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: December 5, 2014

RE: November 2014 Hydrologic Conditions Report for the District

RAINFALL

- District-wide rainfall in November, typically the driest month of the year, was 3.53” or about 50% above average based on records beginning in 1932. Accumulations were the result of two cold fronts on the 20th and the 25th-29th. Prior to the first front, most gages went without appreciable rain for 32 consecutive days. All counties ended the month with above-average rainfall (Table 1, Figure 1). The highest totals fell in Jefferson and Madison counties (Figure 2) where rainfall had been much below normal since June. Watersheds in Georgia that contribute to the Suwannee River saw 200-300% of normal after months of dry weather (Figure 3).
- The highest gaged monthly total (6.22”) and the highest daily total (2.54”) were recorded at the Cabbage Grove Tower gage in southwestern Taylor County. The lowest gaged total was 2.21” at Rosewood Tower near Cedar Key.
- Average rainfall for the 12 months ending November 30 was nearly 7” higher than the long-term average of 54.63". Twelve-month departures improved in the upper Aucilla and Santa Fe basins, with only isolated areas seeing up to a 10” deficit (Figure 4).
- Average rainfall for the 3 months ending November 30 was 2.8” above the long-term average of 10.8” (Figure 5).

SURFACEWATER

- **Rivers:** Levels fell steadily up until the first cold front, but with the exception of the Alapaha River most gages stayed in a range considered normal for the time of year. Alapaha gages in Georgia remained below the 10th percentile, considered very low. The storms brought Alapaha gages back up to normal or above-normal, while Withlacoochee River gages saw flows above the 90th percentile, considered high. Storm totals were lower in the Santa Fe Basin, where gages ended the month with normal or above-normal flows. The Aucilla and Econfina rivers also saw above-normal flows, while the Steinhatchee and Fenholloway rivers remained typical of the season. Flow statistics for a number of rivers are presented graphically in Figure 6, and conditions relative to historic conditions in Figure 7.
- **Lakes**: Lake levels rose slightly after the first storm, but most still ended the month lower than October levels. Sneads Smokehouse Lake remained near its record low level. Figure 8 shows levels relative to the long-term average, minimum, and maximum levels for a number of monitored lakes.
- **Springs**: Twenty-two springs or spring groups were measured by the USGS, District staff, and District contractors in November. Flows generally remained stable with most above their long-term median. Flow records for a number of springs are shown in Figure 9.

GROUNDWATER

Levels in most upper Floridan monitor wells continued to fall in November, even in areas of higher rainfall. Overall, by the end of November levels fell to the 69th percentile from the 75th percentile in October based on records beginning no earlier than the 1970s (Figure 10). Eighty percent of the wells had levels above median, while 40 percent were above the 75th percentile, considered high. One well in northeastern Madison County was 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 November 29 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 February. The El Niño watch issued by the CPC in March remained in effect. Their December 4 report gave a 65% chance that El Niño conditions would be present during the winter and last into spring. An increase in equatorial Pacific sea surface temperature anomalies during November implied weak El Niño conditions, but atmospheric anomalies associated with El Niño had not yet developed. The lack of atmospheric response kept the CPC from declaring an El Niño event. The model consensus was for a weak event if El Niño fully emerges. 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.
- The U.S. Drought Monitor report of December 2 showed abnormally dry conditions in the Aucilla basin and in the upper Withlacoochee and Alapaha basins in Georgia.

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 Eastern Standard Time (between November 2, 2014 and March 8, 2015) 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	November 2014	November Average	Month % of Normal	Last 12 Months	Annual % of Normal
Alachua	2.91	2.35	124%	60.72	119%
Baker	3.24	2.22	146%	59.02	118%
Bradford	2.86	2.32	124%	53.47	105%
Columbia	3.38	2.44	138%	63.76	124%
Dixie	2.64	2.50	106%	59.13	100%
Gilchrist	2.82	2.72	104%	62.79	110%
Hamilton	4.42	2.72	163%	62.89	120%
Jefferson	5.71	3.44	166%	56.03	92%
Lafayette	2.83	2.78	102%	65.71	116%
Levy	3.01	2.55	118%	63.83	107%
Madison	5.16	3.12	165%	57.30	102%
Suwannee	3.45	2.53	136%	65.65	124%
Taylor	3.69	2.85	130%	64.49	108%
Union	2.86	2.55	112%	59.18	110%

November 2014 Average:	3.53
November Average (1932-2013):	2.32
Historical 12-month Average (1932-2013):	54.63
Past 12-Month Total:	61.56
12-Month Rainfall Surplus:	6.93

