MEMORANDUM

TO: Suwannee River Water Management District Governing Board

FROM: Tom Mirti, Director, Division of Water Resources

THRU: Noah Valenstein, Executive Director

DATE: June 10, 2016

RE: May 2016 Hydrologic Conditions Report for the SRWMD

RAINFALL

- District-wide rainfall in May averaged 2.62" across the District, about 20 percent below the long-term average May rainfall of 3.27". Highest rainfall amounts fell in the eastern portion of the District; Union County received just over 5" of rain and Alachua and Bradford counties also received well above normal amounts. Jefferson and Madison counties, on the other hand, received about a third of the normal rainfall for the month. (Table 1 and Figure 1). The upper Santa Fe River basin received generally received over 3" in most areas, particularly north of the river, as did scattered areas on northern San Pedro Bay (Figure 2). Georgia rainfall, on the whole, was in a deficit status for the month, with only the upper Alapaha River receiving more than normal rainfall totals (Figure 3).
- The highest gaged monthly rainfall total of 5.62" was recorded at the Ocean Pond rainfall station in Baker County, and the highest daily total of 4.49" (on May 17) was recorded at the Oleno Tower rainfall station in southern Columbia County. The lowest gaged monthly total was 0.98" at the Cooks Hammock rainfall station in southwest Lafayette County.
- The rainfall average across the District for the 12-month period ending May 30 was 51.4", compared to the long-term average of 54.7". The cumulative 12-month deficit improved very slightly for a second consecutive month to 3.3". Annual rainfall deficits improved significantly in both the Santa Fe and Suwannee river basins during the month, but declined in the coastal regions of the District (Figure 4).
- Average District rainfall for the 3 months ending May 31 totaled 10.1", about 10 percent below the long-term average of 11.3". The Santa Fe River deficit improved during May, but other basins generally saw less rain over the past 90 days. The Aucilla River basin experienced the greatest shift of -2.5", although it remained in surplus. The Waccasassa basin deficit remained at about 30 percent below normal (Figure 5).

SURFACEWATER

- **Rivers:** Most District river level stations began May in the normal range of flows (between the 25th and the 75th percentiles) and trended downward as the month progressed. A mid-month rainfall event slowed the decline on smaller basins, but May ended with all District gages lower than the beginning of the month. The Steinhatchee River near Tennille dropped into the low category (below the 25th percentile) by month end but all other District gages were in the normal range of flows. 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**: All but one District monitored lakes decreased in level during May and six were at below average levels as the month ended. Alligator Lake in Lake City dropped nearly 3' during May—a typical decline for the lake for its range of levels in a dry month, but the decline was likely aided by the presence of lake bottom sinkholes. Palestine Lake in Union County rose by only 0.02', despite the high rainfall in that county. Figure 8 shows lake levels relative to their respective long-term minimum, average and maximum levels.

- **Springs**: The flows of 9 springs or spring groups were measured by the USGS, District staff, and District contractors during May. The decreasing river levels from the relatively dry month allowed springs to show flow increases for the most part. Fanning and Convict springs, for example, showed such a rebound, while the Wacissa River showed a flow decline that may be caused by vegetative backwater from submersed aquatic vegetation in the river system. Historical flow data for four springs are provided in graphical format on Figure 9.

GROUNDWATER

Groundwater levels in Upper Floridan Aquifer monitor wells declined sharply and ended the month at the 53rd percentile as an average across the District, a drop of 17 percentile points. Only two wells, on both banks of the Suwannee River above the Luraville bridge, saw an increase in level, while coastal areas of Levy and Dixie counties and the Steinhatchee River corridor dropped into the low category (below the 25th percentile) as shown in 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 June 4 showed ongoing near-normal conditions in north Florida and southern Georgia; the remainder of Florida is experiencing similar conditions although the report precedes the onset of Tropical Storm Colin.
- The National Weather Service Climate Prediction Center (CPC) is now projecting normal chances for rainfall in North Florida over the next three months. On June 9, the CPC announced that the ongoing El Niño event had concluded and that weak La Niña conditions may occur as early as August.
- The U.S. Drought Monitor report of June 7 showed no dry conditions anywhere in Florida as a result of the passage of Tropical Storm Colin on June 5-7.

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 (gage-adjusted radar-derived estimate), groundwater (117 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	May 2016	May Average	Month % of Normal	Last 12 Months	Annual % of Normal
Alachua	3.79	2.27	167%	52.56	103%
Baker	2.45	1.89	130%	42.44	85%
Bradford	3.83	2.22	172%	48.33	95%
Columbia	3.10	3.21	97%	45.92	89%
Dixie	1.92	3.43	56%	60.26	102%
Gilchrist	2.09	3.36	62%	52.09	91%
Hamilton	1.64	3.16	52%	47.99	92%
Jefferson	2.05	5.88	35%	44.31	73%
Lafayette	1.84	3.33	55%	49.37	87%
Levy	2.44	2.67	92%	57.84	97%
Madison	1.75	4.73	37%	48.15	86%
Suwannee	2.79	3.24	86%	47.07	89%
Taylor	2.03	4.16	49%	51.05	86%
Union	5.02	2.21	228%	45.46	84%

May 2016 Average:	2.62
May Average (1932-2015):	3.27
Historical 12-month Average (1932-2015):	54.66
Past 12-Month Total:	51.38
12-Month Rainfall Surplus/Deficit:	-3.28

