MEMORANDUM

TO: Suwannee River Water Management District Governing Board

FROM: Tom Mirti, Director, Division of Water Resources

THRU: Noah Valenstein, Executive Director

DATE: March 4, 2016

RE: February 2016 Hydrologic Conditions Report for the SRWMD

RAINFALL

- District-wide rainfall in February was 3.49", about 90 percent of the long-term average February rainfall of 3.89". All areas of the District received at least 2.25" of rain during the month, and rainfall patterns again were relatively well-distributed District-wide. Jefferson County received almost 4.5", and the Aucilla River and New River basins on the west and east of the District, respectively, received over 4" (Table 1 and Figure 1). Broad areas of the central region of the District received under 3", with most counties in that region receiving about 75% of normal monthly totals (Figure 2). The Georgia tributary basins of the Suwannee River received above normal rains, with the exception of the Upper Suwannee Basin and the Okefenokee Swamp. A narrow band across the Alapaha and Withlacoochee basins reached up to twice normal February rainfall (Figure 3).
- The highest gaged monthly rainfall total (4.94") was recorded at the Wacissa Tower rainfall station in Jefferson County, and the highest daily total (3.07" on February 4) was recorded at the Goethe State Forest rainfall station in southern Levy County. The lowest gaged monthly total was 2.63" at the Suwannee Valley Extension Center rainfall station in northern Suwannee County.
- The rainfall average across the District for the 12-month period ending February 29 was 49.5", compared to the long-term average of 54.7". The cumulative 12-month deficit increased slightly to 5.2" and the District has received average or below average rainfall since September. Annual rainfall deficits in the Santa Fe River basin eased again during the month; but basin-wide deficits in the Aucilla, Coastal, and Suwannee River basins all increased by an inch or more. The cumulative rainfall surplus persists in the lower Steinhatchee and Suwannee river basins (Figure 4).
- Average District rainfall for the 3 months ending December 31 totaled 8.8", about 20 percent below the long-term average of 10.7". The Santa Fe and Waccasassa basins exhibited the largest 3-month deficits; in limited areas of the Santa Fe Basin the deficit exceeds 4". A small 3-month surplus exceeding 5 inches was located in near the Georgia border in the Aucilla River (Figure 5).

SURFACEWATER

- **Rivers:** All major river level stations in the Suwannee River basin in both Florida and Georgia ended the month within the normal range of flows (between the 25th and the 75th percentiles) with the exception of the Withlacoochee River near Quitman. Major stations in the District declined throughout the month and were slightly below the 50th percentile by month's end (Figure 6). Georgia river level stations began the month within the normal range but both rose to high levels and then receded sufficiently by month end to enter normal status again. 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 lake increased in level during February—generally by marginal amounts--and only one lake remained below its long term average level by

month end (Alligator Lake in Lake City). Lake Sampson in Bradford County was the sole falling lake, at -0.2', while Andrews Lake in Taylor 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 11 springs or spring groups were measured by the USGS, District staff, and District contractors during February. Due to relatively high river levels in the Suwannee River system, many springs experienced reverse flows during the month. Historical flow data for four of the measured springs—large springs or spring systems being measured by the USGS in cooperation with the District--are provided in graphical format on Figure 9.

GROUNDWATER

Groundwater levels in upper Floridan aquifer monitor wells rebounded in the District and ended the month at the 66th percentile, up 5 percentile points from January. Aquifer levels rebounded in the south and east of the District and the area exhibiting high groundwater levels (above the 75th percentile) expanded to cover Baker County. Increased aquifer levels were also evident along the Withlacoochee, Alapaha, and Suwannee river corridors as a result of backflow of river water into the aquifer through springs and floodplain sinks. The remainder of the District displayed 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 February 27 showed ongoing near-normal conditions in north Florida and southern Georgia, although areas to the north and west were unusually moist.
- The National Weather Service Climate Prediction Center (CPC) has indicated that the peak of the El Niño event has passed. Despite low to low-average rainfall amounts over the past three months, above-normal rainfall conditions continue to be projected for north Florida through May. The current Oceanic Niño Index level (El Niño Region 3.4 temperature metric) is 2.1 and expected to decline throughout the coming spring.
- The U.S. Drought Monitor report of March 1 indicated abnormally dry conditions along the entire Suwannee and Steinhatchee river corridors. The remainder of the District and State of Florida 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 once per week during Standard Time (between November 1, 2015 and March 13, 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 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	February 2016	February Average	Month % of Normal	Last 12 Months	Annual % of Normal
Alachua	3.63	3.59	101%	52.56	103%
Baker	3.88	3.44	112%	42.44	85%
Bradford	3.75	3.64	103%	48.33	95%
Columbia	3.45	3.72	93%	45.92	89%
Dixie	3.10	3.98	78%	60.26	102%
Gilchrist	3.11	4.18	74%	52.09	91%
Hamilton	3.00	4.01	75%	47.99	92%
Jefferson	4.46	4.65	96%	44.31	73%
Lafayette	2.81	3.98	71%	49.37	87%
Levy	3.70	3.63	102%	57.84	97%
Madison	3.87	4.36	89%	48.15	86%
Suwannee	2.96	3.73	79%	47.07	89%
Taylor	3.19	3.94	81%	51.05	86%
Union	4.00	3.63	110%	45.46	84%

February 2016 Average:	3.49
February Average (1932-2015):	3.89
Historical 12-month Average (1932-2015):	54.66
Past 12-Month Total:	49.48
12-Month Rainfall Surplus/Deficit:	-5.18

