MEMORANDUM

TO: Suwannee River Water Management District Governing Board

FROM: Tom Mirti, Interim Division Director, Water Resources

THRU: Noah Valenstein, Executive Director

DATE: December 4, 2015

RE: November 2015 Hydrologic Conditions Report for the SRWMD

RAINFALL

- District-wide rainfall in November was 2.76", a tenth of an inch above the long-term average November rainfall of 2.65". After a four month drought, Jefferson County received the most rainfall during the month—about 6.5"—while northern Taylor County and north central Bradford County also received greater than average rainfall. Dixie County received the least amount of rainfall in the District—about 1.7" (Table 1 and Figure 1). Lower rainfall totals followed the Suwannee River corridor during the month, with the area generally receiving less than 2" of rain (Figure 2). Rainfall amounts in the Georgia portion of the Suwannee River basin were above average in all major tributaries, and broad areas received twice the monthly rainfall average (Figure 3).
- The highest gaged monthly rainfall total (9.38") was recorded at the Sneads Smokehouse Lake station in northern Jefferson County, and the highest daily total (3.65" on November 19) was recorded at the Cabbage Grove station in western Taylor County. The lowest gaged monthly total was 1.22" at both the Alligator Lake and Benton Tower rainfall stations in Columbia County.
- The rainfall average across the District for the 12-month period ending November 30 was 51.7", compared to the long-term average of 54.6". The cumulative 12-month deficit increased marginally to 2.9". Rainfall deficits in the western Santa Fe River basin expanded during the month to include the Lake City area. The cumulative rainfall surplus in the lower Steinhatchee and Suwannee River basins continued to decline from the previous month end but remains well above the 12-month normal (Figure 4).
- Average District rainfall for the 3 months ending November 30 totaled 9.4", about 15 percent below the long-term average of 11.0". Southeastern Madison County and the Watermelon Pond area of southwest Alachua County display the largest 3 month surpluses of just over 5" although these amounts are well below those of the previous month end. Similarly, 3-month deficit maxima also declined with the largest deficits now between 5 and 10" in Suwannee and Columbia counties (Figure 5).

SURFACEWATER

- **Rivers:** All major river level stations in the District began the month within the normal range of flows (between the 25th and the 75th percentiles). November rains pushed the Upper Santa Fe River stations to above normal levels (above the 75th percentile). Georgia rivers all increased significantly during the month as a result of higher than normal rainfall amounts. The Withlacoochee River basin rose from below normal levels and all Alapaha River stations rose to well above average levels. Despite the high amount of rain in the Aucilla River basin, flows there remain within the normal range. 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 declined in stage during November. Palestine Lake in northern Union County declined the greatest amount, at -0.9', while Lake Sampson in Bradford County increased by 0.5'. Figure 8 shows lake levels relative to their respective long-term minimum, average and maximum levels.

- **Springs**: The flow of 10 springs or spring groups were measured by the USGS, District staff, and District contractors during November. Springflows overall increased slightly. Historical flow data for four of the measured springs are provided in Figure 9.

GROUNDWATER

Groundwater levels in upper Floridan aquifer monitor wells continued to decrease across most areas of the District and ended the month at the 59th percentile, a decrease of 3 percentile points from October. The southeastern region of the District remains in the high groundwater level category (above the 75th percentile). Most of the remainder of the District is in the normal range. In the vicinity of the middle Aucilla and Wacissa rivers, groundwater levels improved from extremely low conditions (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 November 28 showed ongoing near-normal conditions in north Florida and southern Georgia.
- The National Weather Service Climate Prediction Center (CPC) is forecasting above-normal rainfall conditions for December and now projects them to continue through May for north Florida. The current El Niño 3.4 Index level is 2.3, indicating a strong event is in place, and the CPC is projecting strengthening to an index level of 2.6 by the end of December. If this occurs, it would exceed the 1997-98 El Niño event peak by 0.3 index units and set a new index record.
- The U.S. Drought Monitor report of November 24 indicated abnormally dry conditions in Jefferson, Taylor, and Dixie counties as well as western Lafayette and Madison counties. The remainder of the District is within normal conditions.

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 9 and October 31, 2015) 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 the SRWMD's year-round irrigation 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	November 2015	November Average	Month % of Normal	Last 12 Months	Annual % of Normal
Alachua	2.63	2.35	112%	48.56	95%
Baker	2.10	2.22	95%	45.38	91%
Bradford	3.50	2.32	151%	40.92	81%
Columbia	1.94	2.44	79%	50.18	98%
Dixie	1.69	2.50	68%	45.77	77%
Gilchrist	1.90	2.72	70%	47.87	83%
Hamilton	2.56	2.72	94%	53.84	103%
Jefferson	6.56	3.44	190%	48.23	80%
Lafayette	2.07	2.78	75%	49.65	88%
Levy	2.13	2.55	84%	48.49	81%
Madison	3.27	3.12	105%	48.80	87%
Suwannee	1.86	2.53	73%	51.96	98%
Taylor	4.21	2.85	148%	47.84	80%
Union	2.28	2.55	89%	46.00	85%

November 2015 Average:	2.76
November Average (1932-2013):	2.65
Historical 12-month Average (1932-2013):	54.63
Past 12-Month Total:	51.68
12-Month Rainfall Surplus/Deficit:	-2.95