Figure 1: Comparison of District-wide Monthly Rainfall

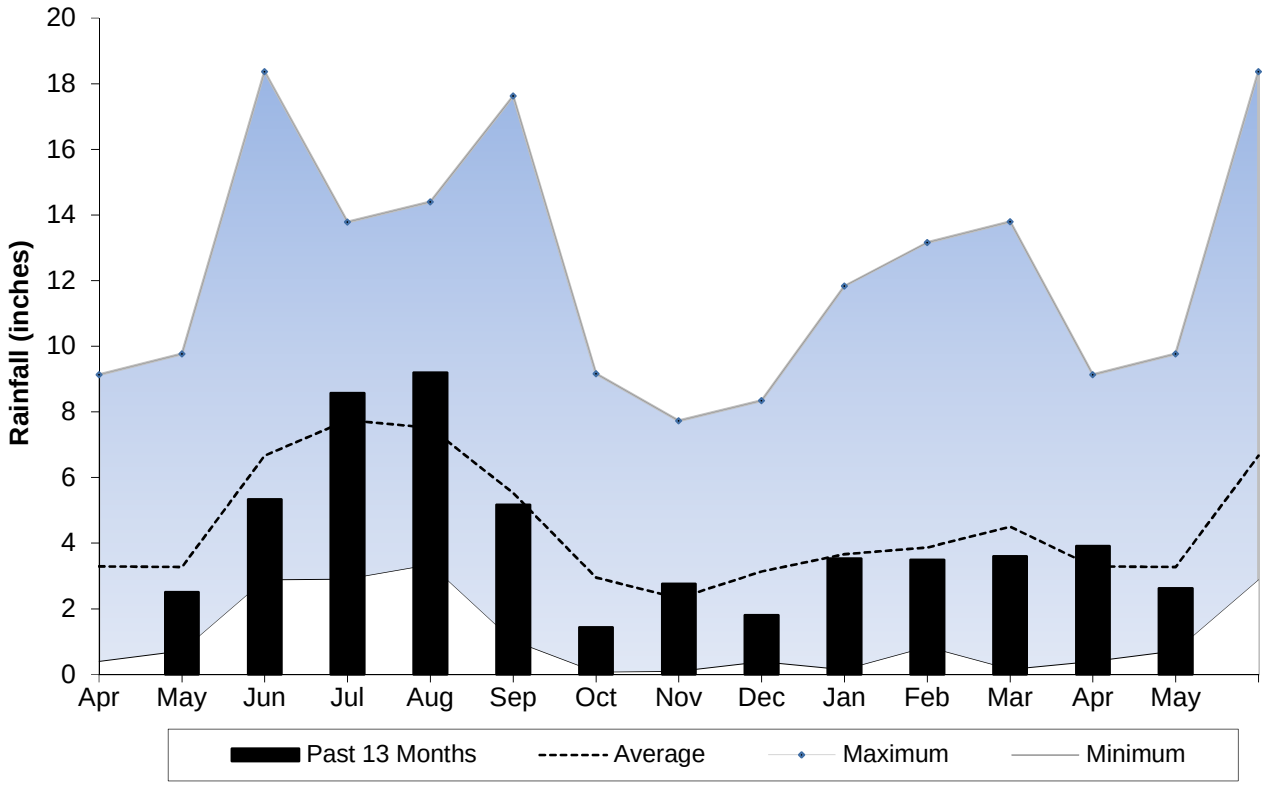


Figure 2: May 2016 Gage-Adjusted Radar Rainfall Estimate

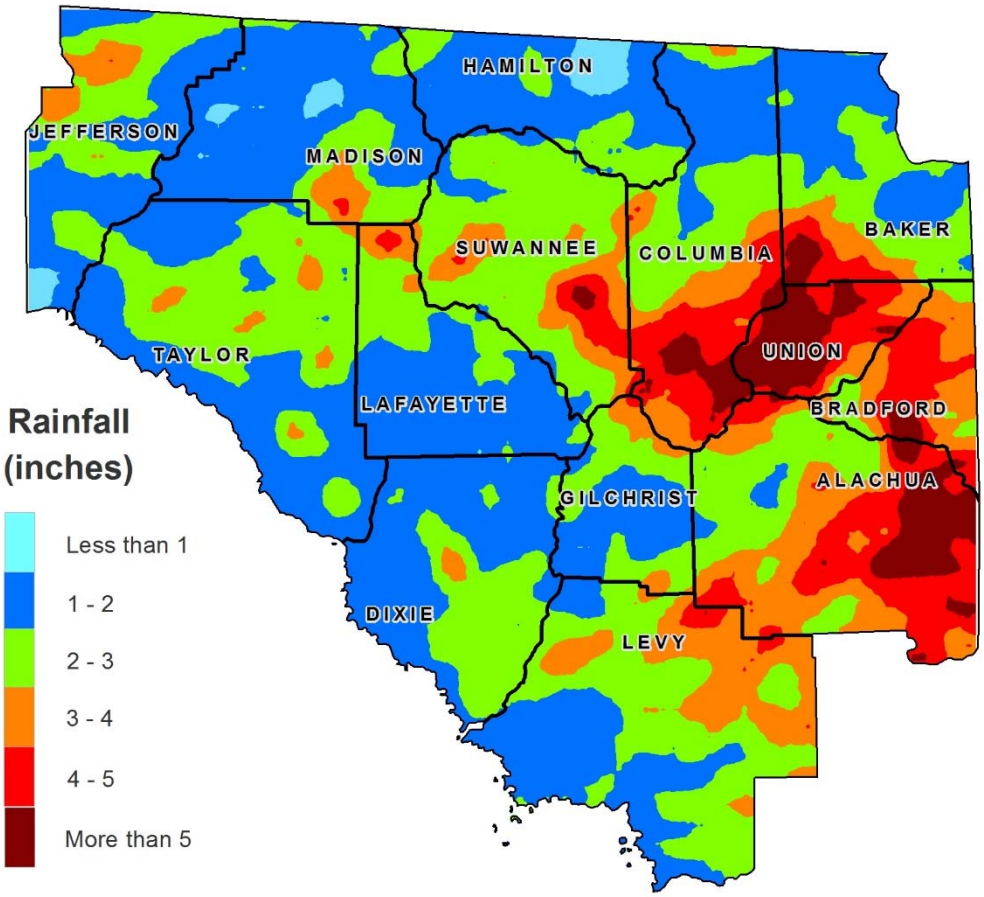


Figure 3: May 2016 Percent of Normal Rainfall

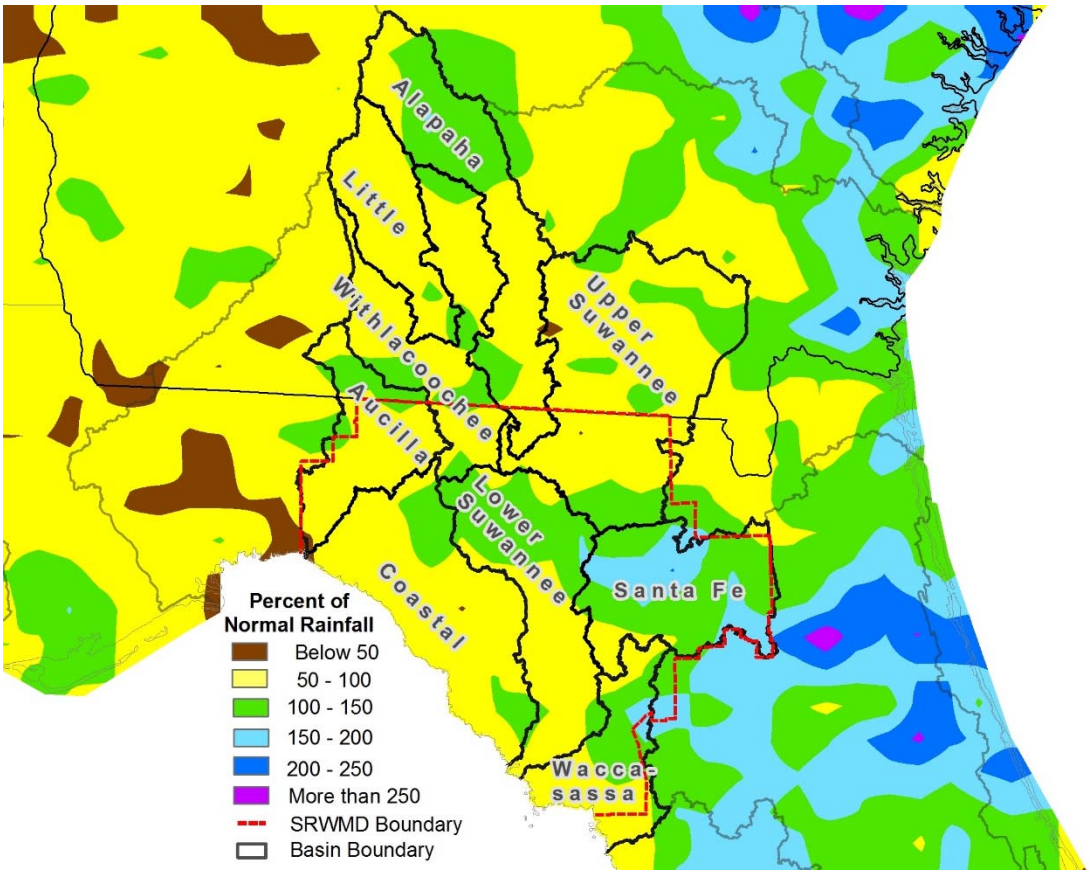


Figure 4: 12-Month Rainfall Surplus/Deficit by River Basin
Through May 31, 2016

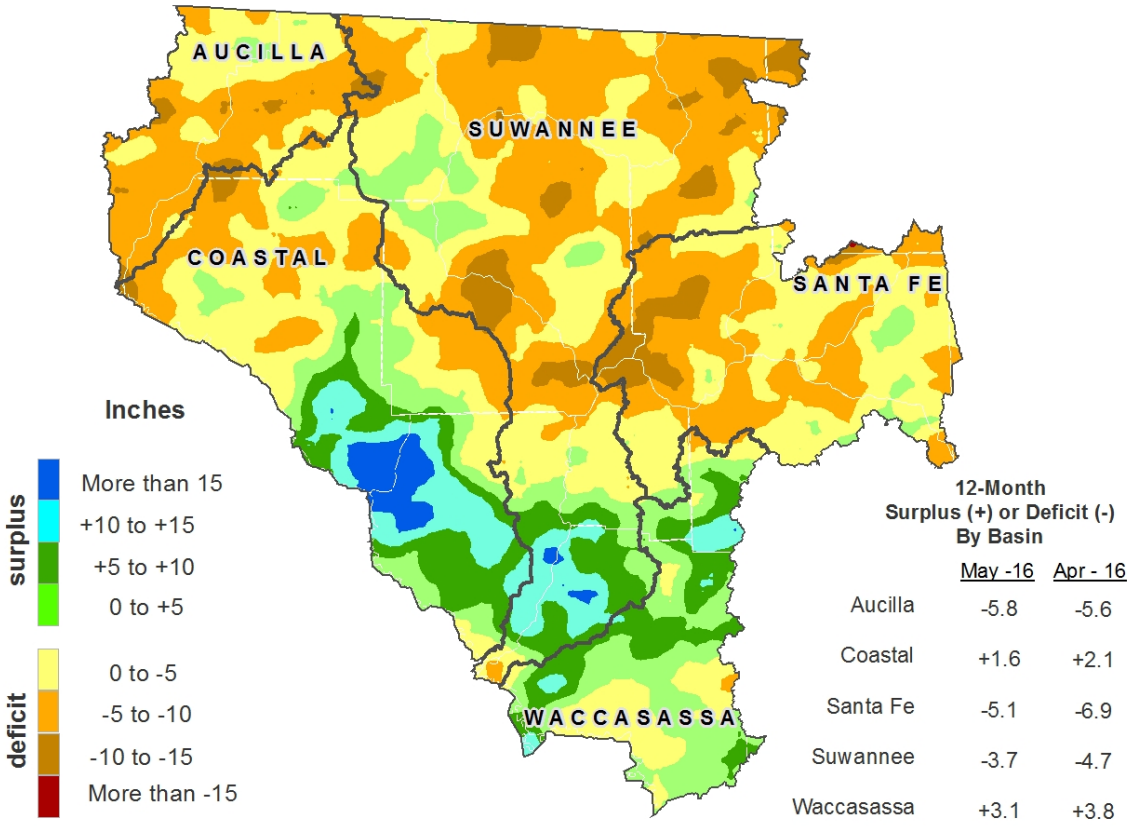


Figure 5: 3-Month Rainfall Surplus/Deficit by River Basin
Through May 31, 2016

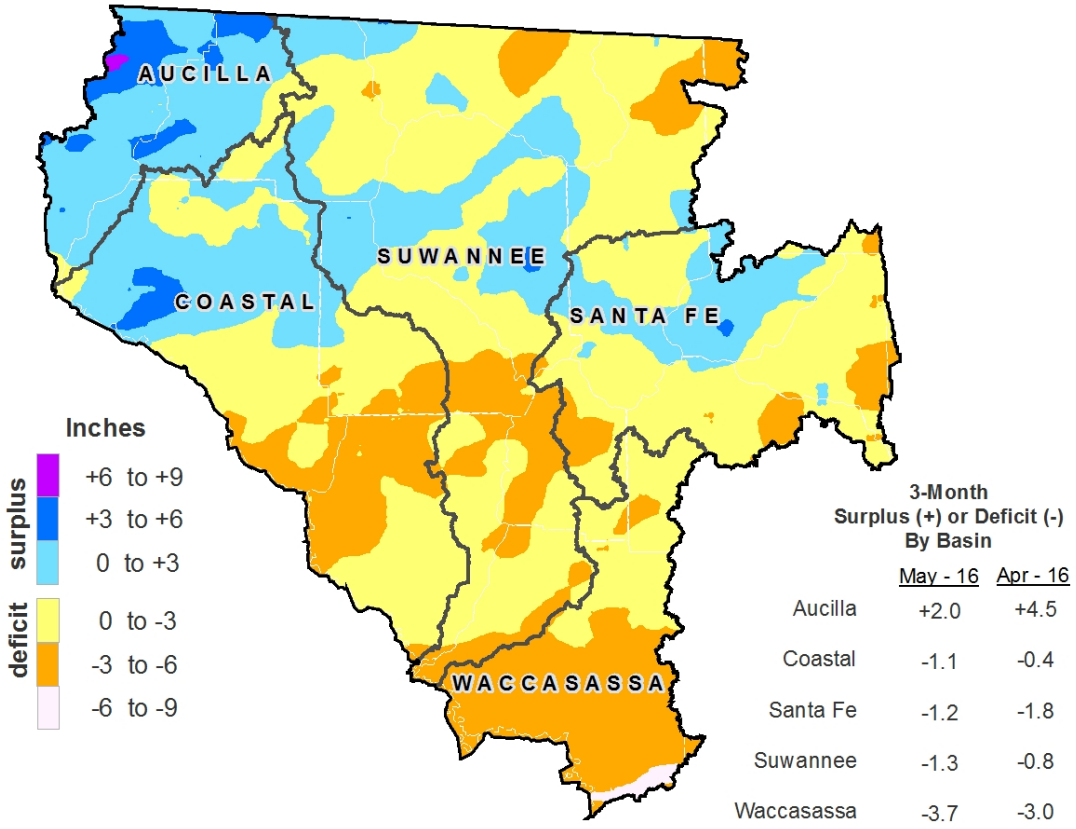
