MEMORANDUM

TO: Suwannee River Water Management District Governing Board

FROM: Tom Mirti, Chief, Bureau of Hydrologic Data Services

THRU: Carlos D. Herd, P.G., Interim Executive Director
Erich R. Marzolf, Ph.D., Division Director, Water Resources

DATE: August 7, 2015

RE: July 2015 Hydrologic Conditions Report for the SRWMD

RAINFALL

- District-wide rainfall in July was 8.57", about an inch more than the long-term average July rainfall of 7.64". Heavy rainfall in the coastal portions of Dixie and Levy counties resulted in average county rainfall amounts of about 14" during the month. Jefferson County again received the least amount of rainfall in the District—about 4.2" of rain (Table 1). The towns of Steinhatchee and Cedar Key each received around 20" of rainfall and amounts in excess of 16" fell along a path coincident with US Highway 19 from Salem in southwest Taylor County to Otter Creek in Levy County. The northwestern portion of the District received relatively less rainfall, particularly in Jefferson County and along the Georgia border in Hamilton and Madison counties (Figure 2). Rainfall amounts in the Suwannee River basin in Georgia were generally below average during the month, with the exception of the Okefenokee Swamp portion of the Upper Suwannee River basin (Figure 3).
- The highest gaged monthly total (17.43") was recorded at the Rosewood Tower rainfall gage near Cedar Key, and the highest daily total (4.39" on July 24) was also recorded there. The lowest gaged monthly total was 4.51" at Blue Spring in Madison County.
- The rainfall average across the District for the 12-month period ending July 30 was 52.1", compared to the long-term average of 54.6". The cumulative 12-month deficit improved to 2.5". The Suwannee and Waccasassa basins begin showing modest annual rainfall surpluses and other major river basins improved significantly with the exception of the Aucilla River basin. Bradford County and some coastal areas continue to show annual rainfall deficits above 10" locally (Figure 4).
- Average District rainfall for the 3 months ending July 30 was about 1" below the long-term average of 17.3". The Coastal Rivers and Waccasassa basins showed dramatic improvement to surplus amounts, while the Aucilla River worsened markedly (Figure 5).

SURFACEWATER

- **Rivers:** River level stations across the District generally began the month in the normal flow range (25^{th} to 75^{th} percentile of flows, except for below normal flows along the mainstem of the Santa Fe River and on the Fenholloway River. By July 31, all stations in the District were in the normal flow range except the Aucilla River at Lamont, which declined to below normal levels (10^{th} to 25^{th} percentile) for the first time since November. Suwannee River basin stations in Georgia also stayed within the normal range with the exception of the most upstream locations; the Little River near Adel remained at below normal levels, and the Alapaha River near Alapaha improved to normal status. 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 of the District's monitored lakes showed water level increases during July, with the exception of lakes in the northwestern area of the District. Alligator Lake in Columbia County rose 1.8' during the month to 96.3' while Andrews Lake in northern

Taylor County declined 0.4' to 77.0'. Figure 8 shows lake levels relative to their respective long-term average, minimum, and maximum levels.

- **Springs**: Twenty springs or spring groups were measured by the USGS, District staff, and District contractors in July. Springs continued to flow well but overall showed declines in discharge as groundwater levels in spring recharge areas continued to drop. The Wacissa River in Jefferson County was measured at 185 million gallons per day during the month. Historical flow data for several major springs are provided in Figure 9.

GROUNDWATER

Groundwater levels in the upper Floridan aquifer monitor wells improved slightly on average during July, and the District ended the month at the 56th percentile aquifer level overall. The low aquifer levels (in some areas below the 10th percentile) that had developed in coastal areas of the District rebounded sharply and the entire Steinhatchee River basin and much of Dixie County improved to the highest aquifer levels since 1998. Most of the remainder of the District is in the normal range, but coastal Jefferson County remained in the low range (Figure 10). Only three monitor wells remain in the low aquifer level category (below at least the 25th percentile), and 11 wells either remain or improved to the high category. Floridan aquifer levels for a representative sample of wells are provided in Figure 11 along with summary statistics, and regional long-term well information is provided in Figure 12 along 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 August 1 showed near-normal conditions in north Florida and south Georgia.
- The National Weather Service Climate Prediction Center (CPC) has again modified its forecast for north central Florida, calling for normal conditions through the end of September, followed by above normal rainfall conditions beginning in October and continuing through the winter months. The longer term projection is based on ongoing strengthening of the El Niño phenomenon and an expectation that it will continue to increase.
- The U.S. Drought Monitor report of July 28 showed an expansion of dry conditions in both the western and northeastern portions of the District, with moderate drought conditions prevalent in the Aucilla River basin. Late month rainfall events improved this status along the coast however. Normal conditions are present all along the Suwannee River and in the lower Santa Fe River as well.

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 a 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	July 2015	July Average	Month % of Normal	Last 12 Months	Annual % of Normal
Alachua	8.70	7.01	124%	48.56	95%
Baker	6.86	7.06	97%	45.38	91%
Bradford	8.99	6.92	130%	40.92	81%
Columbia	7.79	7.01	111%	50.18	98%
Dixie	14.35	9.14	157%	45.77	77%
Gilchrist	9.99	8.03	124%	47.87	83%
Hamilton	6.71	6.79	99%	53.84	103%
Jefferson	4.17	7.23	58%	48.23	80%
Lafayette	8.35	8.21	102%	49.65	88%
Levy	13.85	8.98	154%	48.49	81%
Madison	5.38	7.29	74%	48.80	87%
Suwannee	7.06	7.17	98%	51.96	98%
Taylor	9.41	8.62	109%	47.84	80%
Union	8.32	7.49	111%	46.00	85%

July 2015 Average:	8.57
July Average (1932-2013):	7.64
Historical 12-month Average (1932-2013):	54.63
Past 12-Month Total:	52.11
12-Month Rainfall Surplus/Deficit:	-2.52

