MEMORANDUM

TO: Governing Board

FROM: Megan Wetherington, P.E., Senior Professional Engineer

THRU: Ann B. Shortelle, Ph.D., Executive Director
Erich Marzolf, Ph.D., Division Director, Water Resources

DATE: September 5, 2014

RE: August 2014 Hydrologic Conditions Report for the District

RAINFALL

- District-wide rainfall in August was 5.39", which is about 70% of normal based on records beginning in 1932. Totals were half of normal or less in Baker, Madison and Jefferson counties (Table 1, Figure 1). Isolated areas in Alachua, Levy, and Hamilton counties saw as much as 15". Watersheds in Georgia that contribute to the Suwannee River were mostly below normal (Figure 3) for the third month in a row.
- The lowest gaged monthly total was 2.29" at Wacissa Tower in Jefferson County. The highest gaged total was 12.74" at the Alapaha Tower in Hamilton County which also had the highest 24-hour total of 3.96".
- Average rainfall for the 12 months ending August 31 was 1.4" higher than the long-term average of 54.63". Twelve-month departures from normal ranged from up to 15" below normal in isolated areas of the Santa Fe basin to 15" above normal in coastal areas (Figure 4).
- Average rainfall for the 3 months ending August 31 was 7.2" lower than the long-term average of 21.9". This was the second-driest June-August period since 1932, and the driest in 50 years. Six District rain gages reported totals less than the 50-year (2%) 3-month drought, 3 were less than the 20-year (5%) drought, and 9 were less than the 10-year (10%) drought based on long-term Lake City statistics from the National Drought Atlas. The Aucilla basin had 3-month deficits up to 15" (Figure 5).

SURFACEWATER

- **Rivers:** Gages on the Alapaha and Withlacoochee rivers in Georgia remained much below normal throughout the month. New daily low flow records (flows compared to the same day throughout the history of the gage) were set at the Withlacoochee River near Quitman on August 26-28 exactly one year after setting new record daily high flows, based on records beginning in 1929. Flows improved to near normal at the gage on the last day of the month. Gages farther downstream on the Withlacoochee and Alapaha rivers reported flows lower than the 25th percentile, considered below normal. Middle Suwannee and lower Santa Fe gages fell steadily but remained in a range considered typical of the season. The Suwannee River at Branford fell below its median flow for the first time since February. Coastal river conditions were typical of the season, but some fell below normal at the end of the month. Flow statistics for a number of rivers are presented graphically in Figure 6, and conditions relative to historic conditions in Figure 7.
- **Lakes**: Levels at monitored lakes fell in August with the exception of Palestine Lake in Union County. Four of the 14 lakes had levels below median. Figure 8 shows levels relative to the long-term average, minimum, and maximum levels for a number of monitored lakes.
- **Springs**: Fourteen springs or spring groups were measured by the USGS or District staff in August. All fourteen had lower flows than earlier in the summer, but only the Ichetucknee River and the Alapaha Rise had flows lower than their long-term median. White Sulphur Springs continued to flow into the Suwannee River, but the flow remained too fast to safely measure. Statistics for a number of springs are shown in Figure 9.

GROUNDWATER

Upper Floridan aquifer levels continued to fall after peaking at a 9-year high in April. Levels dropped to the 72nd percentile in August from the 82nd percentile in July based on records beginning no earlier than the 1970s (Figure 10). Two wells in southern Jefferson County and the Horseshoe Tower well in Dixie County fell below the 25th percentile, considered low. Nineteen percent of the wells were below median. Forty-three percent were above the 75th percentile, considered high. Statistics for a representative sample of wells are shown in Figure 11, and statistics for a number of regional long-term wells are shown 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, evaluates the severity and frequency of abnormally dry or wet weather using precipitation, temperature, and soil moisture data. The PDSI values for the week ending August 30 indicated near-normal conditions in north Florida and moderate drought in south Georgia.
- The National Weather Service Climate Prediction Center (CPC) three-month outlook showed equal chances of above- or below-normal precipitation through November. The El Niño watch issued by the CPC in March remained in effect. Their September 4 report indicated a 60-65% chance of development. Most of the models continued to predict El Niño development between September and November with a peak at weak strength during the late fall and early winter. According to the National Weather Service, El Niño effects, including enhanced precipitation and severe weather in the southeast, are strongest in the fall, winter, and spring. During hurricane season (June 1 – November 30) El Niño can reduce the formation of tropical cyclones in the Atlantic by causing increased wind shear.
- On August 7, CPC forecasters downgraded the probability of an active hurricane season in their update to the Atlantic Hurricane Season Outlook. The update predicted a 70 percent chance of a below-normal season, a 25 percent chance of a near-normal season and only a five percent chance of an above-normal season. The probabilities in the initial outlook issued on May 22 were 50 percent, 40 percent and 10 percent, respectively. The update predicted a 70% chance of 7 to 12 named storms, including 3 to 6 hurricanes of which up to 2 could become major hurricanes (Category 3, 4, or 5).
- The U.S. Drought Monitor report of September 2 showed severe drought in Georgia counties within the Aucilla, Withlacoochee, and Alapaha watersheds. Moderate drought appeared in Jefferson and Madison counties and in the Okefenokee Swamp. Taylor, Hamilton, Suwannee, Columbia, and Baker counties were abnormally dry.
- On August 31 the USGS characterized all watersheds as having below-normal hydrologic conditions, with the exception of the middle- and lower-Suwannee River basin which was normal.

CONSERVATION

A Phase I Water Shortage Advisory remains in effect. 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 November 2, 2014) based on a water conservation rule that applies to residential landscaping, public or commercial recreation areas, and public and commercial businesses that aren't regulated by a District-issued permit. More information about the SRWMD's year-round lawn and landscape irrigation 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	August 2014	August Average	Month % of Normal	Last 12 Months	Annual % of Normal
Alachua	6.96	7.10	98%	57.08	112%
Baker	3.39	6.59	51%	49.20	99%
Bradford	5.17	7.39	70%	48.52	96%
Columbia	5.34	6.63	80%	53.69	104%
Dixie	5.05	9.11	55%	55.65	94%
Gilchrist	5.99	7.83	77%	57.60	100%
Hamilton	5.49	6.13	90%	54.36	104%
Jefferson	2.67	6.46	41%	50.79	84%
Lafayette	5.41	7.78	69%	59.75	106%
Levy	7.70	9.80	79%	61.27	103%
Madison	3.07	6.13	50%	52.74	94%
Suwannee	5.68	6.40	89%	57.73	109%
Taylor	5.56	8.01	69%	61.55	104%
Union	6.04	7.77	78%	51.82	96%

August 2014 Average:	5.39
August Average (1932-2013):	7.52
Historical 12-month Average (1932-2013):	54.63
Past 12-Month Total:	56.07
12-Month Rainfall Surplus:	1.44

