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: August 8, 2014

RE: July 2014 Hydrologic Conditions Report for the District

RAINFALL

- District-wide rainfall in July was 4.80", which is 62% of normal based on records beginning in 1932 (Table 1, Figure 1). This was the fourth driest July since records began in 1932, and the driest July since 1976. Totals were below normal in all counties except for Alachua which saw up to 12" from a series of storms during the first two weeks of the month (Figure 2). Large areas within Lafayette and Taylor counties had less than half of typical July rainfall. Watersheds in Georgia that contribute to the Suwannee River also saw about half of typical rainfall (Figure 3) for the second month in a row.
- The lowest gaged monthly total was 1.63" at the District's Council gage east of Fargo, followed by 2.33" at the Sanderson gage in southern Baker County. The Council total was less than the 50-year (2%) drought for July according to the National Drought Atlas. Five District gages in Lafayette, Columbia, Union, Bradford, and Baker counties exceeded the 20-year (5%) July drought. The highest gaged total was 10.75" in Lake Butler, only 9 miles from Sanderson. The highest 24-hour total was 3.64" at O'Leno State Park.
- Average rainfall for the 12 months ending July 31 was 3.85" higher than the long-term average of 54.63". Twelve-month departures from normal ranged from 10-20" above normal in Taylor and Lafayette counties to 5-10" below normal in the upper Santa Fe basin and along the Florida-Georgia line (Figure 4). Average rainfall for the 3 months ending July 31 was 2.7" lower than the long-term average of 17.9". Much of the Aucilla River basin was between 3" and 6" below normal for the last three months (Figure 5).

SURFACEWATER

- **Rivers:** Flow statistics for a number of rivers are presented graphically in Figure 6. Flows continued to fall steadily on most rivers, with the greatest declines in areas upstream of the Cody Scarp (Figure 7) where streamflow reacts quickly to dry weather. Gages on the Alapaha and Withlacoochee rivers, both major tributaries of the Suwannee River, reported their lowest flows since December 2012. The Little River, a major tributary of the Withlacoochee in Georgia, had its lowest flow since June 2011. The Suwannee River at White Springs on the upper Suwannee River saw its lowest flow in 18 months. The Georgia gages began the month with normal flows, but most ended the month with flows in the lowest 10% of July records.

  Downstream of the Cody Scarp, Suwannee River flows are sustained by groundwater and springflow and react slowly to droughts. The Suwannee at Ellaville remained above the 25th percentile at the end of the month. Fifty-one miles downstream the Suwannee at Branford remained above the 50th percentile, with a 230% increase in flow between the two gages. With virtually no surface streams in that reach of the river, the increase in flow consisted of mostly groundwater from springs.

Elsewhere in the District, upper Santa Fe River gages rose to their highest levels since April after heavy rains early in the month. Levels at the end of the month were near normal for the season. The Steinhatchee River fell to its lowest flow in over a year.

- **Lakes**: Levels at most monitored lakes fell slightly. Nine of 14 lakes remained above their long-term average levels. Figure 8 shows levels relative to the long-term average, minimum, and maximum levels for a number of monitored lakes.

- **Springs**: Of the 19 springs or spring groups measured by the USGS and District staff in July, 18 were above their historic median flows. The Wacissa River was measured with a flow of 210 MGD (million gallons per day), about 85% of its long-term median. While flows at most springs fell since June, Blue Springs in Gilchrist County was measured at 56 MGD, its highest flow since 1998 and more than double its median. Fanning Springs and Manatee Springs were both about 15% above median. Hart Springs was measured at its third-highest flow with 64 MGD, almost double its 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 82nd percentile by the end of July from the 89th percentile in June based on records beginning no earlier than the 1970s. Falling levels were widespread in coastal counties but continued to climb slowly in Alachua County (Figure 10). Ninety percent of upper Floridan monitor wells had levels higher than their historic median. Sixty-four percent were above the 75th percentile, considered high. Twenty-two percent were above the 90th percentile, considered very high. Ten wells were below their long-term median. 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 2 indicated near-normal conditions in north Florida and south Georgia but with the index approaching moderate drought.
- The National Weather Service Climate Prediction Center (CPC) three-month outlook showed equal chances of above- or below-normal precipitation through October. The El Niño watch issued by the CPC in March remained in effect. Their August 7 report indicated a 65% chance of El Niño development in the fall and winter, with the event potentially continuing into the spring of 2015. The model consensus was for the El Niño to emerge by October and peak at weak strength during the late fall and early winter. None of the models predicted a strong event. 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 August 5 showed abnormally dry conditions in south Georgia and in Jefferson, Madison, Taylor, and Hamilton counties. Moderate drought was indicated for the upper part of the Alapaha River basin in Georgia.

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	July 2014	July Average	Month % of Normal	Last 12 Months	Annual % of Normal
Alachua	7.89	7.01	113%	56.77	111%
Baker	4.24	7.06	60%	52.38	105%
Bradford	6.04	6.92	87%	49.87	98%
Columbia	4.19	7.01	60%	54.95	107%
Dixie	4.58	9.14	50%	58.12	98%
Gilchrist	5.50	8.03	68%	60.42	105%
Hamilton	4.38	6.79	65%	54.27	104%
Jefferson	4.08	7.23	56%	54.97	91%
Lafayette	3.52	8.21	43%	64.28	114%
Levy	5.71	8.98	64%	63.14	106%
Madison	3.68	7.29	51%	57.87	103%
Suwannee	3.94	7.17	55%	60.61	114%
Taylor	3.80	8.62	44%	64.91	109%
Union	5.42	7.49	72%	52.53	97%

July 2014 Average:	4.80
July Average (1932-2013):	7.75
Historical 12-month Average (1932-2013):	54.63
Past 12-Month Total:	58.48
12-Month Rainfall Surplus:	3.85

