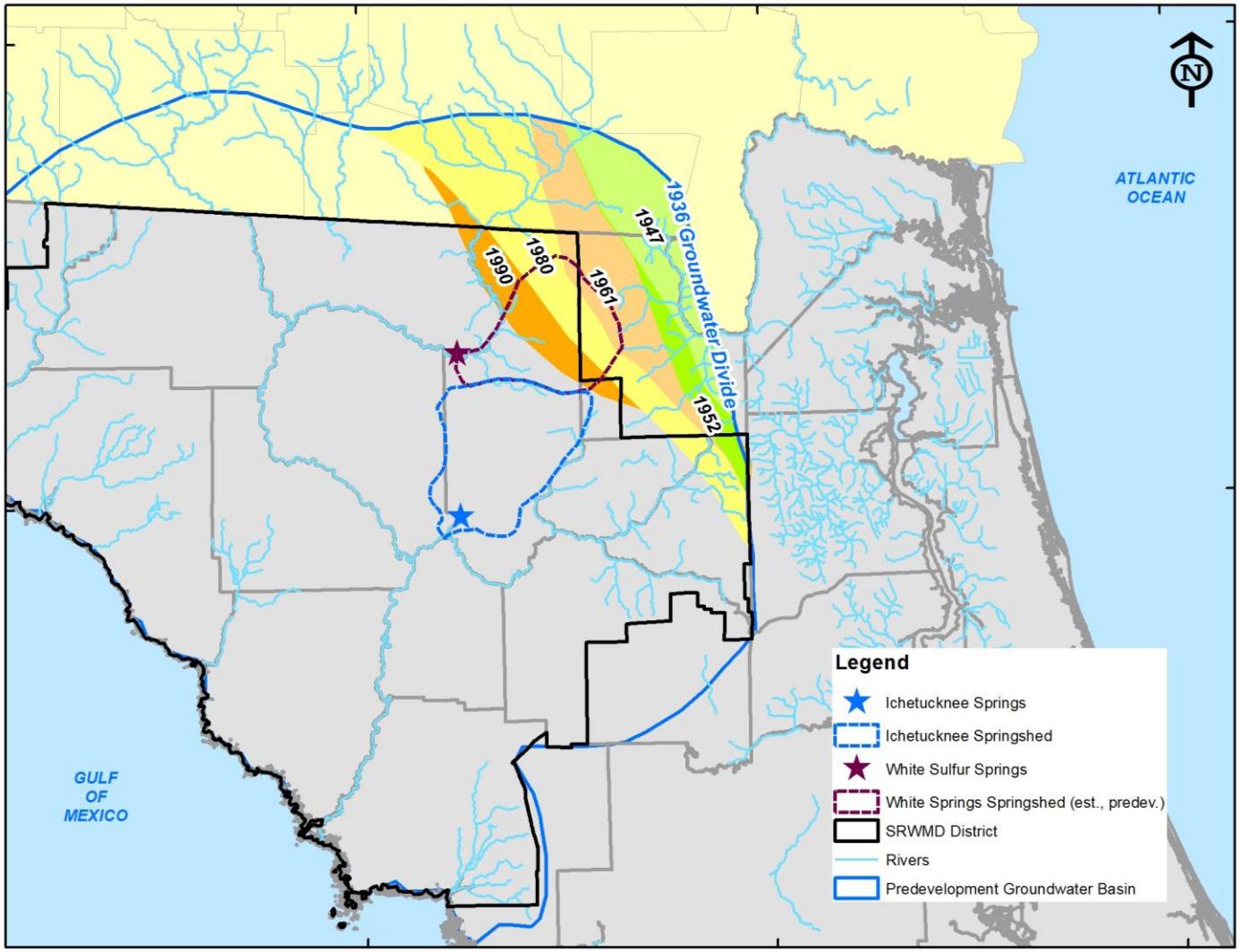
Groundwater Flow Divide (1990)



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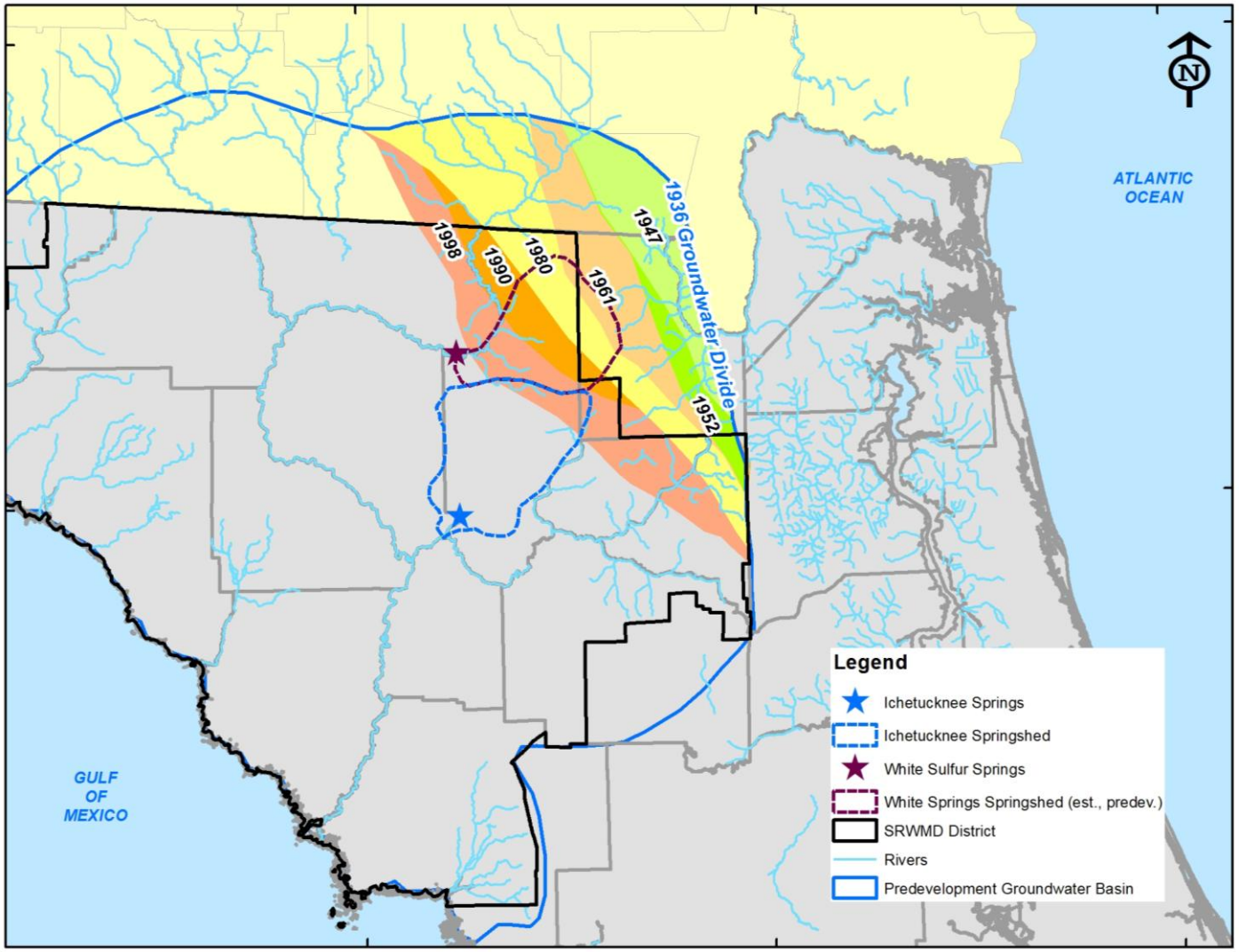
Groundwater Flow Divide (1998)



