MEMORANDUM

TO: Governing Board

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

THRU: Ann B. Shortelle, Ph.D., Executive Director
Jon Dinges, Department Director

DATE: July 7, 2012

RE: June 2012 Hydrologic Conditions Report for the District

RAINFALL

- Average rainfall in the District in June was 18.37", the highest monthly average based on records beginning in 1932. The previous highest average was 17.62" in September 2004 following hurricanes Frances and Jeanne. Typical June rainfall in the District is 6.49" (Table 1, Figure 1). Radar estimates ranged from 9" in localized areas in southern counties and northern Jefferson and Madison counties, up to 33" between McAlpin and Mayo in Suwannee and Lafayette counties (Figure 2). In the 36 days between May 26 and June 30, this area received almost a typical year's amount of rain (Figure 3).
- The highest gaged total for the month was 28.23" near the Benton inspection station in northern Columbia County. The previous highest monthly total in the SRWMD was 28.01" at the Lake City NOAA gage in September 2004.
- The highest gaged 24-hour rainfall during Tropical Storm Debby was 17.66"' at the PCS gage north of White Springs in Hamilton County, followed by 17.15" at the Benton gage. Figure 4 shows rainfall estimates for the storm. The highest 24-hour gaged total recorded in the District was 24" in October 1950 at Cedar Key.
- The highest gaged total for Debby was 22.49" at the PCS gage. Figure 5 shows estimated recurrence intervals for the storm. The areas of highest rainfall in Hamilton and Columbia counties exceeded the 0.2% (500-year) storm.
- The gage at Live Oak Tower recorded 22" for the month, with a maximum 24-hour total of 11.6", exceeding the 1% (100-year) event by nearly 2". The 4-day total was 16.58", also exceeding the 1% storm. The 4-day total for Hurricane Dora in September 1964 was 18.62", with 12.95" as the highest 24-hour total.
- The NOAA gage in Starke reported 14.9" during Tropical Storm Debby, exceeding the 72-hour 1% storm. The total for the month was 27.3".
- The gage at Alligator Lake in Lake City reported 20.82" for the month. The total from Debby was 15.33", with a maximum 24-hour total of 10.1", exceeding the 1% storm. The September 2004 total at this gage was 19.54".

- Rainfall in the Withlacoochee and Alapaha Basins in Georgia, both major tributaries of the Suwannee River, was near normal or below normal during June (Figure 6).
- Average SRWMD rainfall for the 12 months ending June 30 was 1.23" higher than the long-term average of 54.65". This was an improvement, on average, of 13" since May 31. Counties most affected by Tropical Storm Beryl and Debby had rainfall in excess of 20" over the average, while parts of Jefferson, Madison, coastal Taylor, Dixie, and Levy counties had deficits greater than 10" (Figure 7).

SURFACEWATER

The worst effects of Tropical Storm Debby were widespread flooding of small streams, lakes, and inland depressional areas affecting roads, homes, and businesses across the District, along with many reports of sinkholes.

- **Suwannee River:**
    - The Suwannee River at White Springs was immediately downstream of the record rainfall totals from Debby. The river crested here early on June 28 with an unofficial stage near 85.3', which is the third highest crest since gaging began in 1906 and close to the second-highest crest in April 1984. The flood of record at this gage was 88.56' in April 1973. The river rose 32' in two days, the fastest rise in the record. The flow rate was measured by the USGS at 28,300 cubic feet per second (cfs), a flow exceeding the 2% (50-year) flood but not reaching the 1% (100-year) flood according to USGS frequency statistics.
    - The Suwannee River at Suwannee Springs crested 2 days later at a stage near 70.3, a foot lower than the crest caused by the 2004 hurricanes and nearly 2 feet lower than the spring 1998 flood. The flow was slightly greater than the 10% (10-year) flood.
    - Gages below Suwannee Springs crested below flood stage and well below the last major flood in 2009. The attenuation in severity downstream of the severe flood at White Springs was a combination of low river levels, extremely dry surface conditions, and extremely low groundwater levels. Another major factor in the reduced downstream severity was the lack of contribution of the Alapaha and Withlacoochee rivers, which in 2009 backed up the upper Suwannee and caused major flooding on the middle Suwannee. Debby caused the reverse, with the Suwannee backing up the lower Withlacoochee and Alapaha. These areas crested far below the 2009 flood.

- **Santa Fe River**:
    - Tropical Storm Beryl in late May reduced soil and surfacewater storage in the upper Santa Fe basin, and the additional 10"-15" from Debby caused major flooding of many lakes and Santa Fe tributaries. The New River near Lake Butler and the Santa Fe River at Worthington

Springs crested with the highest stage since 1992. Both exceeded the 10% flood according to USGS frequency statistics.
  - The Santa Fe at O'Leno State Park crested higher than any recorded flood since 1980, although the peak stage during the 1992 event is not in the record. The stage at crest reported by Park staff was 2' higher than the 1998 flood. The river flowed across the land bridge between the Sink and the Rise.
  - Downstream of O'Leno, the river crested 3' higher than the 2004 flood at the U.S. 441 bridge, and 2' higher at the S.R. 47 bridge near Fort White. The crest at Fort White was about 8" lower than the 1998 flood. Flows at both bridges were near the 10% flood.
  - Like the upper Suwannee, the Santa Fe flood was reduced in severity as the crest made its way downstream. Both the Three Rivers gage and the U.S. 129 gage crested several feet below the last major flood in 2009. Record-low groundwater levels caused the river to flow back into the Floridan aquifer, resulting in reports of brown water in wells near the river. Alachua County staff estimated the river flowing back into Hornsby Springs at a rate exceeding 200 cfs and measured flow into Poe Springs at over 30 cfs. These two observations alone were 2% of the peak flow at the Fort White gage.

- **Aucilla River:** The Aucilla River at Lamont crested near flood stage, 3' lower than the last flood in 2009.

- **Steinhatchee River:** The Steinhatchee River above U.S.19 went from an apparent record low on May 26 to the highest stage since 1985 and the fourth-highest crest since gaging began there in 1950. The upper parts of the Steinhatchee basin received over 30" of rain since the record low was set. This flood exceeded the 10% event.

- **Econfina River:** The Econfina River above U.S. 98 reached its highest stage since 2005, cresting with a flow near the 50% (2-year) flood event.

- **Waccasassa River:** The river at U.S. 19 crested 3' lower than the record set in August 2010. The river was dry in its upper reaches prior to the storm, according to Levy County staff.

- **Fenholloway River:** The river at U.S. 27 rose to its highest level since 2005, cresting near the 50% (2-year) flood.

Statistics for a number of rivers are presented graphically in Figure 8 and conditions relative to historic conditions for the time of year in Figure 9.

- **Lakes**: The Sampson Lake outlet at C.R. 225 rose 6" higher than the levels recorded after the 2004 hurricanes. Peak lake levels there are yet to be

- determined. Hampton and Altho lakes, whose levels were near record lows prior to the storms, rose to near-average stages. Lake Butler rose to its highest level since 1998. Alligator Lake and Ocean Pond were at their highest stages since 2004. Lakes in the western part of the District remained below average, and Waters Lake near Trenton and Governor Hill Lake in Dixie County remained dry at the gages. Figure 10 shows levels relative to the long-term average, minimum, and maximum levels for lakes where the gages were accessible.

GROUNDWATER

Only Floridan aquifer levels available after June 25 were used in this report. By the end of June, levels in all but two District monitor wells had risen. These two wells set new record lows in June, compared to 30 new lows set in May. Wells in the eastern part of the District in areas of mostly confined aquifer started to rise even in advance of Debby, and levels should continue to climb upward slowly. Wells near the Suwannee and Santa Fe rivers rose to their highest levels since previous floods. Thirty-four percent of the monitored wells were in the lowest 10% of records, 13% were below normal, 34% were normal, and 18% were above normal (Figure 11). Median conditions across the District compared to all historic levels rose from the 1st percentile in May to the 29th percentile (based on records beginning no earlier than 1978). Statistics for a representative sample of wells are shown in Figure 12.