Figure 1: Comparison of District-wide Monthly Rainfall

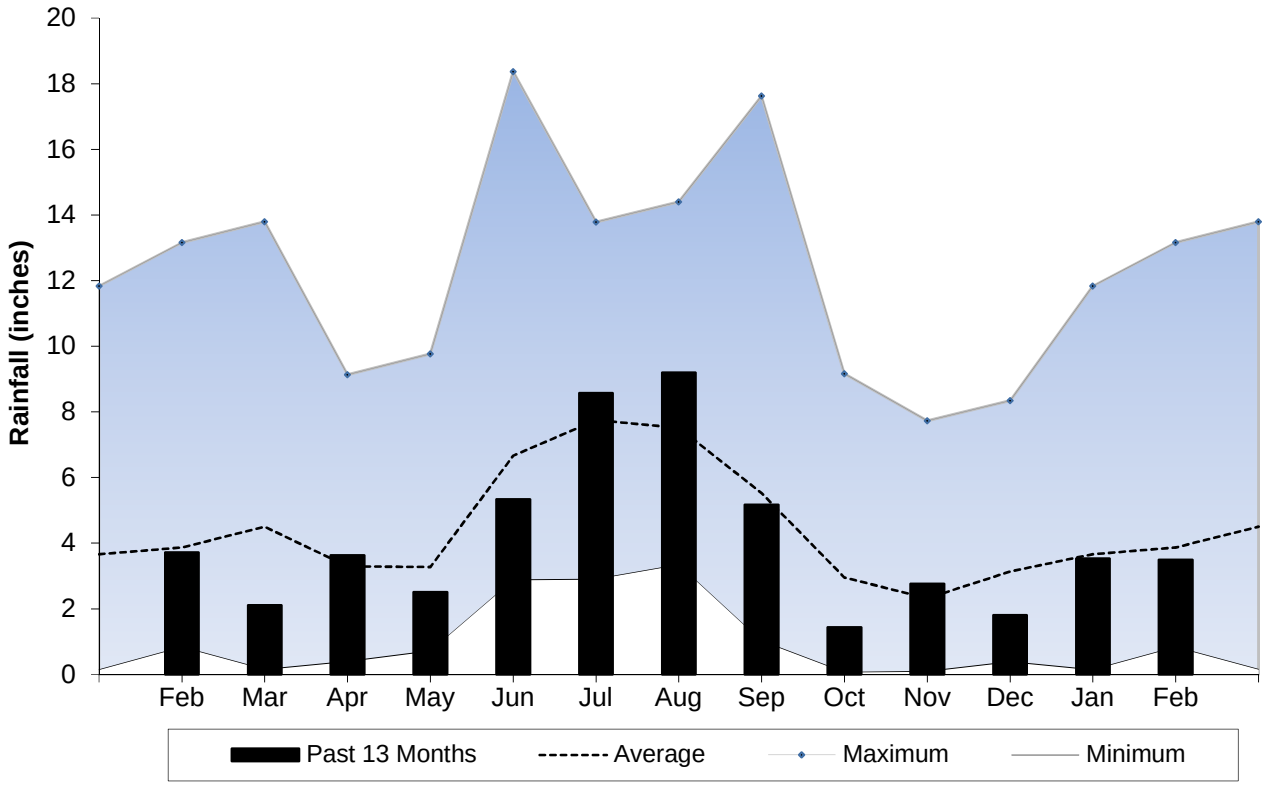


Figure 2: February 2016 Rainfall Estimate

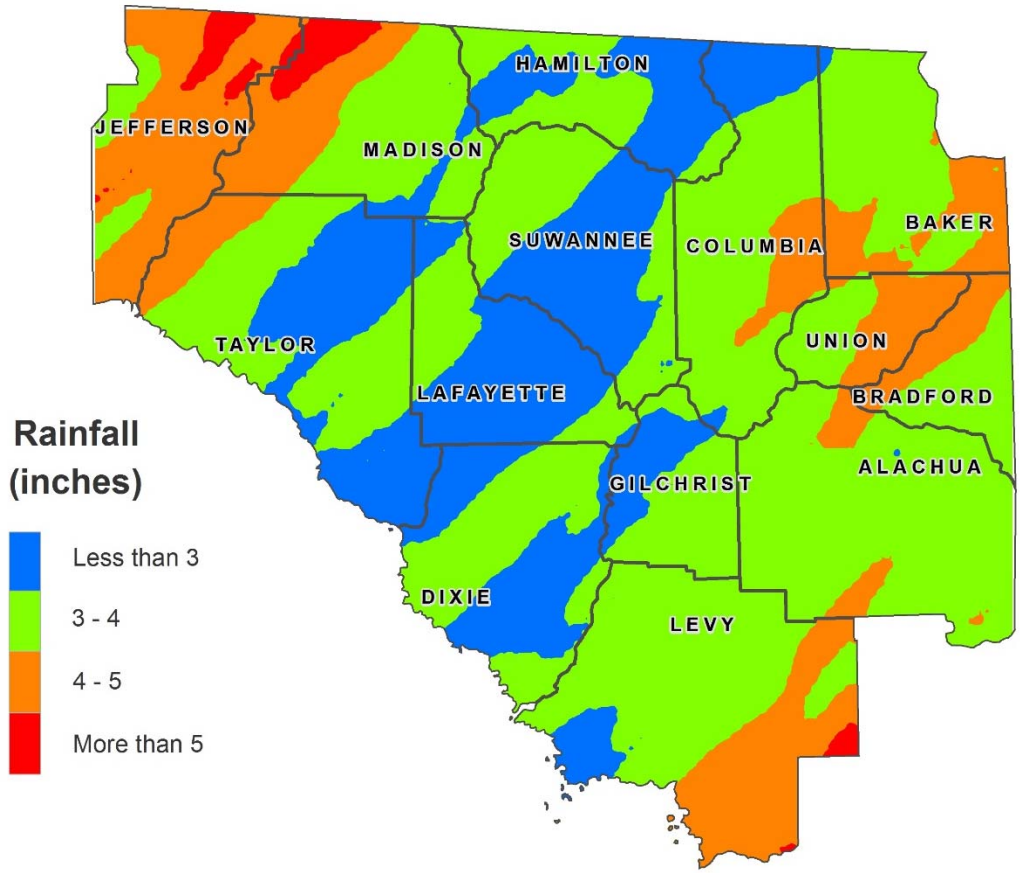


Figure 3: February 2016 Percent of Normal Rainfall

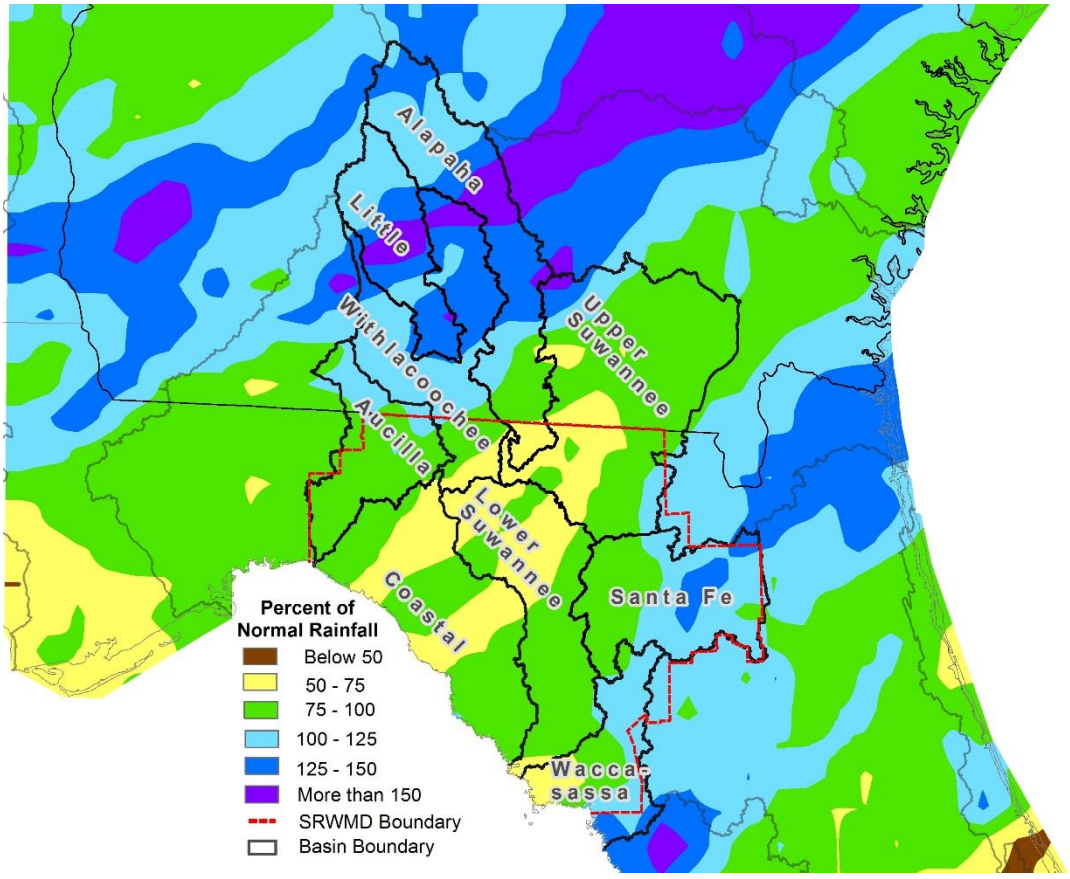


Figure 4: 12-Month Rainfall Surplus/Deficit by River Basin
Through February 29, 2016

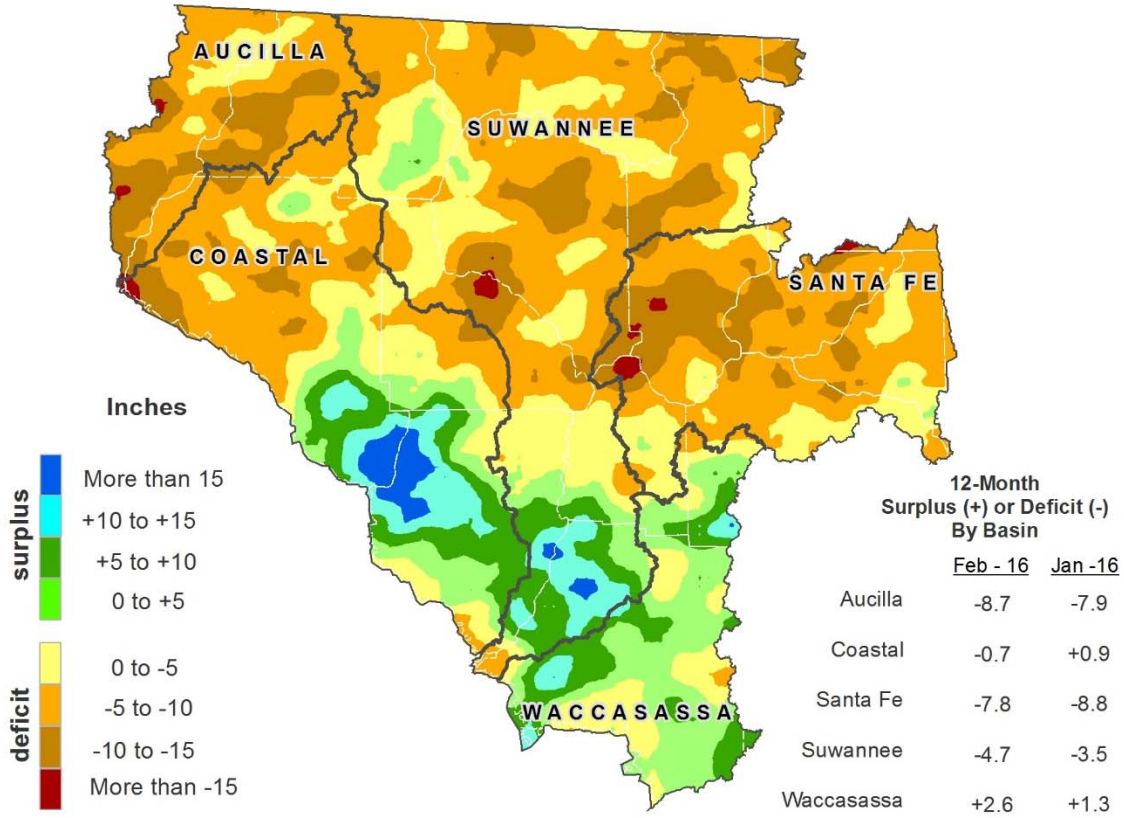


Figure 5: 3-Month Rainfall Surplus/Deficit by River Basin
Through February 29, 2016

