

Hydrogeology of Florida

Part Deux

<http://www.youtube.com/watch?v=AfuPmBmzcq4>

Florida & Water

- A. Population growth of Florida is greater than that of the World or the United States.
- B. With population growth, there is a growth in the demand for water.
- C. Concerns about the quantity of water has led to artificial recharge through injection wells (Lake Alice) and use of retention ponds.
- D. Concerns about the quality of water resulting from a thin and often permeable cover or overburden.
- E. Inputs do not depend on inflowing surface waters (rivers from Georgia and Alabama) or snow melt. Principal input is precipitation.
- F. Florida is in the envious position, with plentiful rainfall, low relief, and prolific aquifer storage resulting in lakes, springs, and wetlands.

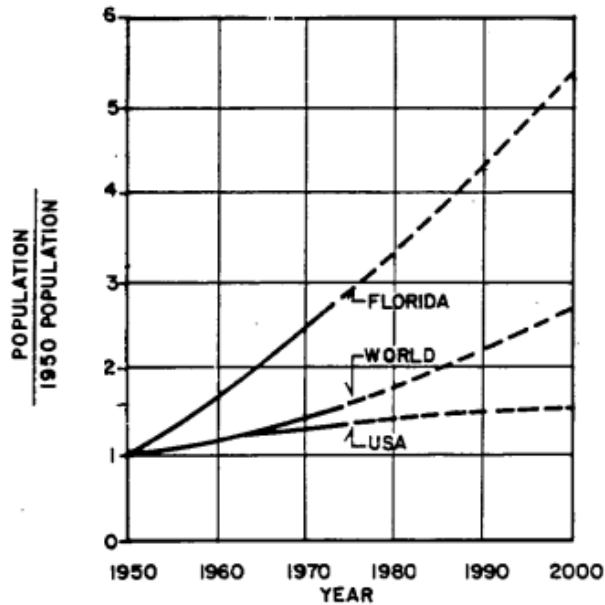


Figure 1. Population trends for Florida, U.S. and World.

Of course the population of Florida has flattened (at least temporarily) due to the economic downturn, but the exodus is relatively small compared to the previous 40+ years of growth.

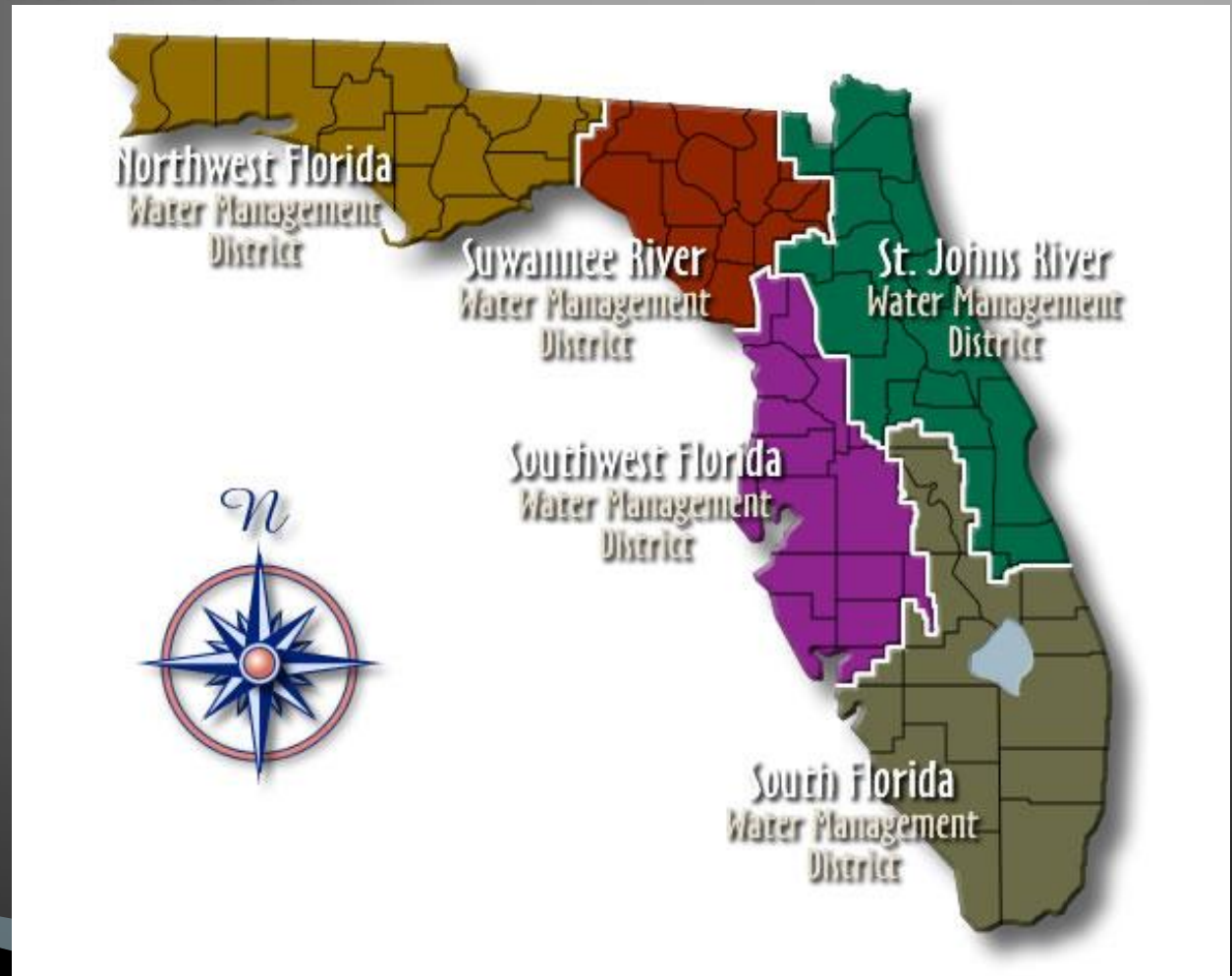
WATER USE (10⁶ gal./day)	1960	1980
TOTAL WITHDRAWN	3,760	7,309
PUBLIC SUPPLIES	530	1,361
ALL INDUSTRIAL	2,460	2,641
IRRIGATION	660	2,997
RURAL	110	310
GROUND WATER (%)	23	51
POPULATION (millions)	4.9	9.7

Figure 2. Florida's total fresh water use in 1960 and 1980.