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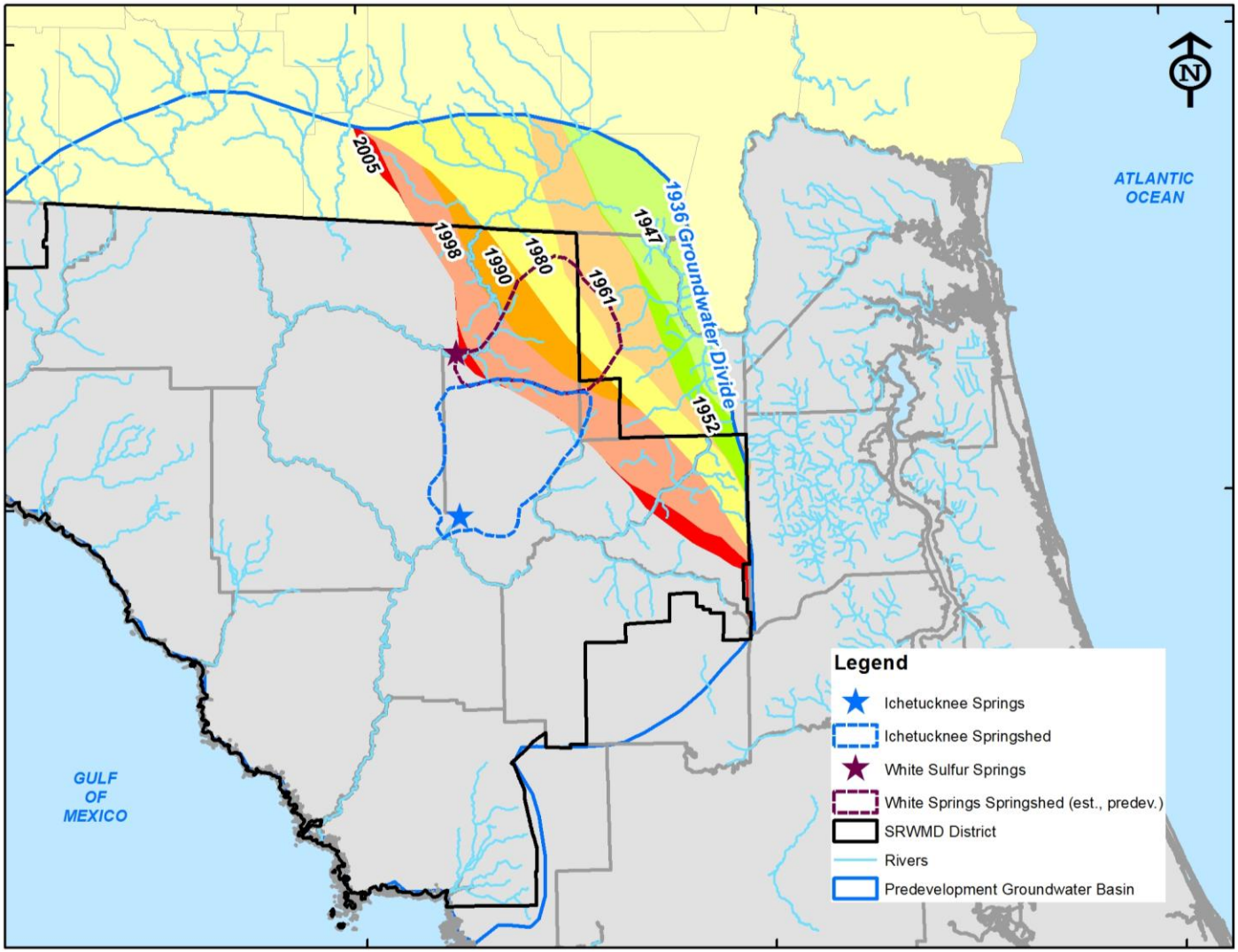
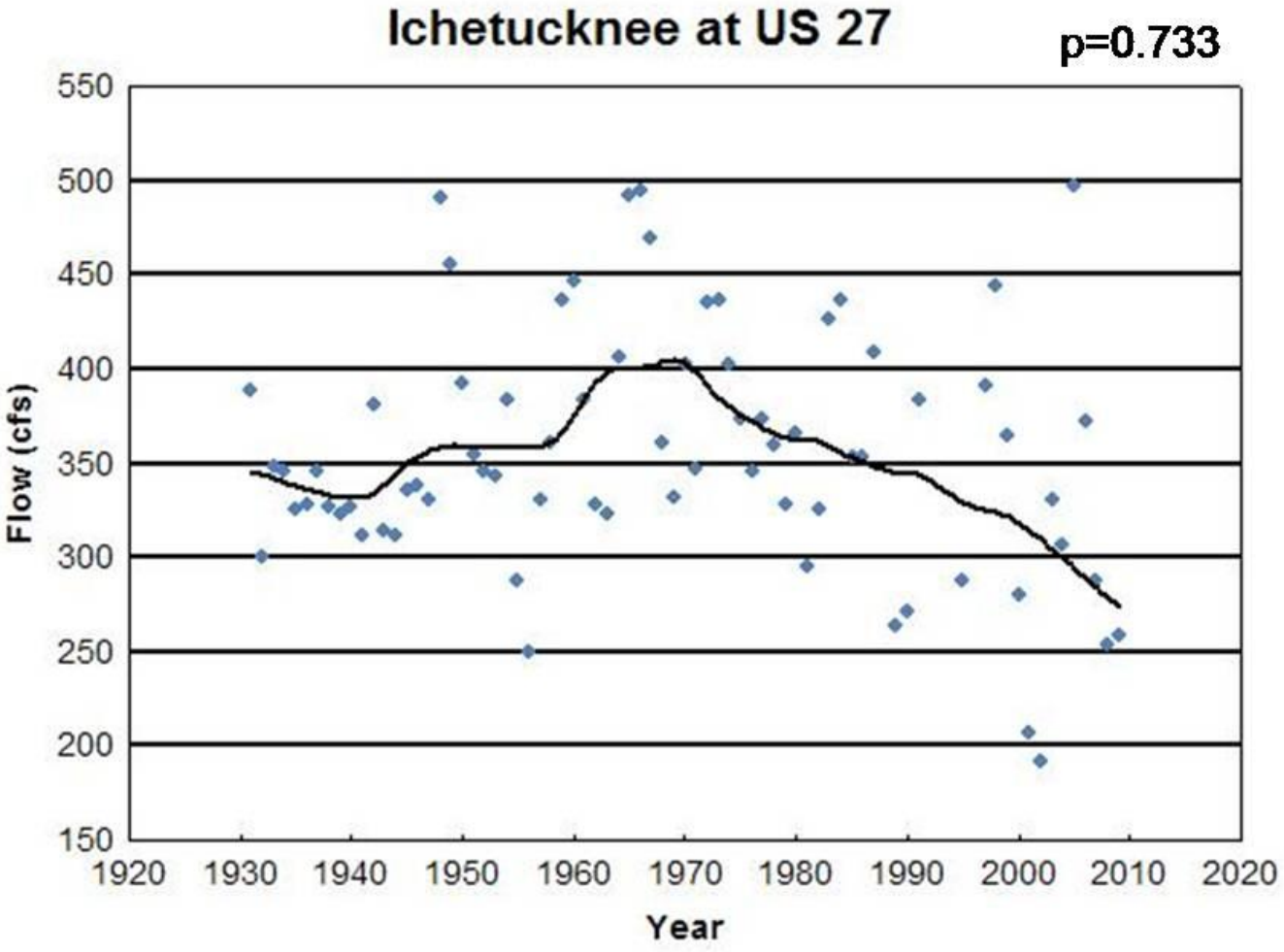
Groundwater Flow Divide (2005)