HYDROLOGICAL/METEOROLOGICAL/WATER USE 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 value for the week ending June 30 was 4.42 in North Florida, indicating extremely wet conditions. Conditions in South Georgia were in a range near normal.
- The 3-month outlook issued by the Climate Prediction Center calls for above-normal precipitation and temperatures through September.
- Figure 13 shows overhead irrigation application at a number of farms in the District. The average application rate in June was nearly half the rate observed in May.

CONSERVATION

A modified Phase III Water Shortage remains in effect until the longer-term effects of the tropical storms are evaluated. All users are strongly urged to eliminate unnecessary uses. Details of the restrictions contained in the order are available on the District's webpage (www.mysuwanneeriver.com).

This report is compiled in compliance with Chapter 40B-21.211, Florida Administrative Code, using rainfall (radar-derived estimate), groundwater (61wells), surfacewater (35 stations), agricultural water use (106 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

County	June 2012	June Average	Last 3 Months	Last 12 Months
Alachua	14.86	6.57	23.39	51.66
Baker	22.94	6.29	32.84	61.10
Bradford	18.31	6.11	28.67	55.07
Columbia	23.84	6.25	34.31	63.70
Dixie	14.00	6.42	19.36	51.46
Gilchrist	13.95	6.43	20.64	52.42
Hamilton	20.90	6.13	27.66	56.54
Jefferson	15.94	6.09	21.45	48.64
Lafayette	23.05	6.25	33.43	63.23
Levy	12.60	6.87	17.86	48.52
Madison	18.29	6.08	23.61	57.53
Suwannee	26.26	6.20	36.50	68.37
Taylor	17.76	6.93	24.32	51.63
Union	19.78	6.78	28.53	59.18

June 2012 Average:	18.37
Historical June Average (1932-2011):	6.49
Historical 12-month Average (1932-2011):	54.56
Past 12-Month Total:	55.79
12-month Rainfall Surplus:	1.23

(Rainfall reported in inches)

Figure 1: Comparison of District Monthly Rainfall

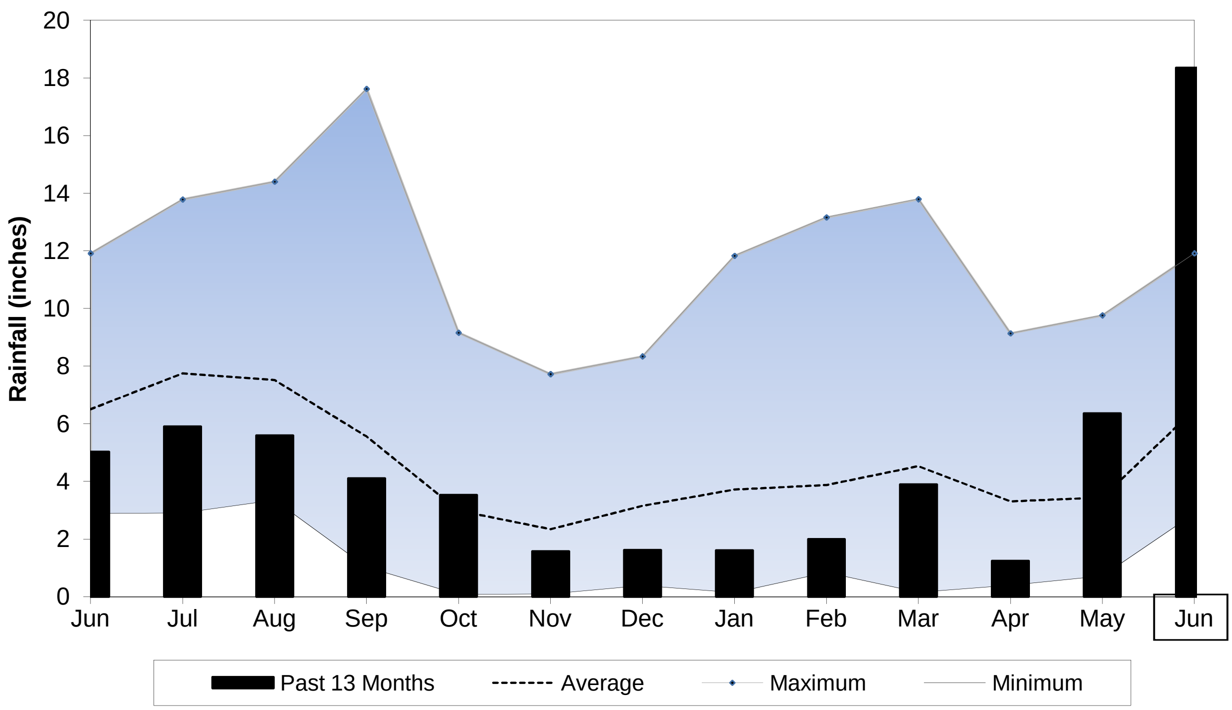


Figure 2: June 2012 Rainfall Estimate

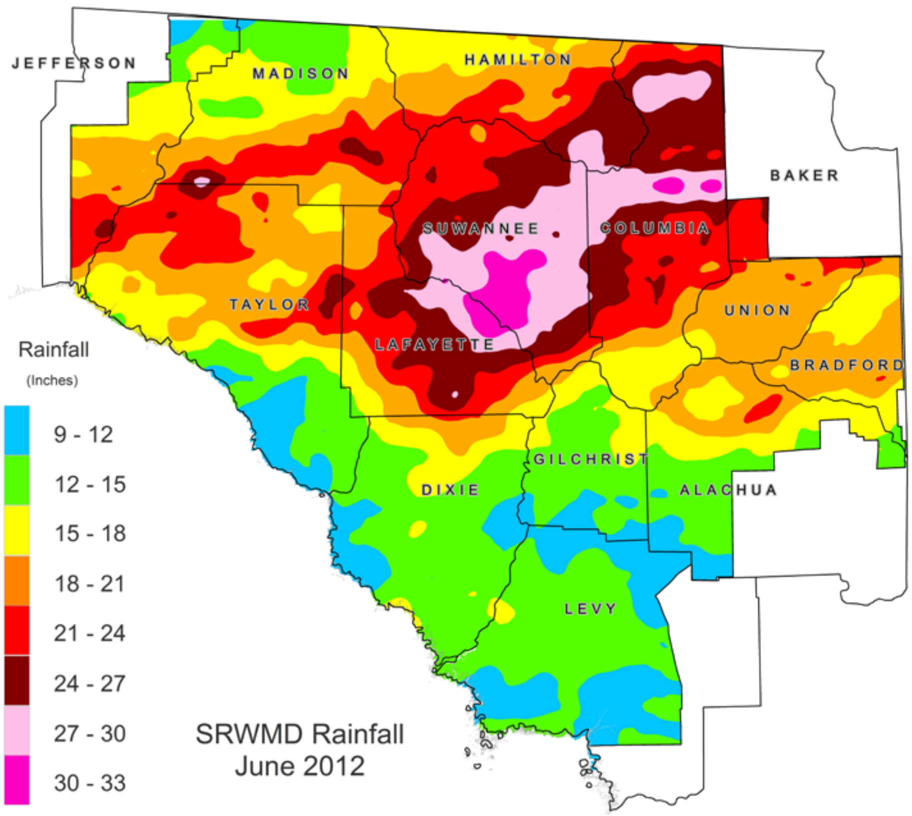


Figure 3: May 26 to June 30 Rainfall Estimate (Includes Tropical Storms Beryl and Debby)