How to Manage Groundwater in Florida?

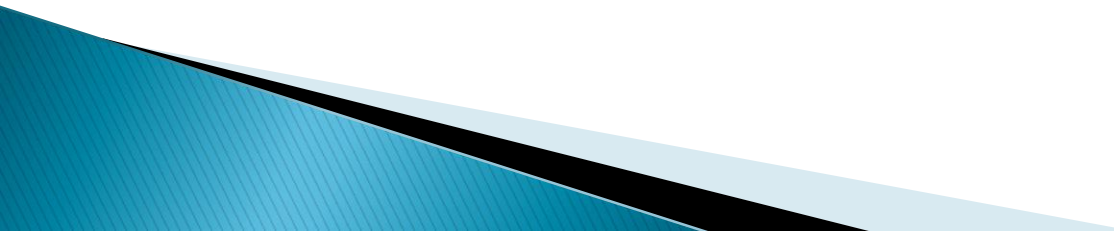
- A. Before 1972, Florida had two water management districts (WMD).
The South Florida Flood Control District and the Southwest Florida Water Management District.

In 1972, three additional WMD were added to the state, St. Johns, Suwannee River, NW Florida



What are Water Management Districts?

Charges:

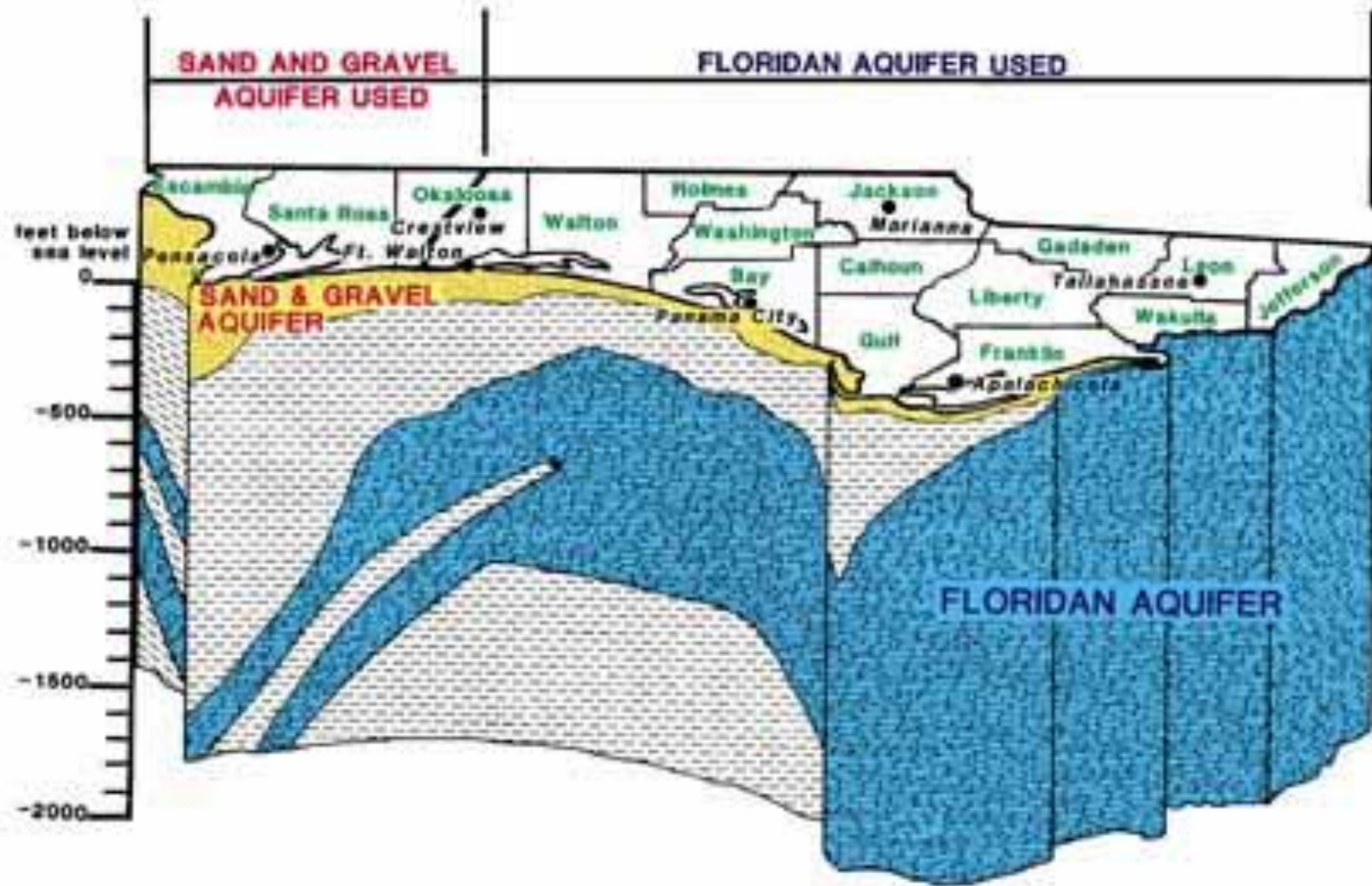
- (a) Administer Flood Protection Programs.
 - (b) Perform Technical Investigations of Water Resources in Florida
 - (c) Develop Water Management programs for shortages and droughts
 - (d) Manage lands under Save our Rivers Program
 - (e) Manage consumptive use, aquifer recharge, well construction and surface water management.
 - (f) Administer Stormwater management
- 

Regions Served by Each WMD

NW Florida: Bay, Calhoun, Escambia, Franklin, Gadsden, Gulf, Holmes, Jackson, Jefferson (western half), Leon, Liberty, Okaloosa, Santa Rosa, Wakulla, Walton, & Washington



NW Florida WMD



Issues NW FI WMD

Contains some of the largest rivers and important streams, lakes, springs and estuaries.

In terms of annual discharge :3/5 of the states largest rivers the Apalachicola, Choctawhatchee and Escambia.

Many of the District's major rivers originate in Alabama and Georgia and interstate water management relating to these rivers is an increasingly important issue.

Areas within the District of particular concern are designated as Water Resource Caution Areas.

