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: October 9, 2014

RE: September 2014 Hydrologic Conditions Report for the District

RAINFALL

- District-wide rainfall in September was 8.54”, which is about 160% of normal based on records beginning in 1932. A weak trough of low pressure delivered 25-50% of the month’s rainfall between September 5th and 7th. Most counties in the District saw totals well above normal, with the exception of Jefferson County which received less than 70% of typical rainfall (Table 1, Figure 1). Parts of Madison and western Taylor counties also remained drier than normal. Overall, this was the wettest September since hurricanes Frances and Jeanne struck in 2004, and the 11th wettest September since 1932. Parts of Suwannee, Columbia, and Baker counties received in excess of 14” (Figure 2), causing flooding of low-lying areas. Watersheds in Georgia that contribute to the Suwannee River were mostly near normal (Figure 3), although eastern parts of the Okefenokee Swamp (the headwaters of the Suwannee River) saw 300-400% of normal rainfall.
- The lowest gaged monthly total was 4.59” at Sneads Smokehouse Lake in northern Jefferson County. The highest gaged monthly total was 13.54” at Ocean Pond in Baker County. The highest 24-hour total was 5.65” at Alligator Lake in Lake City. The Alligator Lake two-day total on September 6 and 7 approached the 4% (25-year) storm according to precipitation frequency estimates from the National Weather Service. The three-day storm total of 8.81” at that gage was only 0.2” less than the storm total from Hurricane Frances exactly 10 years earlier.
- Average rainfall for the 12 months ending September 30 was 6.1” higher than the long-term average of 54.63". Twelve-month departures from normal ranged from up to 10” below normal in isolated areas of the Santa Fe and Aucilla basins to 20” above normal in parts of Levy and Taylor counties (Figure 4).
- Despite the high September totals, the average rainfall for the 3 months ending September 30 was 2” lower than the long-term average of 20.8”. Three-month deficits of up to 15” persisted in the Aucilla basin (Figure 5). The 3-month total at the District’s gage in Clyattville, Georgia, exceeded the 1-in-10 (10-year) drought according to statistics from the National Drought Atlas.

SURFACEWATER

- **Rivers:** Upper Suwannee River gages were below normal prior to the arrival of the low pressure system. Levels rose significantly during the second week of the month but did not reach flood stage. The river at White Springs rose almost 16’ in two and a half days. Most of the heavy rain missed the Alapaha and Withlacoochee basins in Georgia which kept Suwannee levels downstream from rising more than 3 or 4 feet. Upper Santa Fe River gages saw their highest levels since March. Olustee Creek and Cannon Creek rose to their highest levels since Tropical Storm Debby in 2012. Levels fell the rest of the month until a late cold front brought another 1-2” over the same areas, causing small rises by the 30th. The Aucilla and Econfina rivers remained relatively low, although levels were typical of the season. The Waccasassa River at Gulf Hammock rose to its highest stage since March and the 4th highest stage since 2005. Flow statistics for a number of rivers are presented graphically in Figure 6, and conditions relative to historic conditions in Figure 7.

- **Lakes**: Waters Lake in Gilchrist County had its highest level since the 2004 hurricanes. Palestine Lake in northern Union County rose to its highest level since 1998, the third highest since records began in 1975. Across the District, Sneads Smokehouse Lake fell to a few inches above record low. Cherry Lake ended the month with the lowest level since February 2013. Figure 8 shows levels relative to the long-term average, minimum, and maximum levels for a number of monitored lakes.
- **Springs**: Twenty springs or spring groups were measured by the USGS, District staff, and District contractors in September, including 4 that were measured in support of the Florida Geological Survey's dye test of the Falmouth Springs system in early September. Preliminary results from the study showed that dye released in Falmouth Springs was detected in Suwannacoochee, Edwards, Lime, and Lime Sink Run springs in the Suwannee River State Park. White Sulphur Springs was measured flowing at 15.5 million gallons per day before the Suwannee River rose and began flowing back into the spring. Statistics for a number of springs are shown in Figure 9.

GROUNDWATER

Upper Floridan aquifer levels reacted quickly in areas with heavy rainfall after falling steadily since April. Almost two-thirds of the District's monitor wells saw rising levels in September. Many recovered to levels seen at the start of the dry summer but none approached the peaks of April and May, the highest since 2005. Overall, by the end of September levels rose to the 78nd percentile from the 72nd percentile in August based on records beginning no earlier than the 1970s (Figure 10). Fifty-nine percent were above the 75th percentile, considered high. Two wells in southern Jefferson County remained below the 25th percentile, considered low. 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 October 4 indicated near-normal conditions in north Florida and south Georgia.
- The National Weather Service Climate Prediction Center (CPC) three-month outlook showed a potential for above-average precipitation through December. The El Niño watch issued by the CPC in March remained in effect. Their October 9 report said El Niño is favored to begin by the end of November and gave a 2-in-3 chance of a weak El Niño during the November 2014-January 2015 season. 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.
- The U.S. Drought Monitor report of September 30 showed moderate drought in Jefferson County and in most of the Aucilla, Alapaha, and Withlacoochee watersheds in Georgia. Madison County was abnormally dry.
- The USGS characterized all watersheds as 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	September 2014	September Average	Month % of Normal	Last 12 Months	Annual % of Normal
Alachua	7.51	5.36	140%	60.19	118%
Baker	11.29	5.44	208%	58.11	116%
Bradford	6.21	6.13	101%	52.44	103%
Columbia	12.07	4.85	249%	62.95	122%
Dixie	9.25	6.58	141%	58.55	99%
Gilchrist	10.45	5.75	182%	61.79	108%
Hamilton	8.63	4.63	186%	61.31	117%
Jefferson	3.56	5.31	67%	52.22	86%
Lafayette	10.03	5.46	184%	65.77	116%
Levy	9.78	6.70	146%	64.20	108%
Madison	4.53	4.62	98%	55.46	99%
Suwannee	10.51	5.08	207%	65.21	123%
Taylor	6.85	5.61	122%	63.86	107%
Union	9.25	4.94	187%	58.49	108%

September 2014 Average:	8.54
September Average (1932-2013):	5.52
Historical 12-month Average (1932-2013):	54.63
Past 12-Month Total:	60.70
12-Month Rainfall Surplus:	6.07