Figure 1: Comparison of District Monthly Rainfall

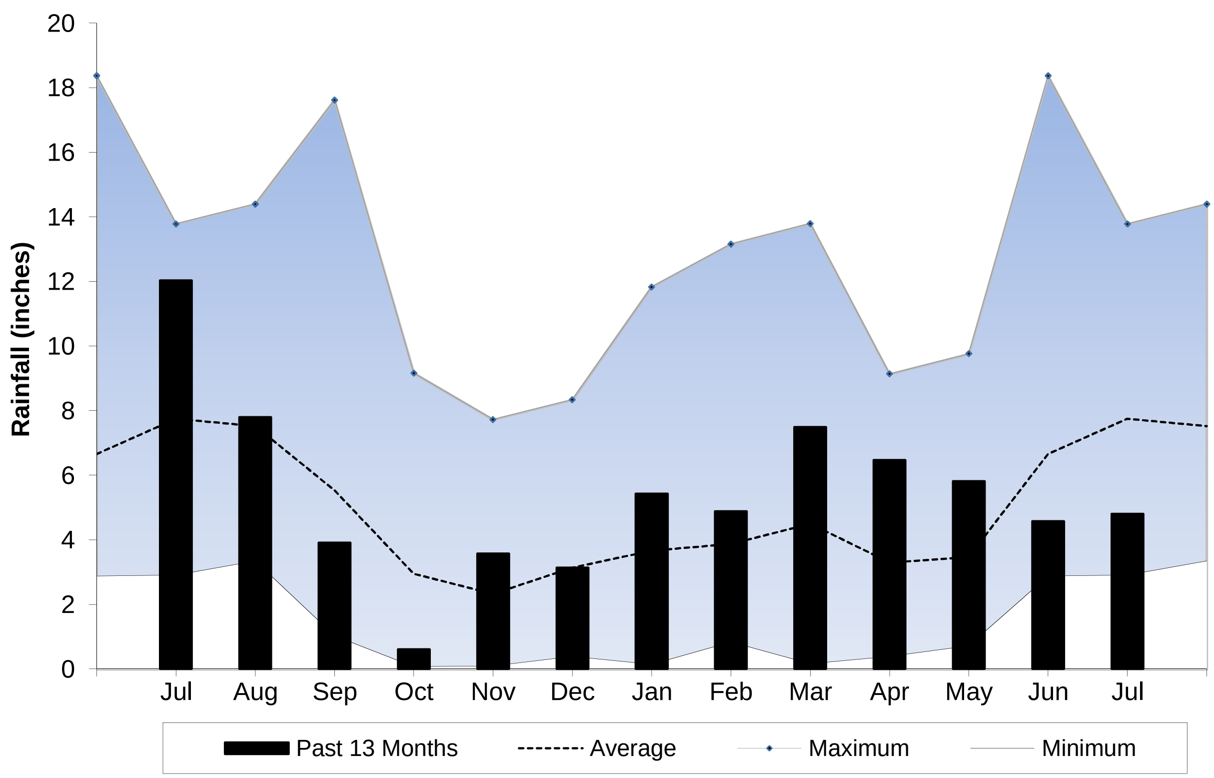


Figure 2: July 2014 Rainfall Estimate

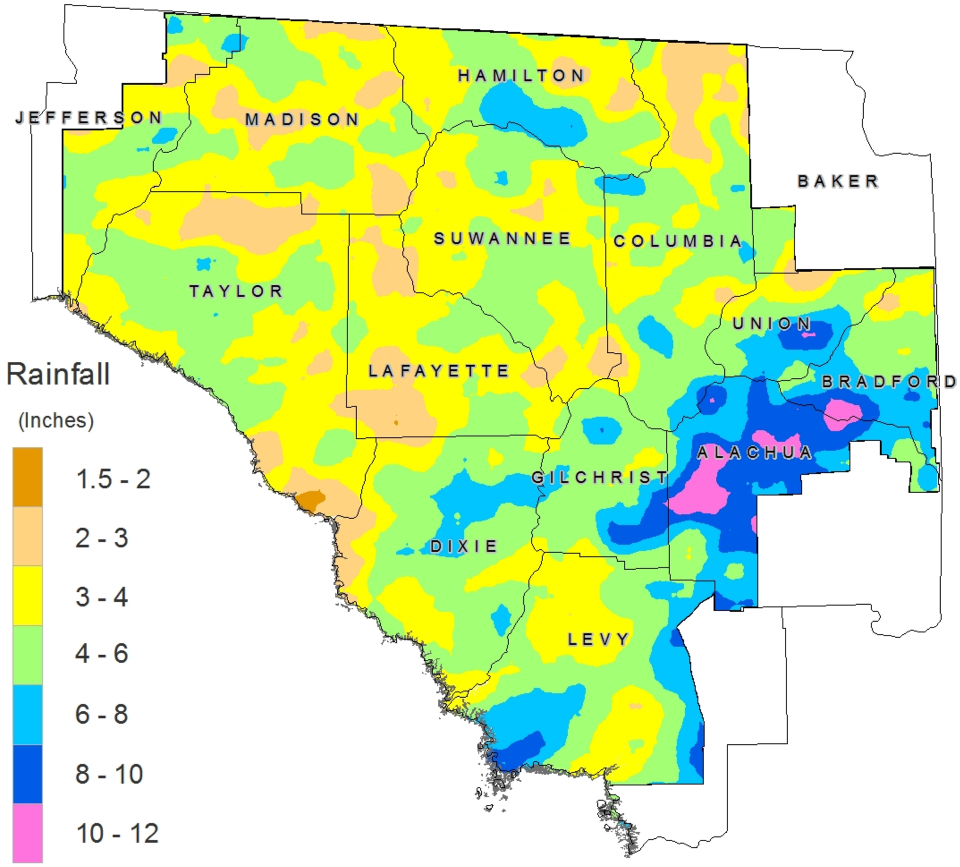


Figure 3: July 2014 Percent of Normal Rainfall

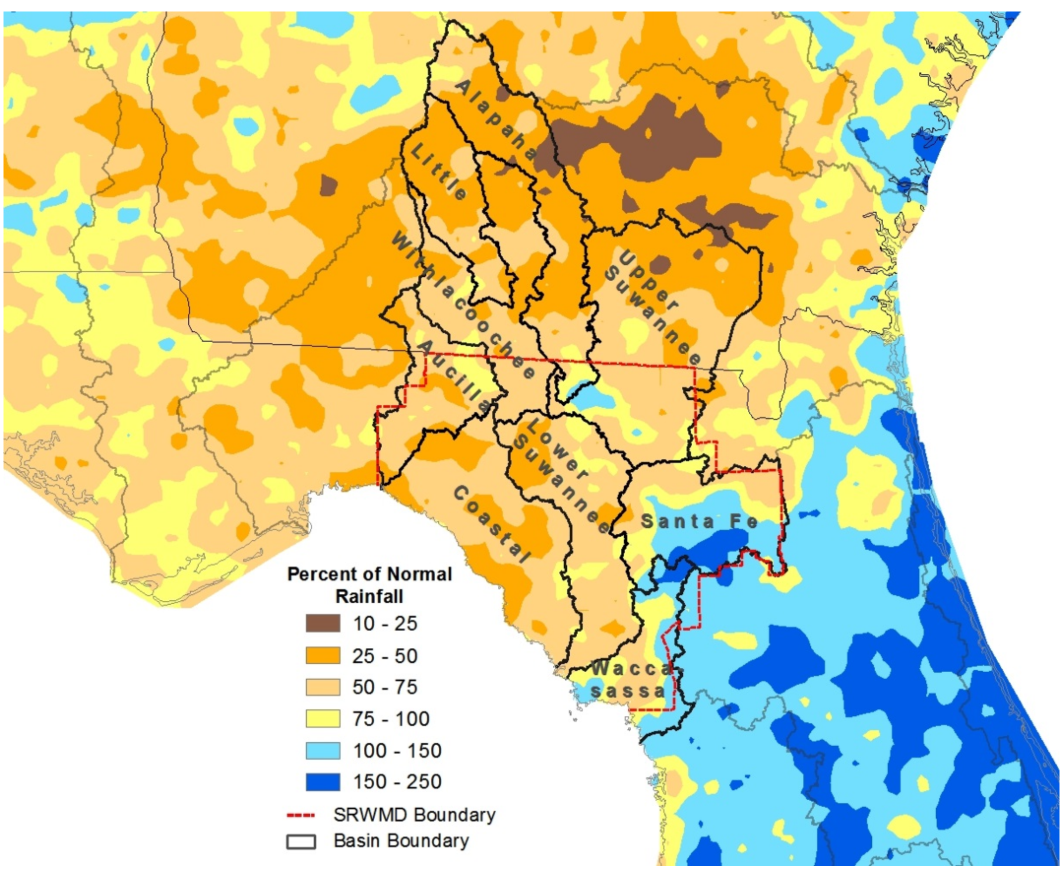
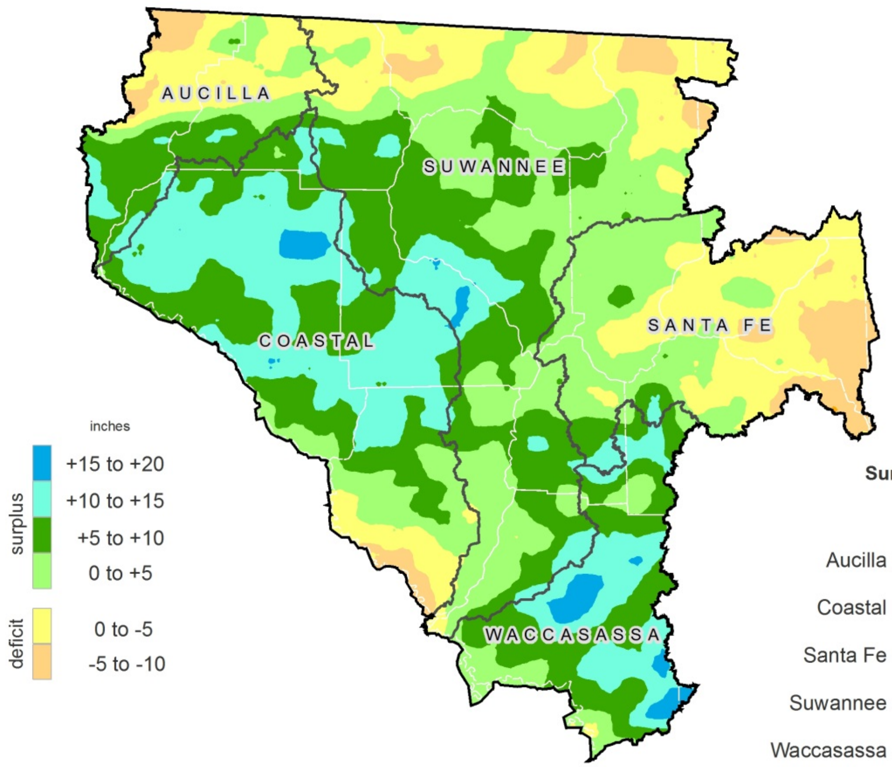