Figure 1: Comparison of District Monthly Rainfall

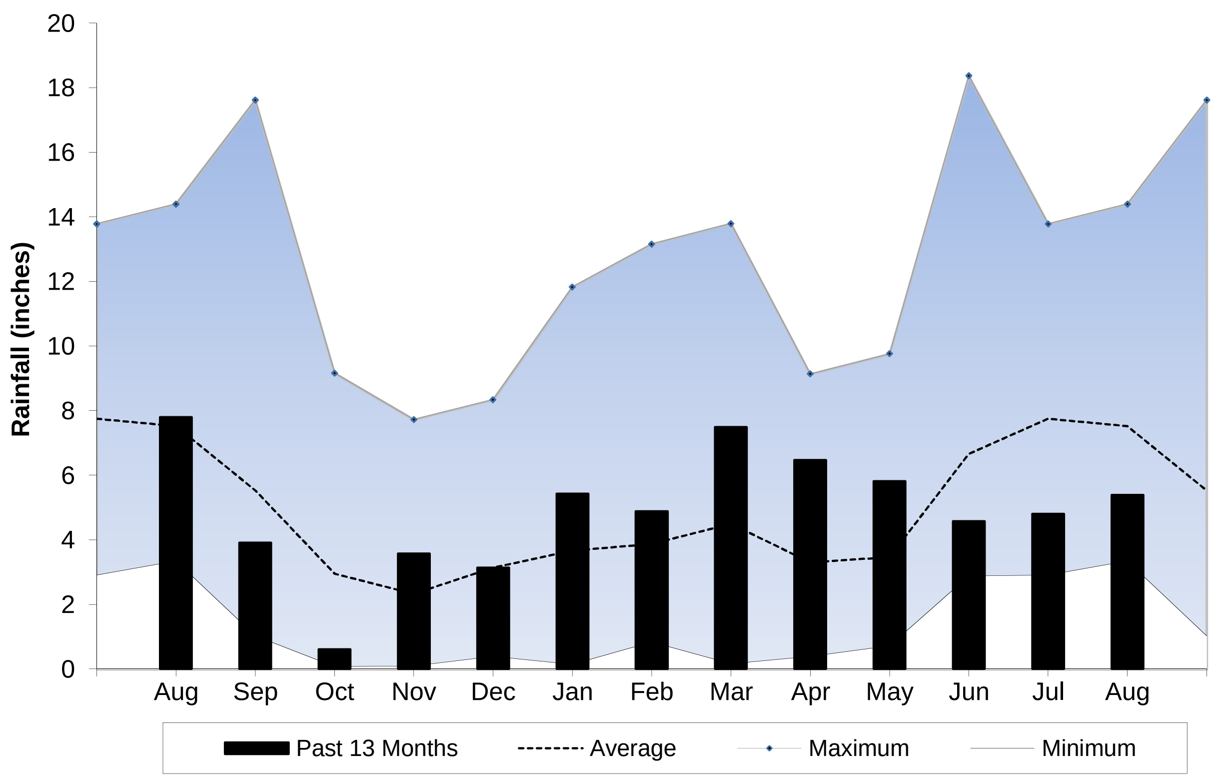


Figure 2: August 2014 Rainfall Estimate

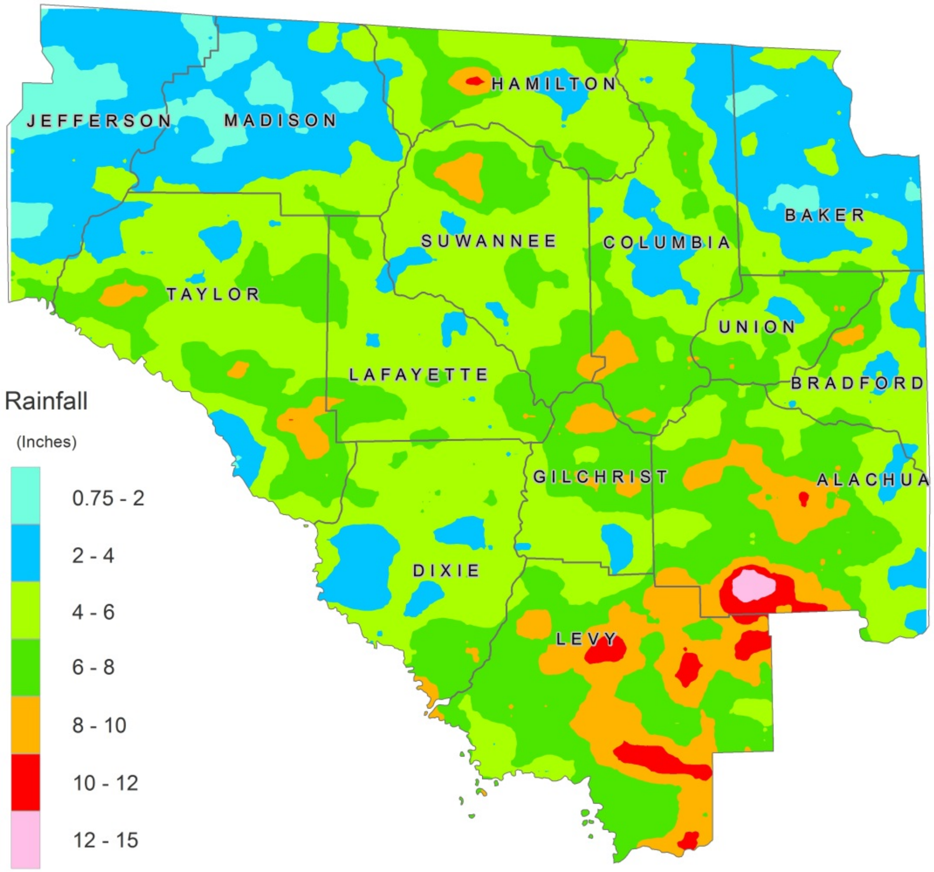


Figure 3: August 2014 Percent of Normal Rainfall

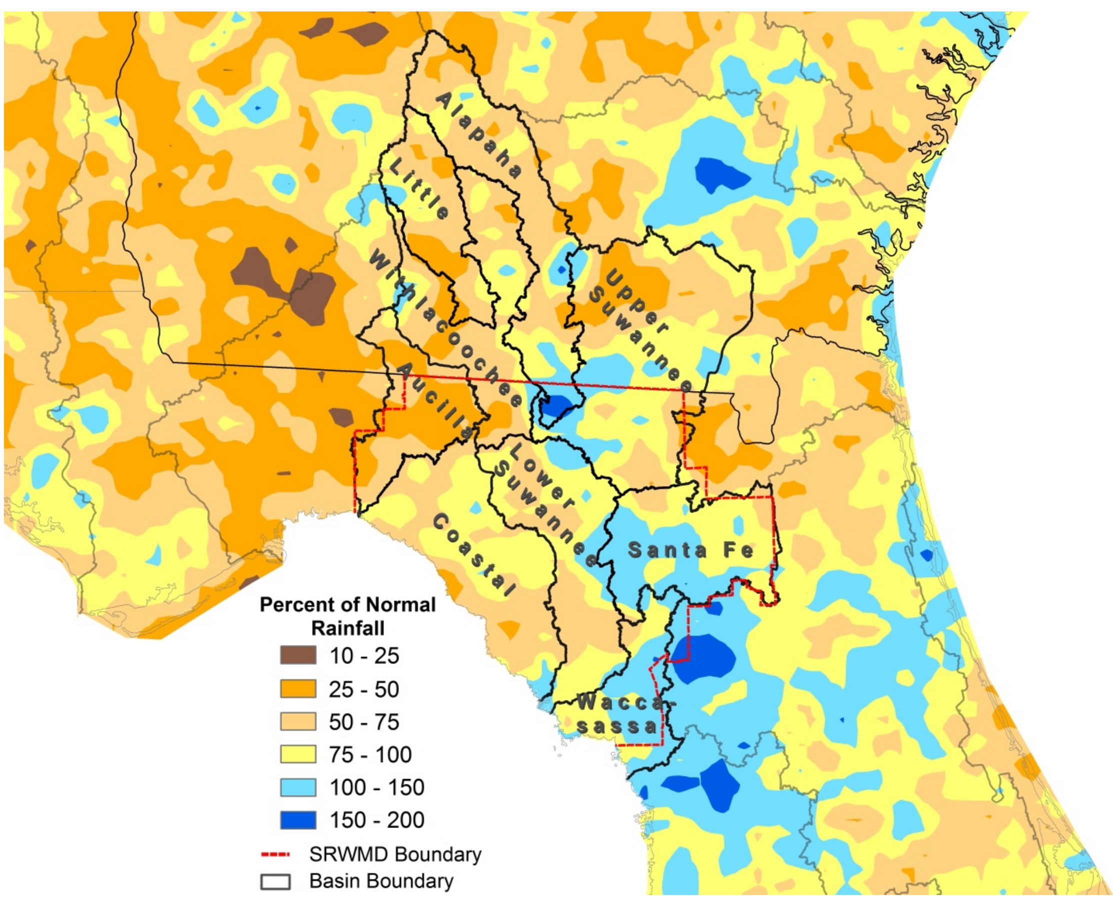
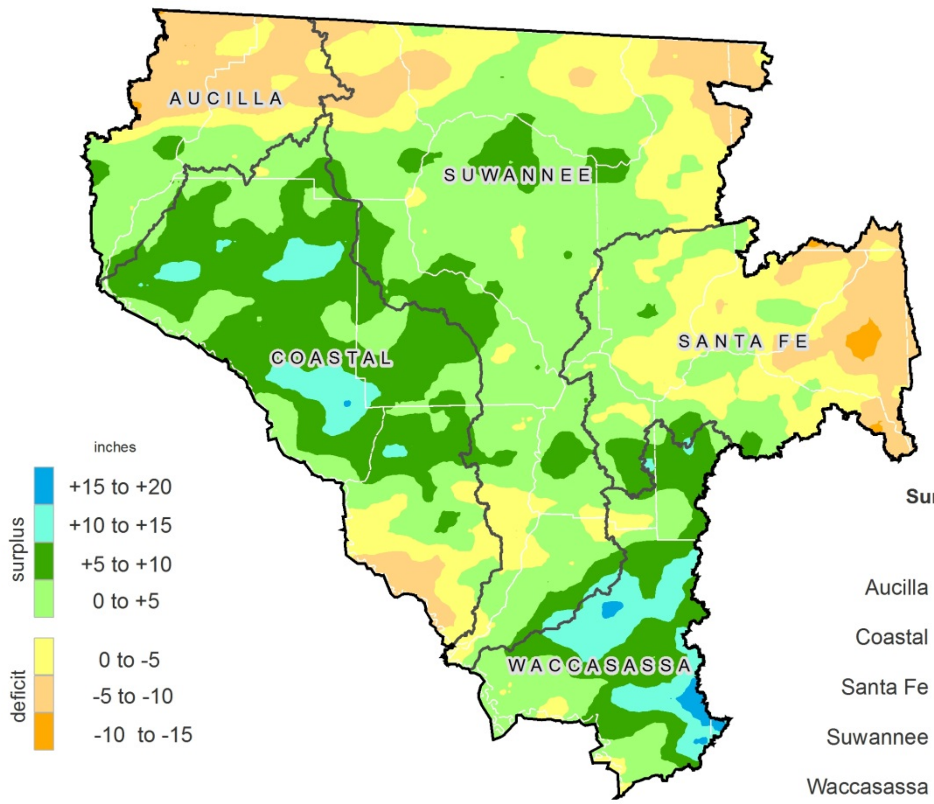