Figure 1: Comparison of District Monthly Rainfall

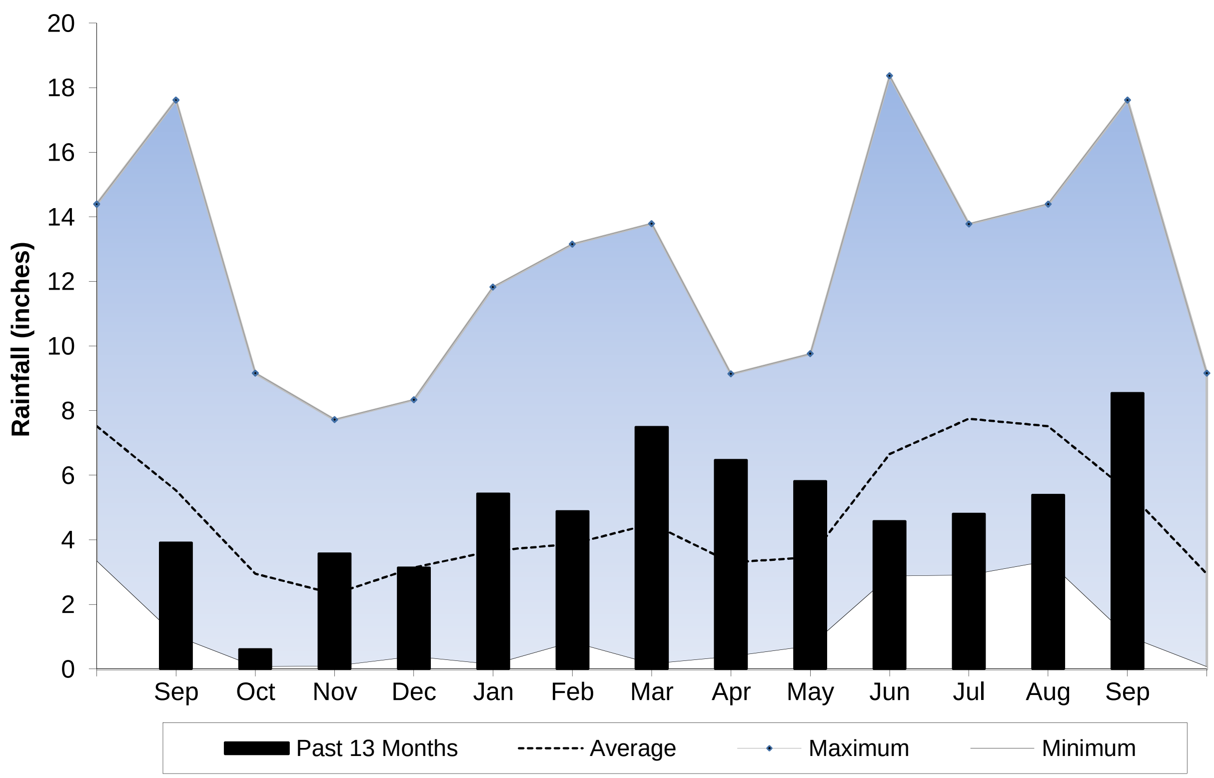


Figure 2: September 2014 Rainfall Estimate

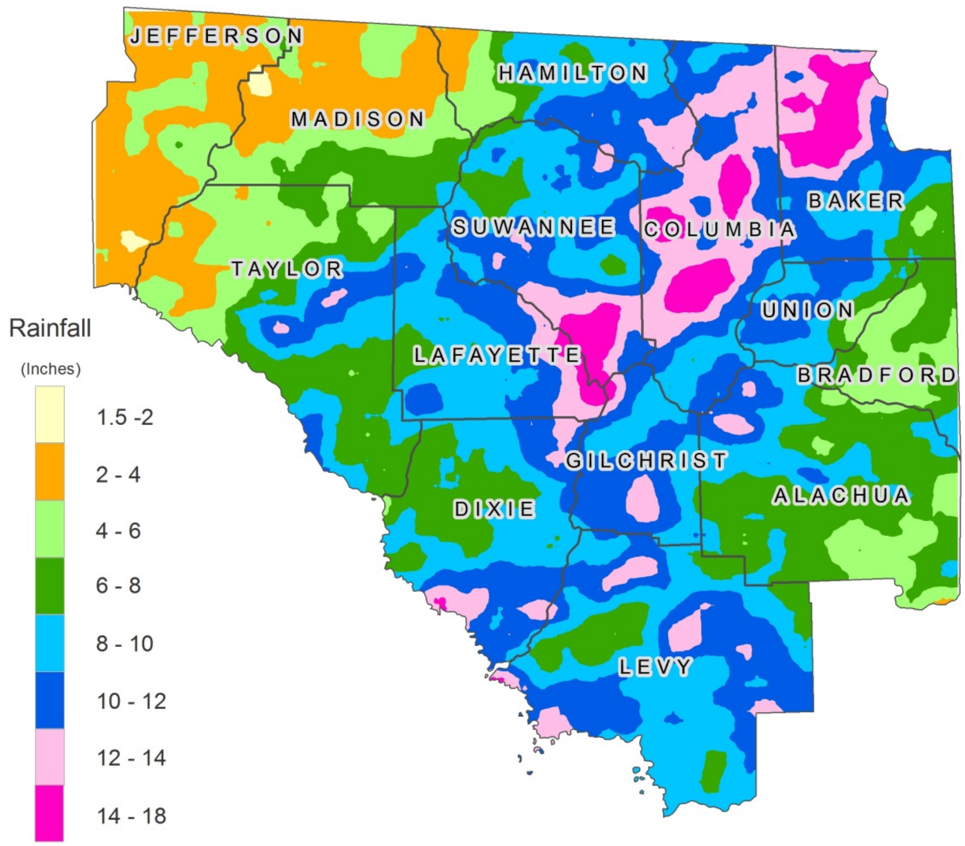


Figure 3: September 2014 Percent of Normal Rainfall

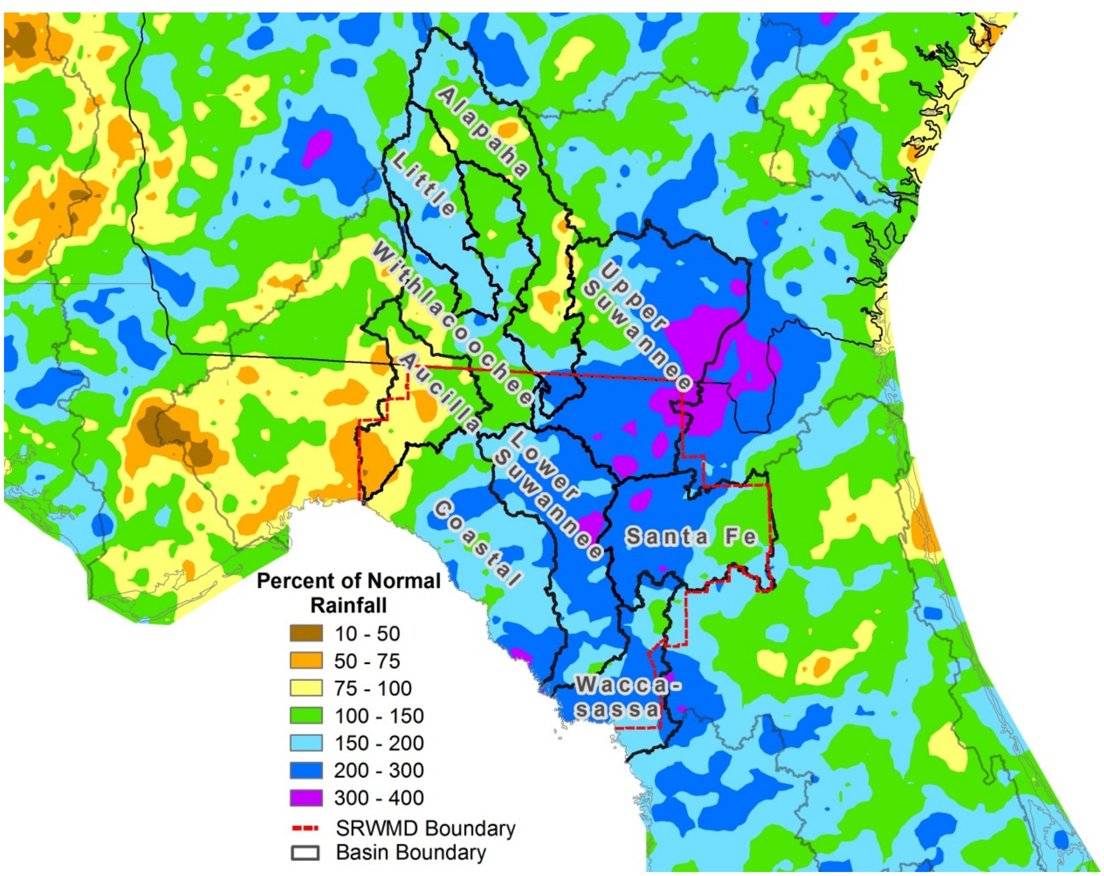
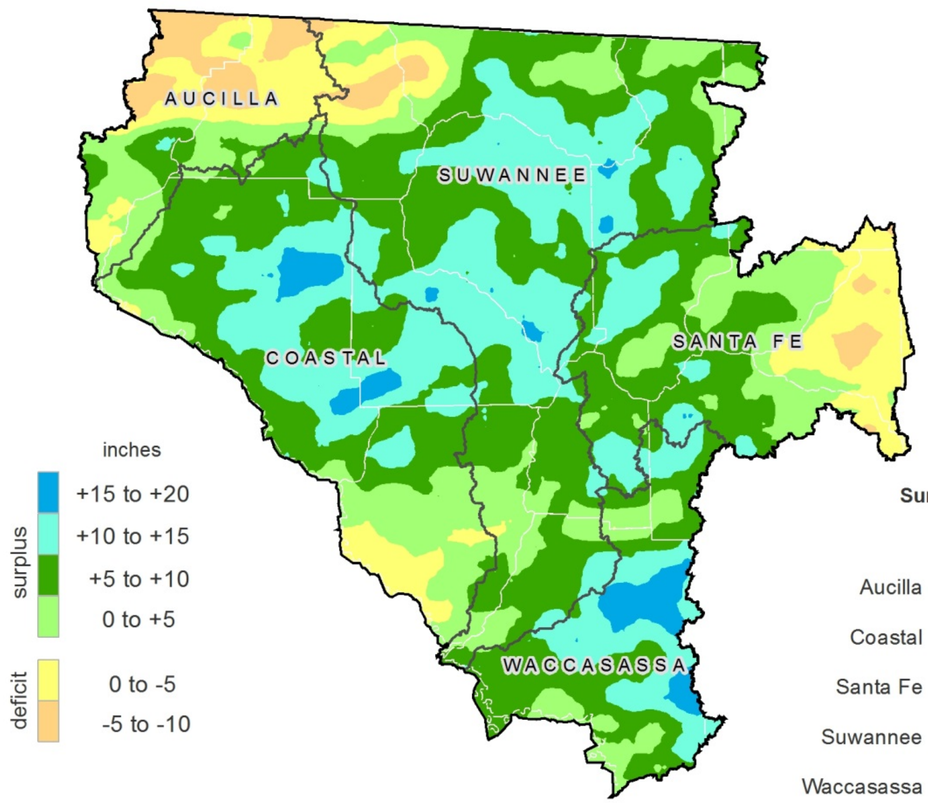