Figure 1: Comparison of District-wide Monthly Rainfall

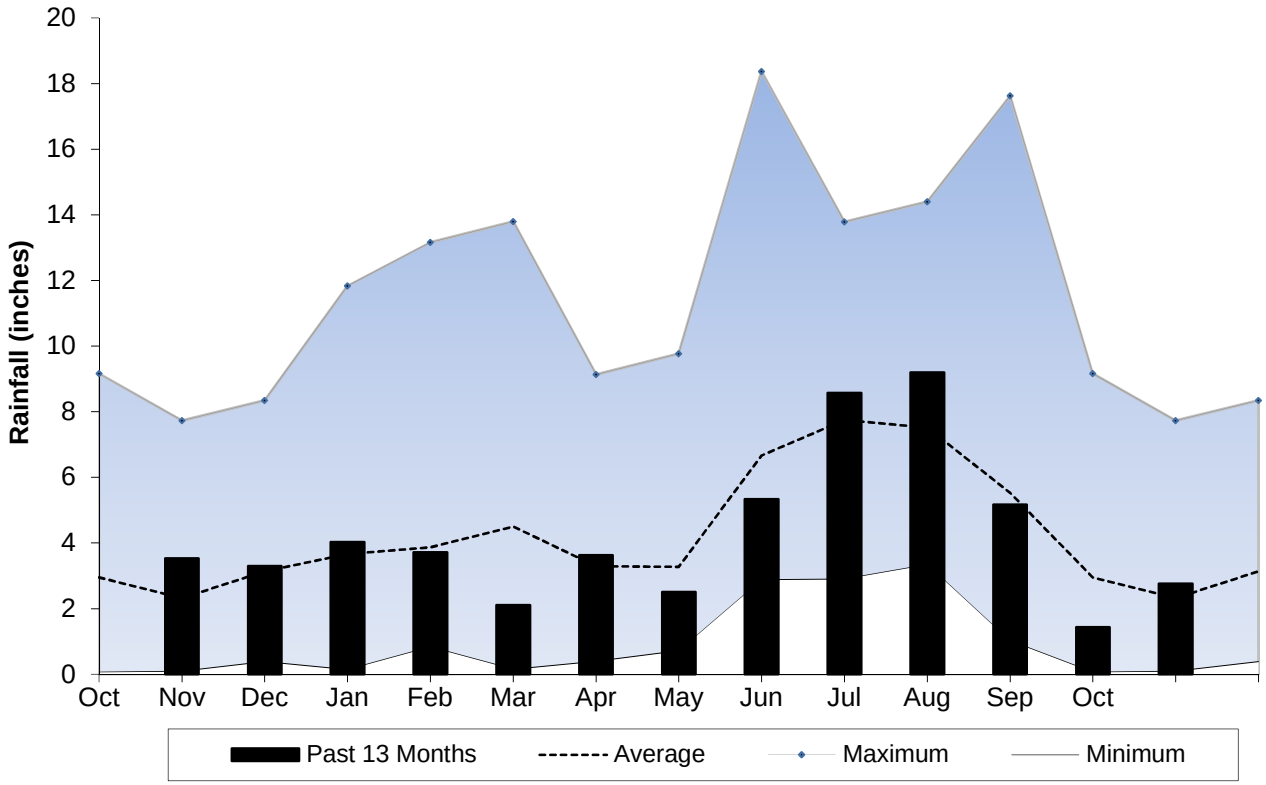


Figure 2: November 2015 Rainfall Estimate

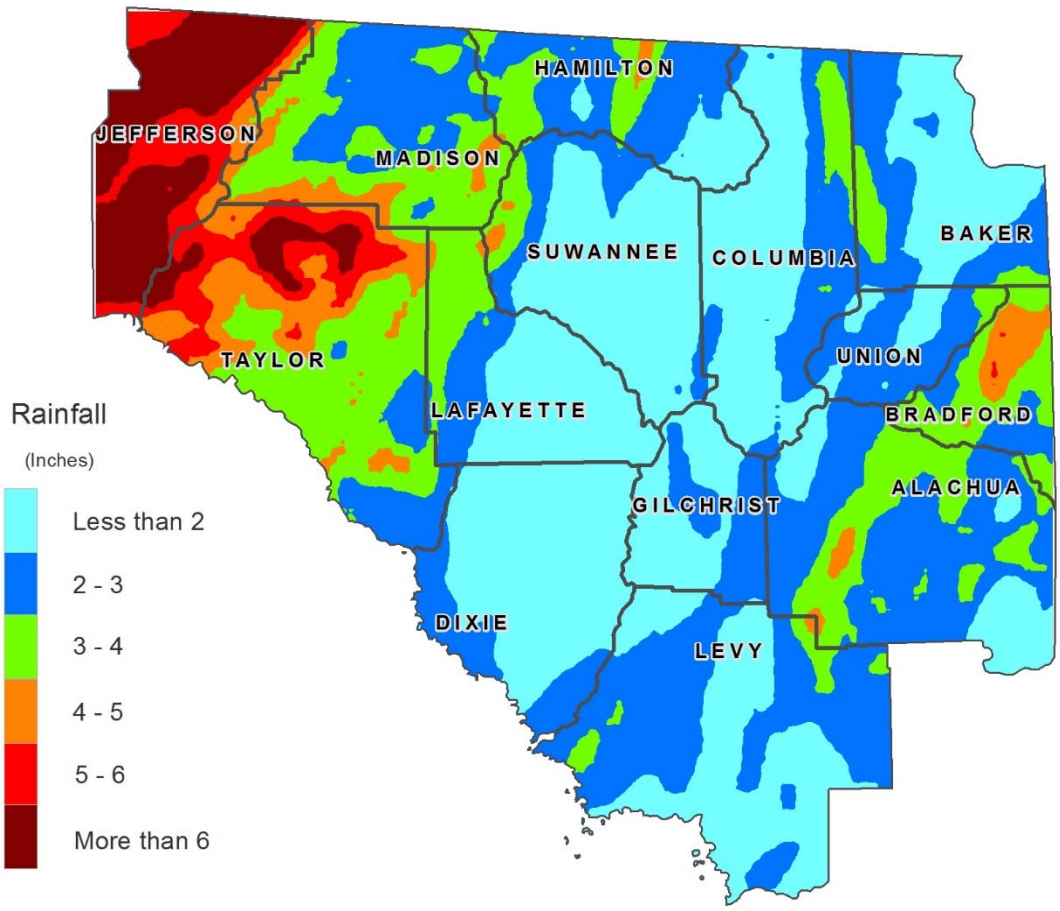


Figure 3: November 2015 Percent of Normal Rainfall

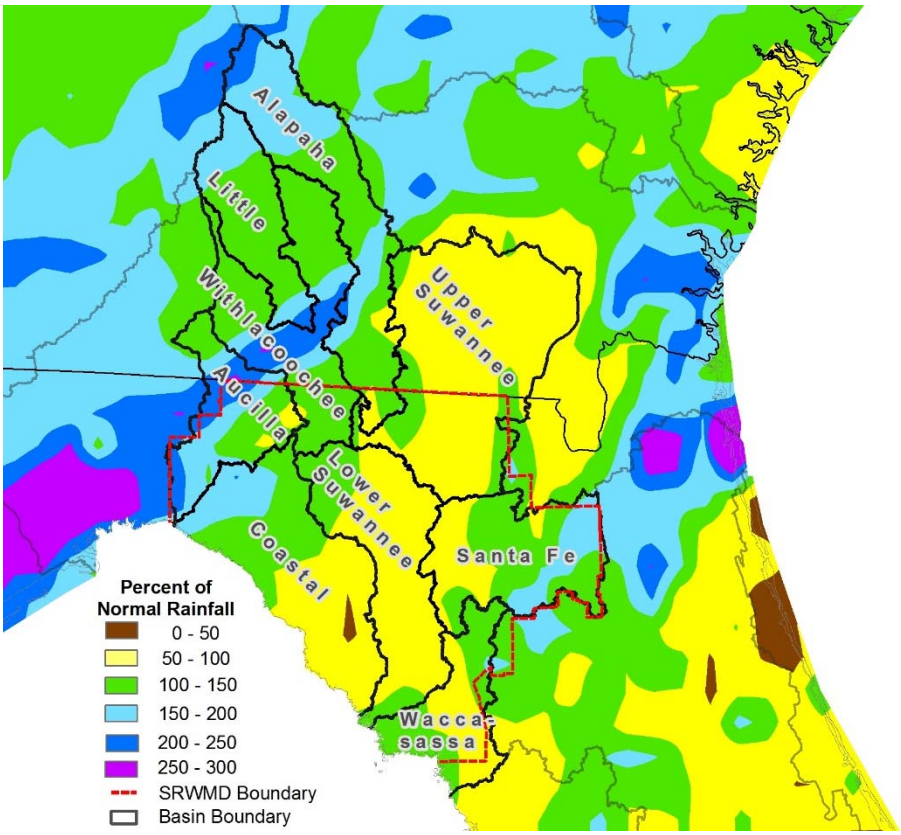
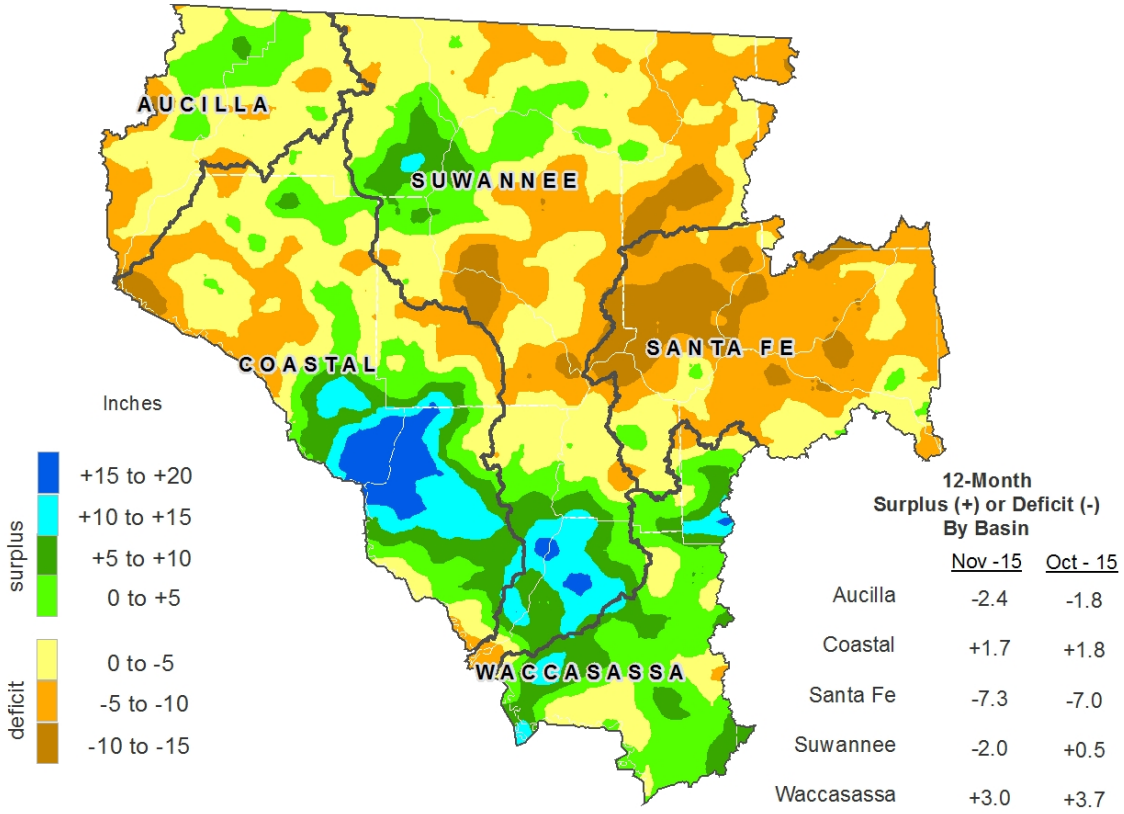


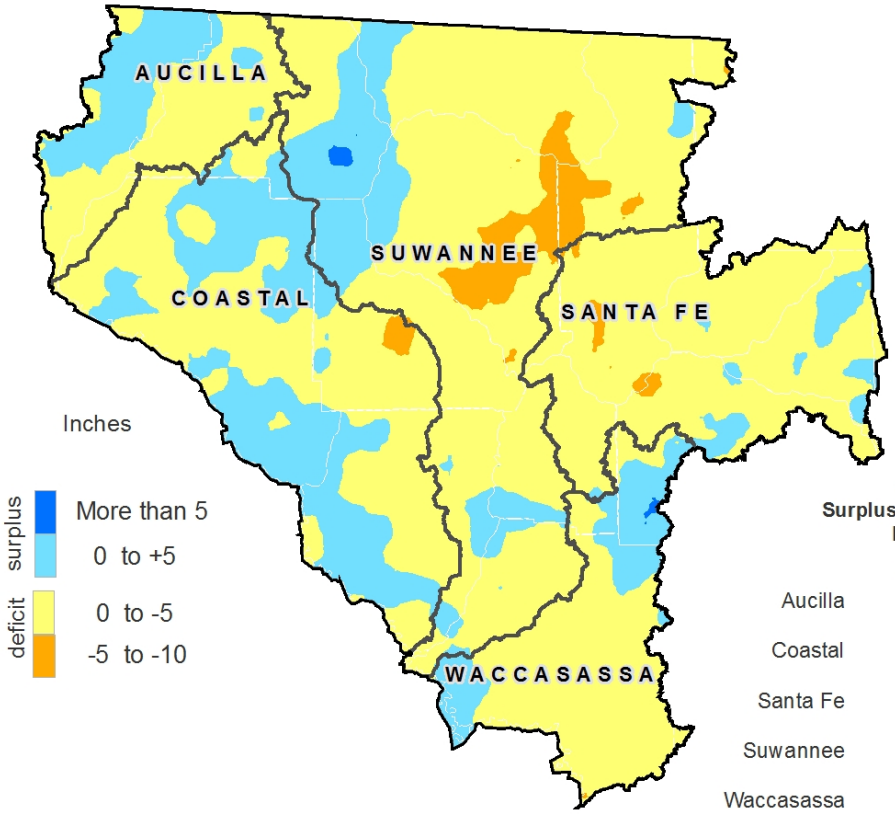
Figure 4: 12-Month Rainfall Surplus/Deficit by River Basin
Through November 30, 2015



12-Month Surplus (+) or Deficit (-) By Basin

	Nov -15	Oct - 15
Aucilla	-2.4	-1.8
Coastal	+1.7	+1.8
Santa Fe	-7.3	-7.0
Suwannee	-2.0	+0.5
Waccasassa	+3.0	+3.7

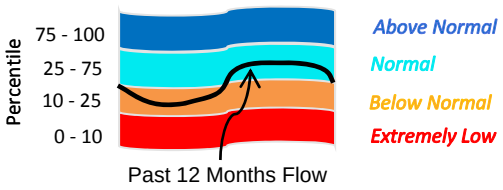
Figure 5: 3-Month Rainfall Surplus/Deficit by River Basin
Through November 30, 2015