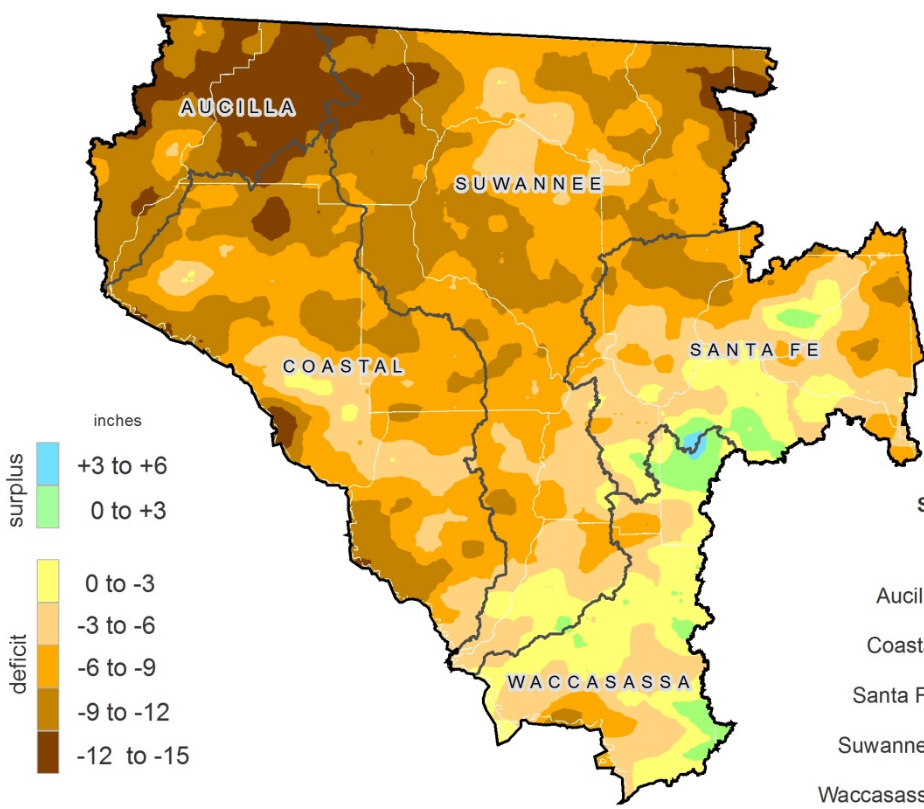
Figure 4: 12-Month Rainfall Surplus/Deficit by River Basin
Through August 31, 2014



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

	Aug -14	July -14
Aucilla	-2.8	+2.2
Coastal	+5.4	+8.6
Santa Fe	-1.7	-0.8
Suwannee	+1.2	+3.6
Waccasassa	+7.3	+9.5

Figure 5: 3-Month Rainfall Surplus/Deficit by River Basin
Through August 31, 2014

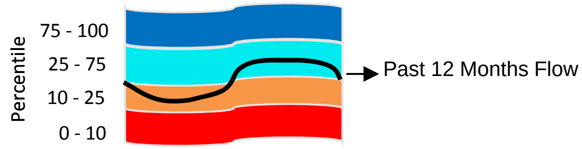


3-Month Surplus (+) or Deficit (-) By Basin

	Aug -14	July -14
Aucilla	-11.9	-6.1
Coastal	-8.0	-3.0
Santa Fe	-5.0	-0.7
Suwannee	-8.2	-3.3
Waccasassa	-2.8	-0.3