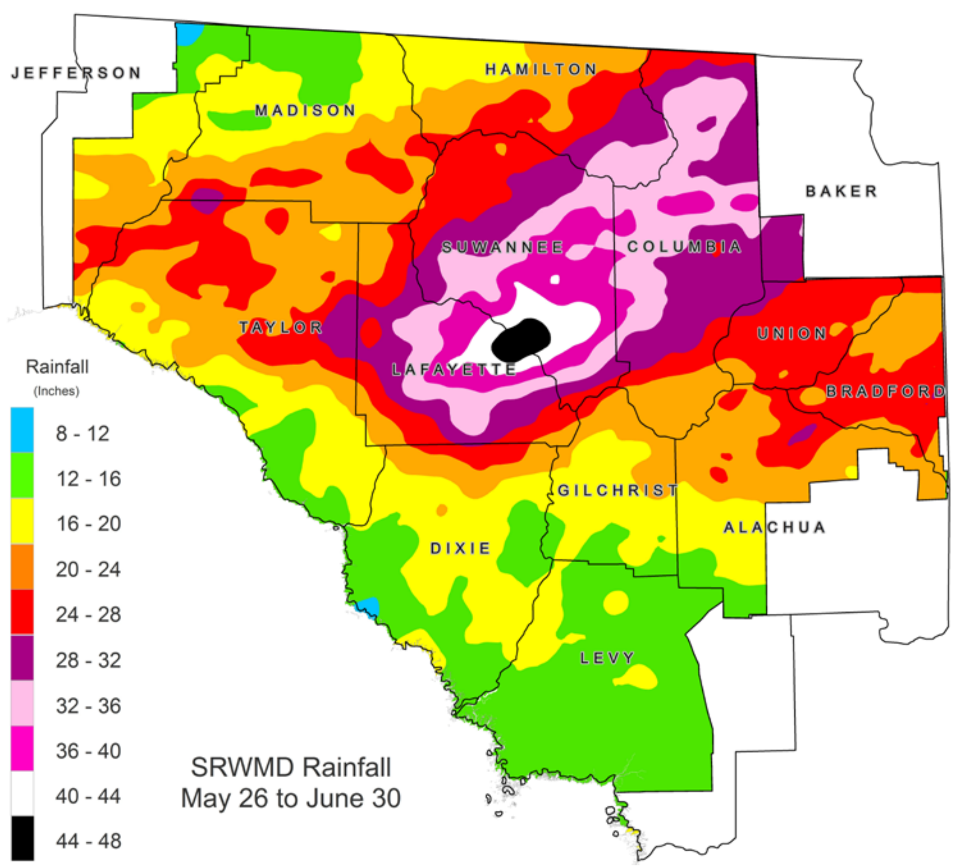


Figure 4: Rainfall Estimate Tropical Storm Debby June 24 - 26

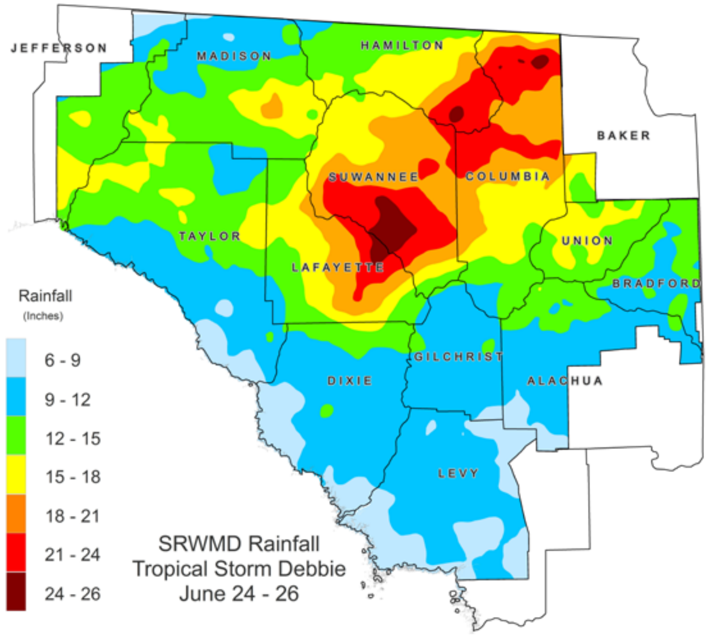


Figure 5: Tropical Storm Debby Rainfall Recurrence Interval (courtesy NOAA)