Figure 1: Comparison of District Monthly Rainfall

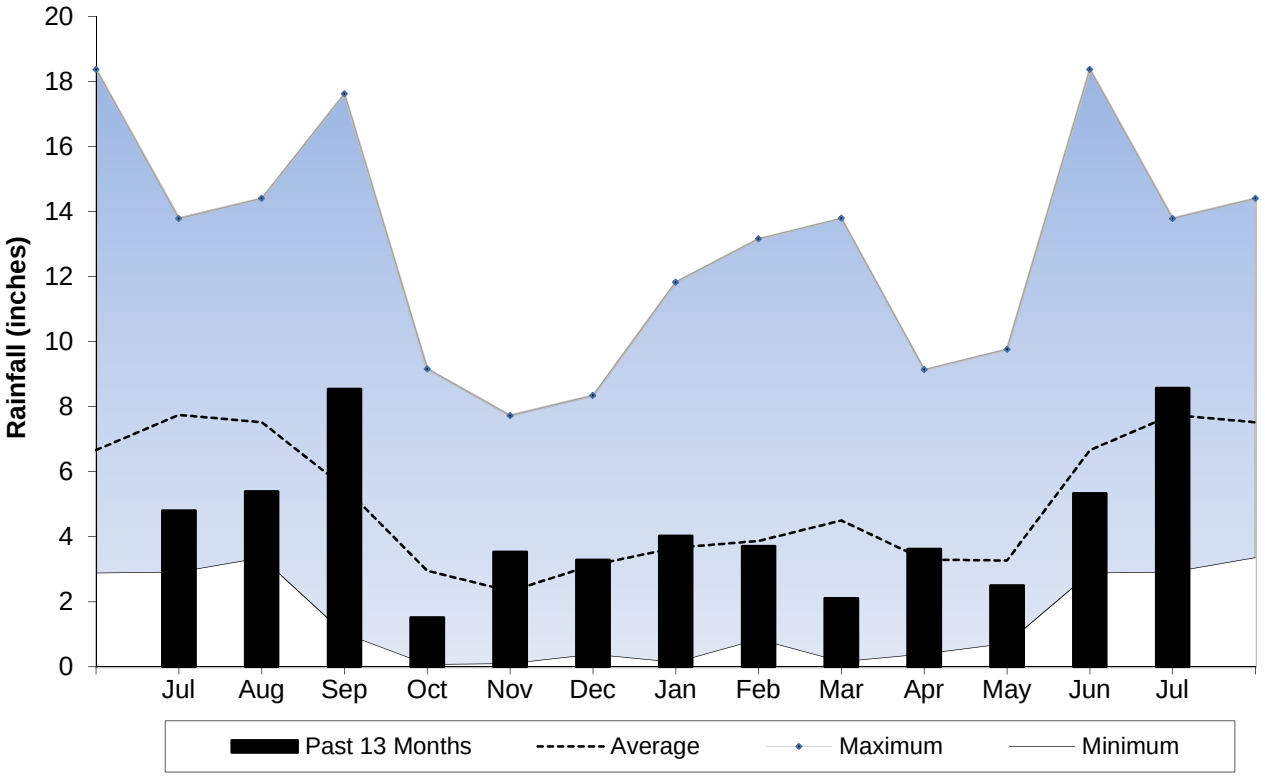


Figure 2: July 2015 Rainfall Estimate

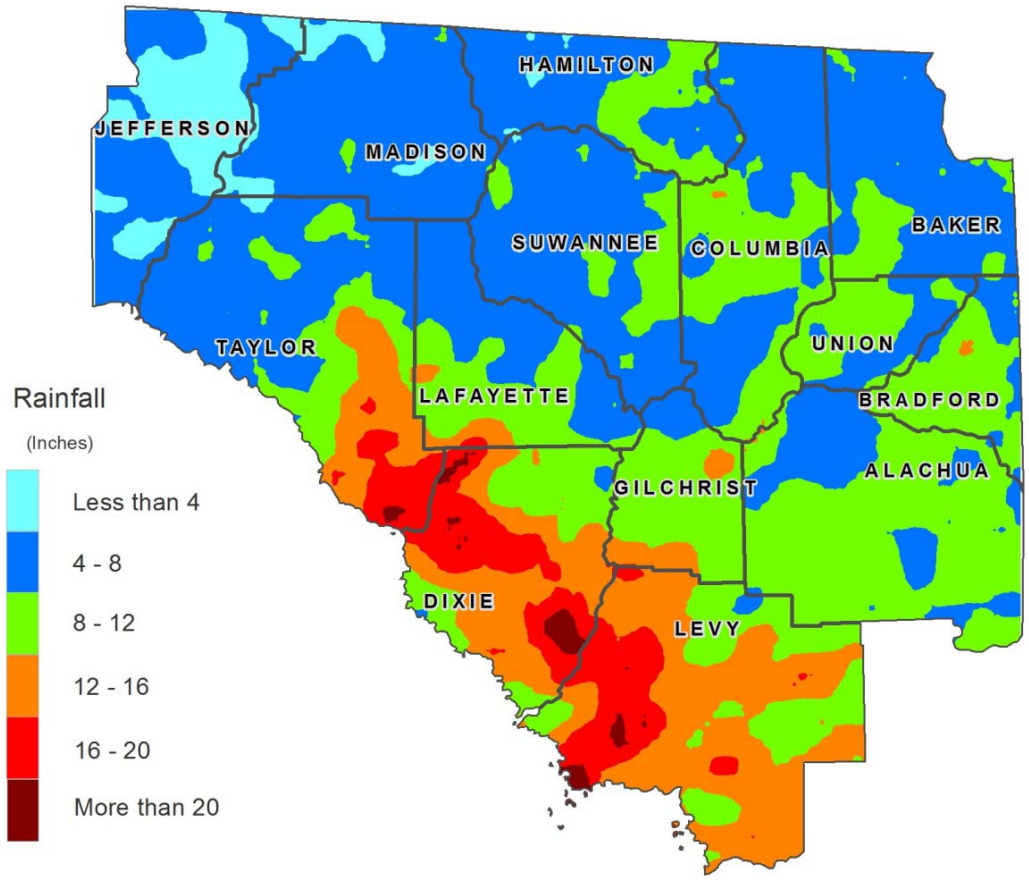


Figure 3: July 2015 Percent of Normal Rainfall

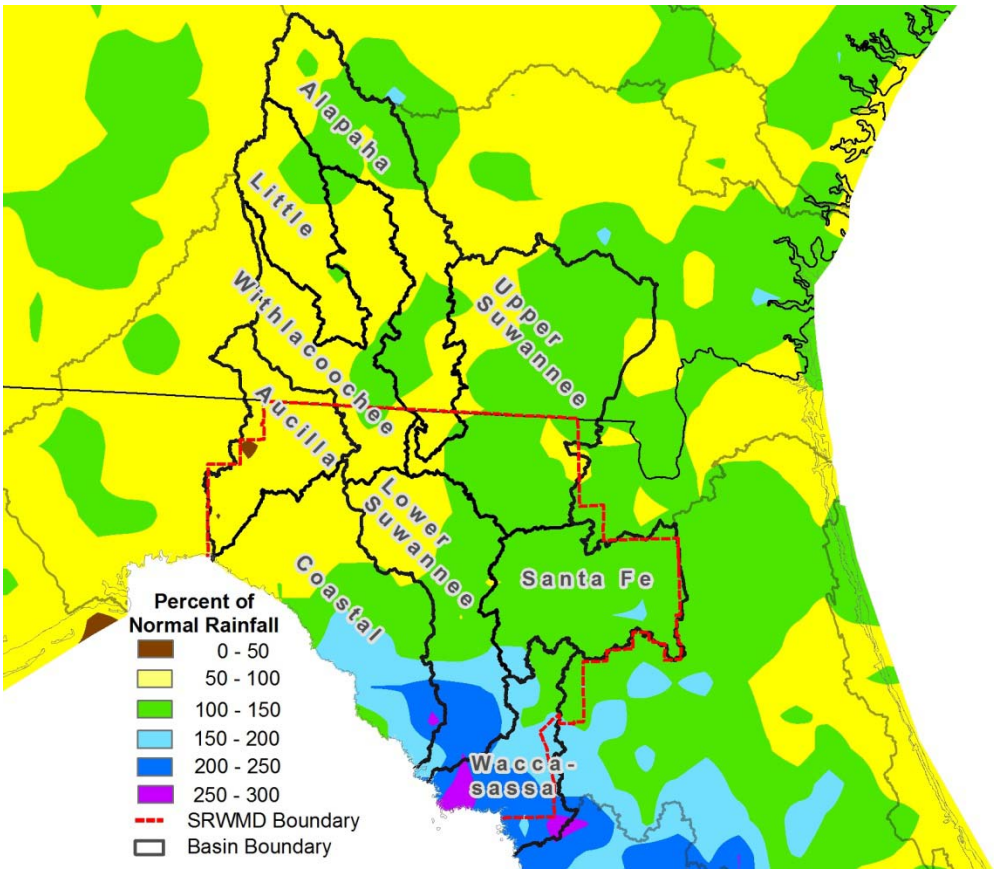


Figure 4: 12-Month Rainfall Surplus/Deficit by River Basin Through July 31, 2015

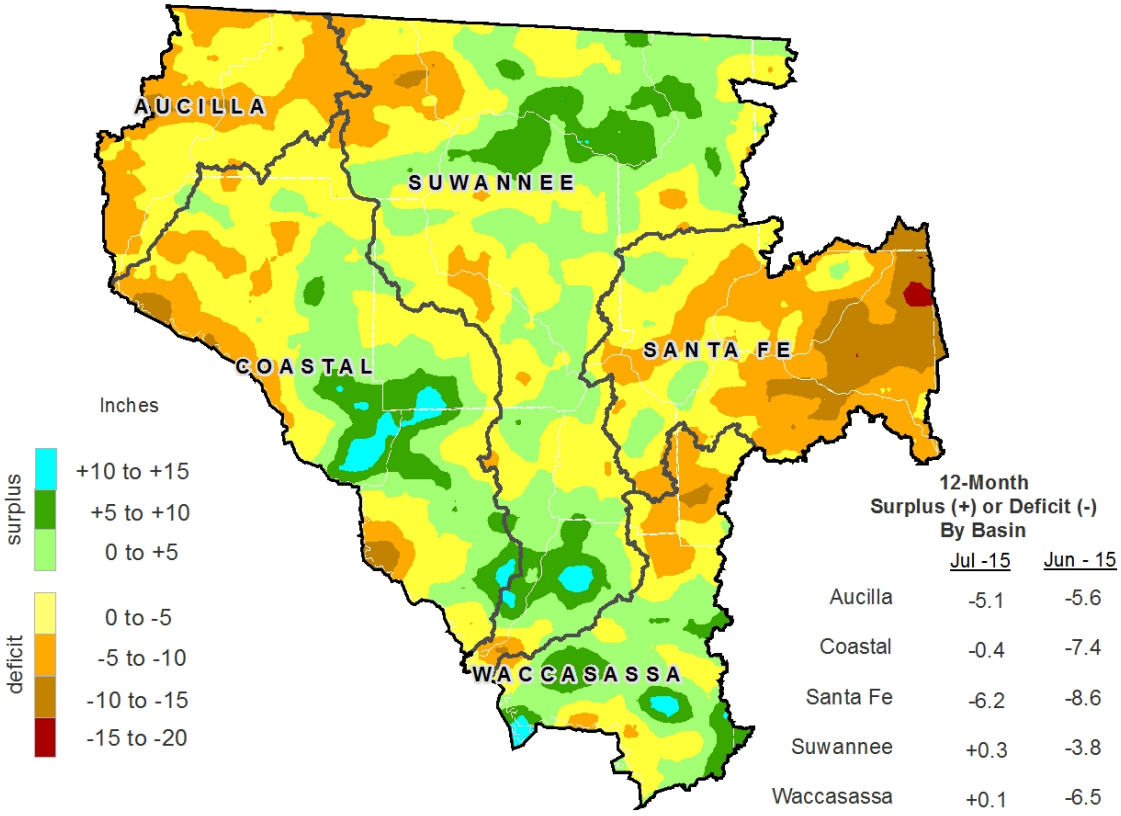


Figure 5: 3-Month Rainfall Surplus/Deficit by River Basin Through July 31, 2015

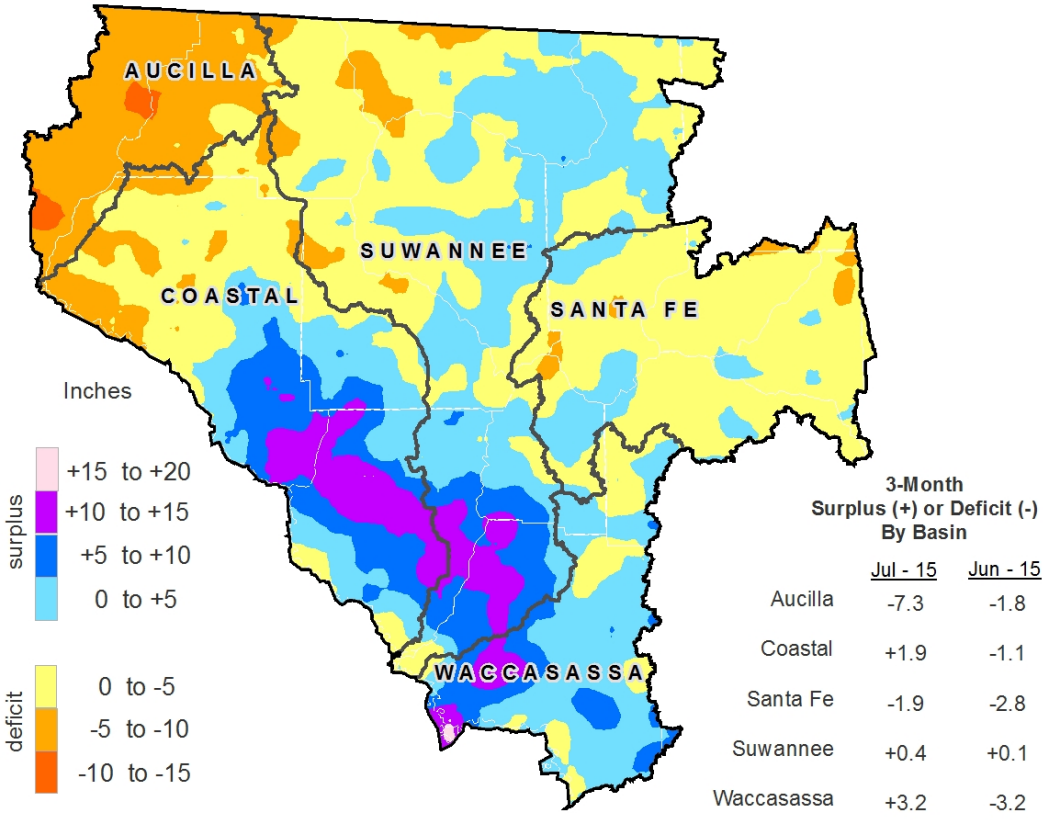