Figure 6: Daily River Flow Statistics

September 1, 2013 through August 31, 2014



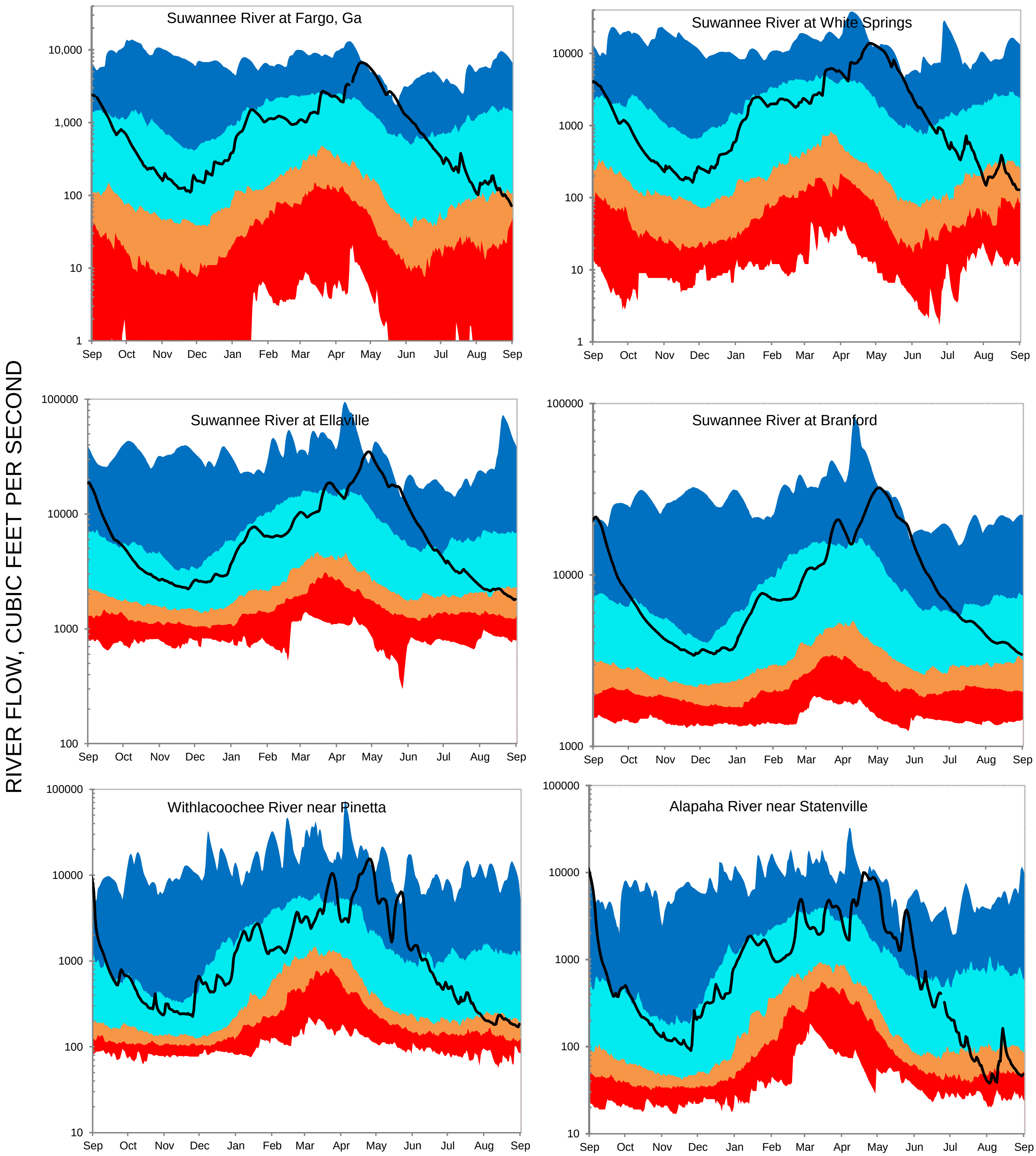
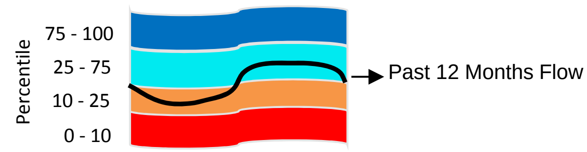
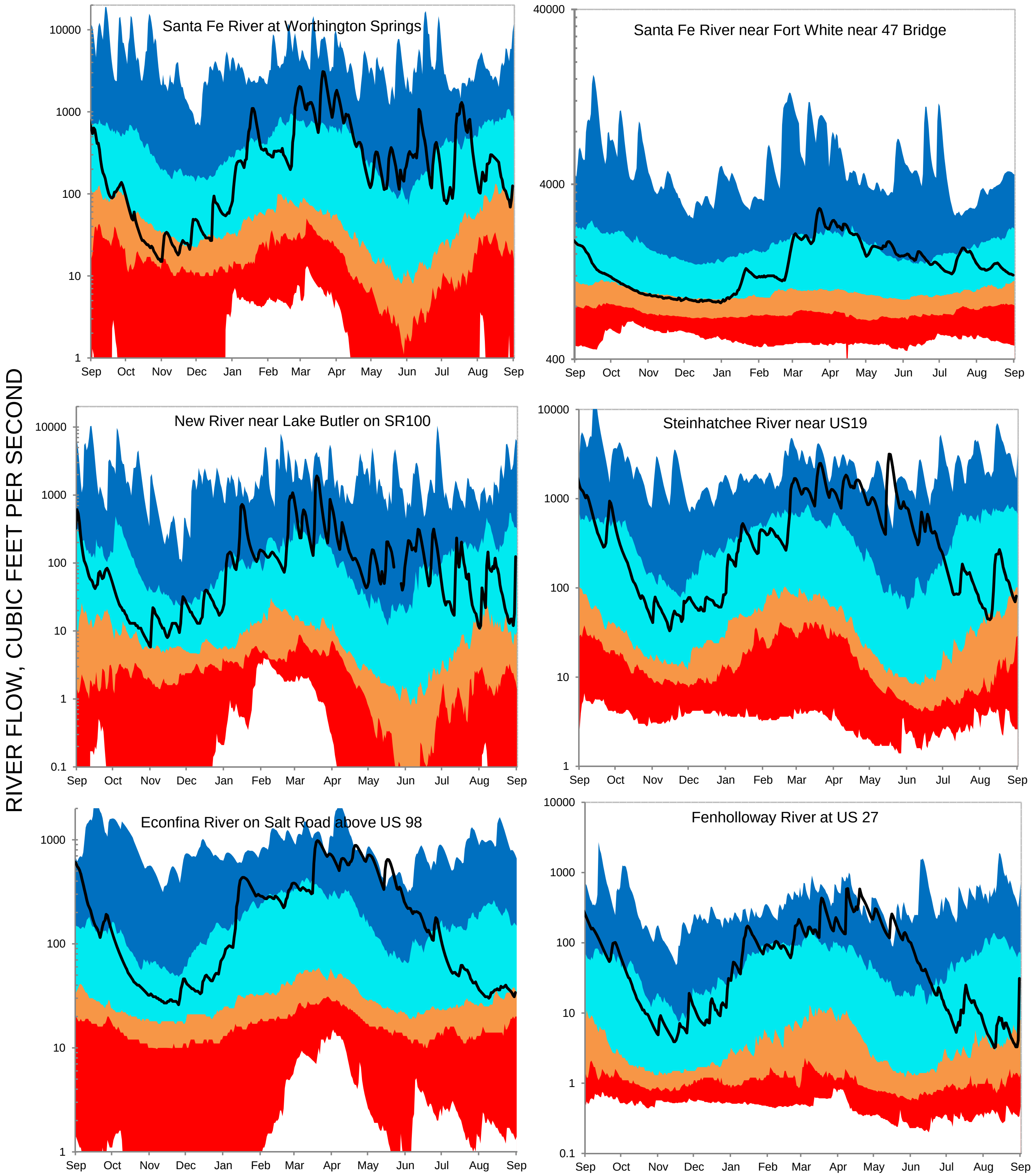


Figure 6, cont: Daily River Flow Statistics
September 1, 2013 through August 31, 2014





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.