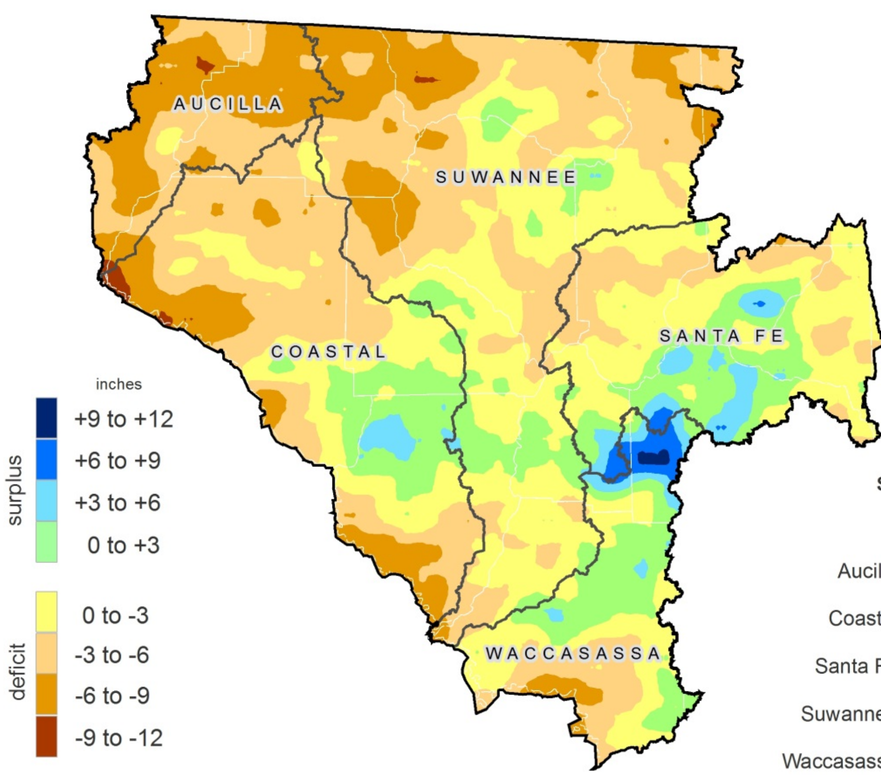
Figure 4: 12-Month Rainfall Surplus/Deficit by River Basin
Through July 31, 2014



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

	July -14	June -14
Aucilla	+2.2	+8.8
Coastal	+8.6	+19.7
Santa Fe	-0.8	+2.8
Suwannee	+3.6	+11.4
Waccasassa	+9.5	+17.4

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

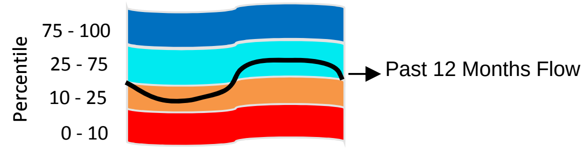


3-Month Surplus (+) or Deficit (-) By Basin

	July -14	June -14
Aucilla	-6.1	+5.1
Coastal	-3.0	+5.2
Santa Fe	-0.7	+1.3
Suwannee	-3.3	+5.1
Waccasassa	-0.3	+0.5

Figure 6: Daily River Flow Statistics

August 1, 2013 through July 31, 2014



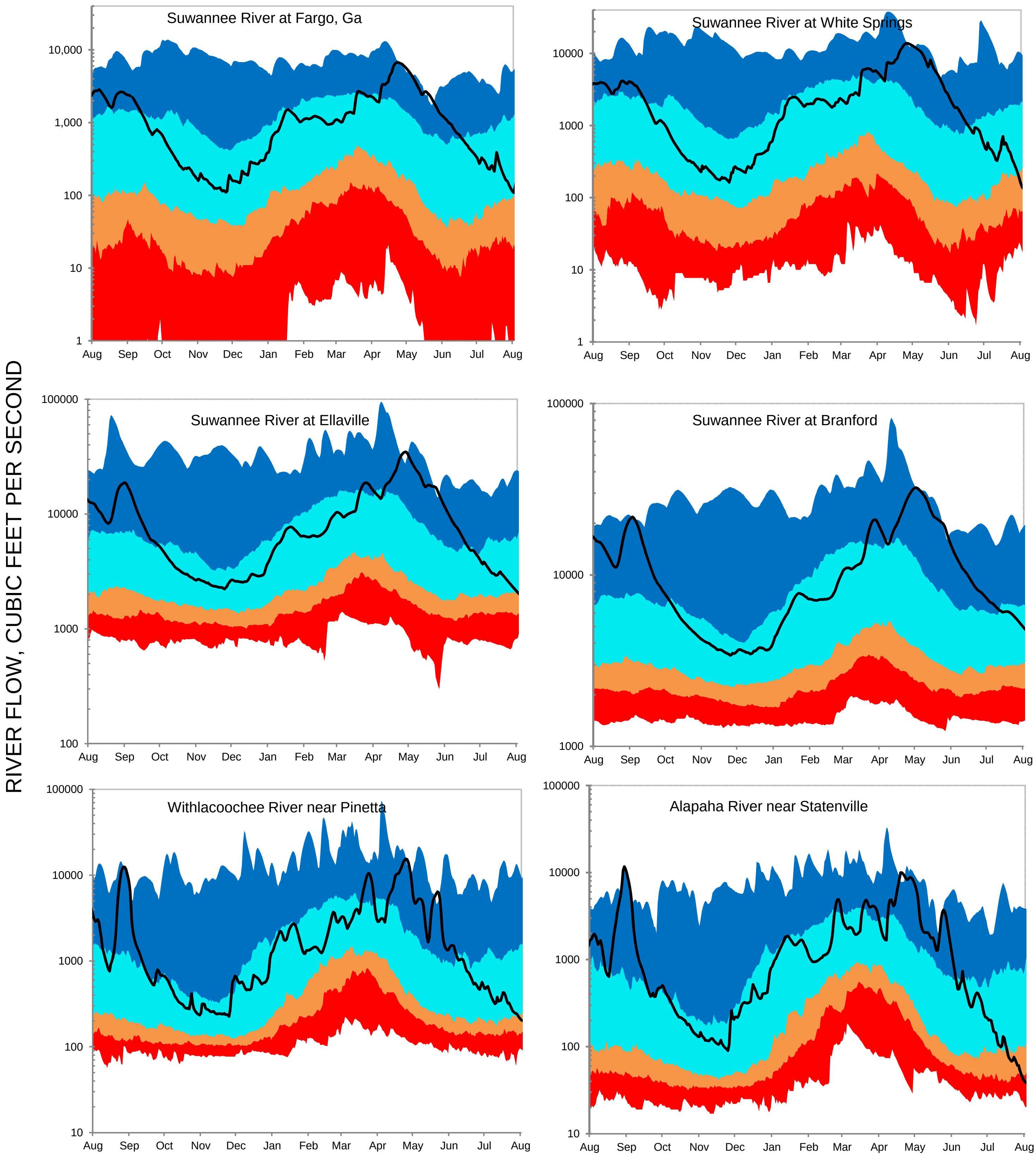
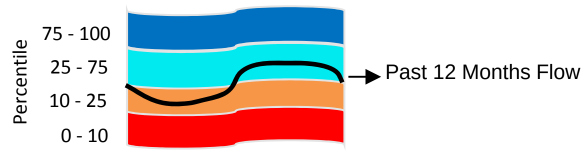
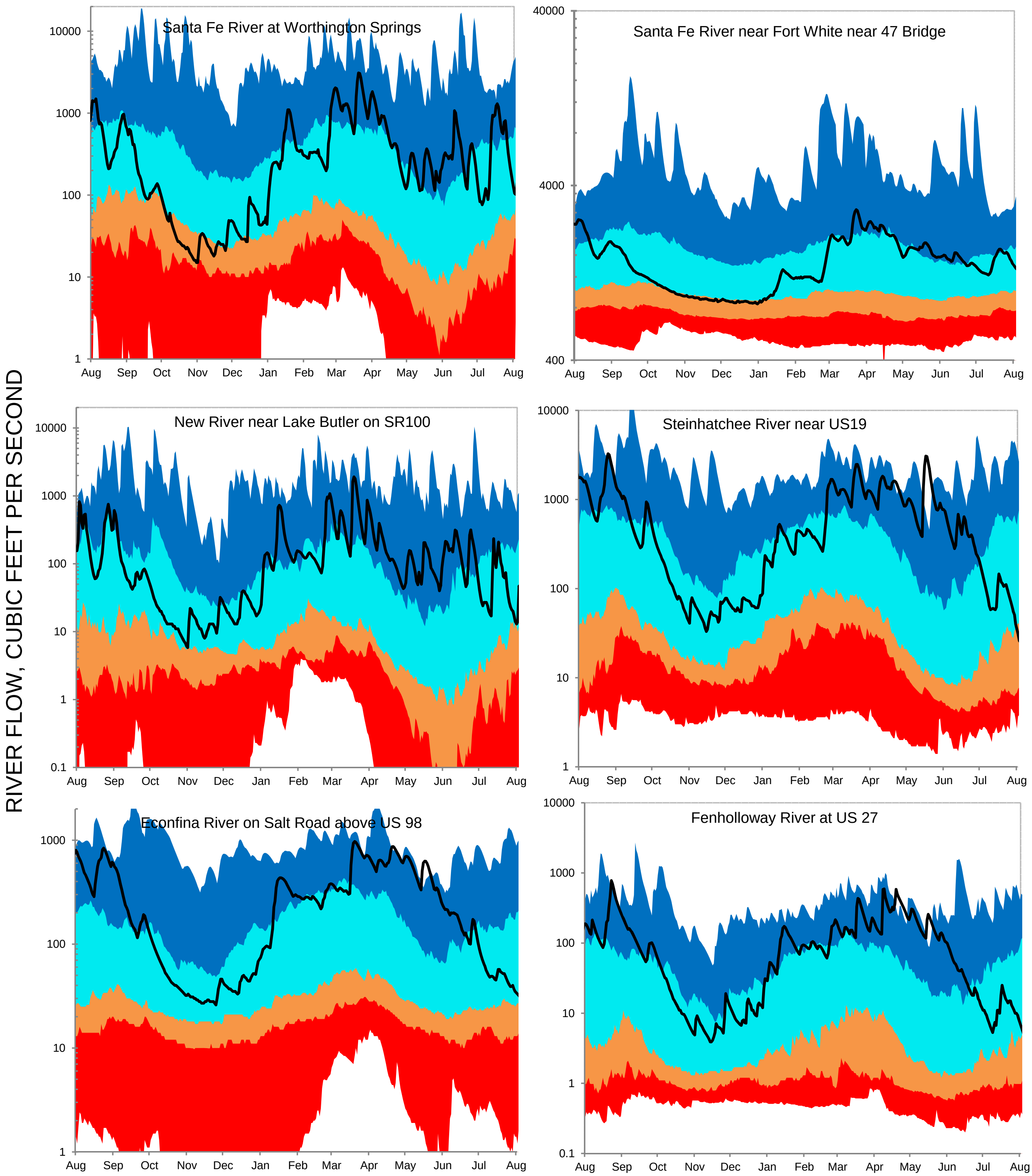