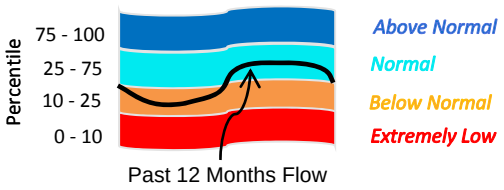
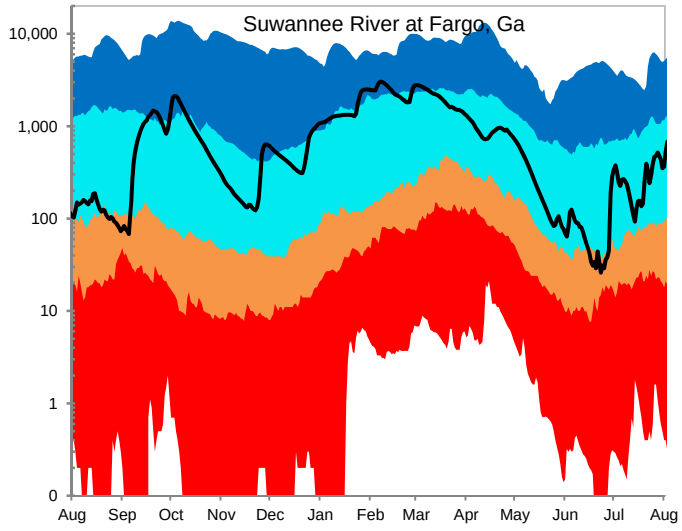
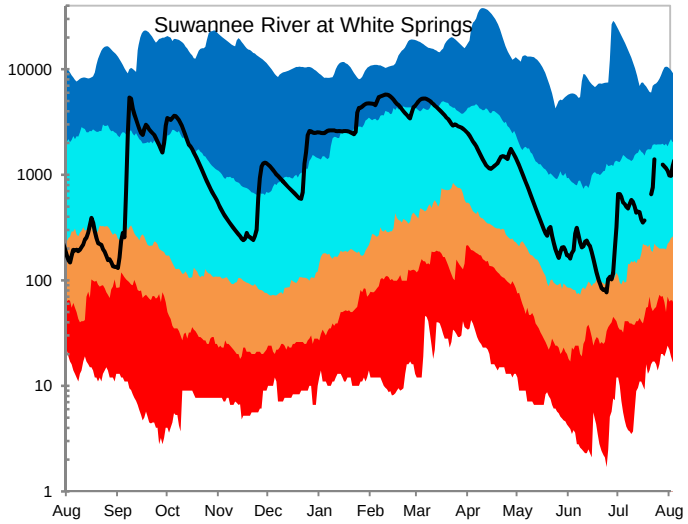


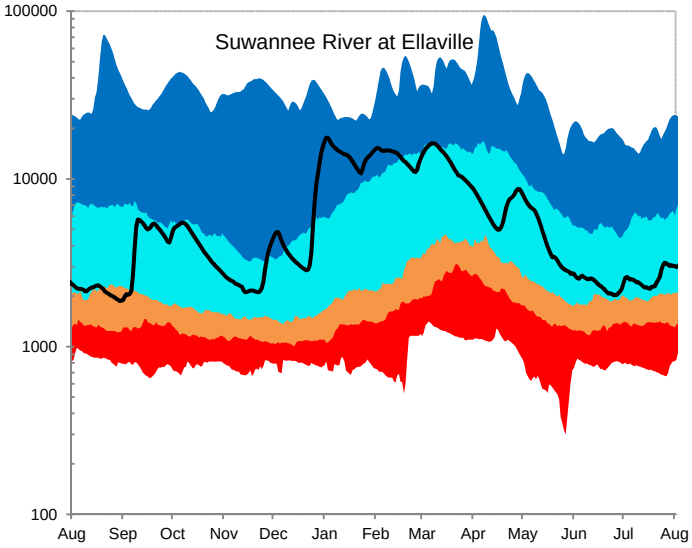
Figure 6: Daily River Flow Statistics
August 1, 2014 through July 31, 2015

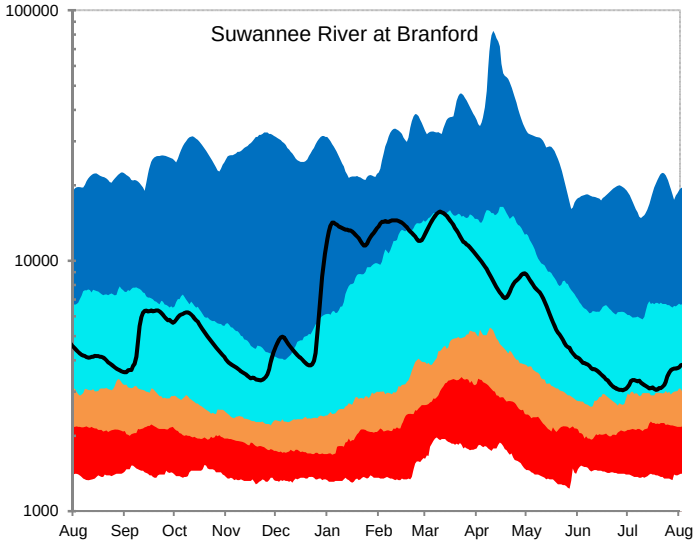


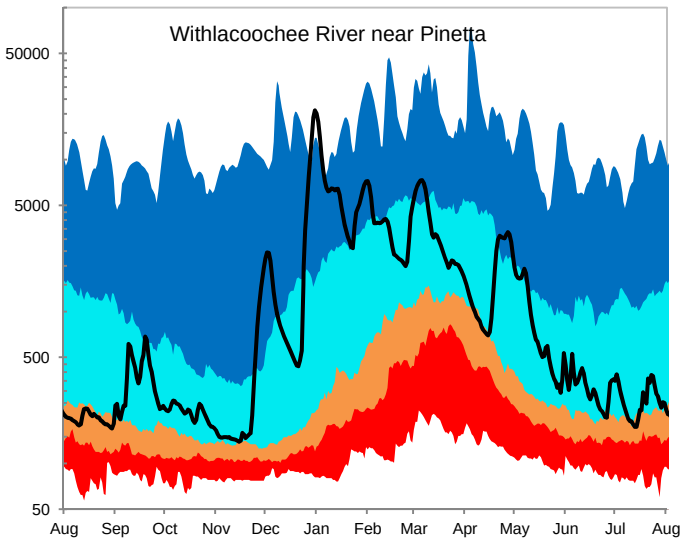
RIVER FLOW, CUBIC FEET PER SECOND











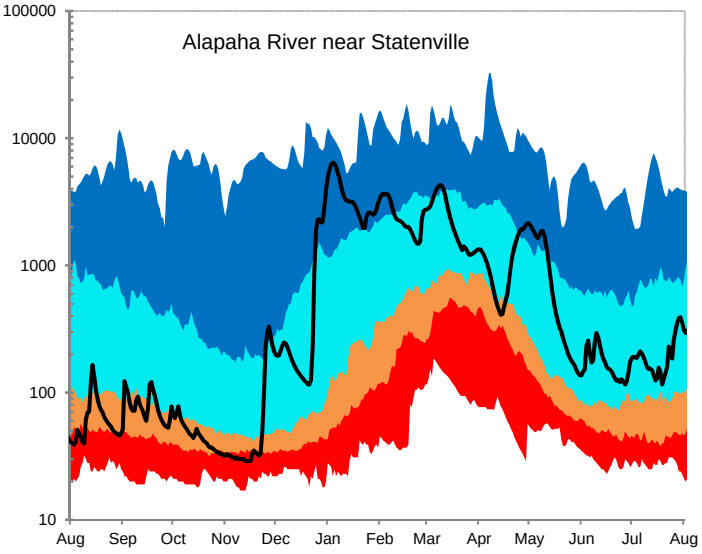
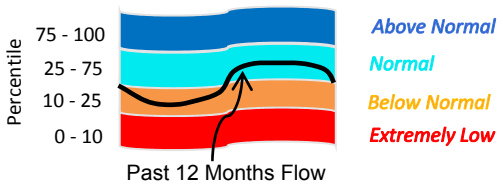
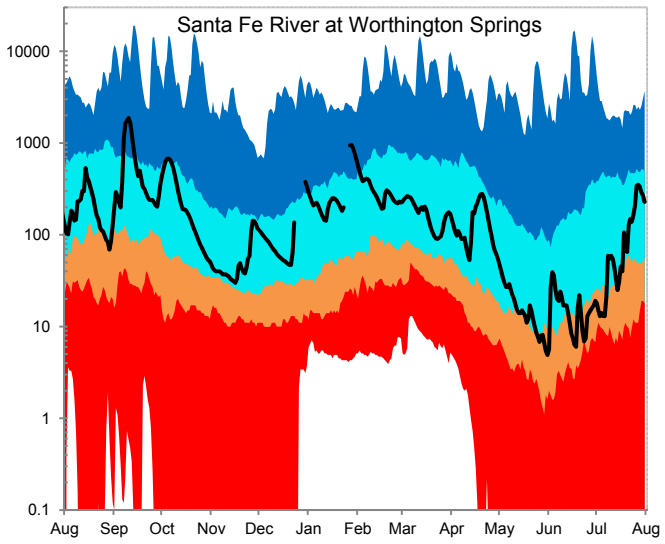
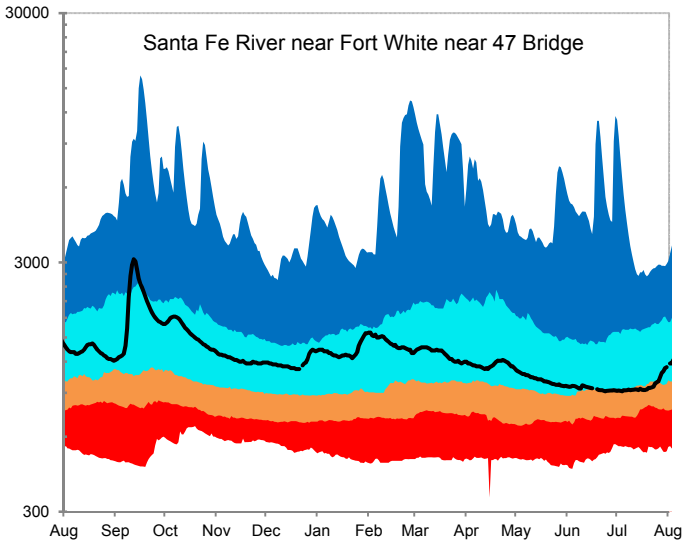