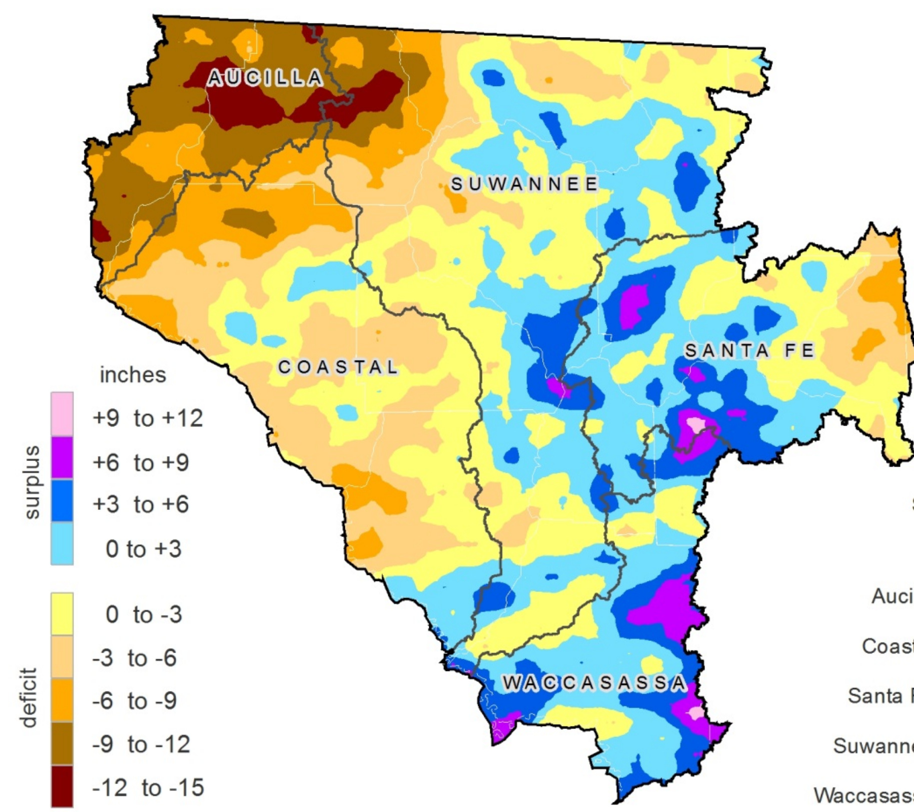
Figure 4: 12-Month Rainfall Surplus/Deficit by River Basin
Through September 30, 2014



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

	Sep -14	Aug -14
Aucilla	-1.2	-2.8
Coastal	+8.2	+5.4
Santa Fe	+4.3	-1.7
Suwannee	+7.8	+1.2
Waccasassa	+9.9	+7.3

Figure 5: 3-Month Rainfall Surplus/Deficit by River Basin
Through September 30, 2014



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

	Sep -14	Aug -14
Aucilla	-10.5	-11.9
Coastal	-3.8	-8.0
Santa Fe	+0.4	-5.0
Suwannee	-1.6	-8.2
Waccasassa	+2.5	-2.8