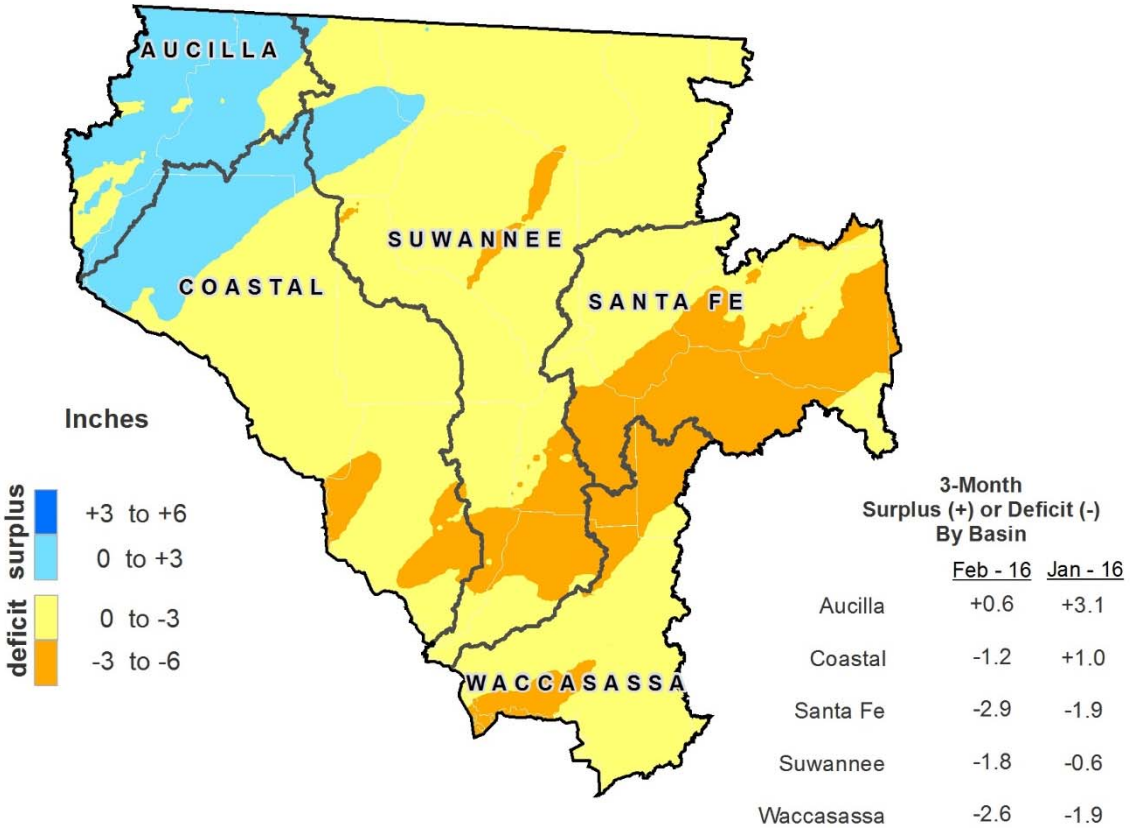
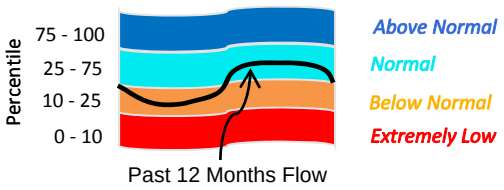
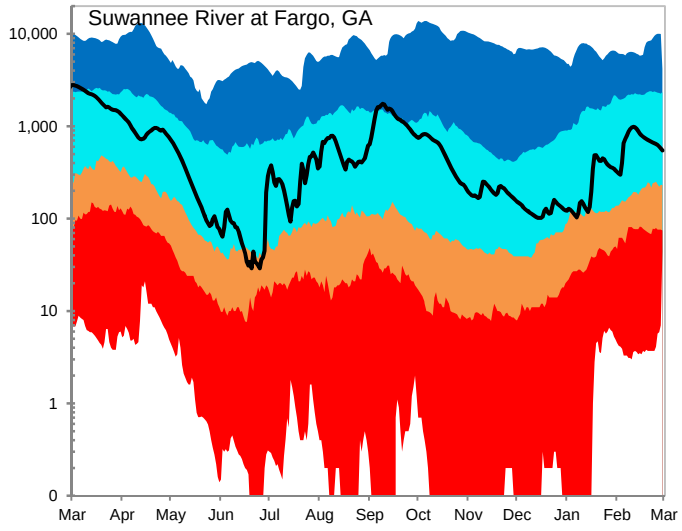
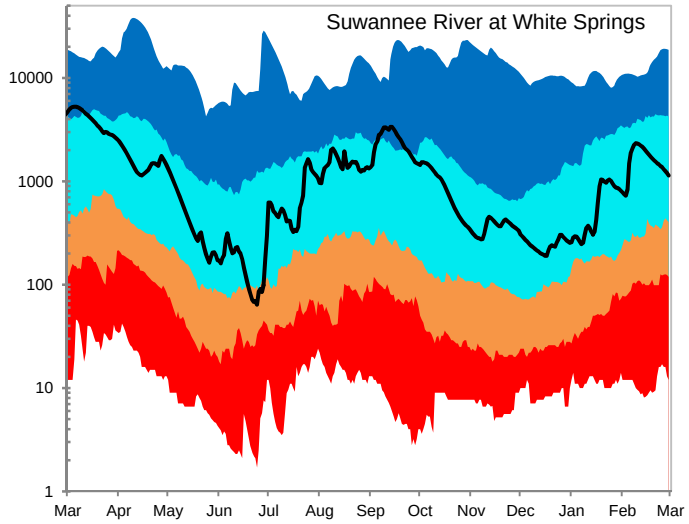


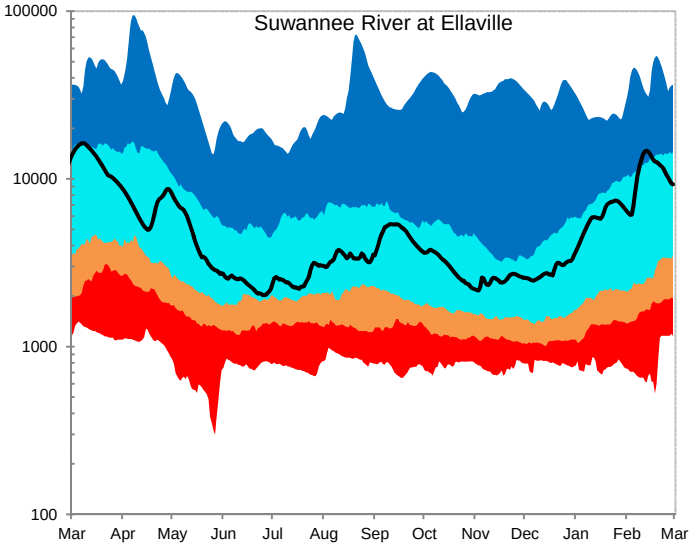
Figure 6: Daily River Flow Statistics
March 1, 2015 through February 29, 2016

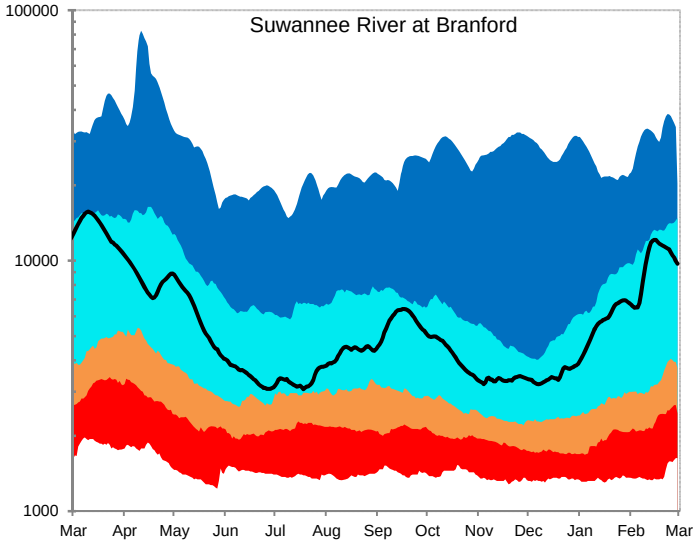


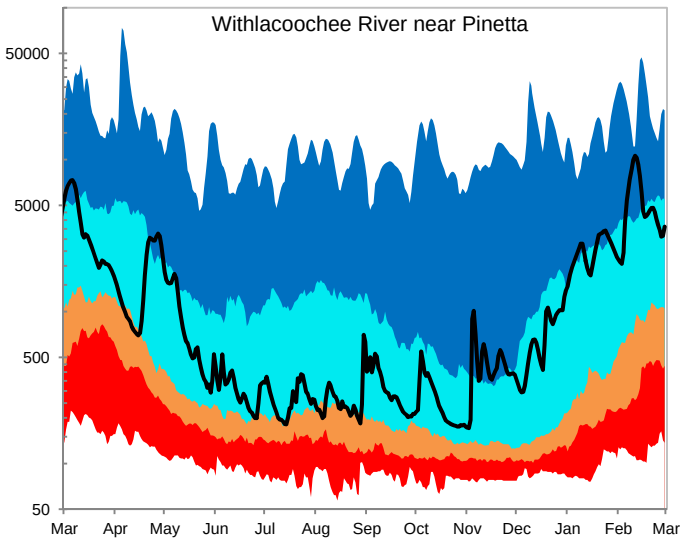
RIVER FLOW, CUBIC FEET PER SECOND











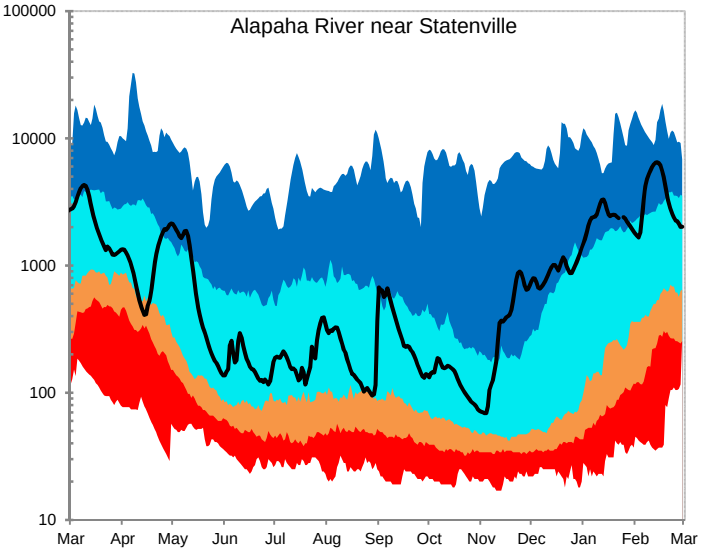
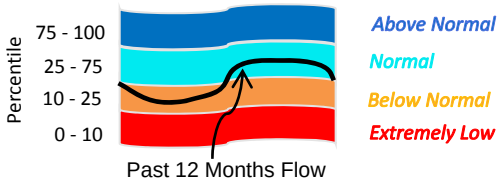
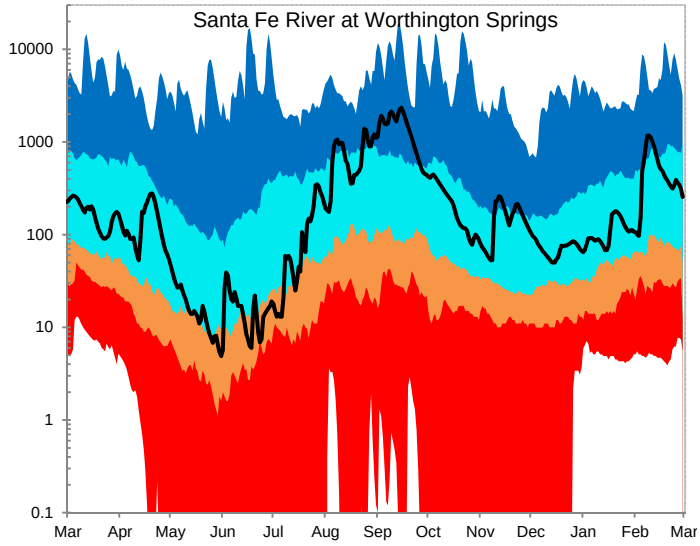
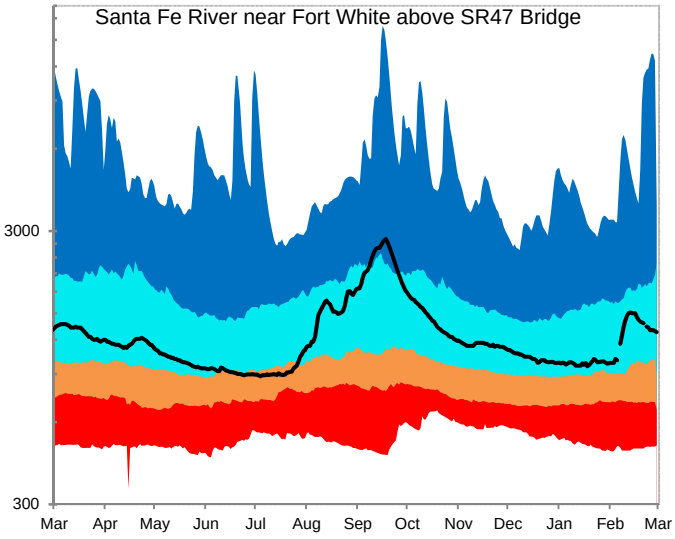