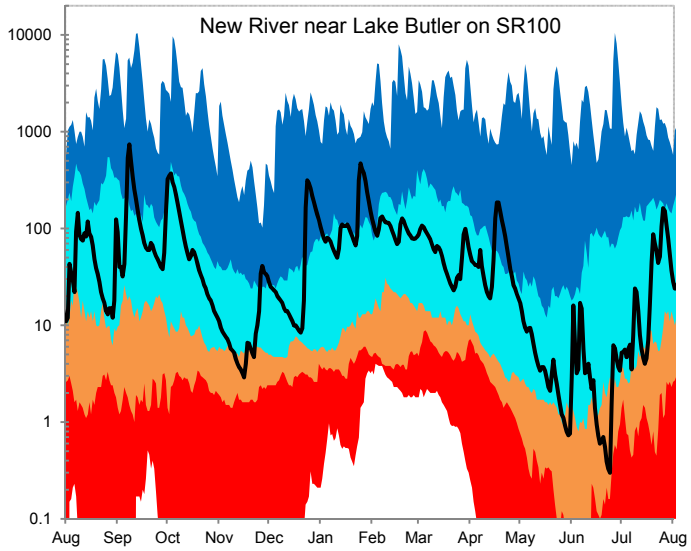
Figure 6, cont: Daily River Flow Statistics
August 1, 2014 through July 31, 2015

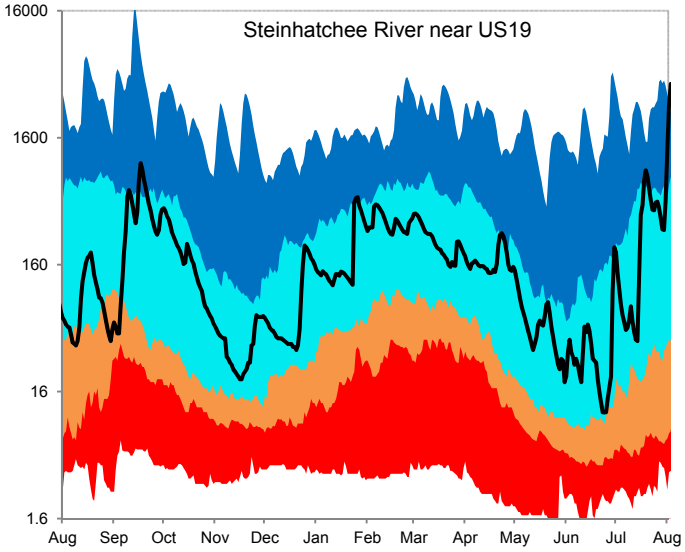


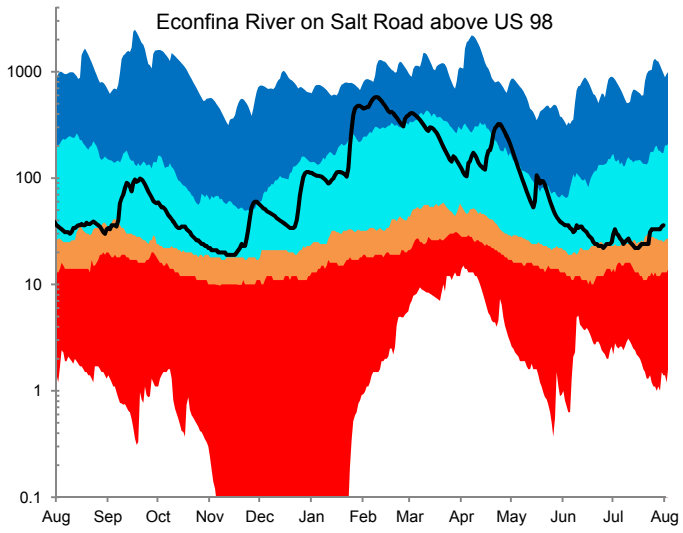
RIVER FLOW, CUBIC FEET PER SECOND

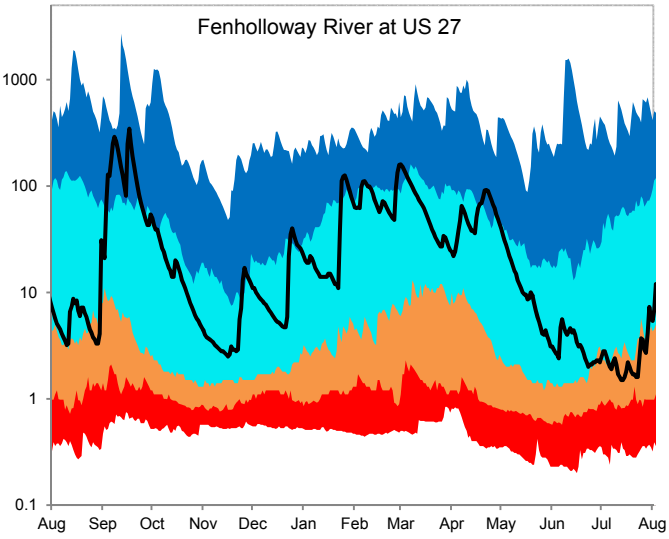












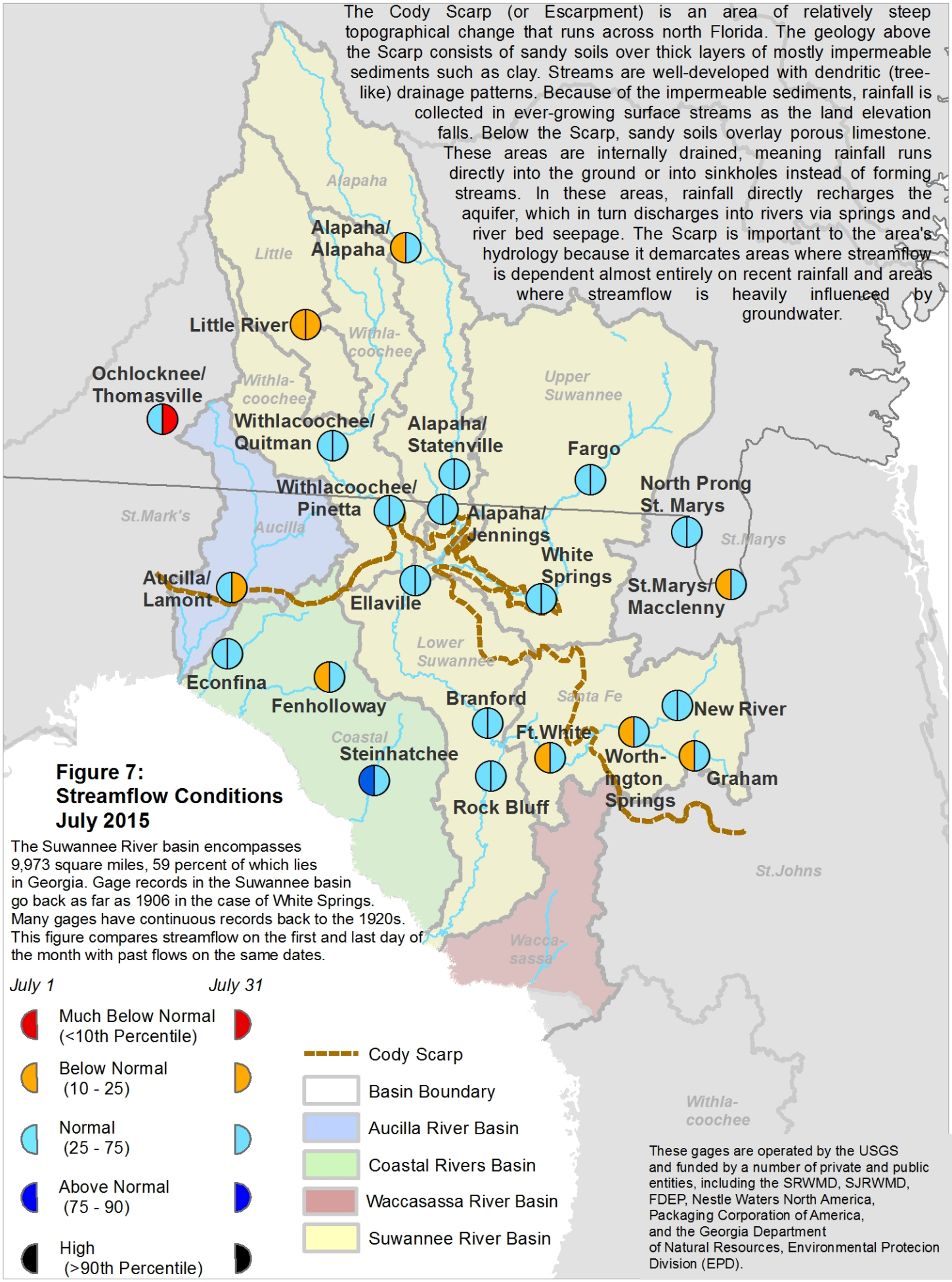
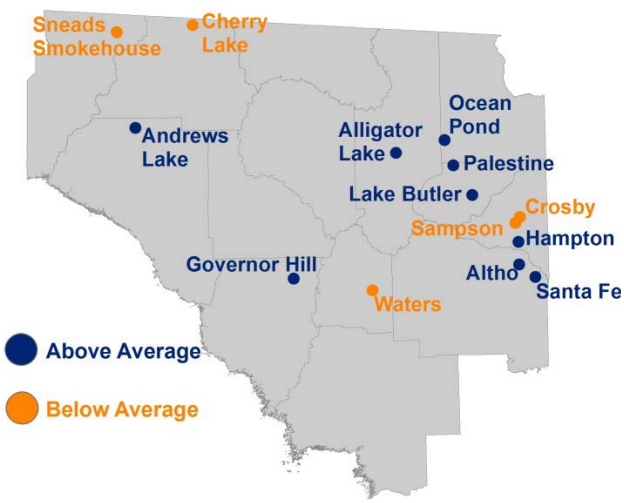

The Cody Scarp (or Escarpment) is an area of relatively steep topographical change that runs across north Florida. The geology above the Scarp consists of sandy soils over thick layers of mostly impermeable sediments such as clay. Streams are well-developed with dendritic (tree-like) drainage patterns. 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
July 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.
July 1
July 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: July 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 provided by volunteer observers. Most monitoring records begin in the 1970s, although the Sampson Lake record starts in 1957.