Figure 6: Daily River Flow Statistics

October 1, 2013 through September 30, 2014

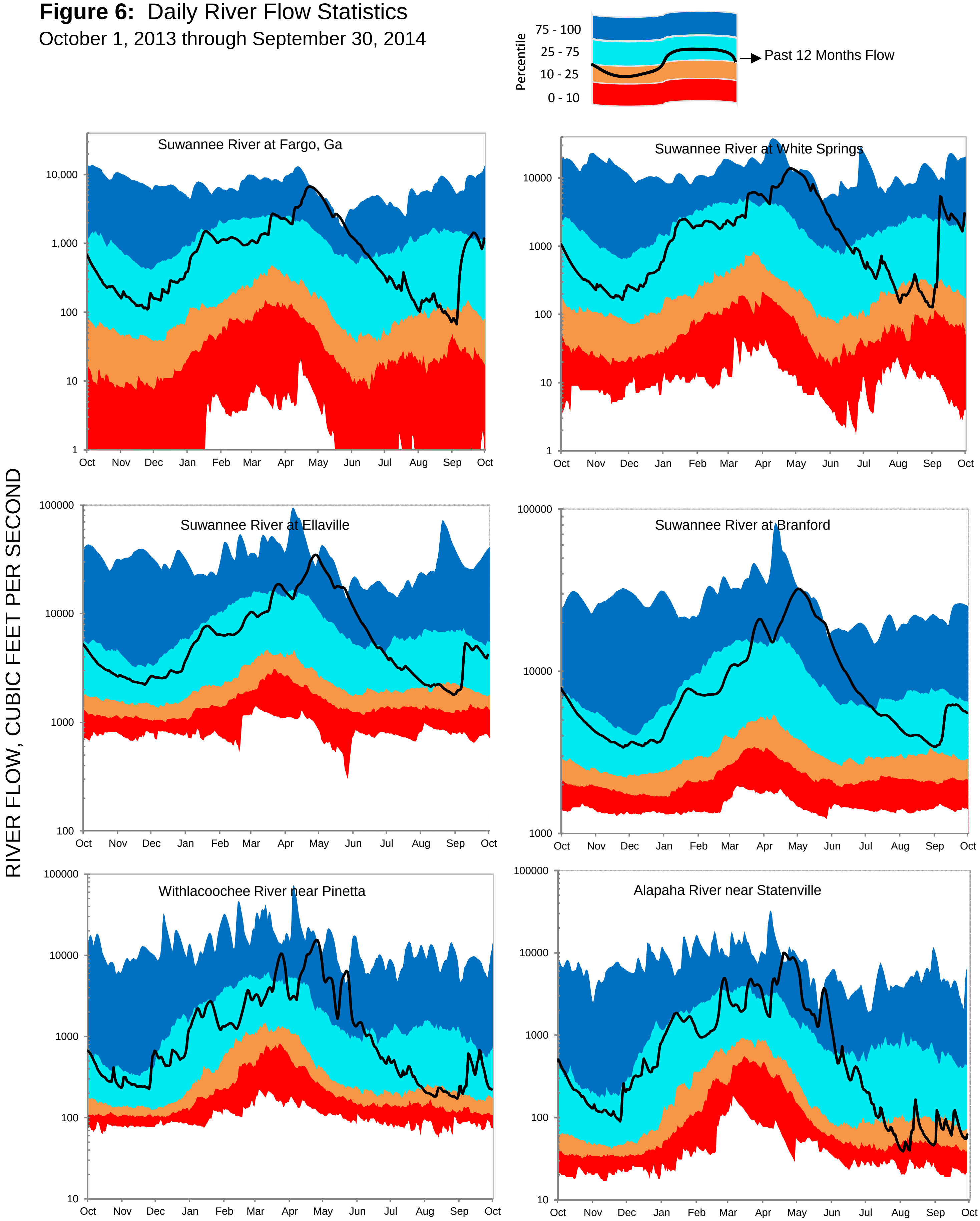
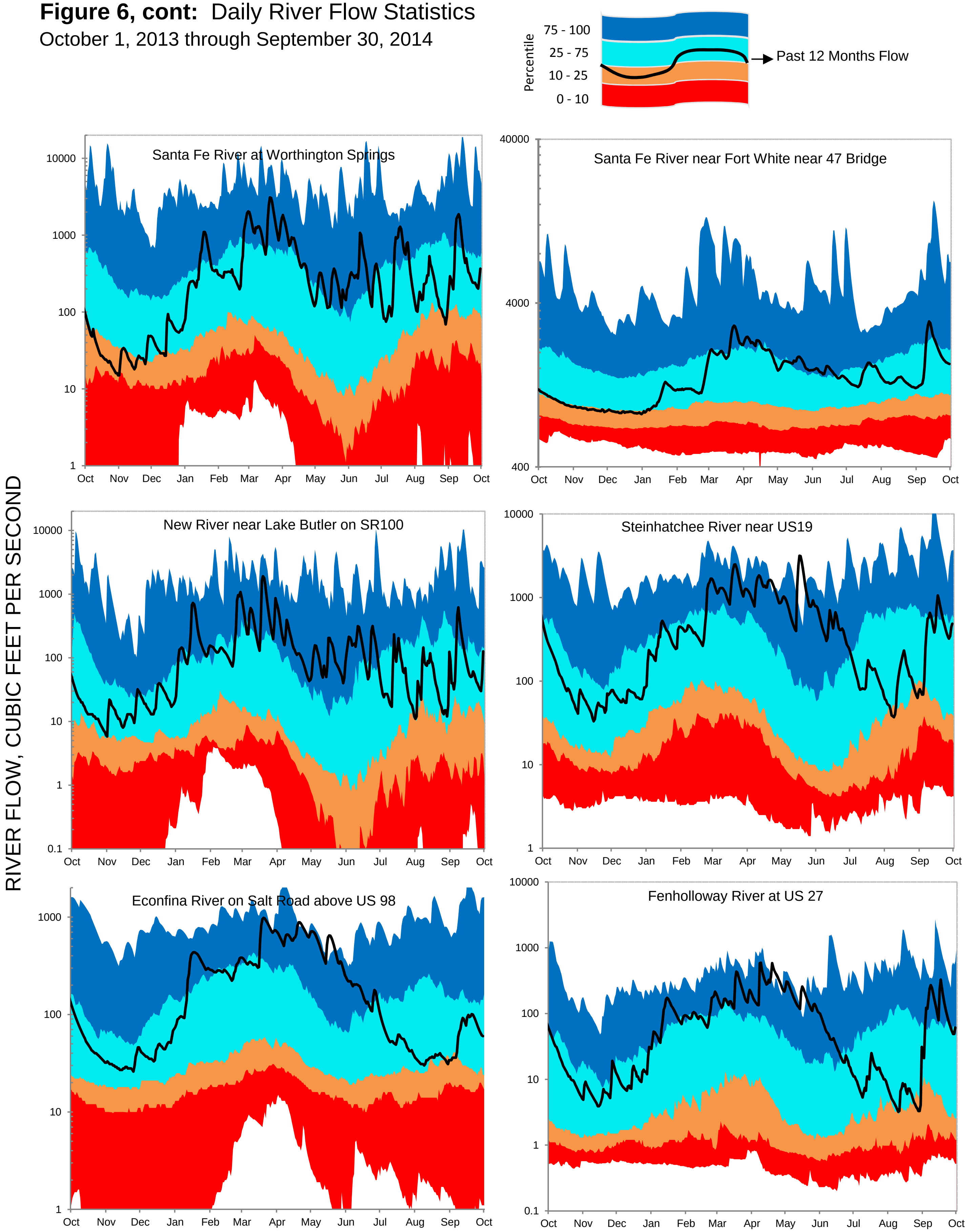


Figure 6, cont: Daily River Flow Statistics

October 1, 2013 through September 30, 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.

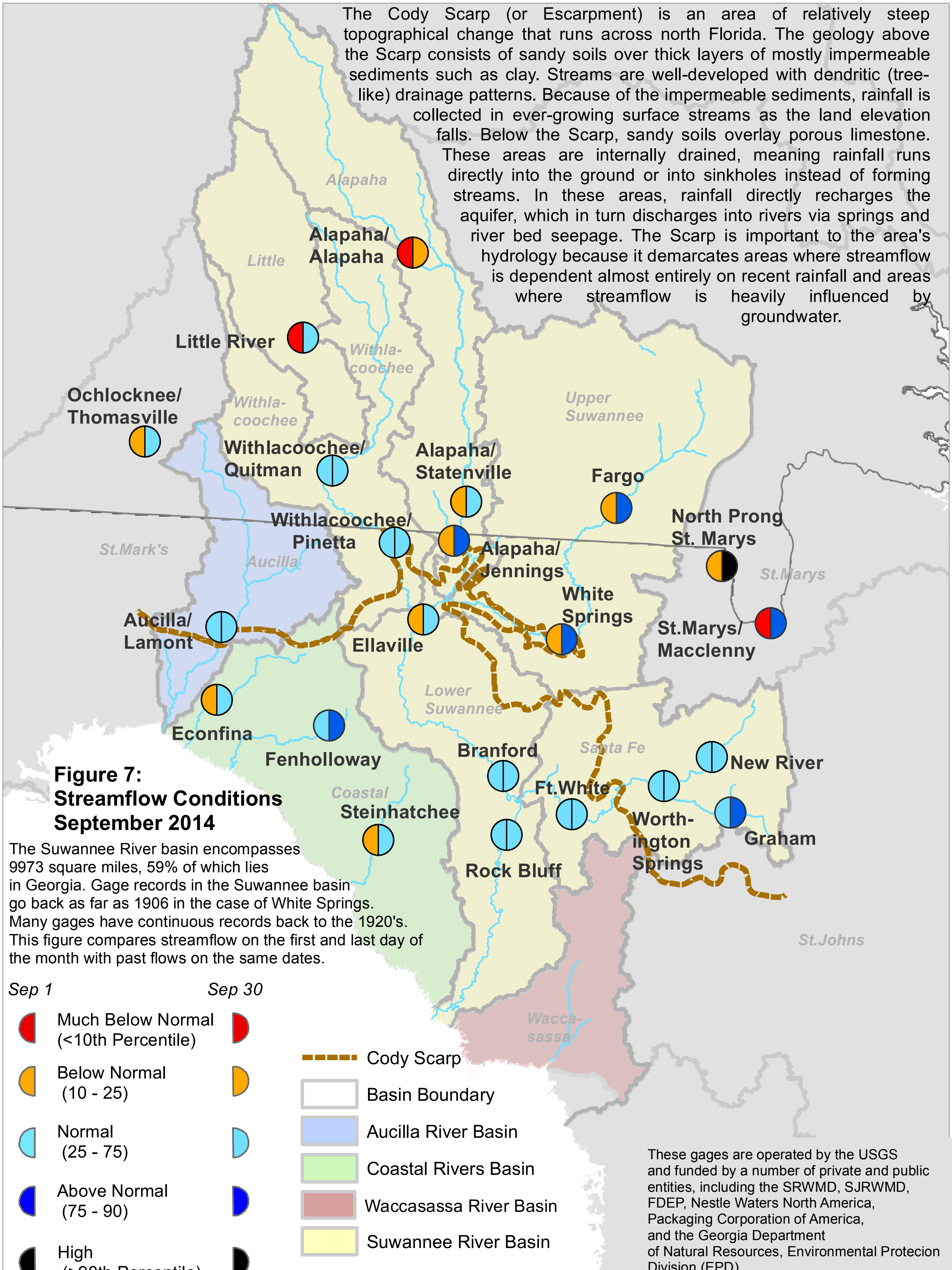
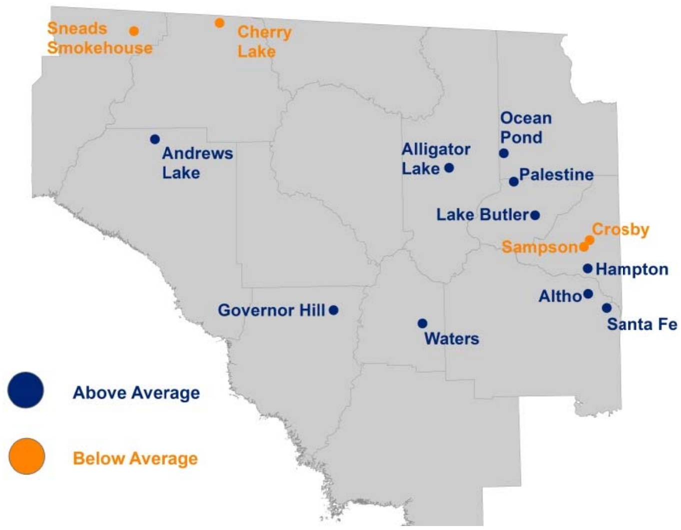


Figure 7: Streamflow Conditions September 2014

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: September 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.