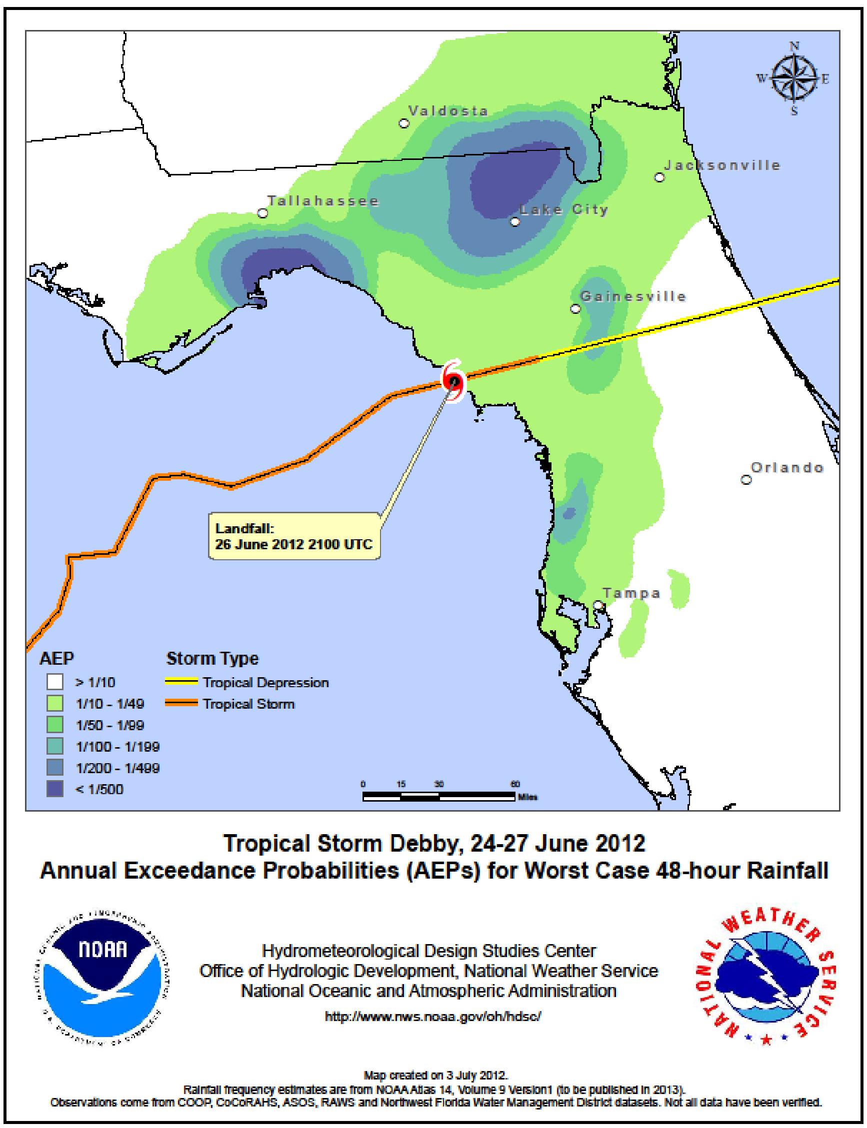


Figure 6: June 2012 Percent of Normal Rainfall

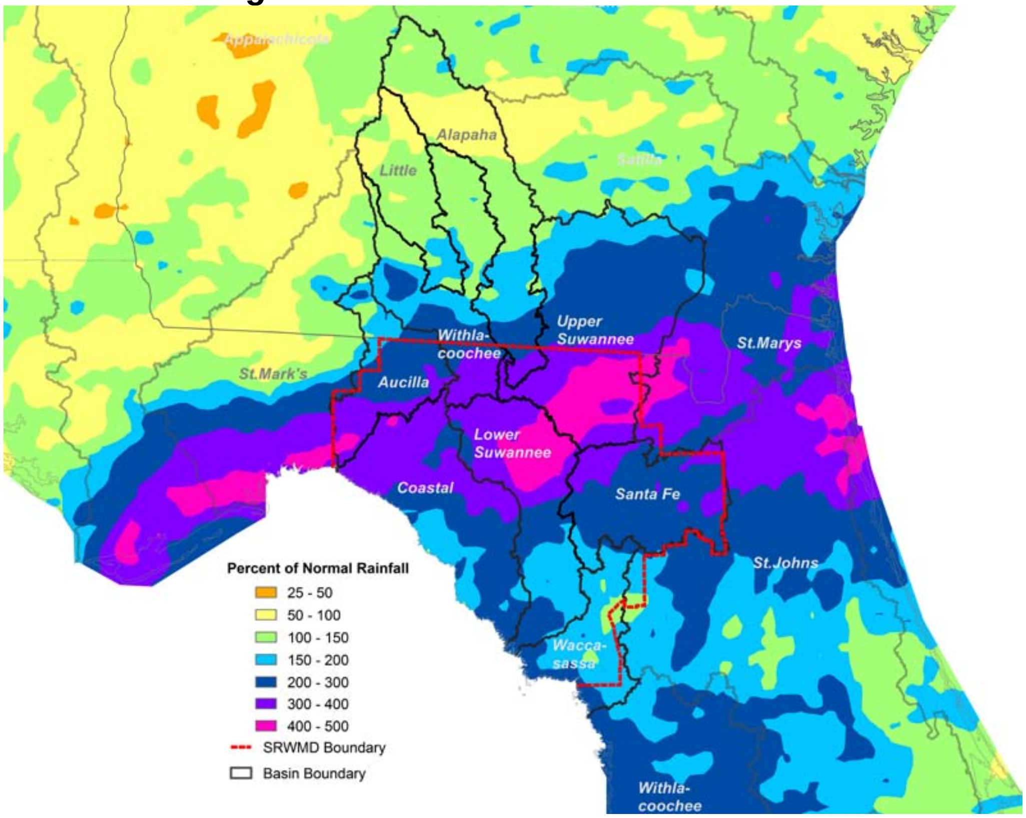


Figure 7: June 2012 12-Month Deficit by River Basin

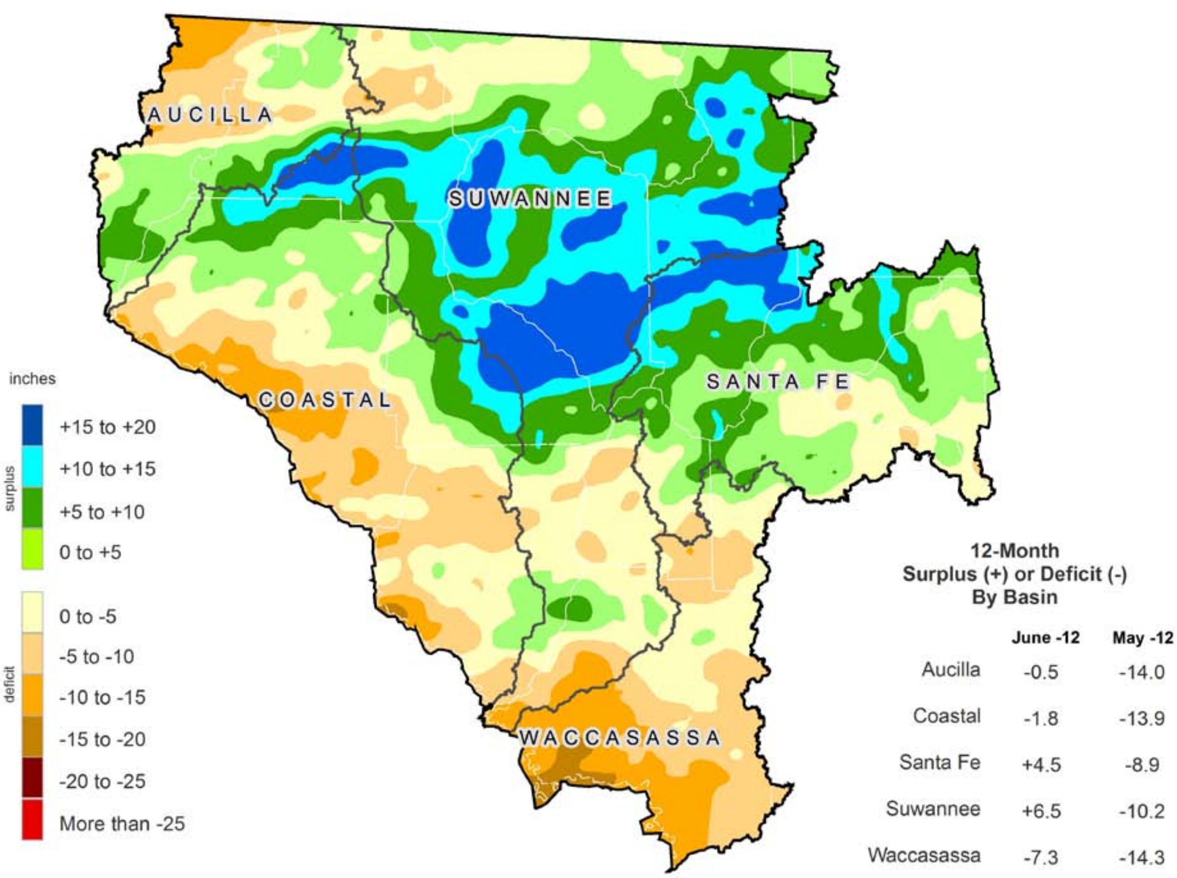
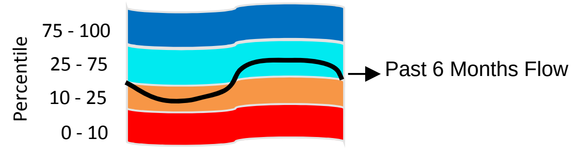


Figure 8: Daily River Flow Statistics

July 1, 2011 through July 5, 2012



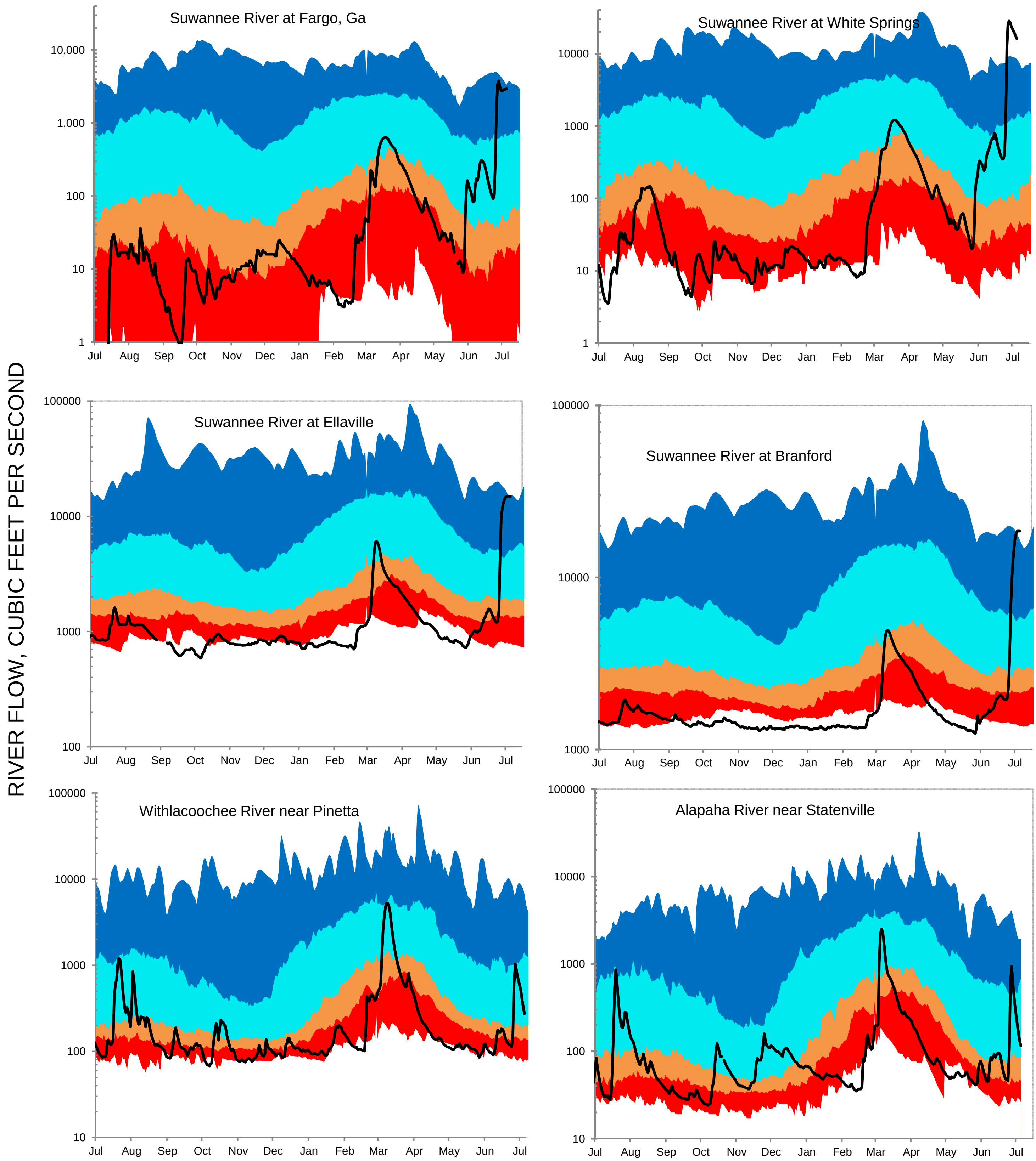
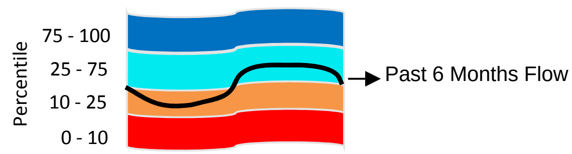