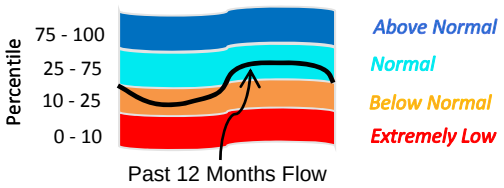
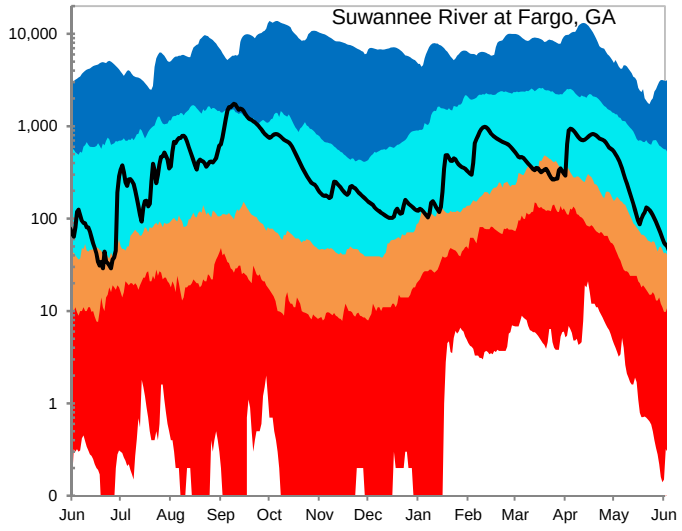
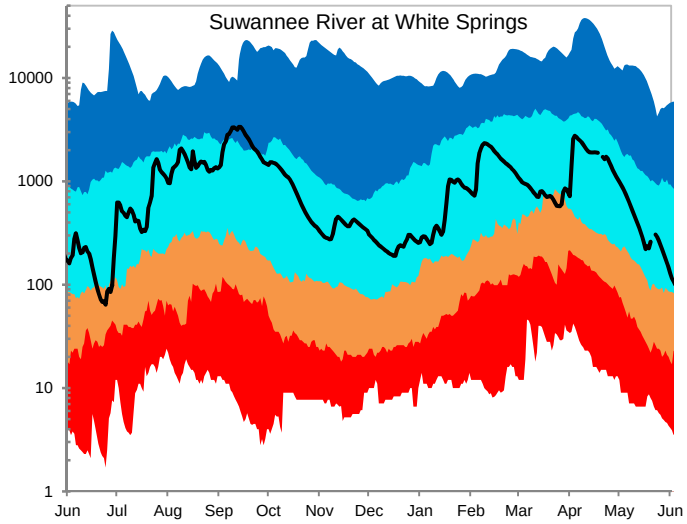


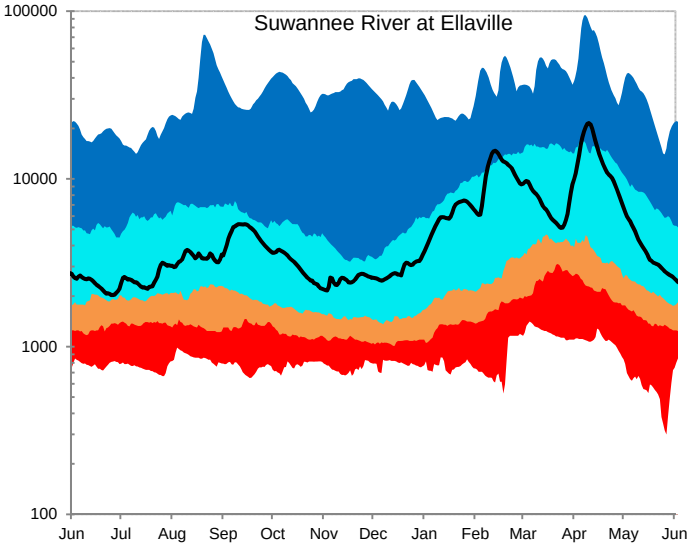
Figure 6: Daily River Flow Statistics
June 1, 2015 through May 31, 2016

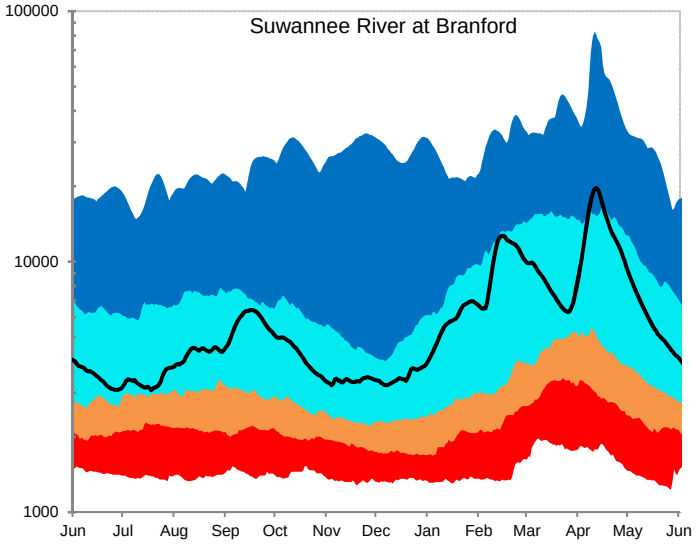


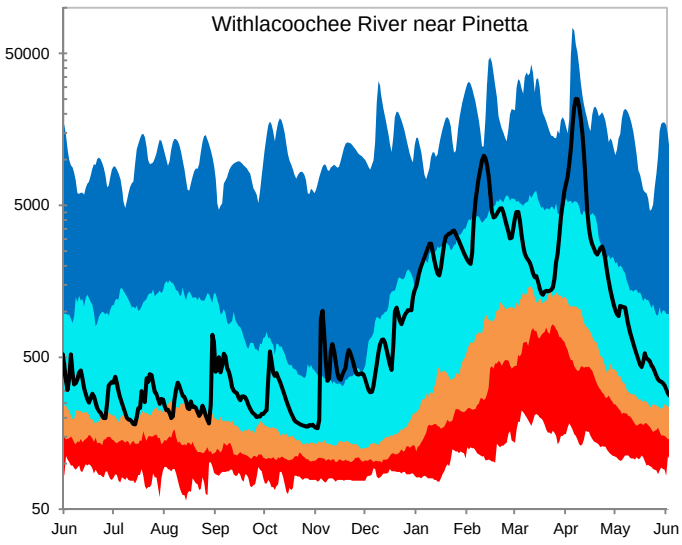
RIVER FLOW, CUBIC FEET PER SECOND











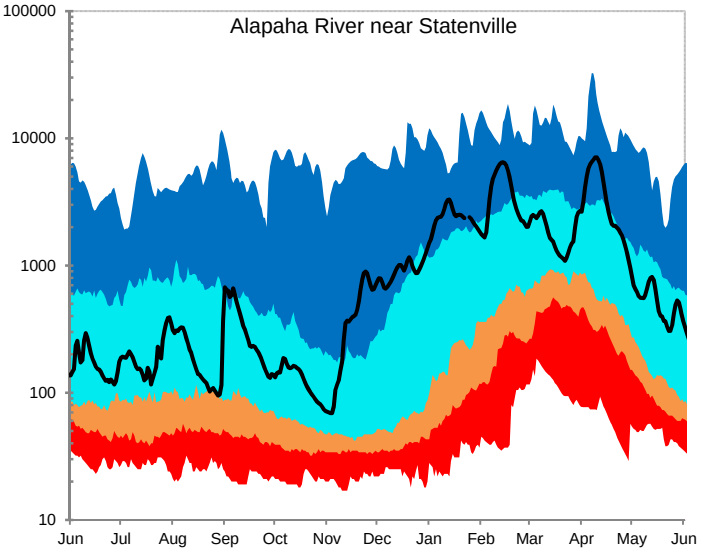
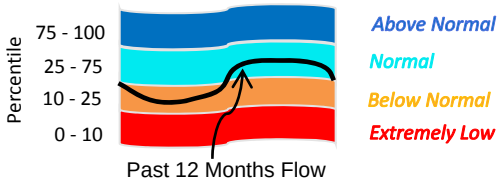
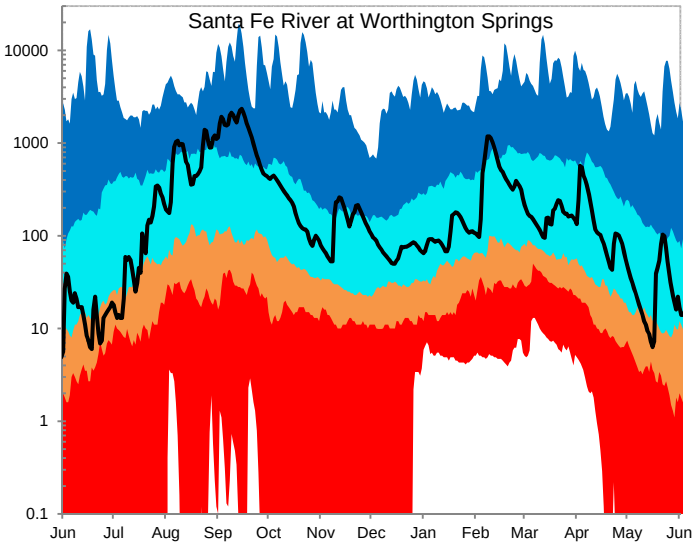
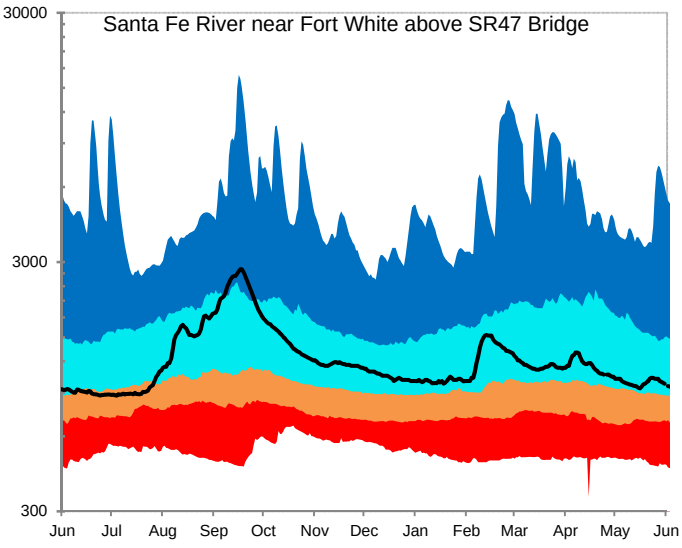