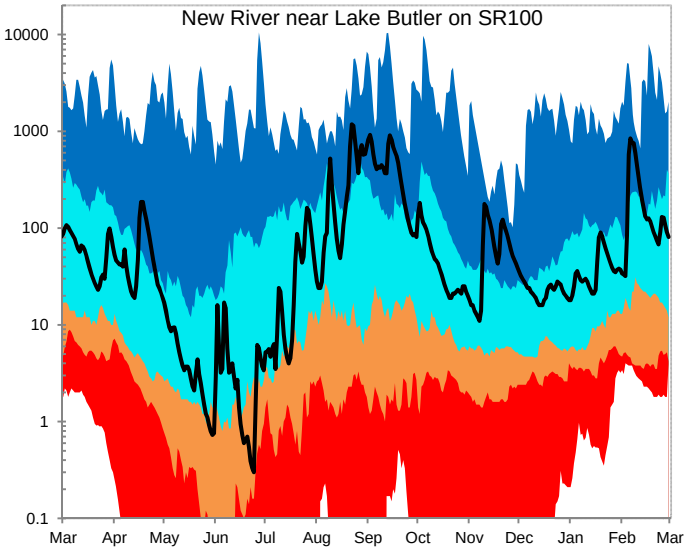
Figure 6, cont: Daily River Flow Statistics
March 1, 2015 through February 29, 2016

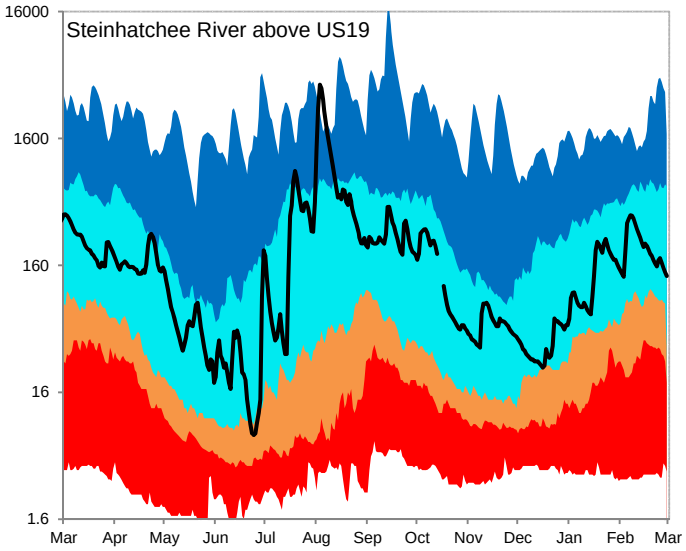


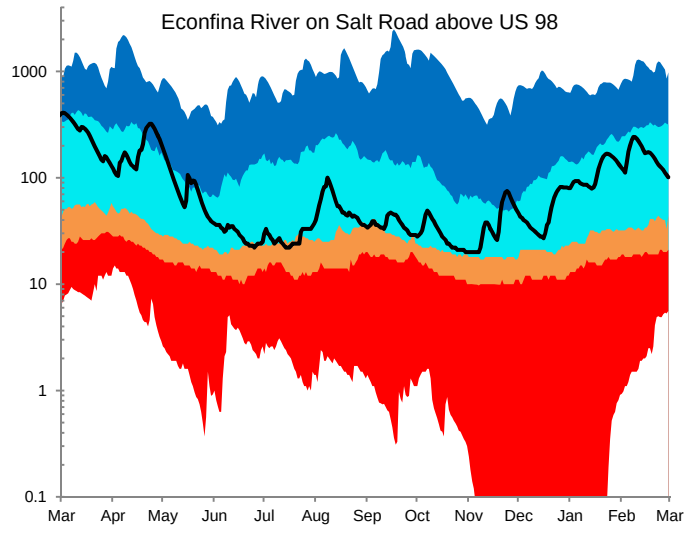
RIVER FLOW, CUBIC FEET PER SECOND

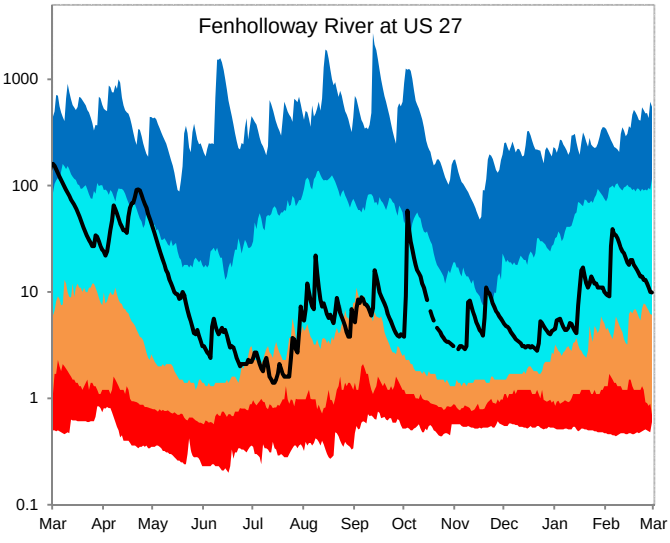












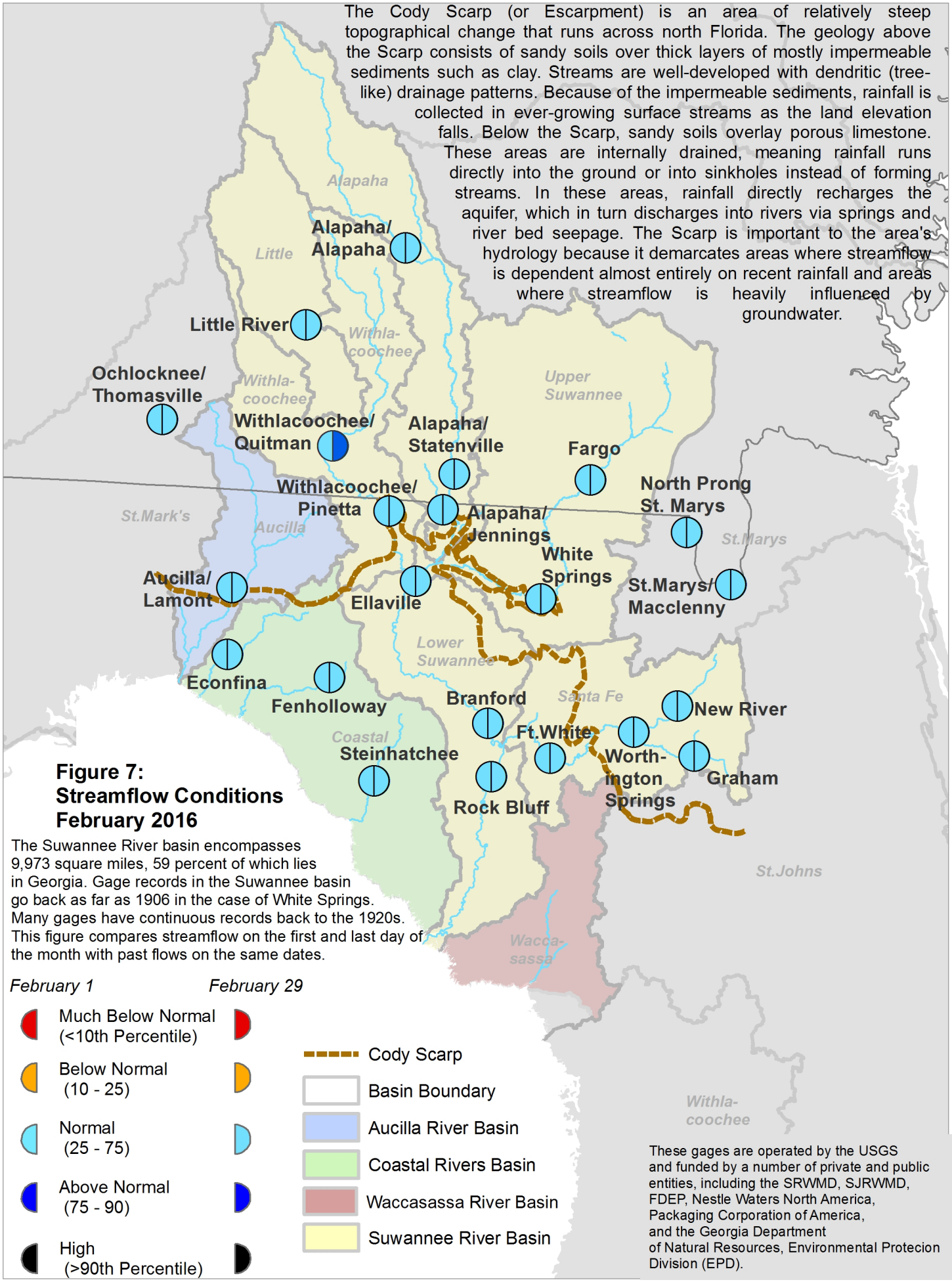
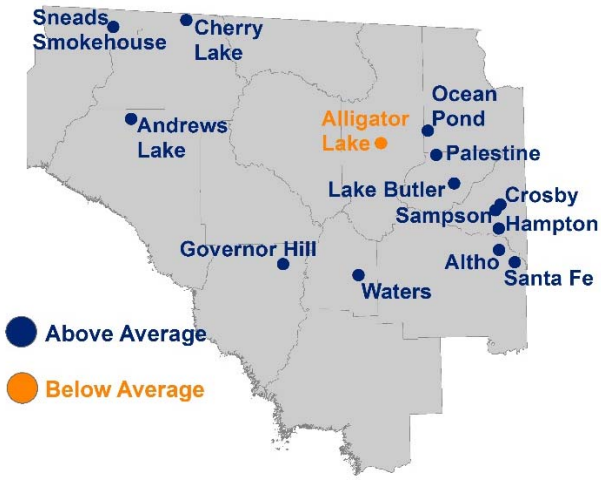
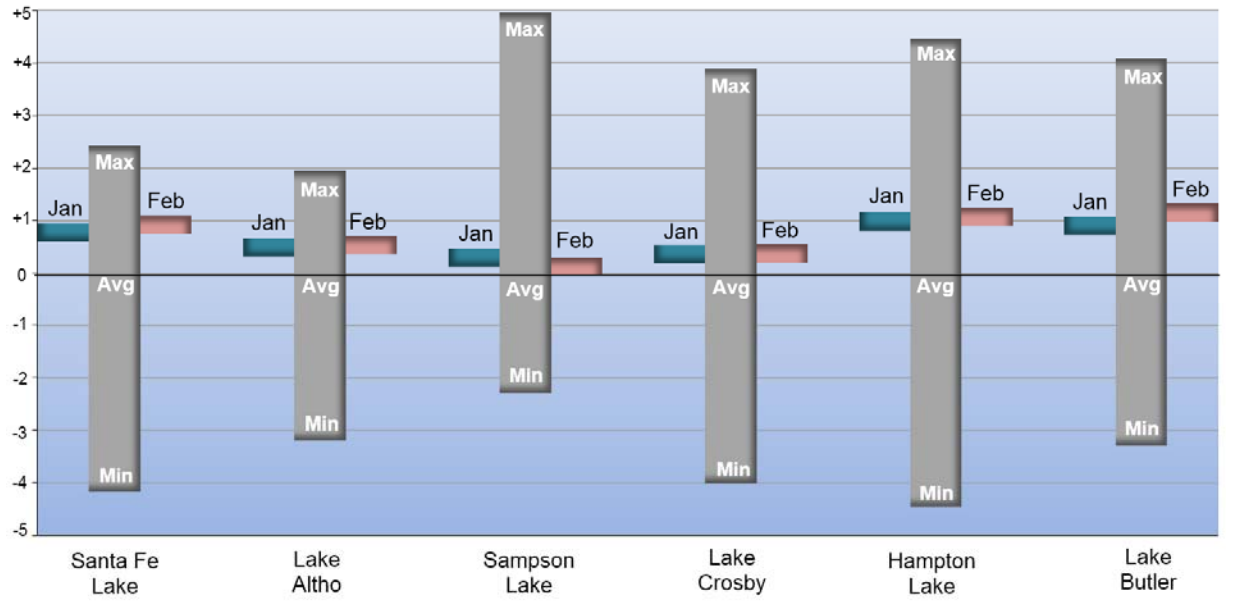