Figure 1: Comparison of District Monthly Rainfall

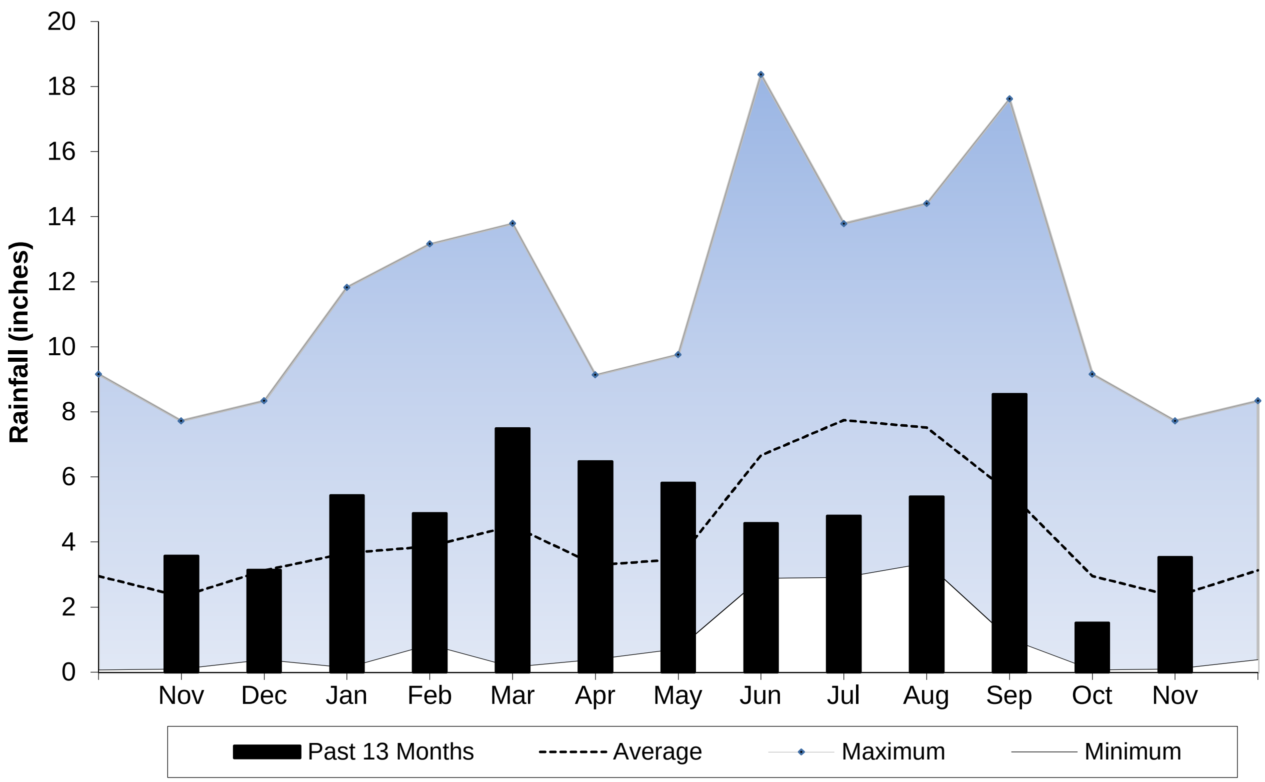


Figure 2: November 2014 Rainfall Estimate

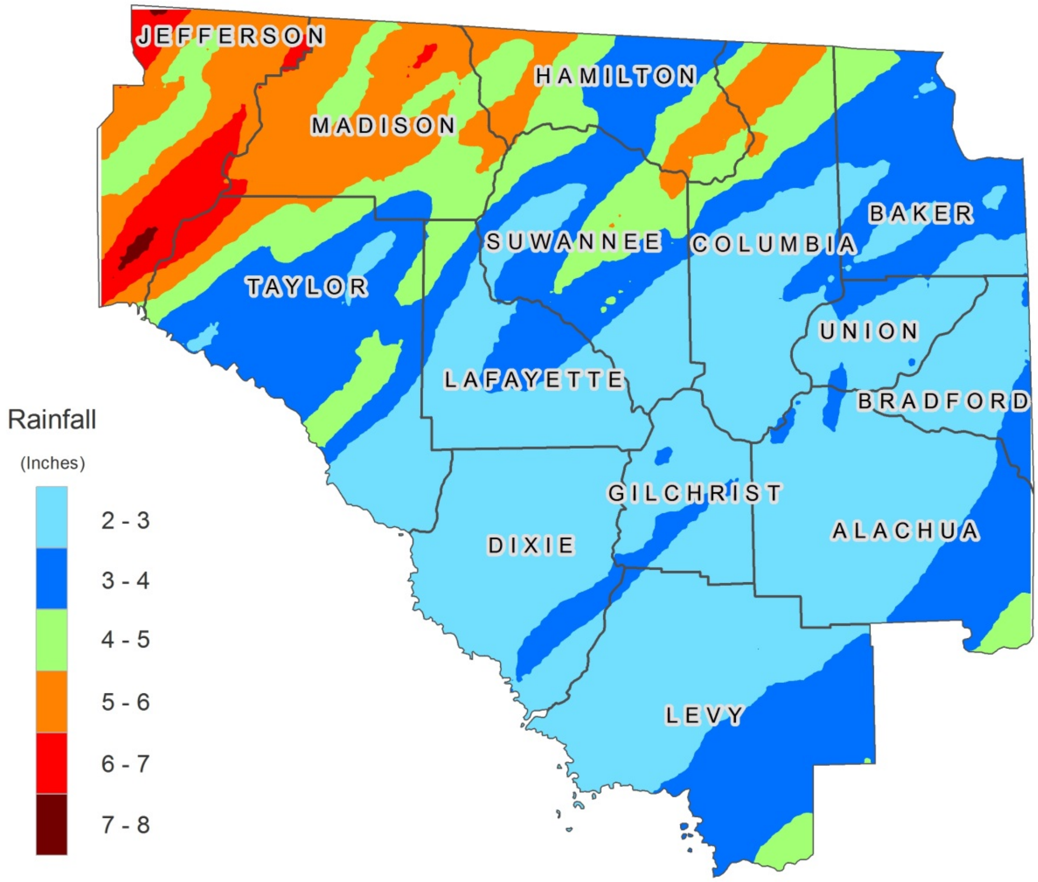


Figure 3: November 2014 Percent of Normal Rainfall

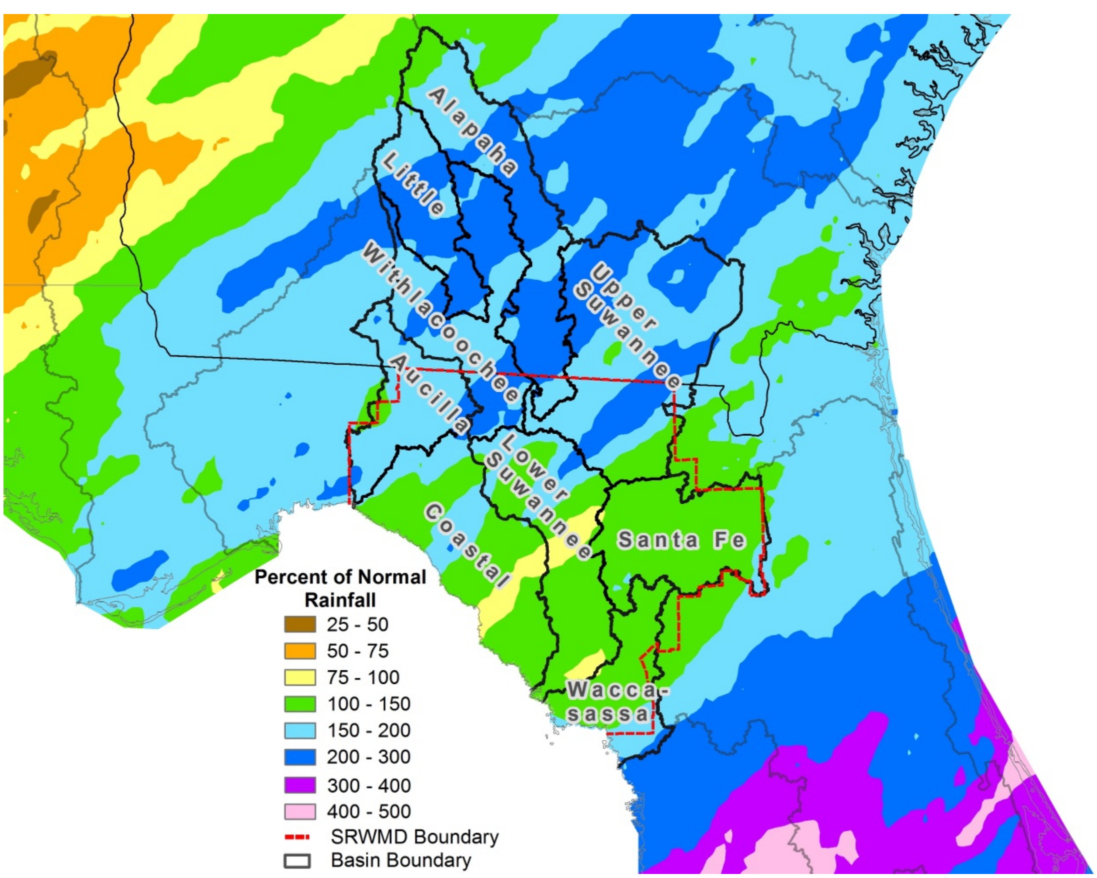
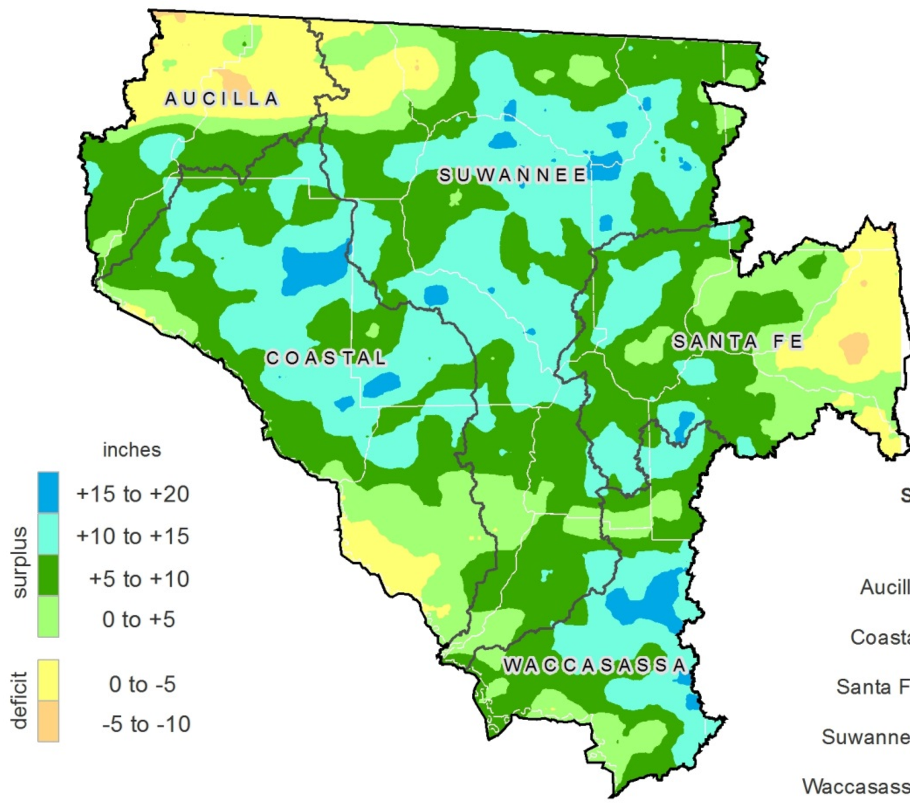