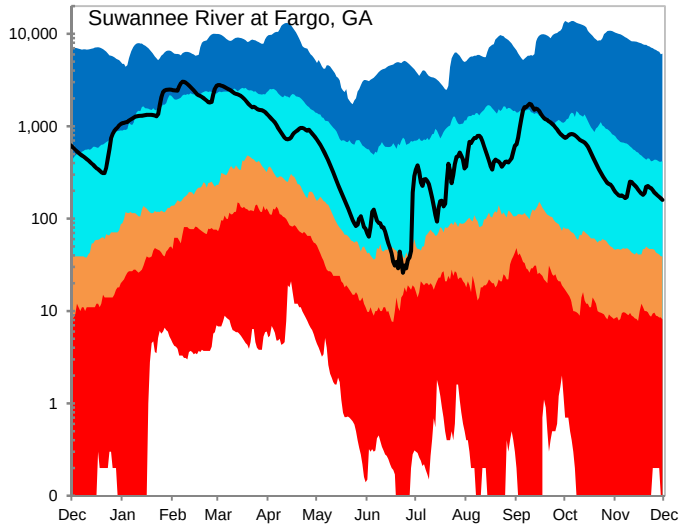
3-Month Surplus (+) or Deficit (-) By Basin

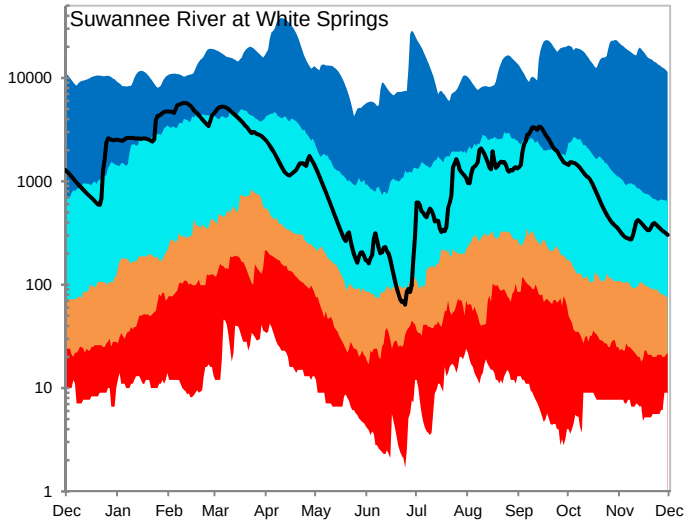
	Nov - 15	Oct - 15
Aucilla	-0.4	- 4.7
Coastal	-0.5	+0.8
Santa Fe	-2.2	- 0.1
Suwannee	-2.1	- 0.4
Waccasassa	-1.0	+6.6

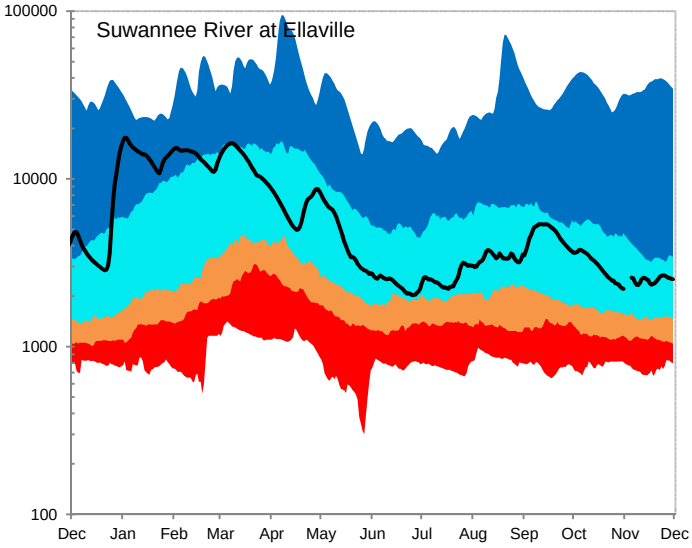
Figure 6: Daily River Flow Statistics
December 1, 2014 through November 30, 2015

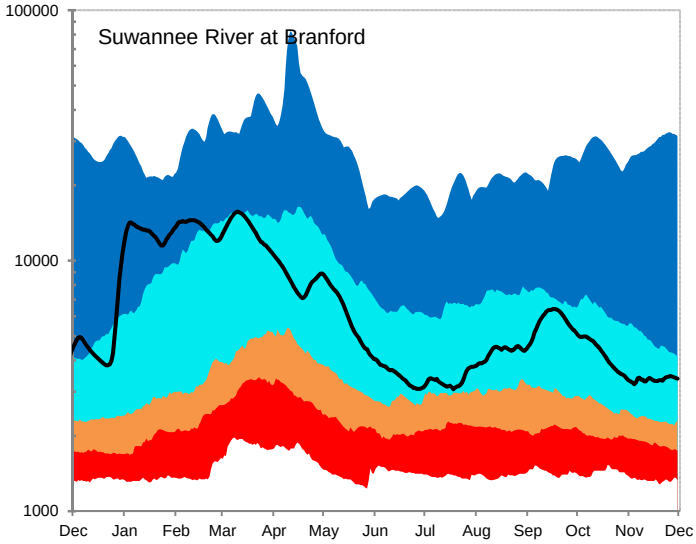


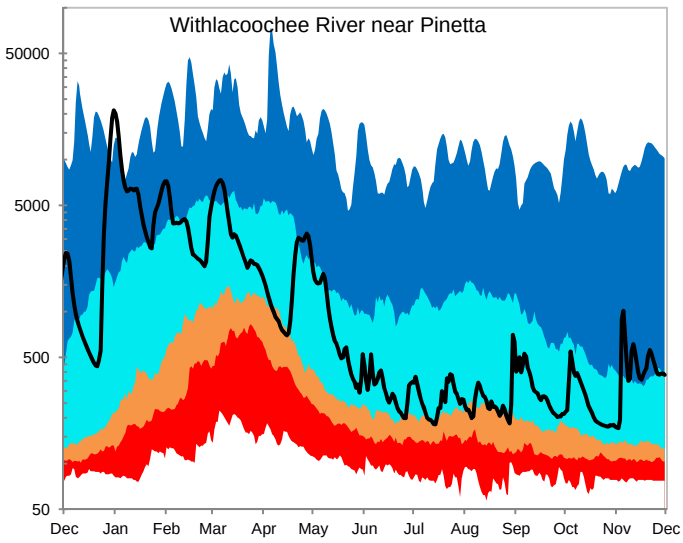
RIVER FLOW, CUBIC FEET PER SECOND











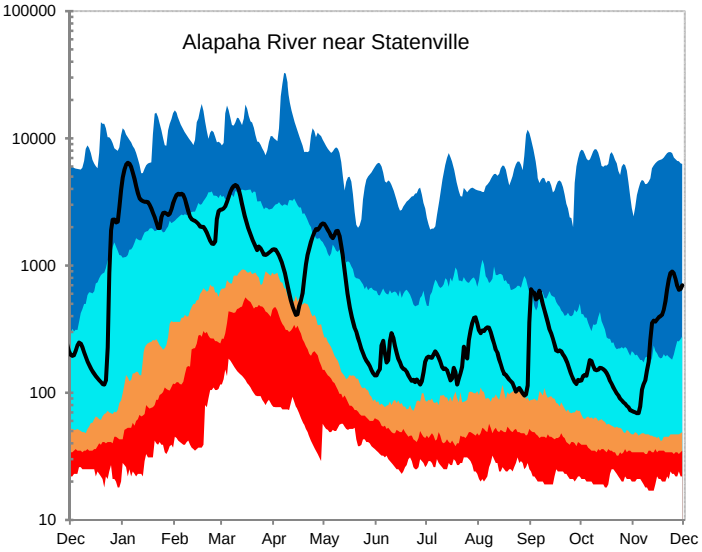
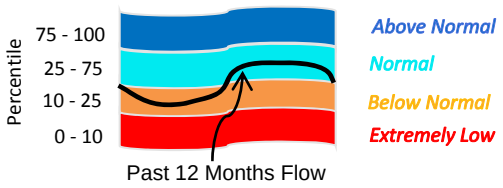
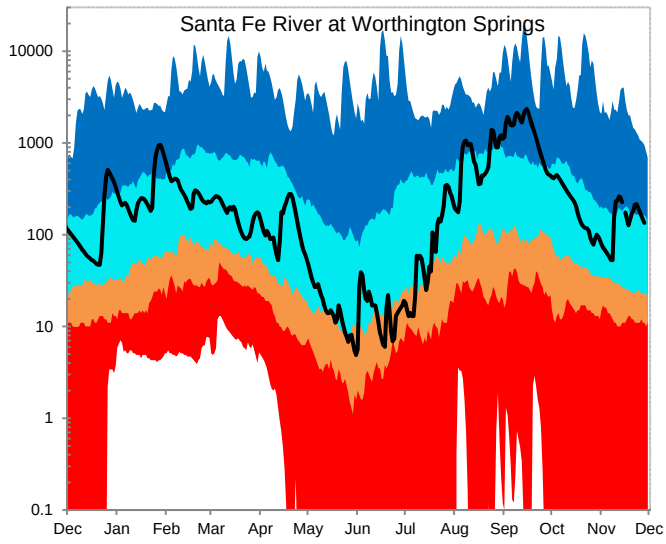
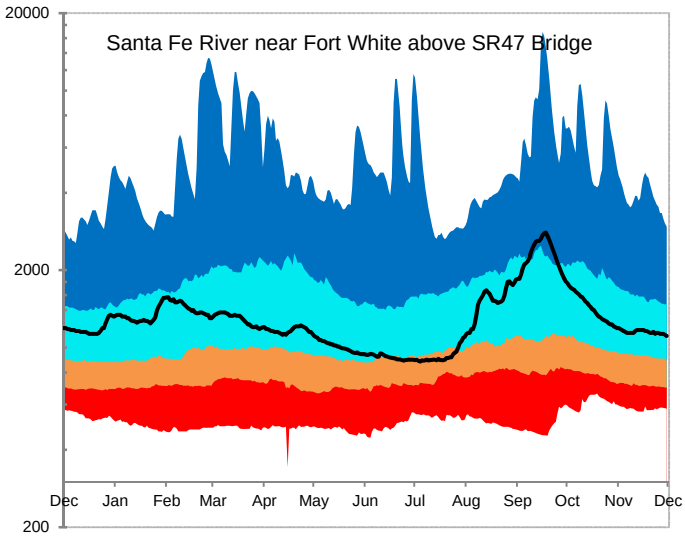