The Cody Scarp (or Escarpment) is an area of relatively steep topographical change that runs across north Florida. The geology above the Scarp consists of sandy soils over thick layers of mostly impermeable sediments such as clay. Streams are well-developed with dendritic (tree-like) drainage patterns. 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
February 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.
February 1
February 29
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).

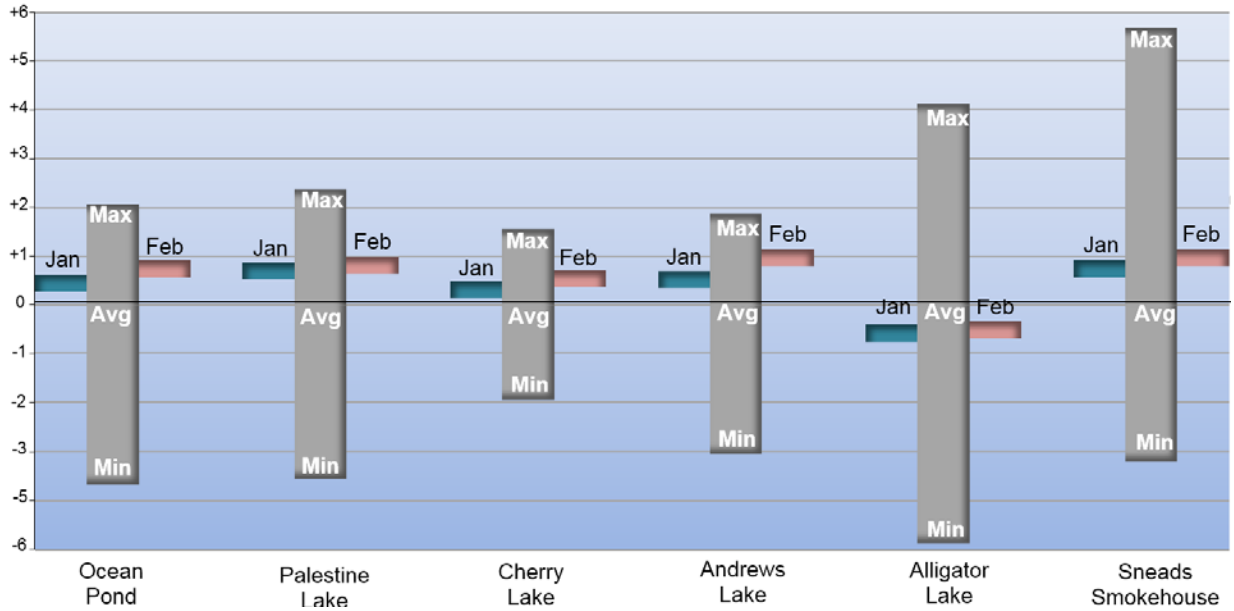
Figure 8: February 2016 Lake Levels



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.



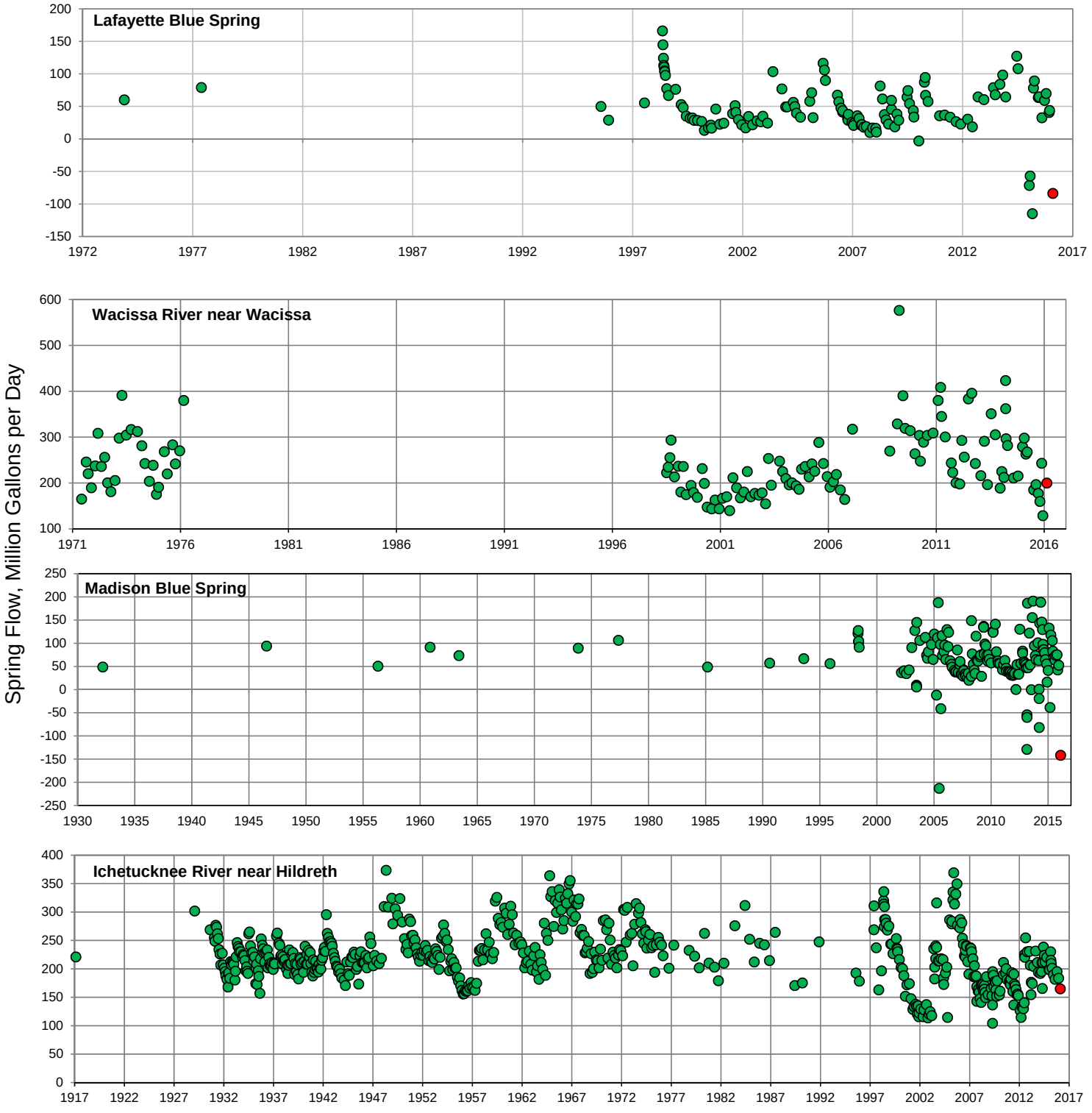


Feet Above or Below Historic Average

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 February 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.