Figure 8, cont: Daily River Flow Statistics

July 1, 2011 through July 5, 2012



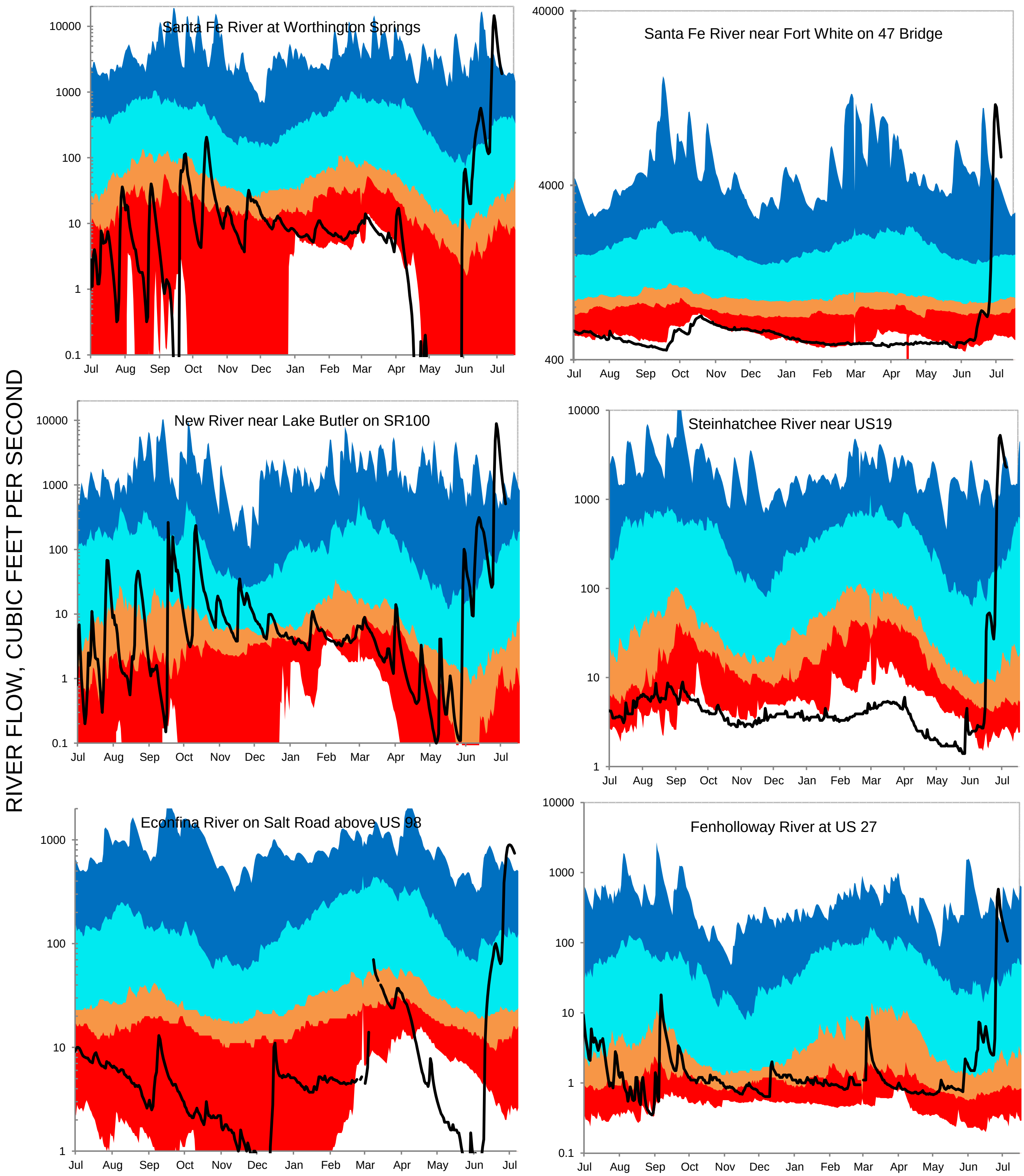
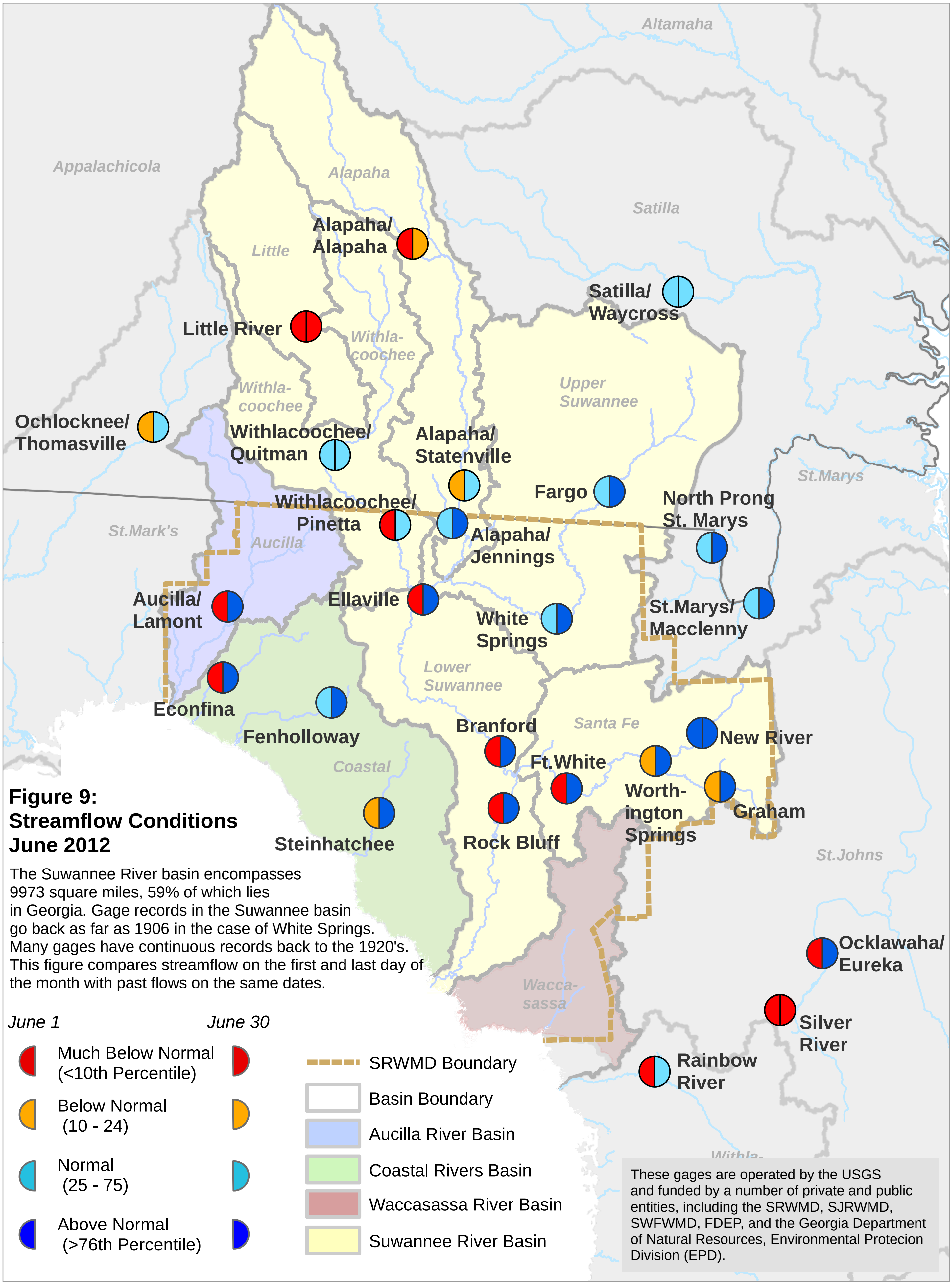