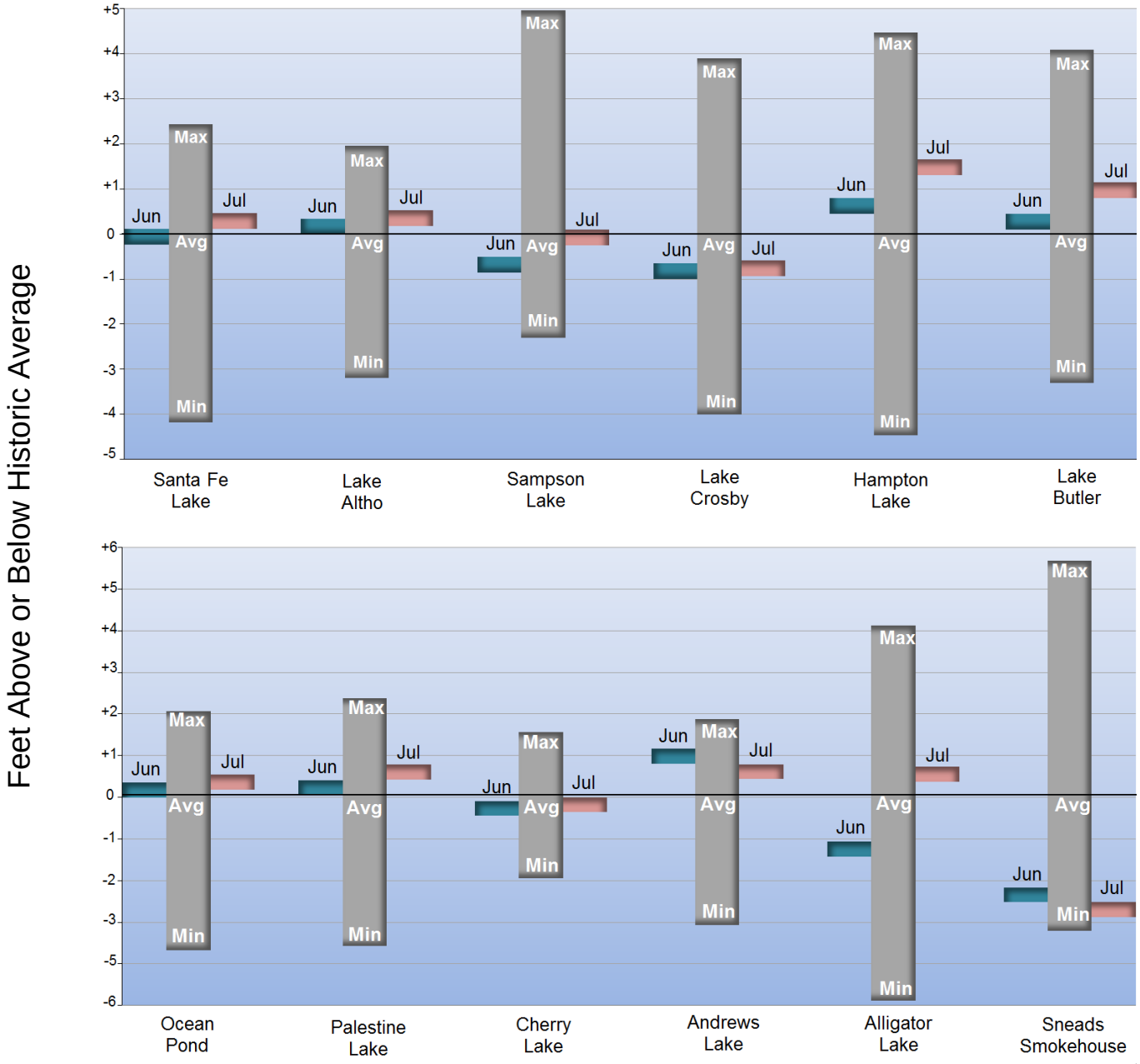
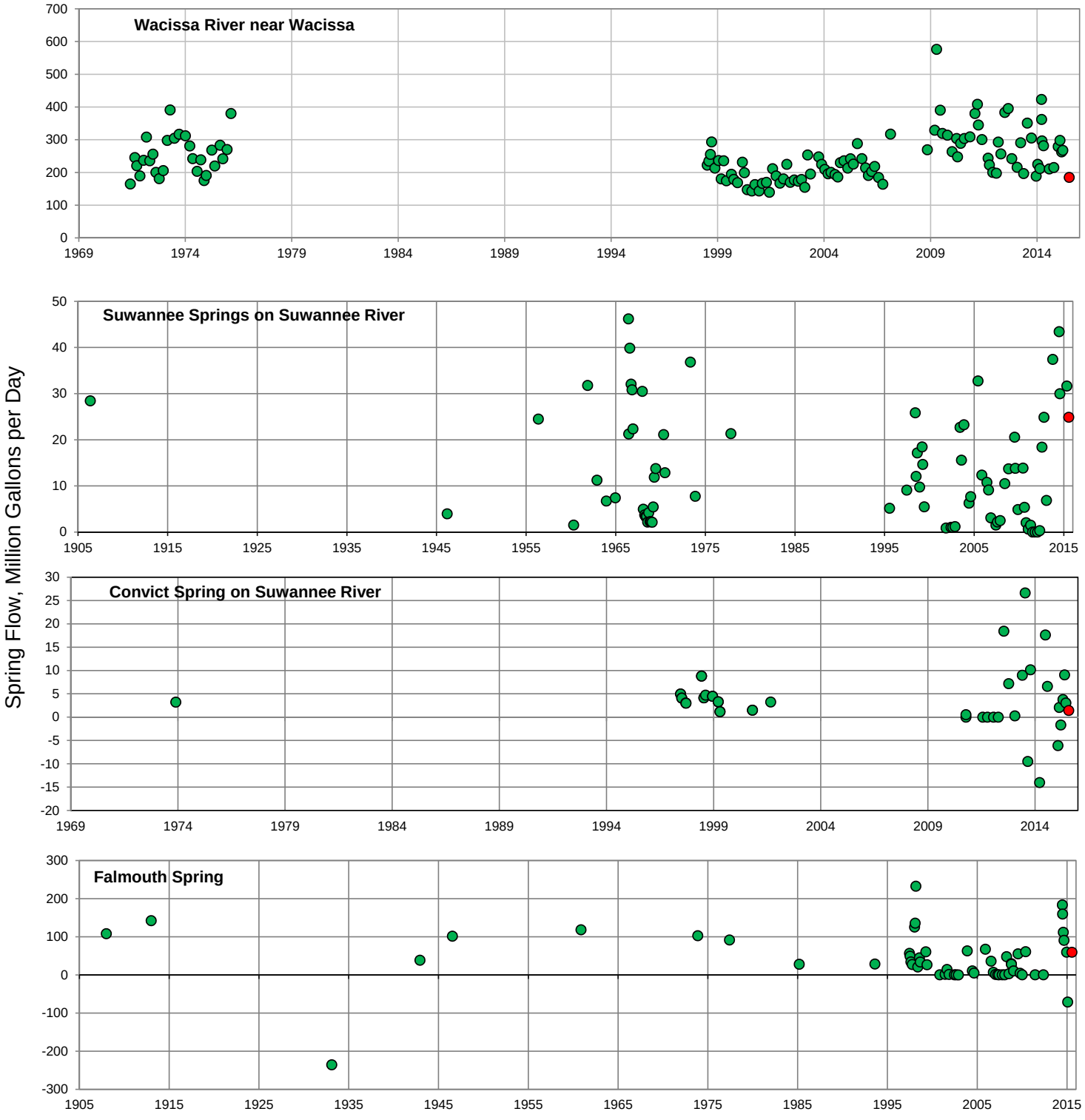