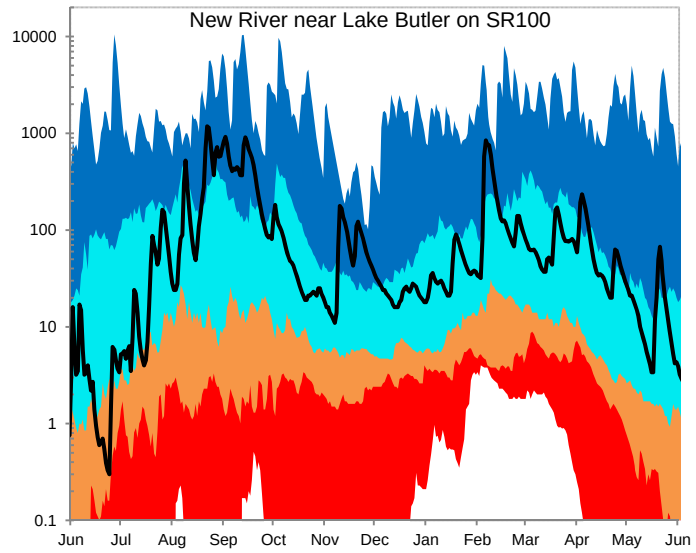
Figure 6, cont: Daily River Flow Statistics
June 1, 2015 through May 31, 2016

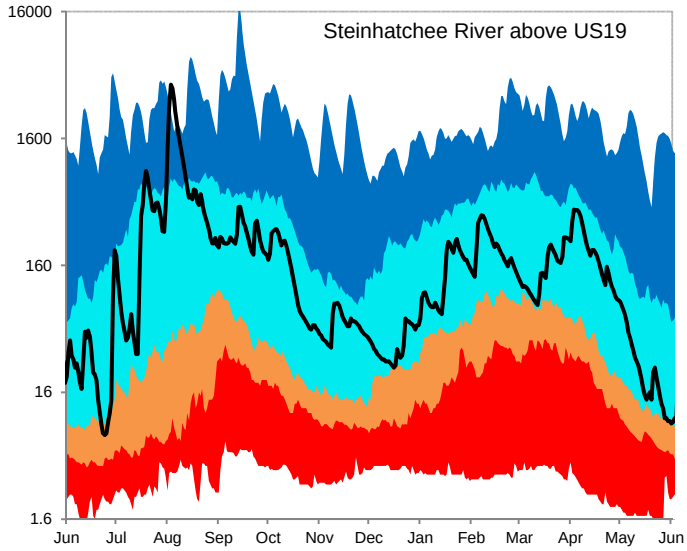


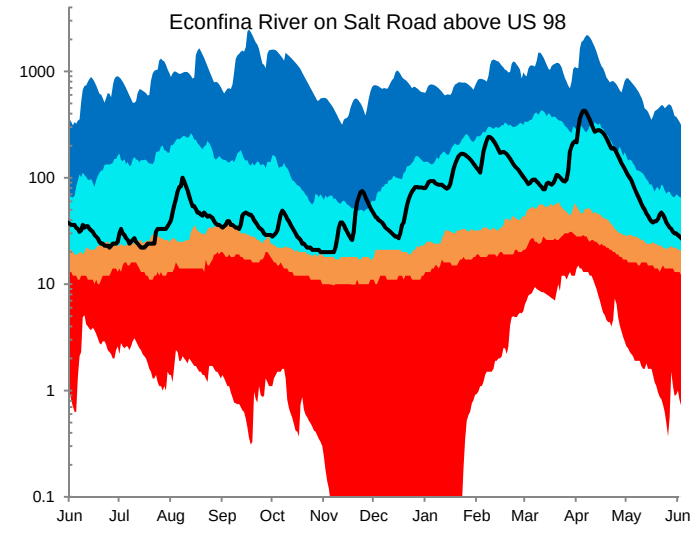
RIVER FLOW, CUBIC FEET PER SECOND

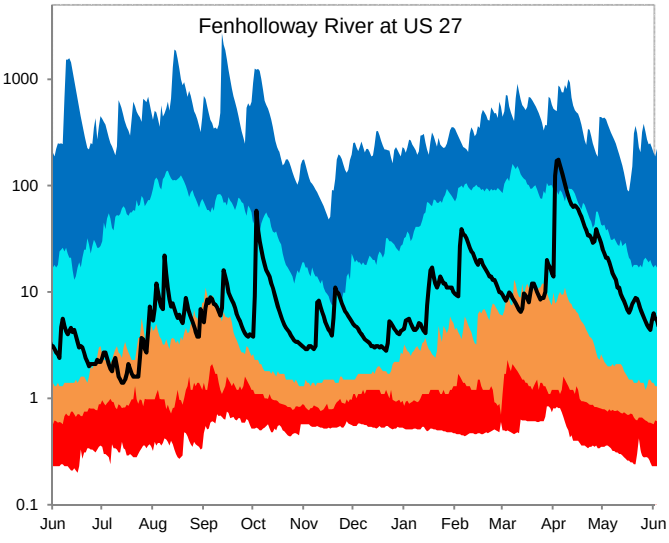












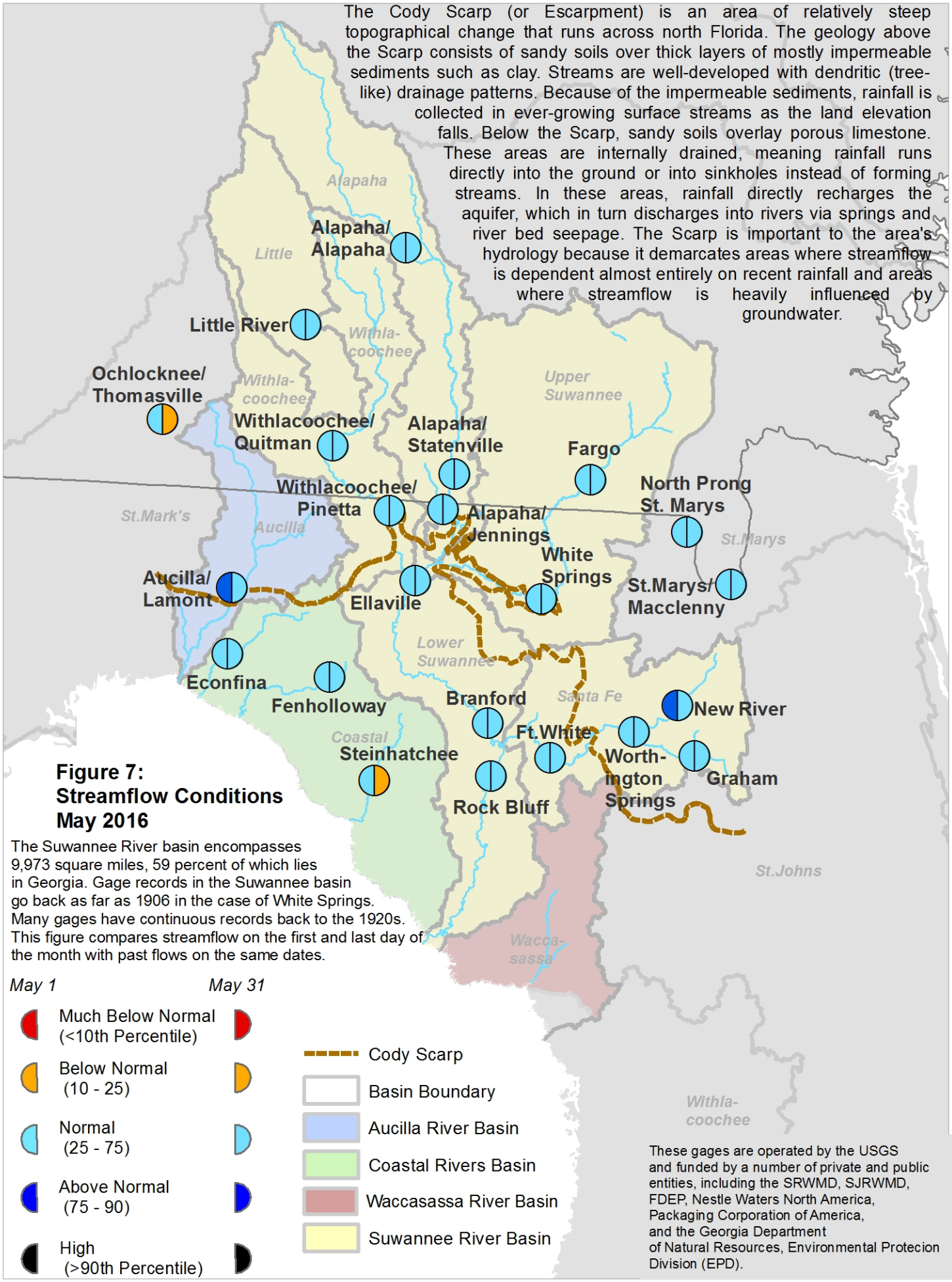
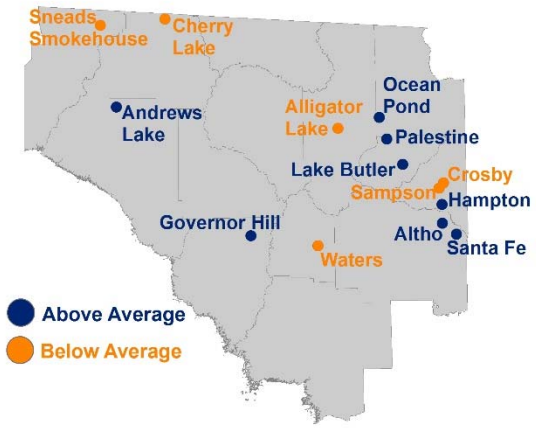

The Cody Scarp (or Escarpment) is an area of relatively steep topographical change that runs across north Florida. The geology above the Scarp consists of sandy soils over thick layers of mostly impermeable sediments such as clay. Streams are well-developed with dendritic (tree-like) drainage patterns. 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
Alapaha/ Jennings
North Prong St. Marys
St.Mark's
Aucilla
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
May 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.
May 1
May 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: May 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.