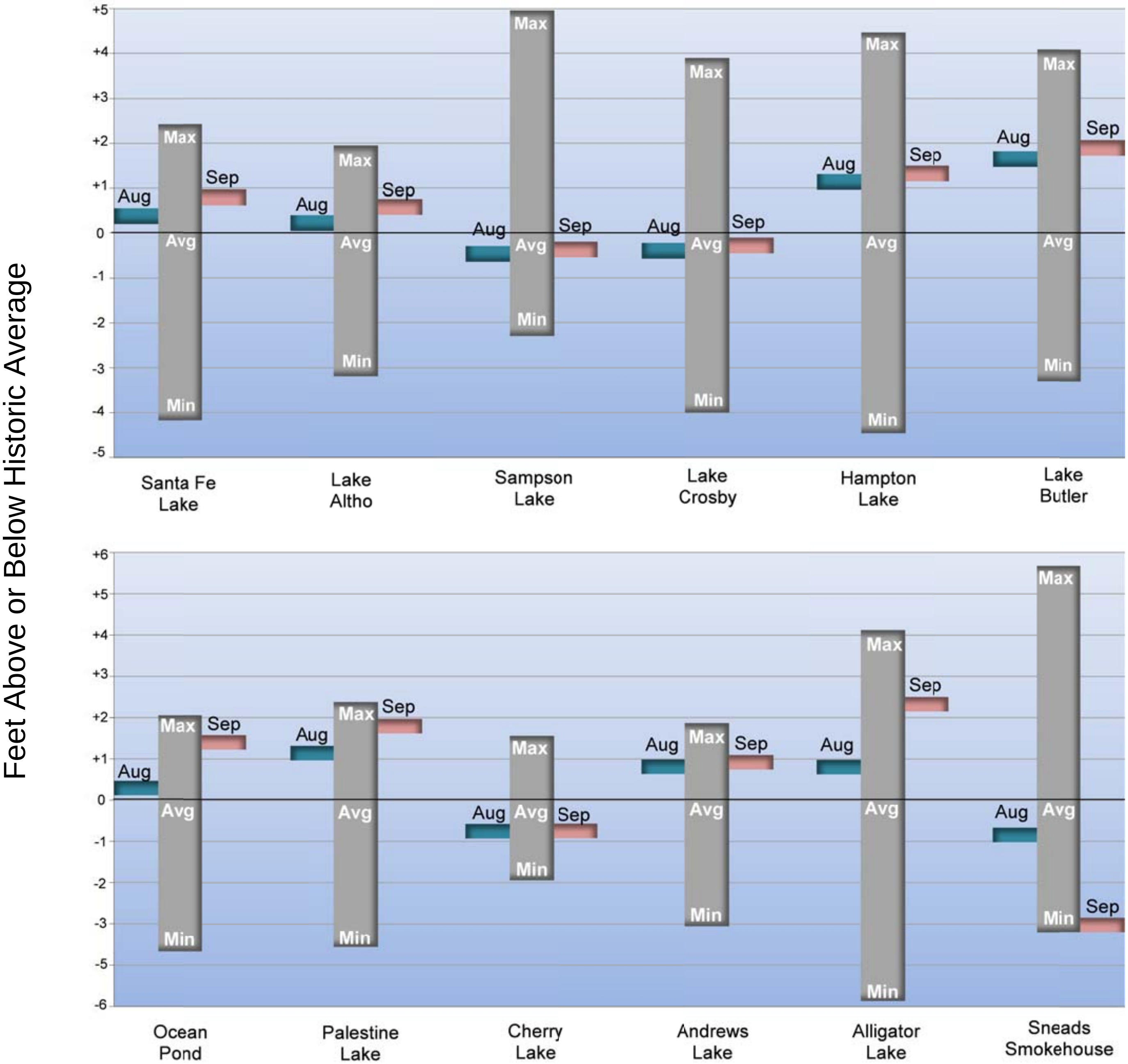


Figure 9: Quarterly Springflow Measurements

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

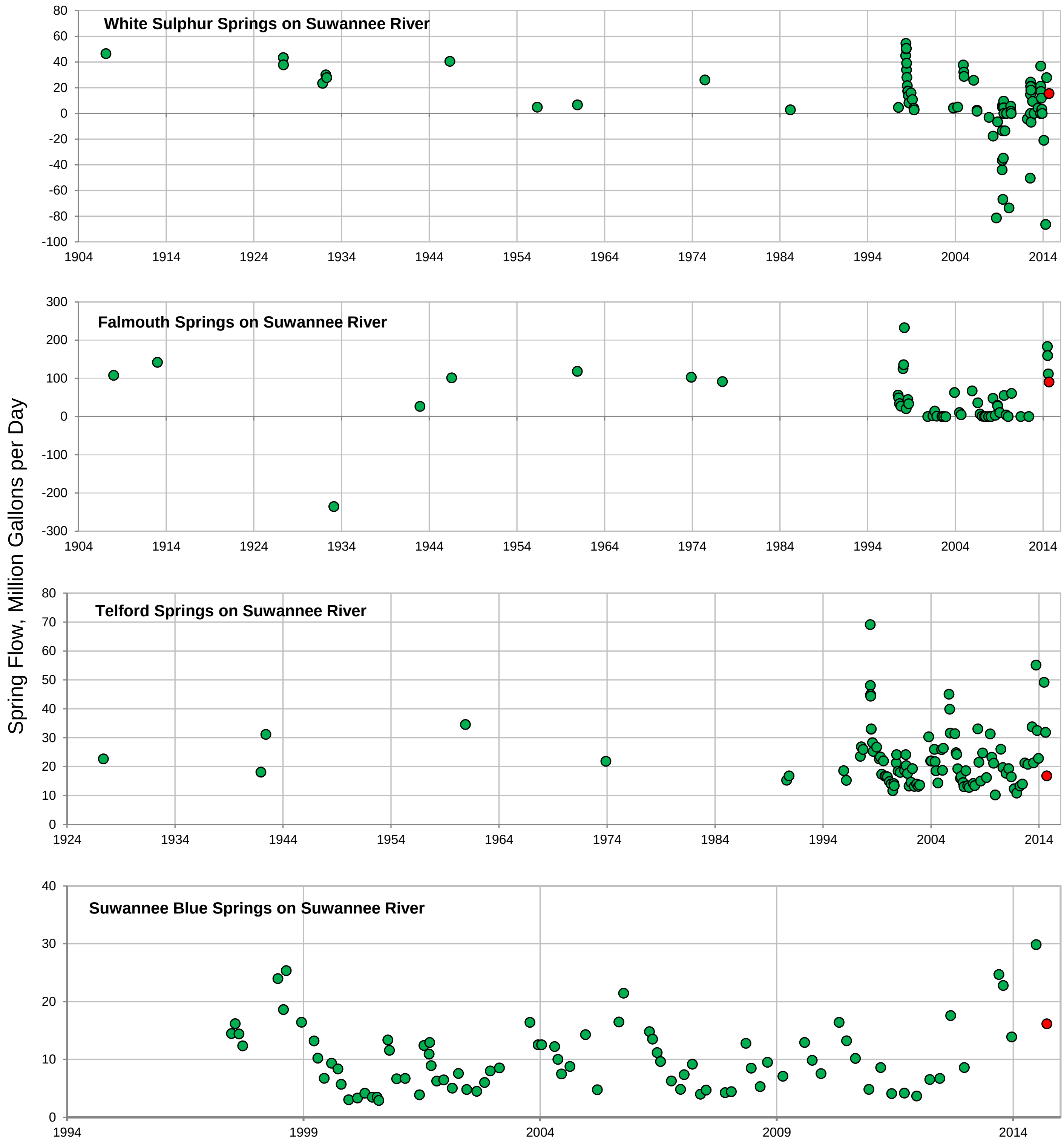