Cardno ENTRIX

Ichetucknee Springs at U.S. 27
(Influence of Rainfall Minimized)



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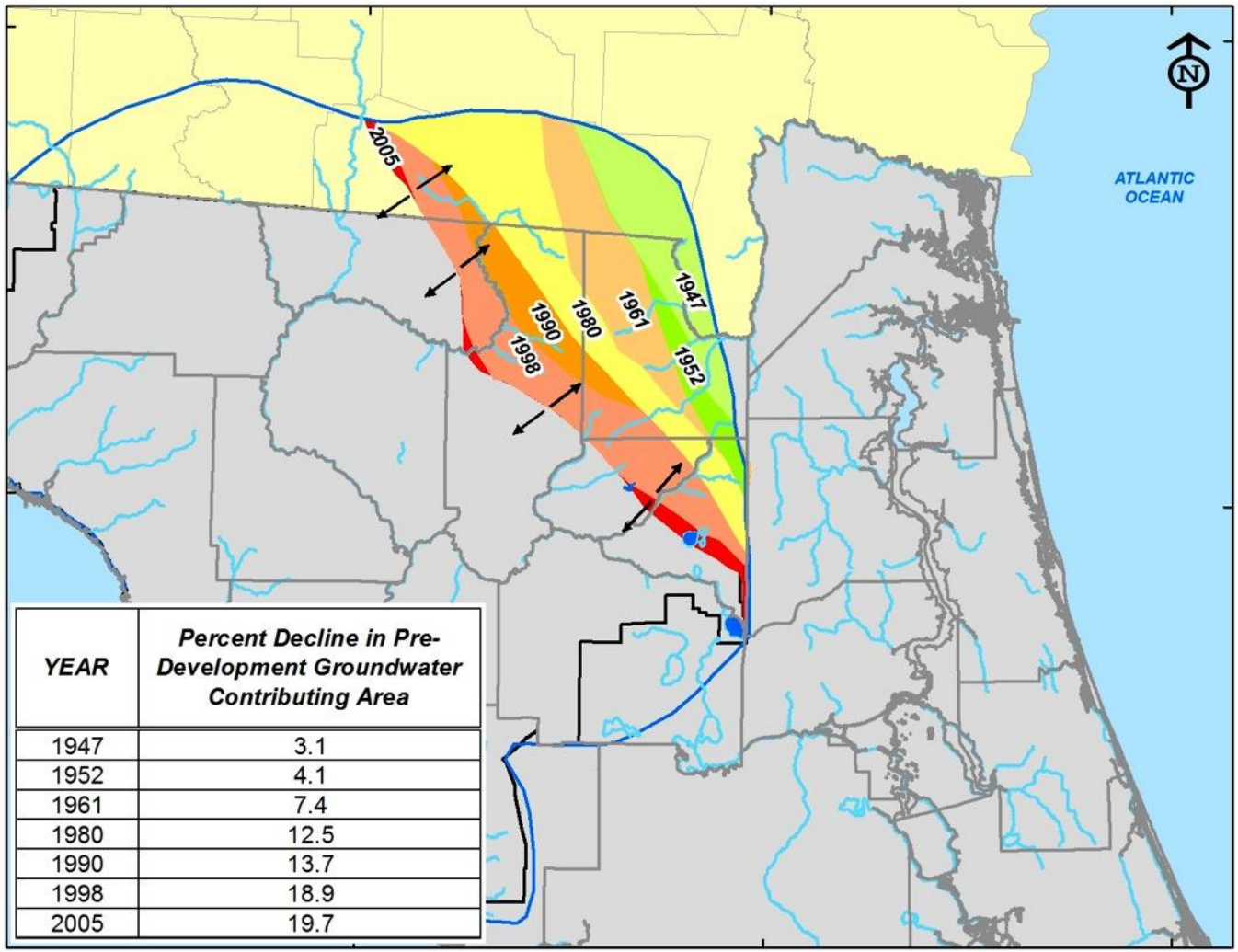
Impacts of Declining Groundwater Levels

- Santa Fe River Basin
  - Stream Flow
  - Lake Levels

Cardno ENTRIX

Migration of the Groundwater Flow Divide (1936-2005)



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2005	19.7

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Groundwater Level Declines Santa Fe River Basin

- Area Contributing Groundwater to the Santa Fe River Basin Declined by 267 Square Miles (32%) from 1936 to 2005.