Figure 9: Monthly Springflow Measurements

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



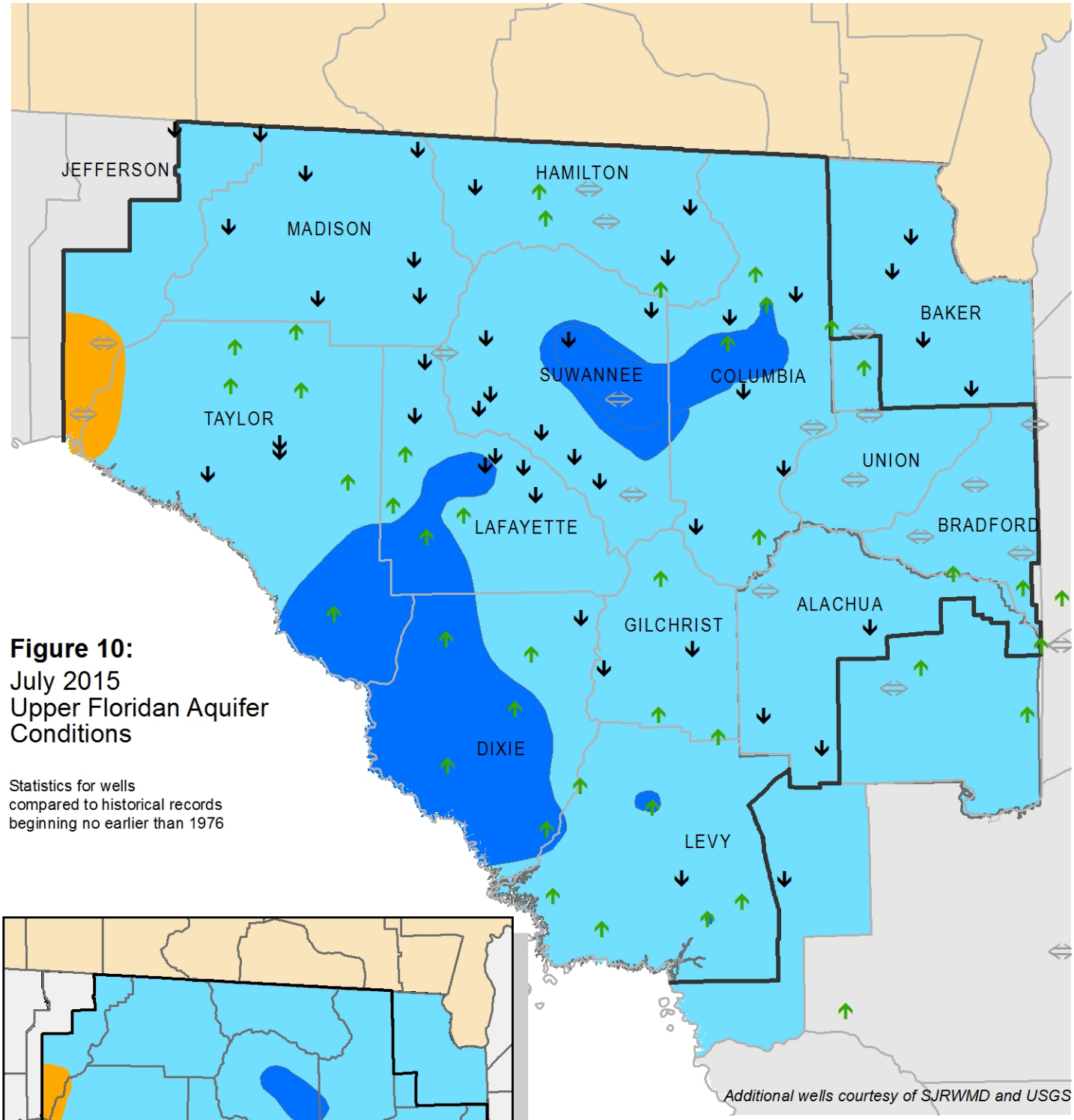
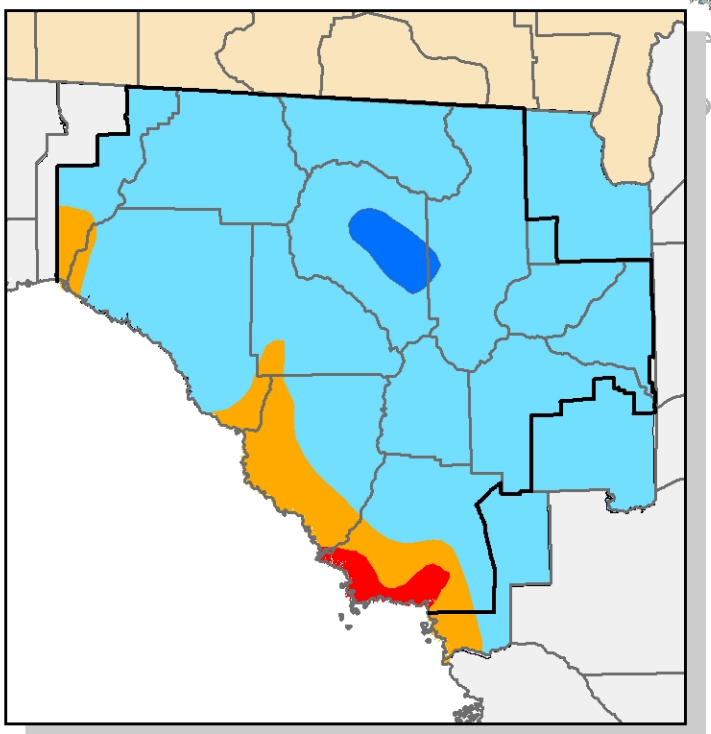


Figure 10:
July 2015
Upper Floridan Aquifer
Conditions

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



Inset: June 2015 Groundwater Levels

High
(Greater than 75th Percentile)

Normal
(25th to 75th Percentile)

Low
(10th to 25th Percentile)

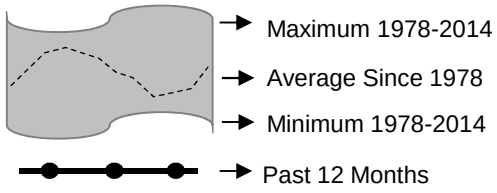
Extremely Low
(Less than 10th Percentile)

Increase/decrease in level since last month

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

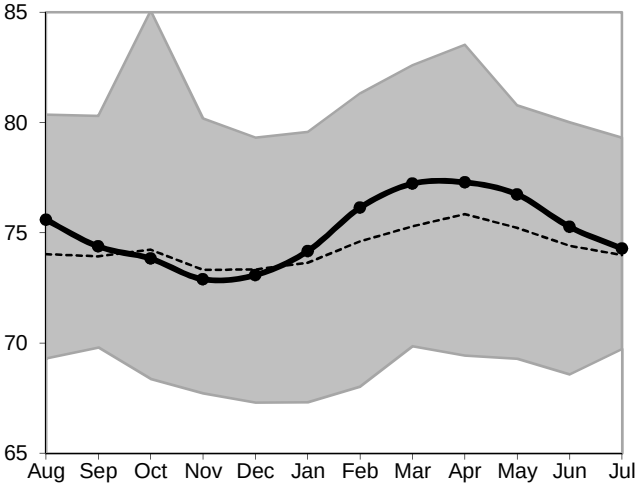
District Boundary

Figure 11: Monthly Groundwater Level Statistics
Levels August 1, 2014 through July 31, 2015
Period of Record Beginning 1978

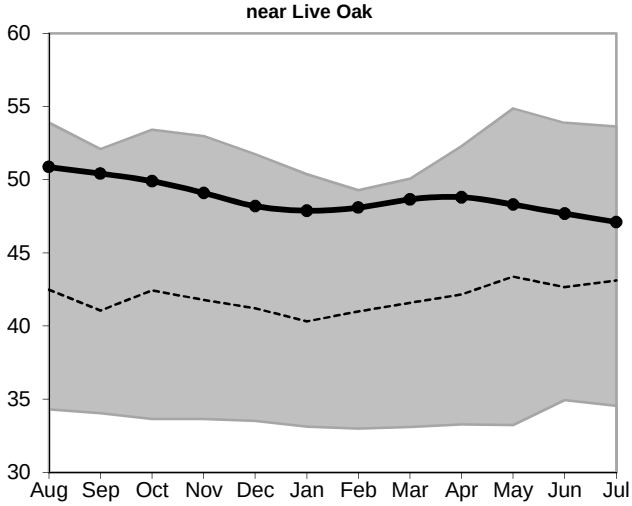


Upper Floridan Aquifer Elevation above NGVD 1929, Feet

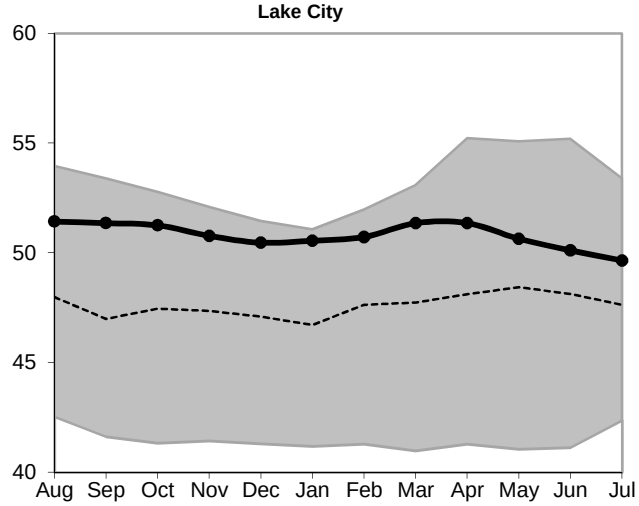
Madison County N010719001
near Greenville



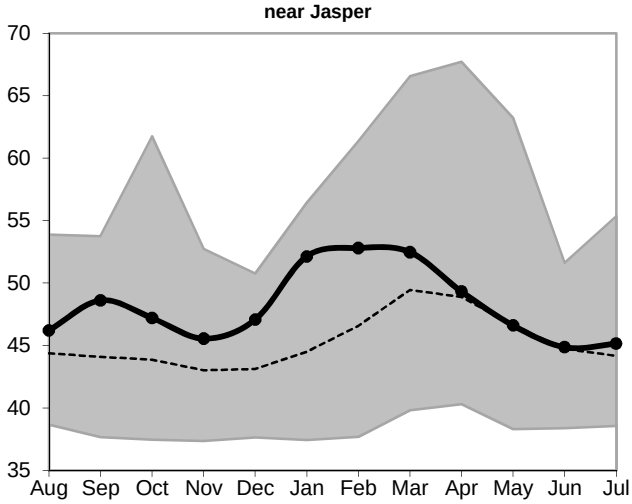
Suwannee County S021335001
near Live Oak