Figure 6, cont: Daily River Flow Statistics
August 1, 2013 through July 31, 2014





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.

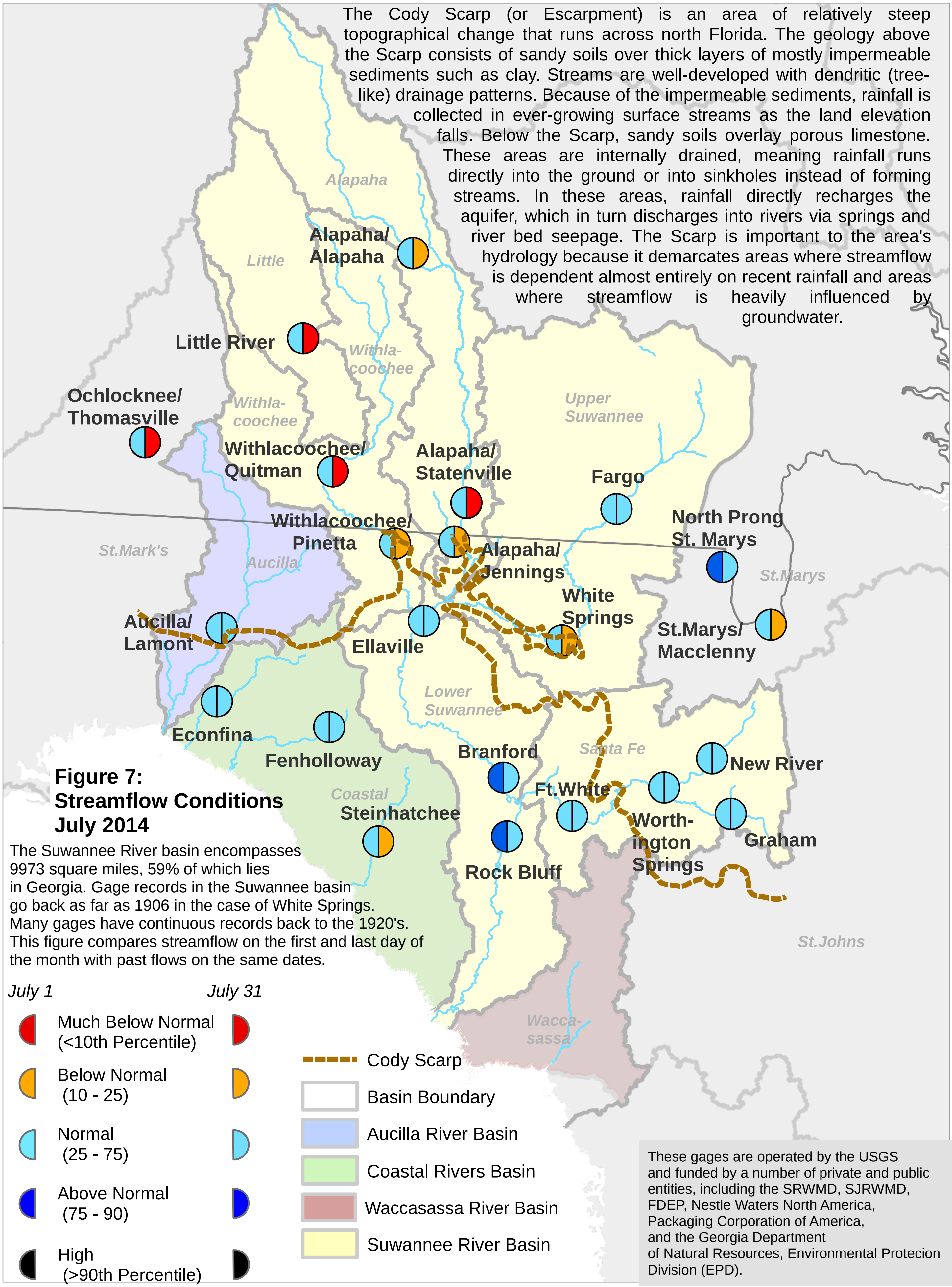
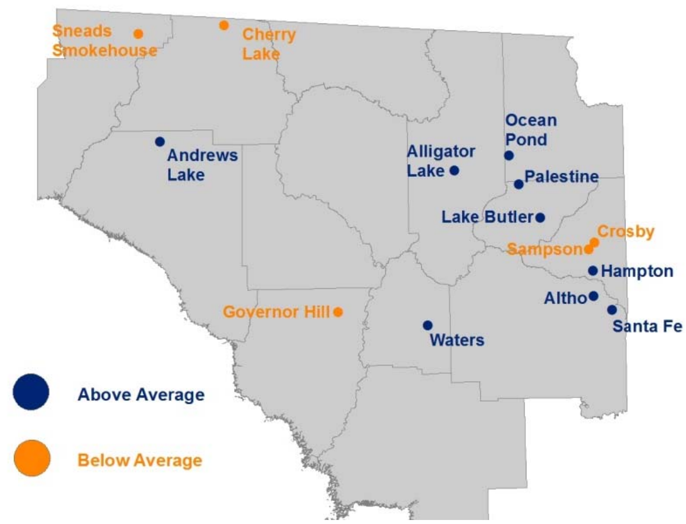


Figure 7:
Streamflow Conditions
July 2014

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.

