MEMORANDUM

TO: Suwannee River Water Management District Governing Board

FROM: Tom Mirti, Director, Division of Water Resources

THRU: Noah Valenstein, Executive Director

DATE: April 7, 2016

RE: March 2016 Hydrologic Conditions Report for the SRWMD

RAINFALL

- District-wide rainfall in March was 3.59", about 75 percent of the long-term average March rainfall of 4.94". The general pattern of rainfall across the District was higher amounts in the northwest and lower amounts in the east and southeast. While no county received above average rainfall, Jefferson County received almost 5", and the Aucilla River Basin had wide areas receiving above 6" (Table 1 and Figure 1). The Santa Fe and New River corridors received under 3" along most of their respective lengths, as did most counties in the Santa Fe basin (Figure 2). The Little River tributary basin to the Withlacoochee River in Georgia received above normal rains, but the Upper Suwannee Basin and the Okefenokee Swamp experienced a significant monthly deficit, as did the Santa Fe Basin (Figure 3).
- The highest gaged monthly rainfall total (5.86") was recorded at the Cabbage Grove rainfall station in western Taylor County, and the highest daily total (1.90" on March 27) was recorded at the Midway Tower rainfall station in Lafayette County. The lowest gaged monthly total was 1.83" at the Bell Tower rainfall station in Gilchrist County.
- The rainfall average across the District for the 12-month period ending March 31 was 51.0", compared to the long-term average of 54.7". The cumulative 12-month deficit improved slightly to 3.7", primarily since March 2015 had been exceptionally dry. Annual rainfall deficits eased during the month, and the Coastal and Aucilla River basins all showed annual surpluses (Figure 4).
- Average District rainfall for the 3 months ending March 31 totaled 10.6", about 12 percent below the long-term average of 12.1". The deficits in the Santa Fe and Waccasassa basins improved slightly, while the surplus in the Aucilla River basin improved across the entire watershed (Figure 5).

SURFACEWATER

- **Rivers:** District river level stations began the month within the normal range of flows (between the 25th and the 75th percentiles) and trended downward as the month progressed, such that the Upper Suwannee and Santa Fe basin gages dropped to near or below the low range of flows (below the 25th percentile). However, a large storm event in the fourth week of the month brought all stations into the normal range and above by month end with the exception of the Suwannee River near Fargo, GA (Figure 6). Most Georgia river level stations began the month within the normal range but all rose during the month with the Withlacoochee Basin reaching high levels (above the 75th percentile). Flow statistics for major river stations are presented graphically in Figure 6, and river level conditions relative to historic conditions are provided in Figure 7.
- **Lakes**: Most District monitored lakes decreased or held steady in level during March and only four of them fell to below average levels by the end of the month. Alligator Lake in Columbia County showed a decline of 7", while Sneads Smokehouse Lake in Jefferson County climbed almost 12" due to the higher rainfall amounts there, particularly toward the last week of March. Figure 8 shows lake levels relative to their respective long-term minimum, average and maximum levels.

- **Springs**: The flow of 21 springs or spring groups were measured by the USGS, District staff, and District contractors during March. Declining river levels in the Middle Suwannee reach of the river, combined with higher groundwater levels prompted many springs there to show their highest flows in two years. Historical flow data for four of these Middle Suwannee springs are provided in graphical format on Figure 9; each display flows above the 80th percentile of all measurements at the respective springs.

GROUNDWATER

Groundwater levels in upper Floridan aquifer monitor wells rebounded in the District and ended the month at the 67th percentile, up 1 percentile point from February. Aquifer levels improved most in the western portion of the District, while increases from the previous month induced by riverine influences along the Alapaha and Middle Suwannee river corridors receded. The eastern portion of the Santa Fe River basin and the upper Waccasassa River basin remained high (above the 75th percentile); much of the remainder of the District continued with normal aquifer conditions (between the 25th percentile and 75th percentiles, Figure 10). Floridan aquifer levels for a representative sample of long-term wells are provided in Figure 11 along with summary statistics, and regional long-term well status is provided in Figure 12 with a description of aquifer characteristics.

HYDROLOGICAL/METEOROLOGICAL INFORMATION

- The Palmer Drought Severity Index (PDSI), a climatological tool produced by the National Climatic Data Center, assesses the severity and frequency of abnormally dry or wet weather using rainfall, temperature, and soil moisture data. PDSI values for the week ending April 2 showed ongoing near-normal conditions in north Florida and southern Georgia
- The National Weather Service Climate Prediction Center (CPC) continues to project higher than normal chances for rainfall in North Florida over the upcoming three months, despite lower than normal rainfall thus far during the ongoing El Niño event. The current Oceanic Niño Index level (El Niño Region 3.4 temperature metric) is 2.0 and expected to decline throughout the coming spring.
- The U.S. Drought Monitor report of April 5 indicated abnormally dry conditions in Levy County and along the Santa Fe River basin. The remainder of the District is within normal conditions, although the lower St. Johns River basin in northeast Florida is also abnormally dry.

CONSERVATION

Water conservation is necessary to sustain healthy flows in springs and rivers. All users are urged to eliminate unnecessary uses. Landscape irrigation is limited to twice per week during Daylight Savings Time (between March 13 and November 6, 2016) based on a water conservation rule that applies to residential landscaping, public or commercial recreation areas, and businesses that aren't regulated by a District-issued permit. Information about SRWMD's year-round water conservation measures is available at www.mysuwanneeriver.com.

This report is compiled in compliance with Chapter 40B-21.211, Florida Administrative Code, using rainfall (radar-derived estimate), groundwater (105 wells), surfacewater (35 stations), and general information such as drought indices and forecasts. Data are provisional and are updated as revised data become available. Data are available at www.mysuwanneeriver.com or by request.

Table 1: Estimated Rainfall Totals (inches)

County	March 2016	March Average	Month % of Normal	Last 12 Months	Annual % of Normal
Alachua	2.89	4.21	69%	52.56	103%
Baker	2.83	4.36	65%	42.44	85%
Bradford	2.35	4.29	55%	48.33	95%
Columbia	3.36	4.62	73%	45.92	89%
Dixie	3.24	4.79	68%	60.26	102%
Gilchrist	2.88	4.84	60%	52.09	91%
Hamilton	3.34	5.17	65%	47.99	92%
Jefferson	4.97	5.80	86%	44.31	73%
Lafayette	4.00	5.03	79%	49.37	87%
Levy	3.04	5.03	61%	57.84	97%
Madison	4.95	5.72	86%	48.15	86%
Suwannee	4.29	5.17	83%	47.07	89%
Taylor	4.82	5.34	90%	51.05	86%
Union	3.31	4.85	68%	45.46	84%

March 2016 Average:	3.59
March Average (1932-2015):	4.94
Historical 12-month Average (1932-2015):	54.66
Past 12-Month Total:	50.97
12-Month Rainfall Surplus/Deficit:	-3.69