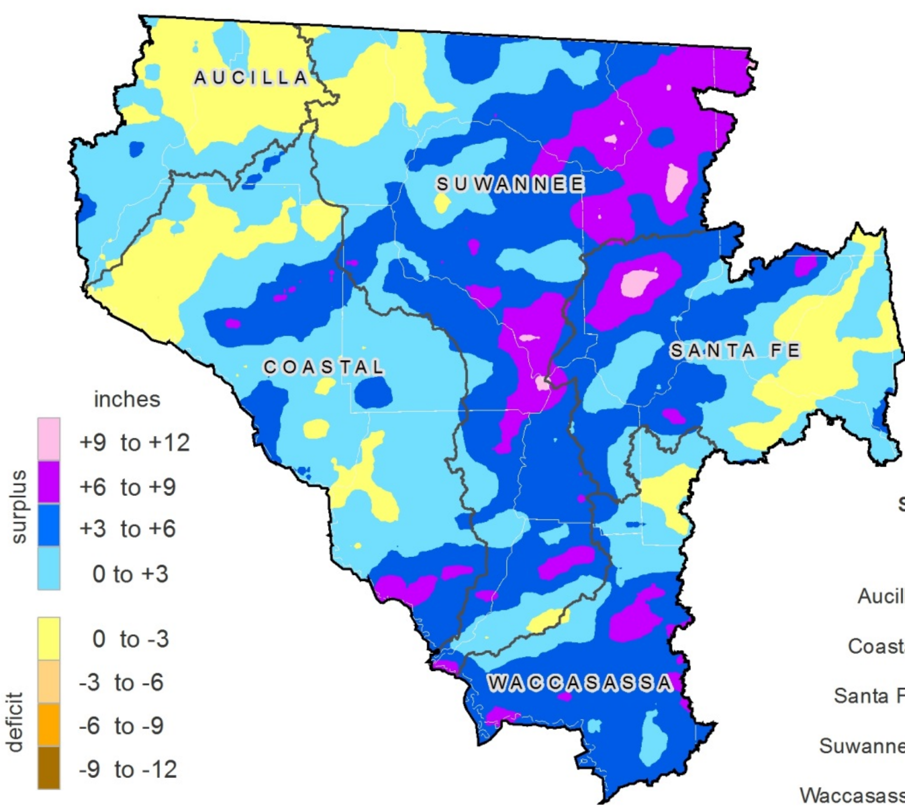
Figure 4: 12-Month Rainfall Surplus/Deficit by River Basin
Through November 30, 2014



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

	Nov -14	Oct -14
Aucilla	+1.6	-0.3
Coastal	+8.6	+8.9
Santa Fe	+5.1	+5.4
Suwannee	+8.7	+8.5
Waccasassa	+9.7	+10.9

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

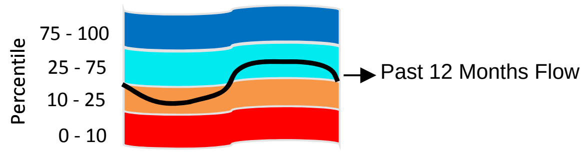


3-Month Surplus (+) or Deficit (-) By Basin

	Nov -14	Oct -14
Aucilla	+0.1	-8.2
Coastal	+1.6	-1.4
Santa Fe	+2.6	+0.6
Suwannee	+4.0	+0.3
Waccasassa	+3.6	+3.0