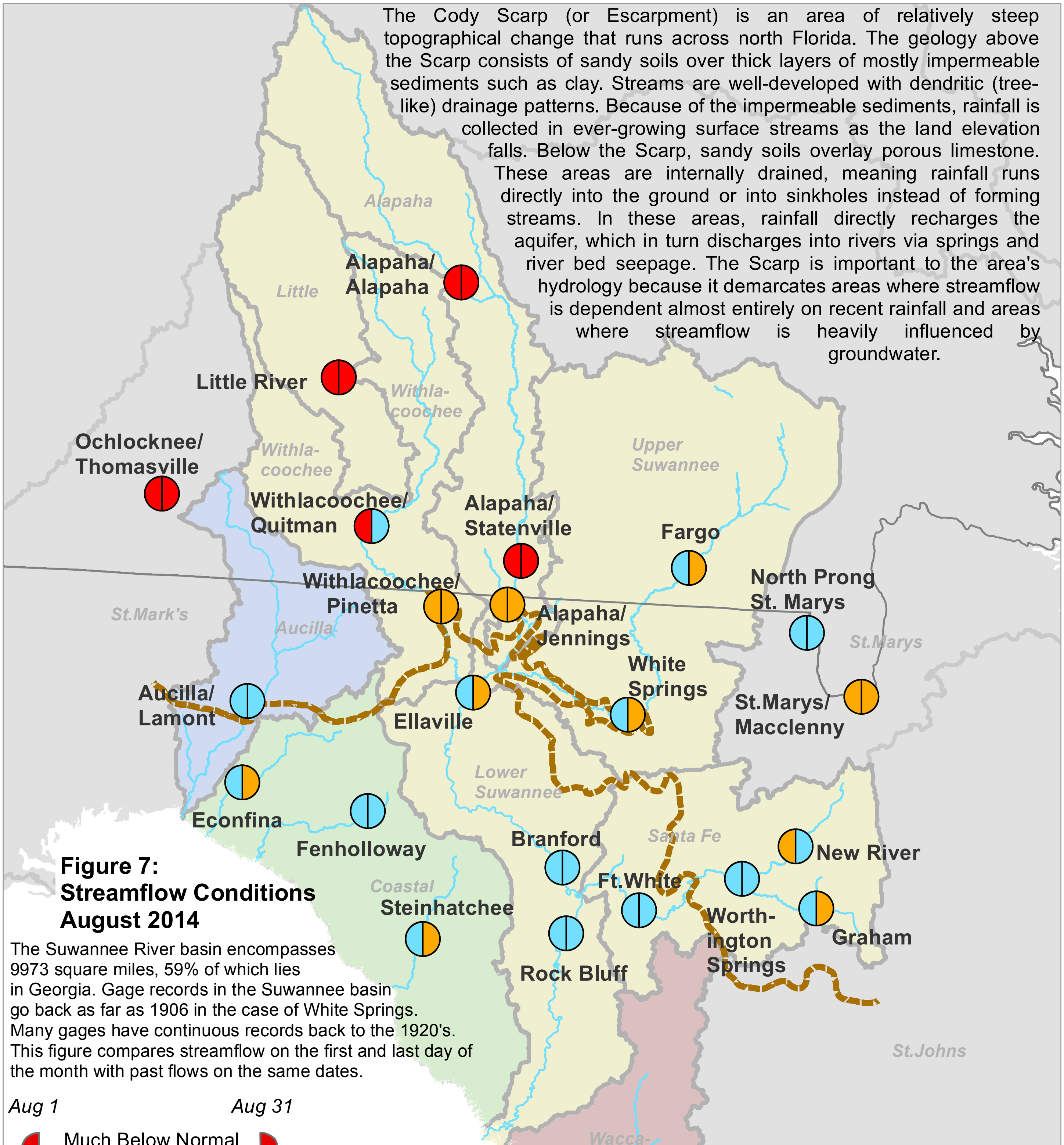


Figure 7: Streamflow Conditions August 2014

The Suwannee River basin encompasses 9973 square miles, 59% 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 1920's. This figure compares streamflow on the first and last day of the month with past flows on the same dates.

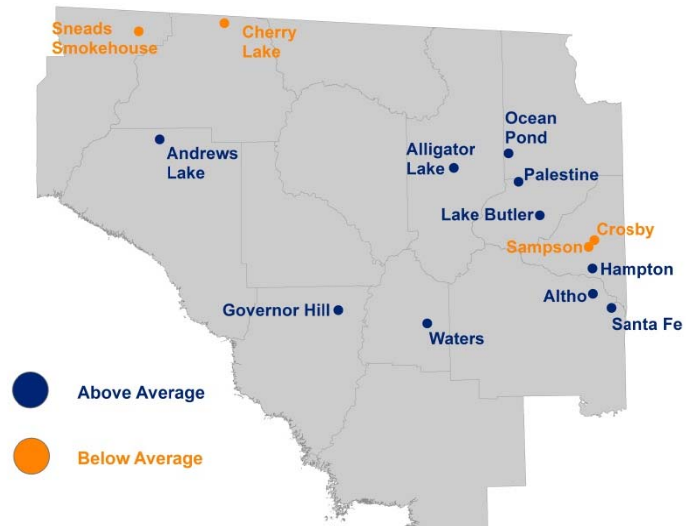
Aug 1 / *Aug 31*

- 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: August 2014 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 records go back to the 1970s, although the Sampson Lake record starts in 1957.