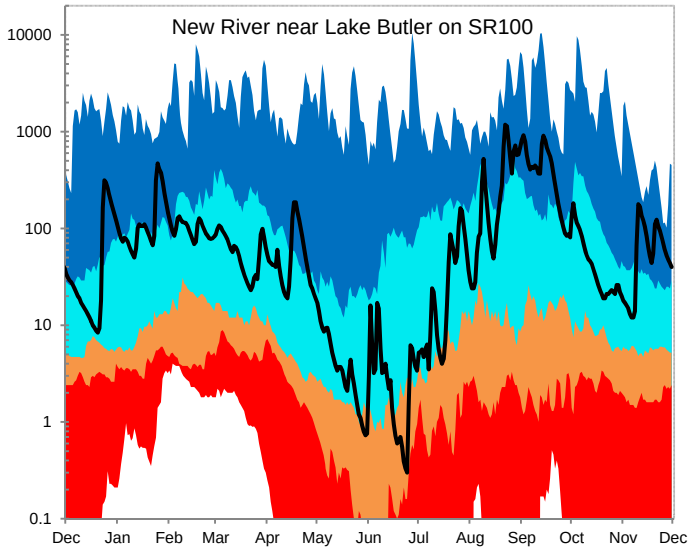
Figure 6, cont: Daily River Flow Statistics
December 1, 2014 through November 30, 2015

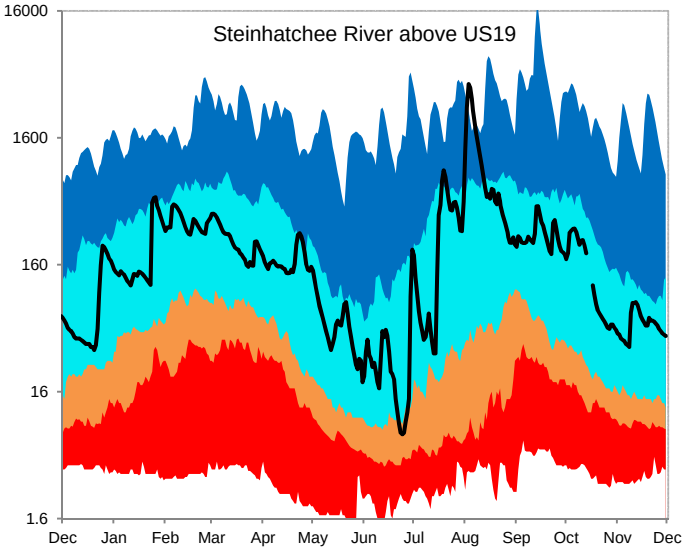


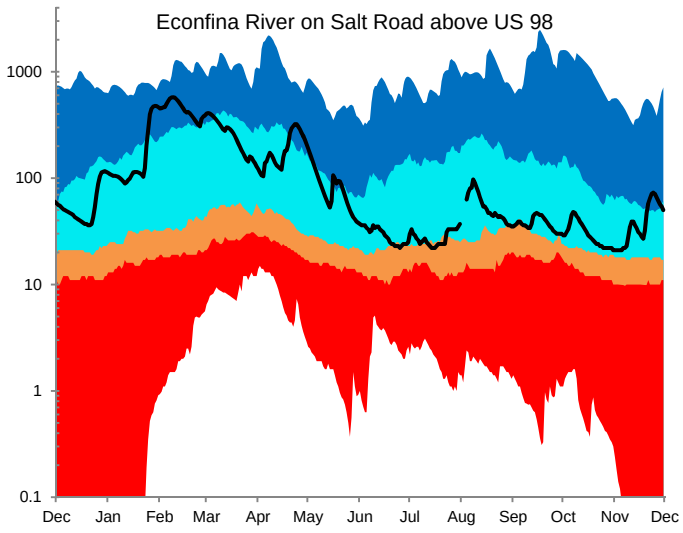
RIVER FLOW, CUBIC FEET PER SECOND

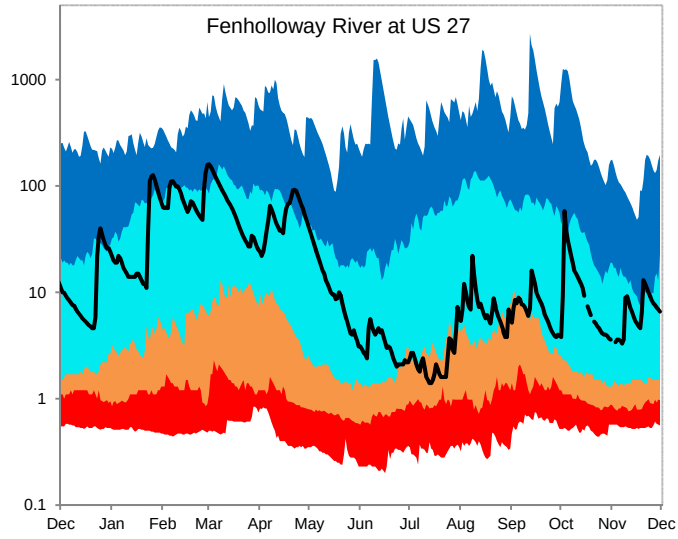












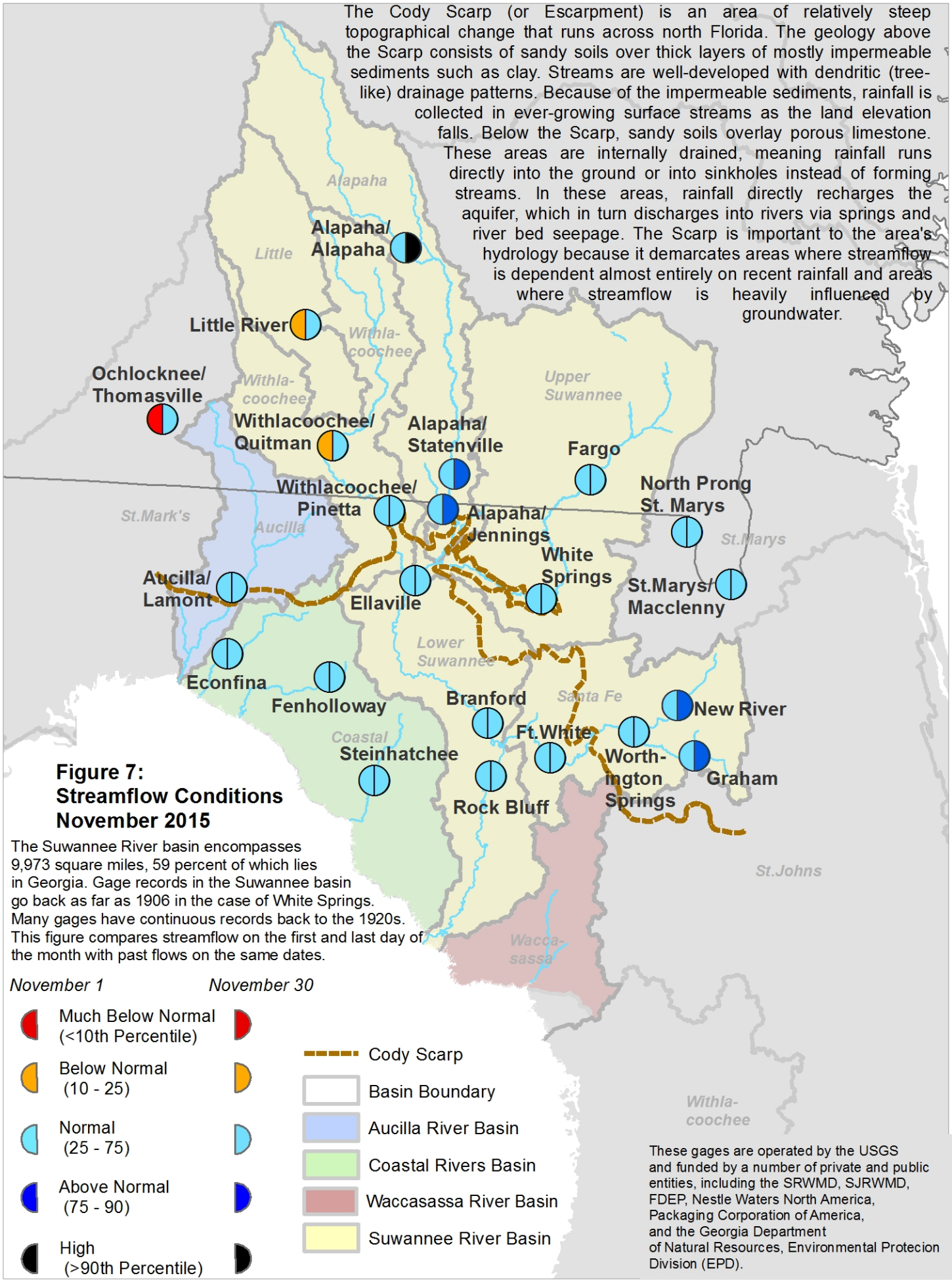
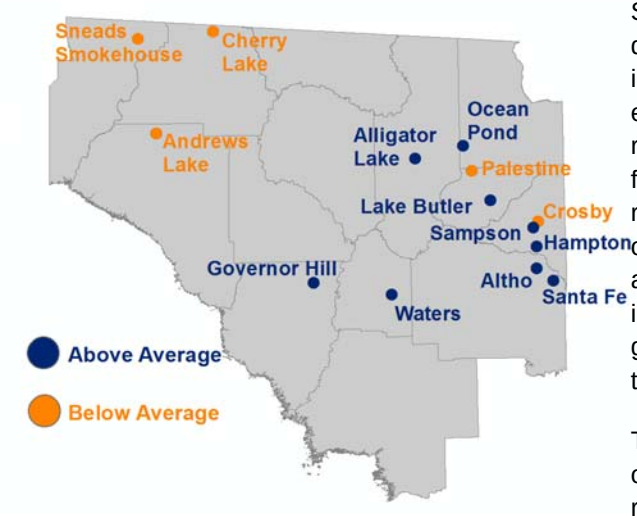

The Cody Scarp (or Escarpment) is an area of relatively steep topographical change that runs across north Florida. The geology above the Scarp consists of sandy soils over thick layers of mostly impermeable sediments such as clay. Streams are well-developed with dendritic (tree-like) drainage patterns. 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
November 2015
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.
November 1
November 30
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: November 2015 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.