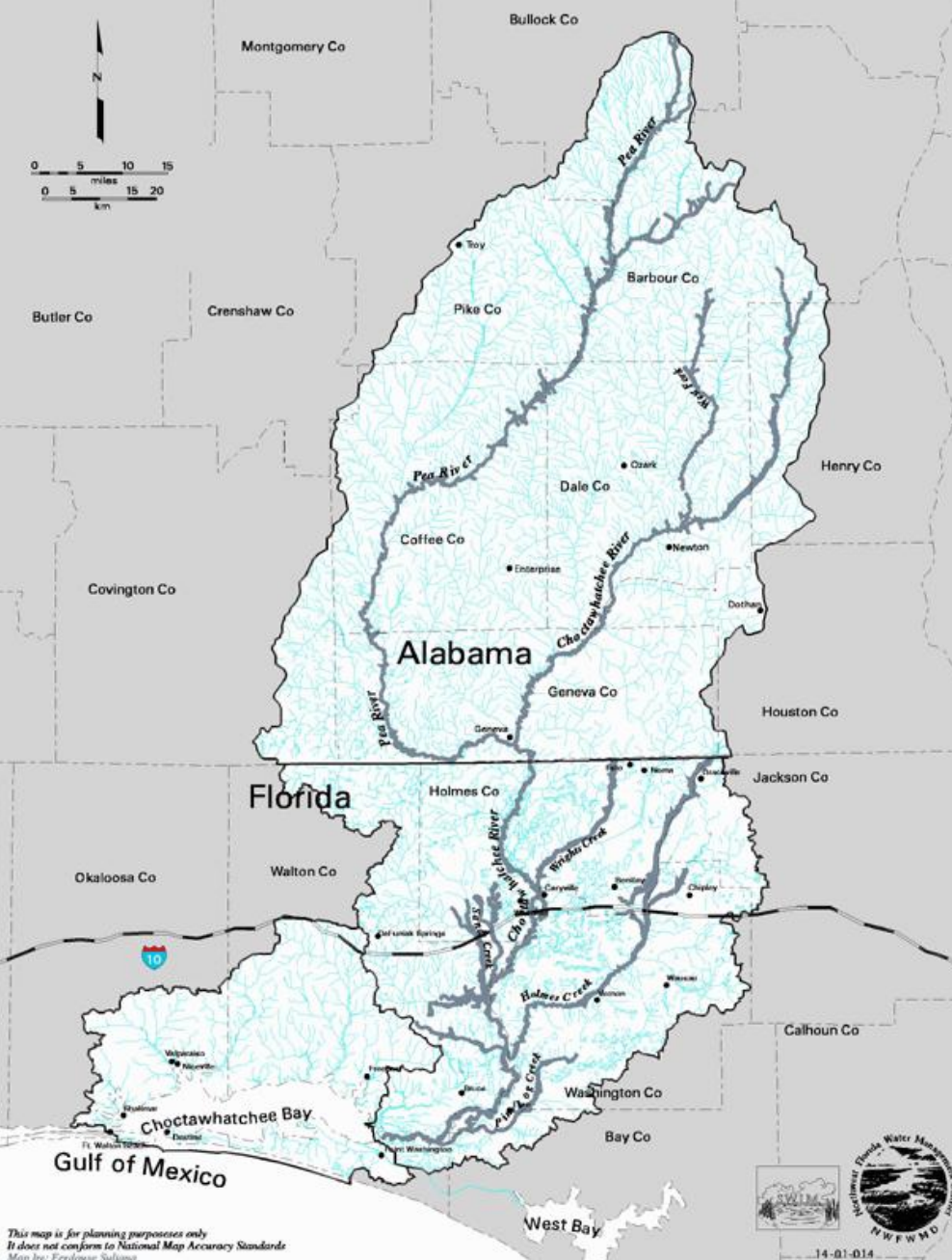
Coastal Santa Rosa, Okaloosa and Walton counties where extensive development and significant withdrawals of ground water have occurred.