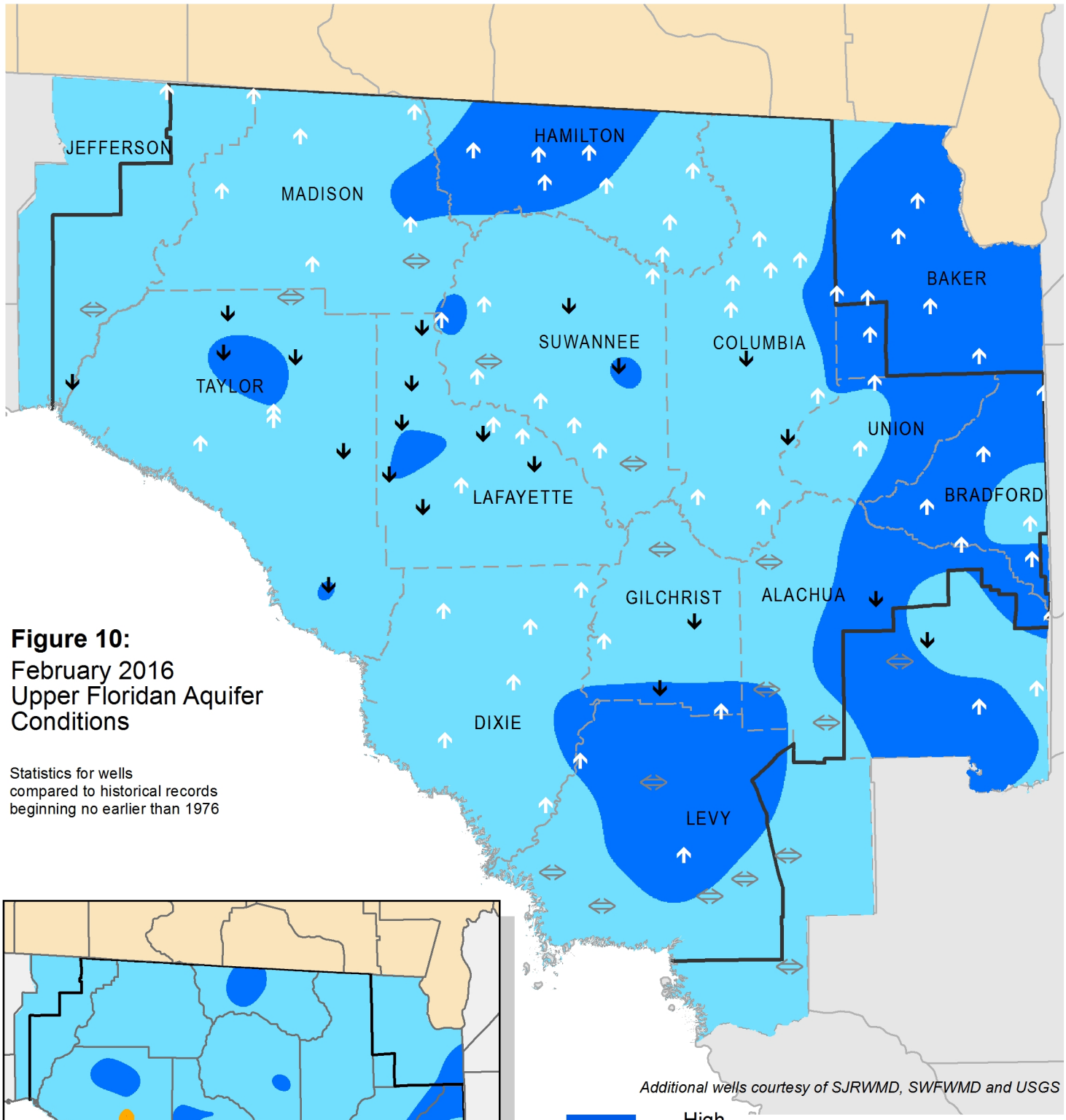


Figure 10:
February 2016
Upper Floridan Aquifer
Conditions

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

Additional wells courtesy of SJRWMD, SWFWMD and USGS

High
(Greater than 75th Percentile)

Normal
(25th to 75th Percentile)

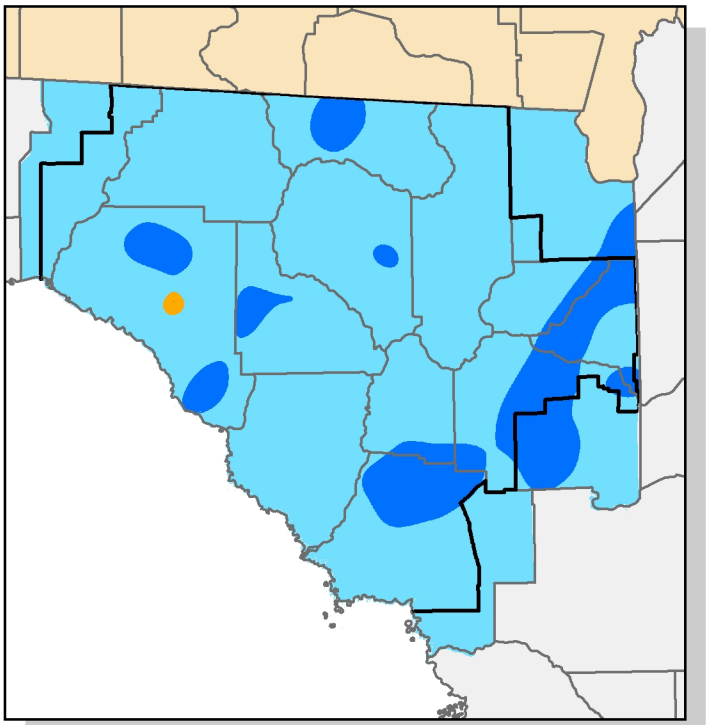
Low
(10th to 25th Percentile)

Extremely Low
(Less than 10th Percentile)

Increase/decrease in level since last month

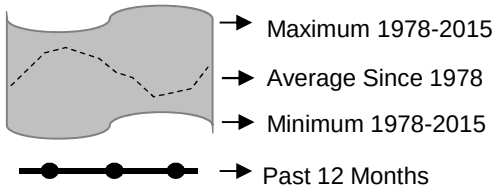
Increase/decrease since last month
less than one percent of historic range

District Boundary



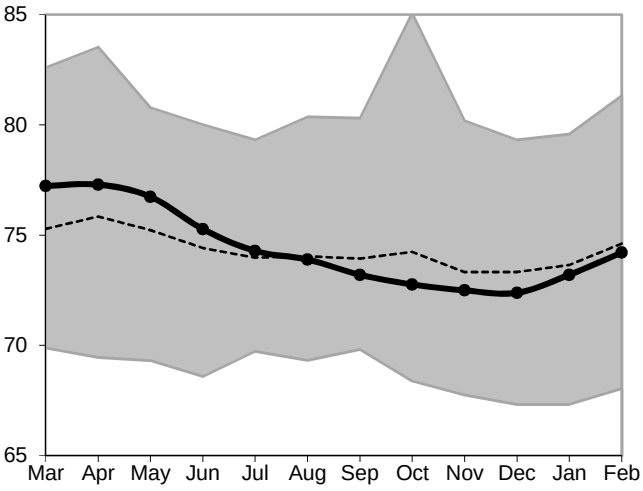
Inset: January Groundwater Levels

Figure 11: Monthly Groundwater Level Statistics
Levels March 1, 2015 through February 29, 2016
Period of Record Beginning 1978

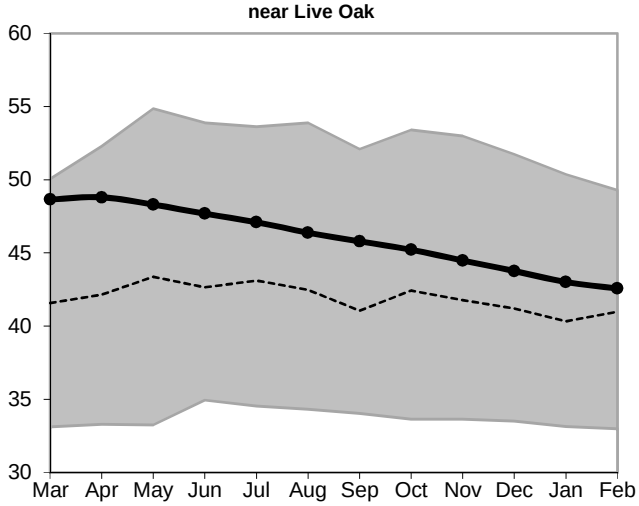


Upper Floridan Aquifer Elevation above NGVD 1929, Feet

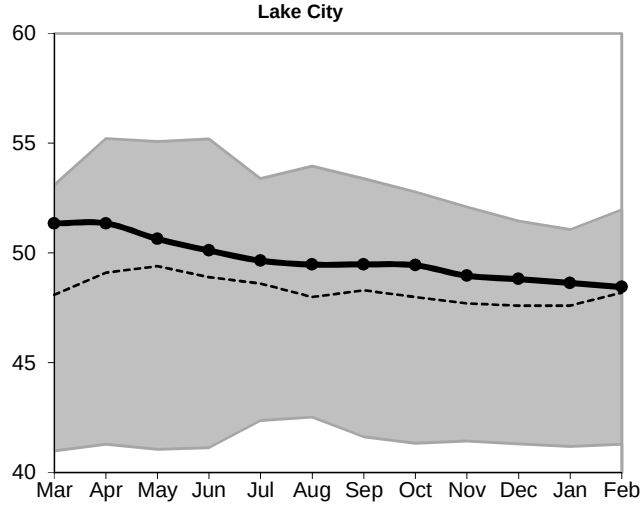
Madison County N010719001
near Greenville



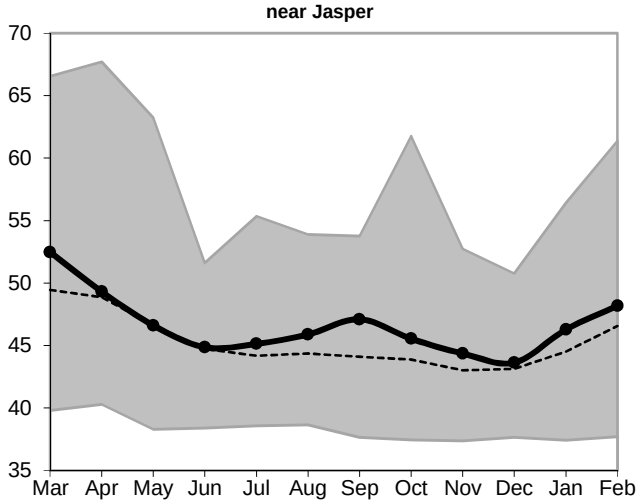
Suwannee County S021335001
near Live Oak