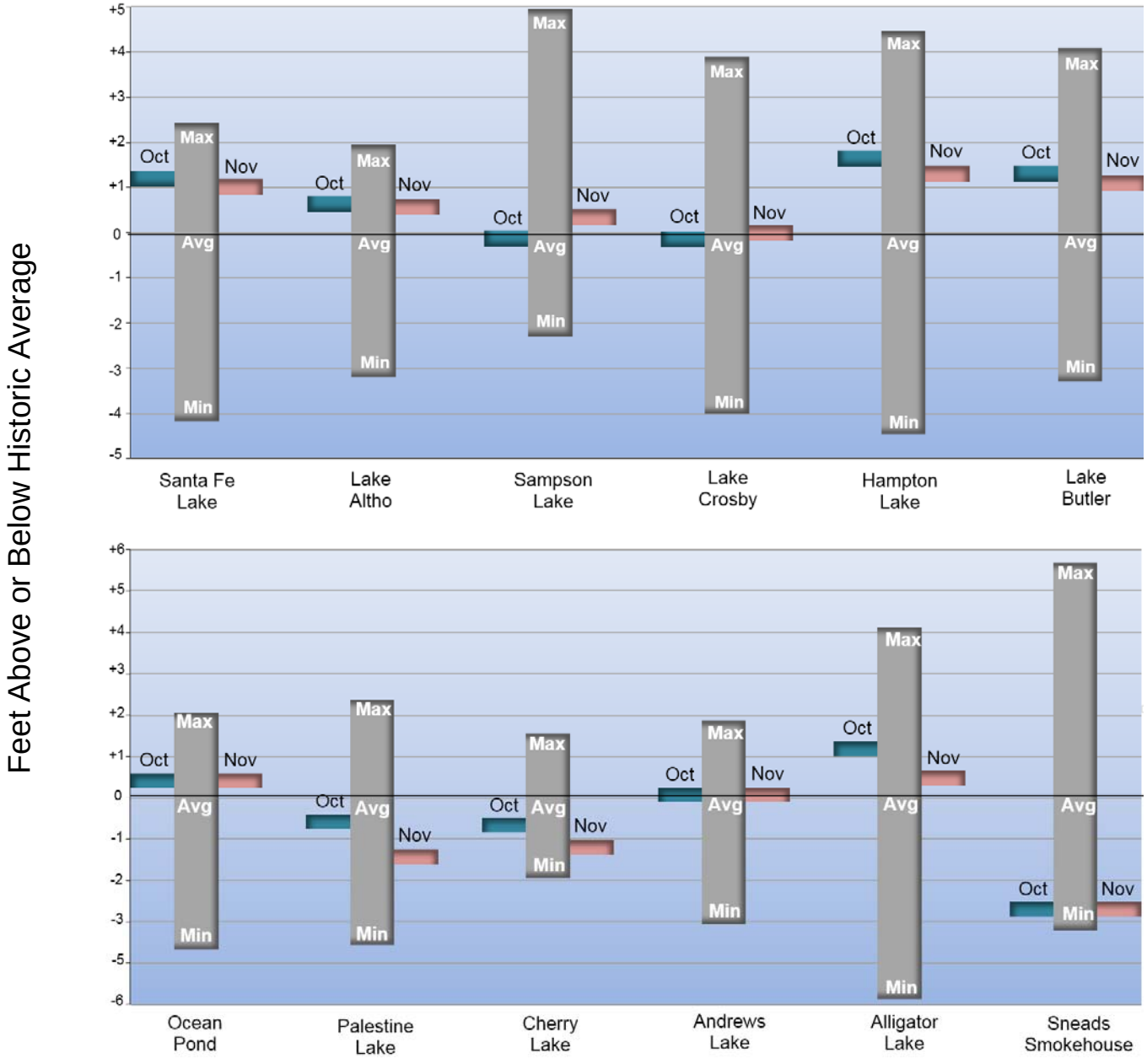
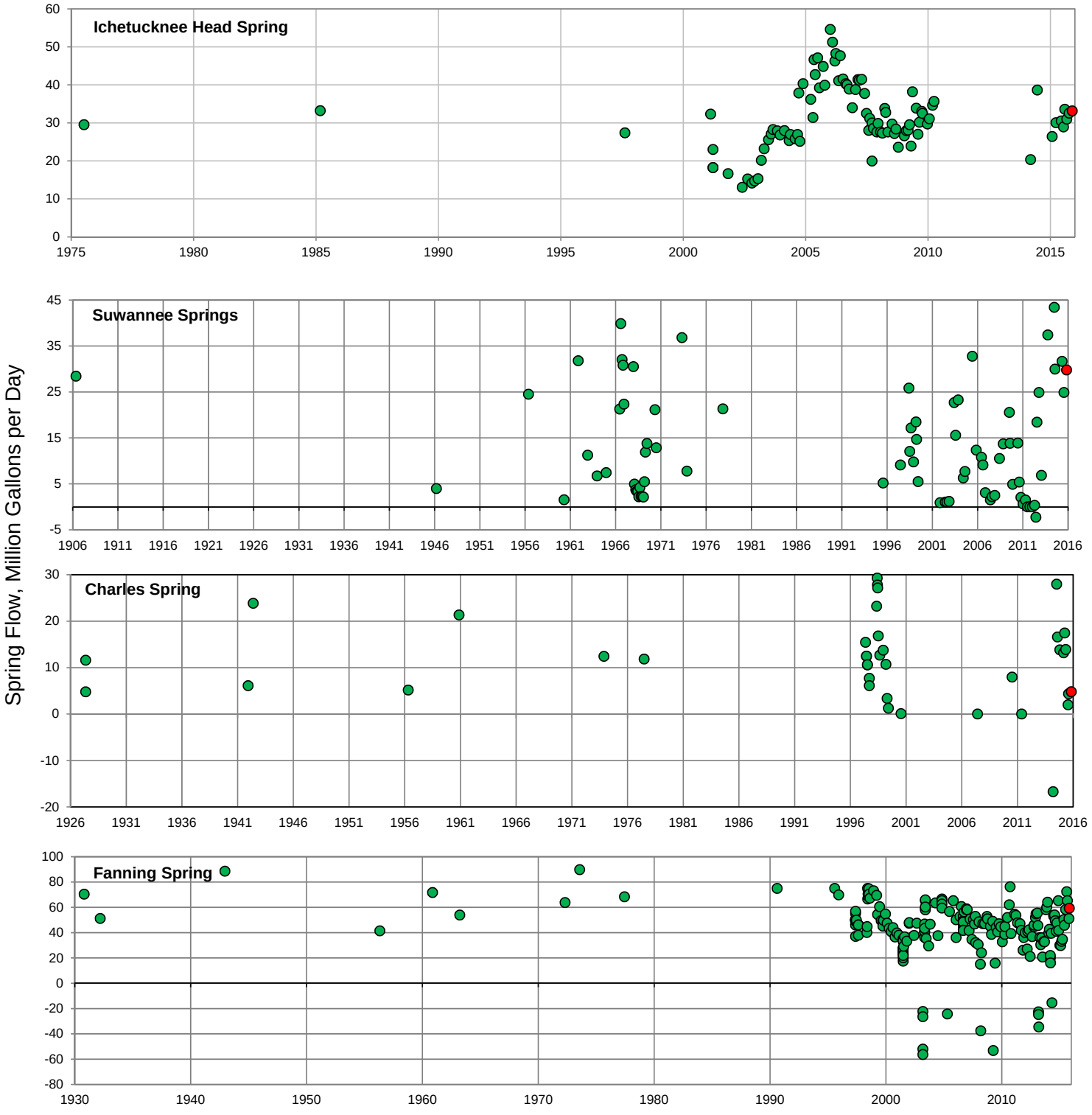


Figure 9: Monthly Springflow Measurements

The SRWMD monitors water quality at 38 springs. Flow is usually measured at the time of the sampling. The springs below were measured in November 2015 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.