Telogia Creek: Major Agricultural use



Appalachicola River Basin

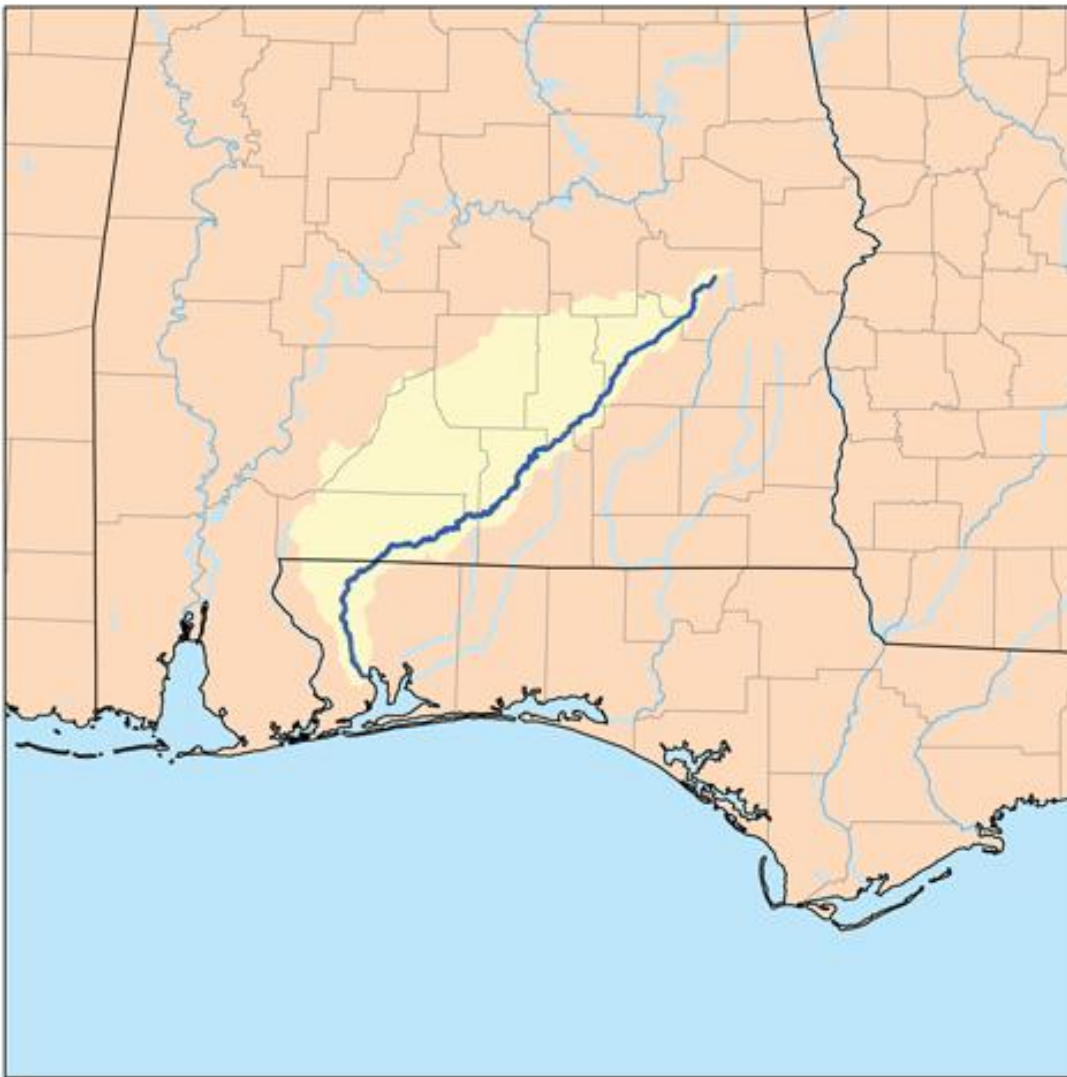
500 miles long, 112 in Florida



Choctawhatchee RB

Numerous estuaries and springs

This map is for planning purposes only. It does not conform to National Map Accuracy Standards. Map by: Ferlose Sullivan



Escambia RB

Flood plains, major estuaries.

Regions Served by Each WMD

Suwannee River WMD Columbia, Dixie, Gilchrist, Hamilton, Lafayette, Madison, Suwannee, Taylor, Union and portions of Alachua, Baker, Bradford, Jefferson & Levy :