Figure 1: Comparison of District-wide Monthly Rainfall

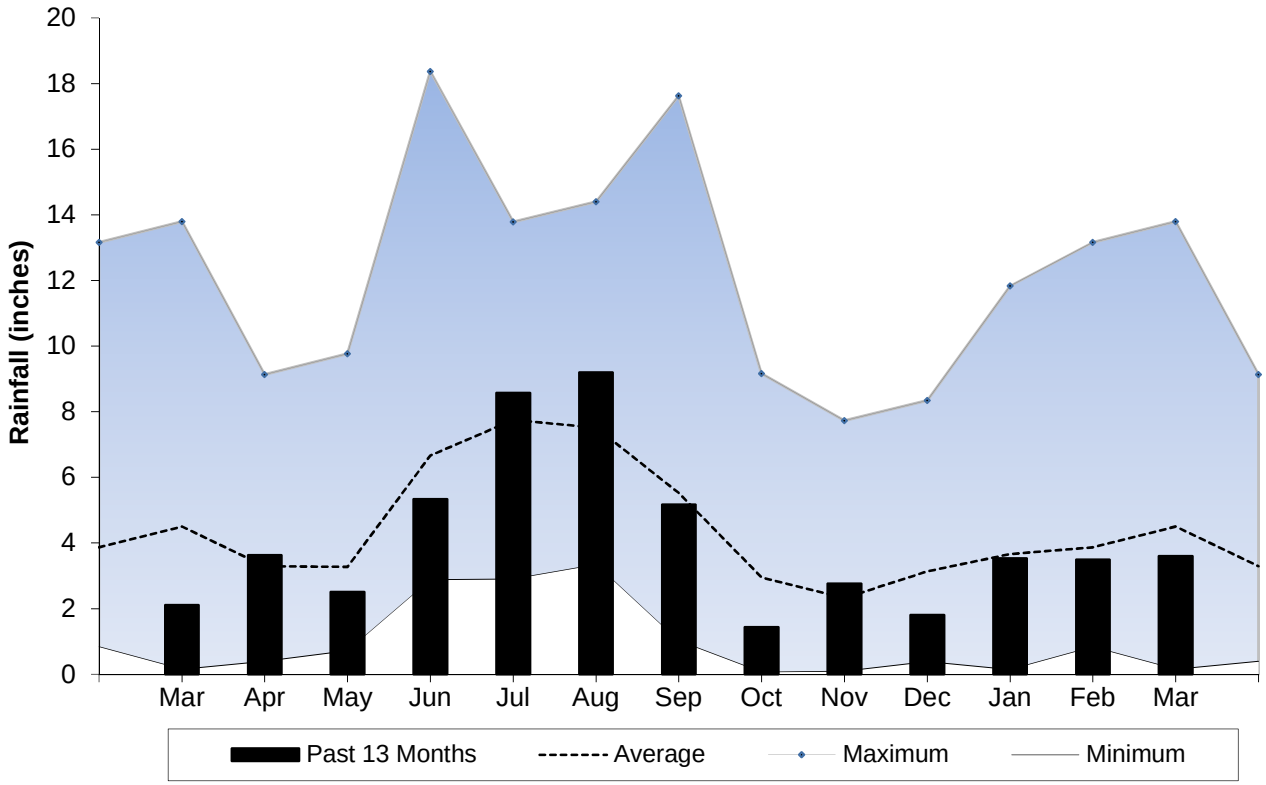


Figure 2: March 2016 Rainfall Estimate

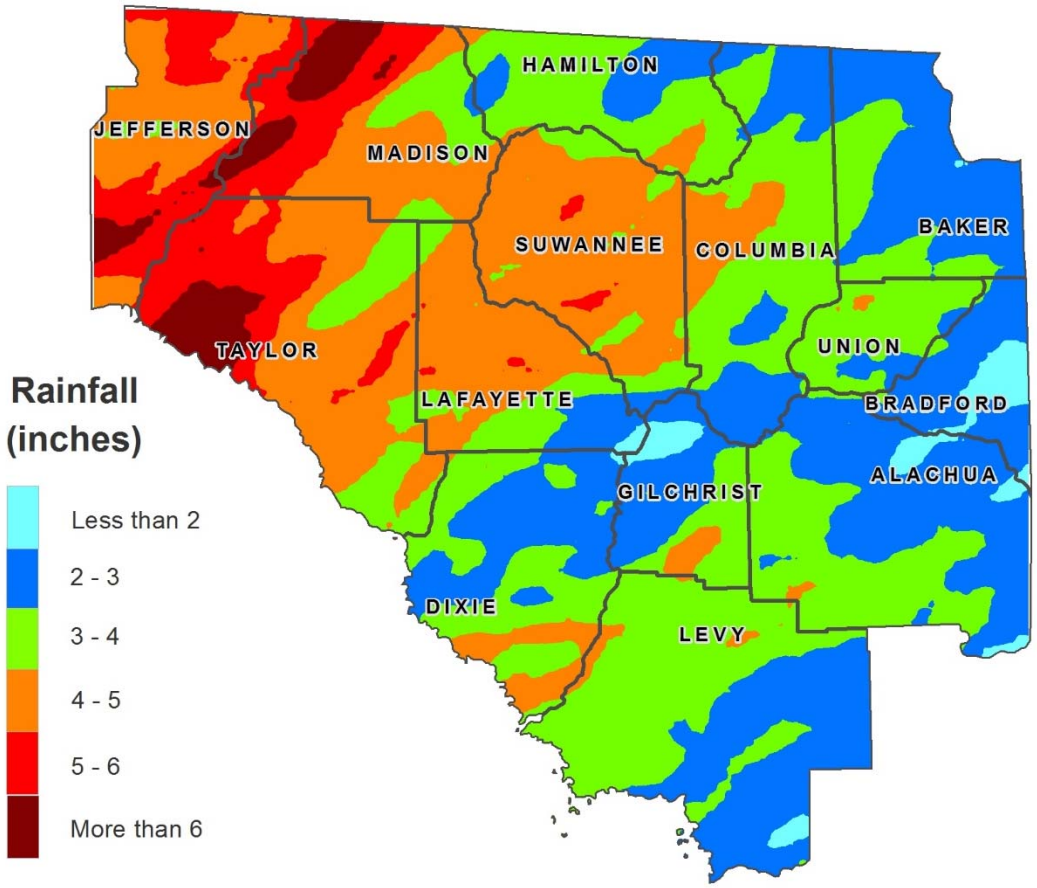


Figure 3: March 2016 Percent of Normal Rainfall

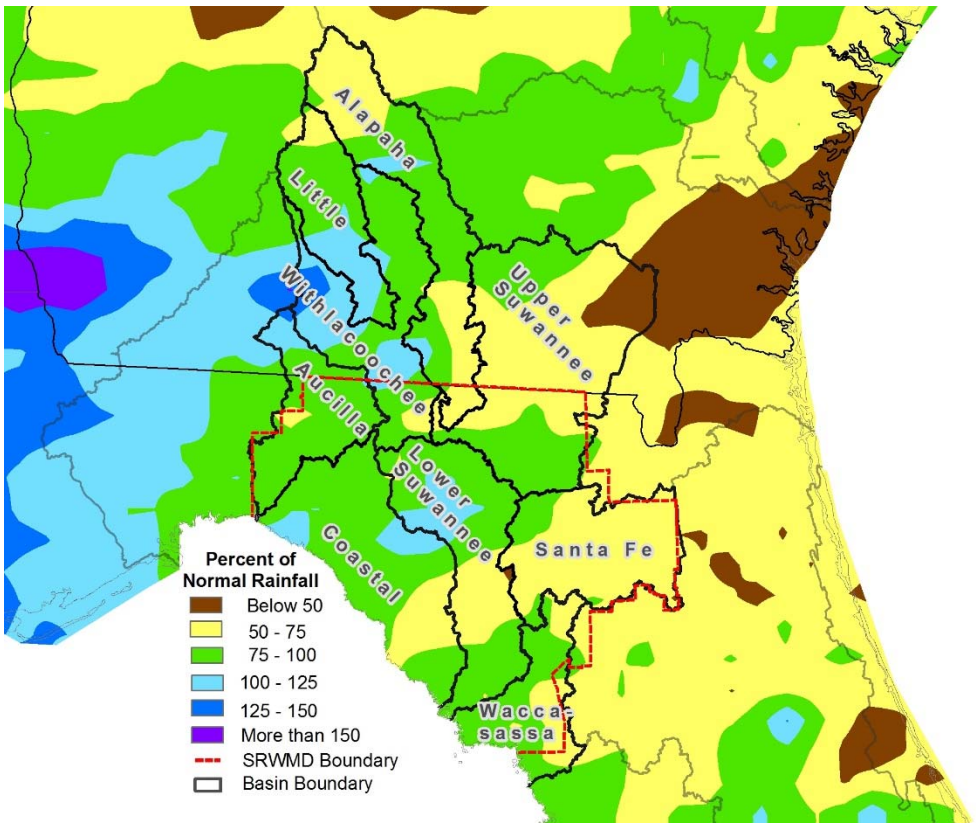


Figure 4: 12-Month Rainfall Surplus/Deficit by River Basin
Through March 31, 2016

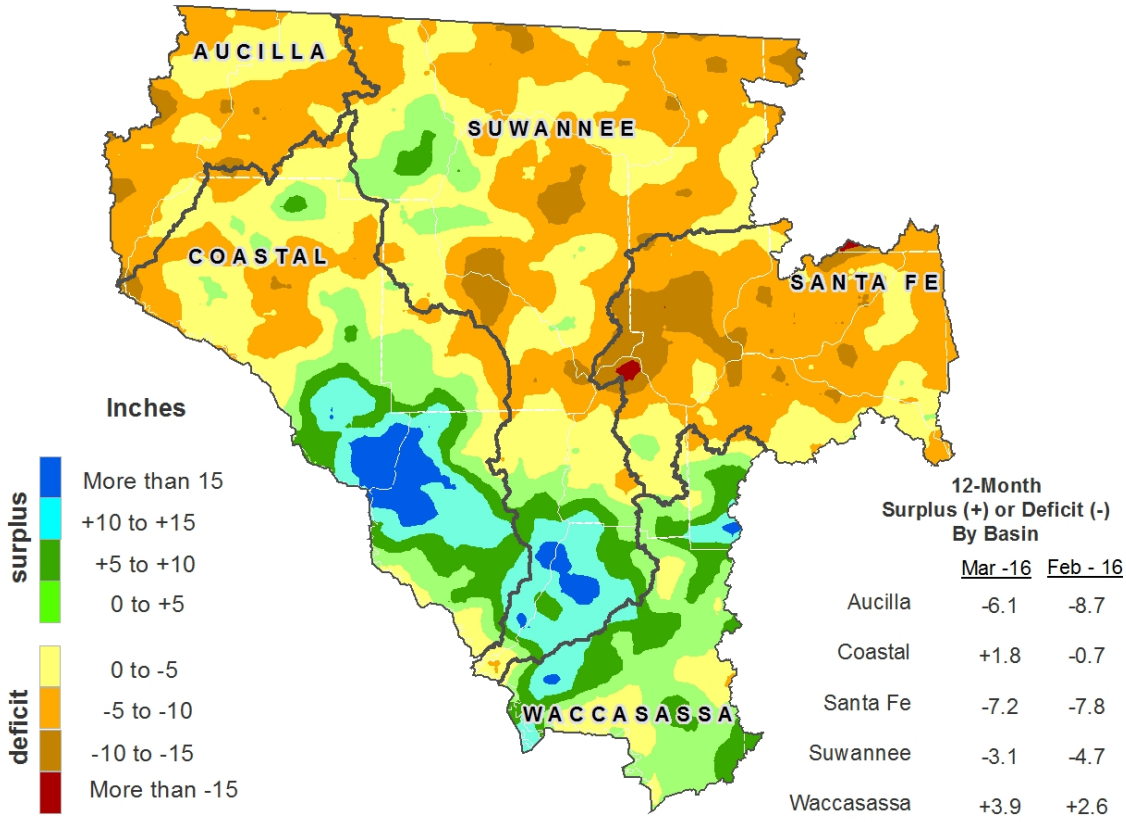


Figure 5: 3-Month Rainfall Surplus/Deficit by River Basin
Through March 31, 2016

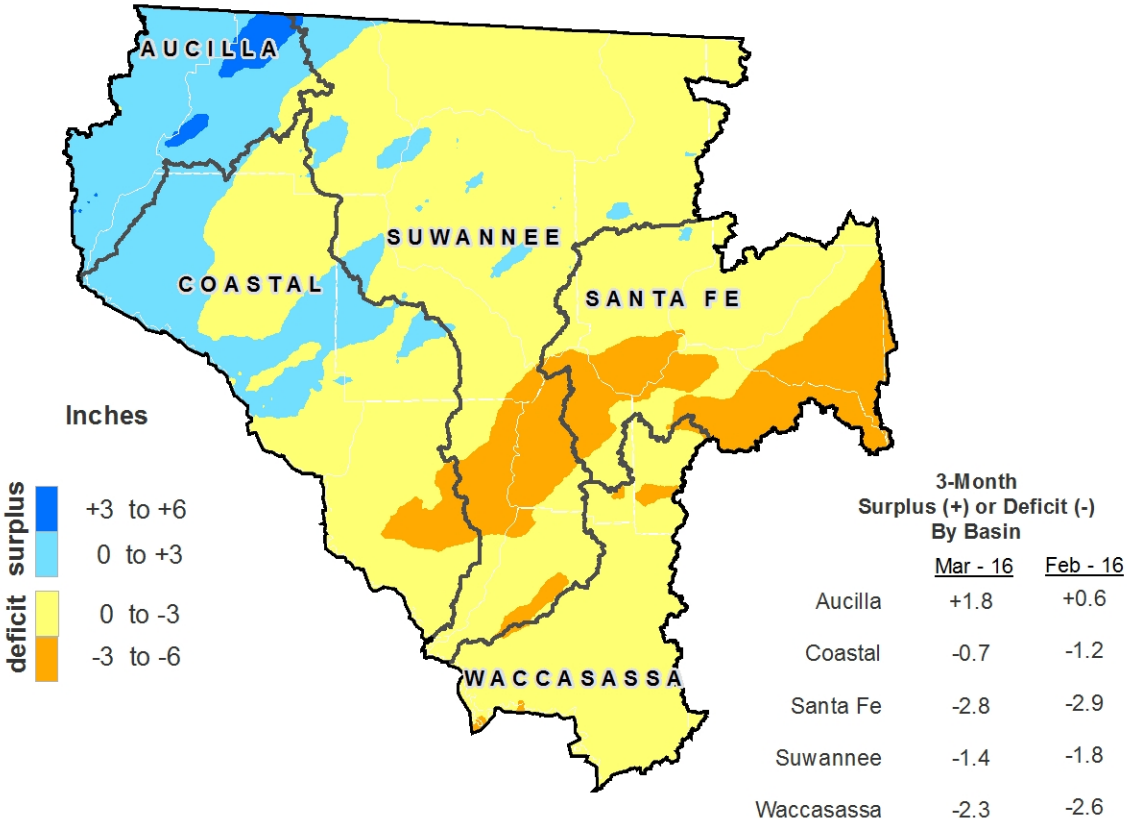
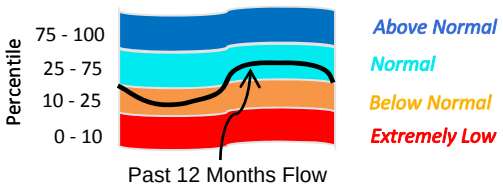
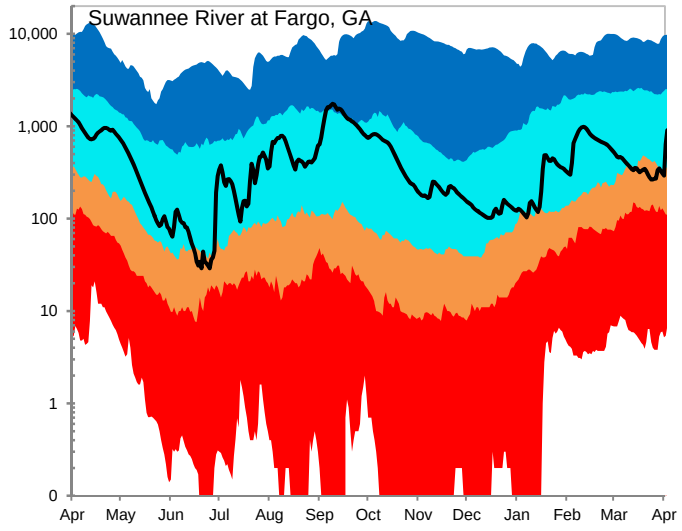
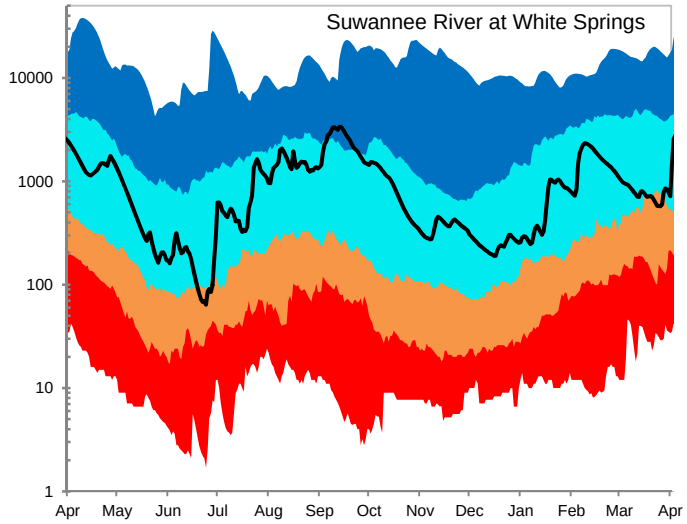