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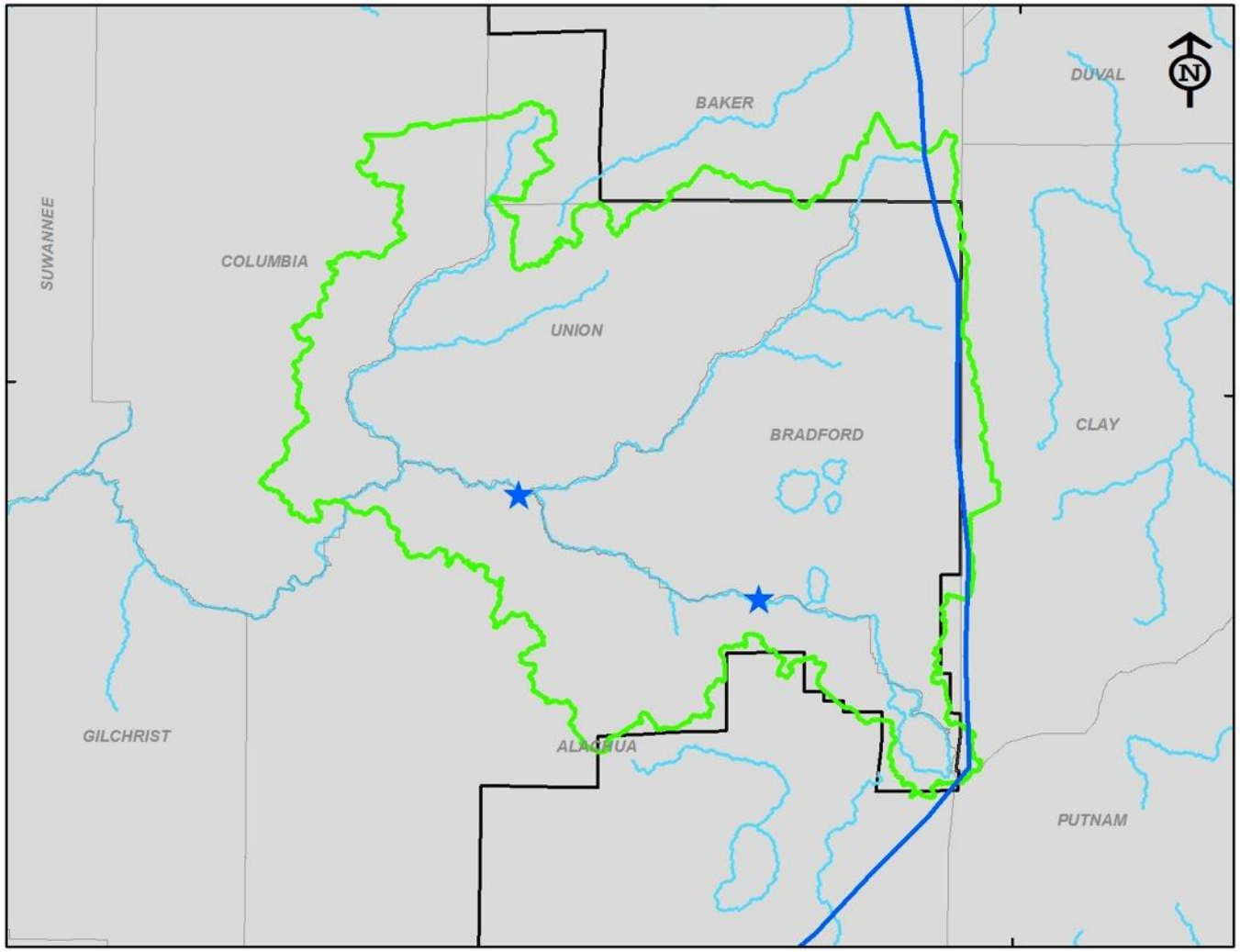
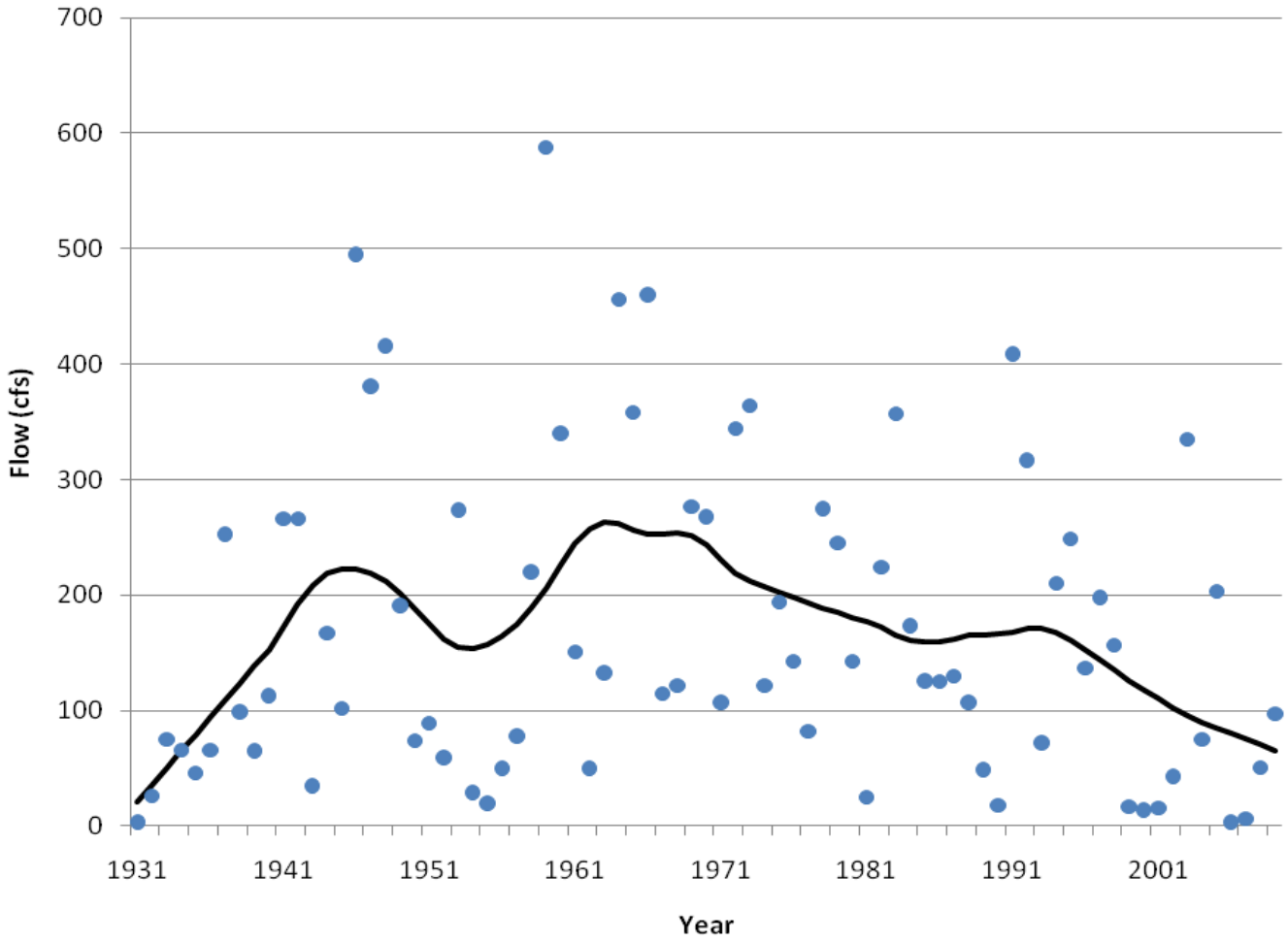
Upper Santa Fe River Long-Term Gauging Stations (Graham and Worthington Springs)