Major Rivers

Suwannee

Santa Fe

Withlacoochee

Aucilla

Alapaha

Ichetucknee

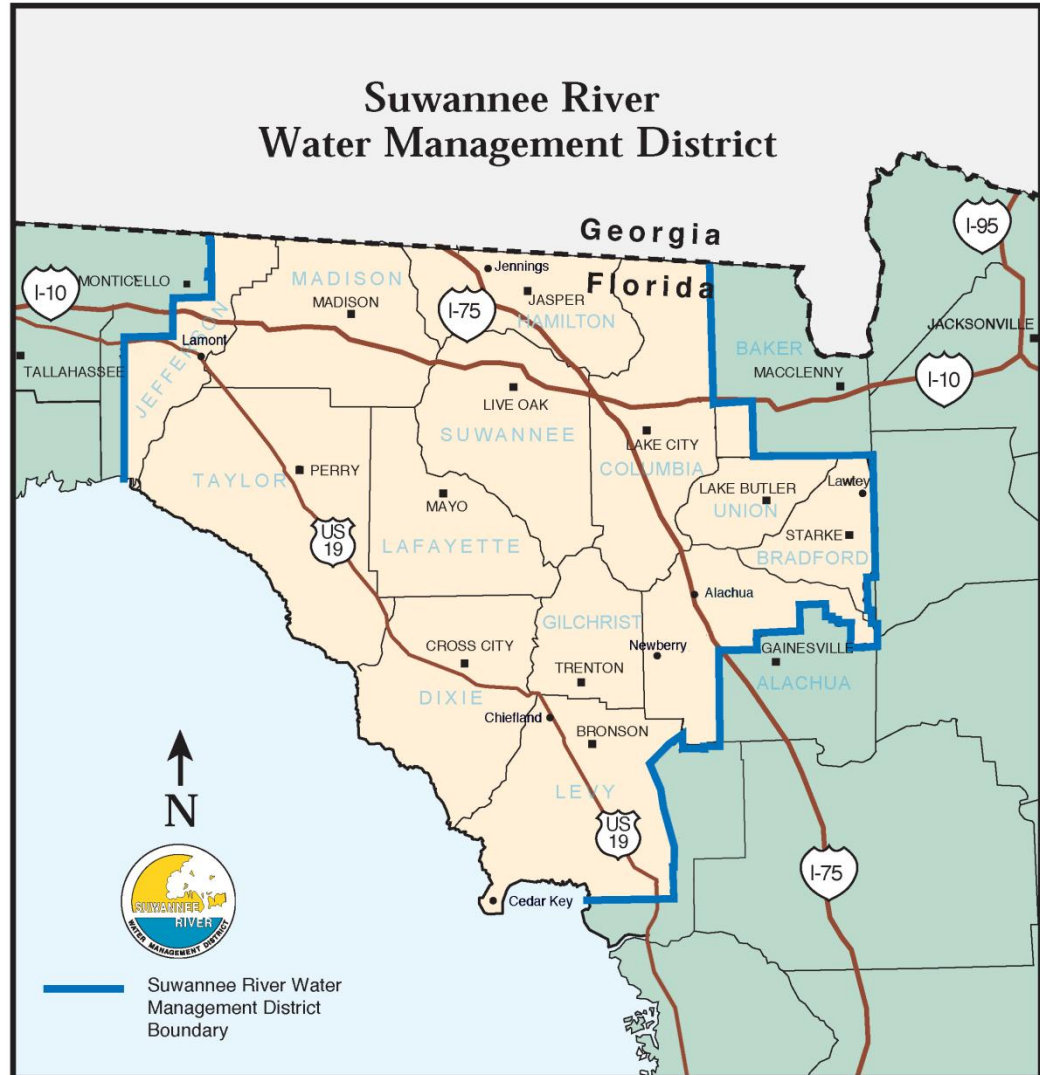
Fenholloway

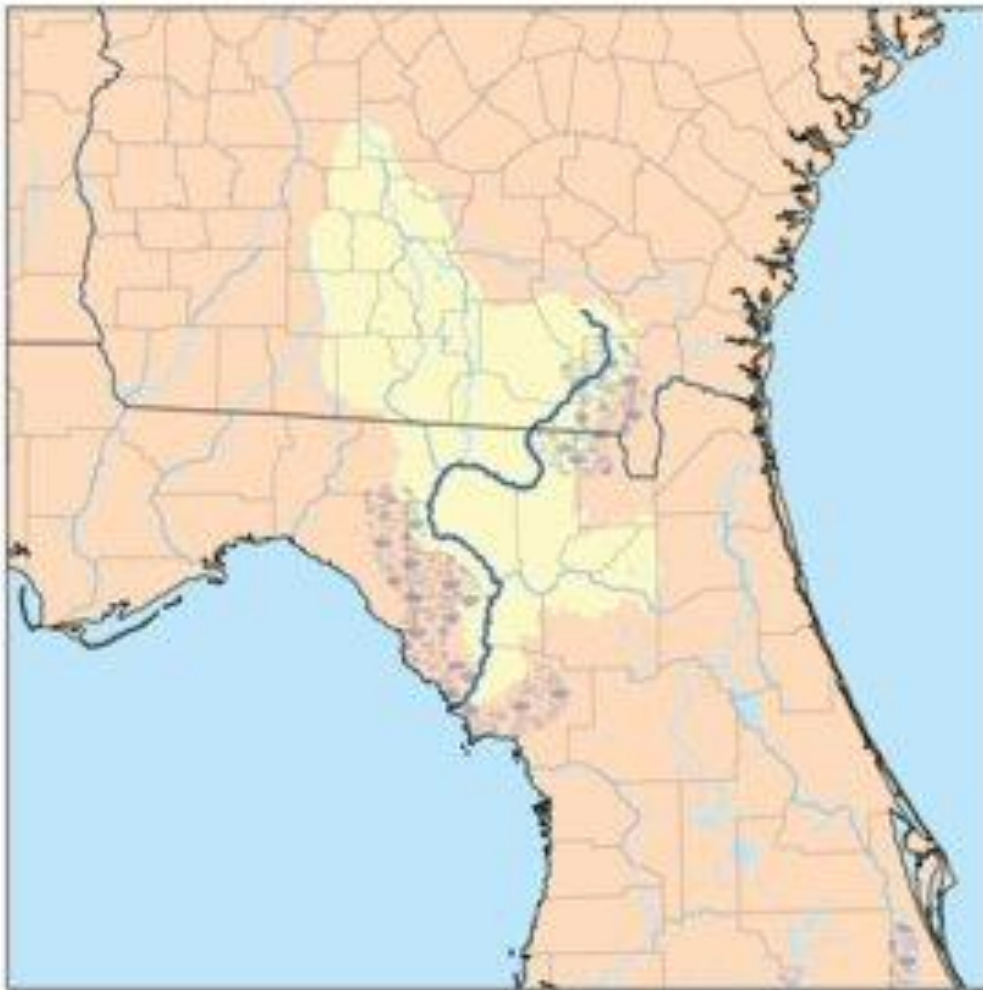
Steinhatchee

Econfina

Waccasassa

Wacissa





Suwannee River was a major log (pineleaf) transport waterway.

Major springs and excellent water quality.

Suwannee River WMD

Least Populous (<400,000 people)

“Swanee”

- ▶ Stephen Foster– Never saw the river, did not know how to spell it, but boy could he write music (words, well that’s a whole ‘nother’ story.....

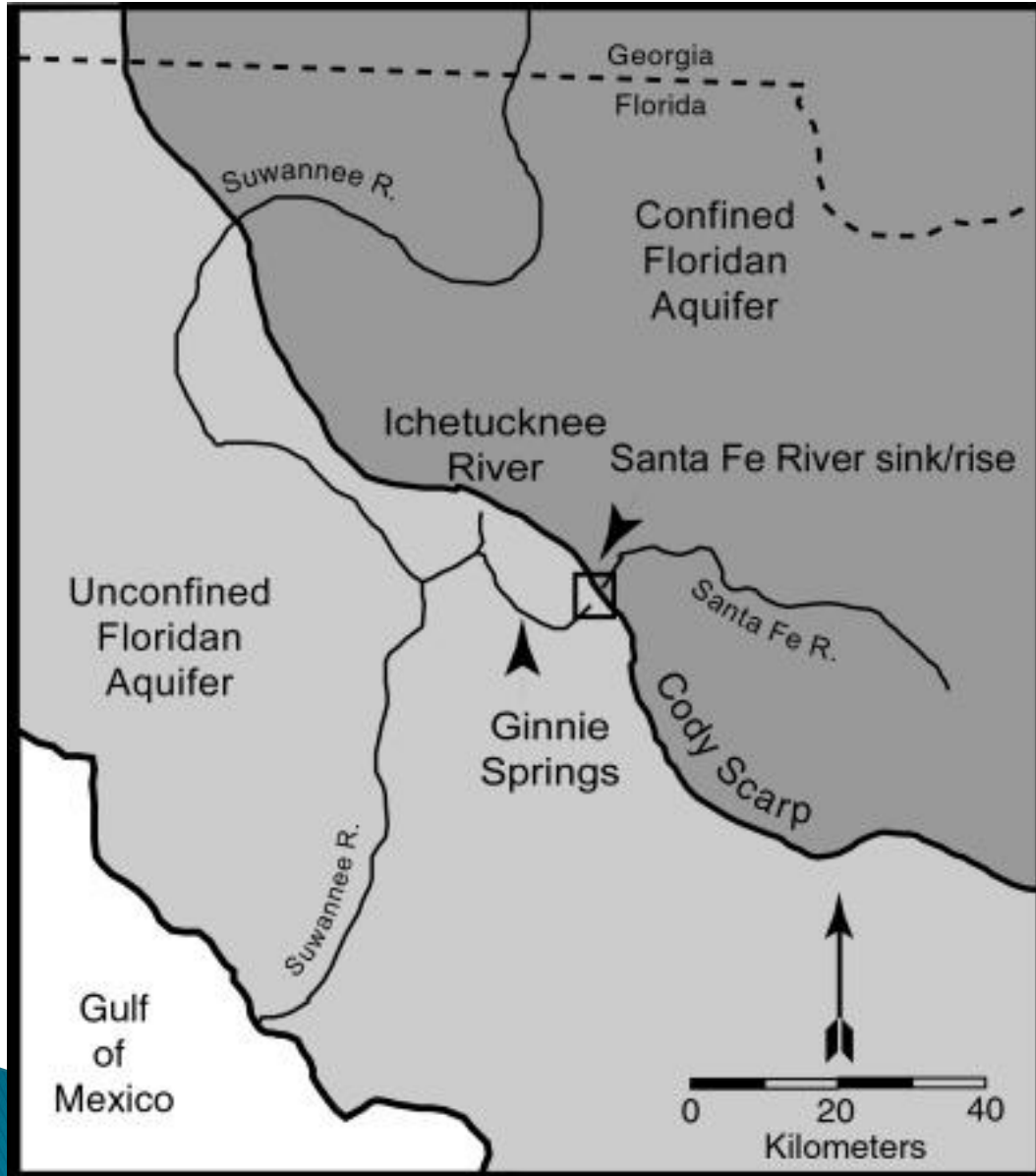
Way down upon de Swanee Ribber,
Far, far away,
Dere's wha my heart is turning ebber,
Dere's wha de old folks stay.
All up and down de whole creation
Sadly I roam,
Still longing for de old plantation,
And for de old folks at home.