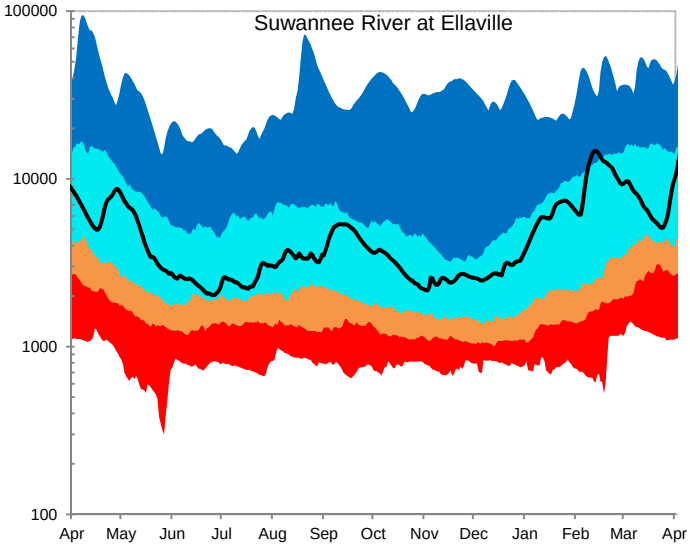
Figure 6: Daily River Flow Statistics
April 1, 2015 through March 31, 2016

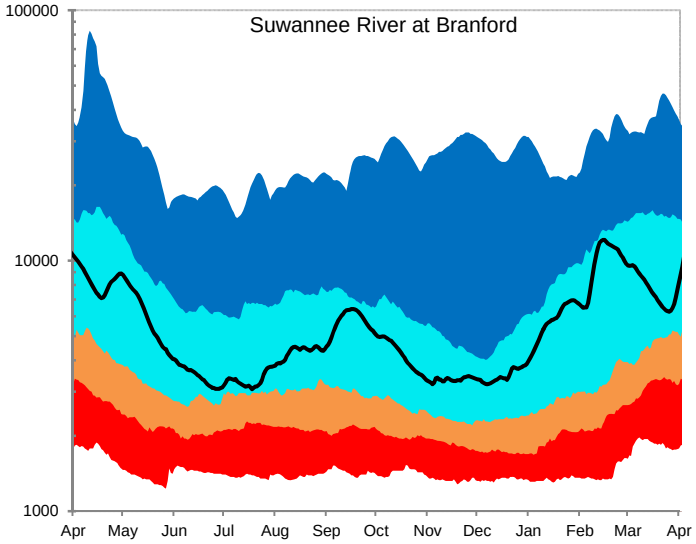


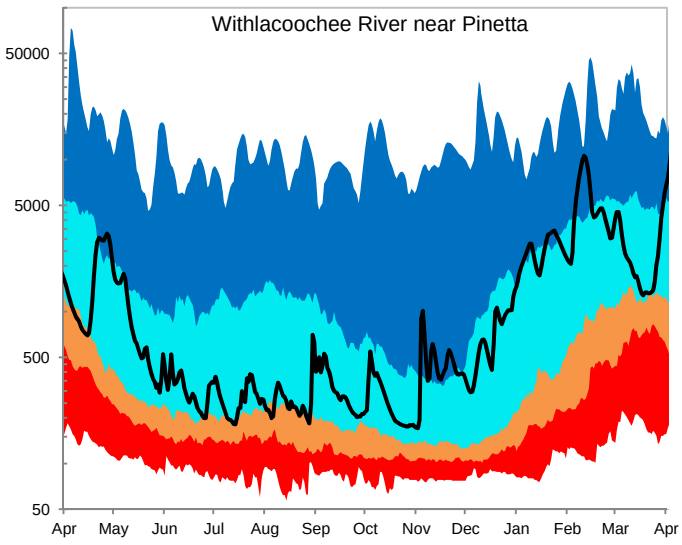
RIVER FLOW, CUBIC FEET PER SECOND











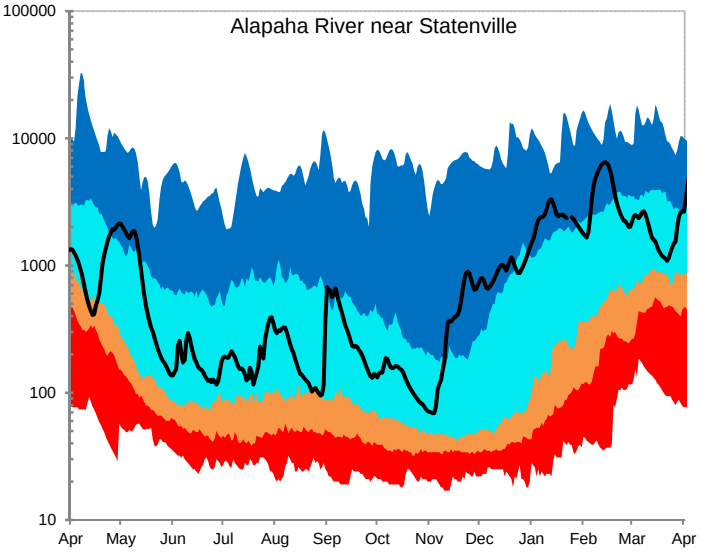
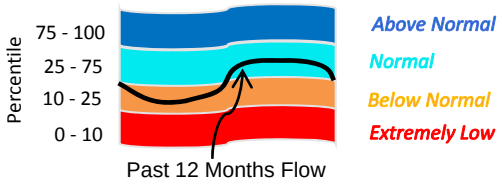
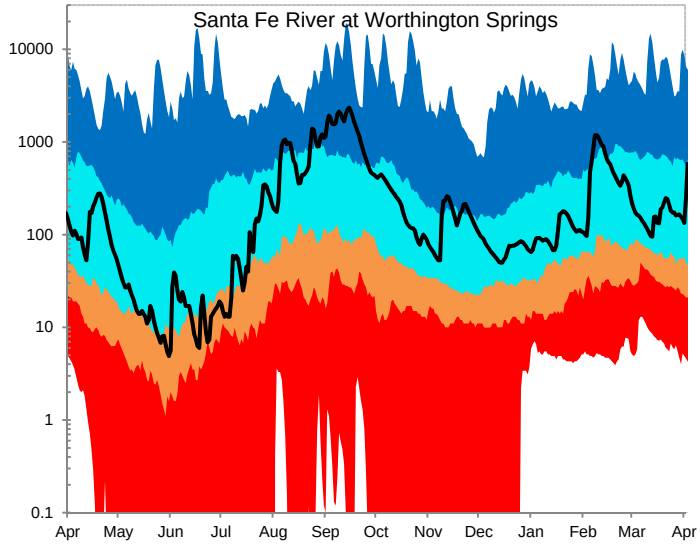
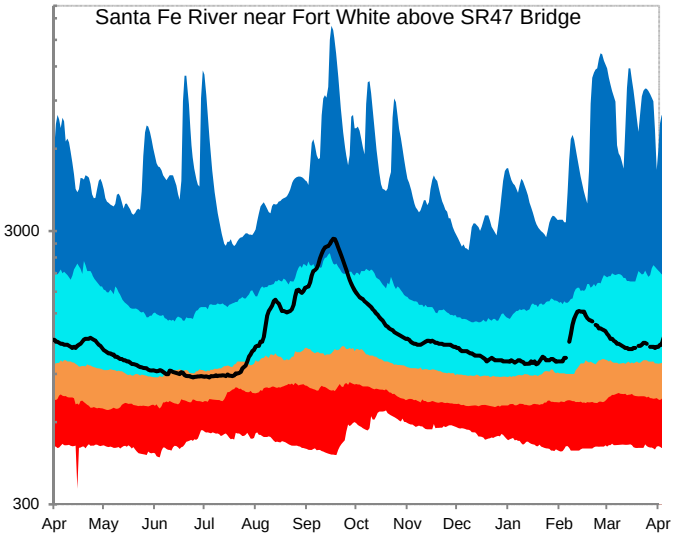


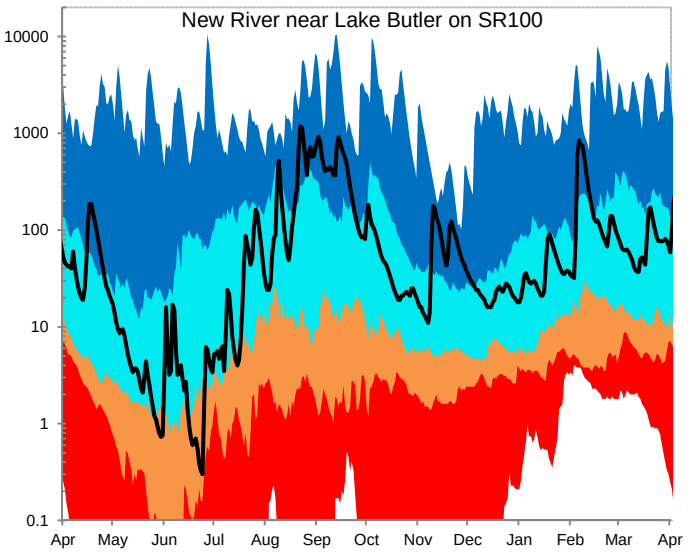
Figure 6, cont: Daily River Flow Statistics
April 1, 2015 through March 31, 2016