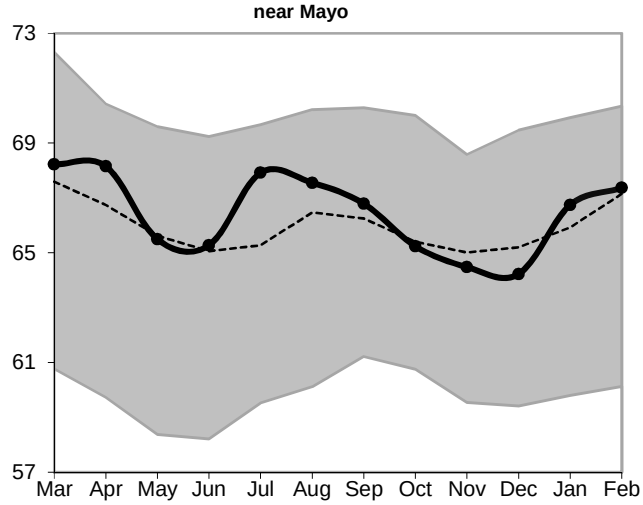
Columbia County S041705001
Lake City



Hamilton County N011422007
near Jasper



Lafayette County S061114001
near Mayo



Taylor County S050701001
near Perry

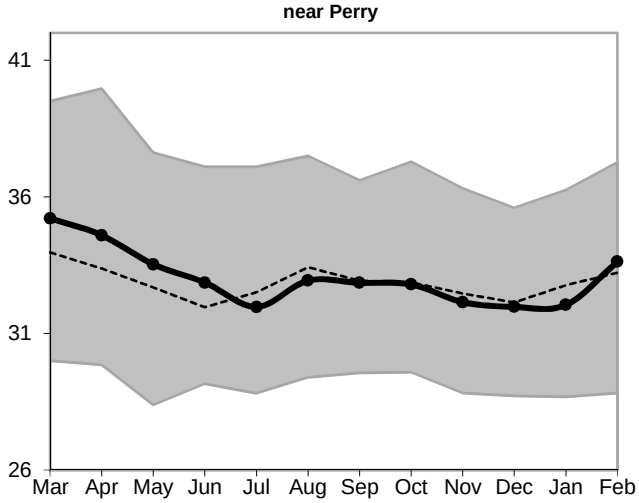
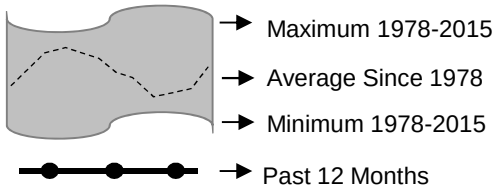
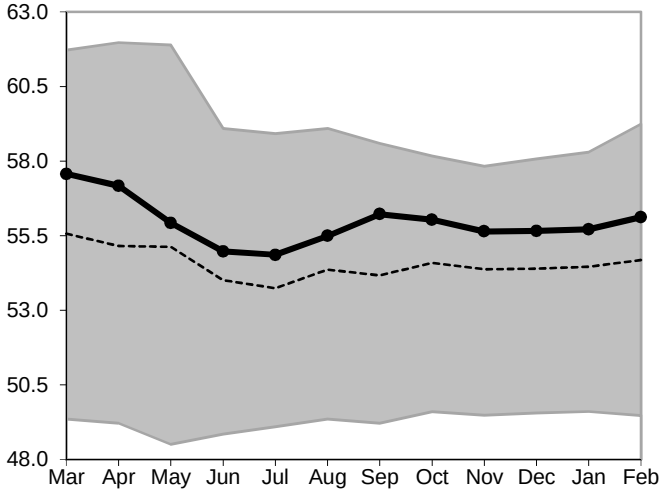


Figure 11, cont.: Groundwater Level Statistics
Levels March 1, 2015 through February 29, 2016
Period of Record Beginning 1978

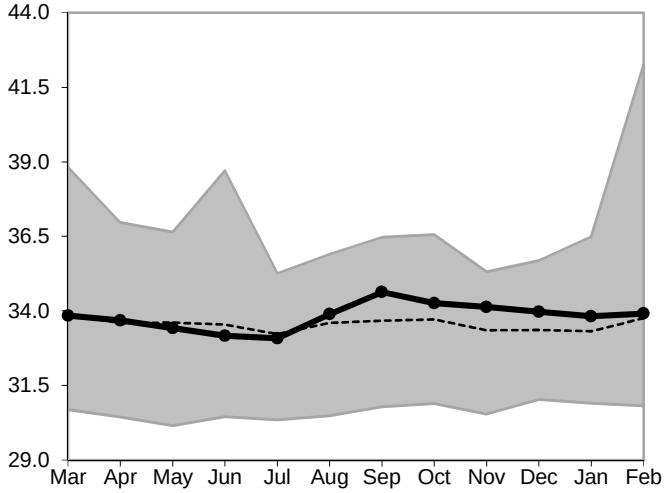


Upper Floridan Aquifer Elevation above NGVD 1929, Feet

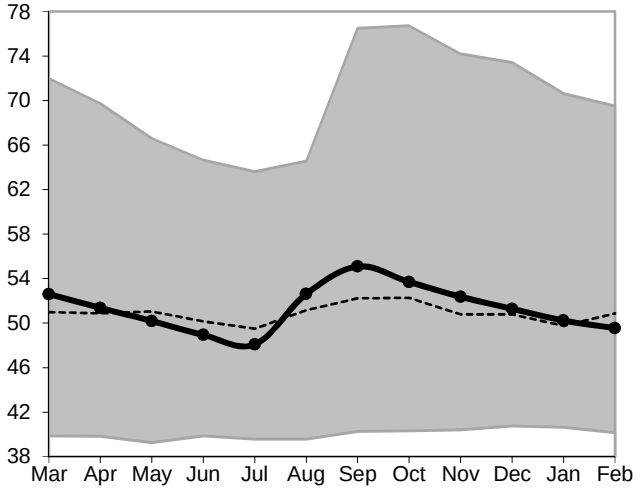
Union County S051933001
near Lake Butler



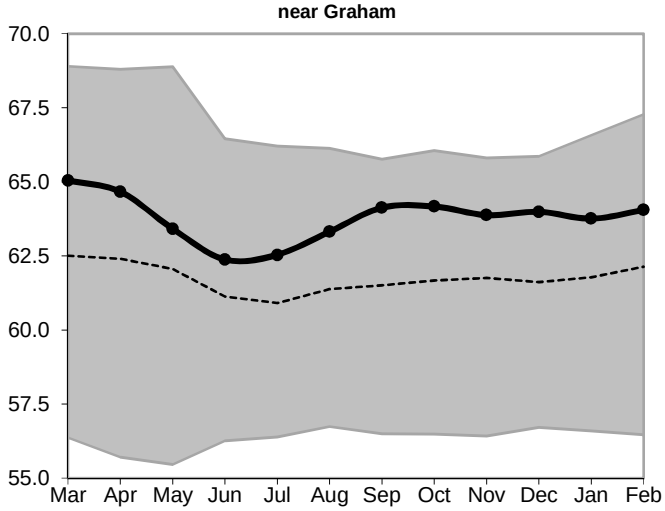
Alachua County S081703001
at High Springs



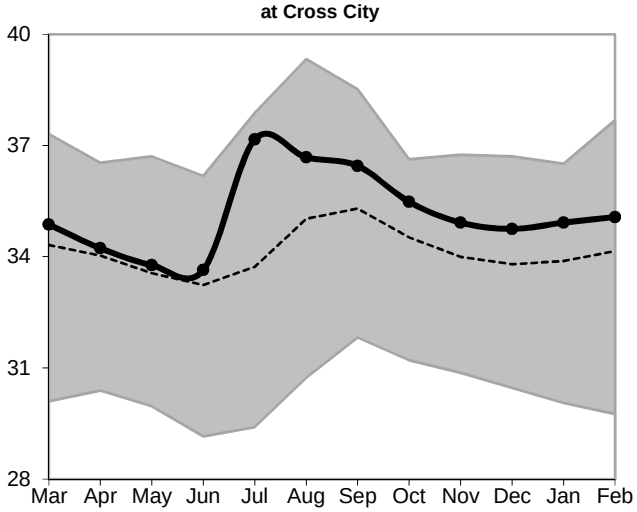
Gilchrist County S091607001
near Trenton