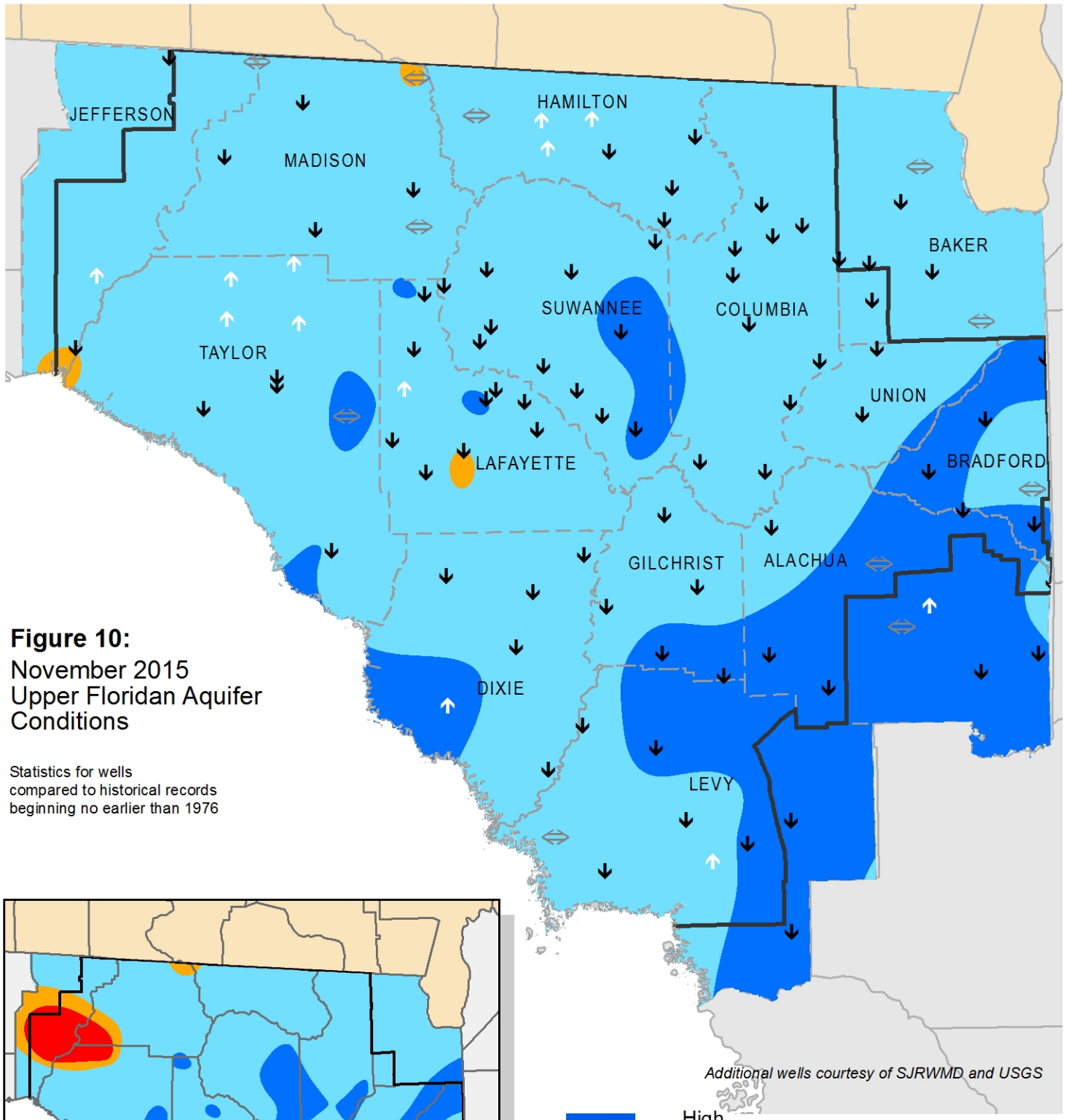
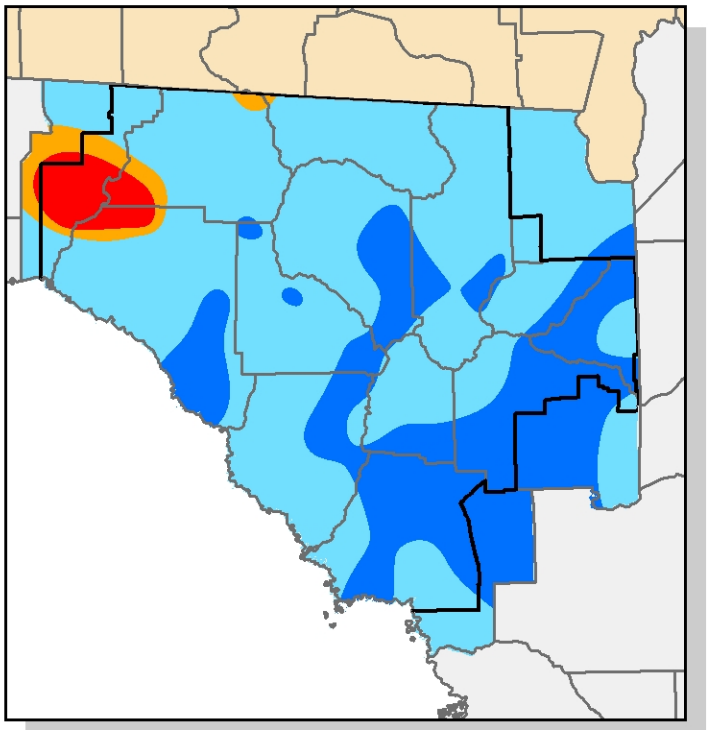


Figure 10:
November 2015
Upper Floridan Aquifer
Conditions

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

Additional wells courtesy of SJRWMD and USGS



Inset: October 2015 Groundwater Levels

High
(Greater than 75th Percentile)

Normal
(25th to 75th Percentile)

Low
(10th to 25th Percentile)

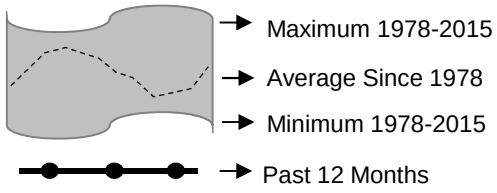
Extremely Low
(Less than 10th Percentile)

Increase/decrease in level since last month

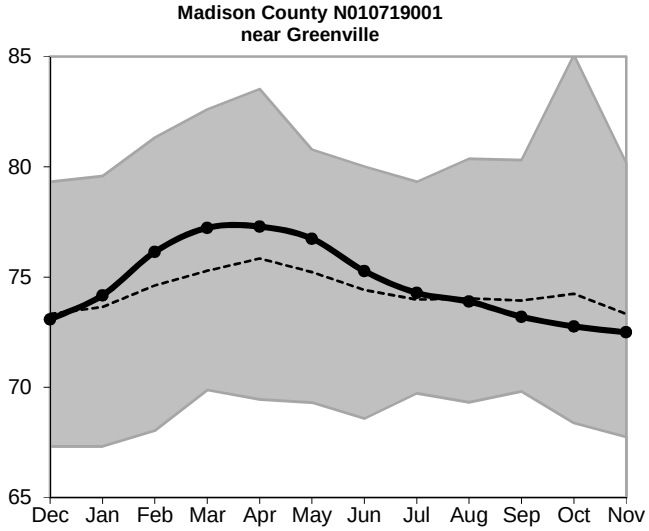
Increase/decrease since last month
less than one percent of historic range

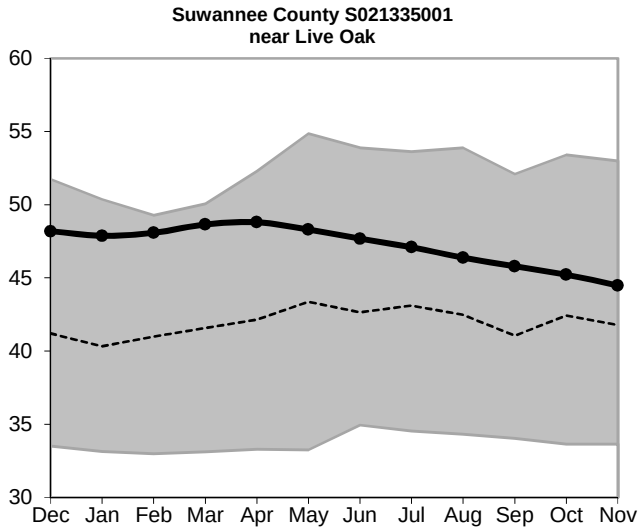
District Boundary

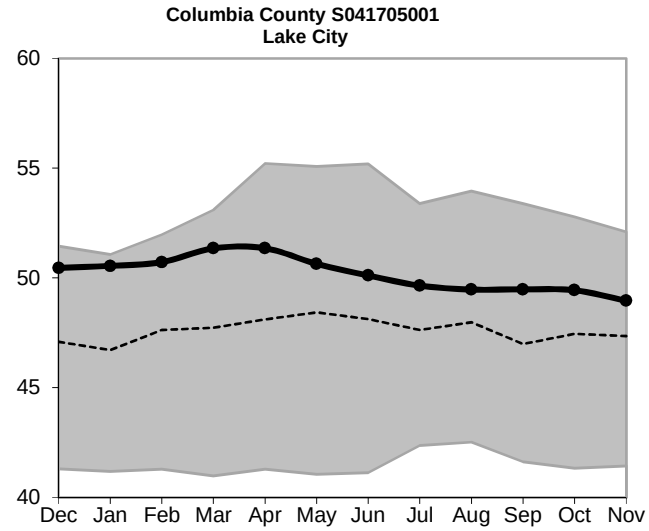
Figure 11: Monthly Groundwater Level Statistics
Levels December 1, 2014 through November 30, 2015
Period of Record Beginning 1978

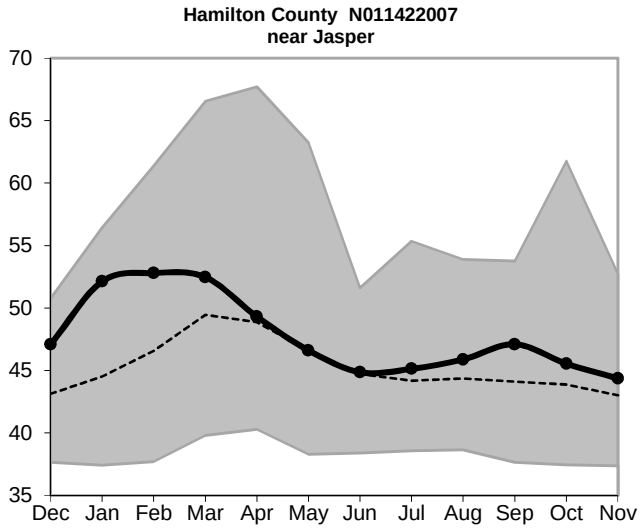


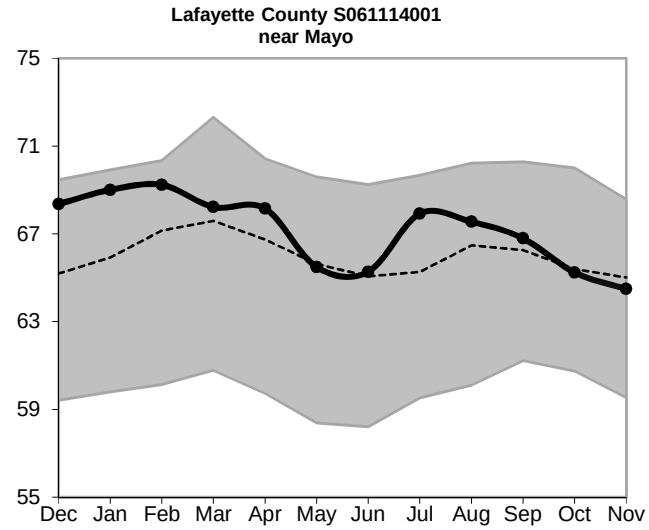
Upper Floridan Aquifer Elevation above NGVD 1929, Feet