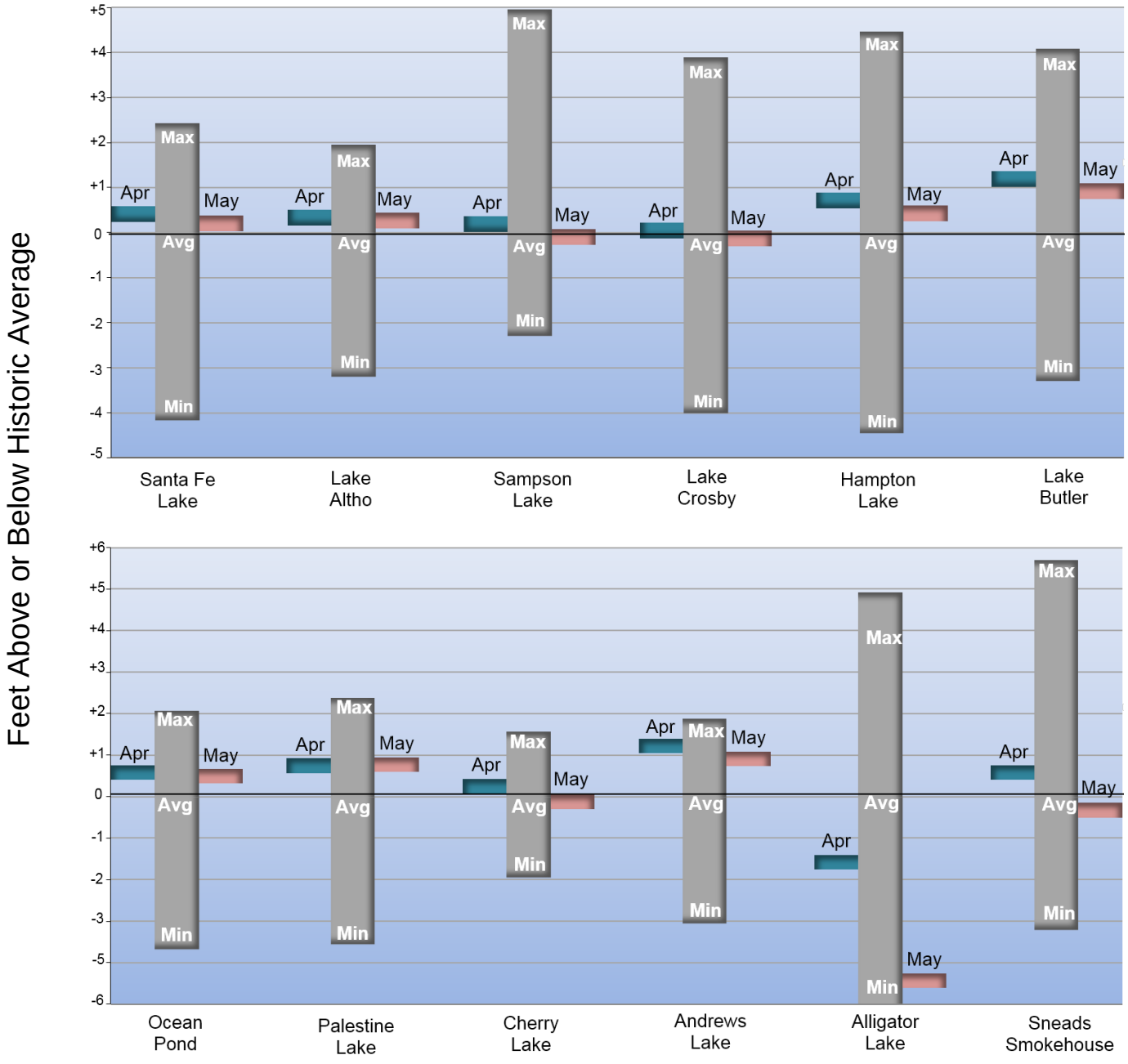
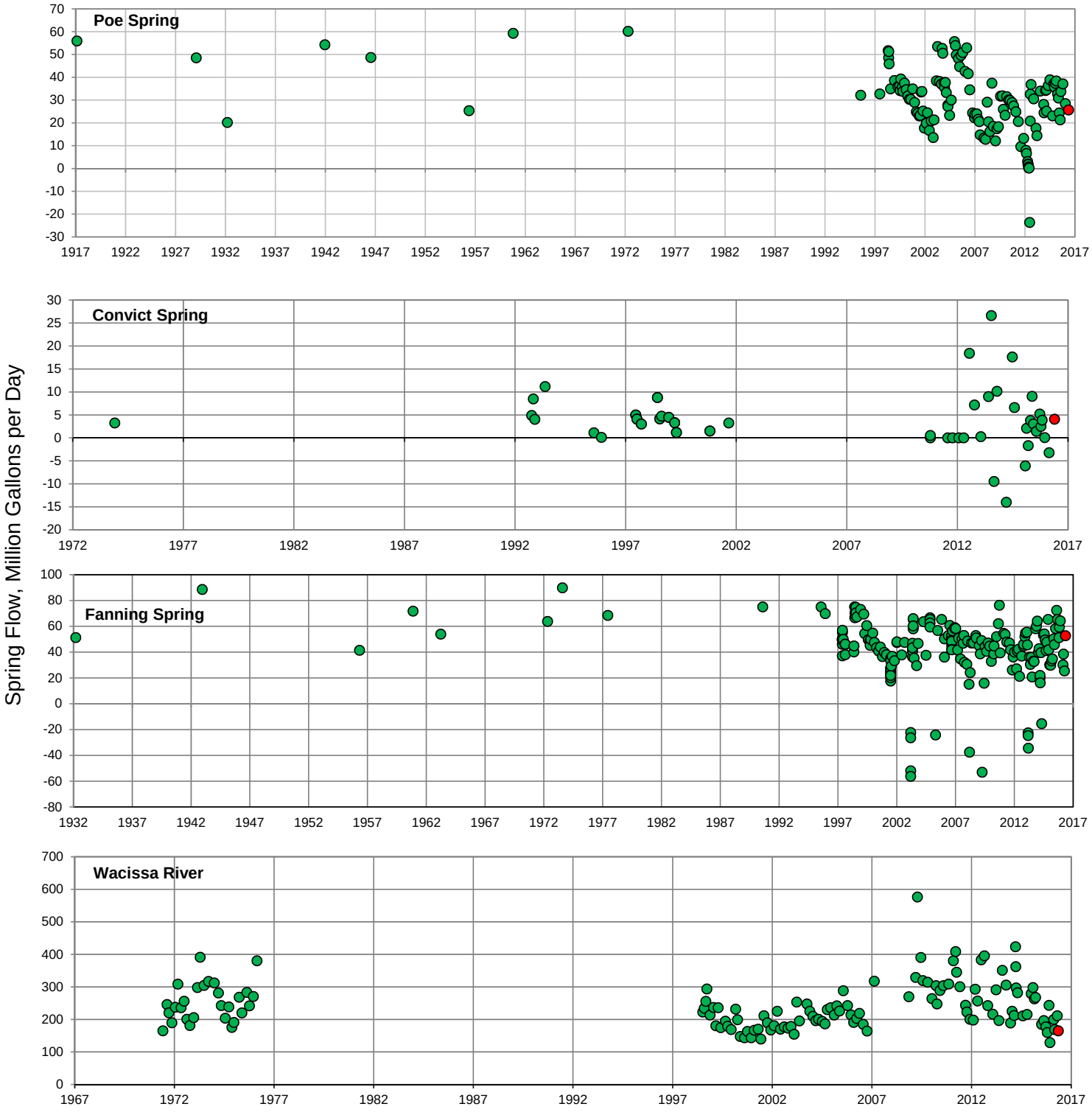


Figure 9: Monthly Springflow Measurements

The SRWMD monitors water quality at 44 springs. Flow is usually measured at the time of the sampling. The springs below were measured in May 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.