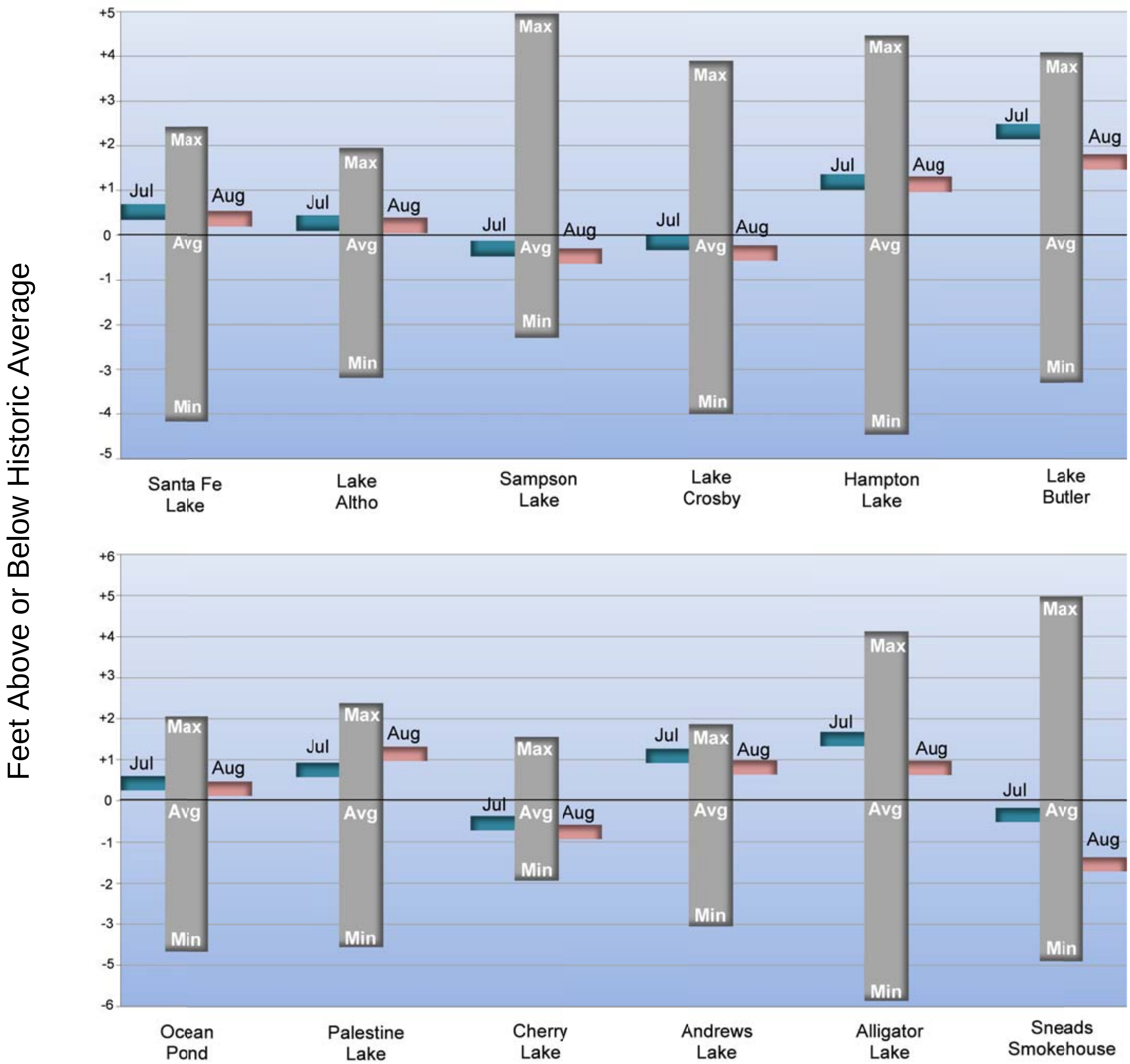


Figure 9: Quarterly Springflow Measurements

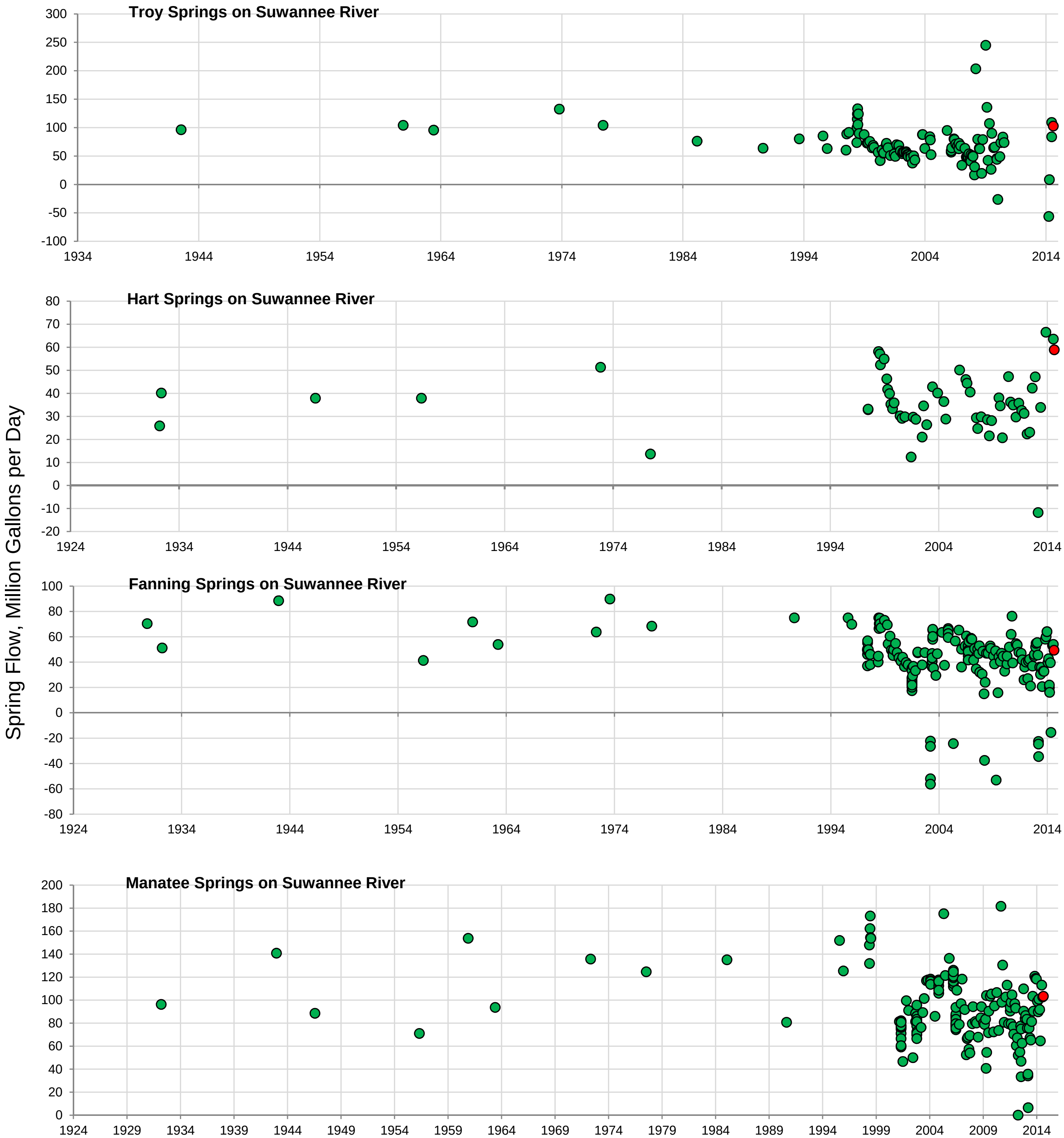
The SRWMD monitors water quality at 38 springs. Flow is usually measured at the time of the sampling. The springs below were measured in August 2014 by SRWMD staff or the USGS with the last measurement marked in red. Flow is given in million gallons per day (MGD). With the exception of the Ichetucknee River 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.

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 flows in this data are the result of flooding and not necessarily drought conditions.

Figure 9: Quarterly Springflow Measurements, continued

The SRWMD monitors water quality at 38 springs. Flow is usually measured at the time of the sampling. The springs below were measured in August 2014 by SRWMD staff or the USGS with the last measurement marked in red. Flow is given in million gallons per day (MGD). With the exception of the Ichetucknee River 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.

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 flows in this data are the result of flooding and not necessarily drought conditions.



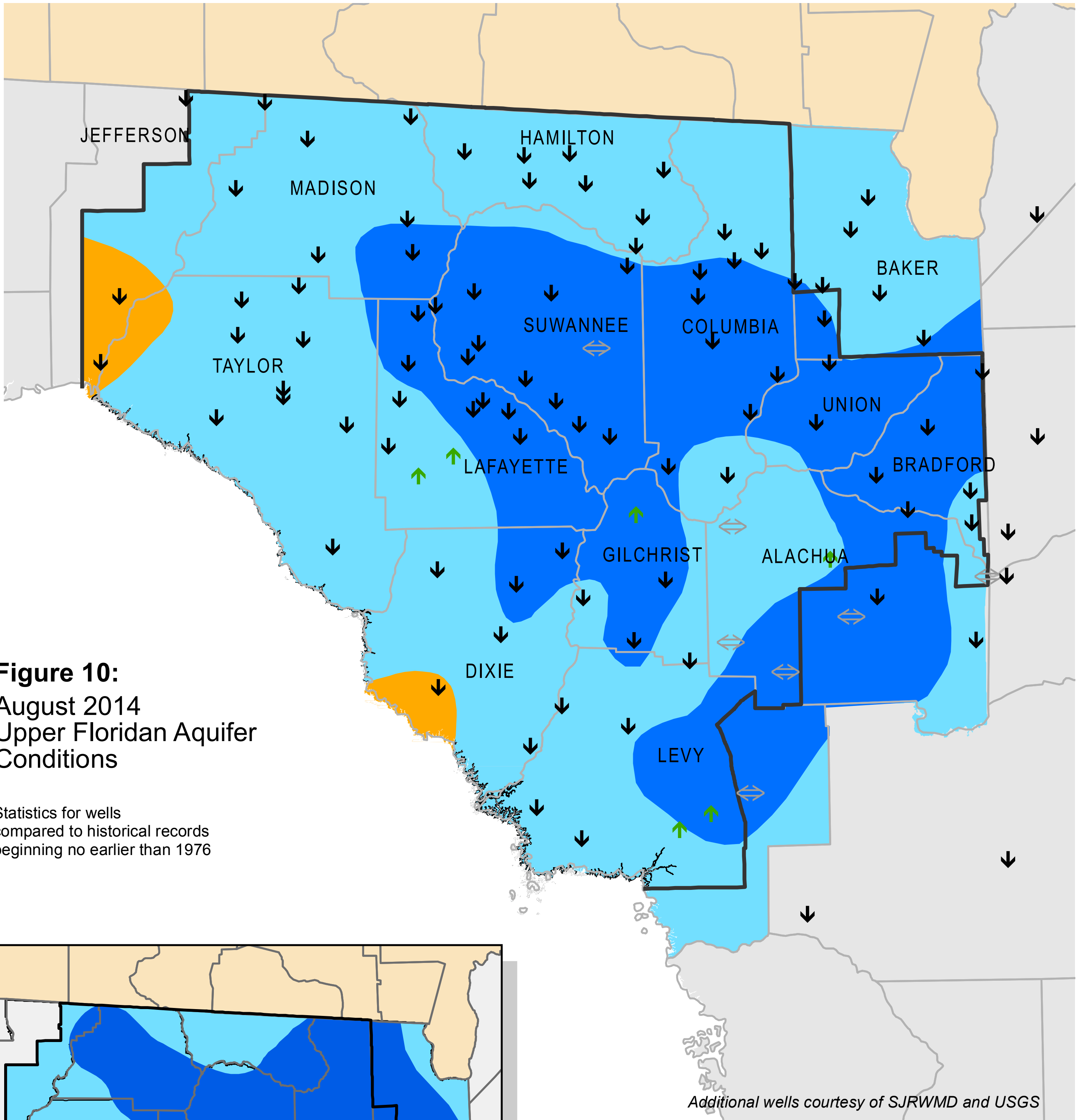
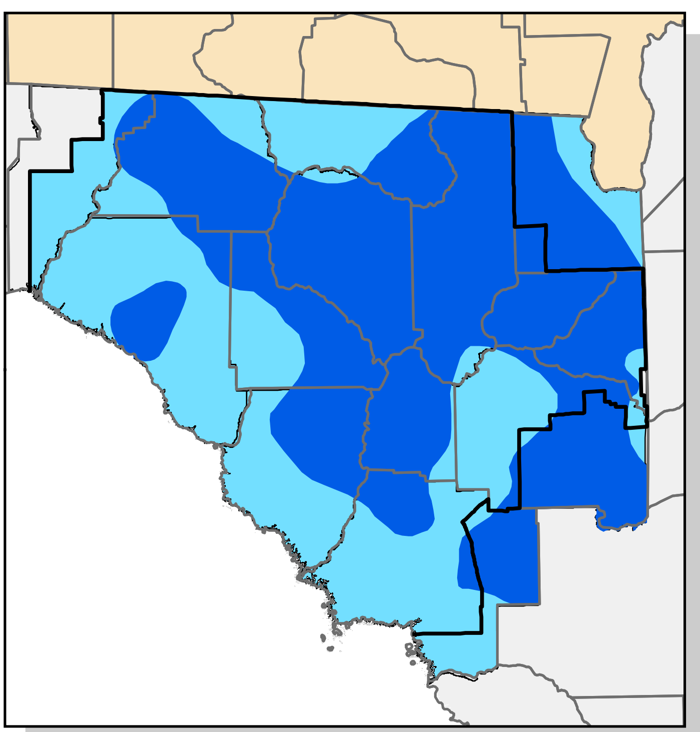