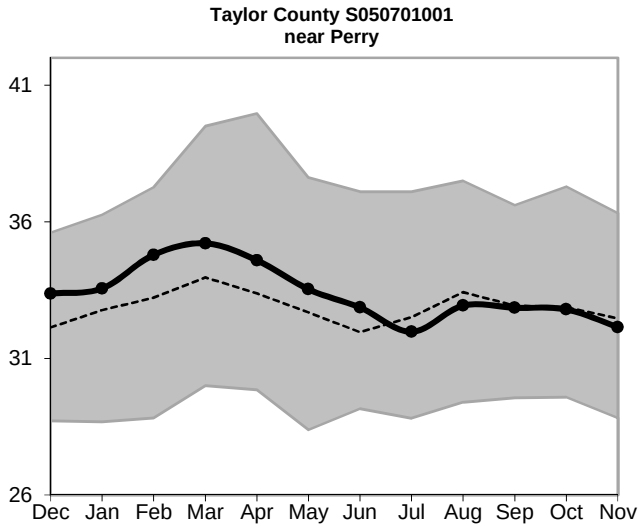


Figure 11, cont.: Groundwater Level Statistics
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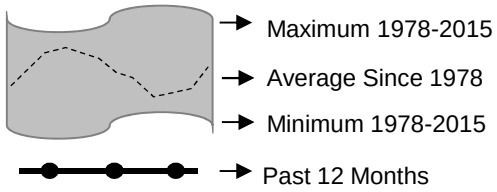
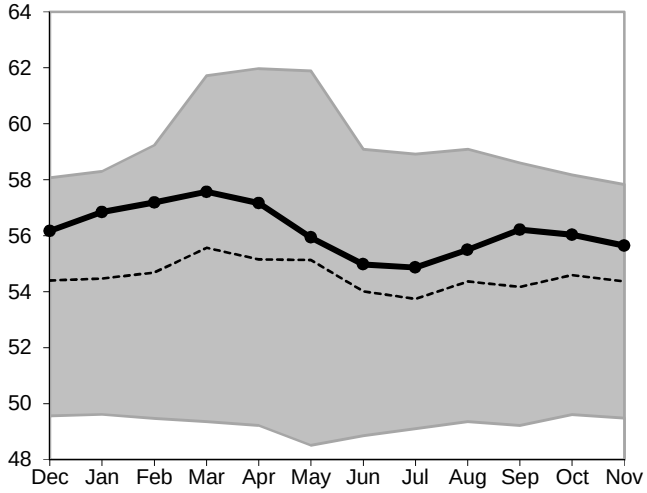
Period of Record Beginning 1978

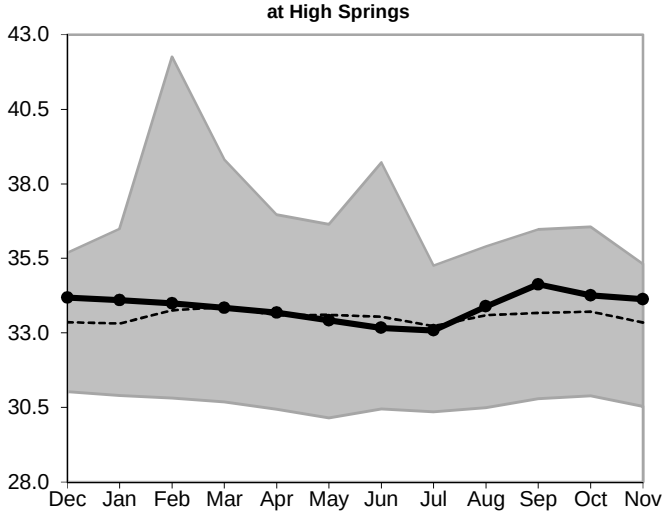


Upper Floridan Aquifer Elevation above NGVD 1929, Feet

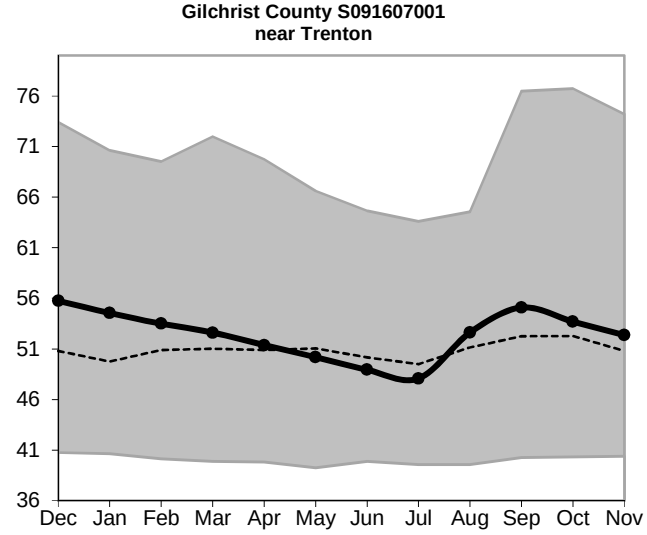
Union County S051933001
near Lake Butler



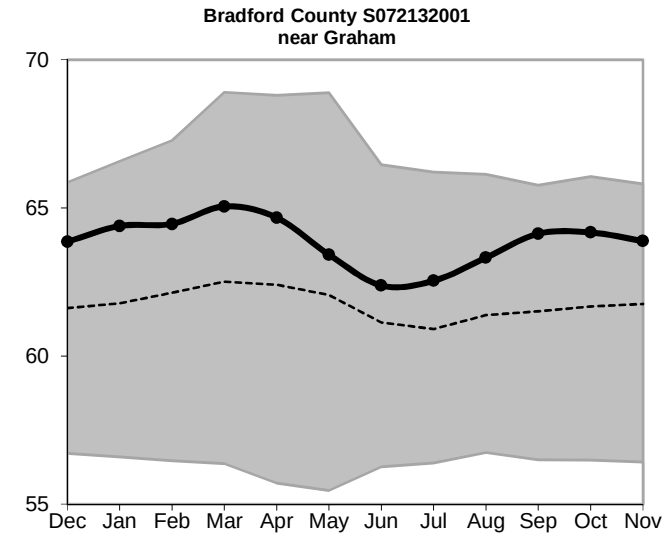
Alachua County S081703001
at High Springs



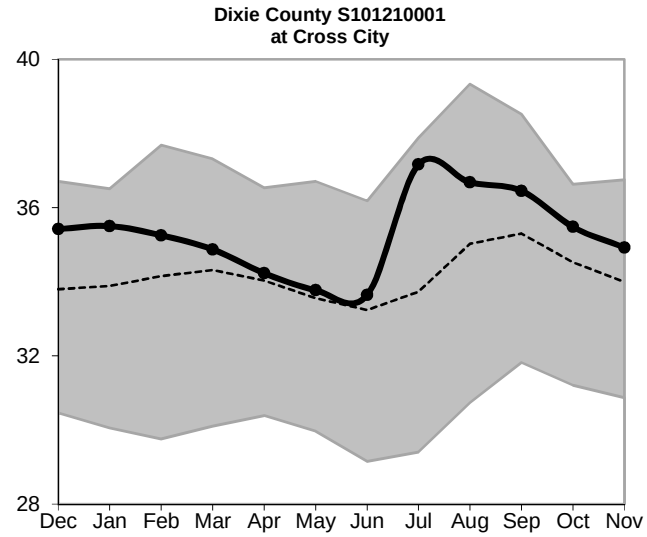
Gilchrist County S091607001
near Trenton