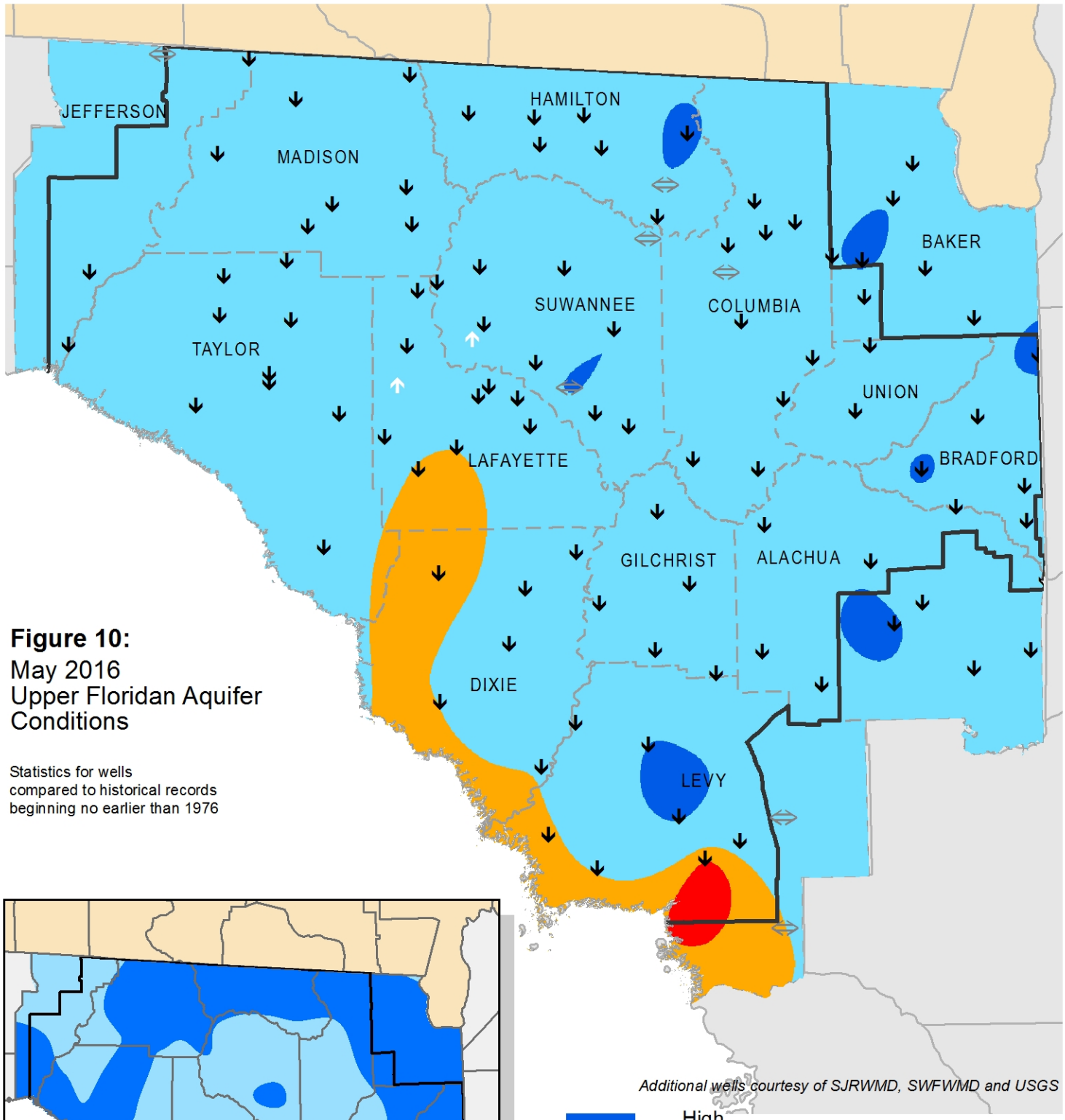
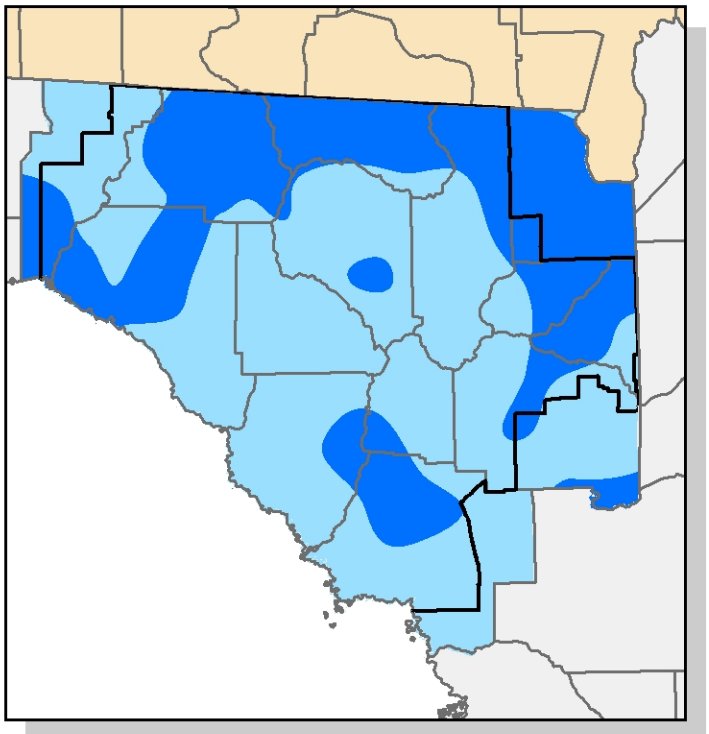


Figure 10:
May 2016
Upper Floridan Aquifer
Conditions

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



Inset: April Groundwater Levels

Additional wells courtesy of SJRWMD, SWFWMD and USGS

High
(Greater than 75th Percentile)

Normal
(25th to 75th Percentile)

Low
(10th to 25th Percentile)

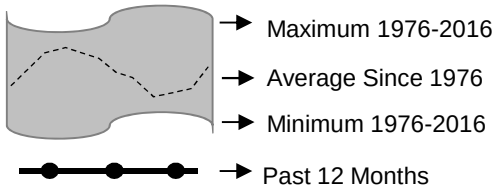
Extremely Low
(Less than 10th Percentile)

Increase/decrease in level since last month

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

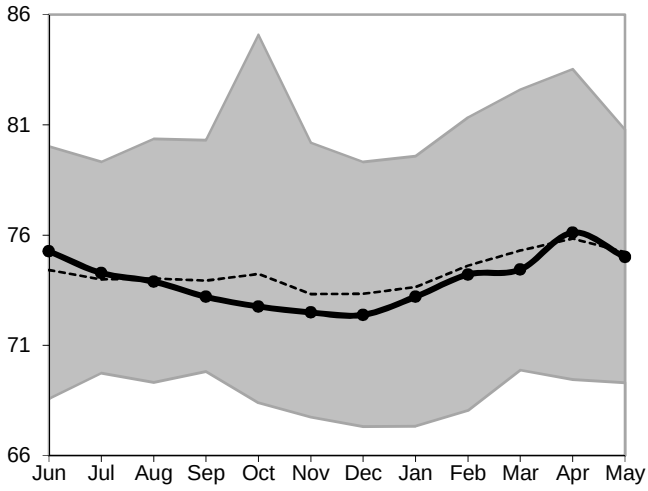
District Boundary

Figure 11: Monthly Groundwater Level Statistics
Levels June 1, 2015 through May 31, 2016
Period of Record Beginning 1976

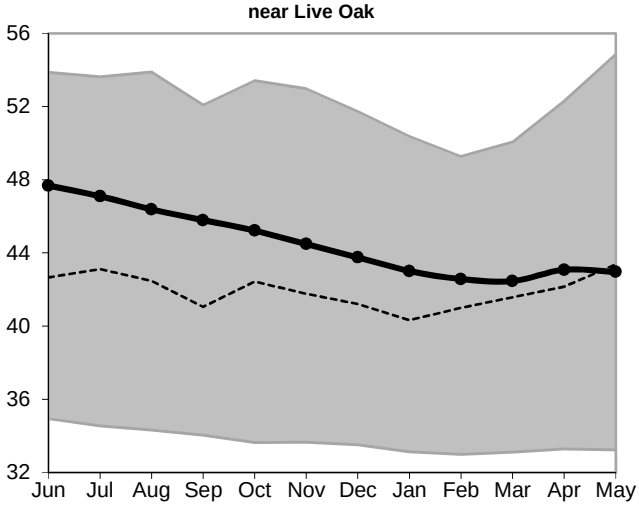


Upper Floridan Aquifer Elevation above NGVD 1929, Feet

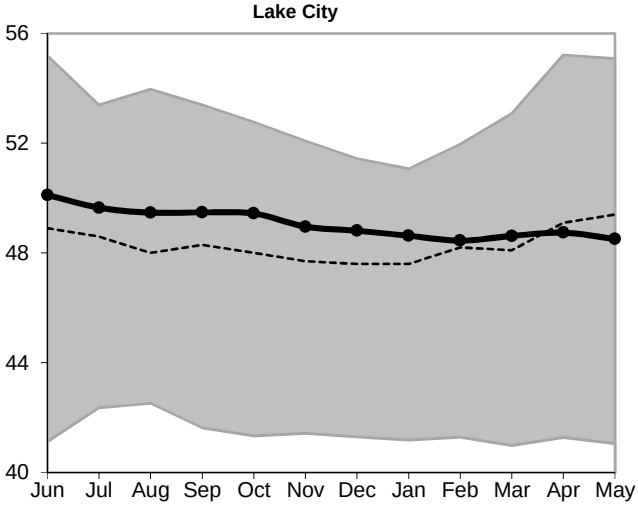
Madison County N010719001
near Greenville



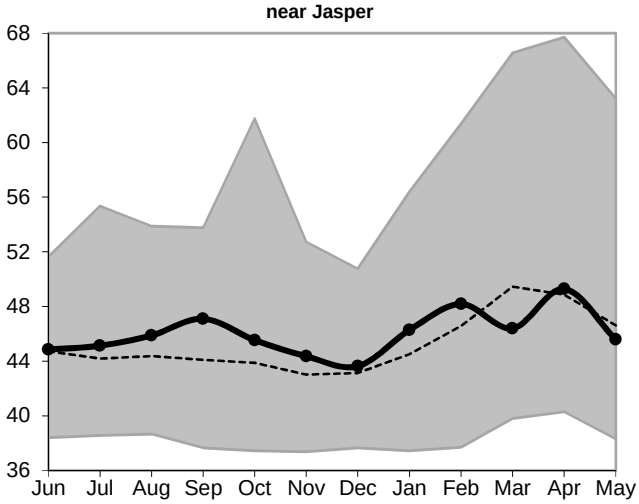
Suwannee County S021335001
near Live Oak