Figure 9: Quarterly Springflow Measurements, continued

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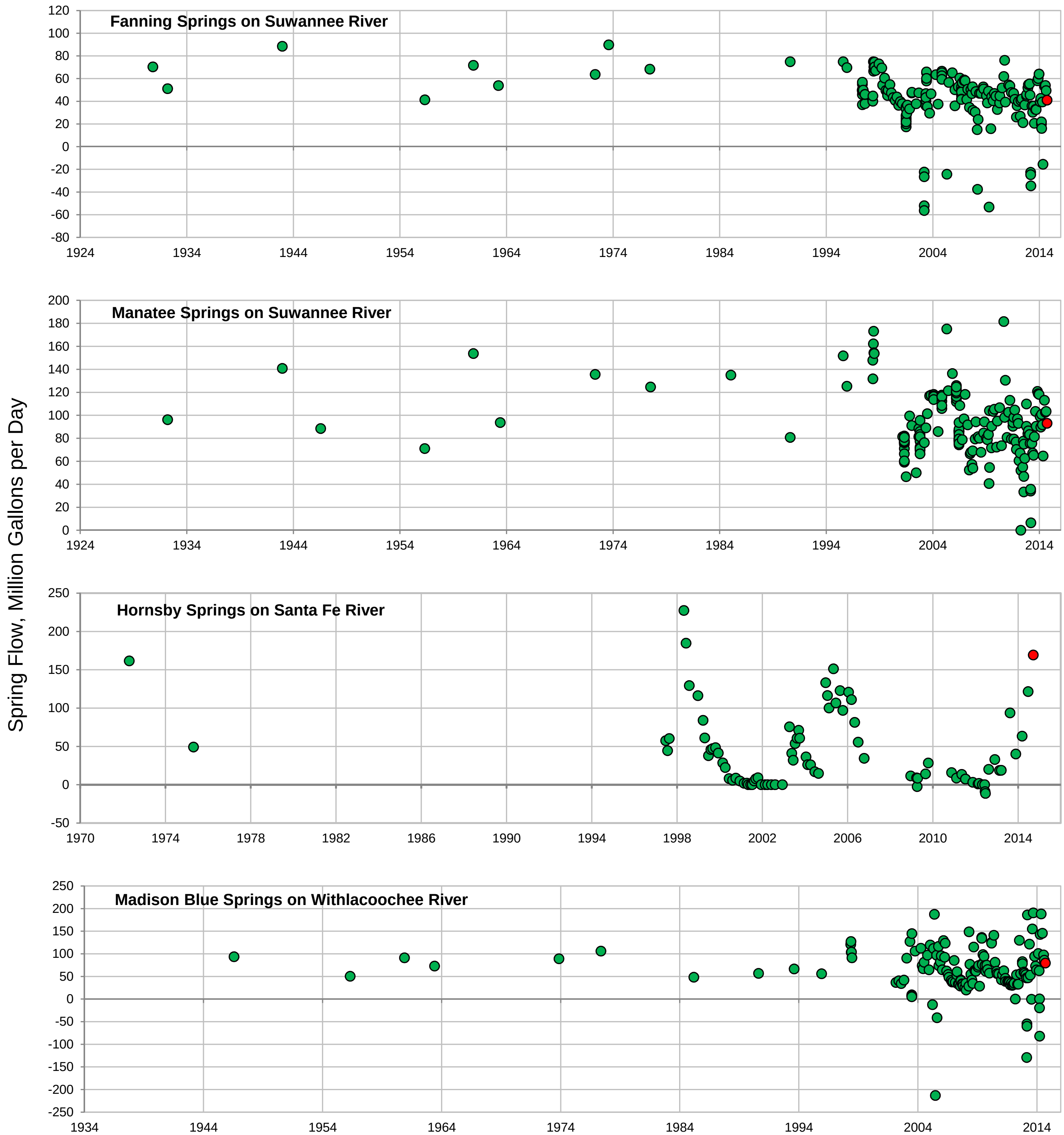


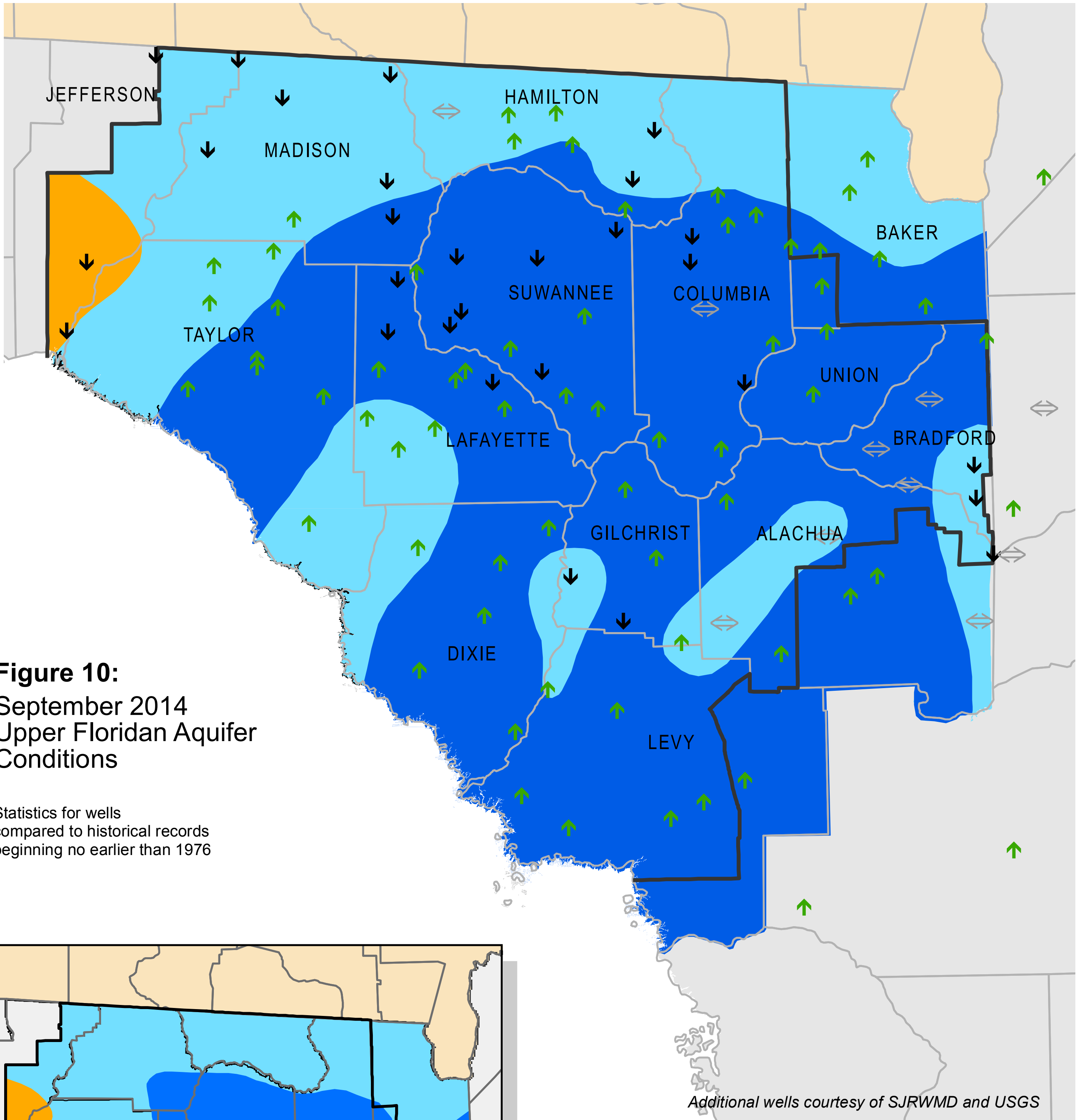
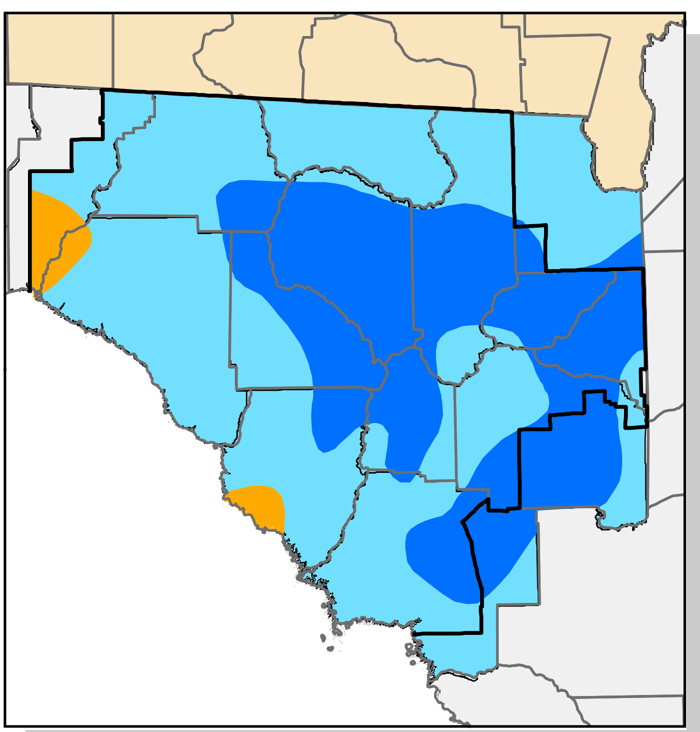