Figure 6: Daily River Flow Statistics

December 1, 2013 through November 30, 2014



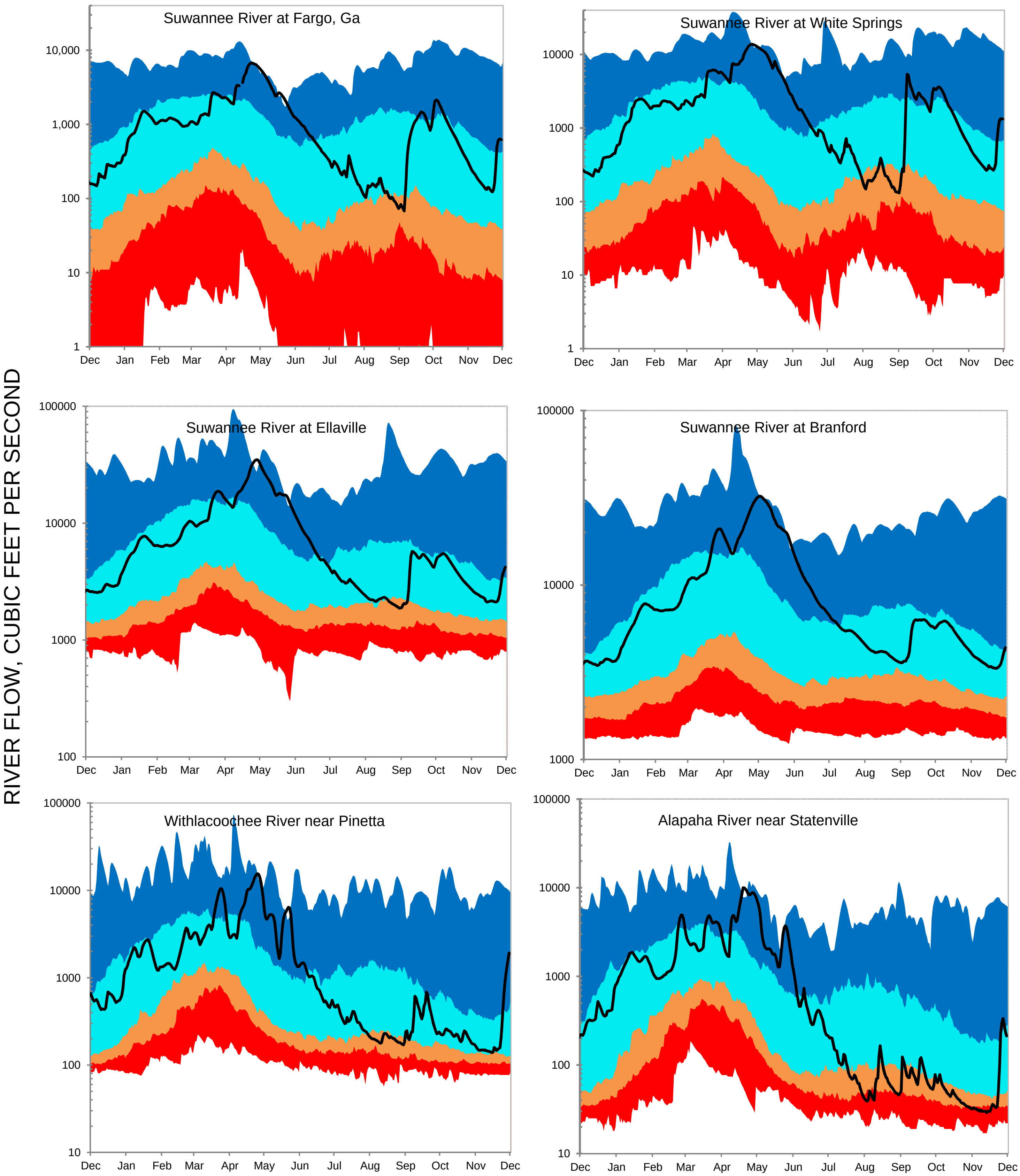
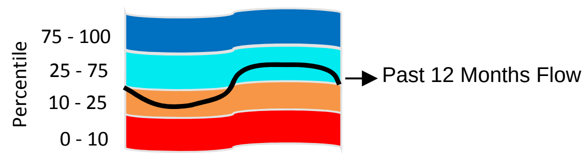
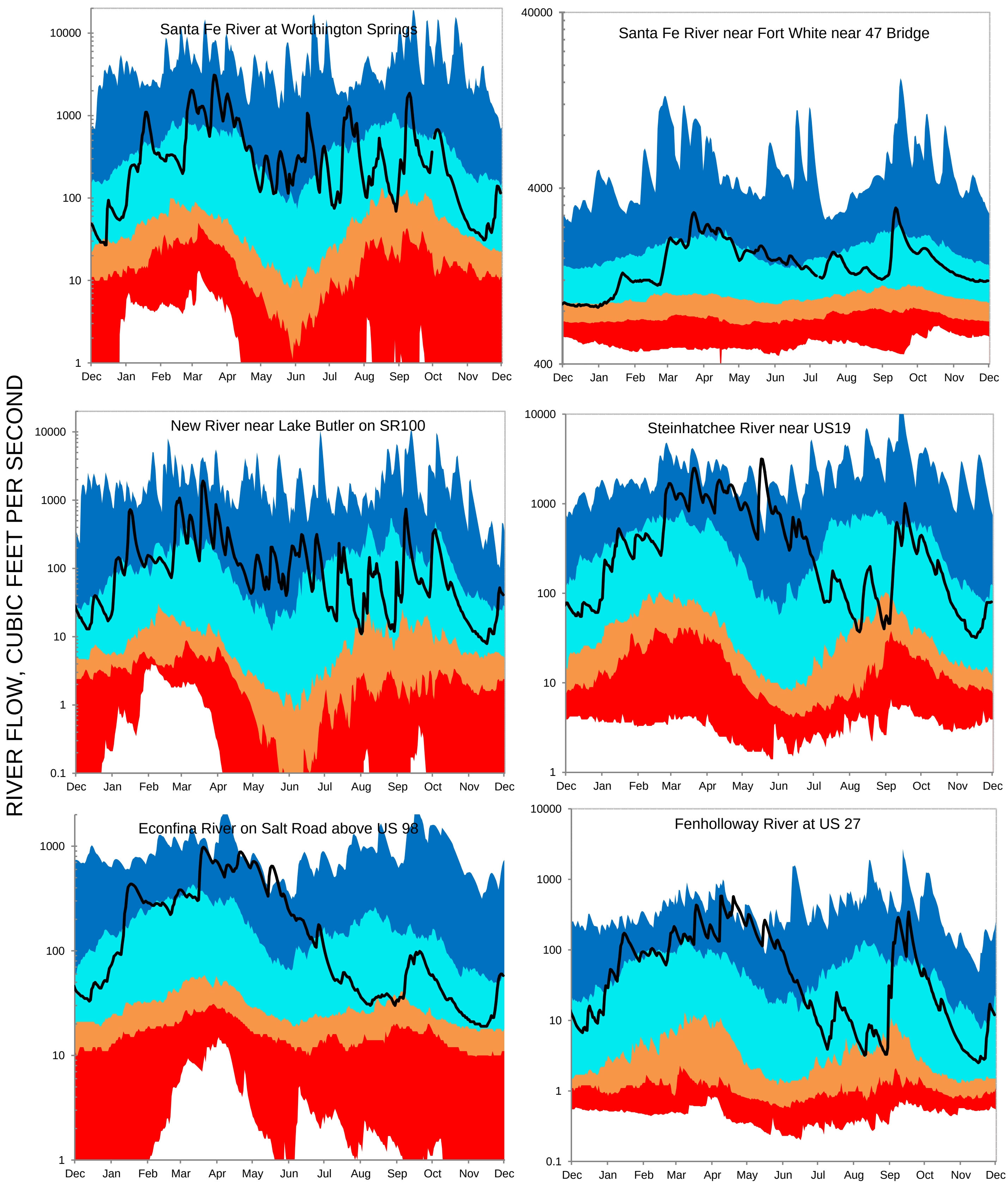