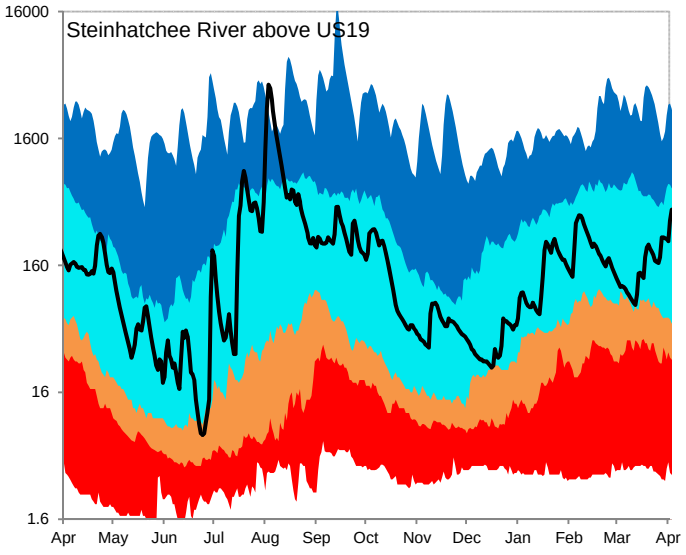


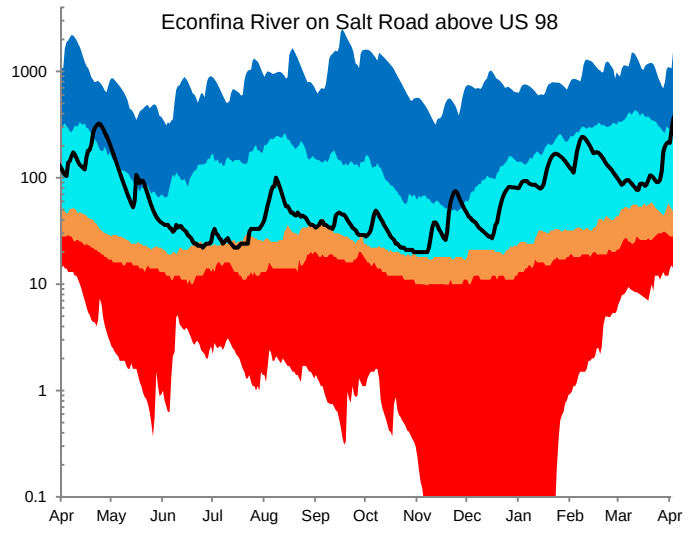
RIVER FLOW, CUBIC FEET PER SECOND

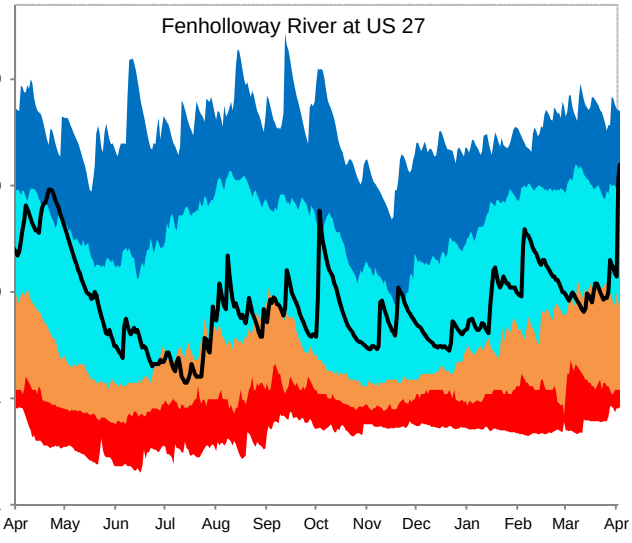












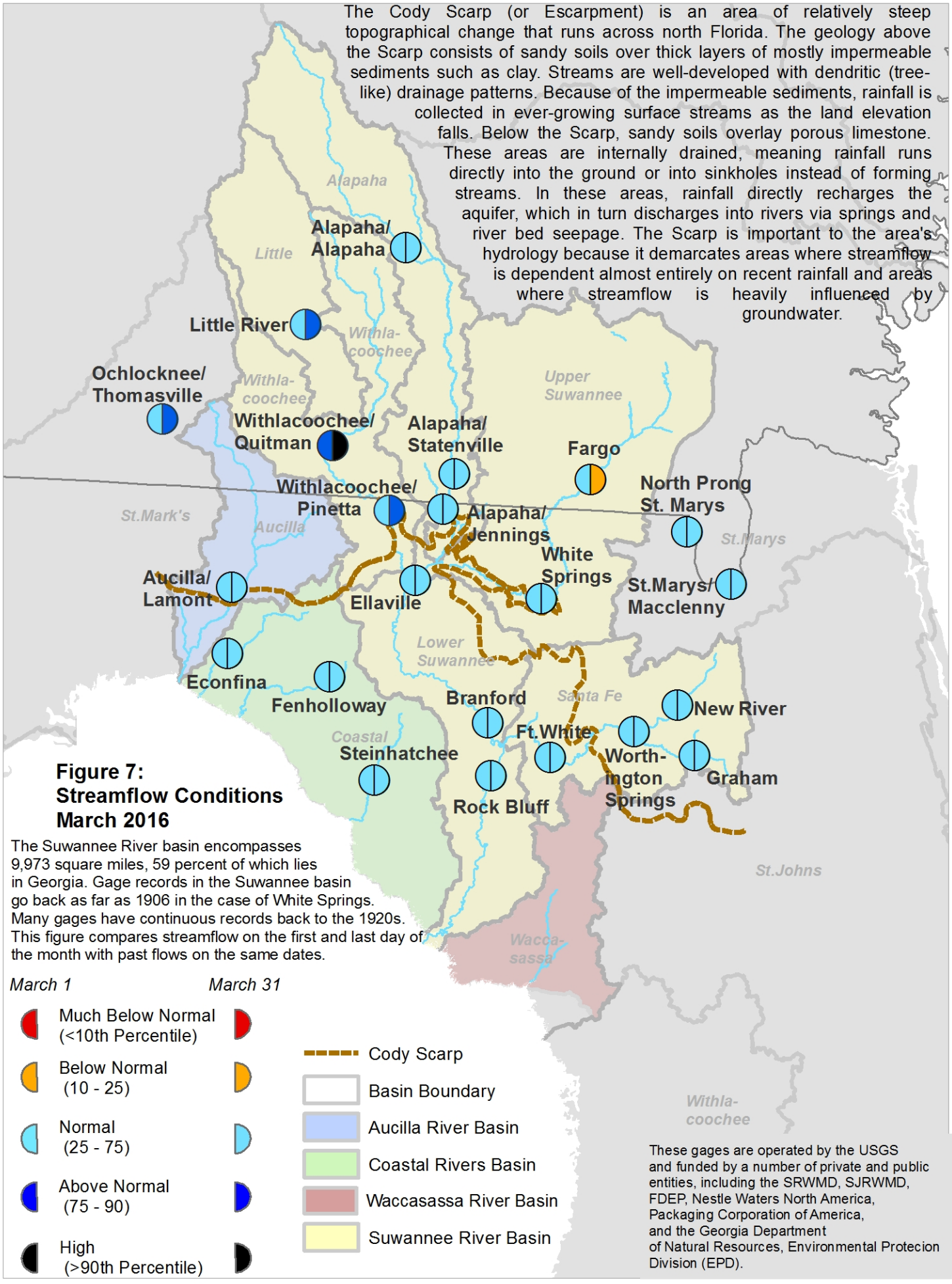
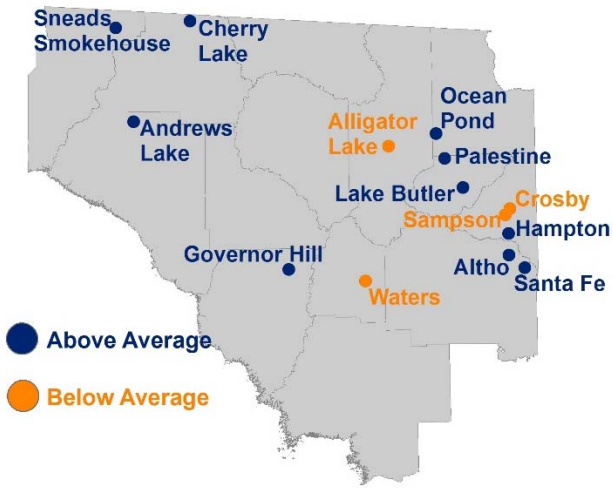
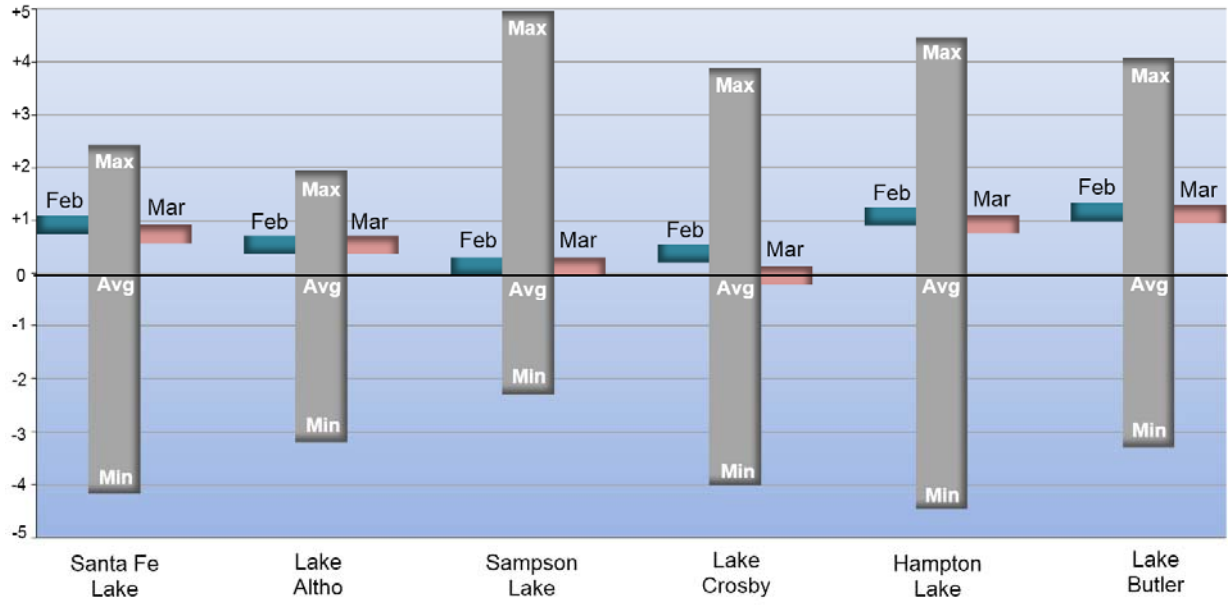