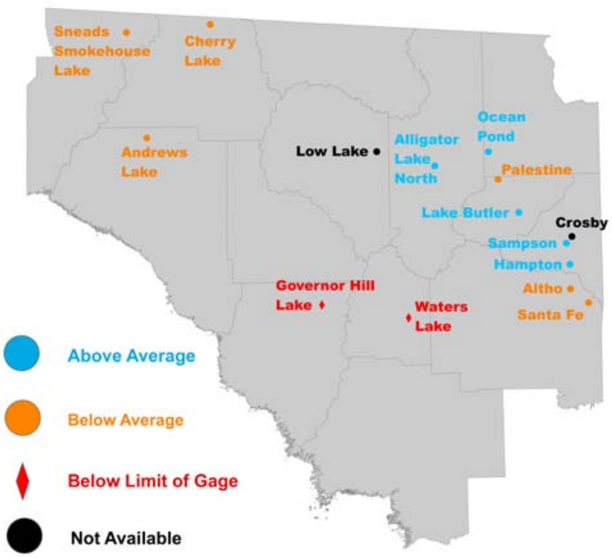
Figure 9: Streamflow Conditions June 2012

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.



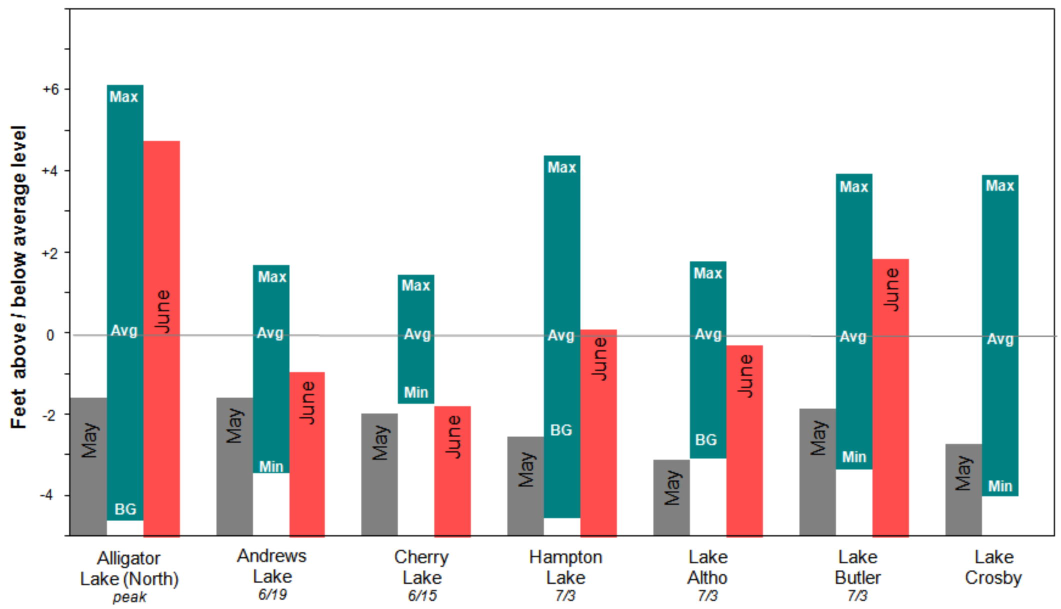
These gages are operated by the USGS and funded by a number of private and public entities, including the SRWMD, SJRWMD, SWFWMD, FDEP, and the Georgia Department of Natural Resources, Environmental Protecion Division (EPD).

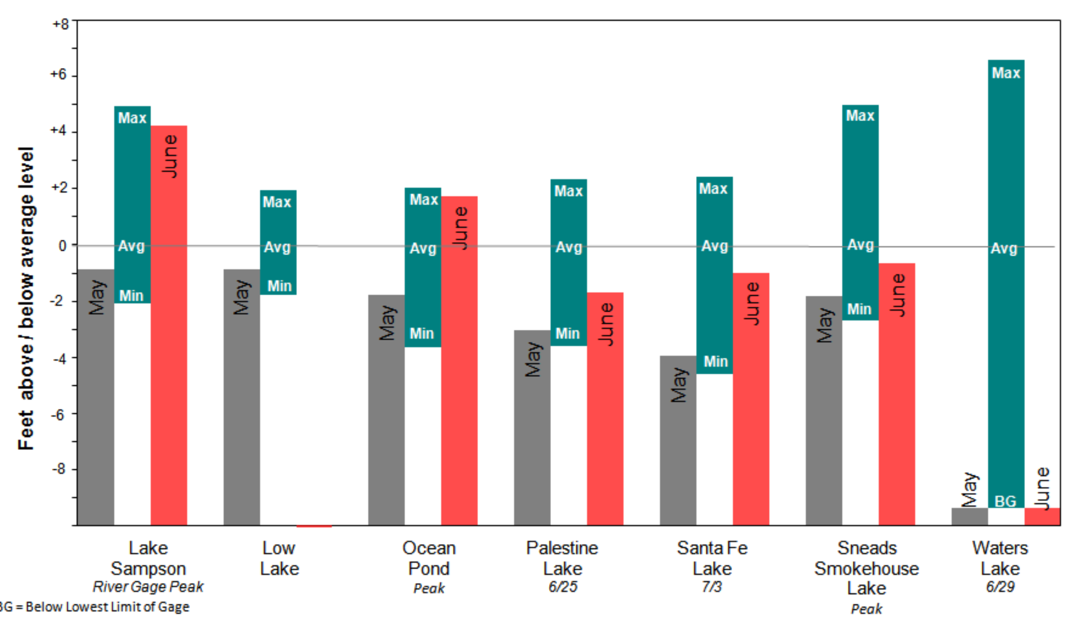
Figure 10: June 2012 Lake Levels



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 full. If aquifer levels are low, these lakes go dry even if rainfall is normal.

The District monitors 15 lakes with much of the data provided by volunteer observers. Most records go back to the 1970’s, although the Sampson Lake record starts in 1957.