Cardno ENTRIX

Santa Fe River at Worthington Springs – Discharge (Influence of Rainfall Minimized)



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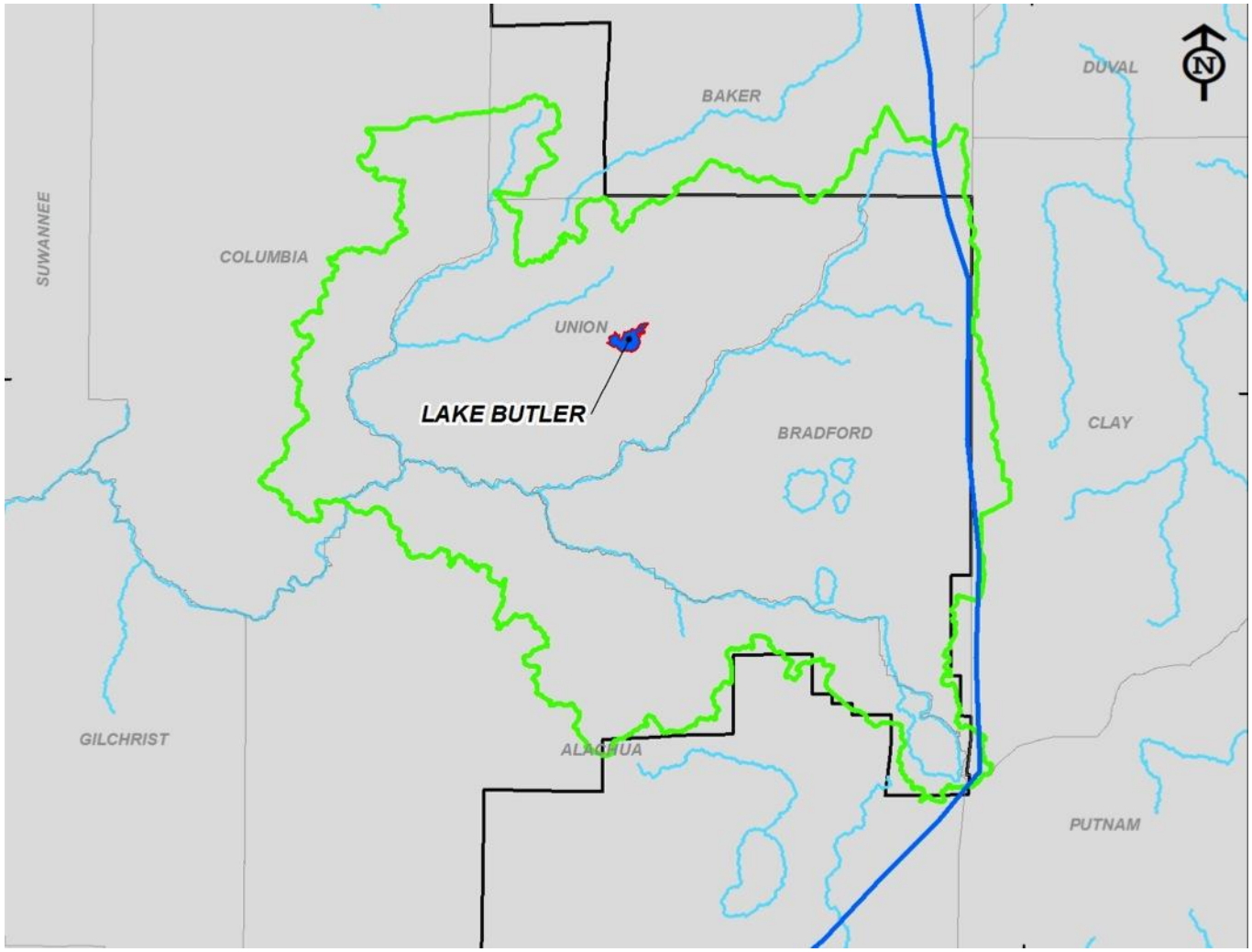
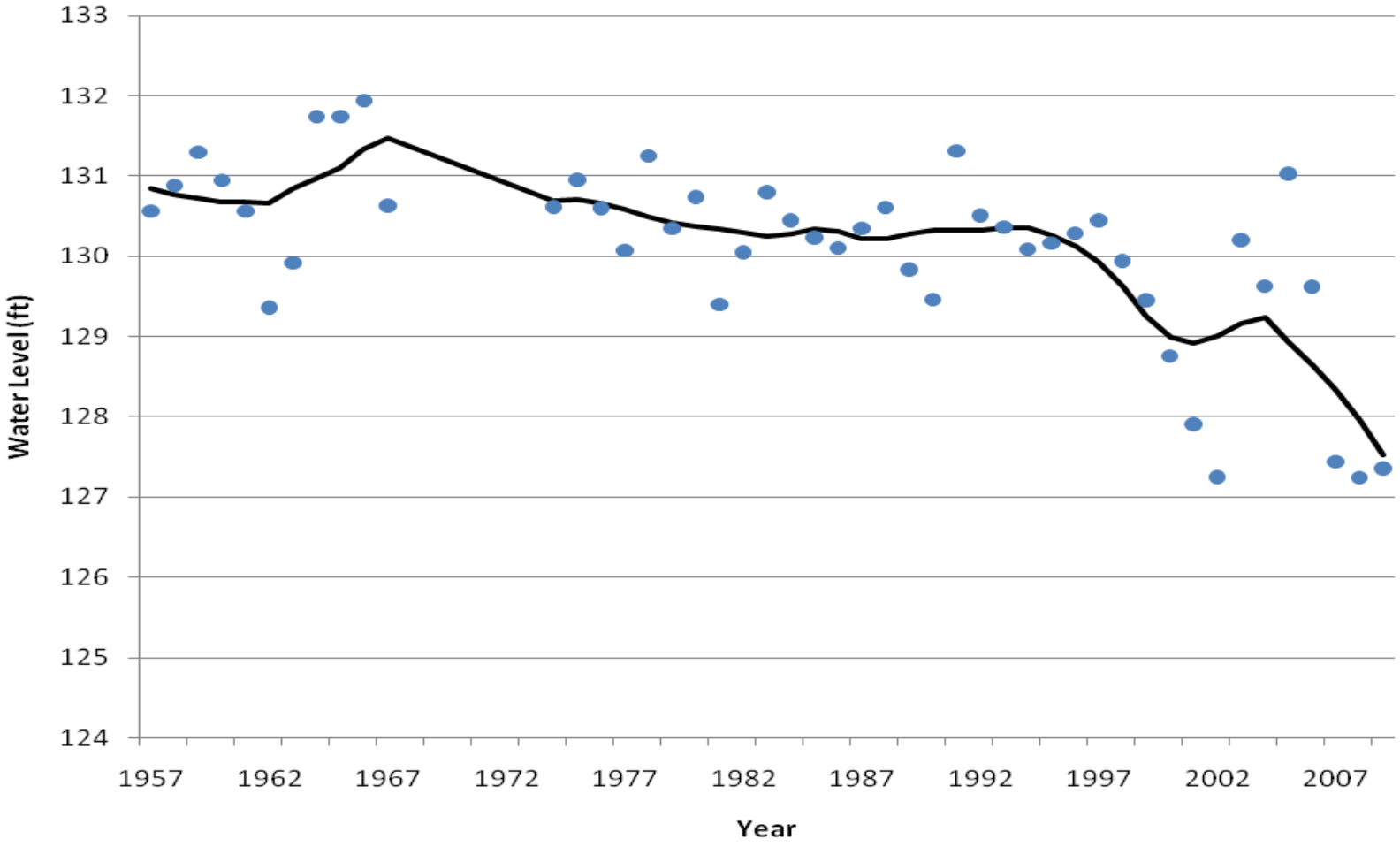
Lake Butler