The Cody Scarp (or Escarpment) is an area of relatively steep topographical change that runs across north Florida. The geology above the Scarp consists of sandy soils over thick layers of mostly impermeable sediments such as clay. Streams are well-developed with dendritic (tree-like) drainage patterns. Because of the impermeable sediments, rainfall is collected in ever-growing surface streams as the land elevation falls. Below the Scarp, sandy soils overlay porous limestone. These areas are internally drained, meaning rainfall runs directly into the ground or into sinkholes instead of forming streams. In these areas, rainfall directly recharges the aquifer, which in turn discharges into rivers via springs and river bed seepage. The Scarp is important to the area's hydrology because it demarcates areas where streamflow is dependent almost entirely on recent rainfall and areas where streamflow is heavily influenced by groundwater.
Alapaha
Alapaha/ Alapaha
Little
Little River
Withla-coochee
Ochlocknee/ Thomasville
Withla-coochee
Upper Suwannee
Withlacoochee/ Quitman
Alapaha/ Statenville
Fargo
Withlacoochee/ Pinetta
North Prong St. Marys
St.Mark's
Aucilla
Alapaha/ Jennings
St.Marys
White Springs
Aucilla/ Lamont
Ellaville
St.Marys/ Macclenny
Lower Suwannee
Econfina
Fenholloway
Branford
Santa Fe
New River
Ft.White
Coastal
Steinhatchee
Worth-ington Springs
Graham
Rock Bluff
St.Johns
Wacca-sassa
Withla-coochee
Figure 7:
Streamflow Conditions
March 2016
The Suwannee River basin encompasses 9,973 square miles, 59 percent of which lies in Georgia. Gage records in the Suwannee basin go back as far as 1906 in the case of White Springs. Many gages have continuous records back to the 1920s. This figure compares streamflow on the first and last day of the month with past flows on the same dates.
March 1
March 31
Much Below Normal (<10th Percentile)
Below Normal (10 - 25)
Normal (25 - 75)
Above Normal (75 - 90)
High (>90th Percentile)
Cody Scarp
Basin Boundary
Aucilla River Basin
Coastal Rivers Basin
Waccasassa River Basin
Suwannee River Basin
These gages are operated by the USGS and funded by a number of private and public entities, including the SRWMD, SJRWMD, FDEP, Nestle Waters North America, Packaging Corporation of America, and the Georgia Department of Natural Resources, Environmental Protecion Division (EPD).

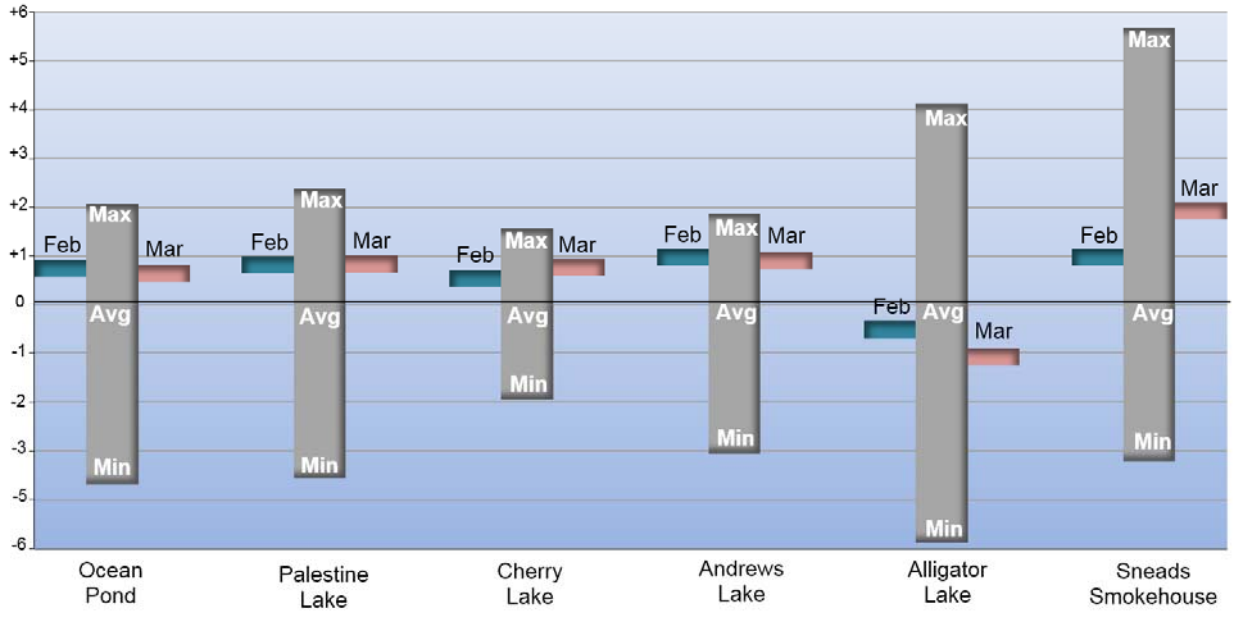
Figure 8: March 2016 Lake Levels



SRWMD lakes react differently to climatic changes depending on their location in the landscape. Some lakes, in particular ones in the eastern part of the District, are embedded in a surficial or intermediate aquifer over relatively impermeable clay deposits. These lakes rise and fall according to local rainfall and surface runoff. They retain water during severe droughts since most losses occur from evaporation. Other lakes, such as Governor Hill and Waters Lake, have porous or "leaky" bottoms that interact with the Floridan aquifer. These lakes depend on groundwater levels to stay high. If aquifer levels are low, these lakes go dry even if rainfall is normal.

The District monitors 14 lakes with much of the data originally provided by volunteer observers. Monitoring records begin in the 1970s, except for Lakes Butler, Sampson, and Santa Fe, which started in 1957.



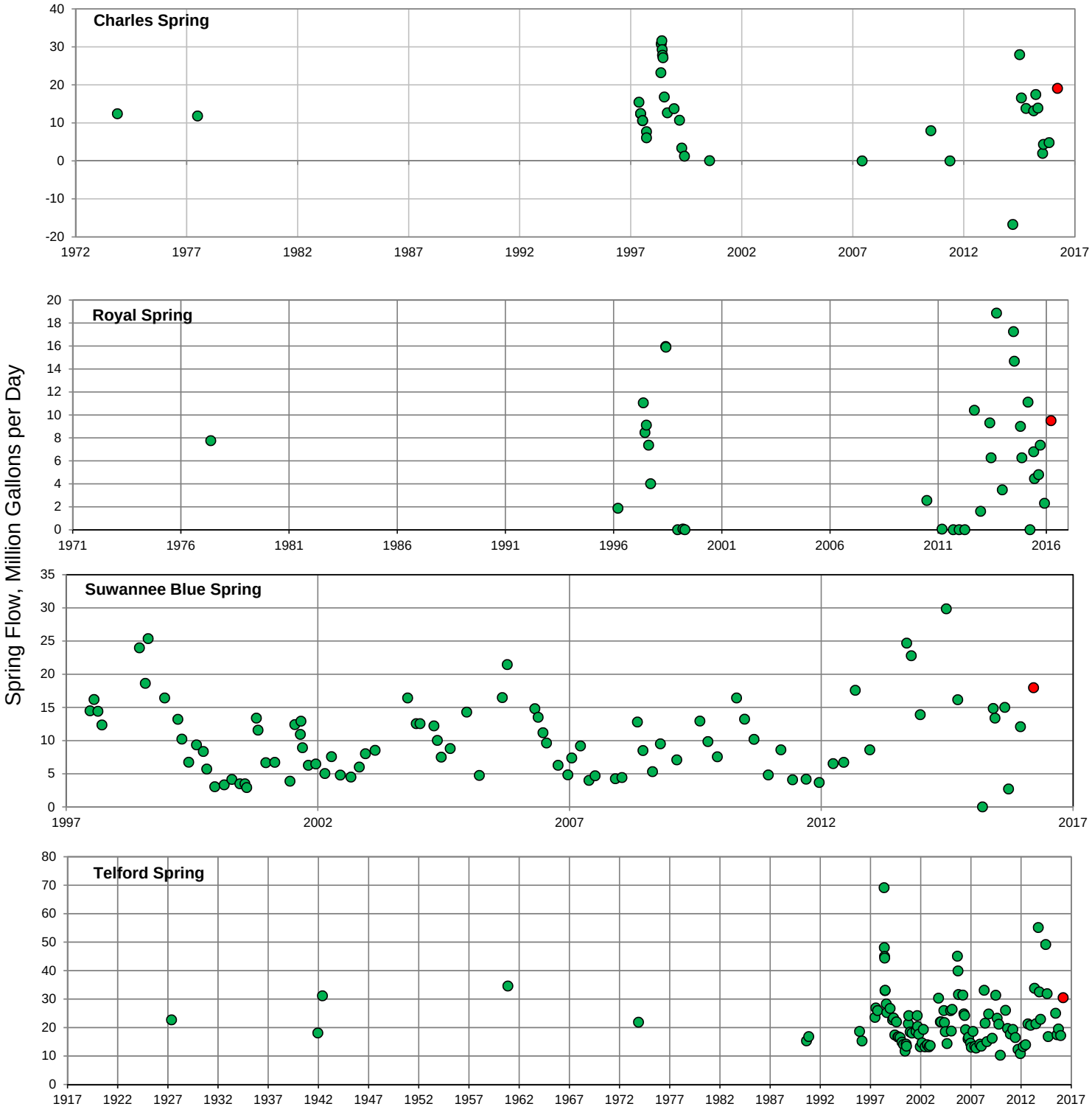


Feet Above or Below Historic Average

Figure 9: Monthly Springflow Measurements

The SRWMD monitors water quality at 38 springs. Flow is usually measured at the time of the sampling. The springs below were measured in March 2016 by SRWMD staff or by the USGS with the last measurement marked in red. Flow is given in MGD (million gallons per day--a million gallons would fill a football field about 3' deep). With the exception of the Ichetucknee River, Santa Fe Rise and the Alapaha Rise, springs in the SRWMD were measured infrequently prior to the late 1990s. Springs with long records were rarely measured more than once per decade; 'reverse' flow measurements have only been made during the past 10 years.

A spring's flow can be greatly affected by the level of the river it runs into. Rising river levels can act like a dam and slow spring flow causing what is known as a backwater effect. A river can flood a spring completely, known colloquially as a "brown-out". If the river levels are high enough, river water can flow back into the spring vent and thence into the aquifer, resulting in a negative flow rate. Because of the interaction between a spring and its receiving water body, some low flow measurements recorded are the result of river flooding and not necessarily drought conditions.