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 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.

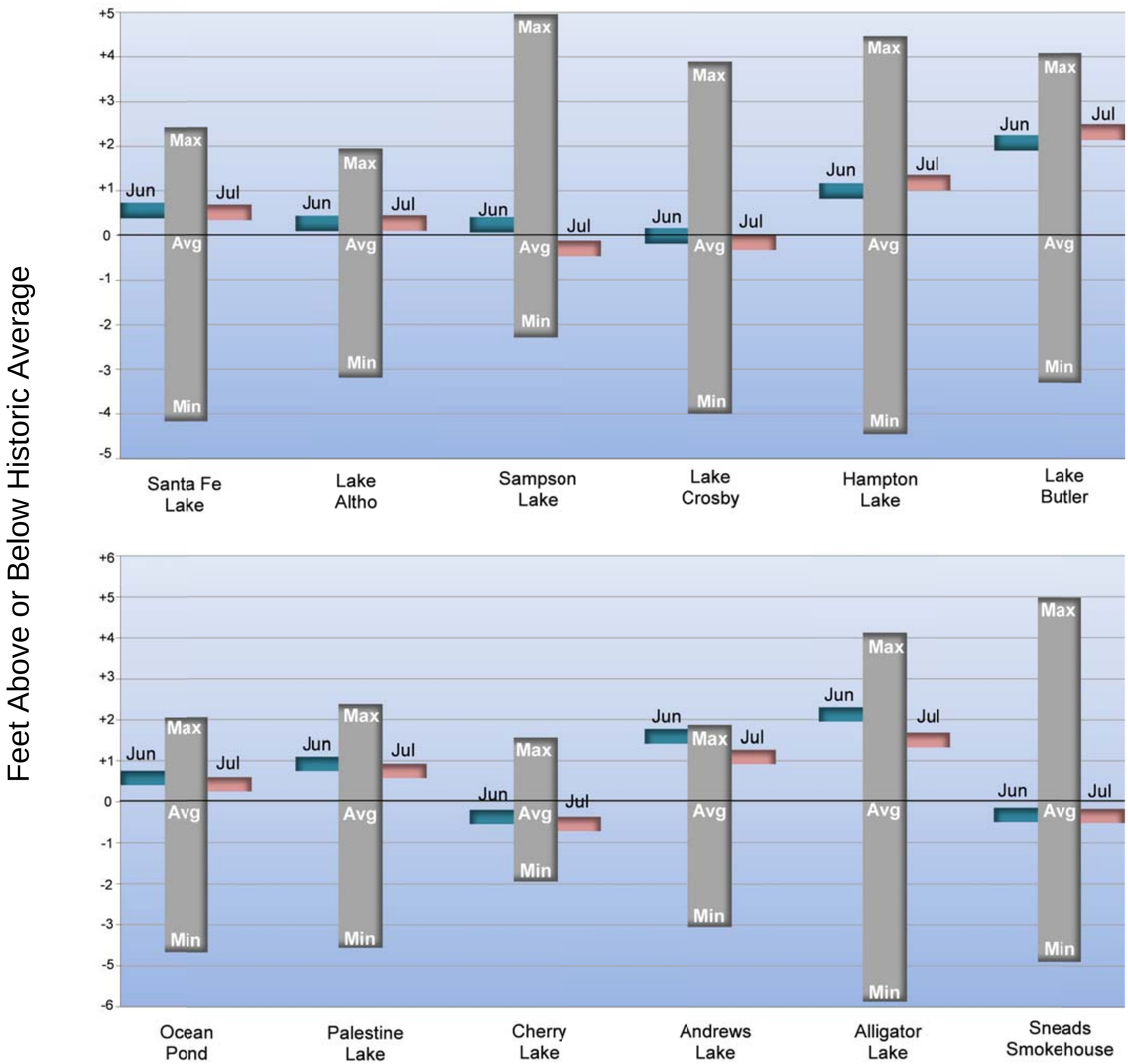


Figure 9: Quarterly Springflow Measurements

The SRWMD monitors water quality at 38 springs. Flow is usually measured at the time of the sampling. The springs below were measured in July 2014 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.