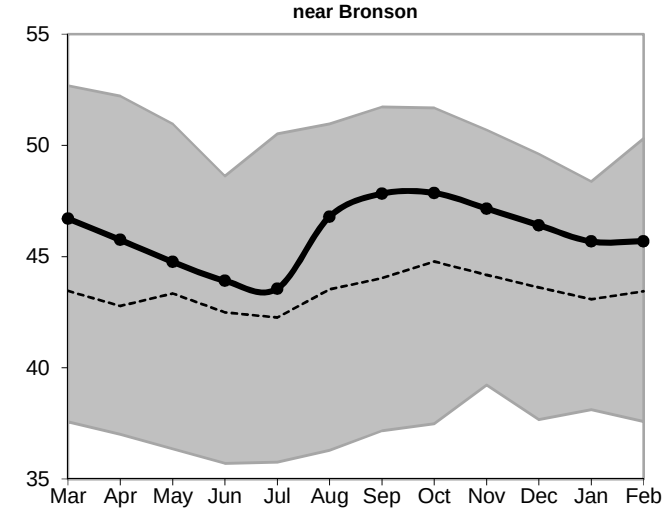
Bradford County S072132001
near Graham



Dixie County S101210001
at Cross City



Levy County S131736001
near Bronson



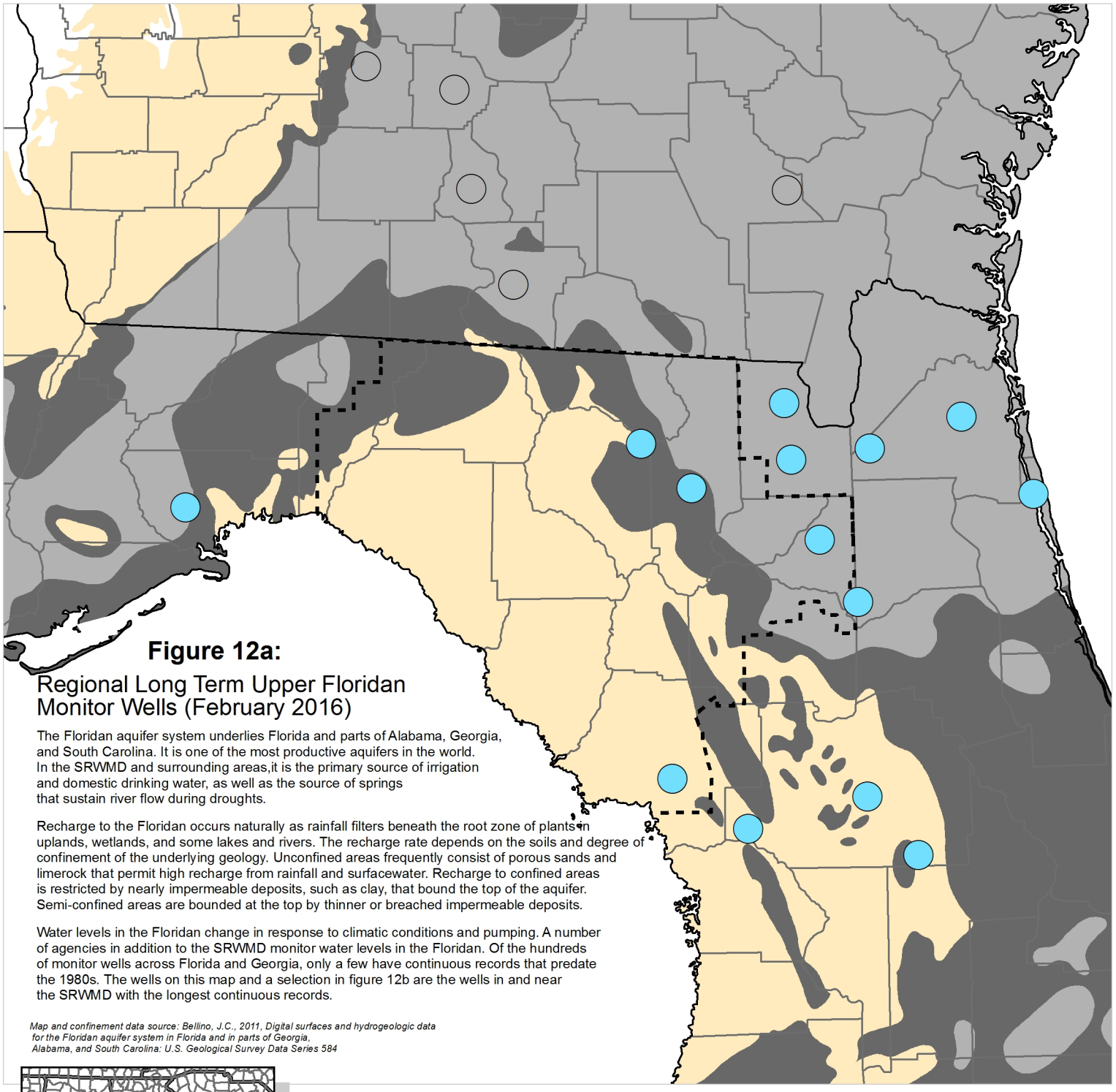


Figure 12a:

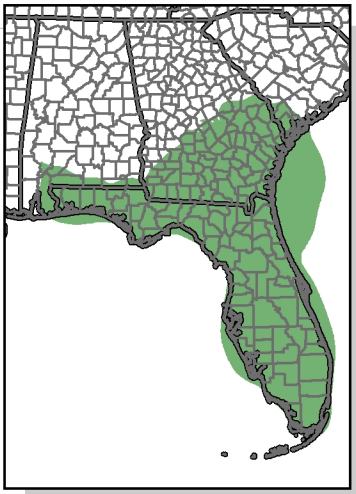
Regional Long Term Upper Floridan Monitor Wells (February 2016)

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

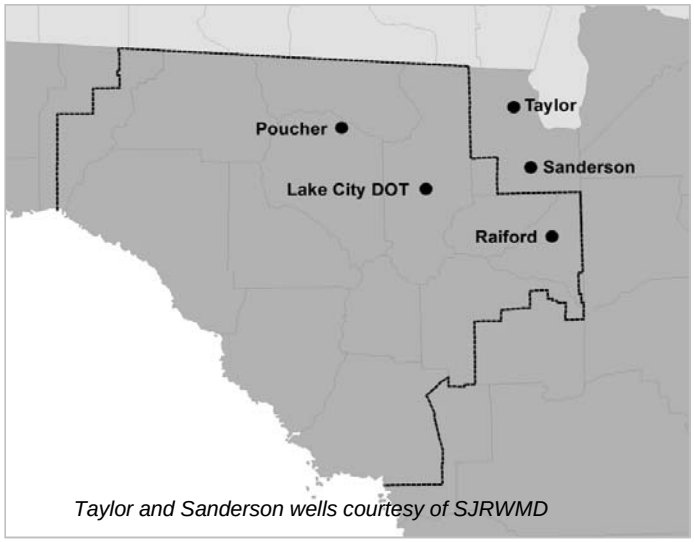
- Confined: Upper confining unit is generally greater than 100 feet thick and unbreached. Recharge is low.
- Semi-confined: Upper confining unit is generally less than 100 feet thick, breached, or both. Recharge is moderate.
- Unconfined: Upper confining unit is absent or very thin. Recharge is high.

Percentile of Most Recent Water Level Relative to Entire Record

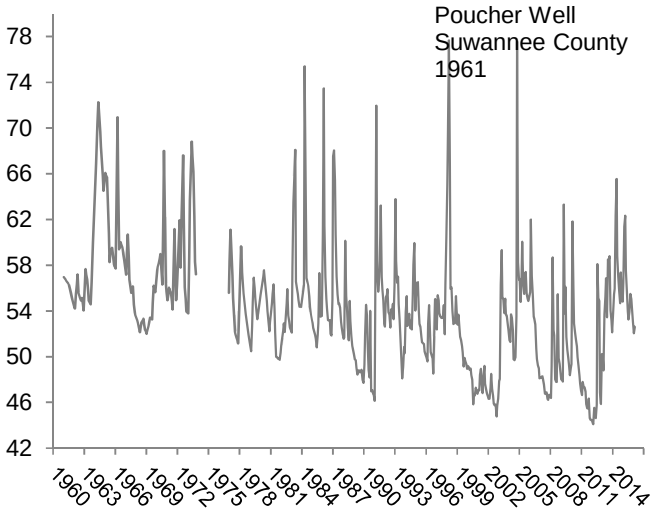
- High (Greater than 75th Percentile)
- Normal (25th to 75th Percentile)
- Low (10th to 25th Percentile)
- Extremely Low (Less than 10th Percentile)
- Not Available
- SRWMD Boundary

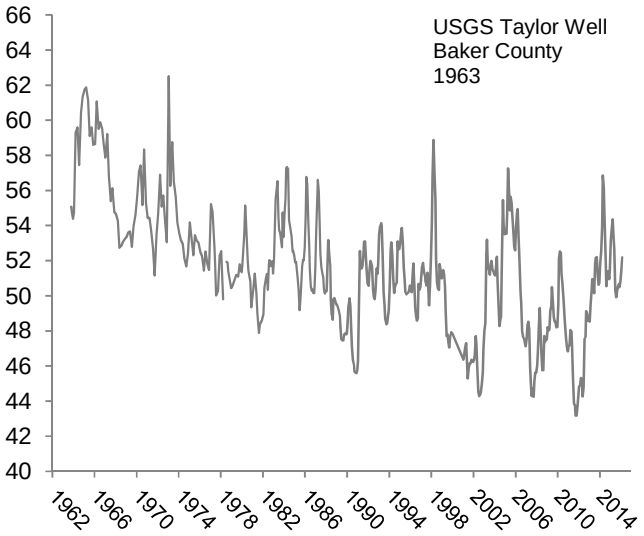
Figure 12b: Regional Long Term Upper Floridan Levels

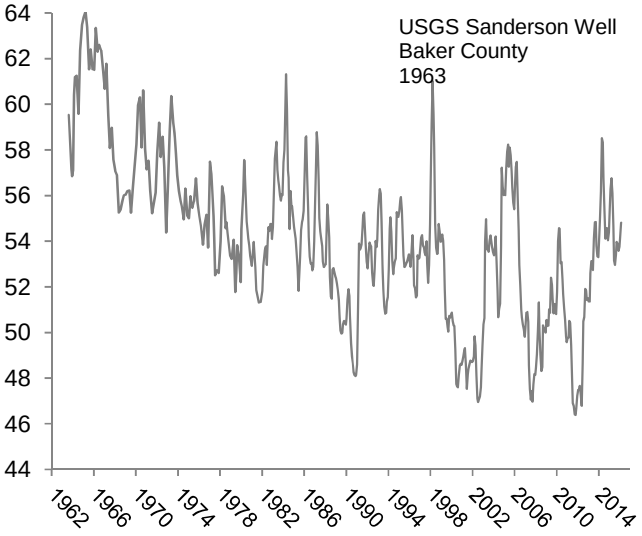
Data through February 2016

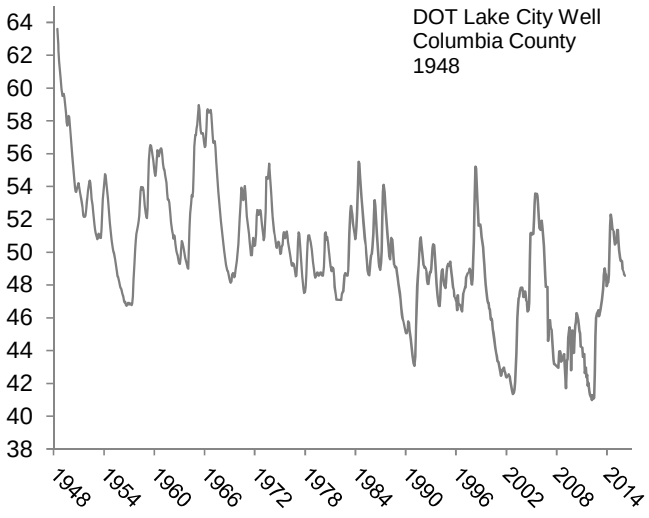


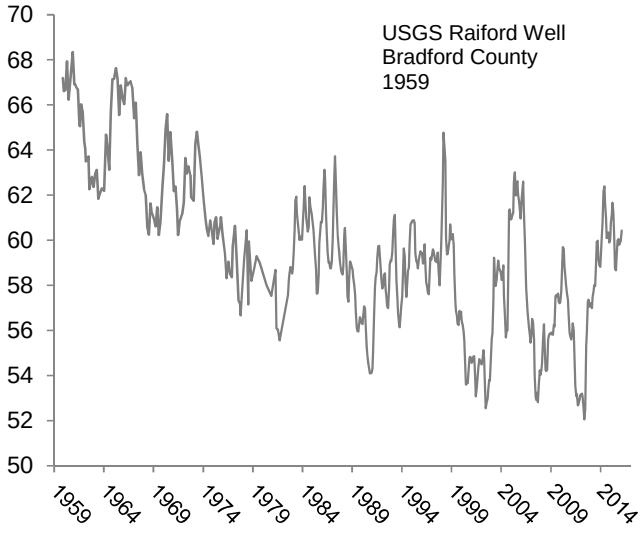
Taylor and Sanderson wells courtesy of SJRWMD











Upper Floridan Aquifer Elevation above NGVD 1929, Feet