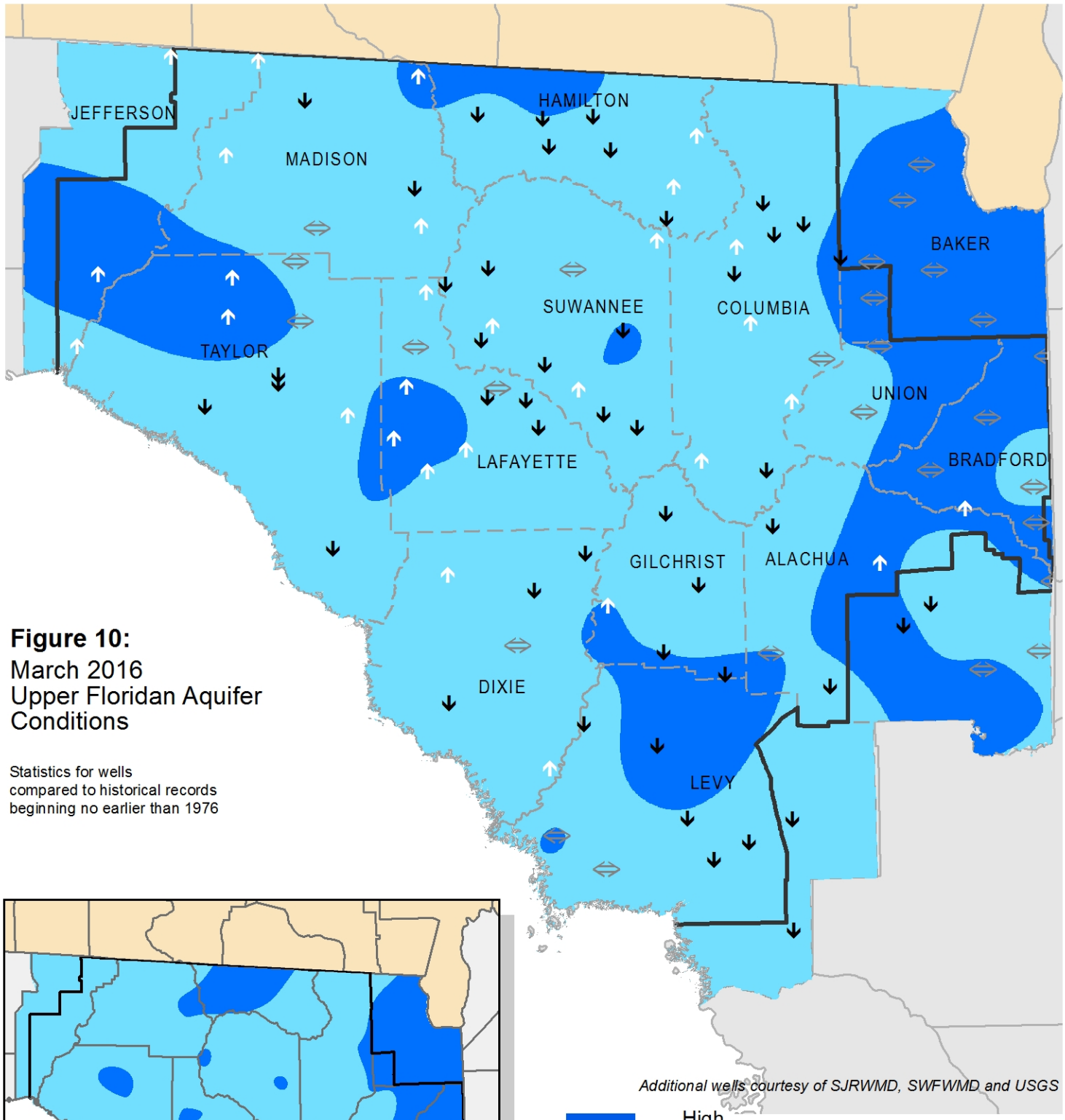
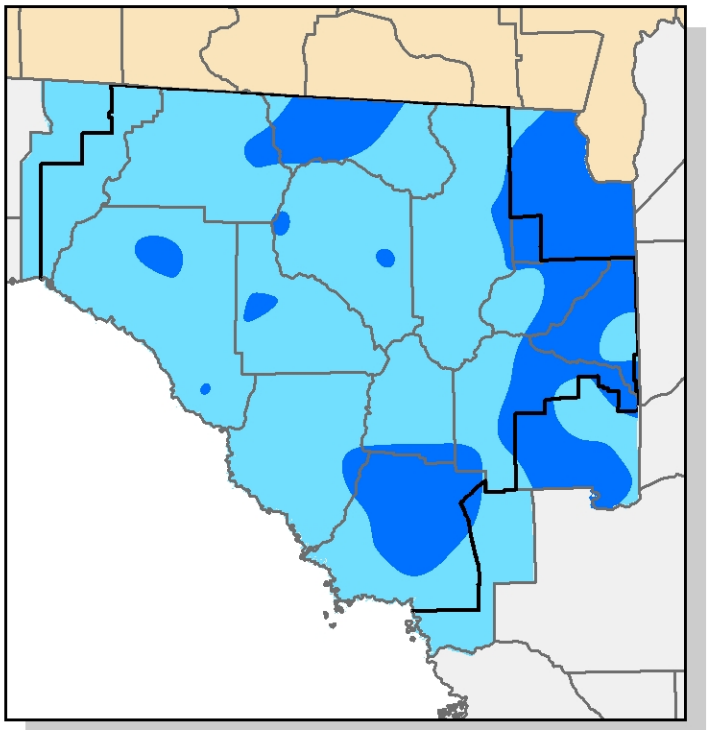


Figure 10:
March 2016
Upper Floridan Aquifer
Conditions

Statistics for wells
compared to historical records
beginning no earlier than 1976

Additional wells courtesy of SJRWMD, SWFWMD and USGS



Inset: February Groundwater Levels

High
(Greater than 75th Percentile)

Normal
(25th to 75th Percentile)

Low
(10th to 25th Percentile)

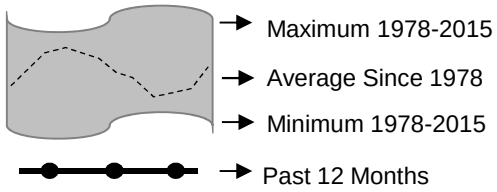
Extremely Low
(Less than 10th Percentile)

Increase/decrease in level since last month

Increase/decrease since last month
less than one percent of historic range

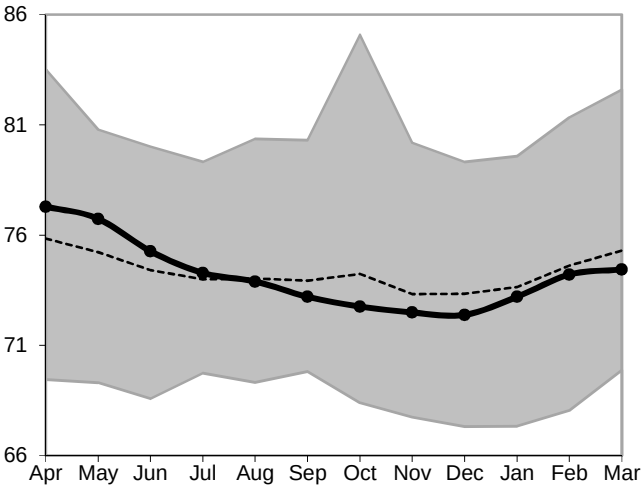
District Boundary

Figure 11: Monthly Groundwater Level Statistics
Levels April 1, 2015 through March 31, 2016
Period of Record Beginning 1978

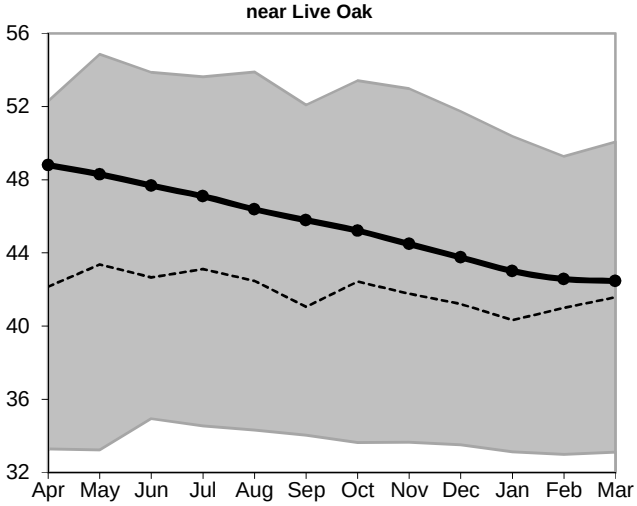


Upper Floridan Aquifer Elevation above NGVD 1929, Feet

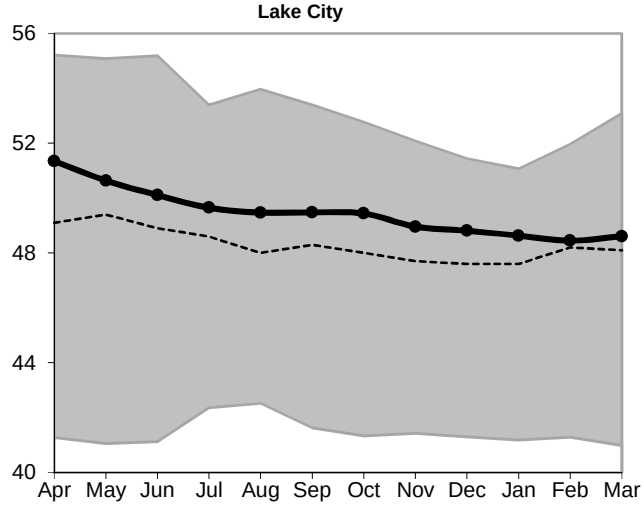
Madison County N010719001
near Greenville



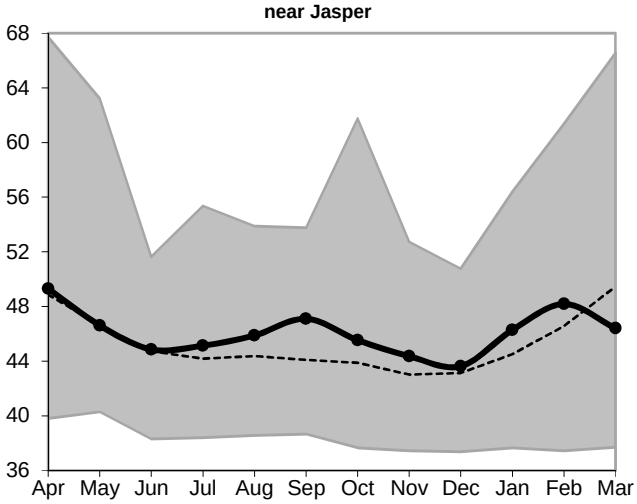
Suwannee County S021335001
near Live Oak