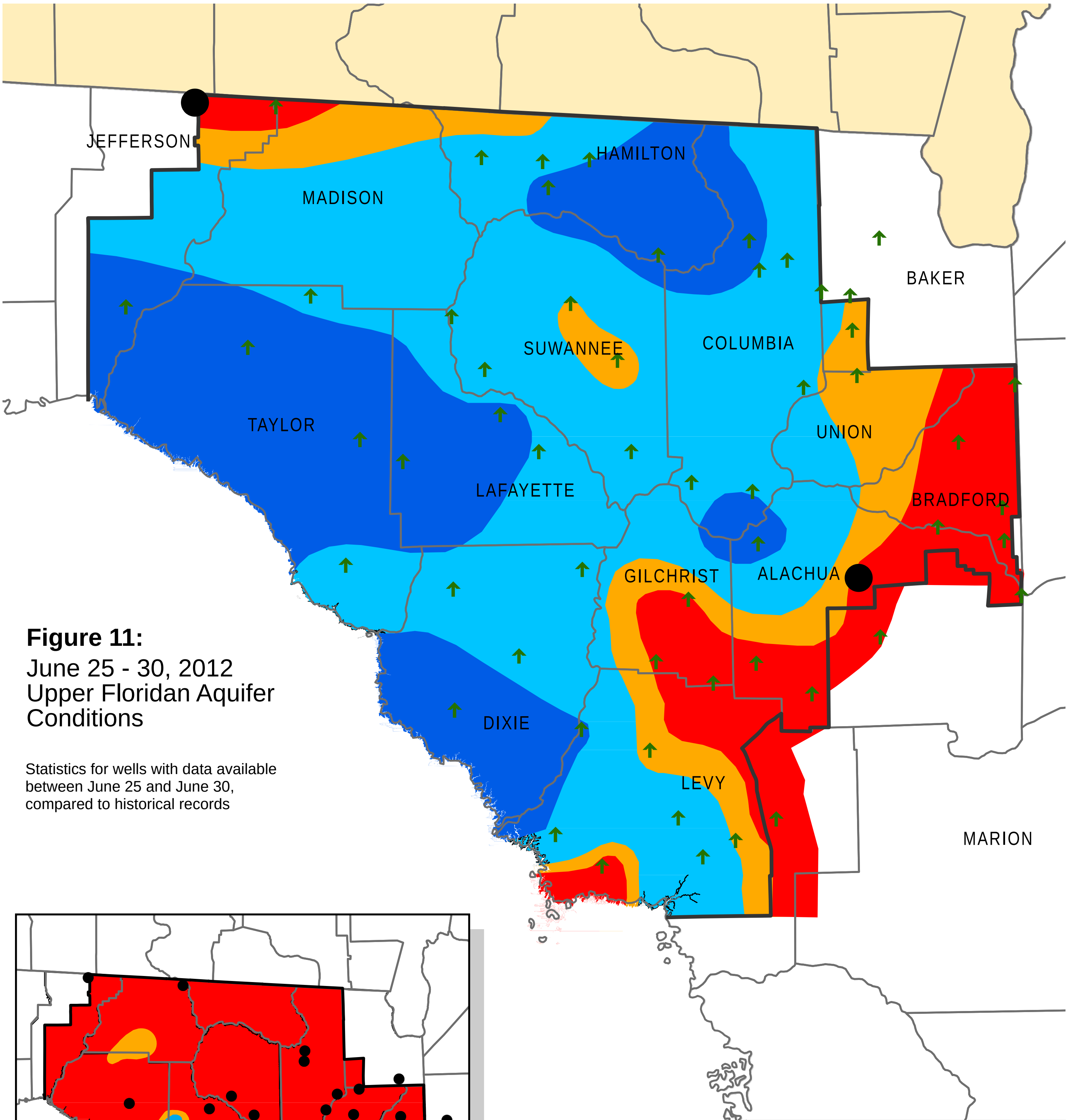


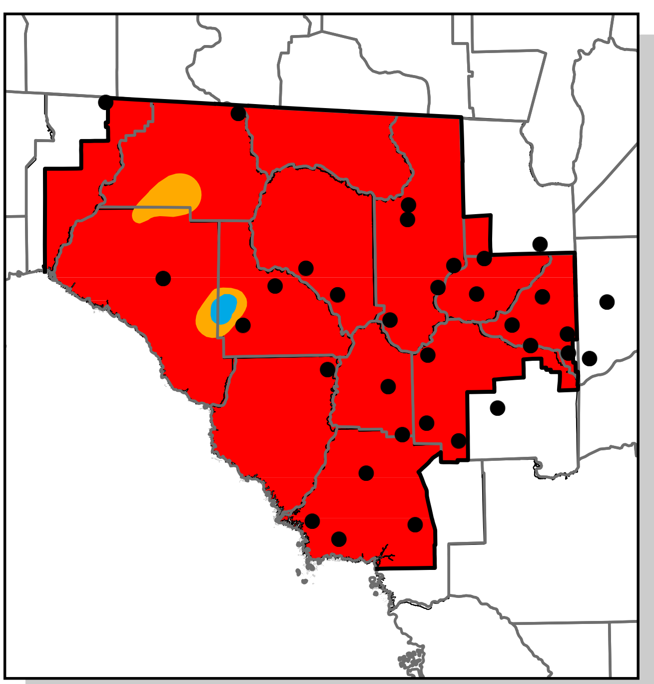


BG = Below Lowest Limit of Gage

Figure 11:
June 25 - 30, 2012
Upper Floridan Aquifer
Conditions

Statistics for wells with data available between June 25 and June 30, compared to historical records



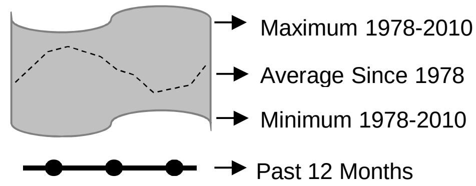


Inset: May 2012 Groundwater Levels

- 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
- District Boundary
- Historic Low

Figure 12: Monthly Groundwater Level Statistics

Levels July 1, 2011 through June 30, 2012
Period of Record Beginning 1978



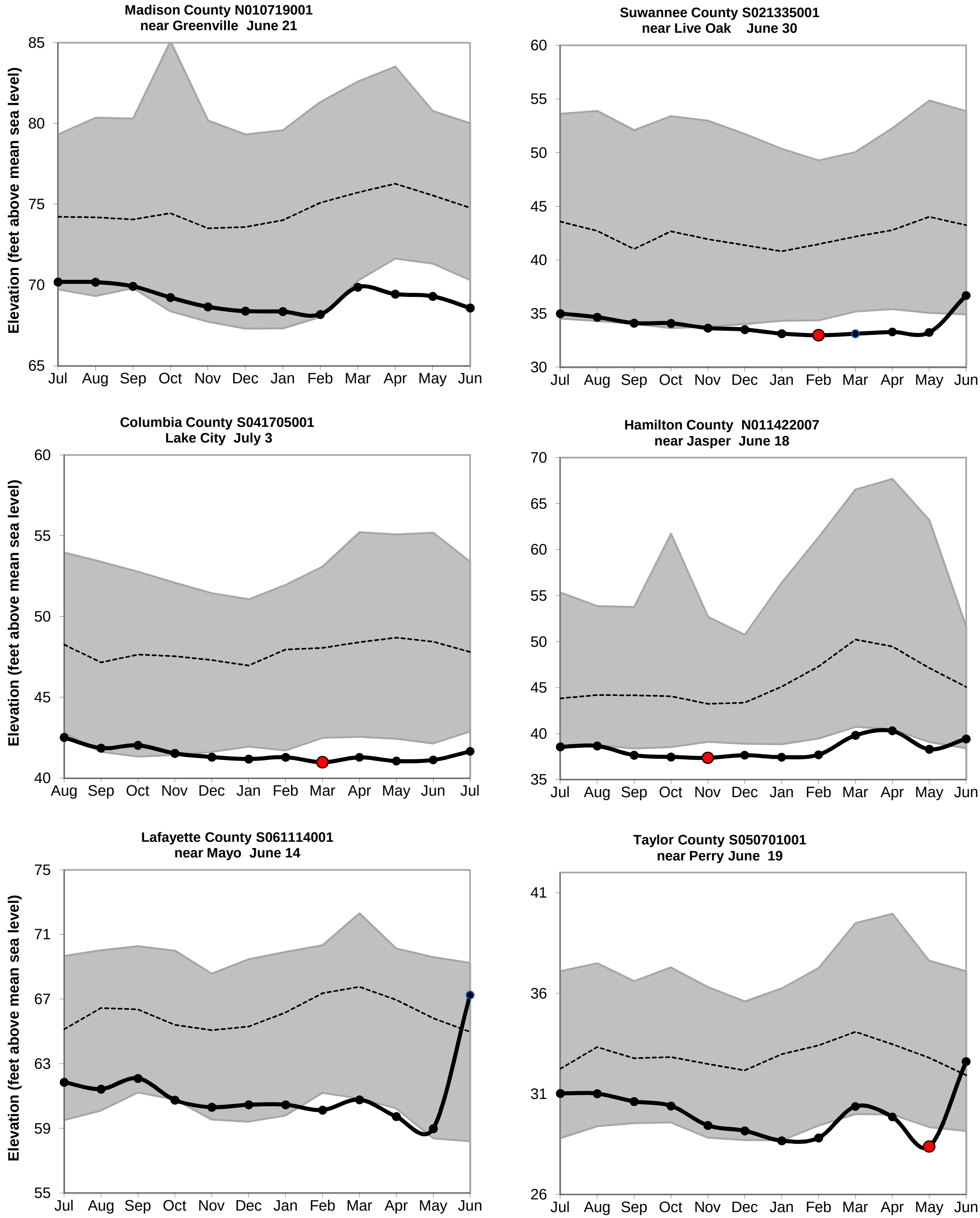
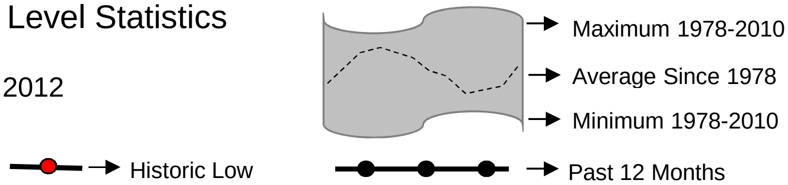
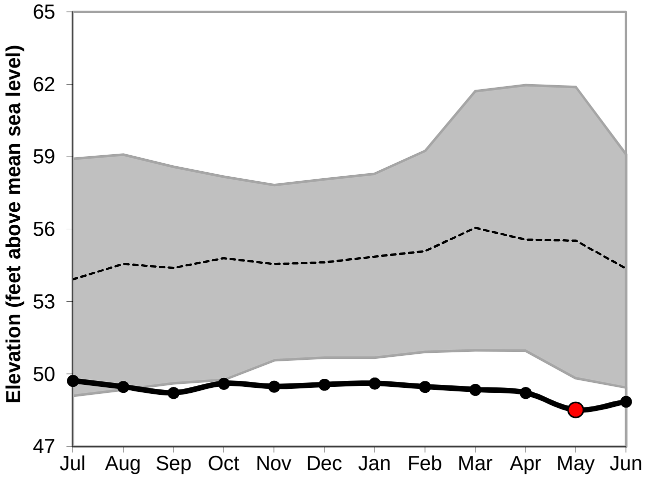