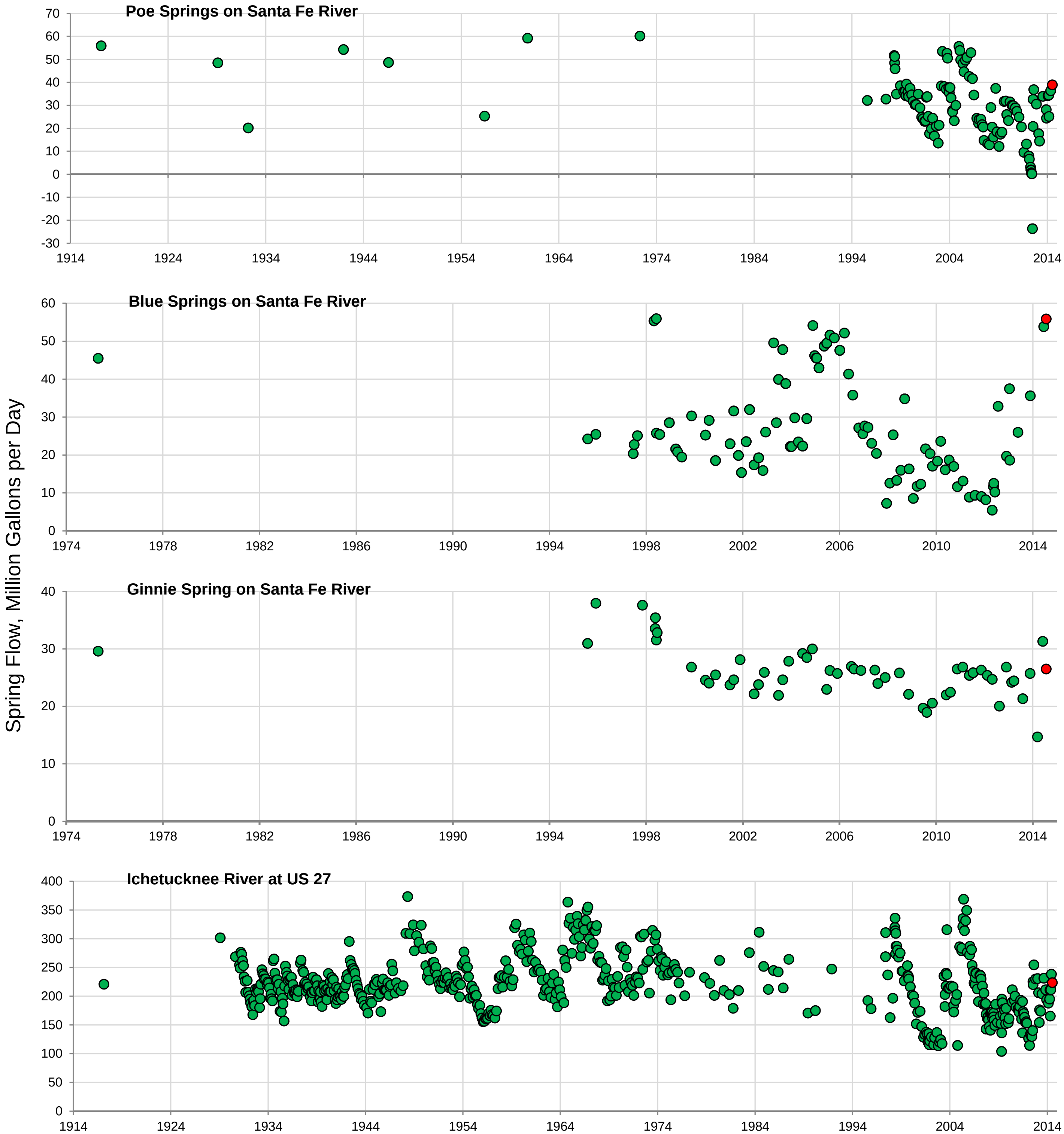


Figure 9: Quarterly Springflow Measurements, continued

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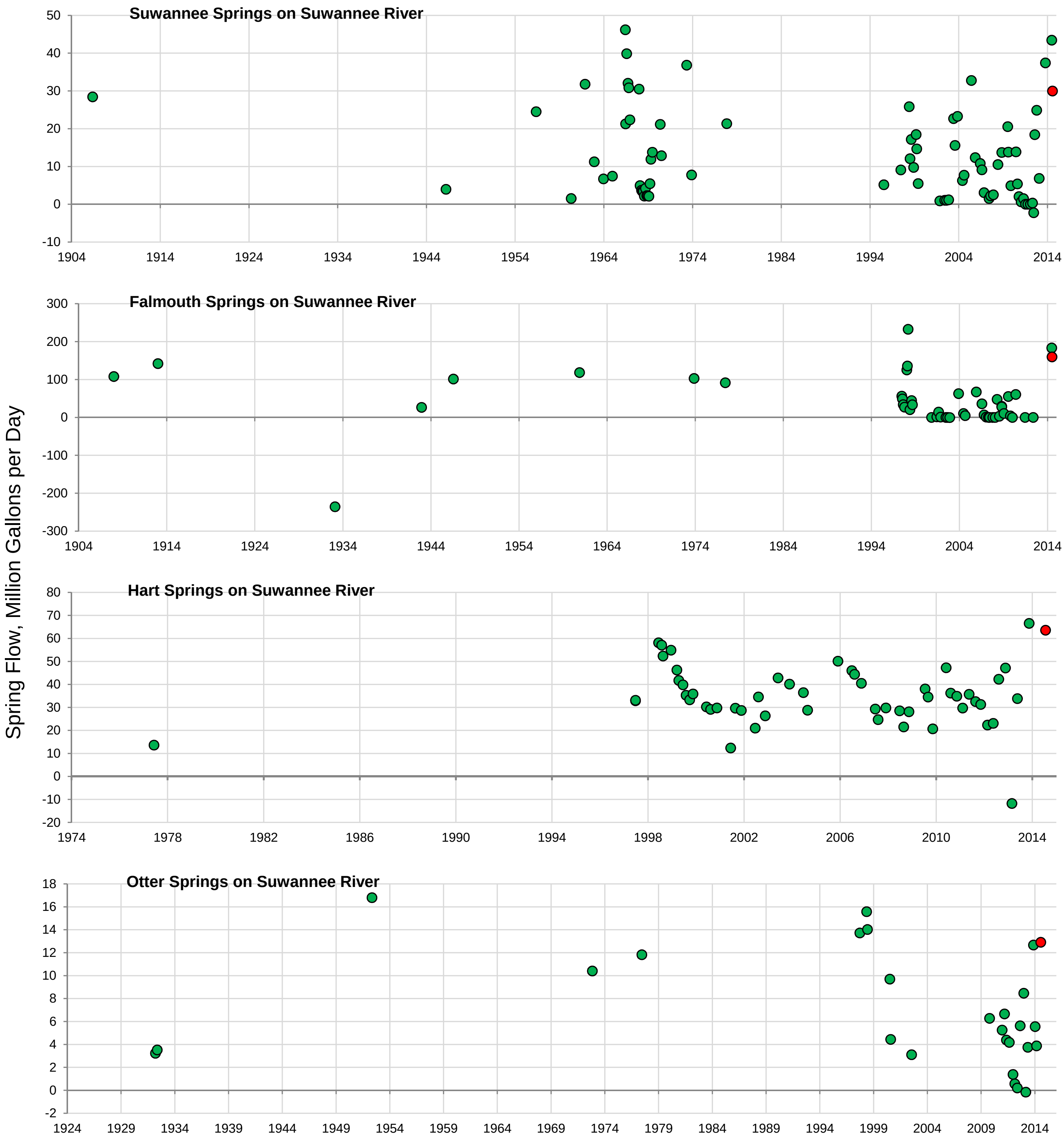


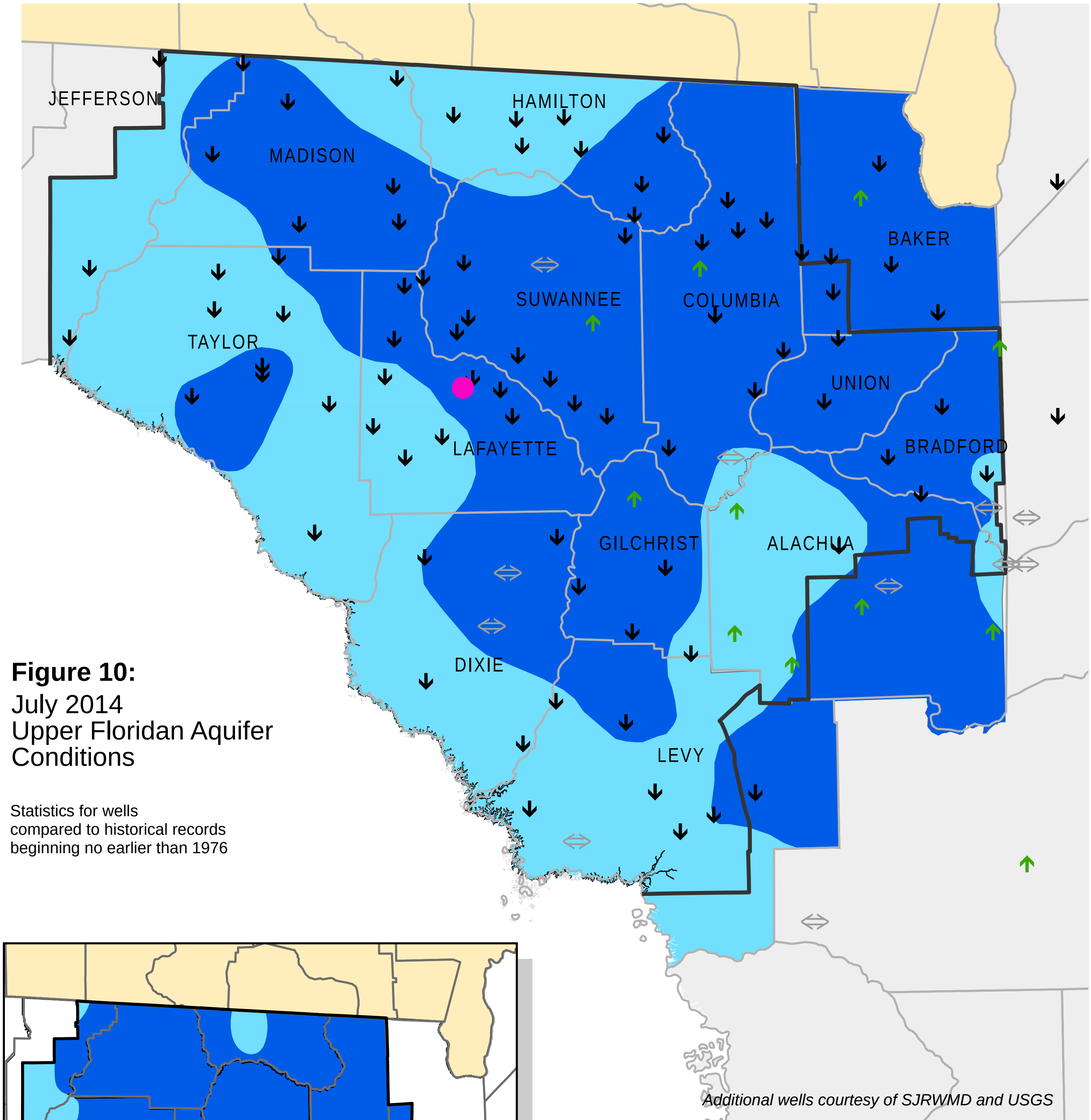
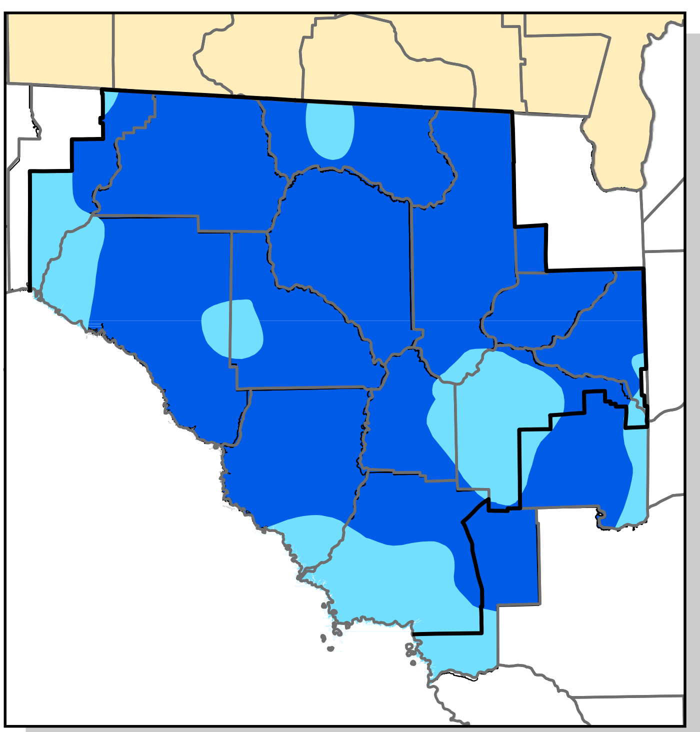