Figure 10:
September 2014
Upper Floridan Aquifer
Conditions

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



Inset: August 2014 Groundwater Levels

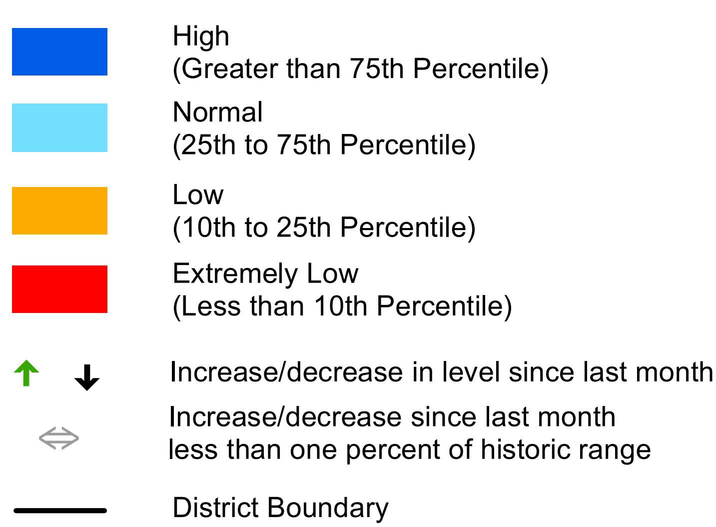
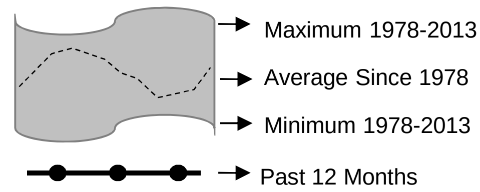


Figure 11: Monthly Groundwater Level Statistics
Levels October 1, 2013 through September 30, 2014
Period of Record Beginning 1978



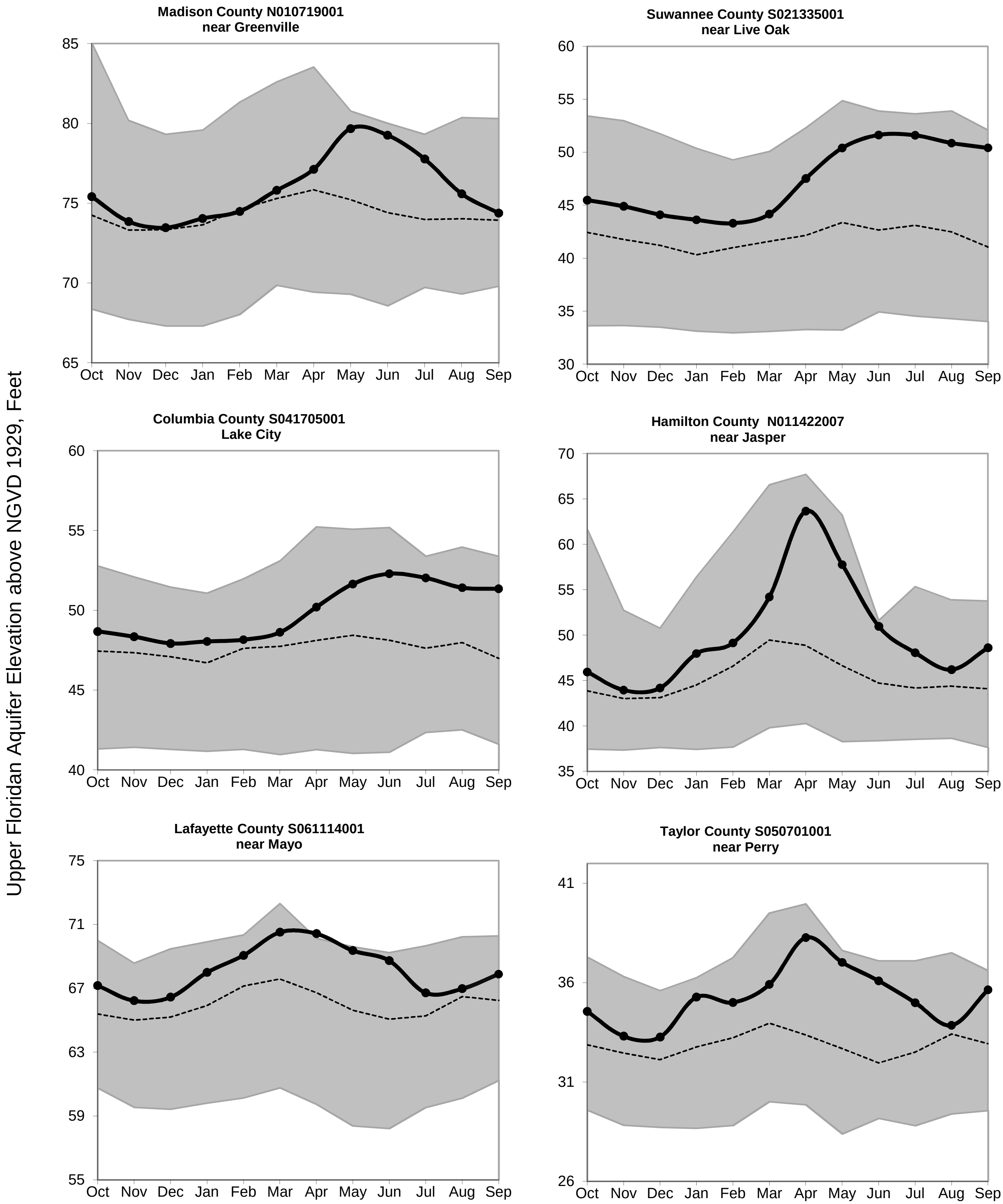
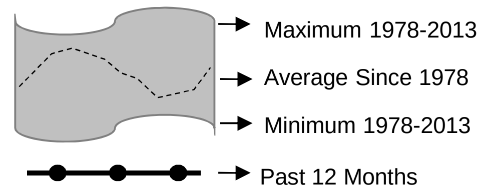
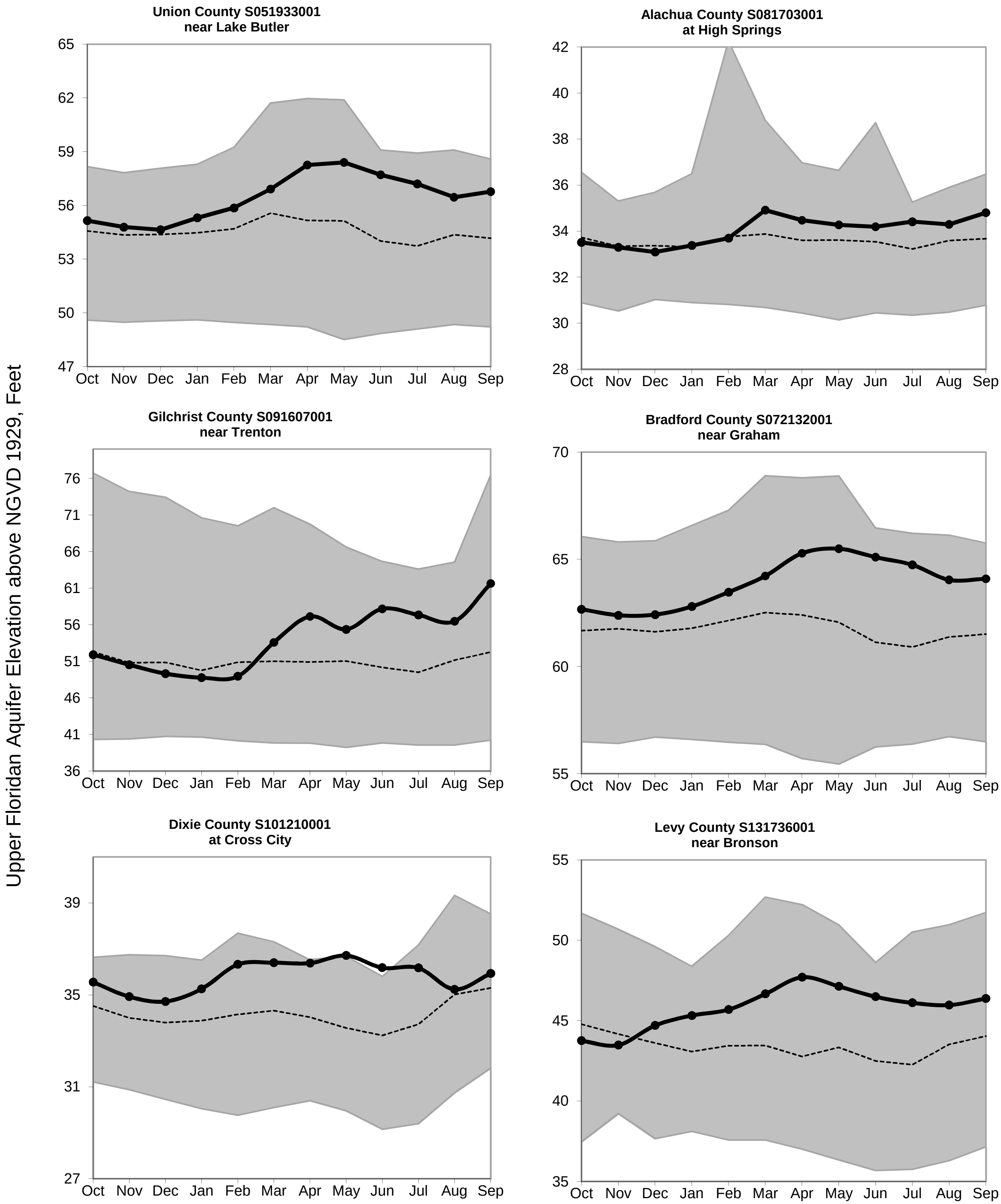