Now, be aware that this is the 'State Song of Florida' and includes the following verse:

All de world am sad and dreary,
Eb-rywhere I roam;
Oh, darkeys, how my heart grows weary,
Far from de old folks at home!

<http://www.youtube.com/watch?v=xF6ERig0yWs>

Santa Fe River

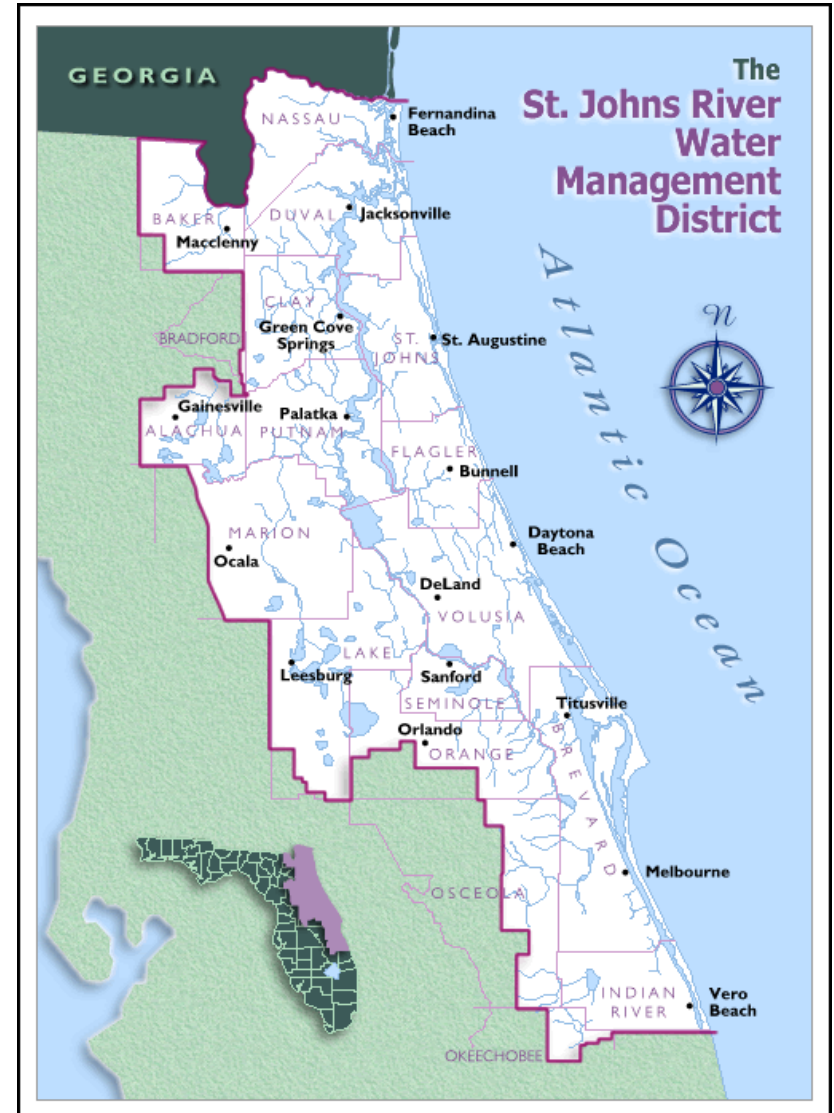
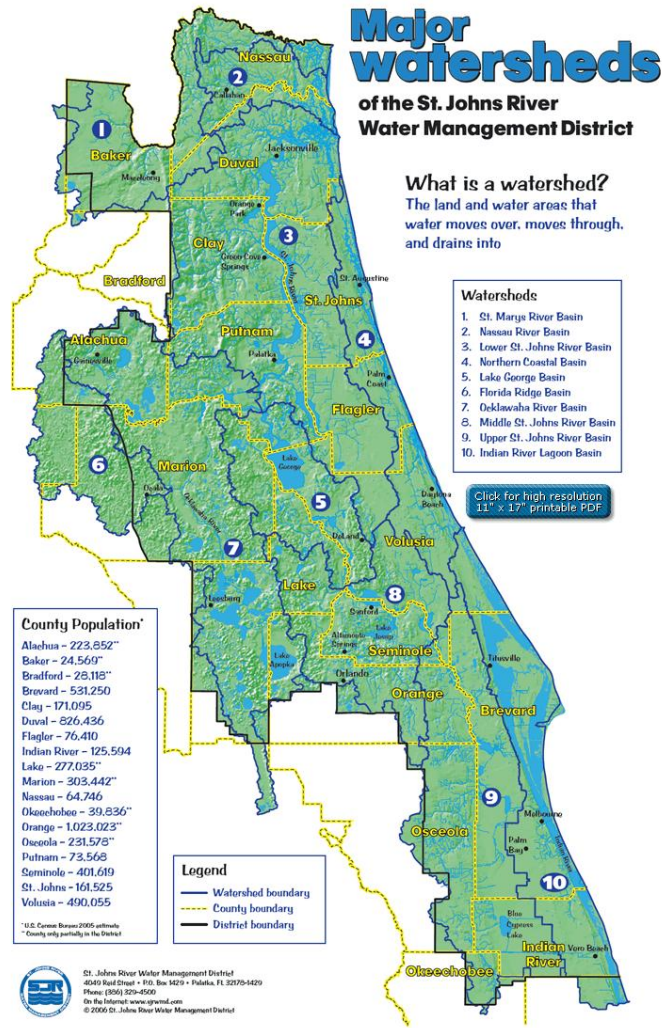


Santa Fe River: River of Springs. It flows towards the Suwannee River across the confined/unconfined boundary of the Floridan aquifer.