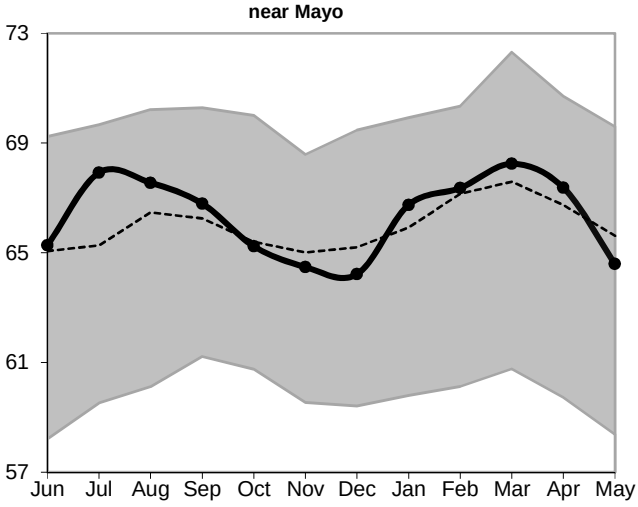
Columbia County S041705001
Lake City



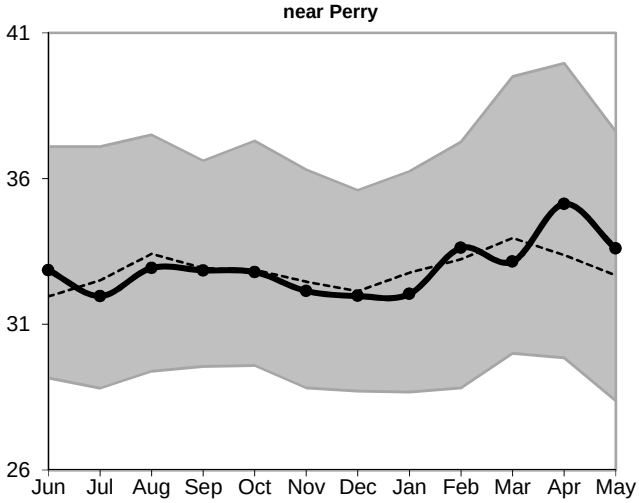
Hamilton County N011422007
near Jasper



Lafayette County S061114001
near Mayo



Taylor County S050701001
near Perry



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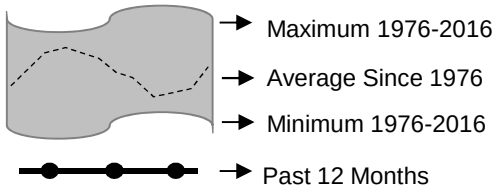
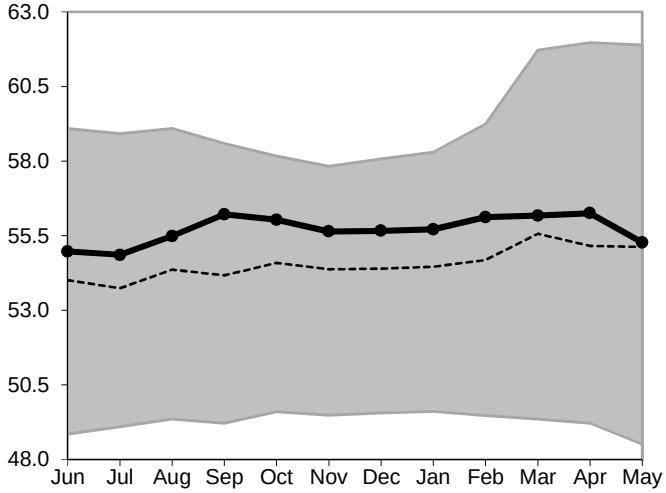
Period of Record Beginning 1976

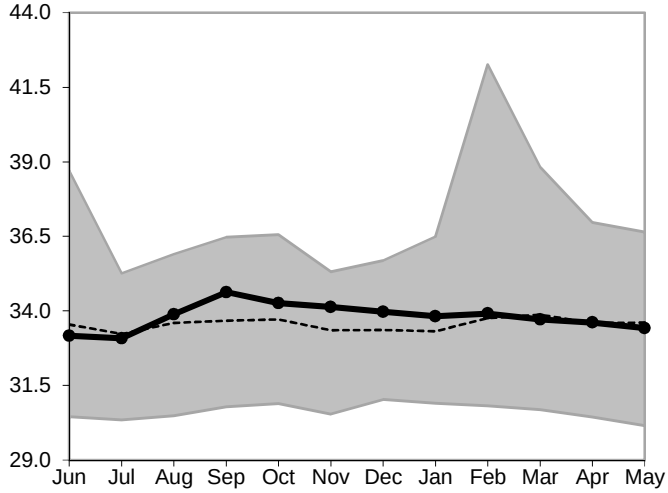


Upper Floridan Aquifer Elevation above NGVD 1929, Feet

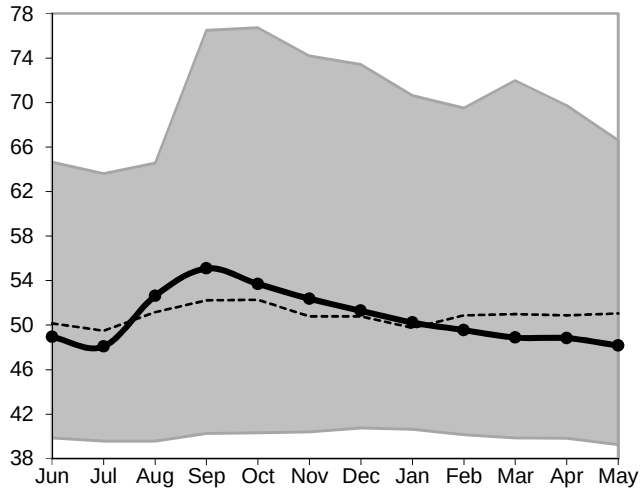
Union County S051933001
near Lake Butler



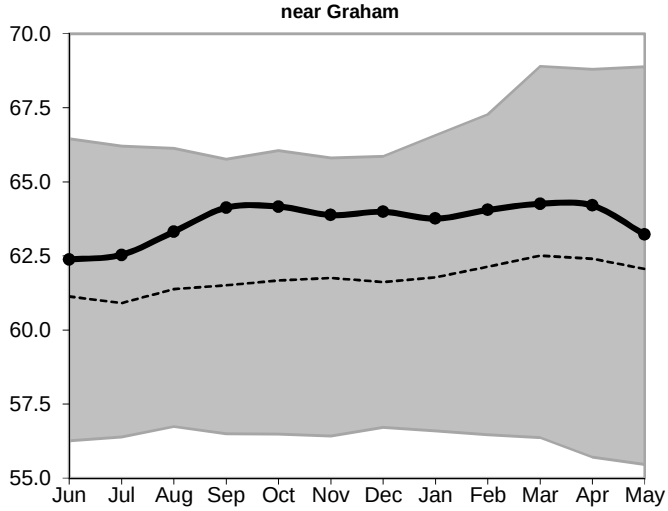
Alachua County S081703001
at High Springs



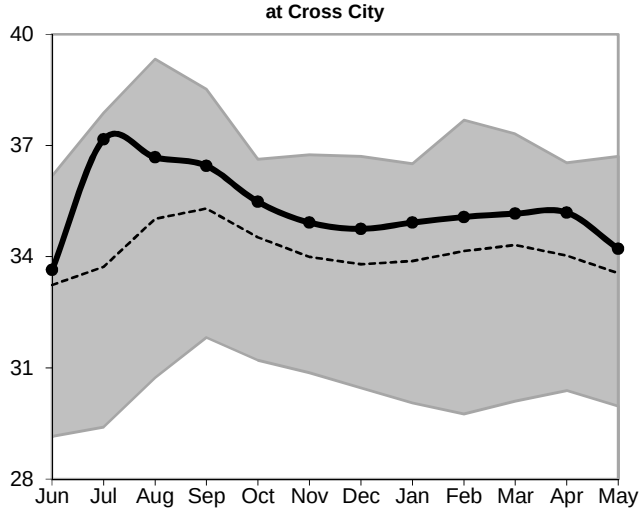
Gilchrist County S091607001
near Trenton