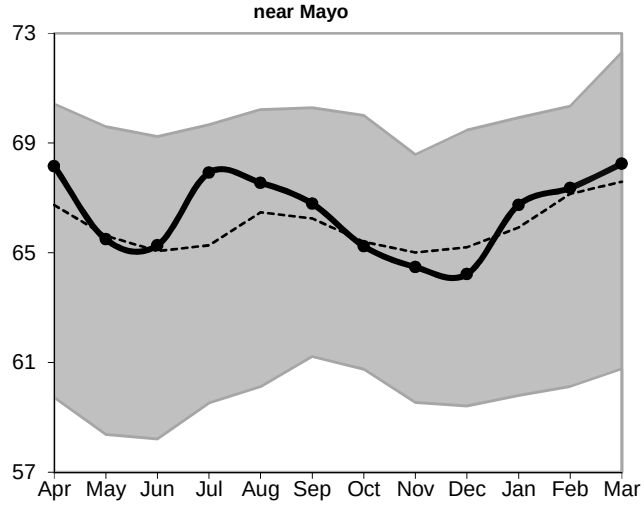
Columbia County S041705001
Lake City



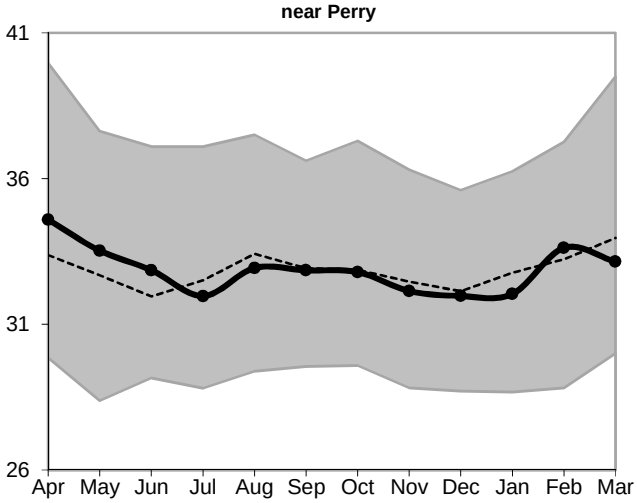
Hamilton County N011422007
near Jasper



Lafayette County S061114001
near Mayo



Taylor County S050701001
near Perry



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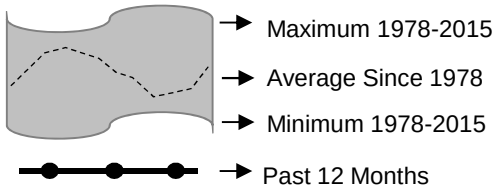
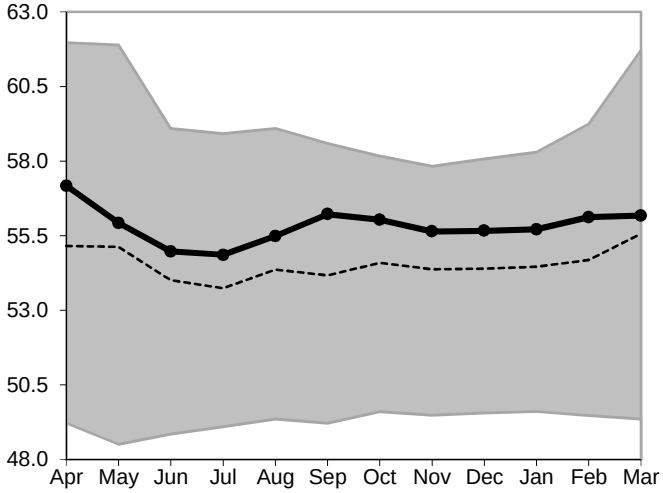
Period of Record Beginning 1978

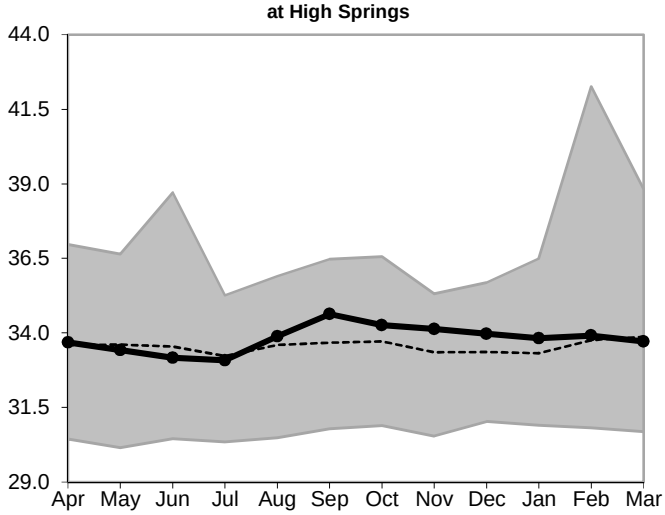


Upper Floridan Aquifer Elevation above NGVD 1929, Feet

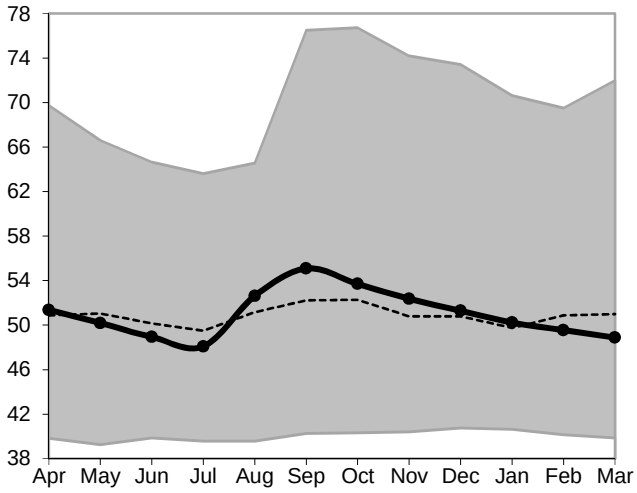
Union County S051933001
near Lake Butler



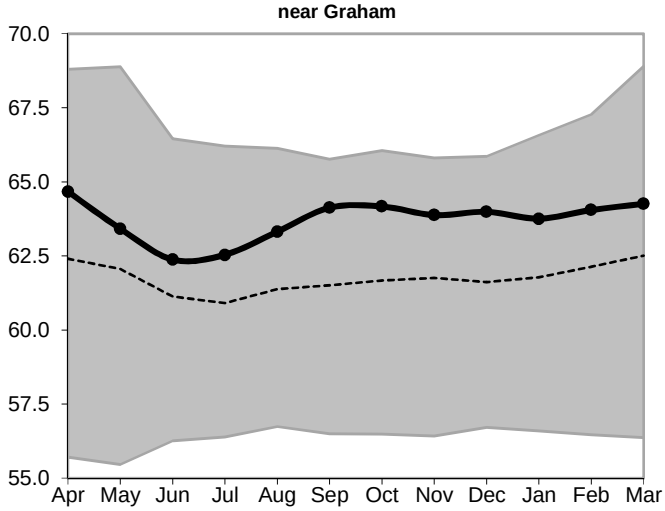
Alachua County S081703001
at High Springs



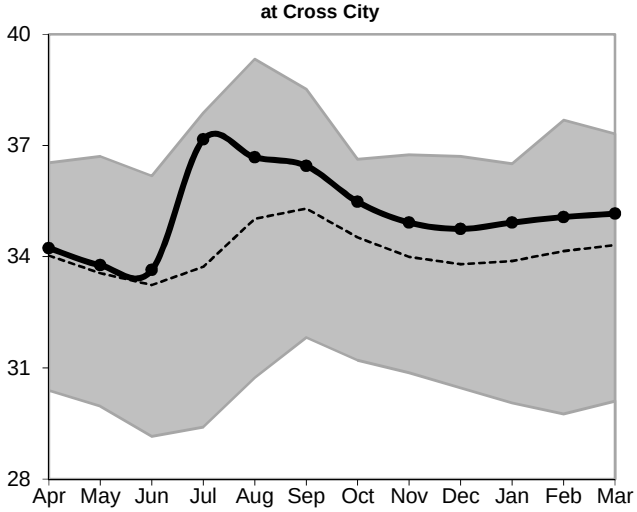
Gilchrist County S091607001
near Trenton



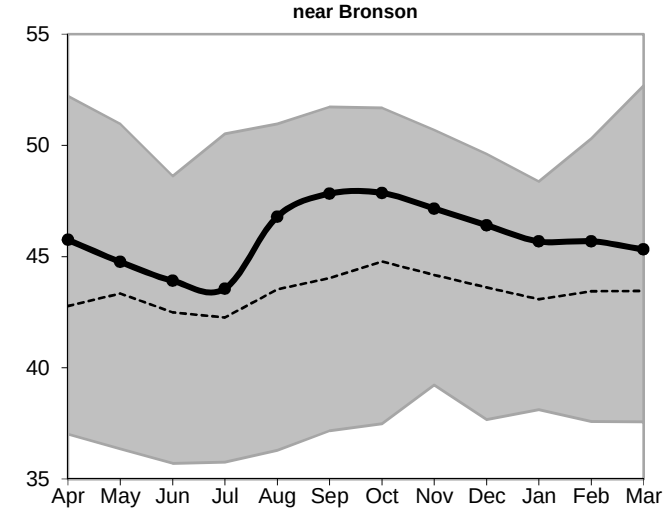
Bradford County S072132001
near Graham



Dixie County S101210001
at Cross City



Levy County S131736001
near Bronson



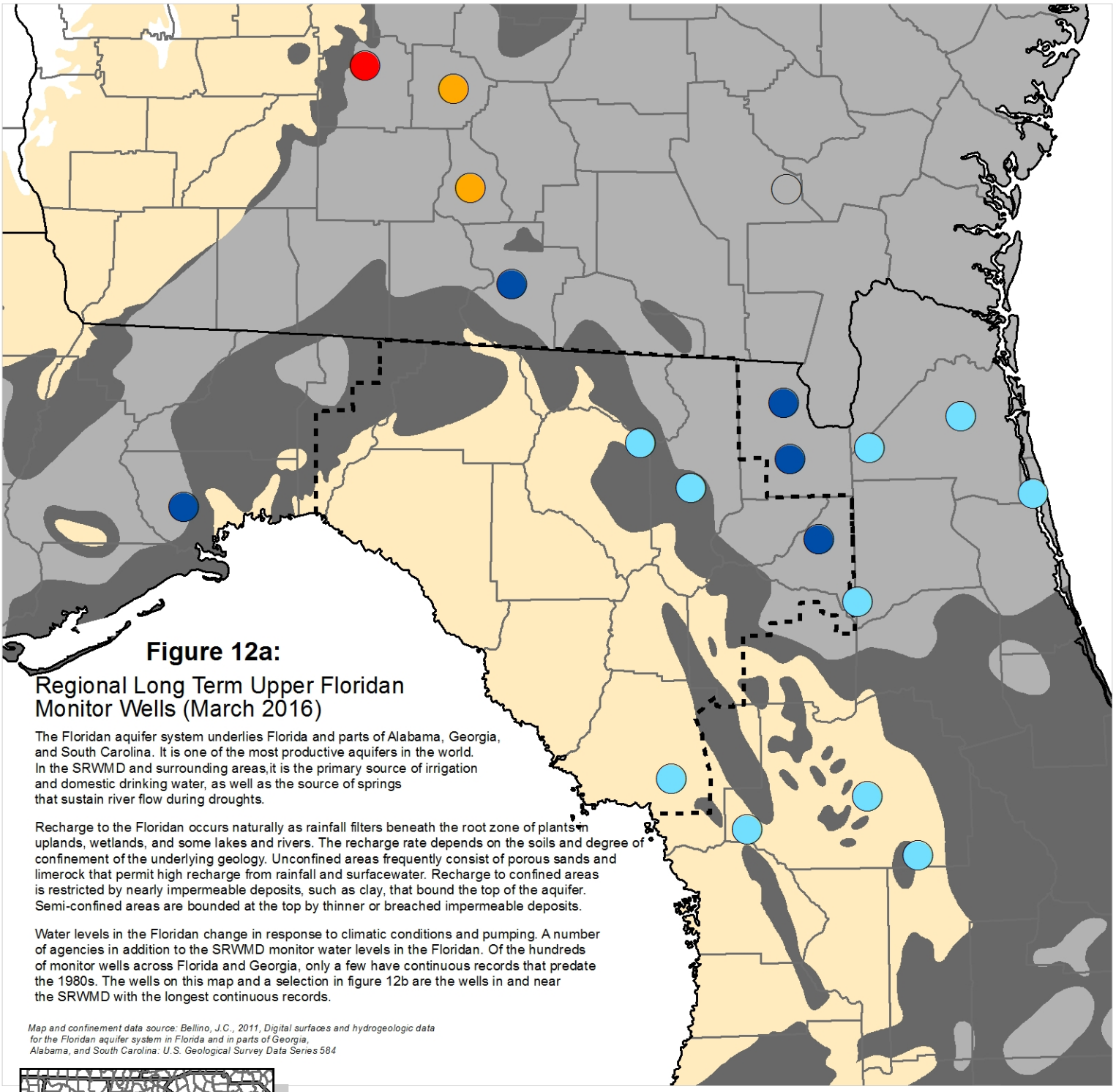


Figure 12a:

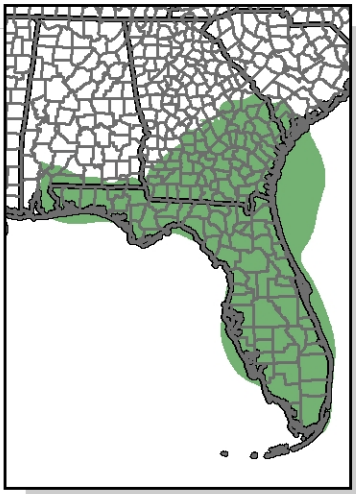
Regional Long Term Upper Floridan Monitor Wells (March 2016)

The Floridan aquifer system underlies Florida and parts of Alabama, Georgia, and South Carolina. It is one of the most productive aquifers in the world. In the SRWMD and surrounding areas,it is the primary source of irrigation and domestic drinking water, as well as the source of springs that sustain river flow during droughts.

Recharge to the Floridan occurs naturally as rainfall filters beneath the root zone of plants in uplands, wetlands, and some lakes and rivers. The recharge rate depends on the soils and degree of confinement of the underlying geology. Unconfined areas frequently consist of porous sands and limerock that permit high recharge from rainfall and surfacewater. Recharge to confined areas is restricted by nearly impermeable deposits, such as clay, that bound the top of the aquifer. Semi-confined areas are bounded at the top by thinner or breached impermeable deposits.

Water levels in the Floridan change in response to climatic conditions and pumping. A number of agencies in addition to the SRWMD monitor water levels in the Floridan. Of the hundreds of monitor wells across Florida and Georgia, only a few have continuous records that predate the 1980s. The wells on this map and a selection in figure 12b are the wells in and near the SRWMD with the longest continuous records.

Map and confinement data source: Bellino, J.C., 2011, Digital surfaces and hydrogeologic data for the Floridan aquifer system in Florida and in parts of Georgia, Alabama, and South Carolina: U.S. Geological Survey Data Series 584



Inset: Extent of Floridan Aquifer

Occurence of Confined and Unconfined Conditions in the Upper Floridan Aquifer

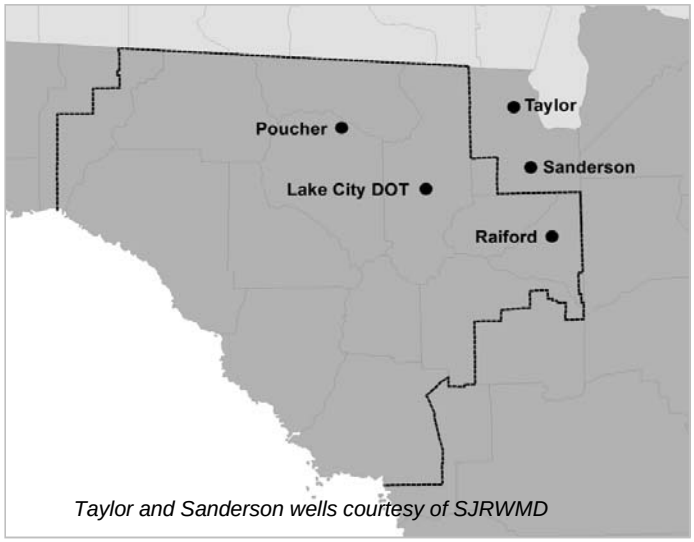
- Confined: Upper confining unit is generally greater than 100 feet thick and unbreached. Recharge is low.
- Semi-confined: Upper confining unit is generally less than 100 feet thick, breached, or both. Recharge is moderate.
- Unconfined: Upper confining unit is absent or very thin. Recharge is high.

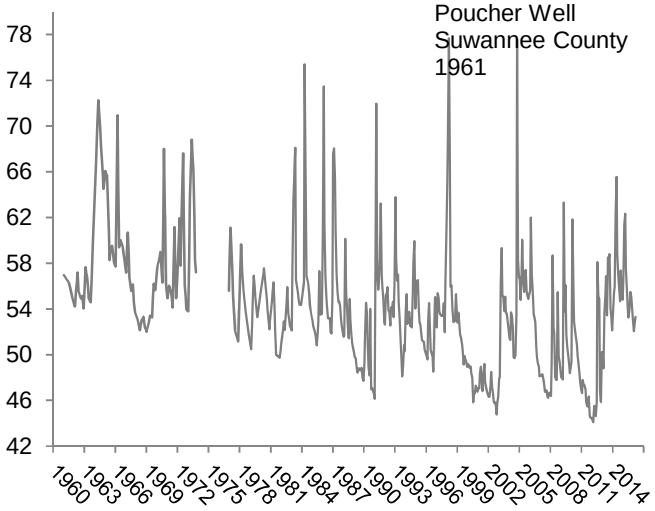
Percentile of Most Recent Water Level Relative to Entire Record

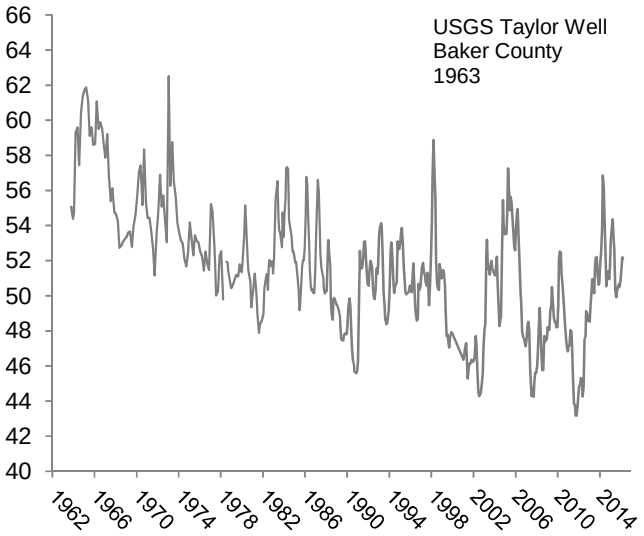
- High (Greater than 75th Percentile)
- Normal (25th to 75th Percentile)
- Low (10th to 25th Percentile)
- Extremely Low (Less than 10th Percentile)
- Not Available
- SRWMD Boundary

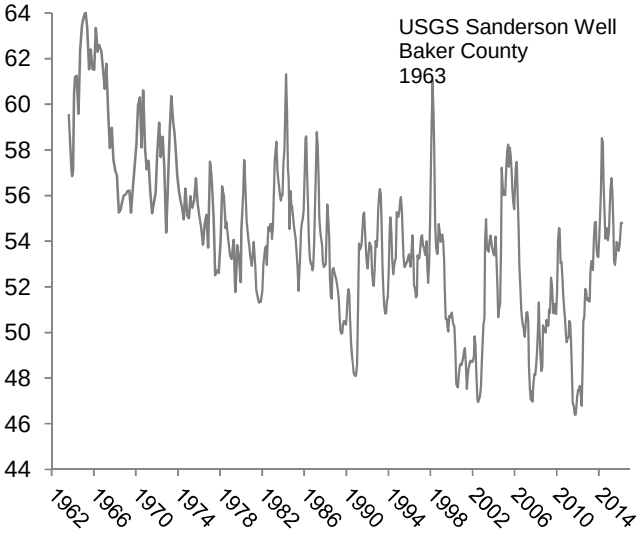
Figure 12b: Regional Long Term Upper Floridan Levels

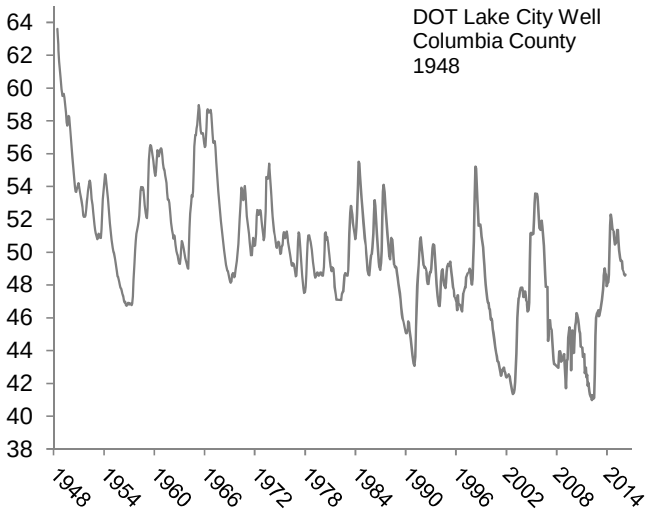
Data through March 2016

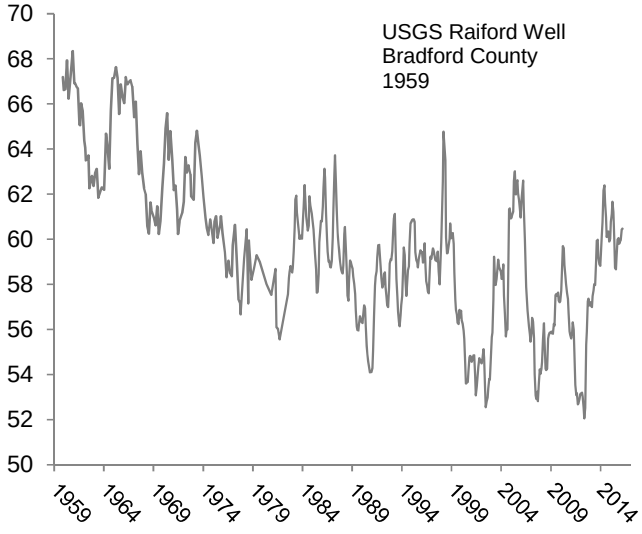












Upper Floridan Aquifer Elevation above NGVD 1929, Feet