Figure 10:
July 2014
Upper Floridan Aquifer
Conditions

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



Inset: June 2014 Groundwater Levels

High
(Greater than 75th Percentile)

Normal
(25th to 75th Percentile)

Low
(10th to 25th Percentile)

Extremely Low
(Less than 10th Percentile)

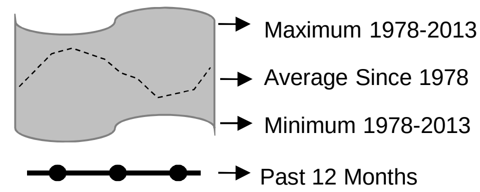
Increase/decrease in level since last month

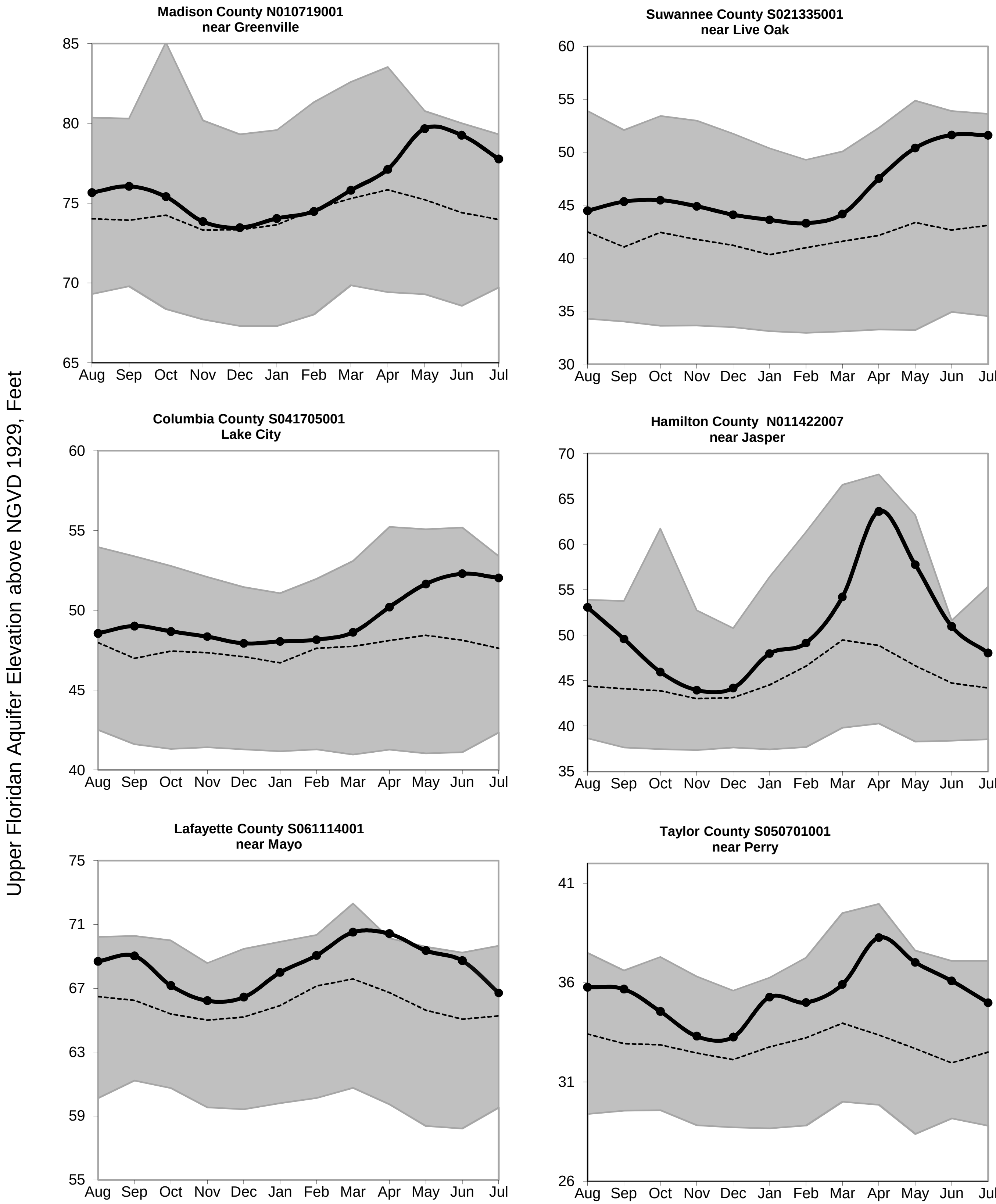
Increase/decrease since last month
less than one percent of historic range

Record High Level

District Boundary

Figure 11: Monthly Groundwater Level Statistics
Levels August 1, 2013 through July 31, 2014
Period of Record Beginning 1978





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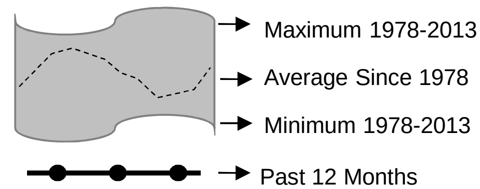