Cardno ENTRIX

Lake Butler Water Levels
(Influence of Rainfall Minimized)



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Predicting When Stream/Spring Flow Will Exceed Minimums

- The SRWMD has Established Minimum Flows/Flow Constraints for Most Major Rivers, Springs, and Lakes.
- Groundwater Modeling was Used to Predict when the Minimums would be Exceeded.

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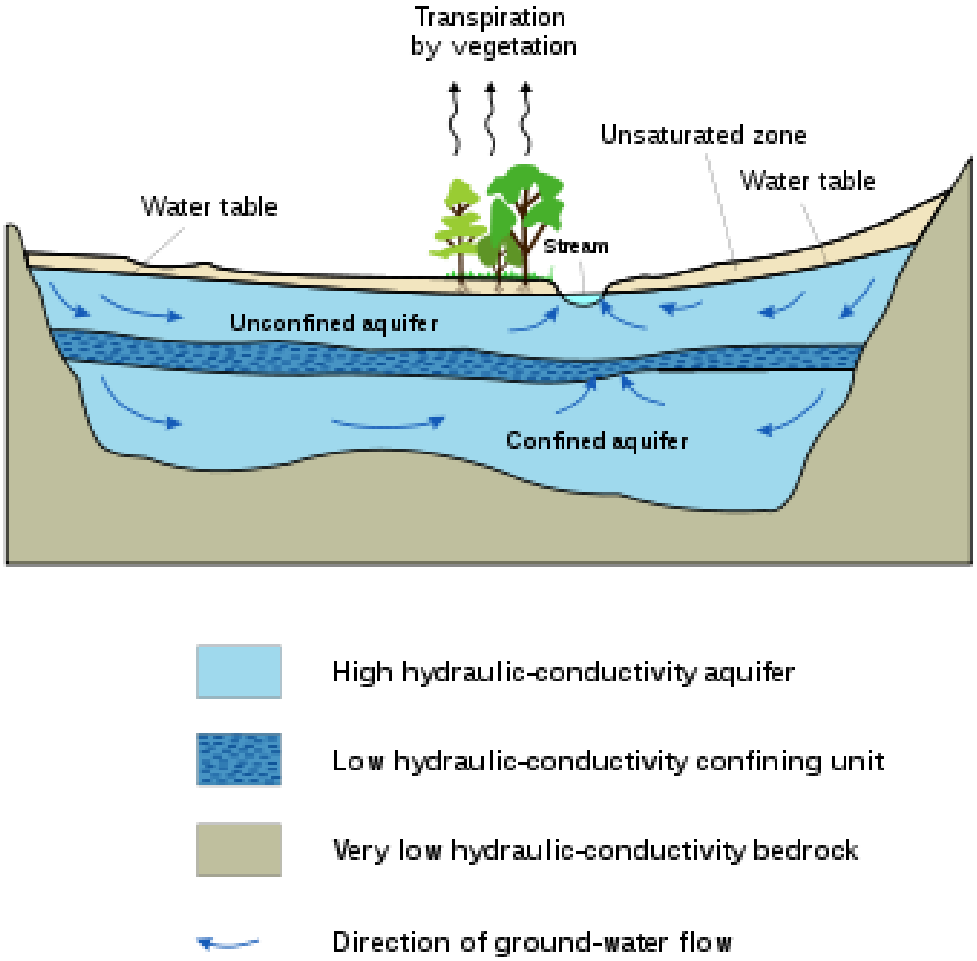
Groundwater Modeling