Figure 12, cont.: Groundwater Level Statistics

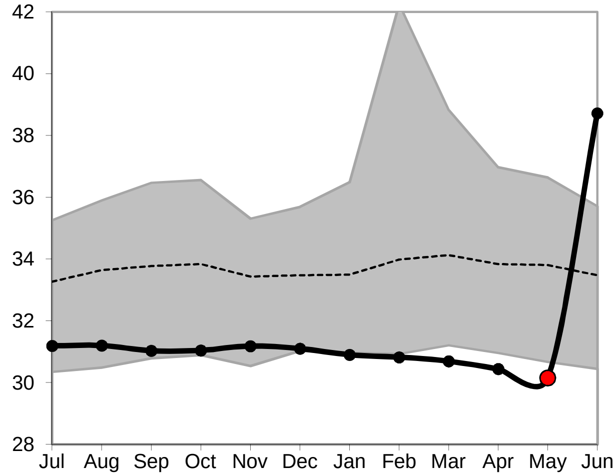
Levels July 1, 2011 through June 30, 2012
Period of Record Beginning 1978



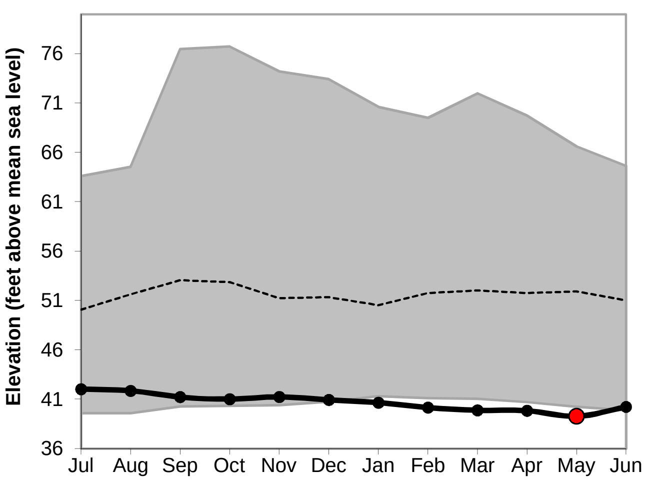
Union County S051933001
near Lake Butler June 14



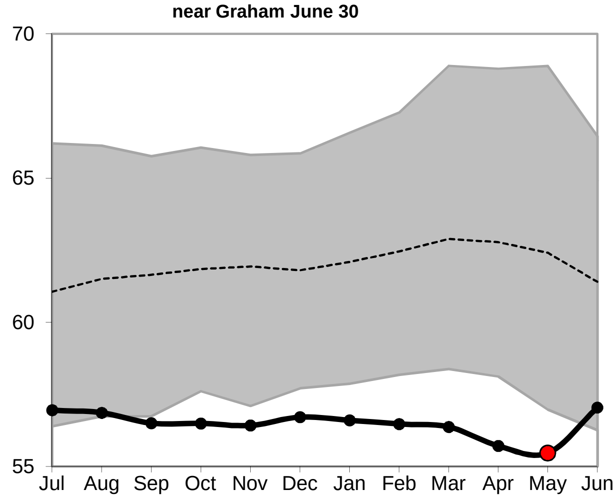
Alachua County S081703001
at High Springs June 30



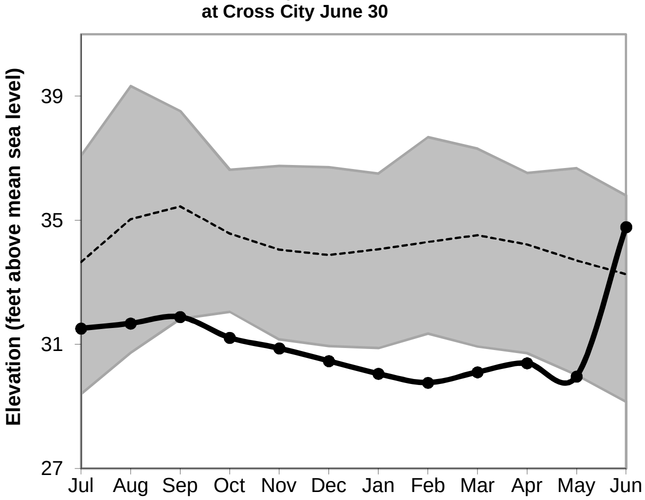
Gilchrist County S091607001
near Trenton June 30



Bradford County S072132001
near Graham June 30



Dixie County S101210001
at Cross City June 30



Levy County S131736001
near Bronson June 30

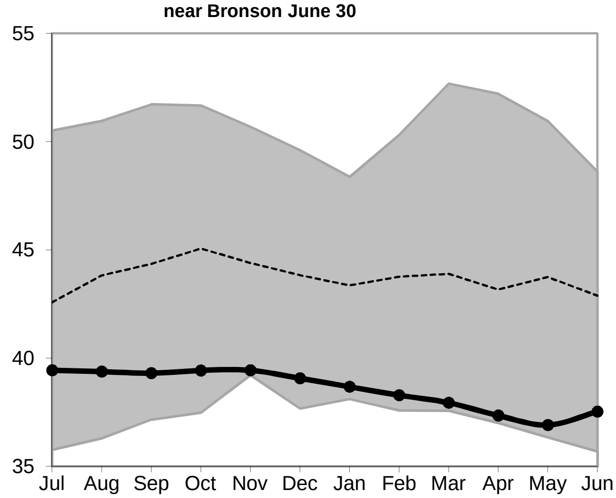


Figure 13: Agricultural Water Use

Daily evapotranspiration (loss of water by evaporation and plant transpiration) and irrigation based on usage reported by up to 106 overhead irrigation systems (12,250 acres total) on a variety of crops throughout the District. These units are part of a network of 190 units installed at 48 agricultural operations by permission of the owners. Evapotranspiration data courtesy of University of Florida IFAS Extension.