Figure 6, cont: Daily River Flow Statistics

December 1, 2013 through November 30, 2014





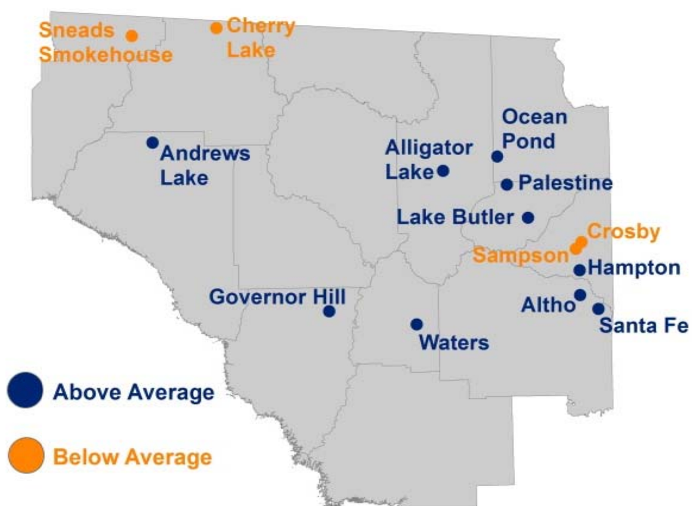
The Cody Scarp (or Escarpment) is an area of relatively steep topographical change that runs across north Florida. The geology above the Scarp consists of sandy soils over thick layers of mostly impermeable sediments such as clay. Streams are well-developed with dendritic (tree-like) drainage patterns.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