Santa Fe River actually flows underground for more than 3 miles. (O'Leno and River Rise)

Regions Served by Each WMD

St Johns: Brevard, Clay, Duval, Flagler, Indian River, Nassau, Seminole, St. Johns, Volusia, and portions of Alachua, Baker, Bradford, Lake, Marion, Okeechobee, Orange, Osceola & Putnam



Major Issues SJWMD

Includes Indian River Lagoon (most biologically diverse estuary)

Lower St Johns River: Problems with algal blooms due to excessive nutrients (from agriculture) into the system.

Industrial waste disposal: Deadly to aquatic life.

Turbidity Plume From Rice Creek April 27, 1997 St. Johns River Water Management District

This animation shows the simulation of a turbidity plume using results from EFDC, a 3D hydrodynamic estuary model. The animation graphics were created using TECPLOT (Amtec Engineering) on a SUN Ultra-2 workstation. The EFDC model was authored by Dr. John Hamrick, now at Tetra Tech, Reston, Virginia.

On April 30, 1997 a chocolate-brown turbidity plume was discovered in the St. Johns River downstream of Rice Creek. Scientists from the St. Johns River Water Management District traced the source of this plume to a reservoir breach that occurred at the RGC titanium mine located on Simms Creek, a branch of Rice Creek.

The reservoir breach at the RGC Mine occurred on April 27, 1997 at approximately 7 a.m. and followed a large rainfall event. Average rainfall over the lower St. Johns River watershed was approximately 5 inches from 4/26-4/28 1997.

The RGC Mine estimated that approximately 7 million gallons of sediment laden water was lost from the tailwater reservoir.

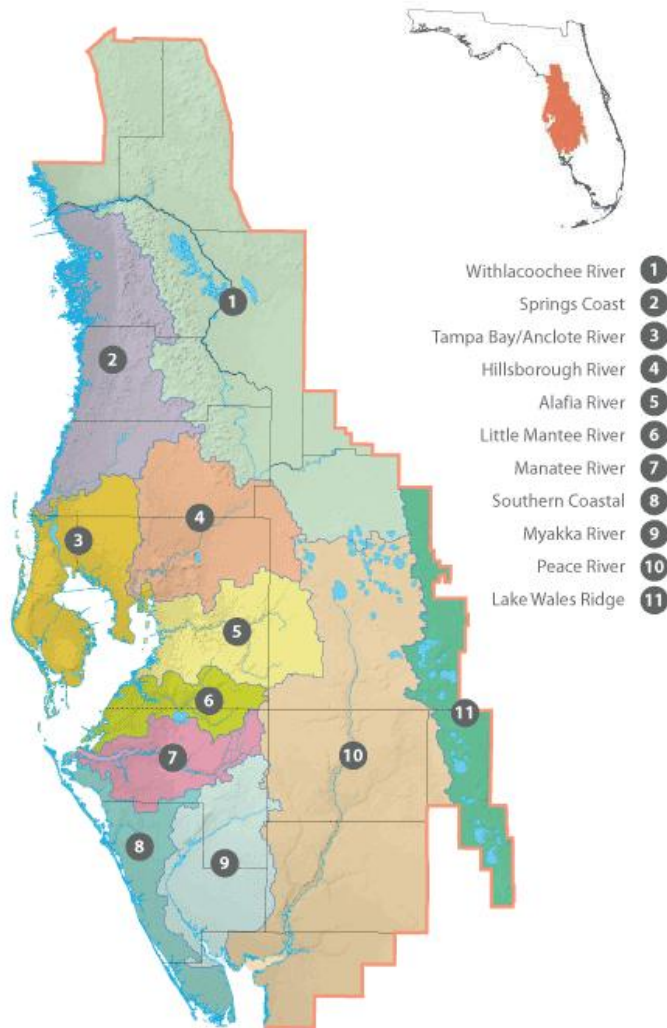
This animation shows a portion of the LSJR from Palatka to Green Cove Springs (approximately 25 miles). It took the plume nearly 2 months to completely exit this area.

The plume exhibited two periods of significant upstream movement, indicative of net upstream river flow. These events, occurring on May 29 and June 6, coincide with a rise in daily-averaged ocean waterlevel. These events illustrate the importance of low-frequency (non-tidal) ocean waterlevel on river transport.



Regions Served by Each WMD

SW Florida: Citrus, DeSoto, Hardee, Hernando, Hillsborough, Manatee, Pasco, Pinellas, Sarasota, Sumter, and portions of Charlotte, Highlands, Lake, Levy, Marion & Polk



Major issues in SW Florida and Southern Florida

1. Population Stress on Water Resources– Critical
2. Salt Water Intrusion.
3. Sinkhole Development due to construction and withdrawal of GW





Distribution of Reported Sinkholes in Florida

The map on the right shows the locations of sinkholes reported since 1954 in the the Florida Geological Survey's statewide Sinkhole Database. It does not include all sinkholes in Florida. The database is available for download at the website:

<http://www.dep.state.fl.us/geology/geologictopics/sinkhole.htm>

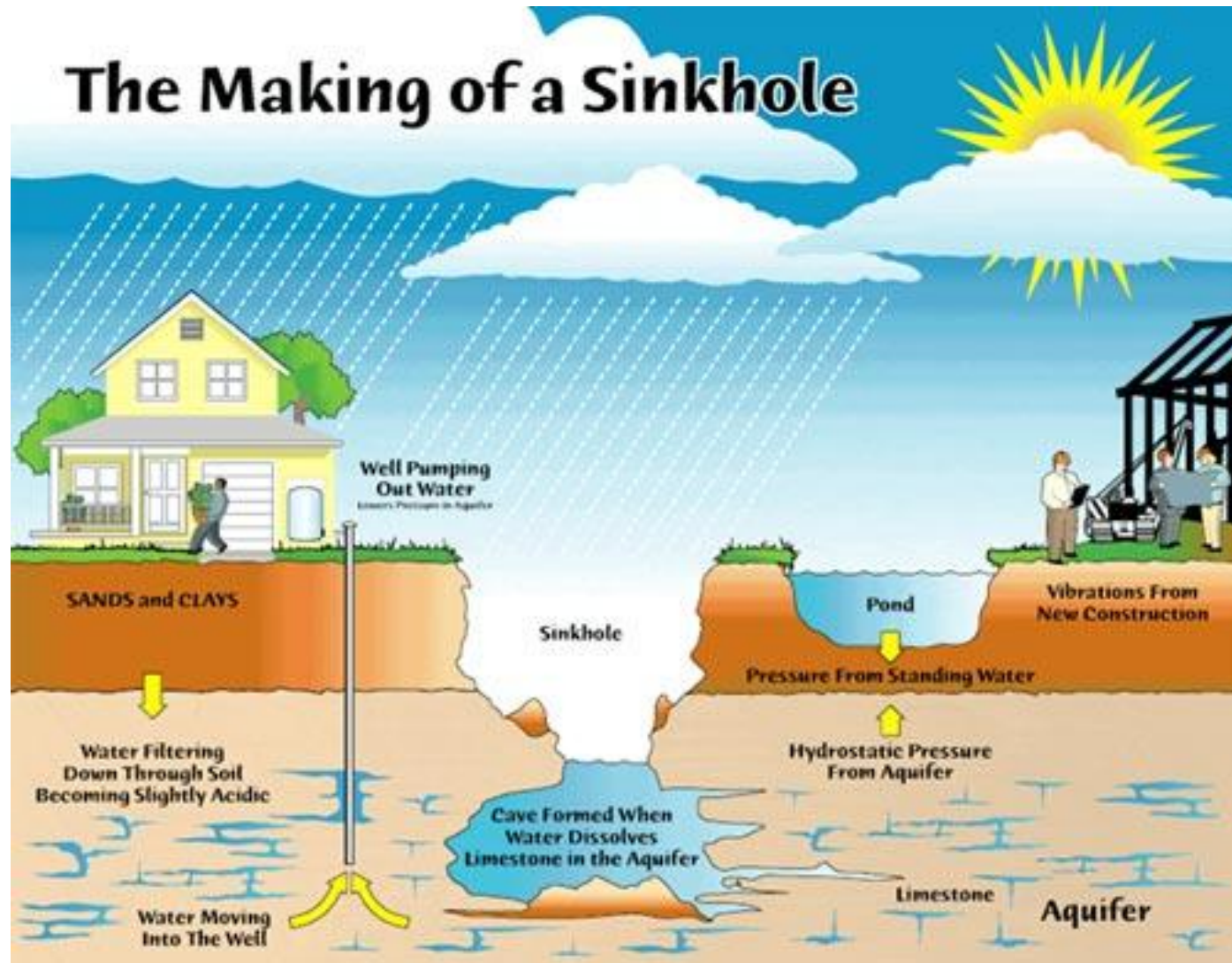
● Sinkhole

Sinkholes...hazards and havens

Sinkhole formation has been accelerated in recent years by both natural and man-made events. An extended drought, punctuated by occasional heavy rains, commonly triggers increased sinkhole activity.

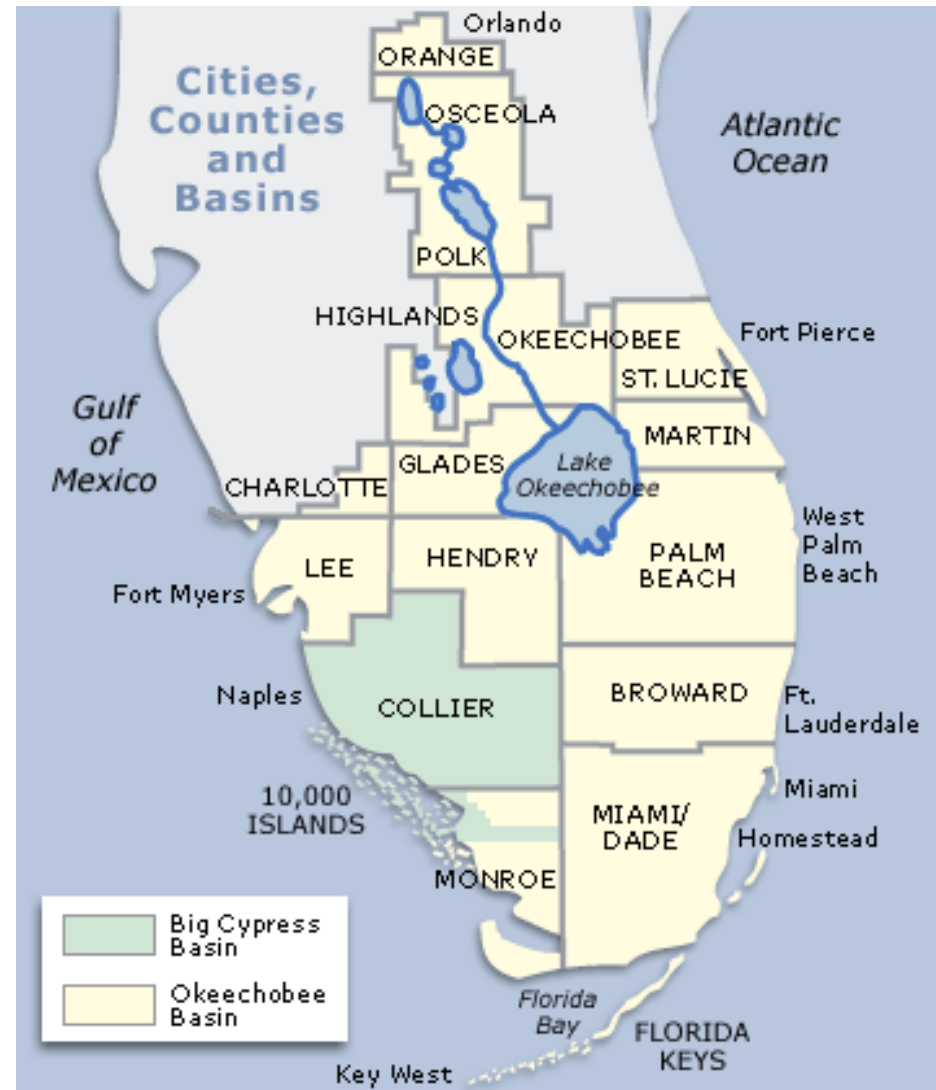


The Making of a Sinkhole



Regions Served by Each WMD

South Florida: Broward, Collier, Dade, Glades, Hendry, Lee, Martin, Monroe, Palm Beach, St. Lucie, and portions of Charlotte, Highlands, Okeechobee, Orange, Osceola & Polk



South Florida WMD: Largest and Most Populous