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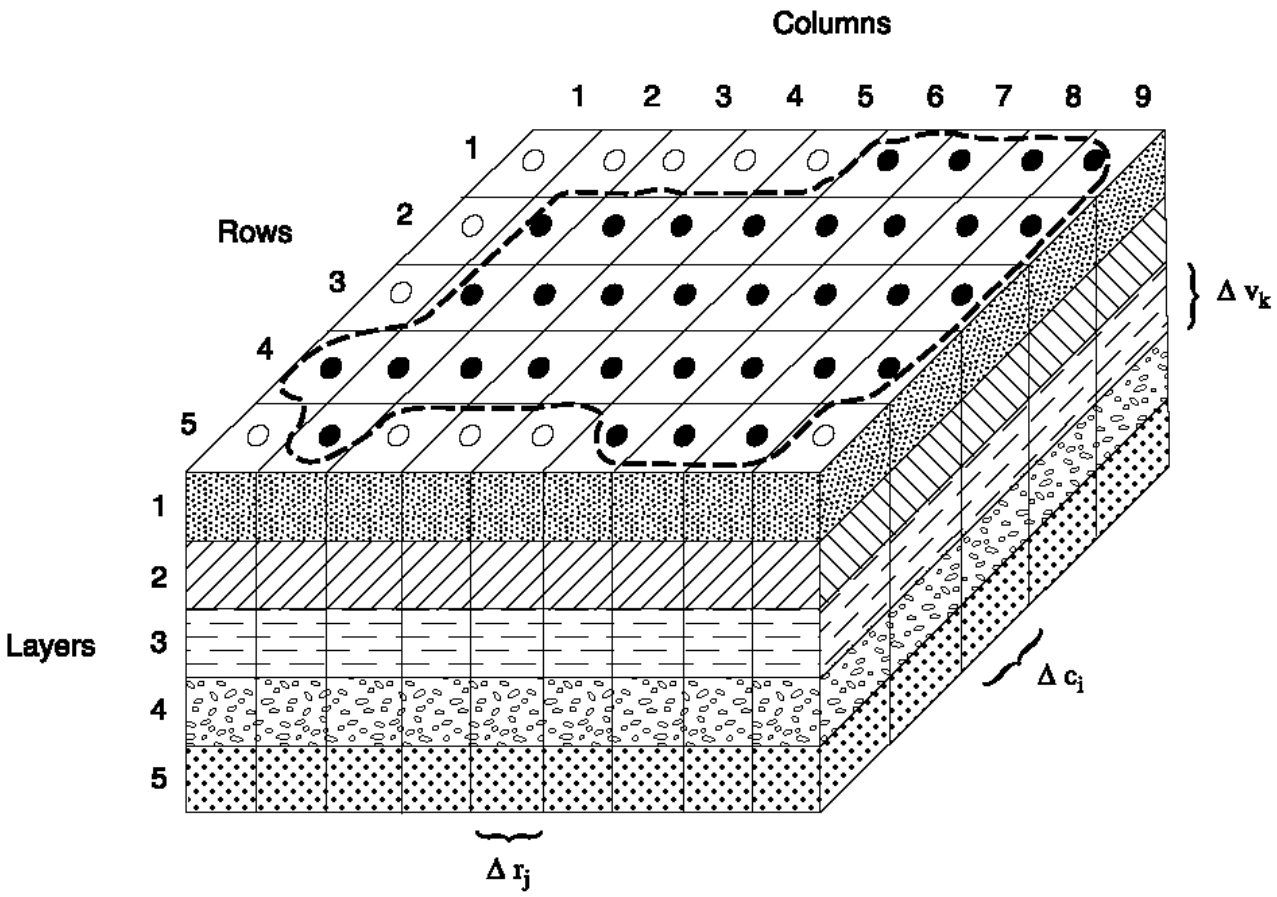
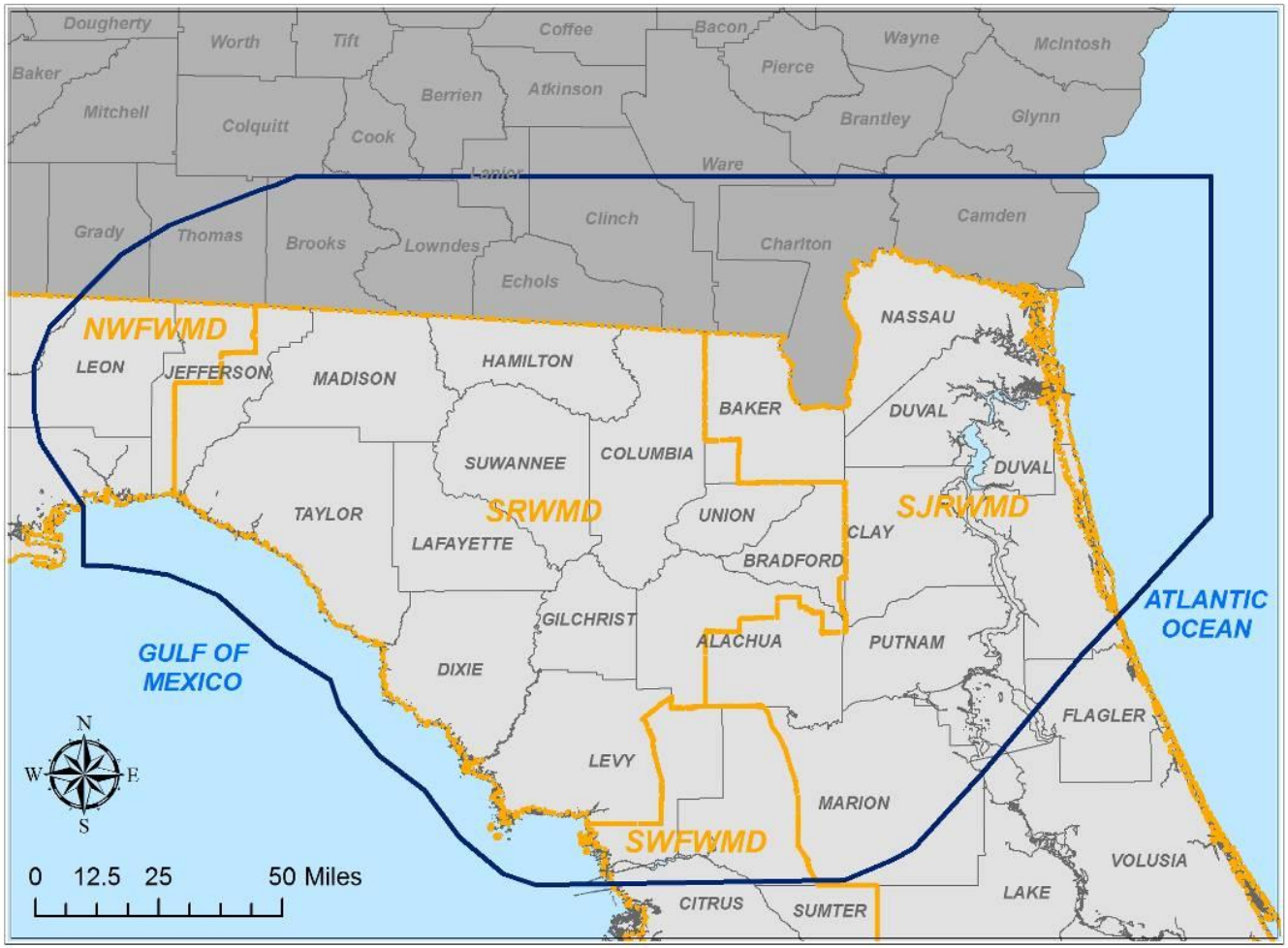
Groundwater Modeling