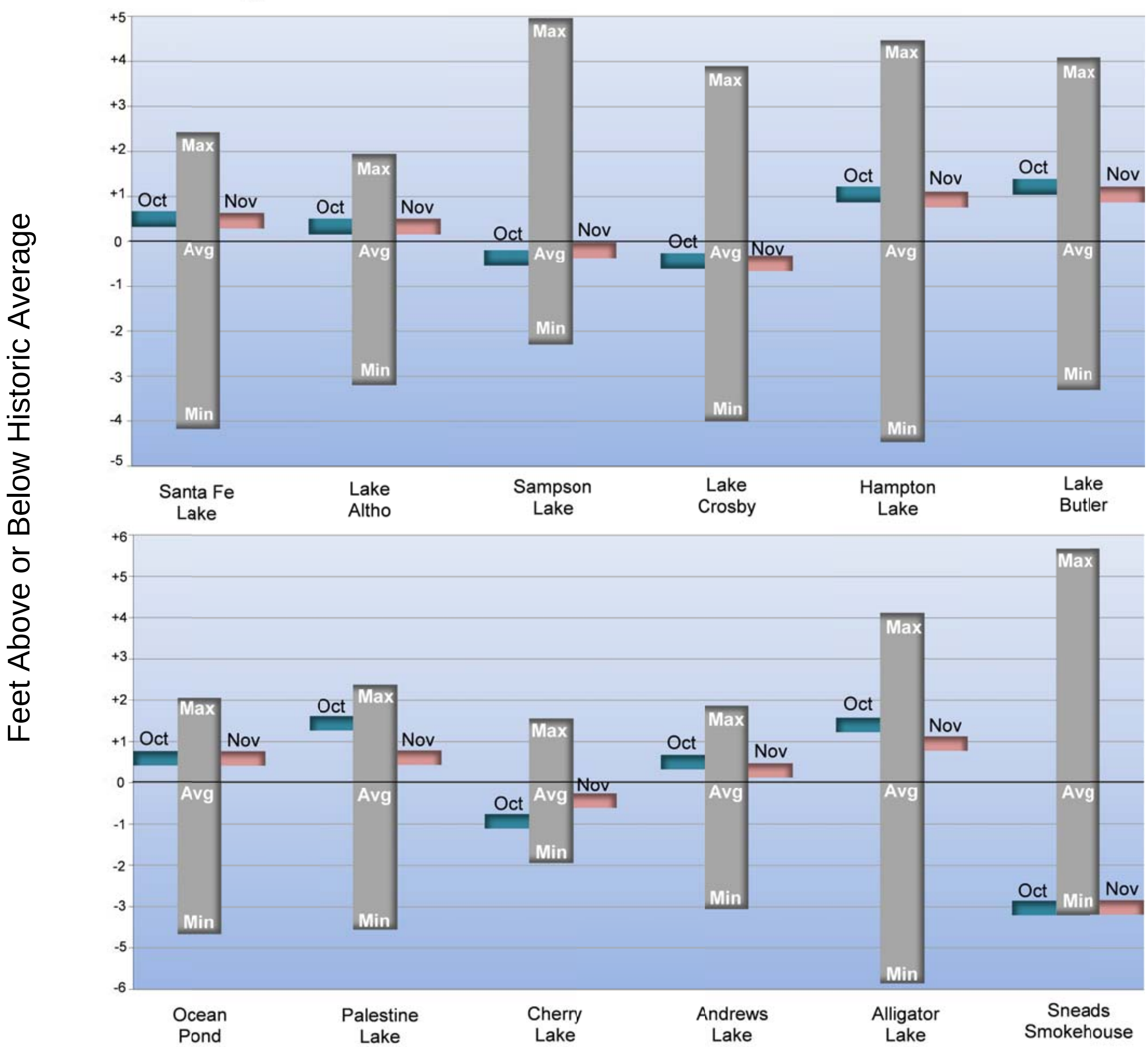


Figure 9: Quarterly Springflow Measurements

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

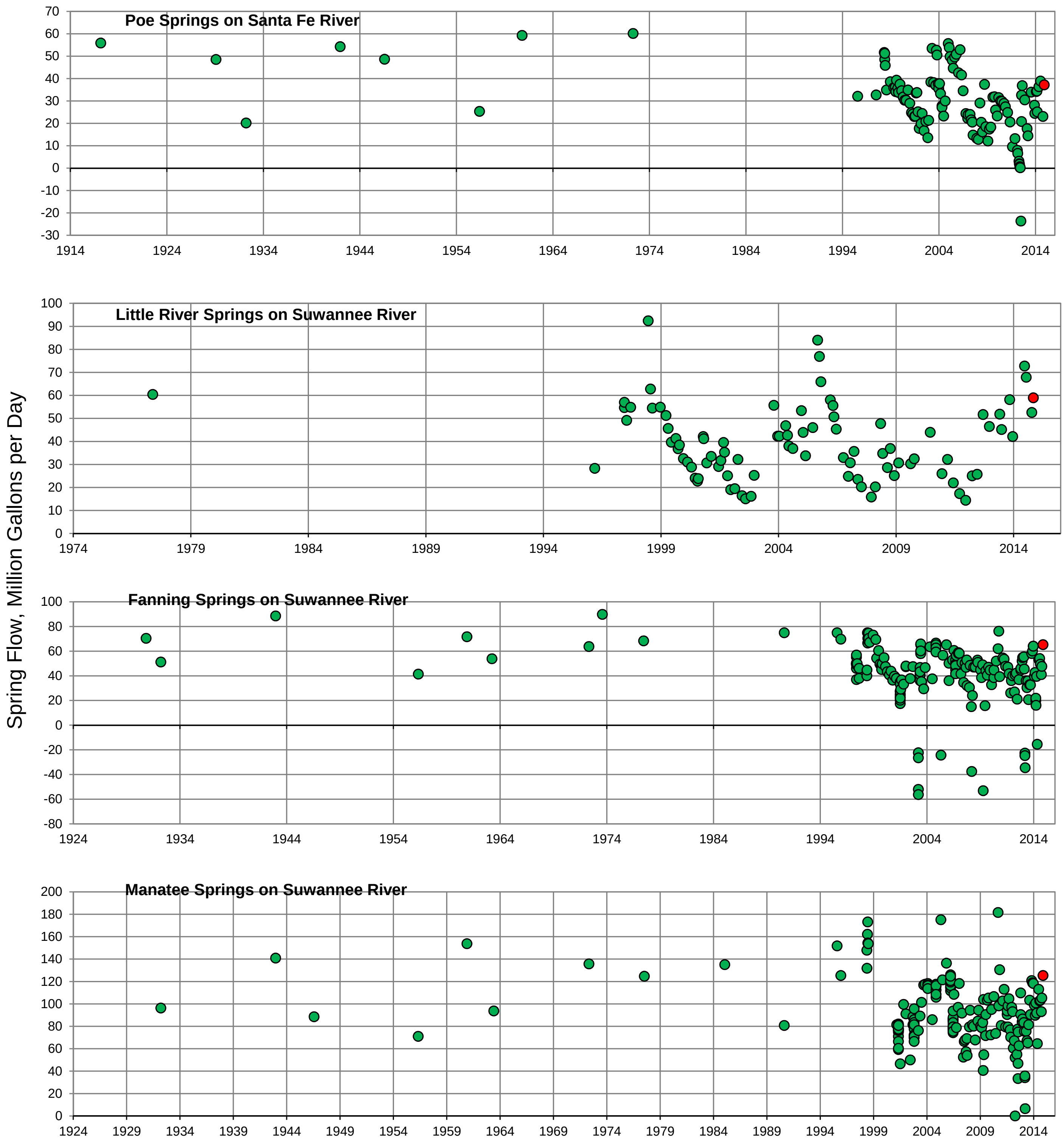
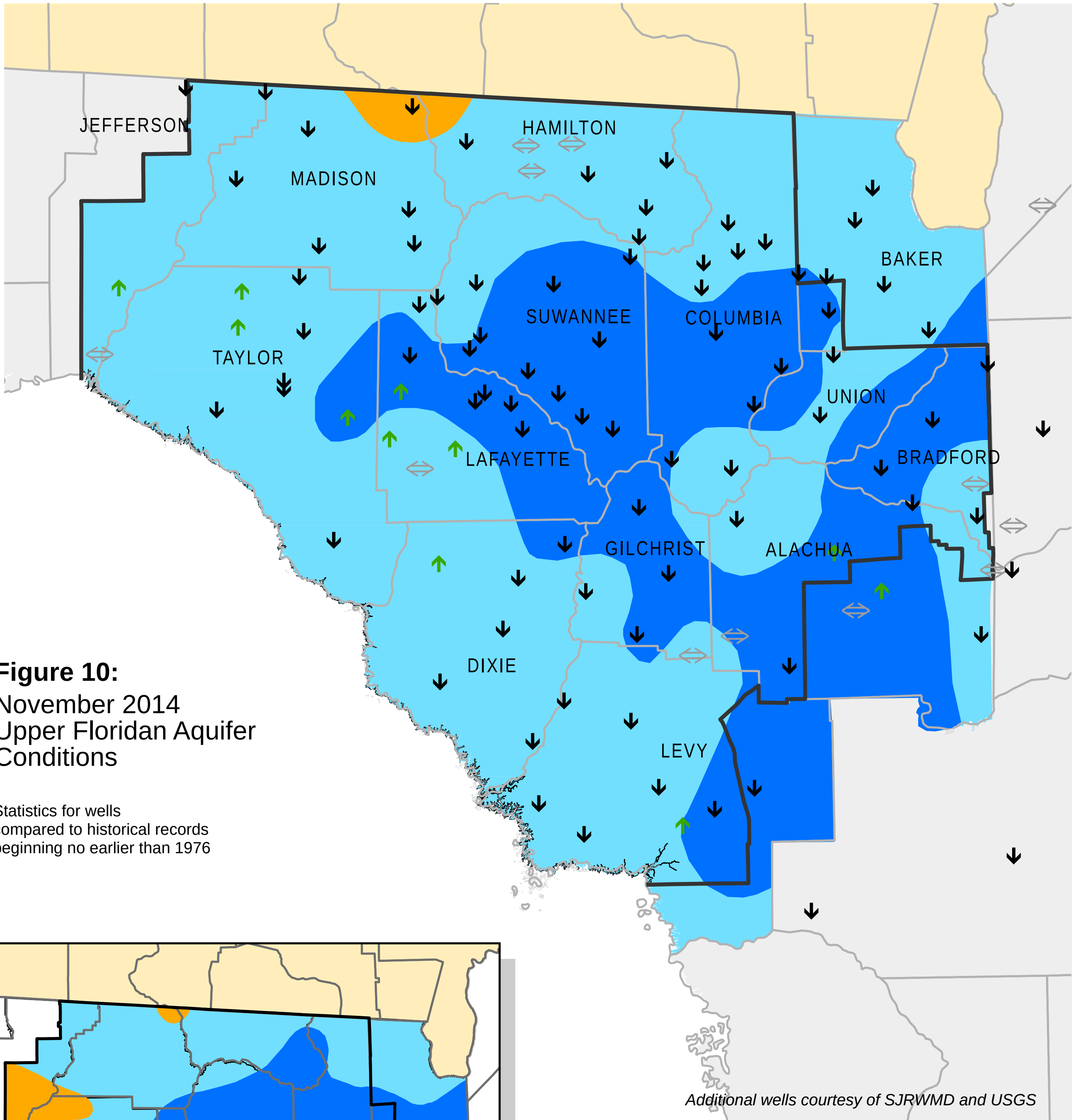
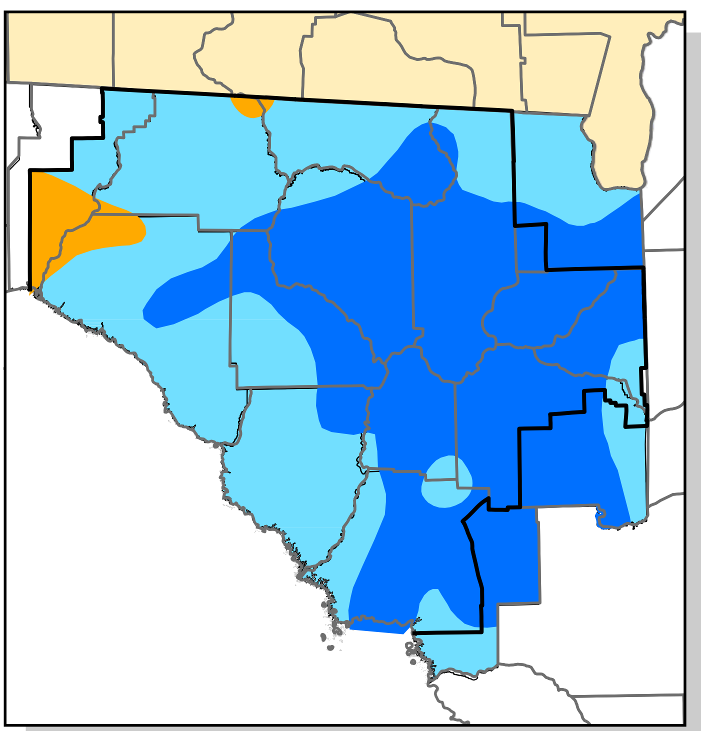