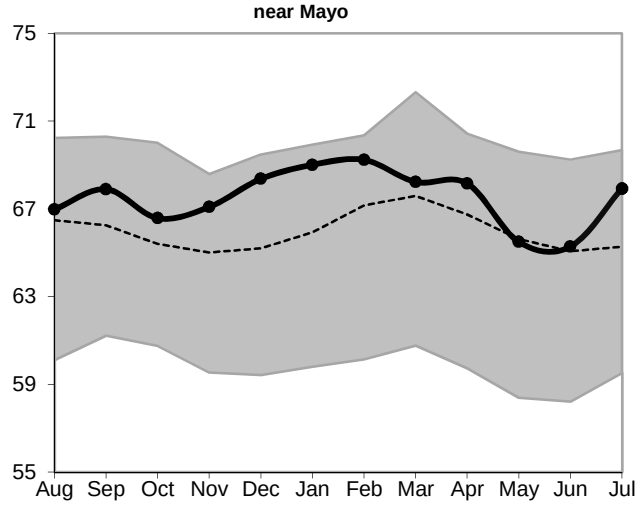
Columbia County S041705001
Lake City



Hamilton County N011422007
near Jasper



Lafayette County S061114001
near Mayo



Taylor County S050701001
near Perry

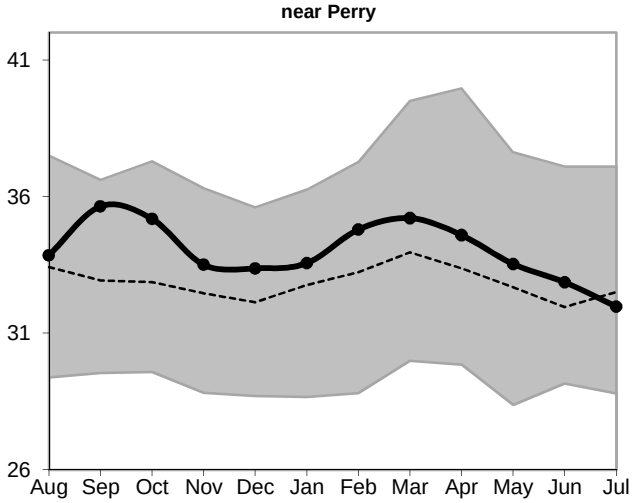
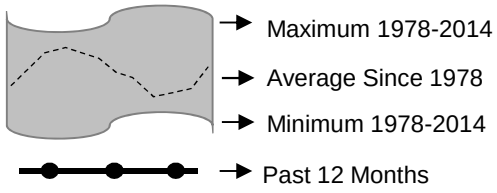
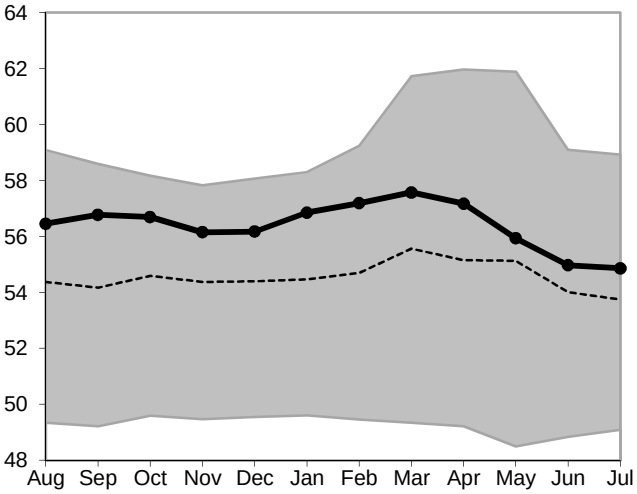


Figure 11, cont.: Groundwater Level Statistics
Levels August 1, 2014 through July 31, 2015
Period of Record Beginning 1978

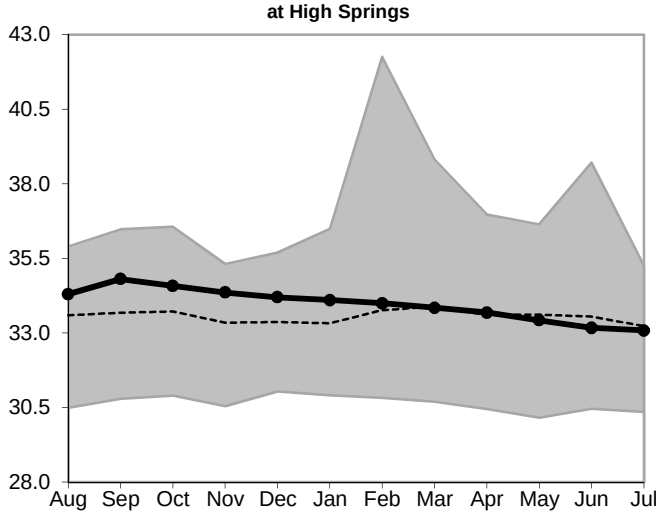


Upper Floridan Aquifer Elevation above NGVD 1929, Feet

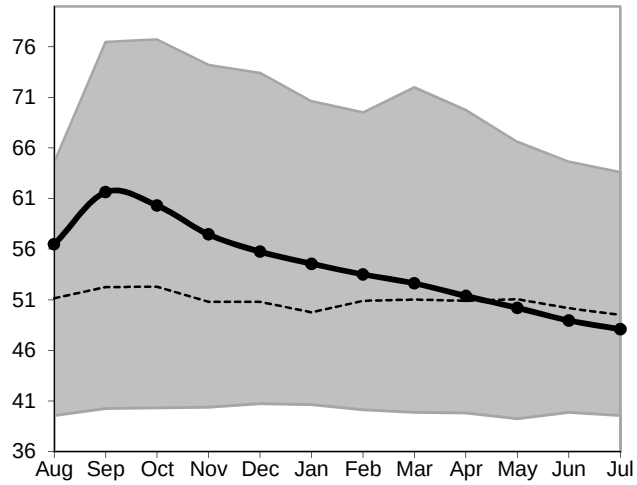
Union County S051933001
near Lake Butler



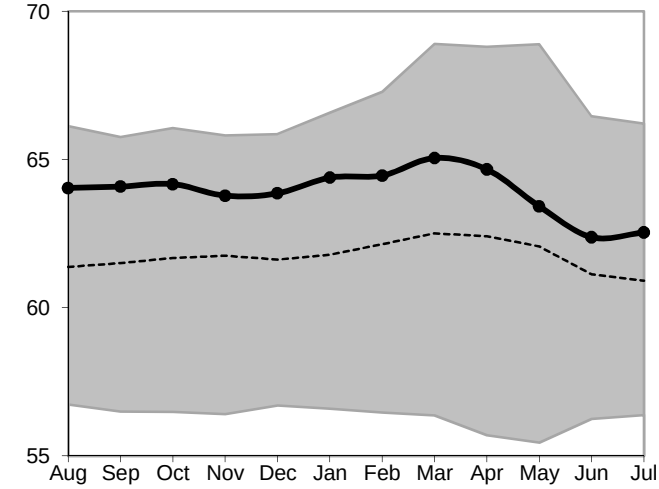
Alachua County S081703001
at High Springs



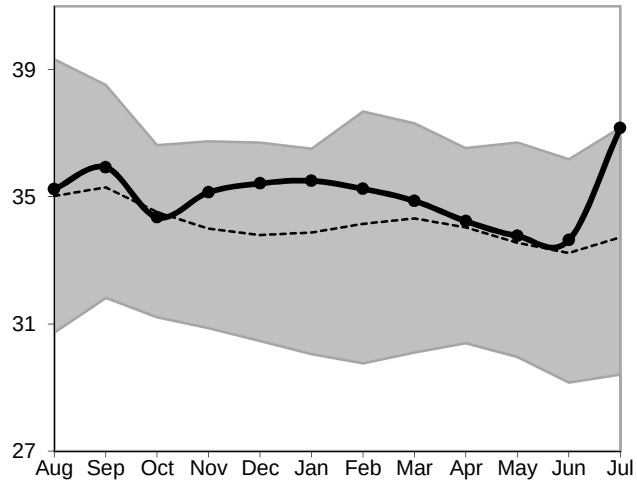
Gilchrist County S091607001
near Trenton