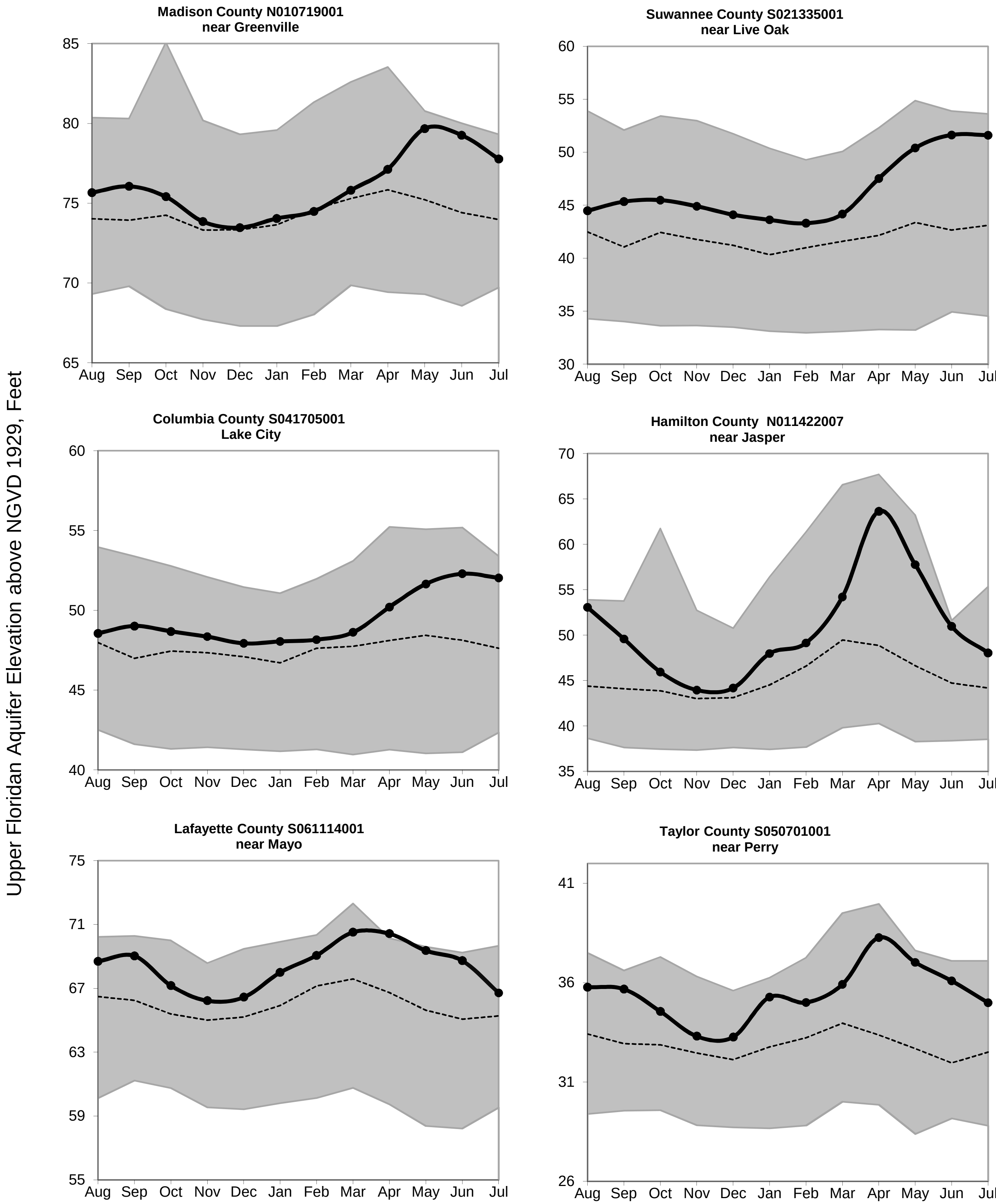
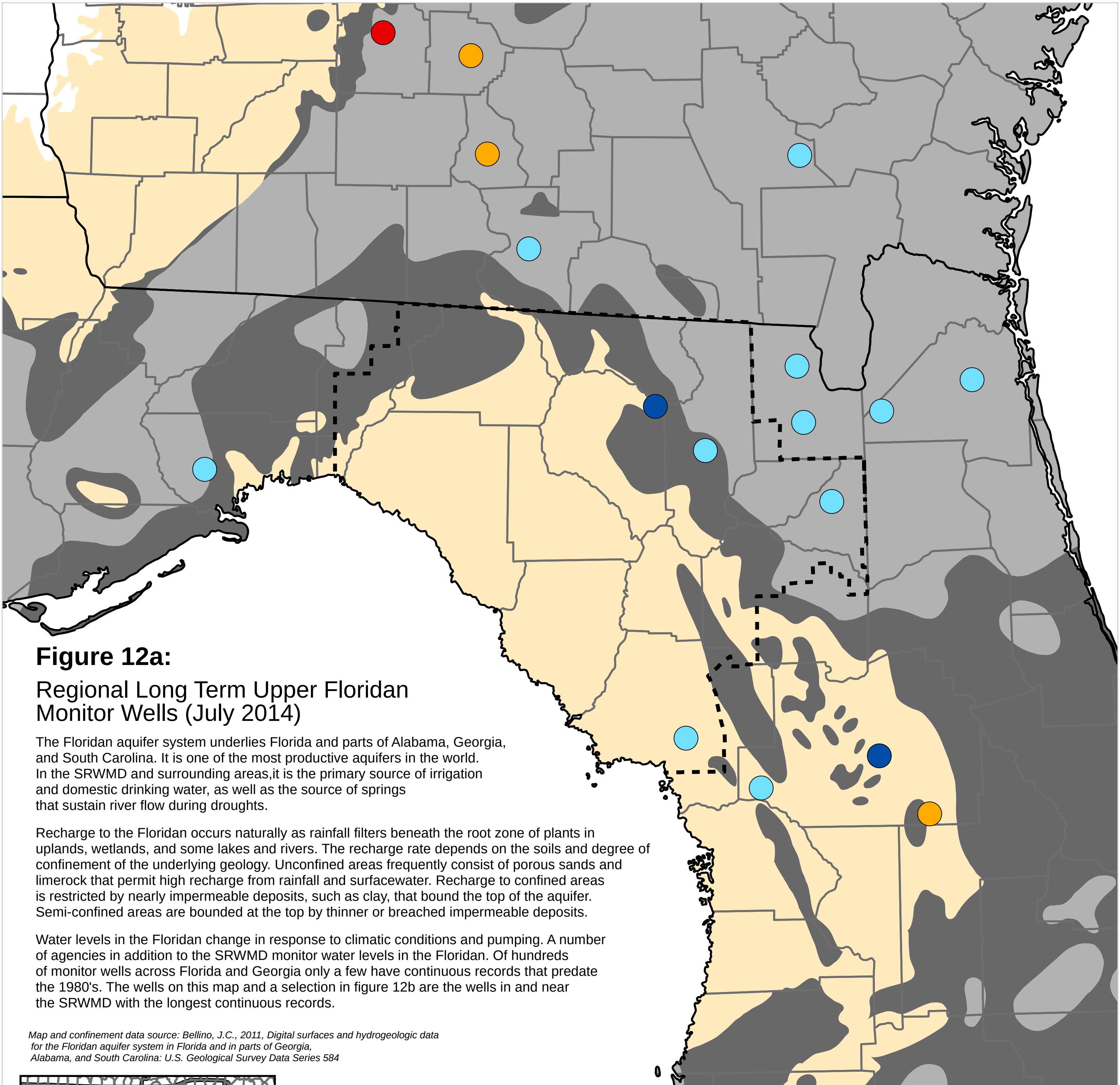


Figure 12a:

Regional Long Term Upper Floridan Monitor Wells (July 2014)

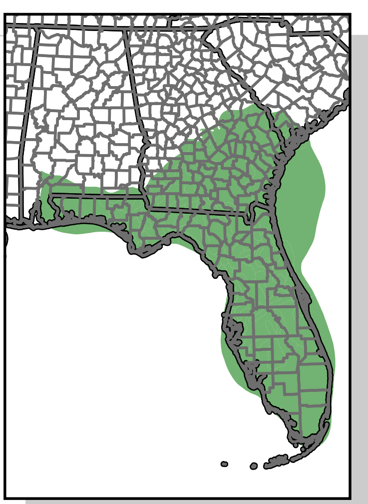


The Floridan aquifer system underlies Florida and parts of Alabama, Georgia, and South Carolina. It is one of the most productive aquifers in the world. In the SRWMD and surrounding areas,it is the primary source of irrigation and domestic drinking water, as well as the source of springs that sustain 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

July 2014