Figure 10:
November 2014
Upper Floridan Aquifer
Conditions

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





Inset: October 2014 Groundwater Levels

High
(Greater than 75th Percentile)

Normal
(25th to 75th Percentile)

Low
(10th to 25th Percentile)

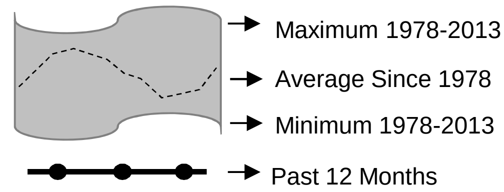
Extremely Low
(Less than 10th Percentile)

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 December 1, 2013 through November 30, 2014
Period of Record Beginning 1978



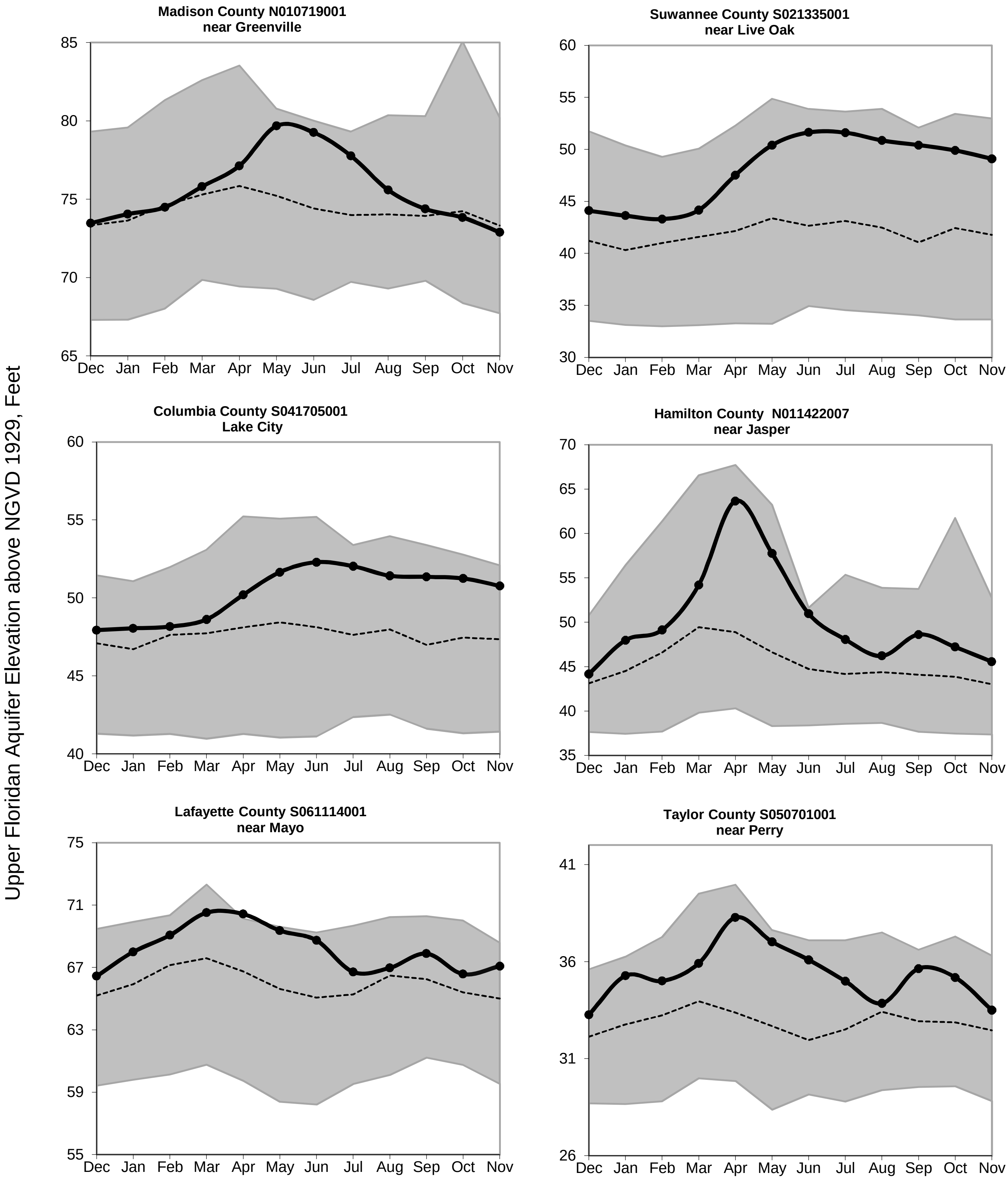
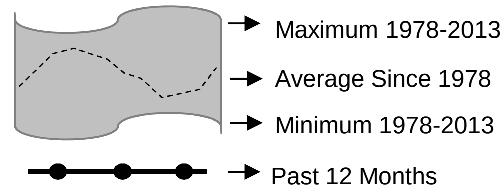
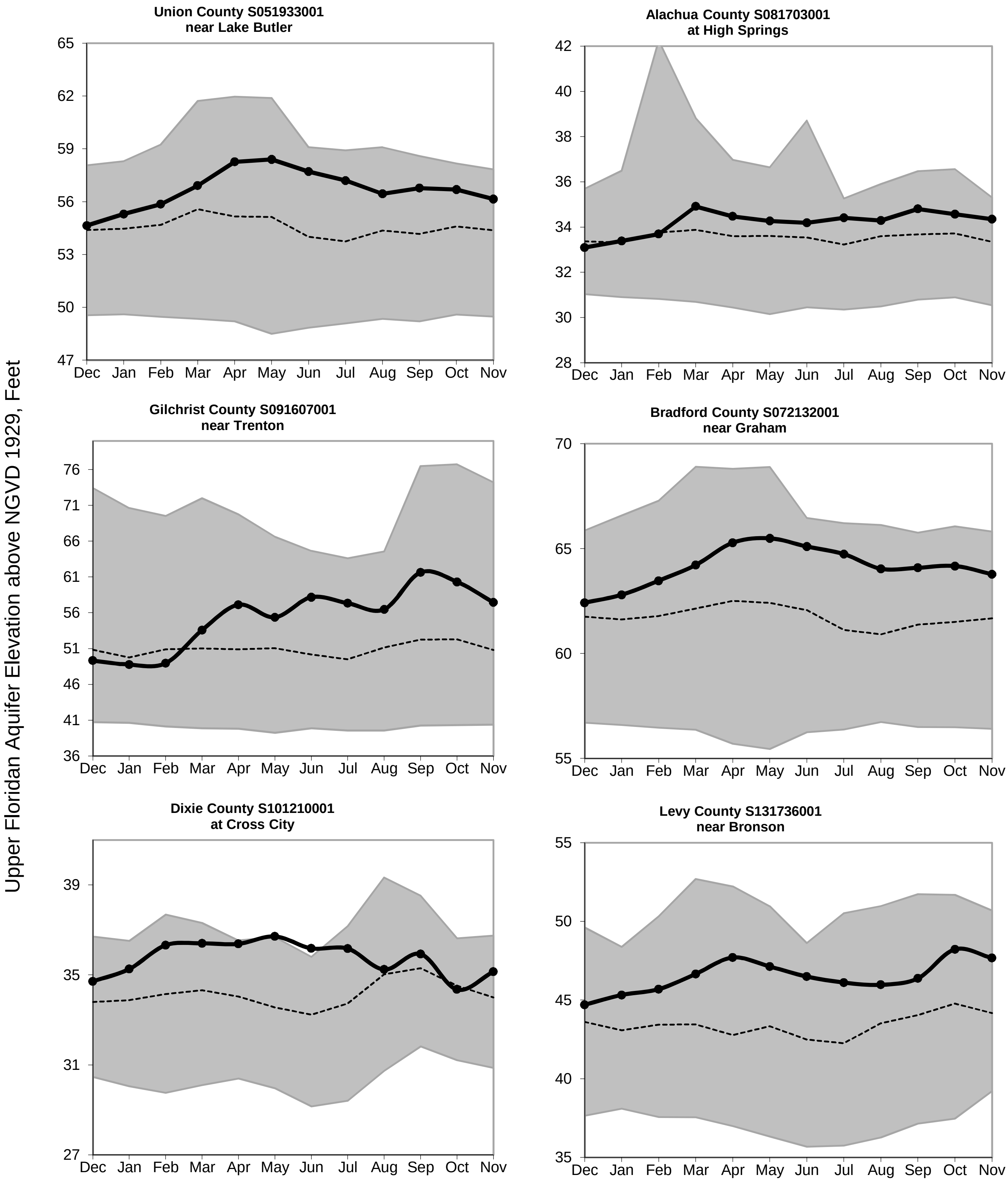