Figure 10:
August 2014
Upper Floridan Aquifer
Conditions

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



Inset: July 2014 Groundwater Levels

High
(Greater than 75th Percentile)

Normal
(25th to 75th Percentile)

Low
(10th to 25th Percentile)

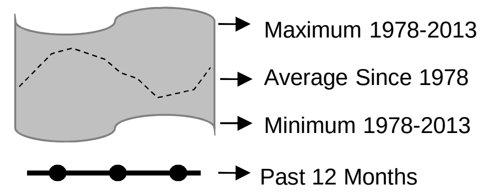
Extremely Low
(Less than 10th Percentile)

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 September 1, 2013 through August 31, 2014
Period of Record Beginning 1978



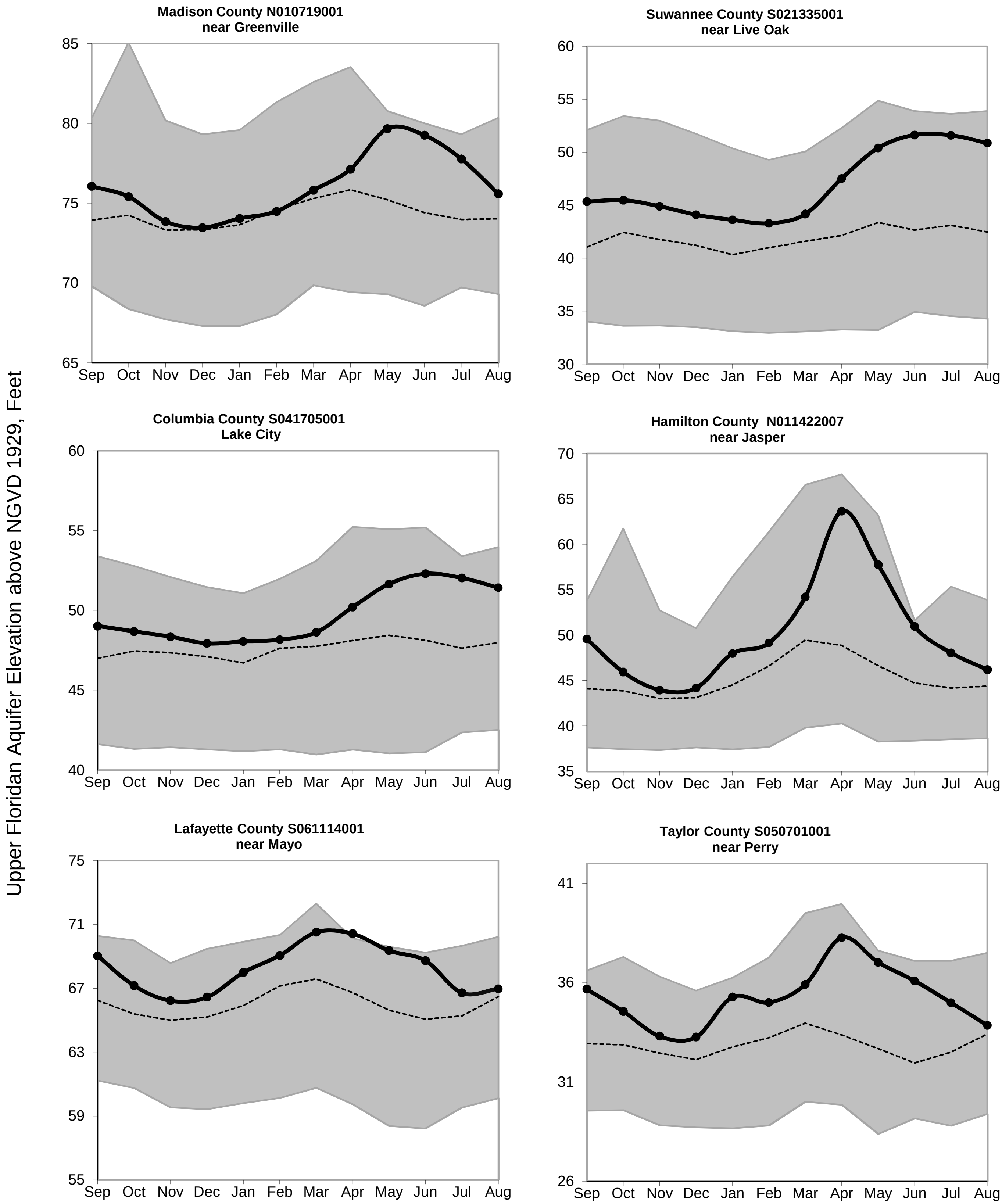
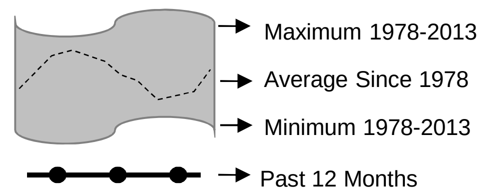
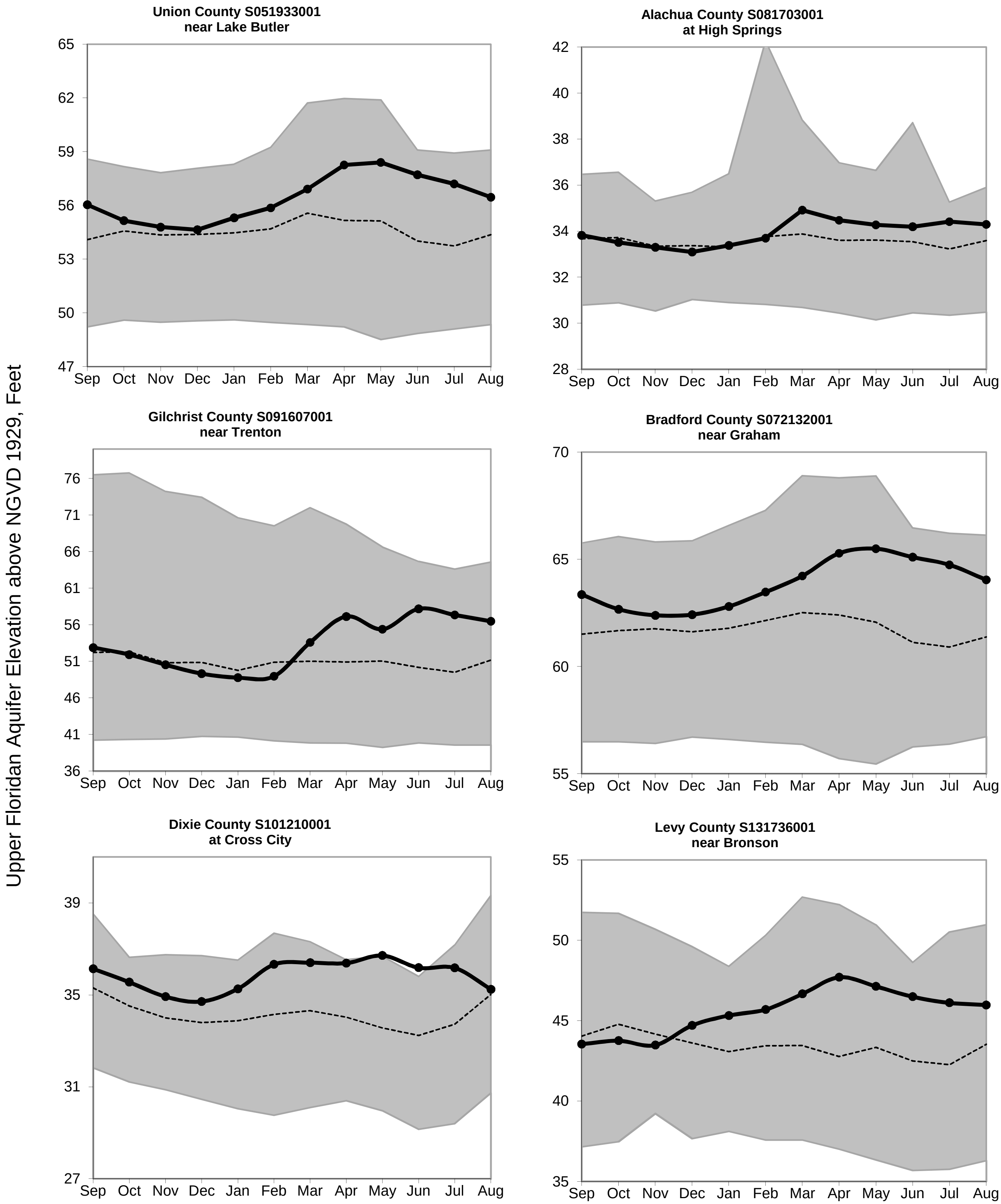