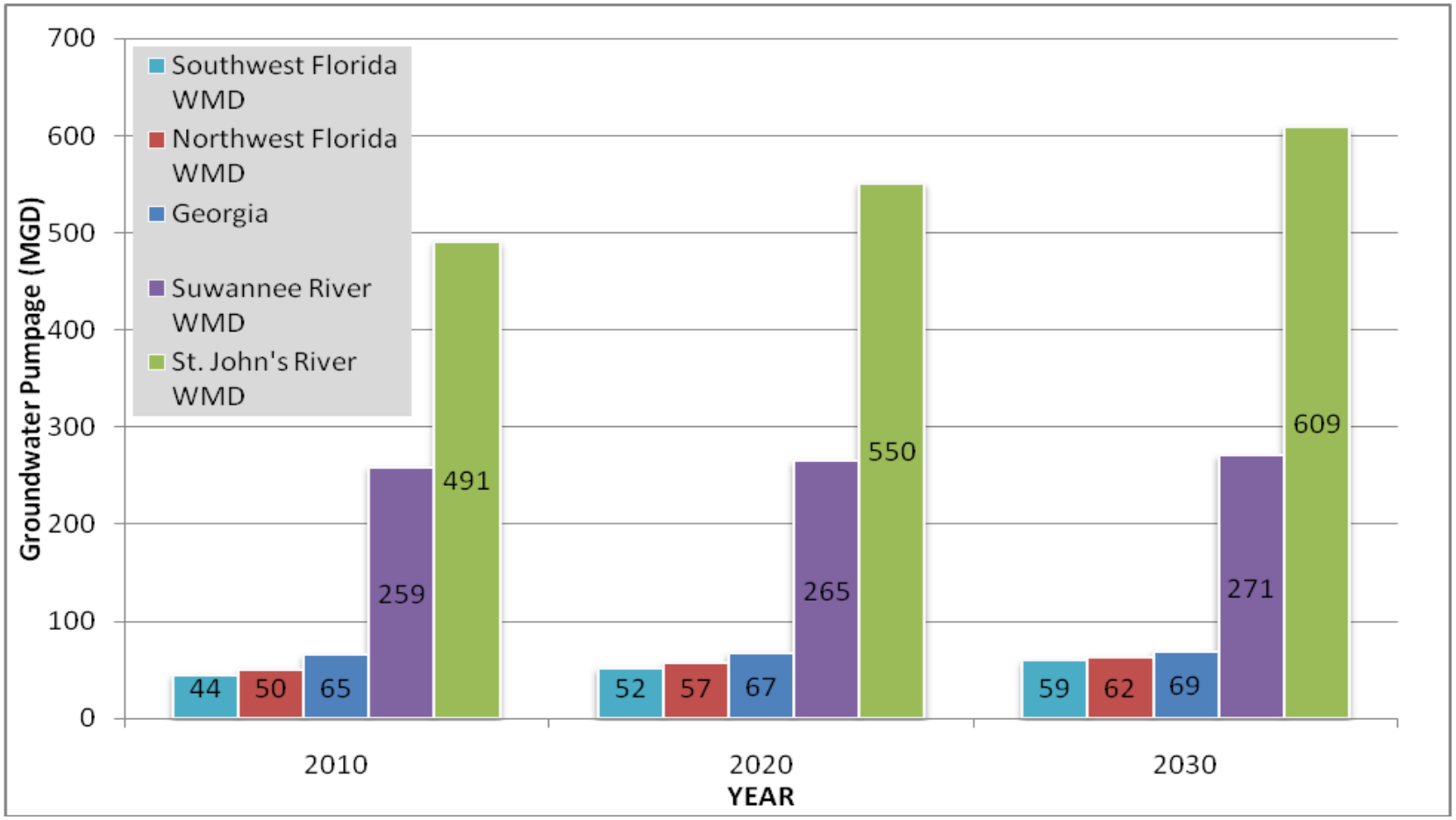


Suwannee River Water Management District
North Florida Model Area



Cardno ENTRIX

Current Groundwater Use and Future Demands in North Florida (2010 -2030)



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Rivers/Springs where Flow Constraints are Predicted to be Exceeded

River/Spring	Flow Constraint Exceeded
Suwannee R. White Springs	2005 – 2010
Alapaha R. Jennings	2005 – 2010
Santa Fe R. Worthington Springs	2005 – 2010
Hornsby Spring	2005 – 2010
Santa Fe River Rise	2015 – 2020
Columbia Spring	2020 – 2025
Treehouse Spring	2020 – 2025
Santa Fe R. Ft. White	2025 – 2030

Presentation Topics

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Cardno ENTRIX

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  - Agriculture?
  - Industry?
- These Questions Must be Answered Before Solutions Can be Developed.

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What Needs to be Done to thoroughly Understand the Problem and Develop Solutions?

- All Flow and Level Data for Groundwater, Springs, Rivers, Lakes, and Wetlands Needs to be Collected and Analyzed for Trends.
- Much Better Understanding of Groundwater Pumping in Southeast Georgia is Needed.
- Comprehensive Groundwater Modeling Study Needed to Determine the Degree that Each Major Groundwater User has Impacted Springs, Rivers, Lakes, and Wetlands in the Area of Concern.

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