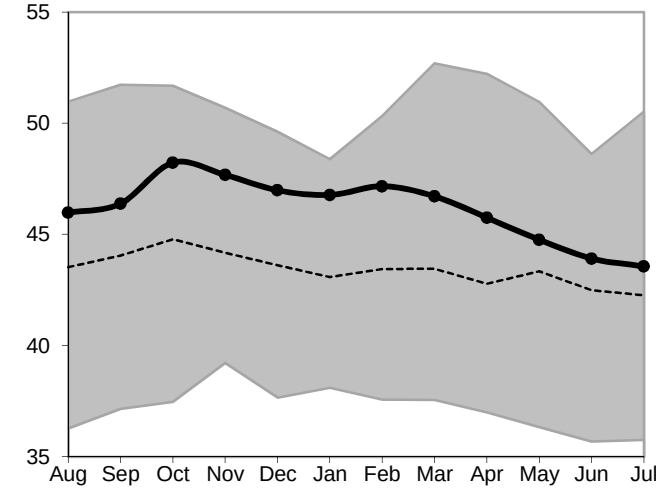
Bradford County S072132001
near Graham



Dixie County S101210001
at Cross City



Levy County S131736001
near Bronson



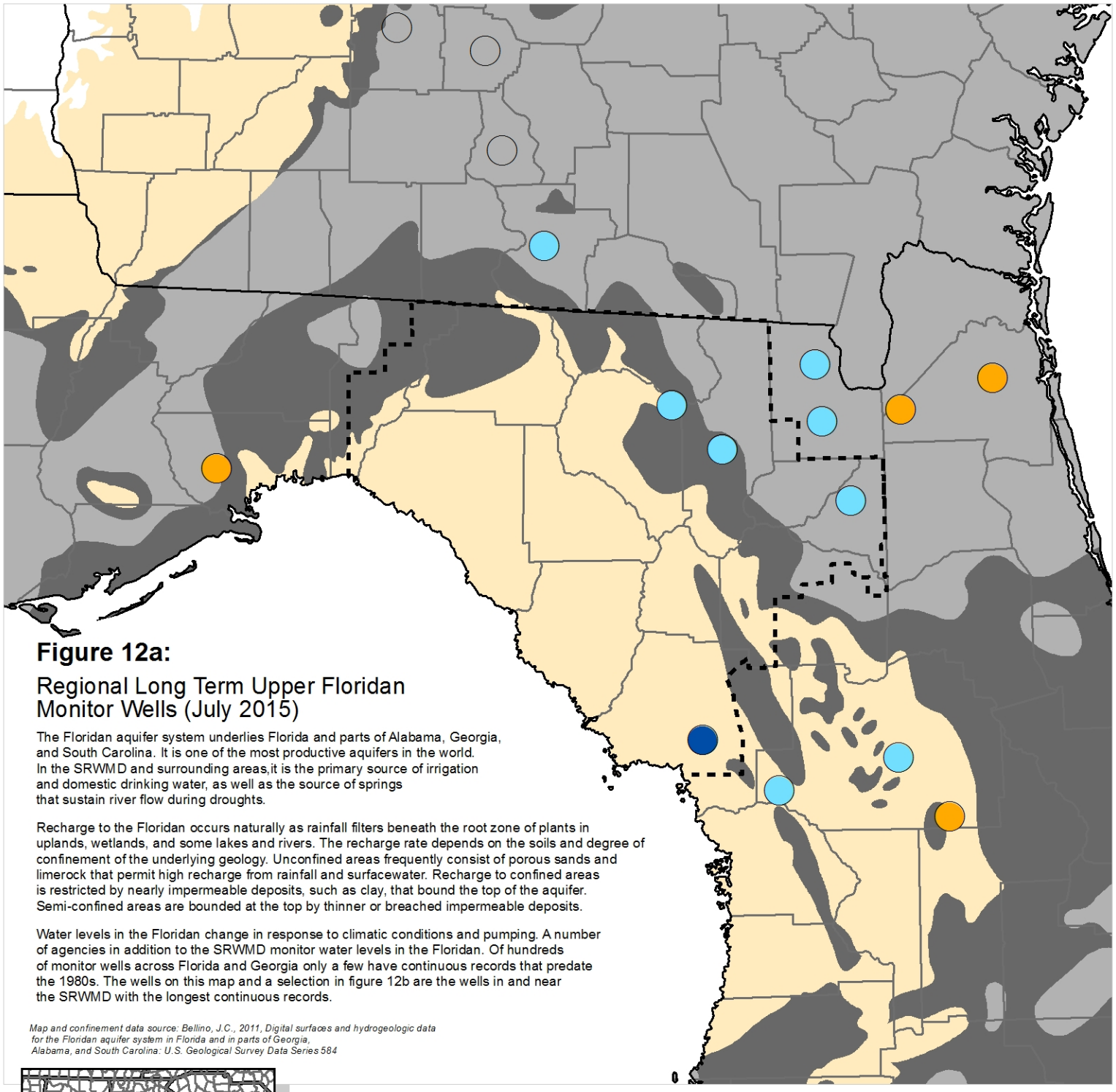


Figure 12a:

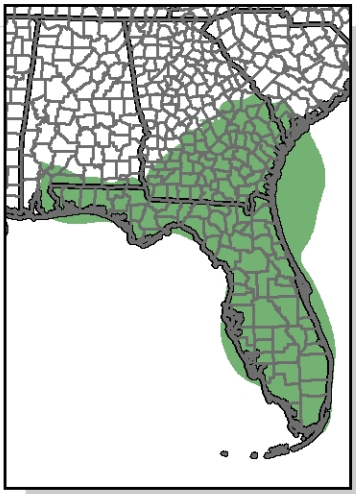
Regional Long Term Upper Floridan Monitor Wells (July 2015)

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

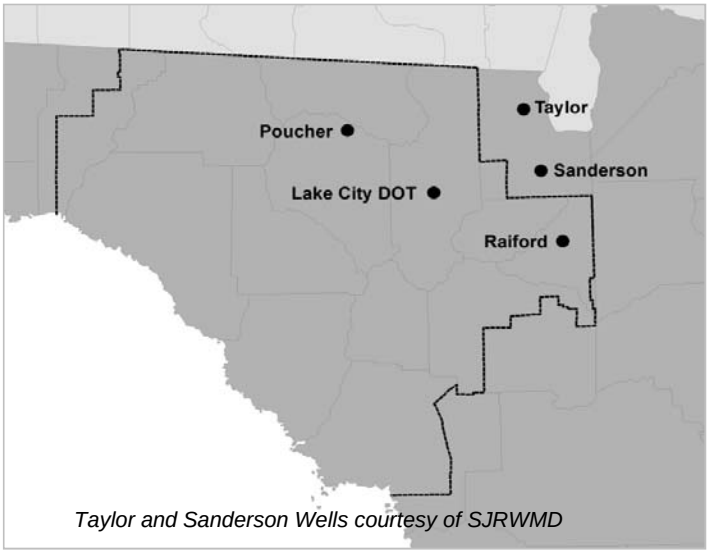
- Confined: Upper confining unit is generally greater than 100 feet thick and unbreached. Recharge is low.
- Semi-confined: Upper confining unit is generally less than 100 feet thick, breached, or both. Recharge is moderate.
- Unconfined: Upper confining unit is absent or very thin. Recharge is high.

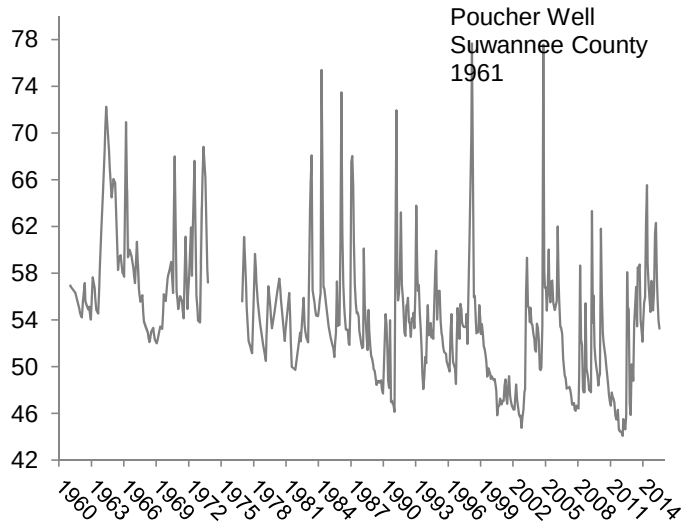
Percentile of Most Recent Water Level Relative to Entire Record

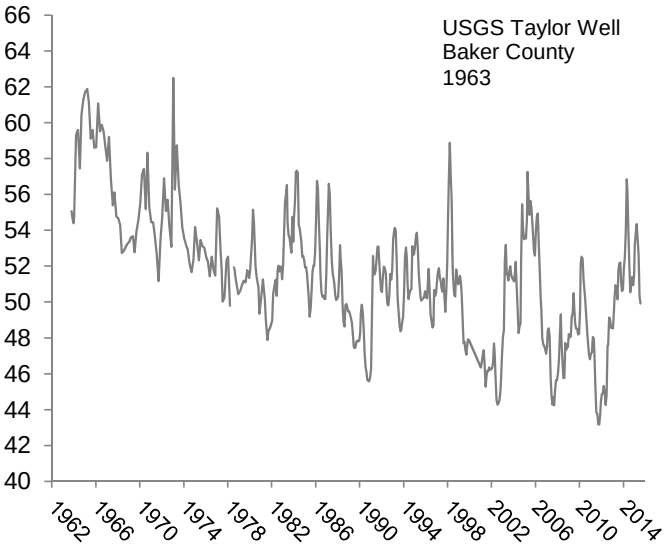
- High (Greater than 75th Percentile)
- Normal (25th to 75th Percentile)
- Low (10th to 25th Percentile)
- Extremely Low (Less than 10th Percentile)
- Not Available
- SRWMD Boundary

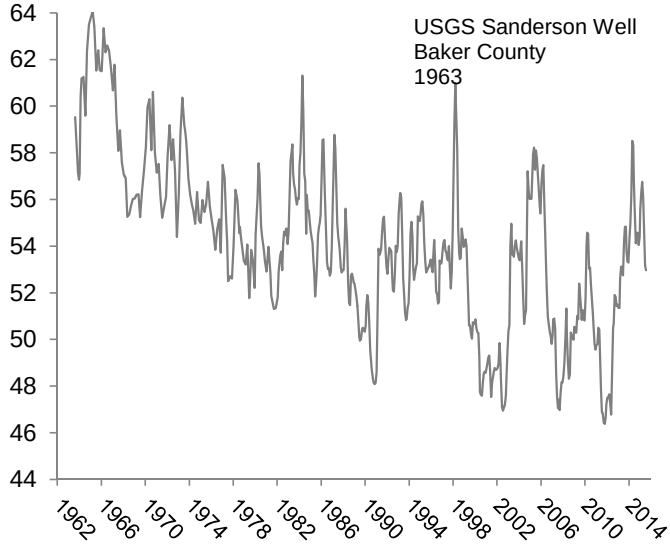
Figure 12b: Regional Long Term Upper Floridan Levels

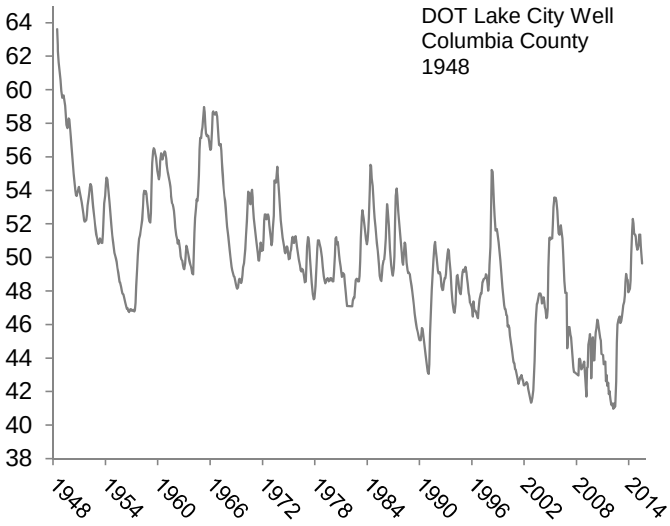
July 2015

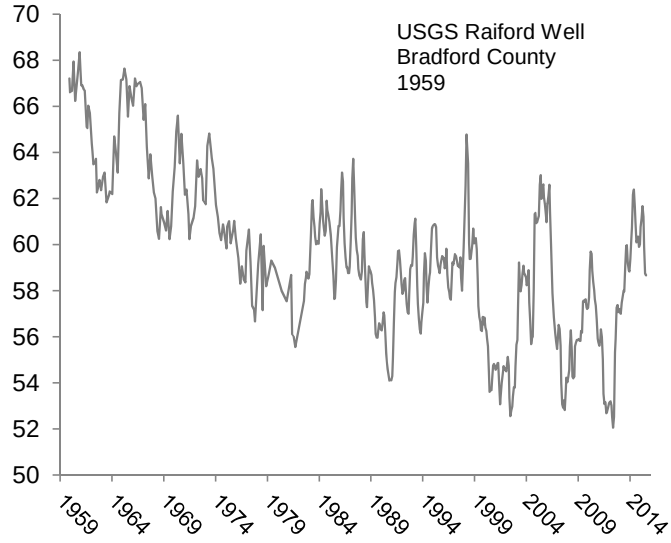












Upper Floridan Aquifer Elevation above NGVD 1929, Feet