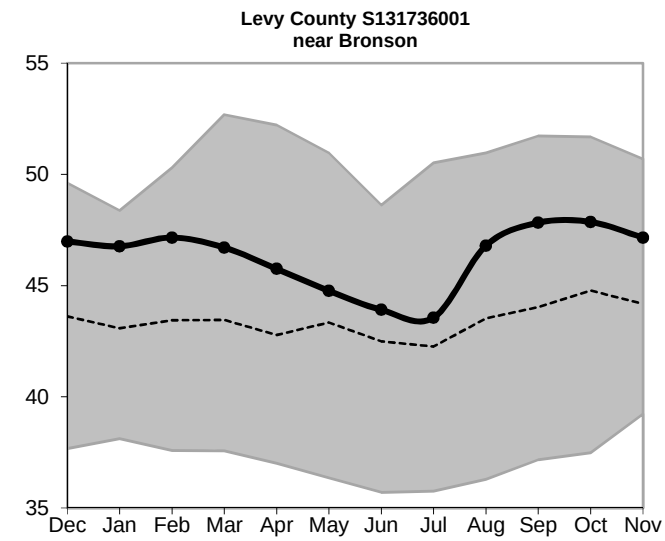
Bradford County S072132001
near Graham



Dixie County S101210001
at Cross City



Levy County S131736001
near Bronson



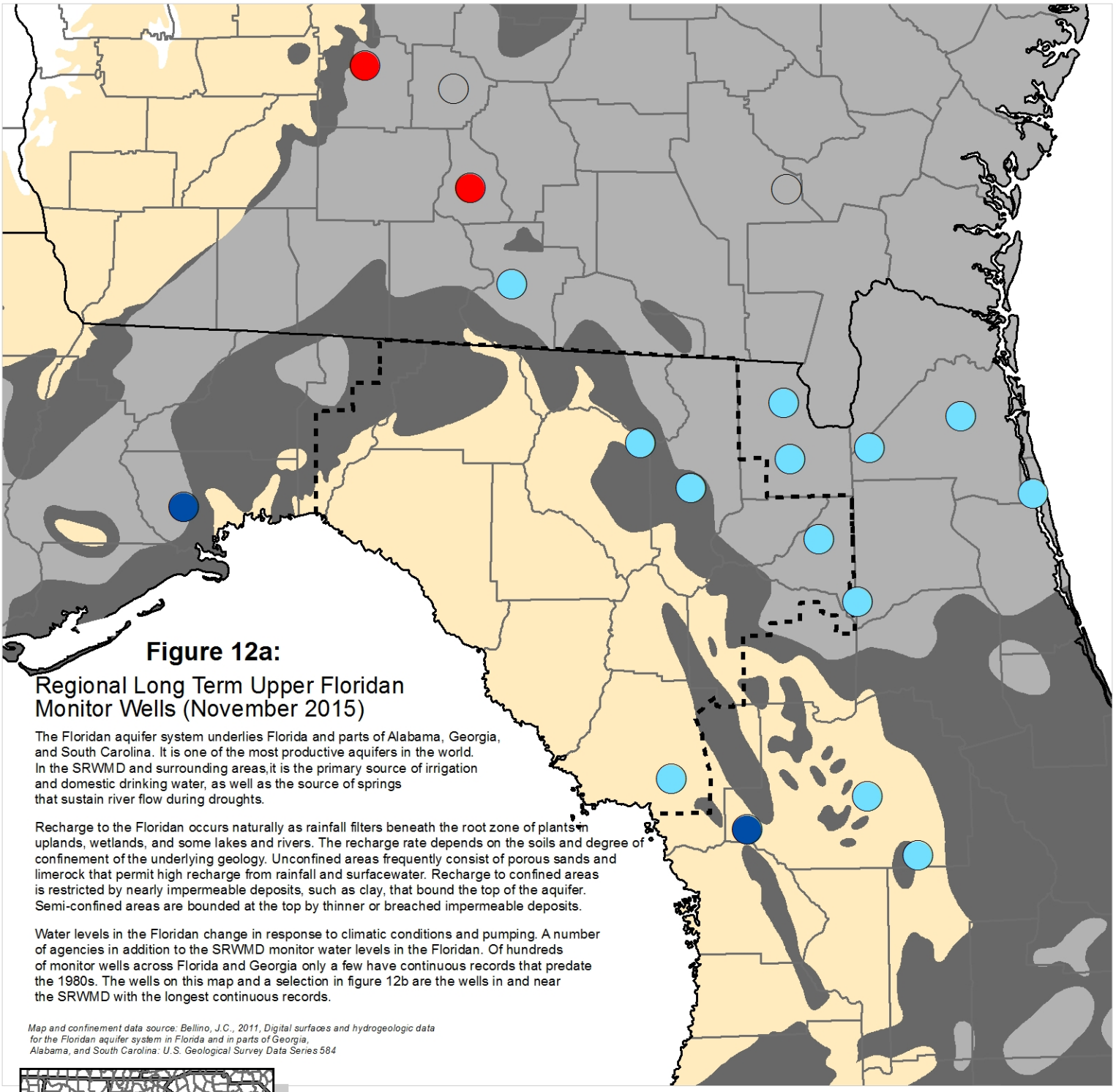


Figure 12a:

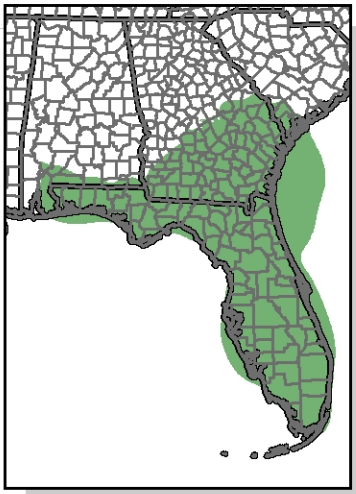
Regional Long Term Upper Floridan Monitor Wells (November 2015)

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 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

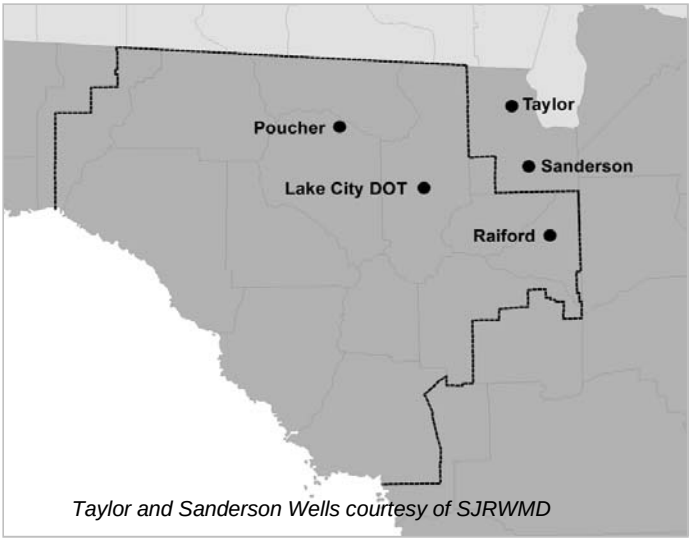
- Confined: Upper confining unit is generally greater than 100 feet thick and unbreached. Recharge is low.
- Semi-confined: Upper confining unit is generally less than 100 feet thick, breached, or both. Recharge is moderate.
- Unconfined: Upper confining unit is absent or very thin. Recharge is high.

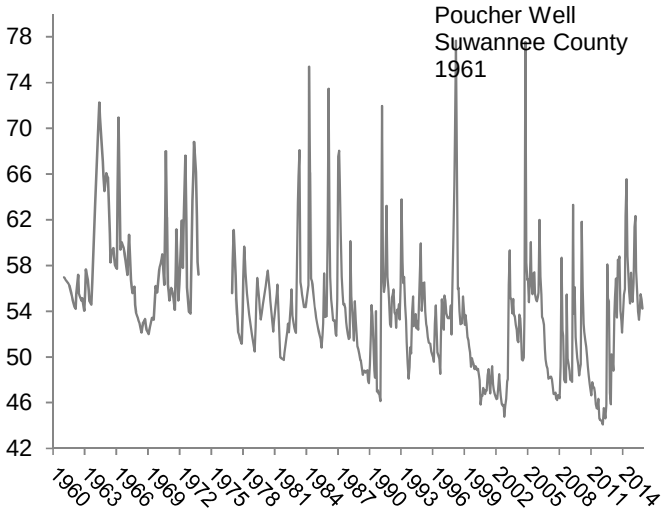
Percentile of Most Recent Water Level Relative to Entire Record

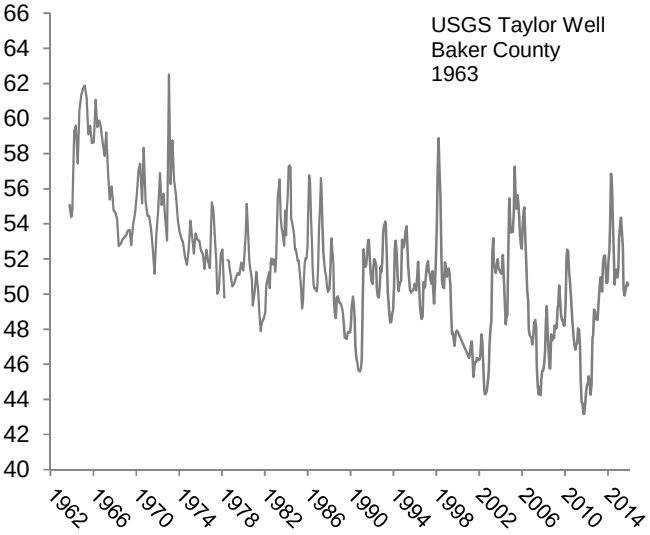
- High (Greater than 75th Percentile)
- Normal (25th to 75th Percentile)
- Low (10th to 25th Percentile)
- Extremely Low (Less than 10th Percentile)
- Not Available
- SRWMD Boundary

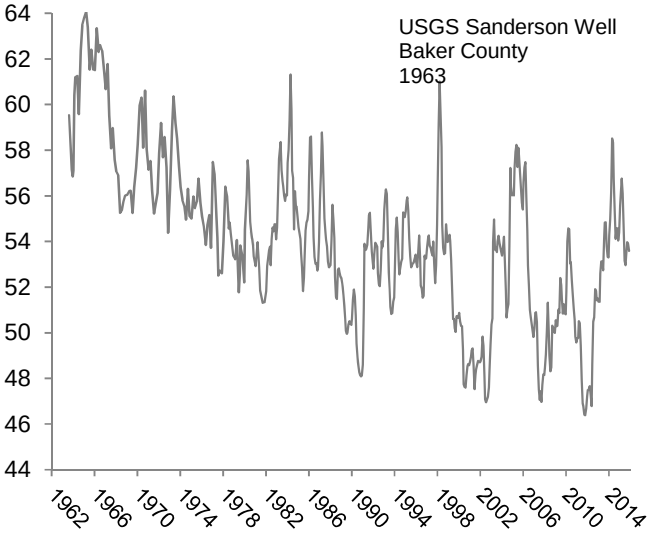
Figure 12b: Regional Long Term Upper Floridan Levels

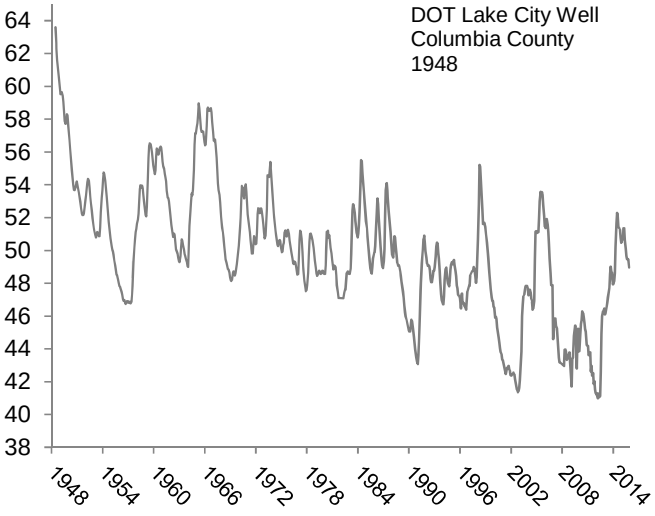
November 2015

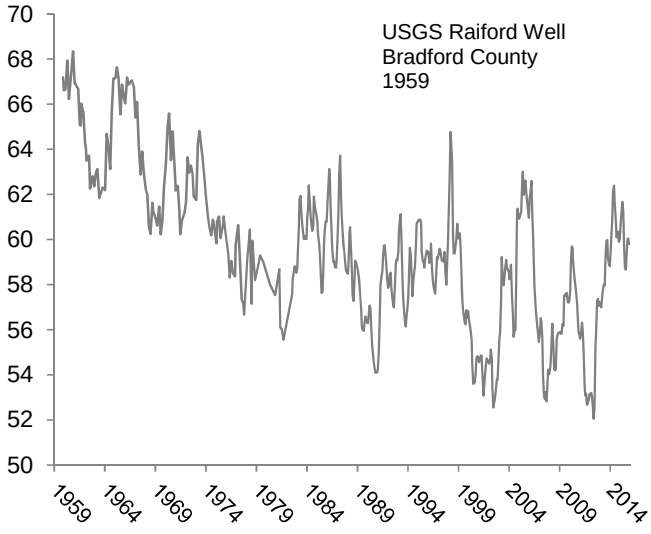












Upper Floridan Aquifer Elevation above NGVD 1929, Feet