Figure 11, cont.: Groundwater Level Statistics
Levels October 1, 2013 through September 30, 2014
Period of Record Beginning 1978





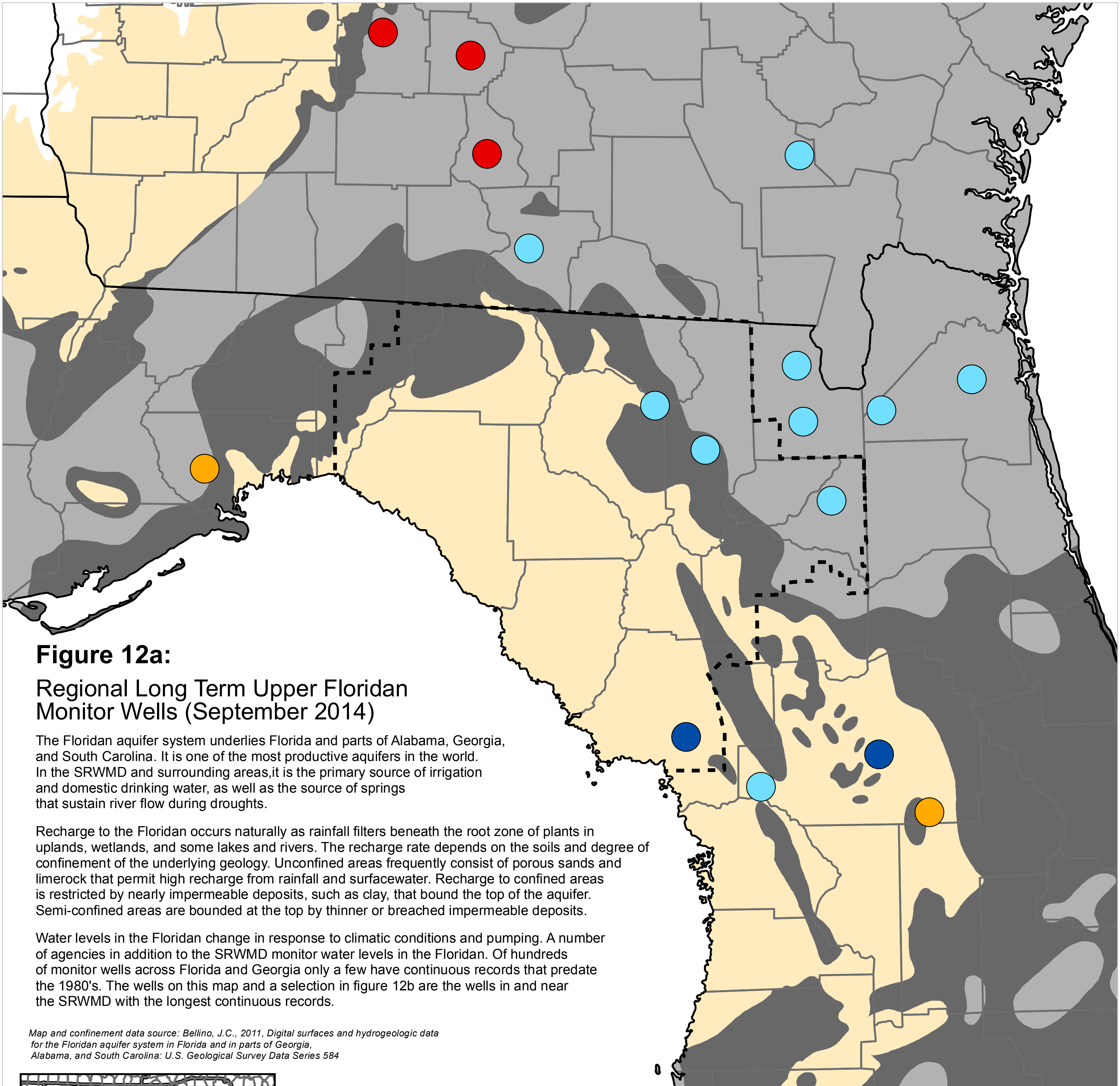


Figure 12a:

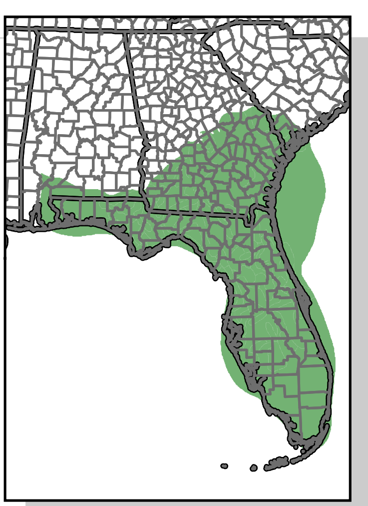
Regional Long Term Upper Floridan Monitor Wells (September 2014)

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

September 2014