Figure 11, cont.: Groundwater Level Statistics
Levels December 1, 2013 through November 30, 2014
Period of Record Beginning 1978





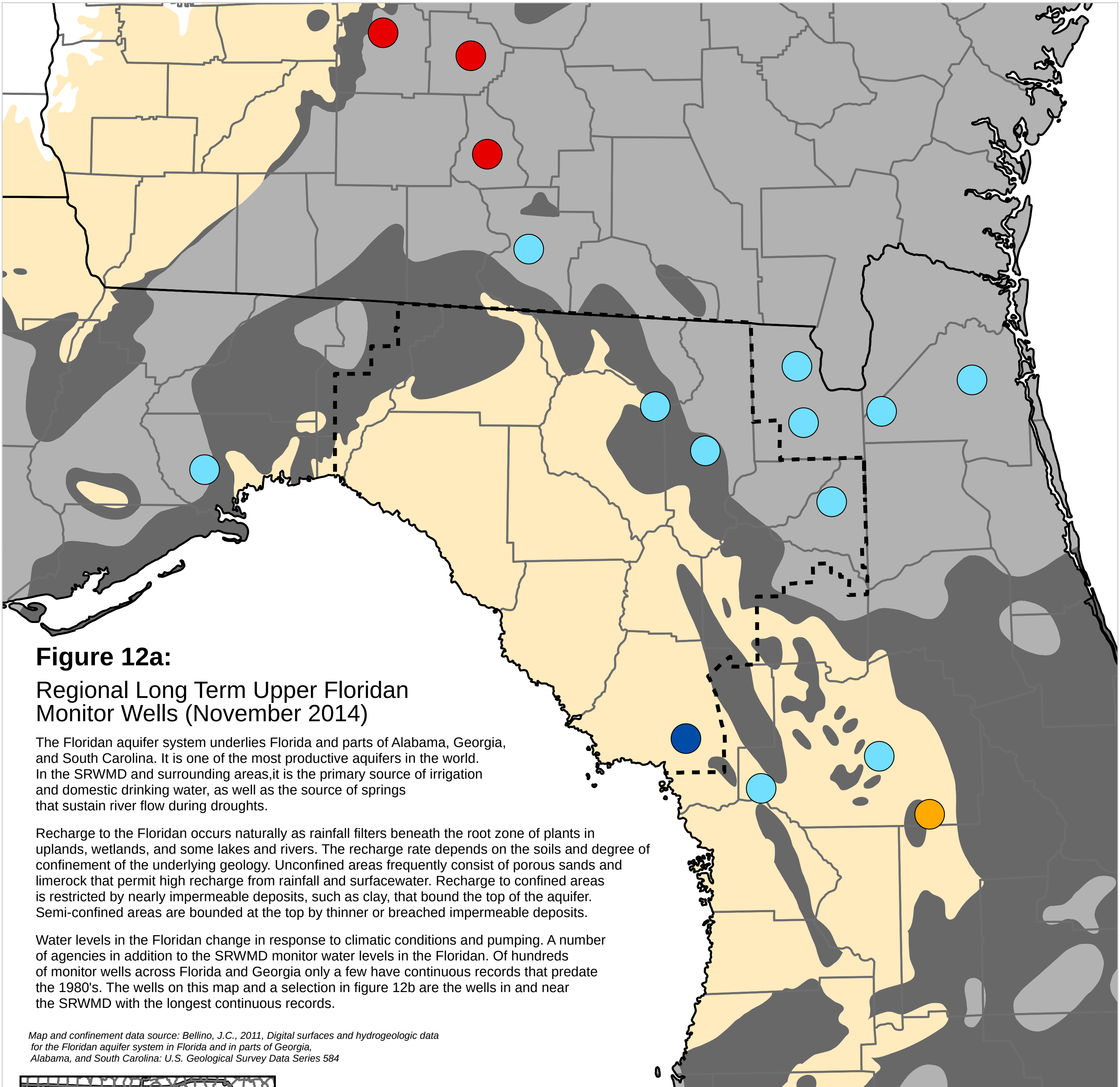


Figure 12a:

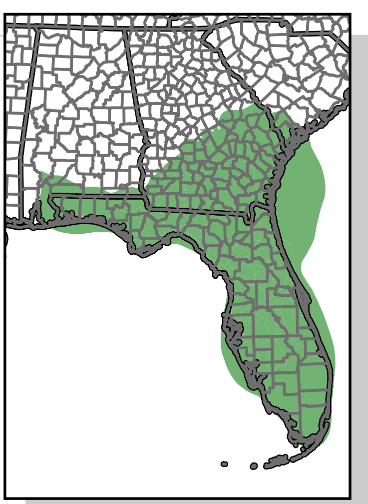
Regional Long Term Upper Floridan Monitor Wells (November 2014)

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

November 2014