Figure 11, cont.: Groundwater Level Statistics
Levels September 1, 2013 through August 31, 2014
Period of Record Beginning 1978





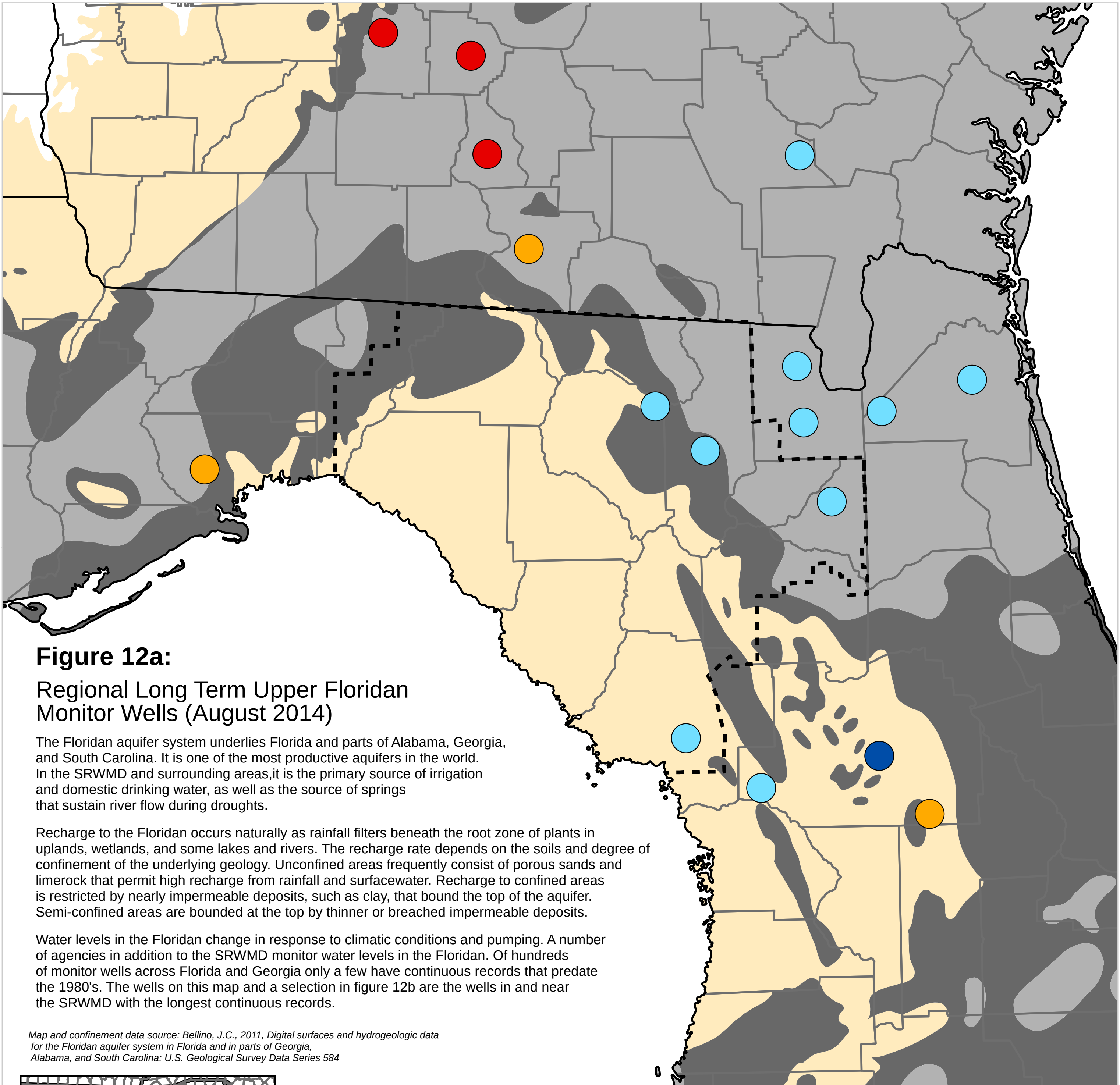


Figure 12a:

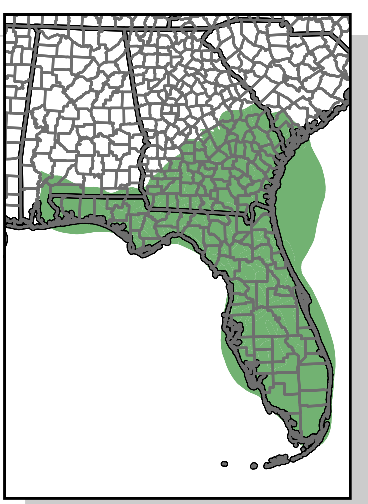
Regional Long Term Upper Floridan Monitor Wells (August 2014)

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 1980's. 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

August 2014