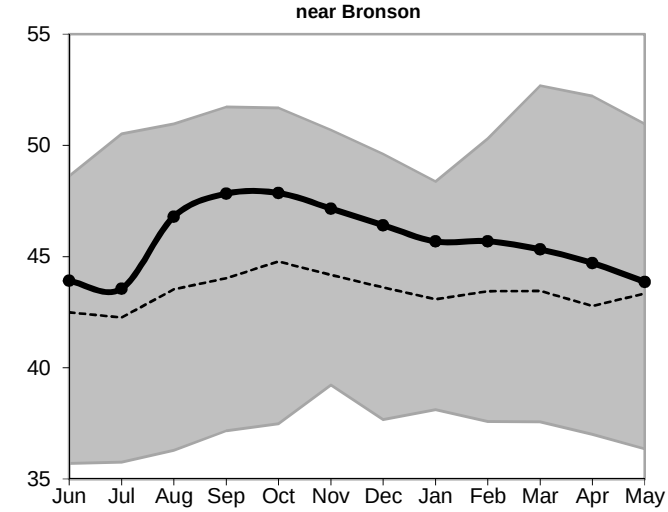
Bradford County S072132001
near Graham



Dixie County S101210001
at Cross City



Levy County S131736001
near Bronson



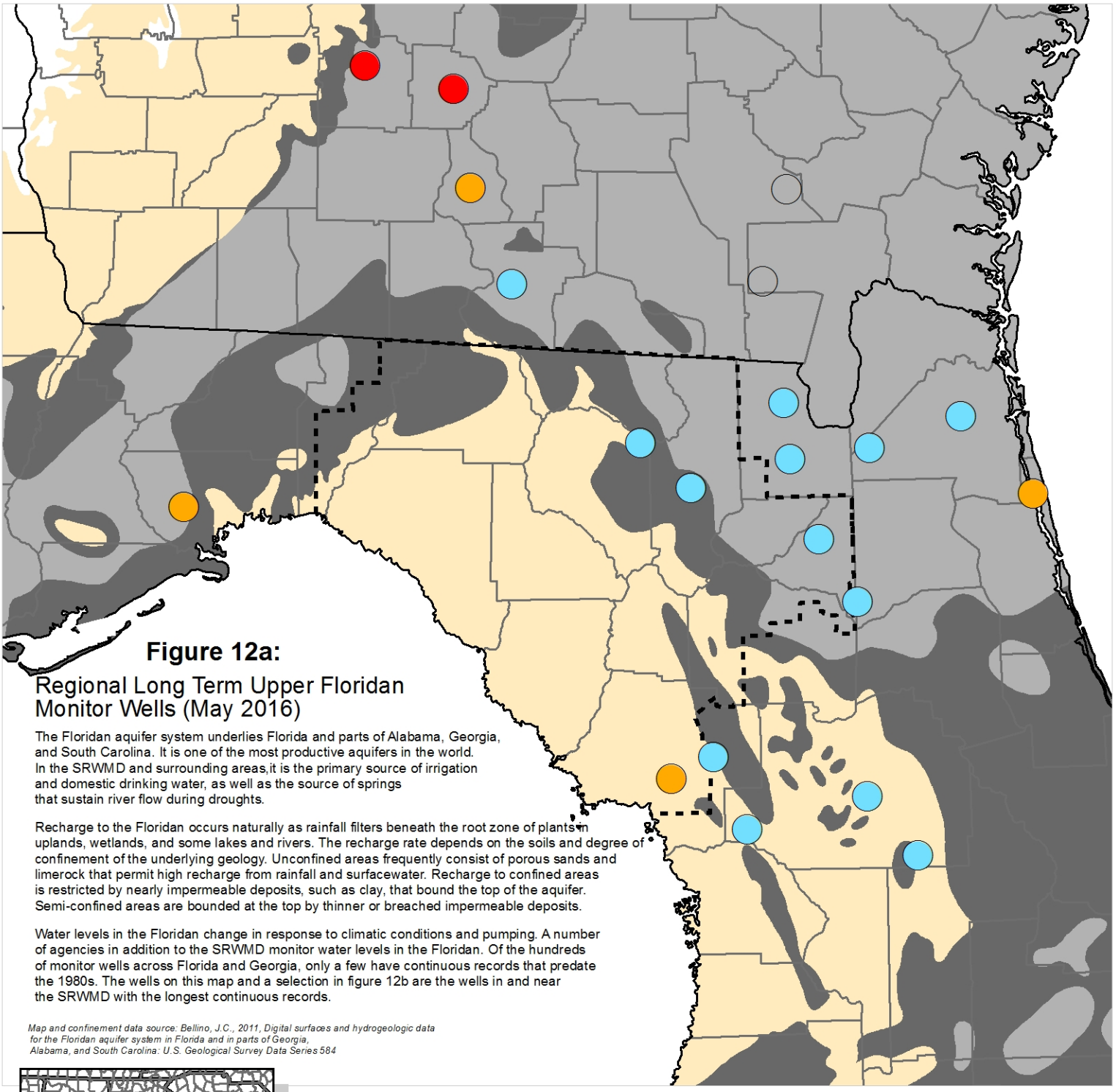


Figure 12a:

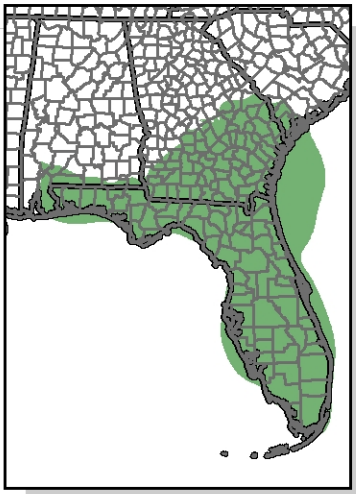
Regional Long Term Upper Floridan Monitor Wells (May 2016)

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

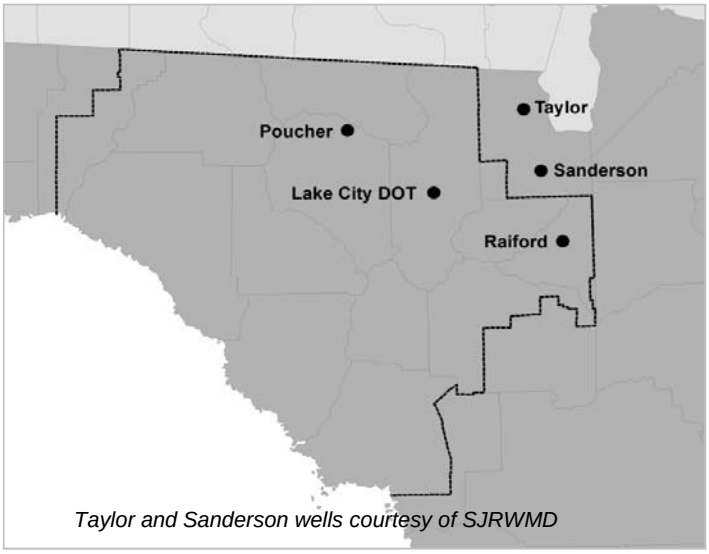
- Confined: Upper confining unit is generally greater than 100 feet thick and unbreached. Recharge is low.
- Semi-confined: Upper confining unit is generally less than 100 feet thick, breached, or both. Recharge is moderate.
- Unconfined: Upper confining unit is absent or very thin. Recharge is high.

Percentile of Most Recent Water Level Relative to Entire Record

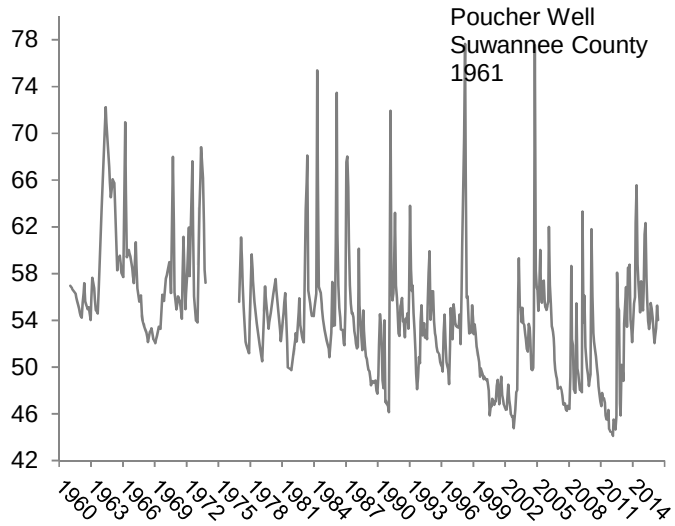
- High (Greater than 75th Percentile)
- Normal (25th to 75th Percentile)
- Low (10th to 25th Percentile)
- Extremely Low (Less than 10th Percentile)
- Not Available
- SRWMD Boundary

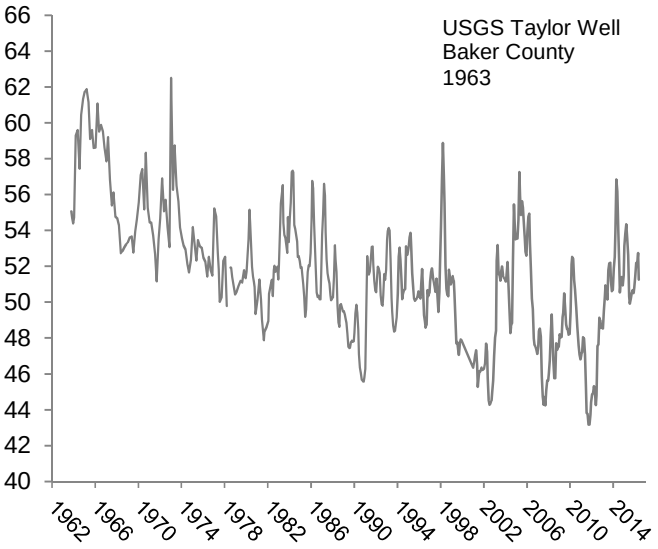
Figure 12b: Regional Long Term Upper Floridan Levels

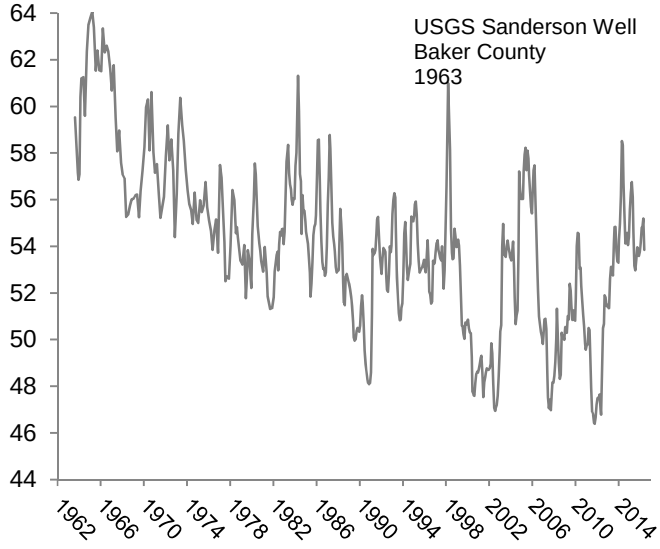
Data through May 2016

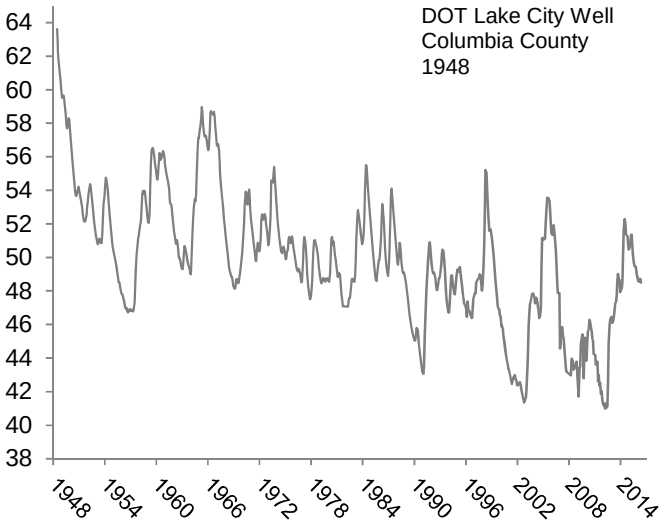


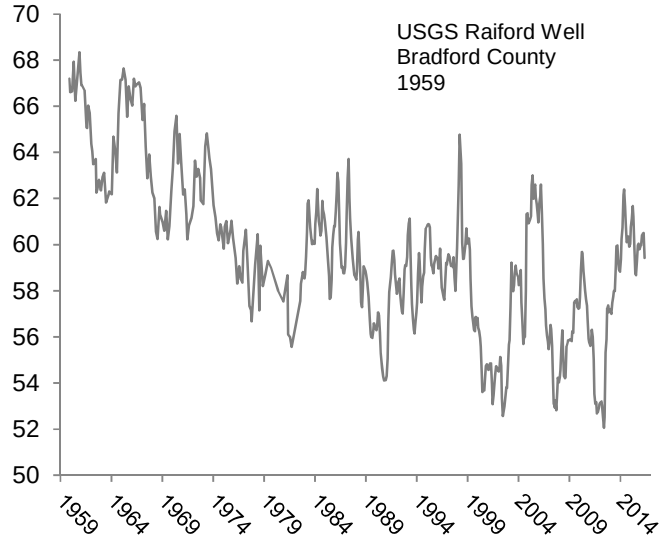
Taylor and Sanderson wells courtesy of SJRWMD











Upper Floridan Aquifer Elevation above NGVD 1929, Feet